

Microsoft Fabric get started documentation

Microsoft Fabric is a unified platform that can meet your organization's data and analytics needs. Discover the Fabric shared and platform documentation from this page.

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What is Microsoft Fabric?

Article • 05/21/2024

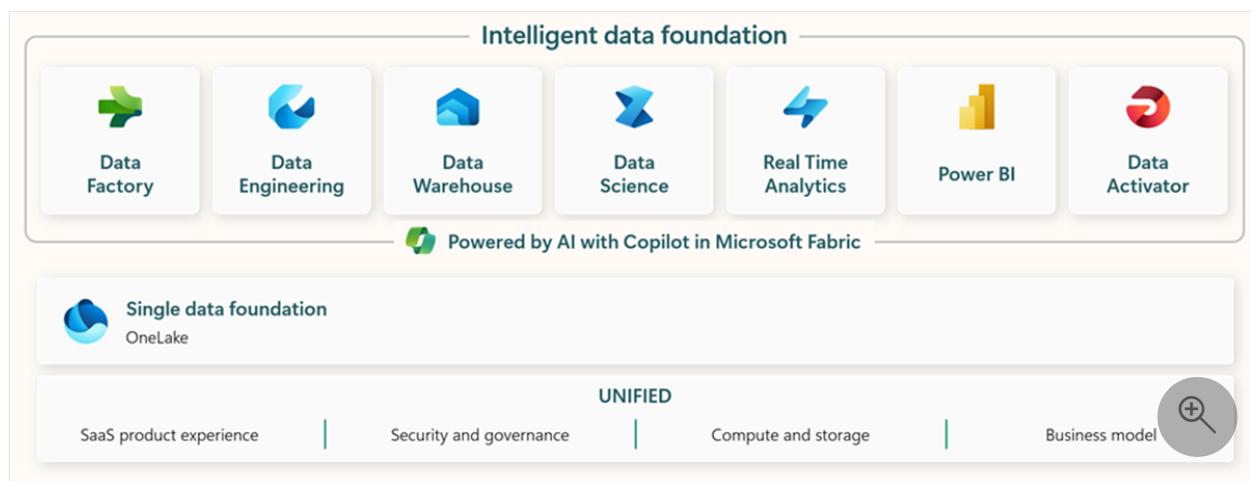
Microsoft Fabric is an end-to-end analytics and data platform designed for enterprises that require a unified solution. It encompasses data movement, processing, ingestion, transformation, real-time event routing, and report building. It offers a comprehensive suite of services including Data Engineering, Data Factory, Data Science, Real-Time Analytics, Data Warehouse, and Databases.

With Fabric, you don't need to assemble different services from multiple vendors. Instead, it offers a seamlessly integrated, user-friendly platform that simplifies your analytics requirements. Operating on a Software as a Service (SaaS) model, Fabric brings simplicity and integration to your solutions.

Microsoft Fabric integrates separate components into a cohesive stack. Instead of relying on different databases or data warehouses, you can centralize data storage with OneLake. AI capabilities are seamlessly embedded within Fabric, eliminating the need for manual integration. With Fabric, you can easily transition your raw data into actionable insights for business users.

Unification with SaaS foundation

Microsoft Fabric is built on a foundation of Software as a Service (SaaS). It combines both new and existing components from Power BI, Azure Synapse Analytics, Azure Data Factory, and more services into a unified environment. These components are then tailored into customized user experiences.



Fabric integrates workloads such as Data Engineering, Data Factory, Data Science, Data Warehouse, Real-Time Intelligence, Industry solutions, and Power BI into a shared SaaS foundation. Each of these experiences is tailored for distinct user roles like data

engineers, scientists, or warehousing professionals, and they serve a specific task. The entire Fabric stack has AI integration and it accelerates the data journey. These workloads work together seamlessly and provide the following advantages:

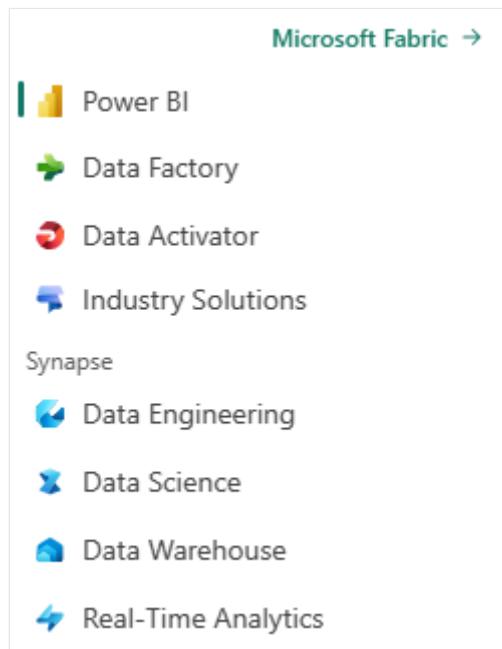
- Access to an extensive range of deeply integrated analytics in the industry.
- Shared experiences across experiences that are familiar and easy to learn.
- Easy access to, and readily reuse all assets.
- Unified data lake storage that preserves data in its original location while using your preferred analytics tools.
- Centralized administration and governance across all experiences.

Fabric seamlessly integrates data and services, enabling unified management, governance, and discovery. It ensures security for items, data, and row-level access. You can centrally configure core enterprise capabilities. Permissions are automatically applied across all the underlying services. Additionally, data sensitivity labels inherit automatically across the items in the suite. Governance is powered by Purview which is built into Fabric.

Fabric allows creators to concentrate on producing their best work, freeing them from the need to integrate, manage, or even understand the underlying infrastructure.

Components of Microsoft Fabric

Fabric offers a comprehensive set of analytics experiences designed to work together seamlessly. The platform tailors each of these experiences to a specific persona and a specific task:



- **Power BI** - Power BI lets you easily connect to your data sources, visualize and discover what's important, and share that with anyone or everyone you want. This integrated experience allows business owners to access all data in Fabric quickly and intuitively and to make better decisions with data. For more information, see [What is Power BI?](#)
- **Data Factory** - Data Factory provides a modern data integration experience to ingest, prepare, and transform data from a rich set of data sources. It incorporates the simplicity of Power Query, and you can use more than 200 native connectors to connect to data sources on-premises and in the cloud. For more information, see [What is Data Factory in Microsoft Fabric?](#)
- **Data Activator** - Data Activator is a no-code experience in Fabric that allows you to specify actions, such as email notifications and Power Automate workflows, to launch when Data Activator detects specific patterns or conditions in your changing data. It monitors data in Power BI reports and eventstreams; when the data hits certain thresholds or matches other patterns, it automatically takes the appropriate action. For more information, see [What is Data Activator?](#)
- **Industry Solutions** - Fabric provides industry-specific data solutions that address unique industry needs and challenges, and include data management, analytics, and decision-making. For more information, see [Industry Solutions in Microsoft Fabric](#).
- **Real-Time Intelligence** - Real-time Intelligence is an end-to-end solution for event-driven scenarios, streaming data, and data logs. It enables the extraction of insights, visualization, and action on data in motion by handling data ingestion, transformation, storage, analytics, visualization, tracking, AI, and real-time actions. The [Real-Time hub](#) in Real-Time Intelligence provides a wide variety of no-code connectors, converging into a catalog of organizational data that is protected, governed, and integrated across Fabric. For more information, see [What is Real-Time Intelligence in Fabric?](#).
- **Synapse Data Engineering** - Synapse Data Engineering provides a Spark platform with great authoring experiences. It enables you to create, manage, and optimize infrastructures for collecting, storing, processing, and analyzing vast data volumes. Fabric Spark's integration with Data Factory allows you to schedule and orchestrate notebooks and Spark jobs. For more information, see [What is Data engineering in Microsoft Fabric?](#)
- **Synapse Data Science** - Synapse Data Science enables you to build, deploy, and operationalize machine learning models from Fabric. It integrates with Azure Machine Learning to provide built-in experiment tracking and model registry. Data

scientists can enrich organizational data with predictions and business analysts can integrate those predictions into their BI reports, allowing a shift from descriptive to predictive insights. For more information, see [What is Data science in Microsoft Fabric?](#)

- **Synapse Data Warehouse** - Synapse Data Warehouse provides industry leading SQL performance and scale. It separates compute from storage, enabling independent scaling of both components. Additionally, it natively stores data in the open Delta Lake format. For more information, see [What is data warehousing in Microsoft Fabric?](#)

Microsoft Fabric enables organizations and individuals to turn large and complex data repositories into actionable workloads and analytics, and is an implementation of data mesh architecture. For more information, see [What is a data mesh?](#)

OneLake: The unification of lakehouses

The Microsoft Fabric platform unifies the OneLake and lakehouse architecture across an enterprise.

OneLake

A data lake is the foundation on which all the Fabric workloads are built. Microsoft Fabric Lake is also known as [OneLake](#). OneLake is built into the Fabric platform and provides a unified location to store all organizational data where the workloads operate.

OneLake is built on ADLS (Azure Data Lake Storage) Gen2. It provides a single SaaS experience and a tenant-wide store for data that serves both professional and citizen developers. OneLake simplifies Fabric experiences by eliminating the need for you to understand infrastructure concepts such as resource groups, RBAC (Role-Based Access Control), Azure Resource Manager, redundancy, or regions. You don't need an Azure account to use Fabric.

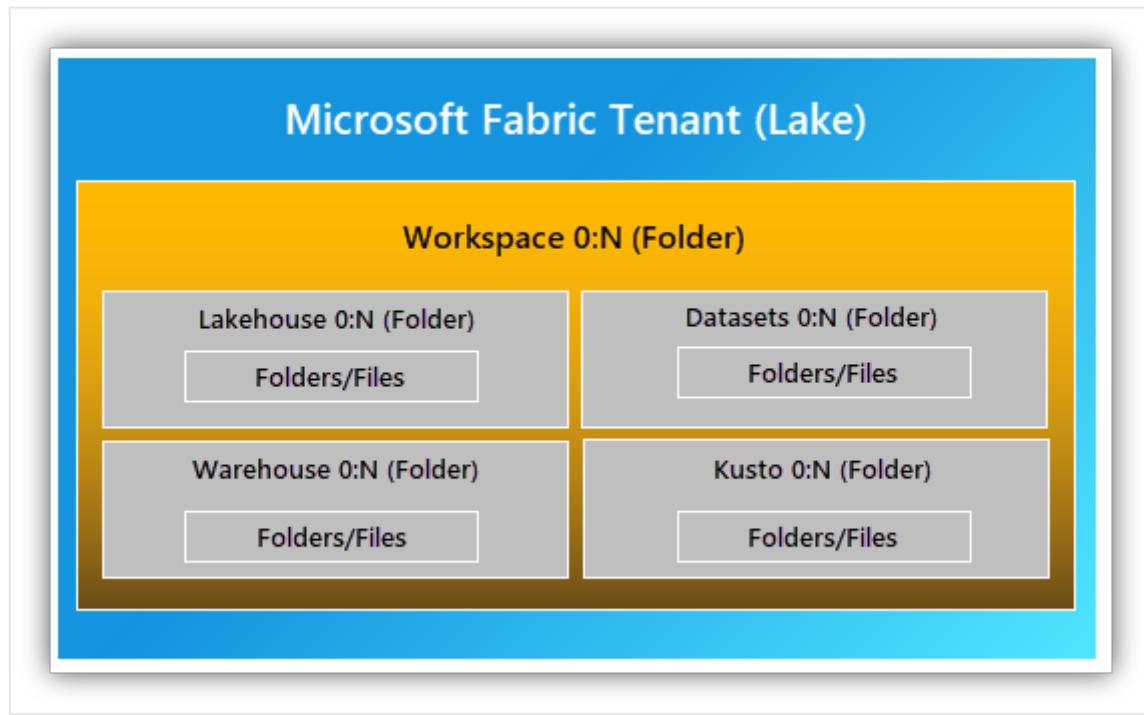
OneLake eliminates data silos, which individual developers often create when they provision and configure their own isolated storage accounts. Instead, OneLake provides a single, unified storage system for all developers. It ensures easy data discovery, sharing, and uniform enforcement of policy and security settings. For more information, see [What is OneLake?](#)

OneLake and lakehouse data hierarchy

OneLake is hierarchical in nature to simplify management across your organization. Microsoft Fabric includes OneLake and there's no requirement for any up-front provisioning. There's only one OneLake per tenant and it provides a single-pane-of-glass file-system namespace that spans across users, regions, and clouds. OneLake organizes data into manageable containers for easy handling.

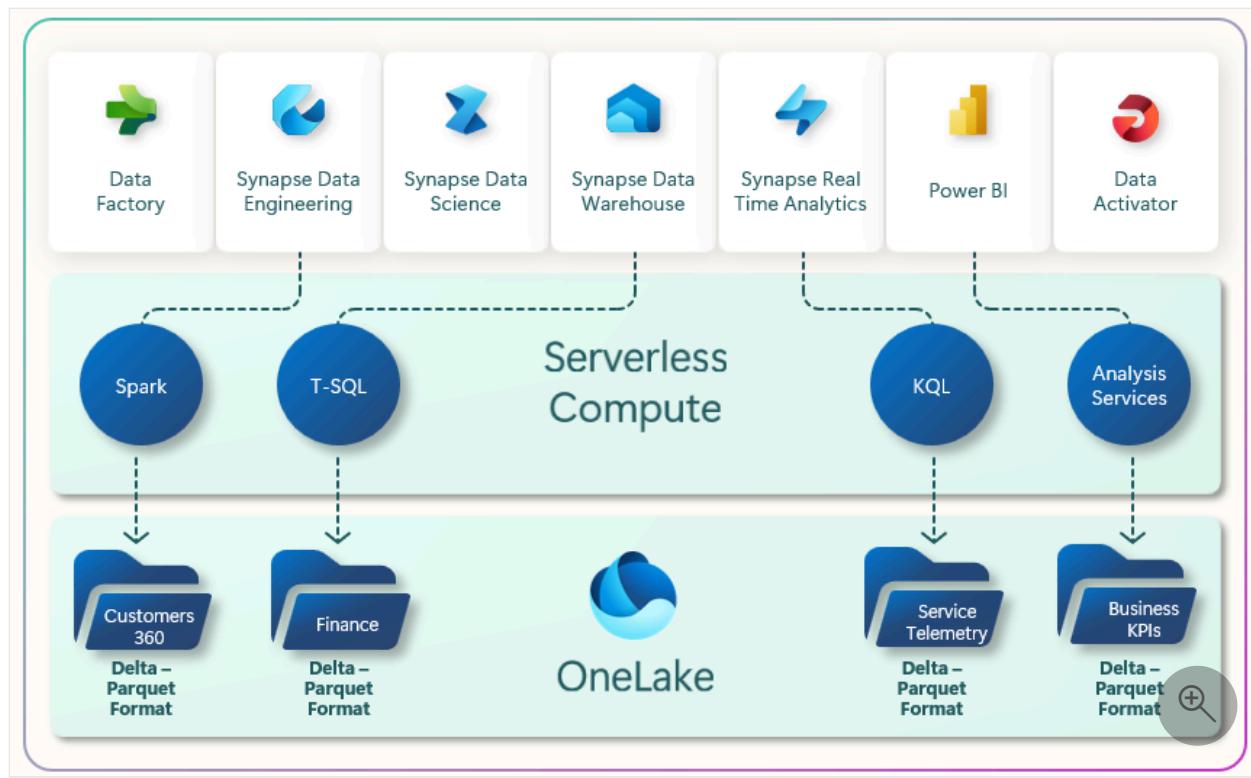
The tenant maps to the root of OneLake and is at the top level of the hierarchy. You can create any number of workspaces, which you can think of as folders, within a tenant.

The following image shows how Fabric stores data in various items within OneLake. As shown, you can create multiple workspaces within a tenant, and create multiple lakehouses within each workspace. A lakehouse is a collection of files, folders, and tables that represents a database over a data lake. To learn more, see [What is a lakehouse?](#).



Every developer and business unit in the tenant can easily create their own workspaces in OneLake. They can ingest data into their own lakehouses, then start processing, analyzing, and collaborating on the data, just like OneDrive in Microsoft Office.

All the Microsoft Fabric compute experiences are prewired to OneLake, just like the Office applications are prewired to use the organizational OneDrive. The experiences such as Data Engineering, Data Warehouse, Data Factory, Power BI, and Real-Time Intelligence use OneLake as their native store. They don't need any extra configuration.



OneLake allows instant mounting of your existing Platform as a Service (PaaS) storage accounts into OneLake with the [Shortcut](#) feature. You don't need to migrate or move any of your existing data. Using shortcuts, you can access the data stored in your Azure Data Lake Storage.

Shortcuts also allow you to easily share data between users and applications without moving or duplicating information. You can create shortcuts to other storage systems, allowing you to compose and analyze data across clouds with transparent, intelligent caching that reduces egress costs and brings data closer to compute.

Real-Time hub - the unification of data streams

The Real-Time hub is a foundational location for data in motion.

The Real-Time hub provides a unified SaaS experience and tenant-wide logical place for all data-in-motion. The Real-Time hub lists all data in motion from all sources that customers can discover, ingest, manage, and consume and react upon, and contains both [streams](#) and [KQL database](#) tables. Streams includes [Data streams](#), [Microsoft sources](#) (for example, [Azure Event Hubs](#), [Azure IoT Hub](#), [Azure SQL DB Change Data Capture \(CDC\)](#), [Azure Cosmos DB CDC](#), and [PostgreSQL DB CDC](#)), and [Fabric events](#) (Fabric system events and external system events brought in from Azure, Microsoft 365, or other clouds).

The Real-Time hub enables users to easily discover, ingest, manage, and consume data-in-motion from a wide variety of source so that they can collaborate and develop

streaming applications within one place. For more information, see [What is the Real-Time hub?](#)

Fabric solutions for ISVs

If you're an Independent Software Vendors (ISVs) looking to integrate your solutions with Microsoft Fabric, you can use one of the following paths based on your desired level of integration:

- **Interop** - Integrate your solution with the OneLake Foundation and establish basic connections and interoperability with Fabric.
- **Develop on Fabric** - Build your solution on top of the Fabric platform or seamlessly embed Fabric's functionalities into your existing applications. You can easily use Fabric capabilities with this option.
- **Build a Fabric workload** - Create customized workloads and experiences in Fabric tailoring your offerings to maximize their impact within the Fabric ecosystem.

For more information, see the [Fabric ISV partner ecosystem](#).

Related content

- [Microsoft Fabric terminology](#)
- [Create a workspace](#)
- [Navigate to your items from Microsoft Fabric Home page](#)
- [End-to-end tutorials in Microsoft Fabric](#)

Feedback

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Microsoft Fabric trial capacity

Article • 09/23/2024

Microsoft Fabric is provided free of charge when you sign up for a Microsoft Fabric trial capacity. Your use of the Microsoft Fabric trial capacity includes access to the Fabric product workloads and the resources to create and host Fabric items. The Fabric trial lasts for 60 days.

ⓘ Note

If you're ready to purchase Fabric, visit the [Purchase Fabric page](#).

With one trial of a Fabric capacity, you get the following features:

- Full access to all of the Fabric workloads and features. There are a few key Fabric [features that aren't available on trial capacities](#).
- OneLake storage up to 1 TB.
- A license similar to Premium Per User (PPU)
- One capacity per trial. Other Fabric capacity trials can be started until a maximum, set by Microsoft, is met.
- The ability for users to create Fabric items and collaborate with others in the Fabric trial capacity.

Creating and collaborating in Fabric includes:

- Creating [Workspaces](#) (folders) for projects that support Fabric capabilities.
- Sharing Fabric items, such as semantic models, warehouses, and notebooks, and collaborating on them with other Fabric users.
- Creating analytics solutions using Fabric items.

About the trial capacity

When you start a trial of a Fabric capacity, your trial [capacity](#) has 64 capacity units (CU). You get the equivalent of an F64 capacity but there are a few key features that aren't available on trial capacities. These features include:

- [Copilot](#)
- [Trusted workspace access](#)
- [Managed private endpoints ↗](#)

About the trial license

Although you don't actually receive a new license, the actions that you can perform and the features that you can use are similar to [Premium Per User](#) during the trial. When you share your workspace that's in trial capacity, the permissions of workspace users are also upgraded. Your Account manager still displays your nontrial license. But in order to make full use of Fabric, your trial includes the equivalent of a Premium Per User (PPU) license.

Use your trial

To begin using your trial of a Fabric capacity, add items to [My workspace](#) or create a new workspace. Assign that workspace to your trial capacity [using the *Trial license mode*](#), and then all the items in that workspace are saved and executed in that capacity. Invite colleagues to those workspaces so they can share the trial experience with you.

Existing Power BI users

If you're an existing Power BI user, you can skip to [Start the Fabric trial](#). If you're already enrolled in a Power BI trial, you don't see the option to [Start trial](#) or [Free trial](#) in your Account manager.

Users who are new to Power BI

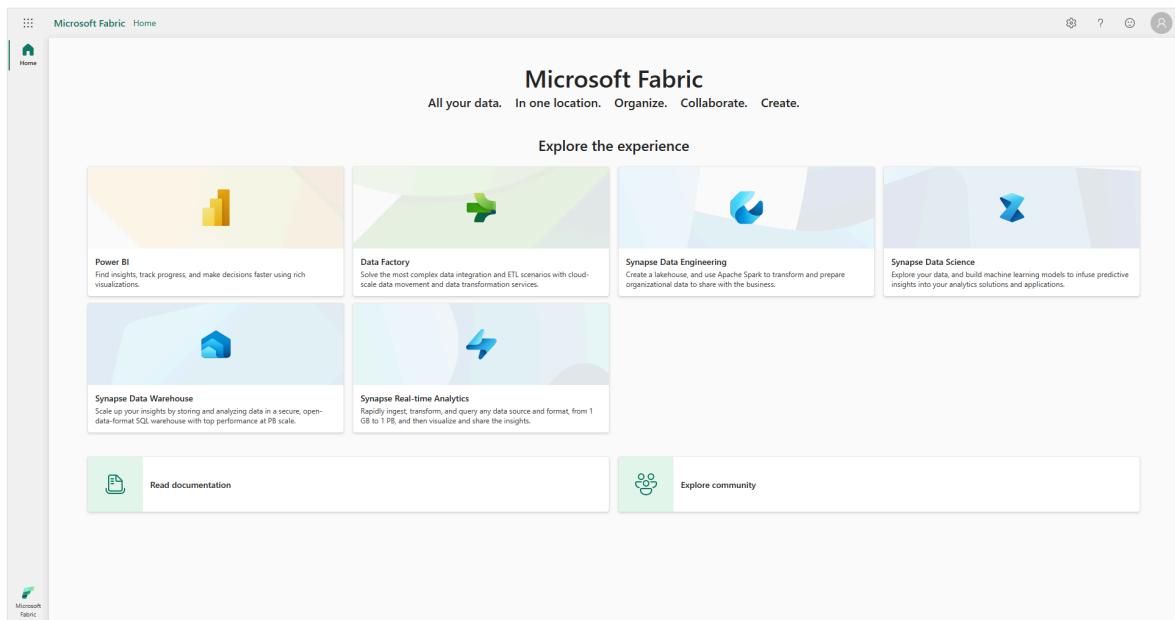
The Fabric trial requires a per-user Power BI license. Navigate to <https://app.fabric.microsoft.com> to sign up for a Fabric (Free) license. Once you have the free license, you can [begin participating in the Fabric capacity trial](#).

You may already have a license and not realize it. For example, some versions of Microsoft 365 include a Fabric (Free) or Power BI Pro license. Open Fabric (app.fabric.microsoft.com) and select your Account manager to see if you already have a license, and which license it is. Read on to see how to open your Account manager.

Start the Fabric capacity trial

Follow these steps to start your Fabric capacity trial.

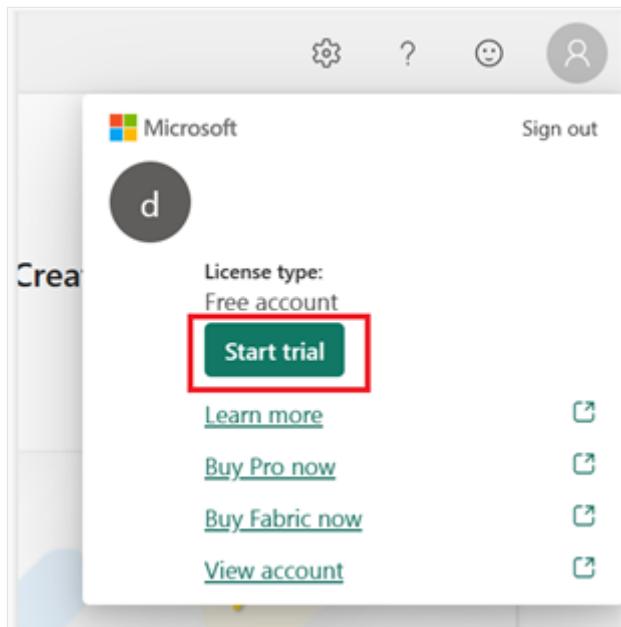
1. Open the [Fabric homepage](#) and select the Account manager.



2. In the Account manager, select **Free trial**. If you don't see **Free trial** or **Start trial** or a **Trial status**, trials might be disabled for your tenant.

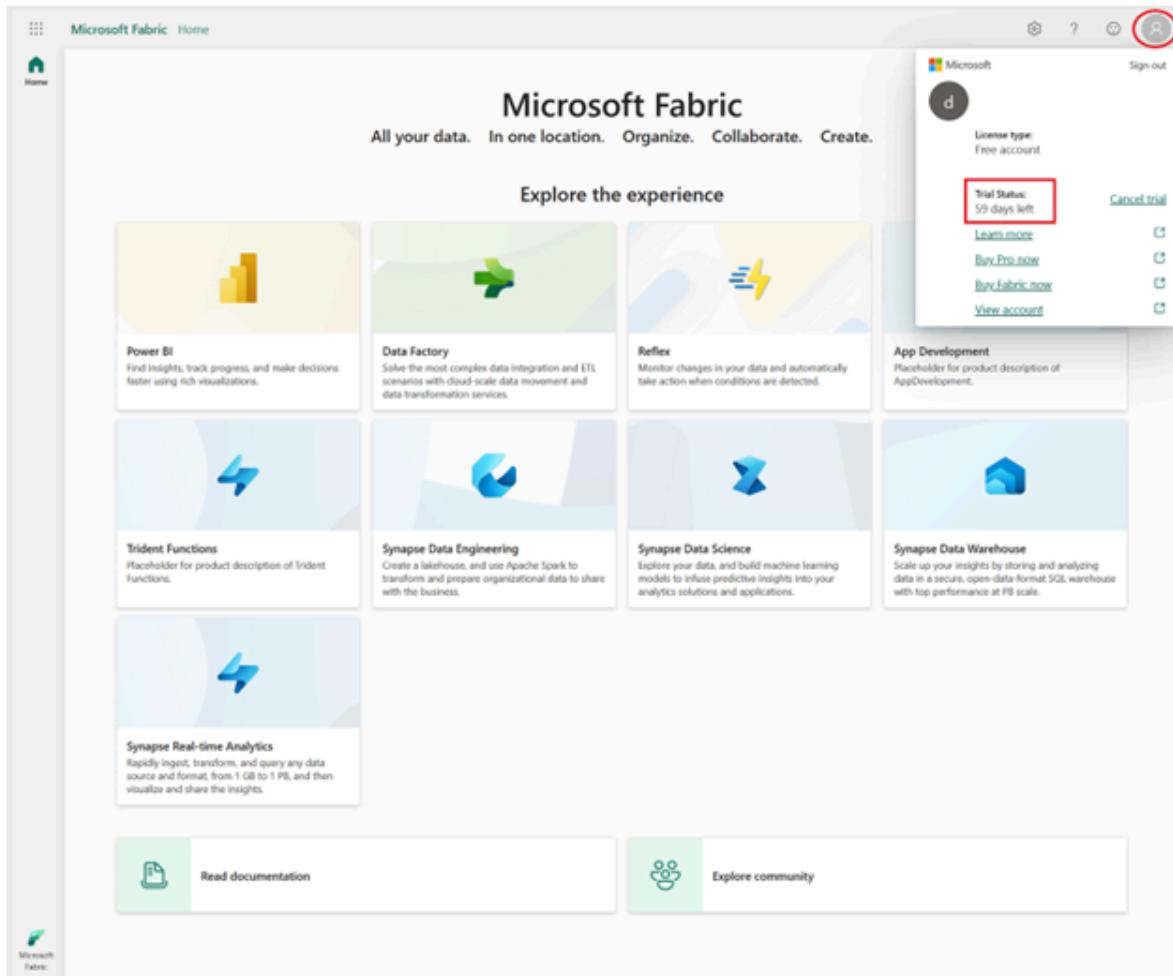
! Note

If the Account manager already displays **Trial status**, you may already have a **Power BI trial** or a **Fabric (Free)** trial in progress. To test this out, attempt to use a Fabric feature. For more information, see [Start using Fabric](#).



3. If prompted, agree to the terms and then select **Start trial**.
4. Once your trial capacity is ready, you receive a confirmation message. Select **Got it** to begin working in Fabric. You're now the Capacity administrator for that trial capacity. To learn how to share your trial capacity using workspaces, see [Share trial capacities](#)

5. Open your Account manager again. Notice the heading for **Trial status**. Your Account manager keeps track of the number of days remaining in your trial. You also see the countdown in your Fabric menu bar when you work in a product workload.



Congratulations. You now have a Fabric trial capacity that includes a Power BI individual trial (if you didn't already have a Power BI *paid* license) and a Fabric trial capacity. To share your capacity, see [Share trial capacities](#).

Other ways to start a Microsoft Fabric trial

In some situations, your Fabric administrator [enables Microsoft Fabric for the tenant](#) but you don't have access to a capacity that has Fabric enabled. You have another option for enabling a Fabric capacity trial. When you try to create a Fabric item in a workspace that you own (such as **My Workspace**) and that workspace doesn't support Fabric items, you receive a prompt to start a trial of a Fabric capacity. If you agree, your trial starts and your **My workspace** is upgraded to a trial capacity workspace. You're the Capacity administrator and can add workspaces to the trial capacity.

Share trial capacities

Each standard Fabric trial includes 64 capacity units. The person who starts the trial becomes the Capacity administrator for only that trial capacity. And that Capacity administrator can share the trial by assigning workspaces to that specific trial capacity.

Other users on the same tenant can also start a Fabric trial and become the Capacity administrator for their trial capacity. Microsoft sets a limit on the number of trial capacities that can be created on a single tenant. So sharing workspaces in trial capacities is essential to allow your colleagues to participate in the Fabric capacity trial. Hundreds of customers can use each Fabric trial capacity.

The Capacity administrator can assign the trial capacity to multiple workspaces. Anyone with access to one of those workspaces is now also participating in the Fabric capacity trial.

If you're the Capacity administrator, assign workspaces to the trial capacity two different ways.

- **Use the Admin center Capacity settings.** All users with access to those workspaces are now able to use that trial capacity. The Fabric administrator can edit **Capacity settings** as well.

Admin portal

Capacity settings Refresh summary

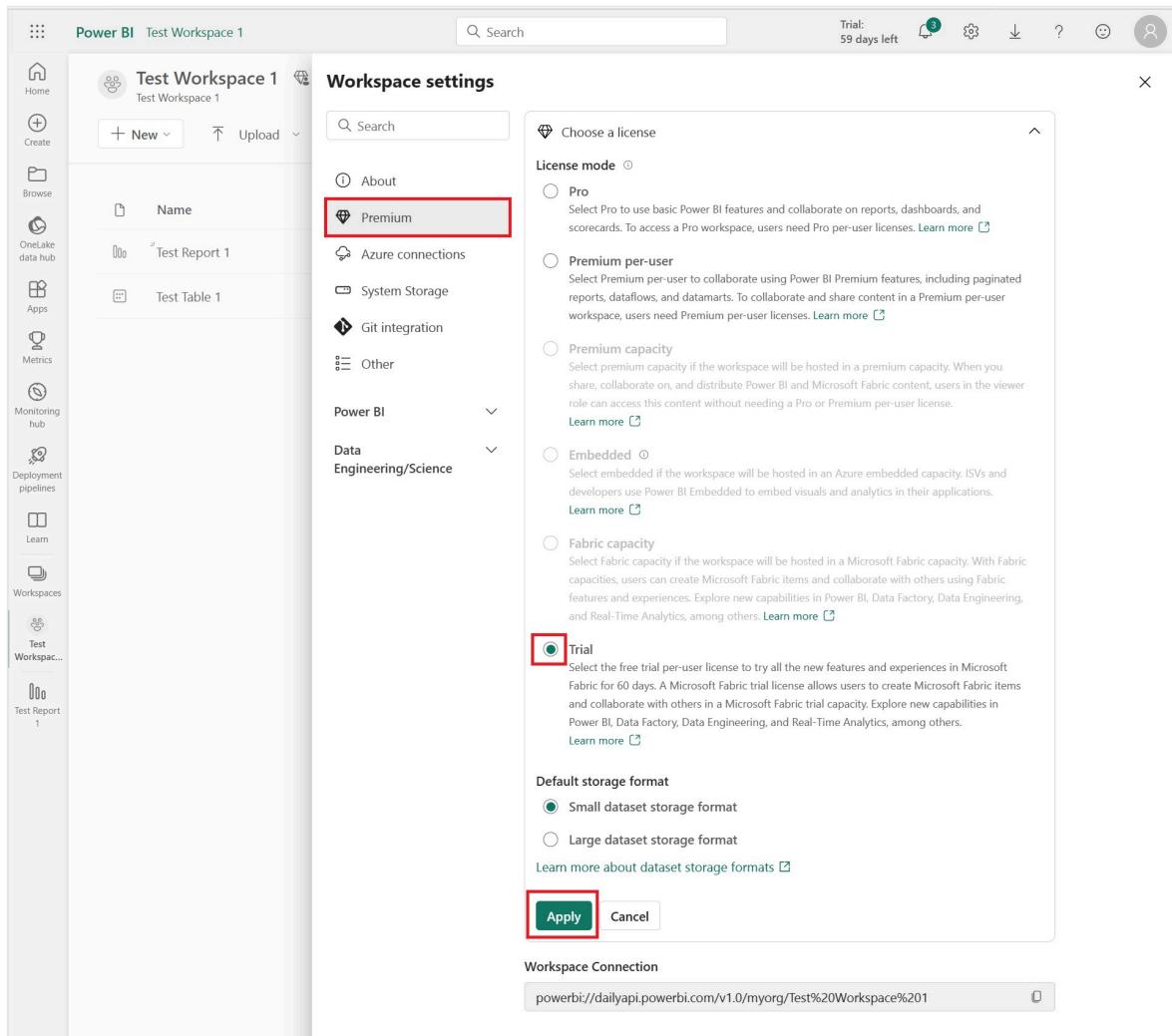
Platform updates on October 1, 2023 require an update to the Capacity Metrics app. Please visit [here](#) to learn more. X

Power BI Premium Power BI Embedded Trial Fabric Capacity

Fabric trial capacity expiration Your non-Power BI items will be permanently deleted 7 days after expiration. [Learn more](#)

CAPACITY NAME	CAPACITY ADMINS	ACTIONS	CAPACITY UNITS	REGION	STATUS
Trial-20240408T040612Z-ca_Qlmy...	Alex	⚙️	64	West Central US	Active

- **Use Workspace settings.**



If the Fabric tenant switch is enabled, users in that tenant can view, consume, and add Fabric content. If the Fabric tenant switch is disabled, users in that tenant can only view and consume Fabric content. For more information, see [Fabric tenant setting](#).

Look up the Fabric tenant switch setting

If you're a Capacity administrator or a tenant admin, you can view, verify, or change the Fabric switch. If you need help, [contact the Capacity administrator directly](#).

Admin portal

Tenant settings New

- Usage metrics
- Users
- Premium Per User
- Audit logs
- Domains New
- Capacity settings
- Refresh summary
- Embed Codes
- Organizational visuals
- Azure connections
- Workspaces
- Custom branding
- Protection metrics

Microsoft Fabric

- Data Activator (preview)
Enabled for the entire organization
- Users can create Fabric items
Enabled for the entire organization

Users can use production-ready features to create Fabric items. Turning off this setting doesn't impact users' ability to create Power BI items. This setting can be managed at both the tenant and the capacity levels. [Learn More](#)

Enabled

Apply to:

- The entire organization
- Specific security groups
- Except specific security groups

Look up the trial Capacity administrator

Contact your Capacity administrator to request access to a trial capacity or to check whether your organization has the Fabric tenant setting enabled. Ask your Fabric administrator to use the Admin portal to look up your Capacity administrator.

If you're the capacity or Fabric administrator, from the upper right corner of Fabric, select the gear icon. Select **Admin portal**. For a Fabric trial, select **Capacity settings** and then choose the **Trial** tab.

Tenant settings New

- Usage metrics
- Users
- Premium Per User
- Audit logs
- Domains New
- Capacity settings
- Refresh summary

Power BI Premium Power BI Embedded Trial Fabric Capacity

[Learn more about Trial capacities](#)

CAPACITY NAME	CAPACITY ADMINS	ACTIONS	CAPACITY UNITS
Trial-20240411	Zalan Bola		64

End a Fabric trial

End a Fabric capacity trial by canceling, letting it expire, or purchasing the full Fabric experience. Only capacity admins can cancel the trial. Individual users don't have this

ability. All licenses return to their original versions. You no longer have the equivalent of a PPU license. If you want to retain your data and continue to use Microsoft Fabric, [purchase a capacity](#) and migrate your workspaces to that capacity.

For more information, see [Canceling, expiring, and closing](#).

The trial expires

A standard Fabric capacity trial lasts 60 days. If you don't upgrade to a paid Fabric capacity before the end of the trial period, non-Power BI Fabric items are removed according to the [retention policy upon removal](#). You have seven days after the expiration date to save your non-Power BI Fabric items by assigning the workspaces to an active capacity.

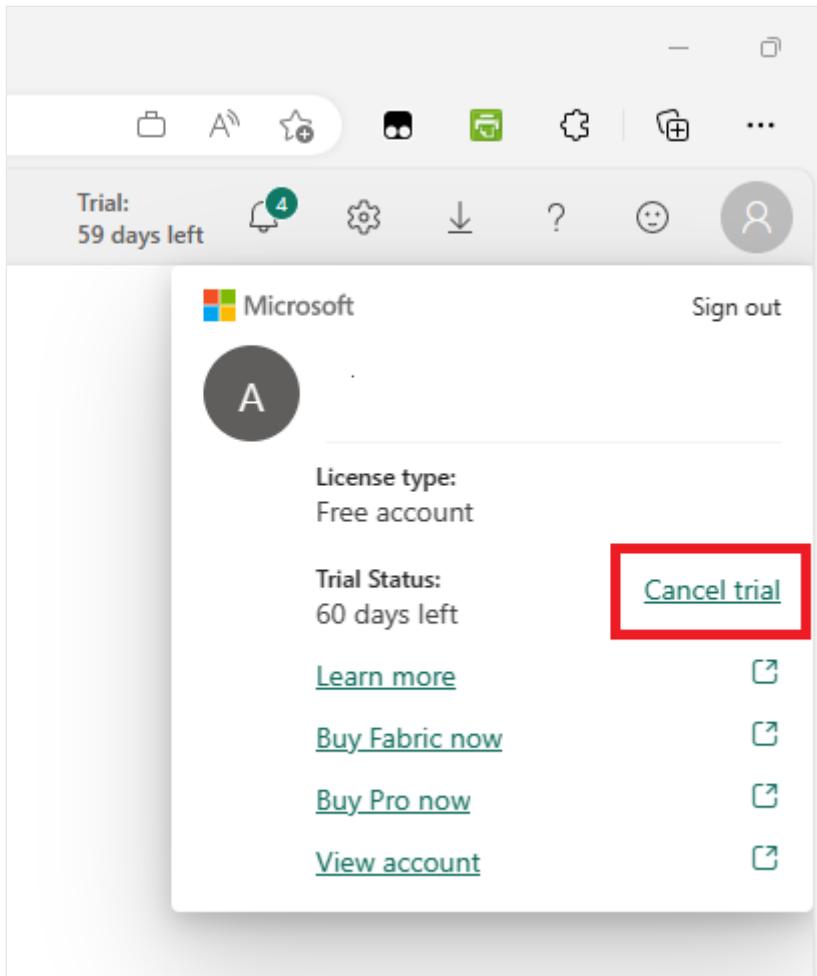
To retain your Fabric items, before your trial ends, [purchase Fabric](#).

Cancel your Fabric capacity trial - non admins

Only the capacity administrator can cancel the Fabric capacity trial.

Cancel the Fabric trial - Capacity admins

To cancel your free Fabric trial capacity, open your Account Manager and select **Cancel trial**. Once canceled, Microsoft can't extend the Fabric capacity trial, and you may not be able to start a new trial using your same user ID. Other users can still start their own Fabric trial capacity. You can also [purchase a capacity](#) and migrate your workspaces to that capacity. If you have workspaces with Fabric items, assign those workspaces to the new trial or purchased capacity within seven days.



When you cancel a free Fabric capacity trial, the trial capacity, with all of its workspaces and their contents, is deleted. In addition, you can't:

- Create workspaces that support Fabric capabilities.
- Share Fabric items, such as machine learning models, warehouses, and notebooks, and collaborate on them with other Fabric users.
- Create analytics solutions using these Fabric items.

Considerations and limitations

I am unable to start a trial

If you don't see the **Start trial** button in your Account manager:

- Your Fabric administrator might disable access, and you can't start a Fabric trial. To request access, [contact your Fabric administrator](#). You can also start a trial using your own tenant. For more information, see [Sign up for Power BI with a new Microsoft 365 account](#).
- You're an existing Power BI trial user, and you don't see **Start trial** in your Account manager. You can start a Fabric trial by attempting to [create a Fabric item](#). When you attempt to create a Fabric item, you receive a prompt to start a Fabric trial. If

you don't see this prompt, it's possible that this action is deactivated by your Fabric administrator.

If you don't have a work or school account and want to sign up for a free trial.

- For more information, see [Sign up for Power BI with a new Microsoft 365 account](#).

If you do see the **Start trial** button in your Account manager:

- You might not be able to start a trial if your tenant exhausted its limit of trial capacities. If that is the case, you have the following options:
 - Request another trial capacity user to share their trial capacity workspace with you. [Give users access to workspaces](#).
 - [Purchase a Fabric capacity from Azure](#) by performing a search for *Microsoft Fabric*.
- To increase tenant trial capacity limits, [reach out to your Fabric administrator](#) to create a Microsoft support ticket.

In Workspace settings, I can't assign a workspace to the trial capacity

This bug occurs when the Fabric administrator turns off trials after you start a trial. To add your workspace to the trial capacity, open the Admin portal by selecting it from the gear icon in the top menu bar. Then, select **Trial > Capacity settings** and choose the name of the capacity. If you don't see your workspace assigned, add it here.

The screenshot shows the Admin portal interface. On the left, there's a sidebar with 'Capacity settings' selected. The main area has a header 'Trial > Trial-' and a 'Capacity usage report' link. Below that is a 'Notifications' section. Under 'Power BI workloads', there's a 'Data Engineering/Science Settings' link. The 'Workspaces assigned to this capacity' section contains a search bar 'Search for, add, or remove workspaces assigned to this capacity' and a 'Search workspaces' button. It lists three workspaces: 'bu' (status: Assigned), 'pp' (status: Assigned), and 'tri' (status: Assigned). Each workspace has a 'View admins' link and a 'Remove' button. At the bottom right of this section, there's a red-bordered button labeled '+ Assign workspaces'. Navigation links like '<<', '<', '1', '>', and '>>' are at the bottom, along with a 'Items per page: 10' dropdown.

What is the region for my Fabric trial capacity?

If you start the trial using the Account manager, your trial capacity is located in the home region for your tenant. See [Find your Fabric home region](#) for information about how to find your home region, where your data is stored.

What impact does region have on my Fabric trial?

Not all regions are available for the Fabric trial. Start by [looking up your home region](#) and then check to [see if your region is supported for the Fabric trial](#). If your home region doesn't have Fabric enabled, don't use the Account manager to start a trial. To start a trial in a region that isn't your home region, follow the steps in [Other ways to start a Fabric trial](#). If you already started a trial from Account manager, cancel that trial and follow the steps in [Other ways to start a Fabric trial](#) instead.

Can I move my tenant to another region?

You can't move your organization's tenant between regions by yourself. If you need to change your organization's default data location from the current region to another region, you must contact support to manage the migration for you. For more information, see [Move between regions](#).

Fabric trial capacity availability by Azure region

To learn more about regional availability for Fabric trials, see [Fabric trial capacities are available in all regions](#).

How is the Fabric trial different from an individual trial of Power BI paid?

A per-user trial of Power BI paid allows access to the Fabric landing page. Once you sign up for the Fabric trial, you can use the trial capacity for storing Fabric workspaces and items and for running Fabric workloads. All rules guiding [Power BI licenses](#) and what you can do in the Power BI workload remain the same. The key difference is that a Fabric capacity is required to access non-Power BI workloads and items.

Autoscale

The Fabric trial capacity doesn't support autoscale. If you need more compute capacity, you can purchase a Fabric capacity in Azure.

For existing Synapse users

- The Fabric trial is different from a Proof of Concept (POC). A Proof of Concept (POC) is standard enterprise vetting that requires financial investment and months' worth of work customizing the platform and using fed data. The Fabric trial is free for users and doesn't require customization. Users can sign up for a free trial and start running product workloads immediately, within the confines of available capacity units.
- You don't need an Azure subscription to start a Fabric trial. If you have an existing Azure subscription, you can purchase a (paid) Fabric capacity.

For existing Power BI users

Trial Capacity administrators can migrate existing workspaces into a trial capacity using workspace settings and choosing **Trial** as the license mode. To learn how to migrate workspaces, see [create workspaces](#).

The screenshot shows the 'Workspace settings' dialog for 'Test Workspace 1'. On the left, there's a sidebar with various Power BI services like Home, Create, Browse, OneLake data hub, Apps, Metrics, Monitoring hub, Deployment pipelines, Learn, Workspaces, and Test Workspaces. The 'Test Workspaces' item is selected. The main area shows the workspace name 'Test Workspace 1' and its contents: 'Name' (highlighted with a red box), 'Test Report 1', and 'Test Table 1'. The 'License mode' section is expanded, showing options: 'Choose a license' (disabled), 'Pro' (disabled), 'Premium per-user' (disabled), 'Premium capacity' (disabled), 'Embedded' (disabled), 'Fabric capacity' (disabled), and 'Trial' (selected and highlighted with a red box). Below this, 'Default storage format' is set to 'Small dataset storage format' (selected and highlighted with a red box). At the bottom are 'Apply' and 'Cancel' buttons.

Related content

- Learn about [licenses](#)
- Review [Fabric terminology](#)

Feedback

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Microsoft Fabric preview information

Article • 09/22/2024

This article describes the meaning of *preview* in Microsoft Fabric, and explains how preview experiences and features can be used.

Preview experiences and features are released with limited capabilities, but are made available on a *preview* basis so customers can get early access and provide feedback.

Preview experiences and features:

- Are subject to separate [supplemental preview terms](#).
- Aren't meant for production use.
- Are not subject to SLAs and support is provided as best effort in certain cases. However, Microsoft Support is eager to get your feedback on the preview functionality, and might provide best effort support in certain cases.
- May have limited or restricted functionality.
- May be available only in selected geographic areas.

Who can enable a preview experiences and features

To enable a preview experience or feature, you need to have a *Fabric administrator admin role*.

Note

When a preview feature is delegated, it can be enabled by a [capacity admin](#) for that capacity.

How do I enable a preview experience or feature

To enable a preview experience or feature, follow these steps:

1. Navigate to the [admin portal](#).

2. Select tenant settings tab.
 3. Select the preview experience or experience you want to enable.
 4. Enable experience using the tenant setting.
-

Feedback

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Microsoft Fabric terminology

Article • 05/21/2024

Learn the definitions of terms used in Microsoft Fabric, including terms specific to Synapse Data Warehouse, Synapse Data Engineering, Synapse Data Science, Real-Time Intelligence, Data Factory, and Power BI.

General terms

- **Capacity:** Capacity is a dedicated set of resources that is available at a given time to be used. Capacity defines the ability of a resource to perform an activity or to produce output. Different items consume different capacity at a certain time. Fabric offers capacity through the Fabric SKU and Trials. For more information, see [What is capacity?](#)
- **Experience:** A collection of capabilities targeted to a specific functionality. The Fabric experiences include Synapse Data Warehouse, Synapse Data Engineering, Synapse Data Science, Real-Time Intelligence, Data Factory, and Power BI.
- **Item:** An item a set of capabilities within an experience. Users can create, edit, and delete them. Each item type provides different capabilities. For example, the Data Engineering experience includes the lakehouse, notebook, and Spark job definition items.
- **Tenant:** A tenant is a single instance of Fabric for an organization and is aligned with a Microsoft Entra ID.
- **Workspace:** A workspace is a collection of items that brings together different functionality in a single environment designed for collaboration. It acts as a container that uses capacity for the work that is executed, and provides controls for who can access the items in it. For example, in a workspace, users create reports, notebooks, semantic models, etc. For more information, see [Workspaces](#) article.

Synapse Data Engineering

- **Lakehouse:** A lakehouse is a collection of files, folders, and tables that represent a database over a data lake used by the Apache Spark engine and SQL engine for big data processing. A lakehouse includes enhanced capabilities for ACID transactions when using the open-source Delta formatted tables. The lakehouse

item is hosted within a unique workspace folder in [Microsoft OneLake](#). It contains files in various formats (structured and unstructured) organized in folders and subfolders. For more information, see [What is a lakehouse?](#)

- **Notebook:** A Fabric notebook is a multi-language interactive programming tool with rich functions. Which include authoring code and markdown, running and monitoring a Spark job, viewing and visualizing result, and collaborating with the team. It helps data engineers and data scientist to explore and process data, and build machine learning experiments with both code and low-code experience. It can be easily transformed to a pipeline activity for orchestration.
- **Spark application:** An Apache Spark application is a program written by a user using one of Spark's API languages (Scala, Python, Spark SQL, or Java) or Microsoft-added languages (.NET with C# or F#). When an application runs, it's divided into one or more Spark jobs that run in parallel to process the data faster. For more information, see [Spark application monitoring](#).
- **Apache Spark job:** A Spark job is part of a Spark application that is run in parallel with other jobs in the application. A job consists of multiple tasks. For more information, see [Spark job monitoring](#).
- **Apache Spark job definition:** A Spark job definition is a set of parameters, set by the user, indicating how a Spark application should be run. It allows you to submit batch or streaming jobs to the Spark cluster. For more information, see [What is an Apache Spark job definition?](#)
- **V-order:** A write optimization to the parquet file format that enables fast reads and provides cost efficiency and better performance. All the Fabric engines write v-ordered parquet files by default.

Data Factory

- **Connector:** Data Factory offers a rich set of connectors that allow you to connect to different types of data stores. Once connected, you can transform the data. For more information, see [connectors](#).
- **Data pipeline:** In Data Factory, a data pipeline is used for orchestrating data movement and transformation. These pipelines are different from the deployment pipelines in Fabric. For more information, see [Pipelines](#) in the Data Factory overview.
- **Dataflow Gen2:** Dataflows provide a low-code interface for ingesting data from hundreds of data sources and transforming your data. Dataflows in Fabric are

referred to as Dataflow Gen2. Dataflow Gen1 exists in Power BI. Dataflow Gen2 offers extra capabilities compared to Dataflows in Azure Data Factory or Power BI. You can't upgrade from Gen1 to Gen2. For more information, see [Dataflows](#) in the Data Factory overview.

Synapse Data Science

- **Data Wrangler:** Data Wrangler is a notebook-based tool that provides users with an immersive experience to conduct exploratory data analysis. The feature combines a grid-like data display with dynamic summary statistics and a set of common data-cleansing operations, all available with a few selected icons. Each operation generates code that can be saved back to the notebook as a reusable script.
- **Experiment:** A machine learning experiment is the primary unit of organization and control for all related machine learning runs. For more information, see [Machine learning experiments in Microsoft Fabric](#).
- **Model:** A machine learning model is a file trained to recognize certain types of patterns. You train a model over a set of data, and you provide it with an algorithm that it uses to reason over and learn from that data set. For more information, see [Machine learning model](#).
- **Run:** A run corresponds to a single execution of model code. In [MLflow](#), tracking is based on experiments and runs.

Synapse data warehouse

- **SQL analytics endpoint:** Each Lakehouse has a SQL analytics endpoint that allows a user to query delta table data with TSQL over TDS. For more information, see [SQL analytics endpoint](#).
- **Synapse Data Warehouse:** The Synapse Data Warehouse functions as a traditional data warehouse and supports the full transactional T-SQL capabilities you would expect from an enterprise data warehouse. For more information, see [Synapse Data Warehouse](#).

Real-Time Intelligence

- **KQL database:** The KQL database holds data in a format that you can execute KQL queries against. For more information, see [Query a KQL database](#).

- **KQL Queryset:** The KQL Queryset is the item used to run queries, view results, and manipulate query results on data from your Data Explorer database. The queryset includes the databases and tables, the queries, and the results. The KQL Queryset allows you to save queries for future use, or export and share queries with others. For more information, see [Query data in the KQL Queryset](#)
- **Event stream:** The Microsoft Fabric event streams feature provides a centralized place in the Fabric platform to capture, transform, and route real-time events to destinations with a no-code experience. An event stream consists of various streaming data sources, ingestion destinations, and an event processor when the transformation is needed. For more information, see [Microsoft Fabric event streams](#).

OneLake

- **Shortcut:** Shortcuts are embedded references within OneLake that point to other file store locations. They provide a way to connect to existing data without having to directly copy it. For more information, see [OneLake shortcuts](#).

Related content

- [Navigate to your items from Microsoft Fabric Home page](#)
- [Discover data items in the OneLake data hub](#)
- [End-to-end tutorials in Microsoft Fabric](#)

Feedback

Was this page helpful?

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What's new in Microsoft Fabric?

Article • 10/31/2024

This page is continuously updated with a recent review of what's new in [Microsoft Fabric](#).

- To follow the latest in Fabric news and features, see the [Microsoft Fabric Updates Blog](#).
- For community, marketing, case studies, and industry news, see the [Microsoft Fabric Blog](#).
- Follow the latest in Power BI at [What's new in Power BI?](#)
- For older updates, review the [Microsoft Fabric What's New archive](#).

New to Microsoft Fabric?

- [Learning Paths for Fabric](#)
- [Get started with Microsoft Fabric](#)
- [End-to-end tutorials in Microsoft Fabric](#)
- [Definitions of terms used in Microsoft Fabric](#)

Features currently in preview

The following table lists the features of Microsoft Fabric that are currently in preview. Preview features are sorted alphabetically.

Note

Features currently in preview are available under [supplemental terms of use](#). Review for legal terms that apply to Azure features that are in beta, preview, or otherwise not yet released into general availability. Microsoft Fabric provides previews to give you a chance to evaluate and [share feedback with the product group](#) on preview features before they become [generally available \(GA\)](#).

 Expand table

Feature	Learn more
Azure Data Factory item	You can now bring your existing Azure Data Factory (ADF) to your Fabric workspace . This new preview capability allows you to connect to your existing Azure Data Factory from your Fabric workspace.

Feature	Learn more
	Select "Create Azure Data Factory" inside of your Fabric Data Factory workspace, and you can manage your Azure data factories directly from the Fabric workspace.
Capacity pools preview	Capacity administrators can now create custom pools (preview) based on their workload requirements, providing granular control over compute resources. Custom pools for Data Engineering and Data Science can be set as Spark Pool options within Workspace Spark Settings and environment items.
Code-First AutoML preview	In Synapse Data Science, the new AutoML feature enables automation of your machine learning workflow. AutoML , or Automated Machine Learning , is a set of techniques and tools that can automatically train and optimize machine learning models for any given data and task type.
Code-First Hyperparameter Tuning preview	In Synapse Data Science, FLAML is now integrated for hyperparameter tuning , currently a preview feature. Fabric's <code>flaml.tune</code> feature streamlines this process, offering a cost-effective and efficient approach to hyperparameter tuning .
Copilot in Fabric is available worldwide	Copilot in Fabric is now available to all customers, including Copilot for Power BI , Data Factory , Data Science & Data Engineering , and Real-Time Intelligence . Read more in our Overview on Copilot in Fabric .
Data Activator preview	We're thrilled to announce that Data Activator is now in preview and is enabled for all existing Microsoft Fabric users.
Apache Airflow job in Data Factory preview	Apache Airflow job (preview) in Data Factory , powered by Apache Airflow, offer seamless authoring, scheduling, and monitoring experience for Python-based data processes defined as Directed Acyclic Graphs (DAGs). For more information, see Quickstart: Create a Data workflow .
Data Wrangler for Spark DataFrames preview	Data Wrangler now supports Spark DataFrames in preview, users can now edit Spark DataFrames in addition to pandas DataFrames with Data Wrangler .
Copy job	The Copy job (preview) has advantages over the legacy Copy activity. For more information, see Announcing Preview: Copy Job in Microsoft Fabric . For a tutorial, see Learn how to create a Copy job (preview) in Data Factory for Microsoft Fabric .
Data Activator preview	Data Activator is in preview and is enabled for all existing Microsoft Fabric users.
Data Science AI skill (preview)	You can now build your own generative AI experiences over your data in Fabric with the AI skill (preview)! You can build question and answering AI systems over your Lakehouses and Warehouses. For

Feature	Learn more
	more information, see Introducing AI Skills in Microsoft Fabric: Now in Preview . To get started, try AI skill example with the AdventureWorks dataset .
Delta column mapping in the SQL analytics endpoint	SQL analytics endpoint now supports Delta tables with column mapping enabled . For more information, see Delta column mapping and Limitations of the SQL analytics endpoint . This feature is currently in preview.
Domains in OneLake (preview)	Domains in OneLake help you organize your data into a logical data mesh, allowing federated governance and optimizing for business needs. You can now create sub domains, default domains for users, and move workspaces between domains. For more information, see Fabric domains .
High concurrency mode for Notebooks in Pipelines (preview)	High concurrency mode for Notebooks in Pipelines enables users to share Spark sessions across multiple notebooks within a pipeline. With high concurrency mode , users can trigger pipeline jobs, and these jobs are automatically packed into existing high concurrency sessions.
Introducing external data sharing (preview)	External Data Sharing (preview) is a new feature that makes it possible for Fabric users to share data from within their Fabric tenant with users in another Fabric tenant.
Fabric gateway enables OneLake shortcuts to on-premises data	Connect to on-premises data sources with a Fabric on-premises data gateway on a machine in your environment, with networking visibility of your S3 compatible or Google Cloud Storage data source. Then, you create your shortcut and select that gateway. For more information, see Create shortcuts to on-premises data .
Fabric Spark connector for Fabric Synapse Data Warehouse in Spark runtime (preview)	The Fabric Spark connector for Synapse Data Warehouse (preview) enables a Spark developer or a data scientist to access and work on data from a warehouse or SQL analytics endpoint of the lakehouse (either from within the same workspace or from across workspaces) with a simplified Spark API.
Fabric Spark Diagnostic Emitter (preview)	The Fabric Apache Spark Diagnostic Emitter (preview) allows Apache Spark users to collect logs, event logs, and metrics from their Spark applications and send them to various destinations, including Azure Event Hubs , Azure Storage , and Azure Log Analytics .
Fabric workload dev kit (preview)	The Microsoft Fabric workload development kit extends to additional workloads and offers a robust developer toolkit for designing, developing, and interoperating with Microsoft Fabric using frontend SDKs and backend REST APIs .
Folder in Workspace preview	As an organizational unit in the workspace, folder addresses this pain point by providing a hierarchical structure for organizing and

Feature	Learn more
	managing your items. For more information, see Create folders in workspaces (preview) .
GraphQL API in Microsoft Fabric preview	The new API for GraphQL is a data access layer that allows us to query multiple data sources quickly and efficiently in Fabric. For more information, see What is Microsoft Fabric API for GraphQL?
Incremental refresh for Dataflow Gen2 (preview)	Incremental refresh for Dataflows Gen2 in Fabric Data Factory is designed to optimize data ingestion and transformation, particularly as your data continues to expand. For more information, see Announcing Preview: Incremental Refresh in Dataflow Gen2 .
Invoke remote pipeline (preview) in Data pipeline	You can now use the Invoke Pipeline (preview) activity to call pipelines from Azure Data Factory or Synapse Analytics pipelines . This feature allows you to utilize your existing ADF or Synapse pipelines inside of a Fabric pipeline by calling it inline through this new Invoke Pipeline activity.
Kusto Cache consumption preview	The preview of Kusto Cache consumption means that you will start seeing billable consumption of the OneLake Cache Data Stored meter from the KQL Database and Eventhouse items. For more information, see KQL Database consumption .
Lakehouse schemas feature	The Lakehouse schemas feature (preview) introduces data pipeline support for reading the schema info from Lakehouse tables and supports writing data into tables under specified schemas. Lakehouse schemas allow you to group your tables together for better data discovery, access control, and more.
Lakehouse support for git integration and deployment pipelines (preview)	The Lakehouse now integrates with the lifecycle management capabilities in Microsoft Fabric , providing a standardized collaboration between all development team members throughout the product's life. Lifecycle management facilitates an effective product versioning and release process by continuously delivering features and bug fixes into multiple environments.
Managed virtual networks (preview)	Managed virtual networks are virtual networks that are created and managed by Microsoft Fabric for each Fabric workspace.
Microsoft 365 connector now supports ingesting data into Lakehouse (preview)	The Microsoft 365 connector now supports ingesting data into Lakehouse tables .
Microsoft Fabric Admin APIs	Fabric Admin APIs are designed to streamline administrative tasks. The initial set of Fabric Admin APIs is tailored to simplify the discovery of workspaces, Fabric items, and user access details.

Feature	Learn more
Mirroring in Microsoft Fabric preview	With database mirroring in Fabric, you can easily bring your databases into OneLake in Microsoft Fabric , enabling seamless zero-ETL, near real-time insights on your data – and unlocking warehousing, BI, AI, and more. For more information, see What is Mirroring in Fabric? .
Native Execution Engine on Runtime 1.3 (preview)	Native Execution Engine for Fabric Runtime 1.3 is now available in preview, offering superior query performance across data processing, ETL, data science, and interactive queries. No code changes are required to speed up the execution of your Apache Spark jobs when using the Native Execution Engine .
Nested common table expressions (CTEs) (preview)	Fabric Warehouse and SQL analytics endpoint both support standard, sequential, and nested CTEs . While CTEs are generally available in Microsoft Fabric, nested common table expressions (CTE) in Fabric data warehouse are currently a preview feature.
Notebook debug within vscode.dev (preview)	You can now place breakpoints and debug your Notebook code with the Synapse VS Code - Remote extension in vscode.dev . This update first starts with the Fabric Runtime 1.3 .
OneLake data access roles	OneLake data access roles for lakehouse are in preview. Role permissions and user/group assignments can be easily updated through a new folder security user interface.
OneLake SAS (preview)	Support for short-lived, user-delegated OneLake SAS is now in preview . This functionality allows applications to request a User Delegation Key backed by Microsoft Entra ID, and then use this key to construct a OneLake SAS token. This token can be handed off to provide delegated access to another tool, node, or user, ensuring secure and controlled access.
Prebuilt Azure AI services in Fabric preview	The preview of prebuilt AI services in Fabric is an integration with Azure AI services , formerly known as Azure Cognitive Services. Prebuilt Azure AI services allow for easy enhancement of data with prebuilt AI models without any prerequisites. Currently, prebuilt AI services are in preview and include support for the Microsoft Azure OpenAI Service , Azure AI Language , and Azure AI Translator .
Purview Data Loss Prevention policies have been extended to Fabric lakehouses	Extending Microsoft Purview's Data Loss Prevention (DLP) policies into Fabric lakehouses is now in preview.
Real-Time Dashboards and underlying KQL databases access separation (preview)	With separate permissions for dashboards and underlying data, administrators now have the flexibility to allow users to view dashboards without giving access to the raw data .

Feature	Learn more
Real-Time hub	Real-Time hub is single, tenant-wide, unified, logical place for streaming data-in-motion. It enables you to easily discover, ingest, manage, and consume data-in-motion from a wide variety of sources. It lists all the streams and Kusto Query Language (KQL) tables that you can directly act on. It also gives you an easy way to ingest streaming data from Microsoft products and Fabric events. For more information, see Real-Time hub overview .
Reserve maximum cores for jobs (preview)	A new workspace-level setting allows you to reserve maximum cores for your active jobs for Spark workloads . For more information, see High concurrency mode in Apache Spark for Fabric .
REST APIs for Fabric Data Factory pipelines preview	The REST APIs for Fabric Data Factory Pipelines are now in preview. REST APIs for Data Factory pipelines enable you to extend the built-in capability in Fabric to create, read, update, delete, and list pipelines.
Secure Data Streaming with Managed Private Endpoints in Eventstream (Preview)	By creating a Fabric Managed Private Endpoint, you can now securely connect Eventstream to your Azure services, such as Azure Event Hubs or IoT Hub, within a private network or behind a firewall. For more information, see Secure Data Streaming with Managed Private Endpoints in Eventstream (Preview) .
Session Expiry Control in Workspace Settings for Notebook Interactive Runs (preview)	A new session expiry control in Data Engineering/Science workspace settings allows you to set the maximum expiration time limit for notebook interactive sessions. By default, sessions expire after 20 minutes, but you can now customize the maximum expiration duration .
Share Feature for Fabric AI skill (preview)	"Share" capability for the Fabric AI skill (preview) allows you to share the AI Skill with others using a variety of permission models.
Share the Fabric AI skill (preview)	Share capability for the Fabric AI skill (preview) allows you to share the AI Skill with others using a variety of permission models.
Spark Run Series Analysis preview	The Spark Monitoring Run Series Analysis features allow you to analyze the run duration trend and performance comparison for Pipeline Spark activity recurring run instances and repetitive Spark run activities, from the same Notebook or Spark Job Definition.
Splunk add-on preview	Microsoft Fabric add-on for Splunk allows users to ingest logs from Splunk platform into a Fabric KQL DB using the Kusto python SDK.
Tags	Tags (preview) help admins categorize and organize data, enhancing the searchability of your data and boosting success rates and efficiency for end users.
Task flows in Microsoft Fabric (preview)	The preview of task flows in Microsoft Fabric is enabled for all Microsoft Fabric users. With Fabric task flows , when designing a data project, you no longer need to use a whiteboard to sketch out the

Feature	Learn more
	different parts of the project and their interrelationships. Instead, you can use a task flow to build and bring this key information into the project itself.
varchar(max) and varbinary(max) support in preview	Support for the varchar(max) and varbinary(max) data types in Warehouse is now in preview. For more information, see Announcing public preview of VARCHAR(MAX) and VARBINARY(MAX) types in Fabric Data Warehouse .
Terraform Provider for Fabric (preview)	The Terraform Provider for Microsoft Fabric is now in preview. The Terraform Provider for Microsoft Fabric supports the creation and management of many Fabric resources. For more information, see Announcing the new Terraform Provider for Microsoft Fabric .
T-SQL support in Fabric notebooks (preview)	The T-SQL notebook feature in Microsoft Fabric (preview) lets you write and run T-SQL code within a notebook. You can use them to manage complex queries and write better markdown documentation. It also allows direct execution of T-SQL on connected warehouse or SQL analytics endpoint. To learn more, see Author and run T-SQL notebooks .
Warehouse restore points and restore in place	You can now create restore points and perform an in-place restore of a warehouse to a past point in time. Restore in-place is an essential part of data warehouse recovery , which allows to restore the data warehouse to a prior known reliable state by replacing or over-writing the existing data warehouse from which the restore point was created.
Warehouse source control (preview)	Using Git integration and/or deployment pipelines with your warehouse , you can manage development and deployment of versioned warehouse objects. You can use SQL Database Projects extension available inside of Azure Data Studio and Visual Studio Code . For more information on warehouse source control, see CI/CD with Warehouses in Microsoft Fabric .

Generally available features

The following table lists the features of Microsoft Fabric that have recently transitioned from preview to general availability (GA).

[] [Expand table](#)

Month	Feature	Learn more
October 2024	Notebook Git integration	Notebook Git integration now supports persisting the mapping relationship of the attached Environment when

Month	Feature	Learn more
		syncing to new workspace. For more information, see Notebook source control and deployment
October 2024	Notebook in Deployment Pipeline	Now you can also use notebooks to deploy your code across different environments , such as development, test, and production. You can also use deployment rules to customize the behavior of your notebooks when they're deployed, such as changing the default Lakehouse of a Notebook. Get started with deployment pipelines , and Notebook shows up in the deployment content automatically.
September 2024	Mirroring for Snowflake	With Mirroring for Snowflake in Fabric, you can easily bring your Snowflake data into OneLake in Microsoft Fabric . For more information, see Mirroring Snowflake .
September 2024	Copilot for Data Factory	Copilot for Data Factory is now generally available and included in the Dataflow Gen2 experience. For more information, see Copilot for Data Factory .
September 2024	Fast Copy in Dataflow Gen2	The Fast Copy feature is now generally available. For more information, read Announcing the General Availability of Fast Copy in Dataflows Gen2 .
September 2024	Fabric Pipeline Integration in On-premises Data Gateway GA	On-premises connectivity for Data pipelines in Microsoft Fabric is now generally available. Learn How to access on-premises data sources in Data Factory for Microsoft Fabric .
September 2024	Data Wrangler for Spark DataFrames	Data Wrangler is now generally available . A notebook-based tool for exploratory data analysis, Data Wrangler works for both pandas DataFrames and Spark DataFrames and arrives at general availability with new usability improvements .
September 2024	Fabric Runtime 1.3	Fabric Runtime 1.3 includes Apache Spark 3.5, Delta Lake 3.1, R 4.4.1, Python 3.11, support for Starter Pools, integration with Environment, and library management capabilities. For more information, see Fabric Runtime 1.3 is Generally Available! .
September 2024	OneLake Shortcuts API	REST APIs for OneLake Shortcuts allow programmatic creation and management of shortcuts, now generally available. You can now programmatically create, read, and delete OneLake shortcuts . For example, see Use OneLake shortcuts REST APIs .
September 2024	GitHub integration for source control	Fabric developers can now choose GitHub or GitHub Enterprise as their source control tool, and version their Fabric items there. For more information, see Intro to Git integration .

Month	Feature	Learn more
September 2024	OneLake shortcuts to Google Cloud Storage	Create a Google Cloud Storage shortcut to connect to your existing data through a single unified name space without having to copy or move data. For more information, see Google Cloud Storage shortcuts generally available .
September 2024	OneLake shortcuts to S3-compatible data sources	Create an S3 compatible shortcut to connect to your existing data through a single unified name space without having to copy or move data. For more information, see S3 compatible shortcuts generally available .
July 2024	Update records in a KQL Database preview	The .update command is now generally available. Learn more about how to Update records in a Kusto database .
July 2024	Warehouse queries with time travel (GA)	Warehouse in Microsoft Fabric offers the capability to query the historical data as it existed in the past at the statement level, now generally available. The ability to query data from a specific timestamp is known in the data warehousing industry as <i>time travel</i> .

For older GA announcements, review the [Microsoft Fabric What's New archive](#).

Community

This section summarizes new Microsoft Fabric community opportunities for prospective and current influencers and MVPs.

- Sign up for the Fabric Community Newsletter.
- Join a local [Fabric User Group](#) or [join a local event](#).
- To learn about the Microsoft MVP Award and to find MVPs, see [mvp.microsoft.com](#).
- Are you a student? Learn more about the [Microsoft Learn Student Ambassadors program](#).
- Vote and contribute to [Microsoft Fabric Ideas](#).
- Visit the [Microsoft Fabric Career Hub](#) for everything you need on your certification journey, including a 50% discount on exams.
- Watch and subscribe to [Microsoft Fabric videos on YouTube](#).
- Ask and answer questions in the [Microsoft Fabric community](#).

Note

The [Microsoft Fabric and AI Learning Hackathon](#) deadline is November 12, 2024. Whether you're an AI enthusiast, a cloud computing expert, or a database guru, this hackathon is the perfect platform to showcase your skills and creativity. Complete [the Microsoft Learn AI Skills Challenge \(Microsoft Fabric\)](#) and build a new Fabric solution that leverages Azure OpenAI services and falls into one of the following hackathon categories. Check out [livestreamed events for the Microsoft Fabric & AI Learning Hackathon](#).

[+] Expand table

Month	Feature	Learn more
October 2024	Fabric Influencers Spotlight October 2024	Check out Microsoft MVPs & Fabric Super Users doing amazing work in October 2024 on all aspects of Microsoft Fabric.
October 2024	Microsoft Fabric and AI Learning Hackathon: Copilot in Fabric	Part of the Microsoft Fabric and AI Learning Hackathon , read this guide of various capabilities that Copilot offers in Microsoft Fabric , empowering you to enhance productivity and streamline your workflows.
October 2024	Get certified in Microsoft Fabric—for free!	For a limited time, the Microsoft Fabric Community team is offering 5,000 free DP-600 exam vouchers to eligible Fabric Community members . Complete your exam by the end of the year and join the ranks of certified experts.
October 2024	DP-700: Implementing Data Engineering Solutions Using Microsoft Fabric (beta)	The new Microsoft Certified: Fabric Data Engineer Associate certification will help demonstrate your skills with data ingestion, transformation, administration, monitoring, and performance optimization in Fabric. To learn more, see DP-700: Implementing Data Engineering Solutions Using Microsoft Fabric (beta) .
October 2024	FabCon Europe 2024	Read a recap of Europe's first Fabric Community Conference and a Recap of Data Factory announcements .
October 2024	Fabric Influencers Spotlight September 2024	The Fabric Influencers Spotlight September 2024 shines a bright light on the places on the internet where Microsoft MVPs & Fabric Super Users are doing some amazing work on all aspects of Microsoft Fabric.
September 2024	Announcing: The Microsoft Fabric & AI Learning Hackathon	Get ready for the Microsoft Fabric & AI Learning Hackathon ! We're calling all Data/AI Enthusiasts and Data/AI practitioners to join us for another exciting opportunity to upskill and build the next generation of Data + AI solutions with Microsoft Fabric! The Hackathon

Month	Feature	Learn more
		is open for a 7-week submission period and offers a total of \$10,000 in prizes!
August 2024	Fabric Influencers Spotlight August 2024	The Fabric Influencers Spotlight August 2024 highlights and amplifies blog posts, videos, presentations, and other content related to Microsoft Fabric from members of Microsoft MVPs & Fabric Super Users from the Fabric community.
August 2024	Winners of the Fabric Community Sticker Challenge	Congratulations to the winners of the Fabric Community Sticker Challenge !
July 2024	Fabric Influencers Spotlight	Introducing the new Fabric Influencers Spotlight series of articles to highlight and amplify blog posts, videos, presentations, and other content related to Microsoft Fabric. Read blogs from Microsoft MVPs and Fabric Super Users from the Fabric community .

For older updates, review the [Microsoft Fabric What's New archive](#).

Power BI

ⓘ Important

If you are accessing Power BI on a web browser version older than Chrome 94, Edge 94, Safari 16.4, Firefox 93, or equivalent, you need upgrade your web browser to a newer version by August 31, 2024. Using an outdated browser version after this date, may prevent you from accessing features in Power BI.

Updates to Power BI Desktop and the Power BI service are summarized at [What's new in Power BI?](#)

Microsoft Copilot in Microsoft Fabric

With Copilot and other generative AI features in preview, Microsoft Fabric brings a new way to transform and analyze data, generate insights, and create visualizations and reports. For more information, see [Copilot in Fabric](#).

[] [Expand table](#)

Month	Feature	Learn more
October 2024	Microsoft Fabric and AI Learning Hackathon: Copilot in Fabric	Part of the Microsoft Fabric and AI Learning Hackathon , read this guide of various capabilities that Copilot offers in Microsoft Fabric , empowering you to enhance productivity and streamline your workflows.
October 2024	Use Azure OpenAI to turn whiteboard sketches into data pipelines	Read this blog to learn how to turn whiteboard sketches into data pipelines , using the GPT-4o model through Azure OpenAI Service.
September 2024	Creating a real time dashboard by Copilot	Copilot can review a table and automatically create a dashboard with insights and a profile of the data with a sample.
September 2024	Copilot in Dataflow Gen2 GA	Copilot for Data Factory is now generally available and included in the Dataflow Gen2 experience. For more information, see Copilot for Data Factory .
September 2024	Copilot for Data Warehouse	Copilot for Data Warehouse (preview) is now available, offering the Copilot chat pane , quick actions , and code completions . For more information and sample scenarios, see Announcing the Preview of Copilot for Data Warehouse in Microsoft Fabric .

For older updates, review the [Microsoft Fabric What's New archive](#).

Data Factory in Microsoft Fabric

This section summarizes recent new features and capabilities of [Data Factory in Microsoft Fabric](#). Follow issues and feedback through the [Data Factory Community Forum](#).

[\[\] Expand table](#)

Month	Feature	Learn more
October 2024	New Features and Enhancements for Virtual Network Data Gateway	We're excited to announce several powerful updates to the Virtual Network (VNET) Data Gateway , designed to further enhance performance and improve the overall user experience.
October 2024	Recap of Data Factory Announcements at Fabric Community Conference Europe	Read a recap of Data Factory announcements from Fabric Community Conference Europe 2024.

Month	Feature	Learn more
September 2024	Copilot in Dataflow Gen2 GA	Copilot for Data Factory is now generally available and included in the Dataflow Gen2 experience. For more information, see Copilot for Data Factory .
September 2024	Fast Copy in Dataflow Gen2 GA	The Fast Copy feature is now generally available. For more information, read Announcing the General Availability of Fast Copy in Dataflows Gen2 .
September 2024	Incremental refresh for Dataflow Gen2 (preview)	Incremental refresh for Dataflows Gen2 in Fabric Data Factory is designed to optimize data ingestion and transformation, particularly as your data continues to expand. For more information, see Announcing Preview: Incremental Refresh in Dataflow Gen2 .
September 2024	Certified connector updates	Updated Dataflow Gen2 connectors have been released, as well as an updated Data pipeline connectors for Salesforce and Vertica. For more information, see the Certified connector updates .
September 2024	Fabric Pipeline Integration in On-premises Data Gateway GA	On-premises connectivity for Data pipelines in Microsoft Fabric is now generally available. Learn How to access on-premises data sources in Data Factory for Microsoft Fabric .
September 2024	Invoke remote pipeline (preview) in Data pipeline	You can now use the Invoke Pipeline (preview) activity to call pipelines from Azure Data Factory or Synapse Analytics pipelines . This feature allows you to utilize your existing ADF or Synapse pipelines inside of a Fabric pipeline by calling it inline through this new Invoke Pipeline activity.
September 2024	Spark Job environment parameters	You can now reuse existing Spark sessions with Session tags . In the Fabric Spark Notebook activity, tag your Spark session, then reuse the existing session using that same tag.
September 2024	Azure Data Factory item in Fabric (preview)	You can now bring your existing Azure Data Factory (ADF) to your Fabric workspace . This new preview capability allows you to connect to your existing Azure Data Factory from your Fabric workspace. Select "Create Azure Data Factory" inside of your Fabric Data Factory workspace, and you can manage your Azure data factories directly from the Fabric workspace.
September 2024	Copy job (preview)	The Copy job (preview) has advantages over the legacy Copy activity. For more information, see Announcing Preview: Copy Job in Microsoft Fabric . For a tutorial,

Month	Feature	Learn more
		see Learn how to create a Copy job (preview) in Data Factory for Microsoft Fabric .
September 2024	Lakehouse Connector in Fabric Data Factory introduces Schema Support	Fabric Lakehouse supports the creation of custom schemas . When reading from a Lakehouse table with the Lakehouse Connector in Fabric Data Factory , custom schema information is now automatically included ↗ .
September 2024	Storage Integration Support in Snowflake Connector for Fabric Data Factory	You can now connect Snowflake with external storage solutions ↗ (such as Azure Blob Storage) using a secure and centralized approach. For more information, see Snowflake SQL storage integration ↗ .
September 2024	New Data Factory Connectors Released in Q3 2024	New Data Factory Connectors include Salesforce , Azure MySQL Database , and Azure Cosmos DB for MongoDB ↗ .
August 2024	Certified connector updates	Updated Dataflow Gen2 connectors have been released, as well as two new Data pipeline connectors for Salesforce and Vertica . For more information, see the August 2024 Certified connector updates ↗ .
August 2024	Data Warehouse Connector Supports TLS 1.3	The Data Warehouse connector now supports TLS 1.3 ↗ , the latest version of the Transport Layer Security protocol.
August 2024	Connect to your Azure Resources by Modern Get Data Experience in Data pipeline	You can easily browse and connect to your Azure resources automatically with the modern data experience of Data Pipeline ↗ .
July 2024	Use existing connections from the OneLake Datahub integration	You can now select any existing connections from OneLake Datahub ↗ , not just your recent and favorite ones. This makes it easier to access your data sources from the homepage of modern get data in data pipeline. For more information, see Modern Get Data experience .
July 2024	Snowflake storage integration	Connect and integrate Snowflake's storage integration ↗ to streamline data workflows and optimize performance across all staging scenarios, without the need to bring external storage to stage your dataset. For more information, see Snowflake connector .
July 2024	Edit JSON code for Data pipelines	You can now edit the JSON behind your Data Factory pipelines ↗ in Fabric. When you design low-code pipeline workflows, directly editing the JSON code behind your visual pipeline canvas can increase your flexibility and improve your market time.

Month	Feature	Learn more
July 2024	Dataflow Gen2 certified connector updates	New and updated Dataflow Gen2 connectors have been released, including two new connectors in Fabric Data Factory data pipeline: Azure MySQL Database Connector and Azure Cosmos DB for MongoDB Connector. For more information, see the July 2024 Certified connector updates .
July 2024	Support for editing Navigation steps	Introducing a new experience to edit navigation steps within Dataflow, to connect to a different object, inside of the Applied steps section of the Query settings pane. For more information, see Editing Navigation steps .
July 2024	Global view in Manage connections	The new Global view in Manage connections allows you to see all the available connections in your Fabric environment so you can modify them or delete them without ever having to leave the Dataflow experience. For more information, see Global view in Manage connections .
July 2024	Fast Copy with On-premises Data Gateway Support in Dataflow Gen2	Fast Copy (preview) in Dataflow Gen2 now supports on-premises data stores using a gateway to access on-premises stores like SQL Server with Fast Copy in Dataflow Gen2 .
July 2024	Fabric API for GraphQL (preview) pricing	API for GraphQL in Fabric starts billing on July 12, 2024, as part of your existing Power BI Premium or Fabric Capacity. Use the Fabric Capacity Metrics app to track capacity usage for API for GraphQL operations, under the name "Query".

For older updates, review the [Microsoft Fabric What's New archive](#).

Data Factory in Microsoft Fabric samples and guidance

[Expand table](#)

Month	Feature	Learn more
September 2024	Integrate your SAP data into Microsoft Fabric	Learn more about an overview of SAP data options in Microsoft Fabric , along with some guidance on the respective use cases.
July 2024	Connect to your Azure Resources from Fabric with the Data Pipeline Modern Get Data Experience	Learn how to connect to your Azure resources automatically with the modern get data experience of Data Pipelines .

Month	Feature	Learn more
July 2024	Fabric Data Pipelines – Advanced Scheduling Techniques (Part 2: Run a Pipeline on a Specific Day)	This blog provides a tutorial on the ability to schedule a Pipeline on a specific day of the month , including both the start of the month along with the last day of the month.

Synapse Data Engineering in Microsoft Fabric

This section summarizes recent new features and capabilities of the [Data Engineering workload in Microsoft Fabric](#).

[+] [Expand table](#)

Month	Feature	Learn more
October 2024	Native Execution Engine available at no additional cost	The Native Execution Engine is now available at no additional cost . The Native Execution Engine now supports Fabric Runtime 1.3, which includes Apache Spark 3.5 and Delta Lake 3.2. This upgrade enhances Microsoft Fabric's Data Engineering and Data Science workflows, offering boosts in performance and flexibility.
October 2024	Use OneLake shortcuts to access data across capacities: Even when the producing capacity is paused	Learn how OneLake capacity consumption works when accessing data through a shortcut, particularly across capacities .
October 2024	Purview Data Loss Prevention policies have been extended to Fabric lakehouses	Extending Microsoft Purview's Data Loss Prevention (DLP) policies into Fabric lakehouses is now in preview.
October 2024	API for GraphQL support for Service Principal Names (SPNs)	Service Principal Names (SPN) support for API for GraphQL offers organizations looking to integrate their apps with API for GraphQL in Microsoft Fabric tie seamlessly with their enterprise identity and access management systems. For more information, see Service Principal Names (SPNs) in Fabric API for GraphQL .
October 2024	Automatic code generation in API for GraphQL	Fabric API for GraphQL now adds the ability to automatically generate Python and Node.js code based on GraphQL queries tested in the API Explorer.
October 2024	Notebook Git integration GA	Notebook Git integration now supports persisting the mapping relationship of the attached Environment when

Month	Feature	Learn more
		syncing to new workspace. For more information, see Notebook source control and deployment
October 2024	Notebook in deployment pipeline GA	Now you can also use notebooks to deploy your code across different environments , such as development, test, and production. You can also use deployment rules to customize the behavior of your notebooks when they're deployed, such as changing the default Lakehouse of a Notebook. Get started with deployment pipelines , and Notebook shows up in the deployment content automatically.
October 2024	Notebook in Org APP	The Notebook feature is now supported in Org APP . You can easily embed Notebook code and markdown cells, visuals, tables, charts, and widgets in OrgAPP, as a practical storytelling tool.
October 2024	Notebook onboarding tour	The new Fabric Notebook Onboarding Tour is now available. This guided tour is designed to help you get started with the essential Notebook features and learn the new capabilities.
October 2024	Notebook mode switcher	The Notebook mode switcher provides flexible access modes (Develop, Run Only, Edit, View) for your notebooks, which can help you easily manage the permissions to the notebook and the corresponding view.
October 2024	Free selection support on display() table view	The free selection function on the rich dataframe preview in the notebook can improve the data analysis experience. To see the new features, read Free selection support on display() table view .
October 2024	Filter, sort and search your Lakehouse objects	Sorting, Filtering, and Searching capabilities make data exploration and analysis more efficient by allowing you to quickly retrieve the information you need based on specific criteria, right within the Lakehouse environment.
September 2024	Fabric Runtime 1.3 GA	Fabric Runtime 1.3 , now generally available, includes Apache Spark 3.5, Delta Lake 3.1, R 4.4.1, Python 3.11, support for Starter Pools, integration with Environment, and library management capabilities. For more information, see Fabric Runtime 1.3 is Generally Available! .
September 2024	Native Execution Engine on Runtime 1.3 (preview)	Native Execution Engine for Fabric Runtime 1.3 is now available in preview, offering superior query performance across data processing, ETL, data science, and interactive queries. No code changes are required to speed up the execution of your Apache Spark jobs when using the Native Execution Engine .

Month	Feature	Learn more
September 2024	High concurrency mode for Notebooks in Pipelines (preview)	High concurrency mode for Notebooks in Pipelines ↗ enables users to share Spark sessions across multiple notebooks within a pipeline. With high concurrency mode , users can trigger pipeline jobs, and these jobs are automatically packed into existing high concurrency sessions.
September 2024	Reserve maximum cores for jobs (preview)	A new workspace-level setting allows you to reserve maximum cores for your active jobs for Spark workloads ↗ . For more information, see High concurrency mode in Apache Spark for Fabric .
September 2024	Session Expiry Control in Workspace Settings for Notebook Interactive Runs (preview)	A new session expiry control ↗ in Data Engineering/Science workspace settings allows you to set the maximum expiration time limit for notebook interactive sessions. By default, sessions expire after 20 minutes, but you can now customize the maximum expiration duration .
September 2024	Fabric Spark Diagnostic Emitter (preview)	The Fabric Apache Spark Diagnostic Emitter (preview) ↗ allows Apache Spark users to collect logs, event logs, and metrics from their Spark applications and send them to various destinations, including Azure Event Hubs , Azure Storage , and Azure Log Analytics .
September 2024	Environment integration with Synapse VS Code extension	You can now create, configure and use an environment in Fabric in VS Code with the Synapse VS Code extension.
September 2024	Notebook debug within vscode.dev (preview)	You can now place breakpoints and debug your Notebook code ↗ with the Synapse VS Code - Remote ↗ extension in vscode.dev ↗ . This update first starts with the Fabric Runtime 1.3 .
September 2024	Invoke Fabric User Data Functions in Notebook	You can now invoke User Defined Functions (UDFs) in your PySpark code directly from Microsoft Fabric Notebooks or Spark jobs. With NotebookUtils integration, invoking UDFs is as simple as writing a few lines of code ↗ .
September 2024	Functions Hub	The new Functions Hub provides a single location to view, access and manage your User Data Functions ↗ .
September 2024	Support for spaces in Lakehouse Delta table names	You can now create and query Delta tables with spaces in their names ↗ , such as "Sales by Region" or "Customer Feedback". All Fabric Runtimes and Spark authoring experiences support table names with spaces.
September 2024	Enable/Disable Functionality in API	The Enable/Disable feature for queries and mutations in GraphQL API ↗ provides administrators and developers

Month	Feature	Learn more
	for GraphQL	with granular control over API access and usage.
September 2024	Public REST API of Livy endpoint	The Fabric Livy endpoint lets users submit and execute their Spark code on the Spark compute within a designated Fabric workspace, eliminating the need to create any Notebook or Spark Job Definition.
September 2024	OneLake SAS (preview)	Support for OneLake SAS is now in preview . This functionality allows applications to request a User Delegation Key backed by Microsoft Entra ID, and then use this key to construct a short-lived, user-delegated OneLake SAS token. This token can be handed off to provide delegated access to another tool, node, or user, ensuring secure and controlled access.
September 2024	Access Databricks Unity Catalog tables from Fabric (preview)	A mirrored Azure Databricks Unity Catalog in Fabric allows you to read data managed by Unity Catalog from Fabric workloads from the Lakehouse. In Fabric, you can now create a new data item called "Mirrored Azure Databricks Catalog". For more information, see Databricks Unity Catalog tables available in Microsoft Fabric .
September 2024	T-SQL support in Fabric notebooks	The T-SQL notebook feature in Microsoft Fabric lets you write and run T-SQL code within a notebook. You can use them to manage complex queries and write better markdown documentation. It also allows direct execution of T-SQL on connected warehouse or SQL analytics endpoint. To learn more, see Author and run T-SQL notebooks .
September 2024	OneLake shortcuts to Google Cloud Storage	Now a generally available feature, Create a Google Cloud Storage shortcut to connect to your existing data through a single unified name space without having to copy or move data.
September 2024	OneLake shortcuts to S3-compatible data sources	Now a generally available feature, Create an S3 compatible shortcut to connect to your existing data through a single unified name space without having to copy or move data.
August 2024	MsSparkUtils upgrade to NotebookUtils	The library MsSparkUtils has been rebranded as NotebookUtils . While <code>NotebookUtils</code> is backward compatible with <code>MsSparkUtils</code> , new features will only be added to the <code>NotebookUtils</code> namespace. For more information, see NotebookUtils (former MSSparkUtils) for Fabric .
August 2024	Import Notebook UX improvement	The Import Notebook feature user interface has been enhanced - you can now effortlessly import notebooks,

Month	Feature	Learn more
		reports, or paginated reports using the unified entry in the workspace toolbar.
August 2024	Lifecycle of Apache Spark runtimes in Fabric	The Lifecycle of Apache Spark runtimes document details the release cadence and versioning for the Azure-integrated platform based on Azure Spark. For more information, see the Fabric runtime lifecycle blog post .
July 2024	MSSparkUtils API	The <code>mssparkutils.runtime.context</code> is a new API that provides context information of the current live session, including the notebook name, default lakehouse, workspace info, if it's a pipeline run, etc. For more information, see Microsoft Spark Utilities (MSSparkUtils) for Fabric.
July 2024	Environment Resources folder	The new Environment Resources Folder is a shared repository designed to streamline collaboration across multiple notebooks.

For older updates, review the [Microsoft Fabric What's New archive](#).

Synapse Data Engineering samples and guidance

[Expand table](#)

Month	Feature	Learn more
October 2024	Optimizing Spark Compute for Medallion Architectures in Microsoft Fabric	Learn how to optimize Spark Compute for Medallion architecture : a popular data engineering approach that emphasizes modularity. It organizes the data platform into three distinct layers: Bronze, Silver, and Gold.
August 2024	Build a custom Sparklens JAR	In this blog, you will learn how to build the sparklens JAR for Spark 3.X , which can be used in Microsoft Fabric.
July 2024	Create a shortcut to a VPC-protected S3 bucket	Learn how to create a shortcut to a VPC-protected S3 bucket , using the on-premises data gateway and AWS Virtual Private Cloud (VPC).
July 2024	Move Your Data Across Workspaces Using Modern Get Data of Fabric Data Pipeline	The new modern get data experience of data pipeline now supports copying to Lakehouse and warehouse across different workspaces with an intuitive experience.

Synapse Data Science in Microsoft Fabric

This section summarizes recent improvements and features for [Data Science in Microsoft Fabric](#).

[+] [Expand table](#)

Month	Feature	Learn more
October 2024	Enhancing Open Source: Fabric's Contributions to FLAML for Scalable AutoML	We have focused on enhancing FLAML's capabilities for Spark workloads. We've contributed several new Spark and non-Spark estimators to the FLAML project . Try these out with AutoML in Fabric (preview) .
September 2024	Data Wrangler for Spark DataFrames GA	Data Wrangler is now generally available. A notebook-based tool for exploratory data analysis, Data Wrangler works for both pandas DataFrames and Spark DataFrames and arrives at general availability with new usability improvements .
September 2024	Share Feature for Fabric AI skill (preview)	"Share" capability for the Fabric AI skill (preview) allows you to share the AI Skill with others using a variety of permission models.
September 2024	Session Expiry Control in Workspace Settings for Notebook Interactive Runs (preview)	A new session expiry control in Data Engineering/Science workspace settings allows you to set the maximum expiration time limit for notebook interactive sessions. By default, sessions expire after 20 minutes, but you can now customize the maximum expiration duration .
September 2024	File editor in Notebook	The file editor feature in Fabric Notebook allows users to view and edit files directly within the notebook's resource folder and environment resource folder in notebook. Supported file types include CSV, TXT, HTML, YML, PY, SQL, and more.
August 2024	Apply MLflow tags on ML experiment runs and model versions	You can now apply MLflow tags directly on ML experiment runs and ML model versions from the user interface .
August 2024	Track related ML Experiment runs in your Spark Application	You can now use an enhancement to the Monitoring Hub to track related ML experiment runs within Spark applications. You can also integrate Experiment items into the Monitoring Hub .

Month	Feature	Learn more
August 2024	Use PREDICT with Fabric AutoML models	You can now move from training with AutoML to making predictions by using the built-in Fabric PREDICT UI and code-first APIs for batch predictions . For more information, see Machine learning model scoring with PREDICT in Microsoft Fabric .
August 2024	Data Science AI skill (preview)	You can now build your own generative AI experiences over your data in Fabric with the AI skill (preview)! You can build question and answering AI systems over your Lakehouses and Warehouses. For more information, see Introducing AI Skills in Microsoft Fabric: Now in Preview . To get started, try AI skill example with the AdventureWorks dataset .
July 2024	Semantic link preinstalled	Semantic Link in now included in the default runtime . If you use Fabric with Spark 3.4 or later, semantic link is already in the default runtime, and you don't need to install it.
July 2024	Semantic Link Labs	Semantic Link Labs is a library of helpful python solutions for use in Microsoft Fabric notebooks . Semantic Link Labs helps Power BI developers and admins easily automate previously complicated tasks, as well as make semantic model optimization tooling more easily accessible within the Fabric ecosystem. For Semantic Link Labs documentation, see semantic-link-labs documentation . For more information and to see it in action, read the Semantic Link Labs announcement blog .

For older updates, review the [Microsoft Fabric What's New archive](#).

Synapse Data Science samples and guidance

[] Expand table

Month	Feature	Learn more
September 2024	Using Microsoft Fabric for Generative AI: A Guide to Building and Improving RAG Systems	This tutorial includes three main notebooks, each covering a crucial aspect of building and optimizing RAG systems in Microsoft Fabric .
September 2024	Harness Microsoft Fabric AI Skill to Unlock Context-Rich Insights from Your Data	This post demonstrates how you can extend the capabilities of Fabric AI Skill in Microsoft Fabric notebooks to deliver richer and more comprehensive responses using additional Large Language Model (LLM) queries.

Synapse Data Warehouse in Microsoft Fabric

This section summarizes recent improvements and features for [Synapse Data Warehouse in Microsoft Fabric](#).

[+] [Expand table](#)

Month	Feature	Learn more
October 2024	Case insensitive collation support	By default, the collation of a warehouse is case sensitive (CS) with 'Latin1_General_100_BIN2_UTF8'. You can now Create a warehouse with case-insensitive (CI) collation .
October 2024	varchar(max) and varbinary(max) support in preview	Support for the varchar(max) and varbinary(max) in data types in Warehouse is now in preview. For more information, see Announcing public preview of VARCHAR(MAX) and VARBINARY(MAX) types in Fabric Data Warehouse .
October 2024	Concurrency performance improvements	We have recently optimized our task scheduling algorithm in our distributed query processing engine (DQP) to reduce contention when the workspace is under moderate to heavy concurrency. In testing we have observed that this optimization makes significant performance improvements in querying workloads.
October 2024	JSON support enhancements	JSON functionalities in warehouse and SQL analytics endpoints for Lakehouse and mirrored databases have been improved. For details see, JSON support enhancements .
October 2024	Nested Common Table Expressions (CTEs) (preview)	Fabric Warehouse and SQL analytics endpoint both support <i>standard</i> , <i>sequential</i> , and <i>nested</i> CTEs. While CTEs are generally available in Microsoft Fabric, nested common table expressions (CTE) in Fabric data warehousing (Transact-SQL) are currently a preview feature.
September 2024	Mirroring for Snowflake GA	With Mirroring for Snowflake in Fabric, you can easily bring your Snowflake data into OneLake in Microsoft Fabric . For more information, see Mirroring Snowflake .
September 2024	Copilot for Data Warehouse	Copilot for Data Warehouse (preview) is now updated and available as a preview feature, offering the Copilot chat pane, quick actions, and code completions.
September 2024	Delta column mapping in the SQL analytics endpoint	SQL analytics endpoint now supports Delta tables with column mapping enabled . For more information, see Delta column mapping and Limitations of the SQL analytics endpoint . This feature is currently in preview.

Month	Feature	Learn more
September 2024	Lakehouse schemas in SQL analytics endpoint	Lakehouse schemas allow delta tables in schemas to be queried in the SQL analytics endpoint. For more information, see Lakehouse schemas feature (preview) .
September 2024	Fabric Spark connector for Fabric Data Warehouse new features (preview)	The Fabric Spark connector for Fabric Data Warehouse (preview) now supports custom or pass-through queries , PySpark , and Fabric Runtime 1.3 (Spark 3.5) .
September 2024	New editor improvements	Editor improvements for Warehouse and SQL analytics endpoint items improve the consistency and efficiency. For more information, see New editor improvements .
September 2024	T-SQL support in Fabric notebooks (preview)	The T-SQL notebook feature in Microsoft Fabric (preview) lets you write and run T-SQL code within a notebook. You can use them to manage complex queries and write better markdown documentation. It also allows direct execution of T-SQL on connected warehouse or SQL analytics endpoint. To learn more, see Author and run T-SQL notebooks .
September 2024	Nested Common Table Expressions (CTEs) (preview)	Fabric Warehouse and SQL analytics endpoint both support standard , sequential , and nested CTEs . While CTEs are generally available in Microsoft Fabric, nested common table expressions (CTE) in warehouse are currently a preview feature.
September 2024	Mirrored Azure Databricks (Preview)	A mirrored Azure Databricks Unity Catalog in Fabric allows you to read data managed by Unity Catalog from Fabric workloads from the Lakehouse. For more information, see Databricks Unity Catalog tables available in Microsoft Fabric .
August 2024	Mirroring integration with modern get data experience	You can now use the Modern Get Data experience to choose from all the available mirrored databases in the OneLake data hub.
August 2024	T-SQL DDL support in Azure SQL Database mirrored database	You can now run DDL operations on a Azure SQL Database mirrored database such as Drop Table, Rename Table, and Rename Column.
August 2024	Delta Lake log publishing pause and resume	You can now pause and resume the publishing of Delta Lake Logs for Warehouses . For more information, see Delta Lake logs in Warehouse in Microsoft Fabric .
August 2024	Managing V-Order behavior of Fabric	You can now manage V-Order behavior at the warehouse level . For more information, see Understand V-Order for

Month	Feature	Learn more
	Warehouses	Microsoft Fabric Warehouse.
August 2024	TRUNCATE T-SQL support	The TRUNCATE T-SQL command is now supported in Warehouse tables.
July 2024	ALTER TABLE and nullable column support	We've added T-SQL ALTER TABLE support for some operations, as well as nullable column support to tables in the warehouse. For more information, see ALTER TABLE (Transact-SQL) .
July 2024	Warehouse queries with time travel (GA)	Warehouse in Microsoft Fabric offers the capability to query the historical data as it existed in the past at the statement level, now generally available. The ability to query data from a specific timestamp is known in the data warehousing industry as <i>time travel</i> .
July 2024	Restore warehouse experience in the Fabric portal	You can now create restore points and perform a restore in-place of a warehouse item . For more information, see Seamless Data Recovery through Warehouse restoration .
July 2024	Warehouse source control (preview)	Using Git integration and/or deployment pipelines with your warehouse , you can manage development and deployment of versioned warehouse objects. You can use SQL Database Projects extension available inside of Azure Data Studio and Visual Studio Code . For more information on warehouse source control, see CI/CD with Warehouses in Microsoft Fabric .
July 2024	Time travel and clone table retention window expanded	The retention period for time travel queries and clone table is now 30 days.

For older updates, review the [Microsoft Fabric What's New archive](#).

Synapse Data Warehouse samples and guidance

[\[+\] Expand table](#)

Month	Feature	Learn more
October 2024	Ensuring Data Continuity in Fabric Warehouse: Best Practices for Every Scenario	Dive deep into the common recovery scenarios and features that help enable seamless end-to-end data recovery and discuss best practices to ensure data resilience .

Month	Feature	Learn more
August 2024	Mirroring SQL Server database to Fabric	While SQL Server isn't currently supported for Fabric mirrored databases, learn how to extend Fabric mirroring to an on-premises SQL Server database as a source, using a combination of SQL Server Transactional replication and Fabric Mirroring ↗ .
July 2024	Microsoft Entra authentication for Fabric Synapse Data Warehouse	For sample connection strings and more information on using Microsoft Entra as an alternative to SQL Authentication, see Microsoft Entra authentication as an alternative to SQL authentication .

Real-Time Intelligence in Microsoft Fabric

This section summarizes recent improvements and features for [Real-Time Intelligence in Microsoft Fabric](#).

[\[\] Expand table](#)

Month	Feature	Learn more
October 2024	Secure Data Streaming with Managed Private Endpoints in Eventstream (Preview)	By creating a Fabric Managed Private Endpoint, you can now securely connect Eventstream to your Azure services, such as Azure Event Hubs or IoT Hub, within a private network or behind a firewall. For more information, see Secure Data Streaming with Managed Private Endpoints in Eventstream (Preview) ↗ .
October 2024	Usage reporting for Data Activator is now live	The Data Activator team has rolled out usage reporting ↗ to help you better understand your capacity consumption and future charges. When you look at the Capacity Metrics App you'll now see operations for the reflex items included.
October 2024	Real-Time Dashboards and underlying KQL databases access separation (preview)	With separate permissions for dashboards and underlying data, administrators now have the flexibility to allow users to view dashboards without giving access to the raw data ↗ .
October 2024	Real-Time Dashboards Integration with GitHub	Fabric's Git integration is now available for Real-Time Dashboards ↗ . For more information, see What is Microsoft Fabric Git integration? .
October 2024	Quickly visualize query results in KQL	You can now graphically visualize KQL Queryset results ↗ instantly and effortlessly and control the formatting

Month	Feature	Learn more
	Queryset	without the need for re-run queries – all using a familiar UI.
October 2024	Pin query to dashboard	You can now save the outcome of any query written in KQL Queryset directly to a new or existing Real-Time Dashboard .
September 2024	Creating a real time dashboard by Copilot	Copilot can review a table and automatically create a dashboard with insights and a profile of the data with a sample.
September 2024	New Real-Time Hub and KQL Database user experiences	The new user experience features new Real-Time hub navigation, a My Streams page, an enhanced database page experience , and more.
September 2024	Eventhouse as a new Destination in Eventstream	Eventhouses, equipped with KQL Databases, can handle and analyze large volumes of data. With the Eventhouse destination in Eventstream , you can efficiently process and route data streams into an Eventhouse and analyze the data in near real-time using KQL.
September 2024	Managed private endpoints for Eventstream	With a Fabric Managed Private Endpoint , you can now establish a private connection between your Azure services, such as Azure Event Hubs, and Fabric Eventstream. For more information, see Eventstream integration with managed private endpoint .
September 2024	Data Activator alerts on KQL Querysets	Now you can set up Data Activator (preview) alerts directly on your KQL queries in KQL querysets . For more information and samples, see Create Data Activator alerts from a KQL Queryset (preview) .
September 2024	Real-Time Dashboards continuous or 10s refresh rate	The dashboard auto refresh feature now supports continuous and 10 second refresh rates , in addition to the existing options. This upgrade, addressing a popular customer request, allows both editors and viewers to set near real-time and real-time data updates.
September 2024	Multivariate anomaly detection	A new workflow for multivariate anomaly detection of time series data is based on the algorithm that is used in the AI Anomaly Detector service (which is being retired as a standalone service). For a tutorial, see Multivariate Anomaly Detection .
September 2024	Real-Time Intelligence Copilot conversational mode	The Copilot assistant, which translates natural language into KQL, now supports conversational mode , allowing you to ask follow-up questions that build on previous queries within the chat.

Month	Feature	Learn more
September 2024	New connectors and UI in Real-Time hub	Four new connectors are released on September 24, 2024: Apache Kafka , Amazon Managed Streaming for Apache Kafka , Azure SQL Managed Instance CDC , SQL Server on VM DB CDC . The tabs in the main page of Real-Time hub are replaced with menu items on the left navigation menu. For more information, see Get started with Fabric Real-Time hub . You can connect to Azure streaming sources using private endpoints now.
September 2024	Announcement: Eventhouse Standard Storage billing	Starting the week of September 16 you will start seeing billable consumption of the OneLake Storage Data Stored meter from the Eventhouse and KQL Database items.
August 2024	Fabric Real-Time Hub Teaching Bubbles	New teaching bubbles provide a step-by-step guide through its major functionalities. These interactive guides allow you to seamlessly navigate each tab of the Real-Time Hub. For more information, see Fabric Real-Time Hub Teaching Bubble .
August 2024	KQL Queryset REST API support	The new Fabric Queryset REST APIs allow you to create/update/delete KQL Querysets in Fabric, and programmatically manage them without manual intervention. For more information, see KQL Queryset REST API support .
July 2024	Update records in a KQL Database preview	The .update command is now generally available. Learn more about how to Update records in a Kusto database .
July 2024	Real-Time Dashboards 1s and 10s refresh rate	Real-time Dashboards now support ultra-low refresh rates of just 1 or 10 seconds. For more information, see Create a Real-Time Dashboard (preview) .

For older updates, review the [Microsoft Fabric What's New archive](#).

Real-Time Intelligence samples and guidance

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Month	Feature	Learn more
August 2024	Advanced Time Series Anomaly Detector in Fabric	Read an example using the time-series-anomaly-detector in Fabric to upload stocks change table to Fabric, train the multivariate anomaly detection model in a Python notebook using Spark engine, and predict anomalies by applying the

Month	Feature	Learn more
		trained model to new data using Eventhouse (Kusto) engine.
August 2024	Acting on Real-Time data using custom actions with Data Activator	Learn how to monitor and acting on data is to use Data Activator, which is a no-code experience in Microsoft Fabric for taking action automatically when the condition of the package temperature is detected in the data.
July 2024	Build real-time order notifications with Eventstream's CDC connector	Read about a a real-life example of how an online store used Eventstream's CDC connector from Azure SQL Database.
July 2024	Automating Real-Time Intelligence Eventhouse deployment using PowerShell	Let's build a PowerShell script to automate the deployment of Eventhouse, KQL Database, Tables, Functions, and Materialized Views into a workspace in Microsoft Fabric.

Microsoft Fabric core features

News and feature announcements core to the Microsoft Fabric experience.

[] [Expand table](#)

Month	Feature	Learn more
October 2024	New Item panel in Workspace	Previously, by selecting +New in the workspace, you can access a drop-down menu with some pre-defined item types to get started. Now, the +New item button shows item types listed in a panel, categorized by tasks .
October 2024	Enhanced Tenant Setting Delegation for Export Controls	Delegation of export settings is now available to workspaces via domain . This new capability provides more granular control over data export permissions, addressing the specific needs of tenant, domain and workspace administrators.
October 2024	APIs for Managed Private Endpoint are now available	REST APIs for managed Private Endpoints are available. You can now create, delete, get, list Managed private endpoints via APIs .
October 2024	Important billing updates coming to Copilot and AI in Fabric	Upcoming pricing and billing updates to make Copilot and AI features in Fabric more accessible and cost-effective .

Month	Feature	Learn more
September 2024	Terraform Provider for Fabric (preview)	The Terraform Provider for Microsoft Fabric is now in preview. The Terraform Provider for Microsoft Fabric supports the creation and management of many Fabric resources. For more information, see Announcing the new Terraform Provider for Microsoft Fabric .
September 2024	Announcing Service Principal support for Fabric APIs	You can now use service principal to access Fabric APIs . Service principal is a security identity that you can create in Microsoft Entra and assign permissions to it in Microsoft Entra and other Microsoft services, such as Microsoft Fabric.
September 2024	Tag your data to enrich item curation and discovery	Tags (preview) help admins categorize and organize data , enhancing the searchability of your data and boosting success rates and efficiency for end users.
September 2024	Trusted workspace access and Managed private endpoints in any Fabric capacity	Trusted workspace access and Managed private endpoints are available in any Fabric capacity . Previously, trusted workspace access and Managed private endpoints were available only in F64 or higher capacities. Managed Private endpoints are now available in Trial capacities.
September 2024	Multitenant organization (MTO) (preview)	Fabric now supports Microsoft Entra ID Multitenant Organizations (MTO) . The multitenant organizations capability in Microsoft Entra ID synchronizes users across multiple tenants, adding them as users of type external member. For more information, see Distribute Power BI content to external guest users with Microsoft Entra B2B .
September 2024	Microsoft Fabric Achieves HITRUST CSF Certification	Microsoft Fabric is now certified for the HITRUST Common Security Framework (CSF) v11.0.1 .
August 2024	OneLake data access role improvements	Based on key feedback, we've updated data access roles with a user interface redesign. For more information, see Get started with OneLake data access roles (preview) .
August 2024	Workspace filter improvement to support nested folders	We have upgraded the filter experience to support filtering through the entire workspace or through a specific folder with all its nested folders.
August 2024	Announcing the availability of Trusted workspace access and Managed private	Use Trusted workspace access and Managed Private endpoints in Fabric with any F capacity and enjoy the benefits of secure and optimized data access and connectivity.

Month	Feature	Learn more
	endpoints in any Fabric capacity	
July 2024	SOC certification compliance	We are excited to announce that Microsoft Fabric, our all-in-one analytics solution for enterprises, is now System and Organization Controls (SOC) 1 Type II, SOC 2 Type II, and SOC 3 compliant .
July 2024	Microsoft Fabric .NET SDK	We are excited to announce the very first release of the Microsoft Fabric .NET SDK ! For more information on the REST API documentation, see Microsoft Fabric REST API documentation .

For older updates, review the [Microsoft Fabric What's New archive](#).

Continuous Integration/Continuous Delivery (CI/CD) in Microsoft Fabric

This section includes guidance and documentation updates on development process, tools, source control, and versioning in the Microsoft Fabric workspace.

[] [Expand table](#)

Month	Feature	Learn more
September 2024	GitHub integration for source control	Now generally available, Fabric developers can now choose GitHub or GitHub Enterprise as their source control tool , and version their Fabric items there. For more information, see Intro to Git integration .
September 2024	New Deployment Pipelines design	A new and improved design for the Deployment Pipeline introduces a range of changes, additions, and improvements designed to elevate your deployment process. Read more about What's changed in deployment pipelines .
July 2024	GitHub integration for source control (preview)	Fabric developers can now choose GitHub or GitHub Enterprise as their source control tool , and version their Fabric items there. For more information, see Get started with Git integration (preview) .
July 2024	Microsoft Fabric .NET SDK	We are excited to announce the very first release of the Microsoft Fabric .NET SDK ! For more information on the REST API documentation, see Microsoft Fabric REST API documentation .

For older updates, review the [Microsoft Fabric What's New archive](#).

Continuous Integration/Continuous Delivery (CI/CD) samples

[] [Expand table](#)

Month	Feature	Learn more
August 2024	Exploration of Microsoft Fabric's CI/CD Features	A guided tour of Microsoft Fabric's CI/CD features for data pipelines, lakehouse, notebooks, reports, and semantic models.

Archive

For older updates, review the [Microsoft Fabric What's New archive](#).

Related content

- [Modernization Best Practices and Reusable Assets Blog](#)
- [Azure Data Explorer Blog](#)
- [Fabric Known Issues](#)
- [Microsoft Fabric Blog](#)
- [Microsoft Fabric terminology](#)
- [What's new in Power BI?](#)
- [Microsoft Fabric videos on YouTube](#)
- [Microsoft Fabric community](#)

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End-to-end tutorials in Microsoft Fabric

Article • 05/27/2024

In this article, you find a comprehensive list of end-to-end tutorials available in Microsoft Fabric. These tutorials guide you through a scenario that covers the entire process, from data acquisition to data consumption. They're designed to help you develop a foundational understanding of the Fabric UI, the various experiences supported by Fabric and their integration points, and the professional and citizen developer experiences that are available.

Multi-experience tutorials

The following table lists tutorials that span multiple Fabric experiences.

[+] Expand table

Tutorial name	Scenario
Lakehouse	In this tutorial, you ingest, transform, and load the data of a fictional retail company, Wide World Importers, into the lakehouse and analyze sales data across various dimensions.
Data Science	In this tutorial, you explore, clean, and transform a taxicab trip semantic model, and build a machine learning model to predict trip duration at scale on a large semantic model.
Real-Time Intelligence	In this tutorial, you use the streaming and query capabilities of Real-Time Intelligence to analyze London bike share data. You learn how to stream and transform the data, run KQL queries, build a Real-Time Dashboard and a Power BI report to gain insights and respond to this real-time data.
Data warehouse	In this tutorial, you build an end-to-end data warehouse for the fictional Wide World Importers company. You ingest data into data warehouse, transform it using T-SQL and pipelines, run queries, and build reports.

Experience-specific tutorials

The following tutorials walk you through scenarios within specific Fabric experiences.

[+] Expand table

Tutorial name	Scenario
Power BI	In this tutorial, you build a dataflow and pipeline to bring data into a lakehouse, create a dimensional model, and generate a compelling report.
Data Factory	In this tutorial, you ingest data with data pipelines and transform data with dataflows, then use the automation and notification to create a complete data integration scenario.
Data Science end-to-end AI samples	In this set of tutorials, learn about the different Data Science experience capabilities and examples of how ML models can address your common business problems.
Data Science - Price prediction with R	In this tutorial, you build a machine learning model to analyze and visualize the avocado prices in the US and predict future prices.
Application lifecycle management	In this tutorial, you learn how to use deployment pipelines together with git integration to collaborate with others in the development, testing and publication of your data and reports.

Related content

- [Create a workspace](#)
- [Discover data items in the OneLake data hub](#)

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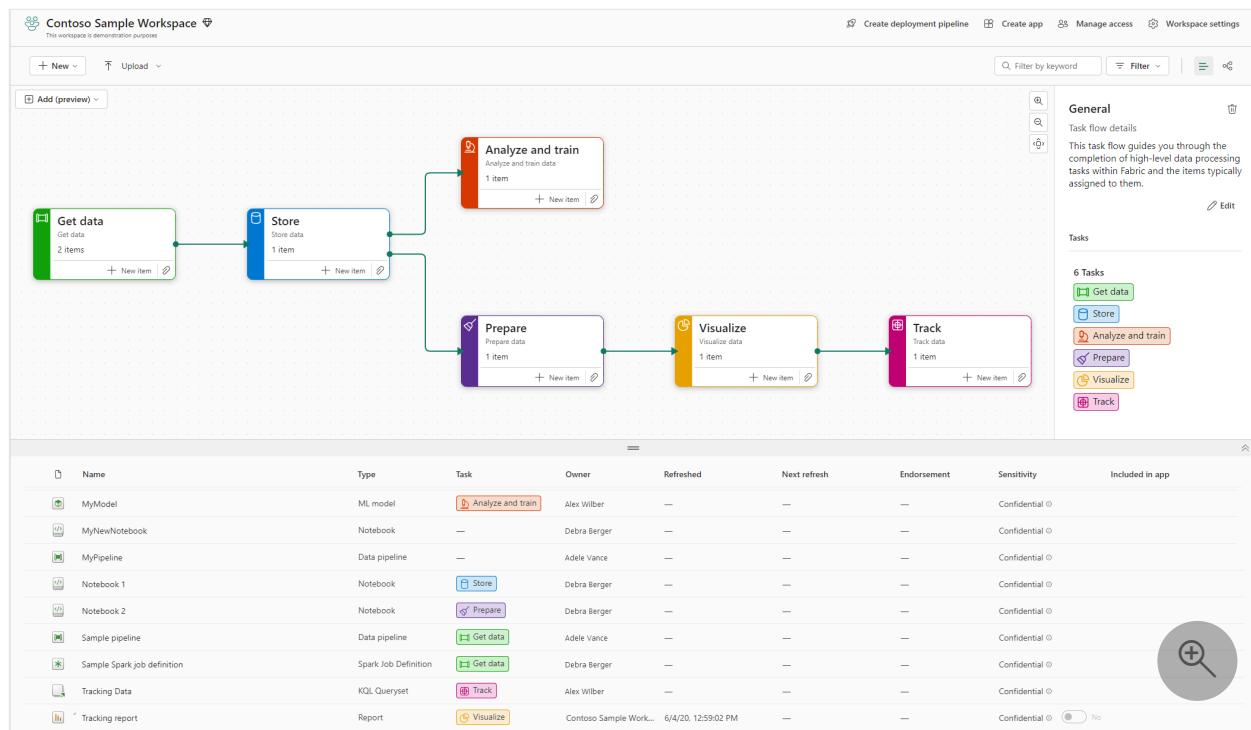
Task flows in Microsoft Fabric (preview)

Article • 06/06/2024

This article describes the task flows feature in Microsoft Fabric. Its target audience is data analytics solution architects who want to use a task flow to build a visual representation of their project, engineers who are working on the project and want to use the task flow to facilitate their work, and others who want to use the task flow to filter the item list to help navigate and understand the workspace.

Overview

Fabric task flow is a workspace feature that enables you to build a visualization of the flow of work in the workspace. The task flow helps you understand how items are related and work together in your workspace, and makes it easier for you to navigate your workspace, even as it becomes more complex over time. Moreover, the task flow can help you standardize your team's work and keep your design and development work in sync to boost the team's collaboration and efficiency.



Fabric provides a range of predefined, end-to-end task flows based on industry best practices that are intended to make it easier to get started with your project. In addition, you can customize the task flows to suit your specific needs and requirements. This enables you to create a tailored solution that meets your unique business needs and goals.

Each workspace has one task flow. The task flow occupies the upper part of workspace list view. It consists of a canvas where you can build the visualization of your data analytics project, and a side pane where you can see and edit details about the task flow, tasks, and connectors.

 **Note**

You can [resize or hide the task flow](#) using the controls on the horizontal separator bar.

Key concepts

Key concepts to know when working with a task flow are described in the following sections.

Task flow

A task flow is a collection of connected tasks that represent relationships in a process or collection of processes that complete an end-to-end data solution. A workspace has one task flow. You can either build it from scratch or use one of Fabric's predefined task flows, which you can customize as desired.

Task

A task is a unit of process in the task flow. A task has recommended item types to help you select the appropriate items when building your solution. Tasks also help you navigate the items in the workspace.

Task type

Each task has a task type that classifies the task based on its key capabilities in the data process flow. The predefined task types are:

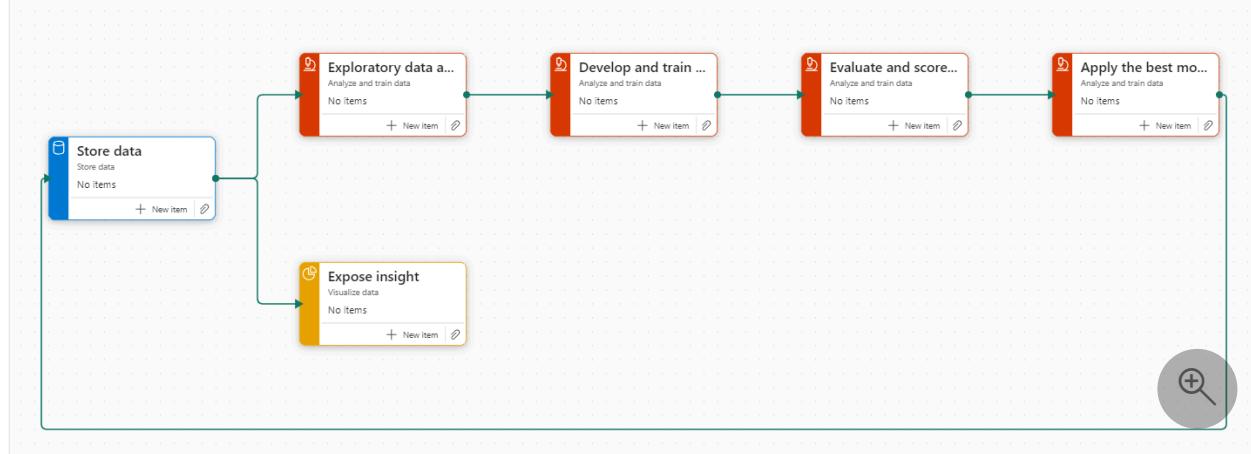
 Expand table

Task type	What you want to do with the task
General	Create a customized task for your project needs that you can assign available item types to.

Task type	What you want to do with the task
Get data	Ingest both batch and real-time data into a single location within your Fabric workspace.
Store data	Organize, query, and store your ingested data in an easily retrievable format.
Prepare data	Clean, transform, extract, and load your data for analysis and modeling tasks.
Analyze and train data	Propose hypotheses, train models, and explore your data to make decisions and predictions.
Track data	Monitor your streaming or nearly real-time operational data, and make decisions based on gained insights.
Visualize data	Present your data as rich visualizations and insights that can be shared with others.

Connector

Connectors are arrows that represent logical connections between the tasks in the task flow. They don't represent the flow of data, nor do they create any actual data connections.



Considerations and limitations

- The positioning of tasks on the task flow canvas is persistent. However, due to a known issue, when a new task is added to the canvas, all tasks that aren't connected to another task will return to their default position. Therefore, whenever possible, it's recommended to connect all tasks before adding a new task.
- Creating paginated reports, dataflows Gen1, and semantic models from a task isn't supported.

- Creating reports from a task is supported only if a published semantic model is picked.

Related content

- [Set up a task flow](#)
- [Work with task flows](#)

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Set up a task flow (preview)

Article • 05/13/2024

This article describes how to start building a task flow, starting either from scratch or with one of Fabric's predefined task flows. It targets data analytics solution architects and others who want to create a visualization of a data project.

Prerequisites

To create a task flow in a workspace, you must be a workspace admin, member, or contributor.

Open the workspace

Navigate to the workspace where you want to create your task flow and open **List view**.

Contoso Task Flow Workspace

Create deployment pipeline Create app Manage access Workspace settings

+ New Upload Filter by keyword Filter Edit

Select a task flow or build your own to get started (preview)

Select from one of Microsoft's predesigned task flows or add a task to start building one yourself.

Select a task flow Add a task

Name	Type	Task	Owner	Refreshed	Next refresh	Endorsement	Sensitivity	Included in app
DataflowsStagingLakehouse	Lakehouse		Contoso Task Flo...	—	—	—	Confidential	
DataflowsStagingLakehouse	Semantic model (...)		Contoso Task Flo...	4/11/24, 1:01:41 AM	N/A	—	Confidential	
DataflowsStagingLakehouse	SQL analytics end...		Contoso Task Flo...	—	N/A	—	Confidential	
DataflowsStagingWarehouse	Warehouse		Contoso Task Flo...	—	N/A	—	Confidential	
DataflowsStagingWarehouse	Semantic model (...)		Contoso Task Flo...	4/11/24, 1:01:42 AM	N/A	—	Confidential	
MyNewNotebook	Notebook		Contoso Task Flo...	—	—	—	Confidential	
MyPipeline	Data pipeline		Contoso Task Flo...	—	—	—	Confidential	

1. List view selector
2. Task flow canvas
3. Task flow details pane
4. Resize bar
5. Show/hide task flow
6. Items list

You'll see that the workspace view is split between the task flow, where you'll build your task flow, and the items list, which shows you the items in the workspace. A moveable

separator bar allows you to adjust the size of the views. You can also hide the task flow if you want to get it out of the way.

The task flow itself is split between the canvas, which will hold the visualization of your work flow, and a side pane that contains information and controls to help you build the task flow. The contents of the side pane changes according to what is selected in the canvas.

When no task flow has been configured, an empty default task flow entitled **Get started with a task flow** is there. To build your task flow, you need to:

- Add tasks to the task flow canvas.
- Arrange the tasks on the task flow canvas in such a way that illustrates the logic of the project.
- Connect the tasks to show the logical structure of the project.
- Assign items to the tasks in the workflow.

To get started, you can either [select one of the predefined task flows](#) or [add a task to start building one from scratch](#).

Start with a predefined task flow

On the empty default task flow, choose **Select a task flow**.

The side pane lists the predefined task flows provided by Microsoft. Each predefined task flow has a brief description of its use case. When you select one of the flows, you'll see a more detailed description of the flow and how it's used, and also the workloads and item types that the flow requires.

Select a task flow or build your own to get started (preview)

Select from one of Microsoft's predesigned task flows or add a task to start building one yourself.

Type	Task	Owner	Ref
Lakehouse	Contoso Task Flow...	—	
Semantic model (...)	Contoso Task Flow...	4/1	
SQL analytics endpoint	Contoso Task Flow...	—	
Warehouse	Contoso Task Flow...	—	
Semantic model (...)	Contoso Task Flow...	4/1	
Notebook	Contoso Task Flow...	—	
Data pipeline	Contoso Task Flow...	—	

Select **Cancel**

General
A high-level data processing task flow that guides you through typical tasks and the items assigned to them.

Basic data analytics
A basic, step-by-step task flow for batch data analytics.

Data analytics using a SQL analytics endpoint
Select unstructured, semi-structured, or structured data from lakehouse files, and then create reports.

Medallion
Organize and improve data progressively as it moves through each layers.

Event analytics
Process and analyze real-time data as it is generated to extract insights quickly.

Lambda
Process batch and real-time data in one data process flow.

Sensitive data insights
Process and analyze your sensitive data.

Required Workloads

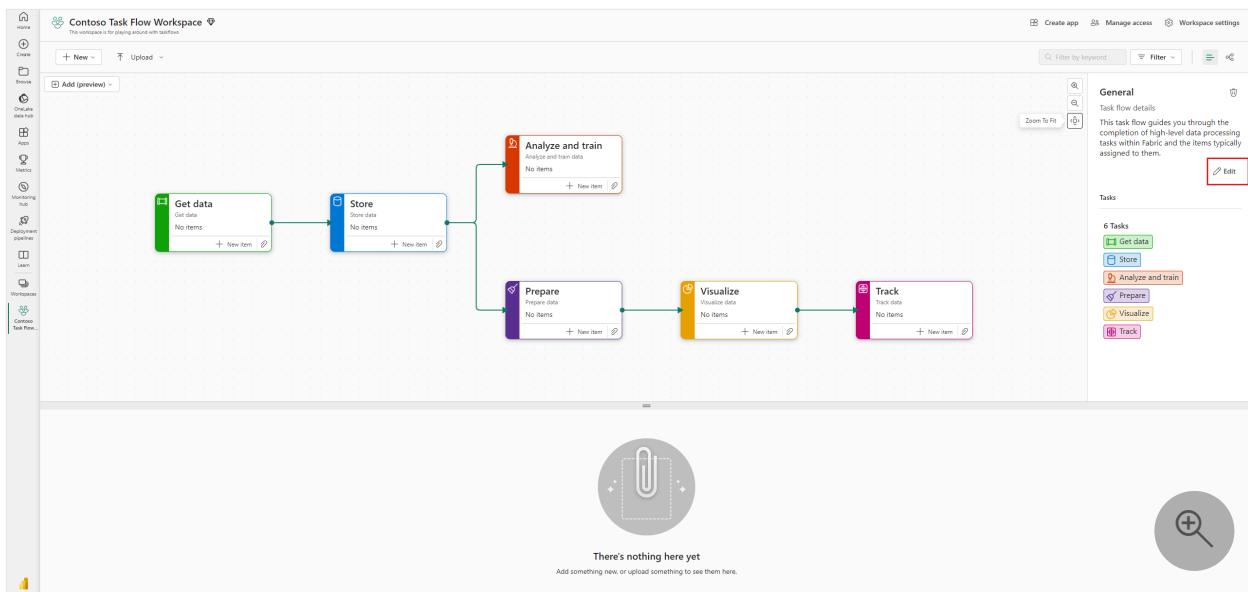
- Data Engineering
- Data Factory
- Data Science
- Data Warehouse
- Power BI

Required item types

- Dataflow Gen2
- Lakehouse
- Warehouse
- Data pipeline
- Notebook
- Spark Job Definition
- Report
- Dashboard
- ML model
- Experiment
- Environment

1. List of predesigned task flows.
2. Name of selected predesigned task flow.
3. Number of tasks in the task flow.
4. Detailed description of the task flow and how it's used.
5. The workloads that the task flow typically requires.
6. The item types that are typically used in task flow.

Select the task flow that best fits your project needs and then choose **Select**. The selected task flow will be applied to the task flow canvas.



The task flow canvas provides a graphic view of the tasks and how they're connected logically.

The side pane now shows detailed information about the task flow you selected, including:

- Task flow name.
- Task flow description.
- Total number of tasks in the task flow.
- A list of the tasks in the task flow.

It's recommended that you change the task flow name and description to something meaningful that enables others to better understand what the task flow is all about. To change the name and description, select **Edit** in the task flow side pane. For more information, see [Edit task flow details](#).

The items list shows all the items and folders in the workspace, including those items that are assigned to tasks in the task flow. When you select a task in the task flow, the items list is filtered to show just the items that are assigned to the selected task.

Note

Selecting a predefined task flow just places the tasks involved in the task flow on the canvas and indicates the connections between them. It is just a graphical representation - no actual items or data connections are created at this point, and no existing items are assigned to tasks in the flow.

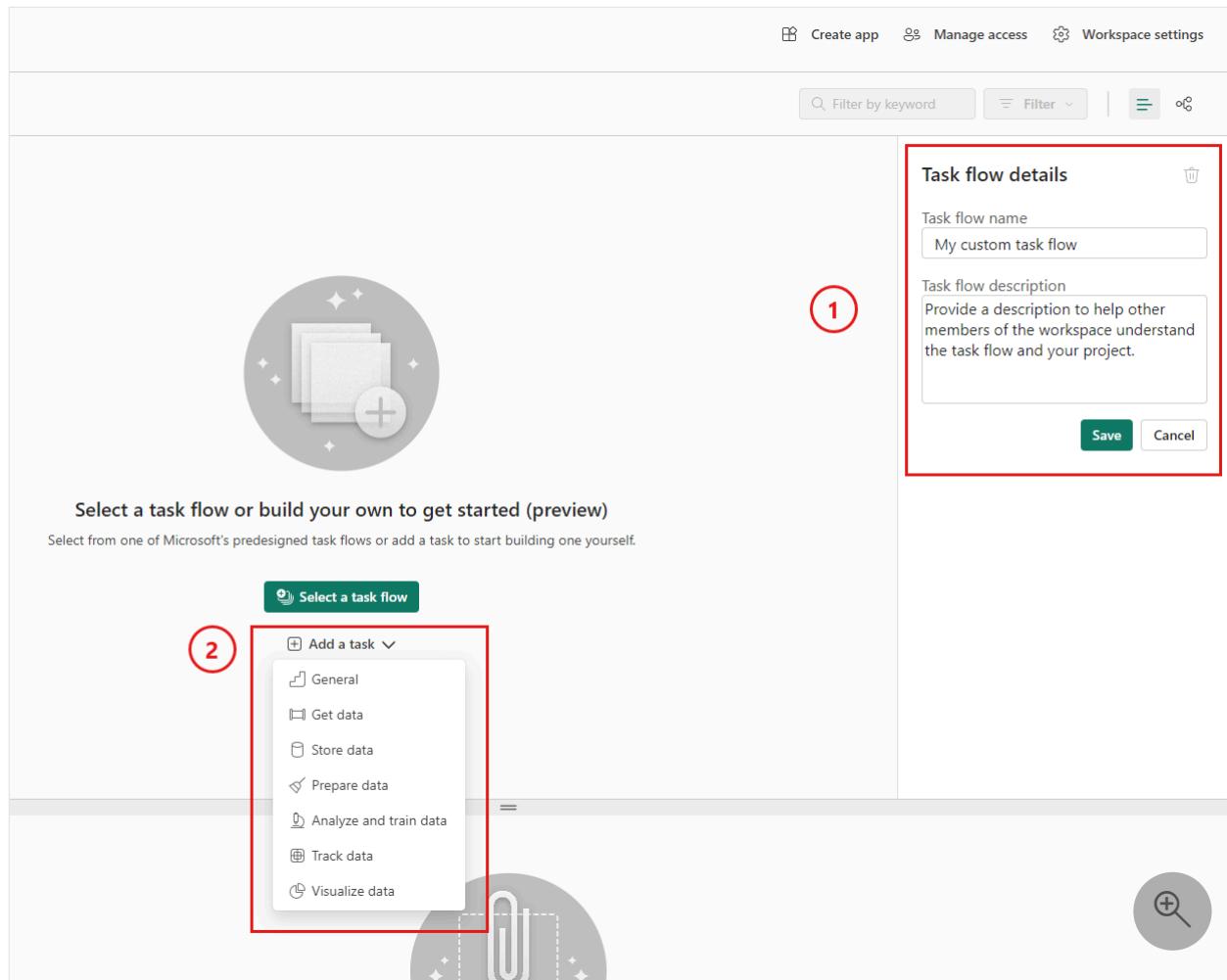
After you've added the predefined task flow to the canvas, you can start modifying it to suit your needs - [arranging the tasks on the canvas](#), [updating task names and descriptions](#), [assigning items to tasks](#), etc. For more information, see [Working with task flows](#).

Start with a custom task flow

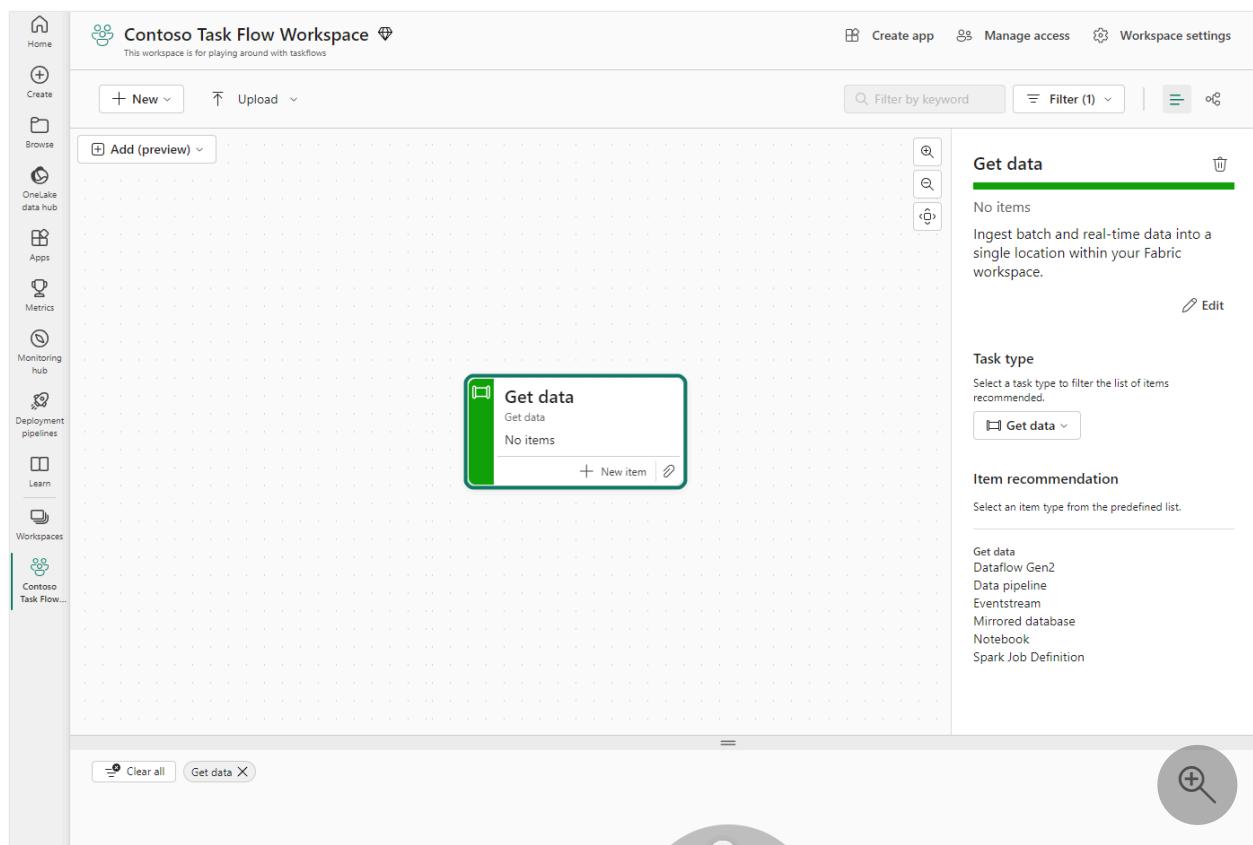
If you already have a clear idea of what the structure of your task flow needs to be, or if none of the predesigned task flows fit your needs, you can build a custom task flow from scratch.

First, select **Edit** in the task flow side pane and provide a name and description for your task flow to help other members of the workspace understand your project and the task flow you're creating.

Next, on the task flow canvas, select Add a task and choose a task type.



The task appears on the canvas. Note that the side pane now shows the task details.



When you add a task to the task flow, it has a default name and description. It's recommended to provide a meaningful name and description to help others understand the task's purpose and use. To update the task name and description, select **Edit** in the task details pane. For more information, see [Edit task flow details](#).

You can continue to [add more tasks to the canvas](#). You'll also have to perform other actions, such as [arranging the tasks on the canvas](#), [connecting the tasks](#), [assigning items to the tasks](#), etc. For more information, see [Working with task flows](#).

Related concepts

- [Task flow overview](#)
 - [Work with task flows](#)
-

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Work with task flows (preview)

Article • 06/06/2024

This article describes how to work with tasks. The target audience is data analytics solution architects who are designing a data analytics solution, engineers who need to know how to use task flows to facilitate their work, and others who want to use the task flow to filter the item list to help navigate and understand the workspace.

Prerequisites

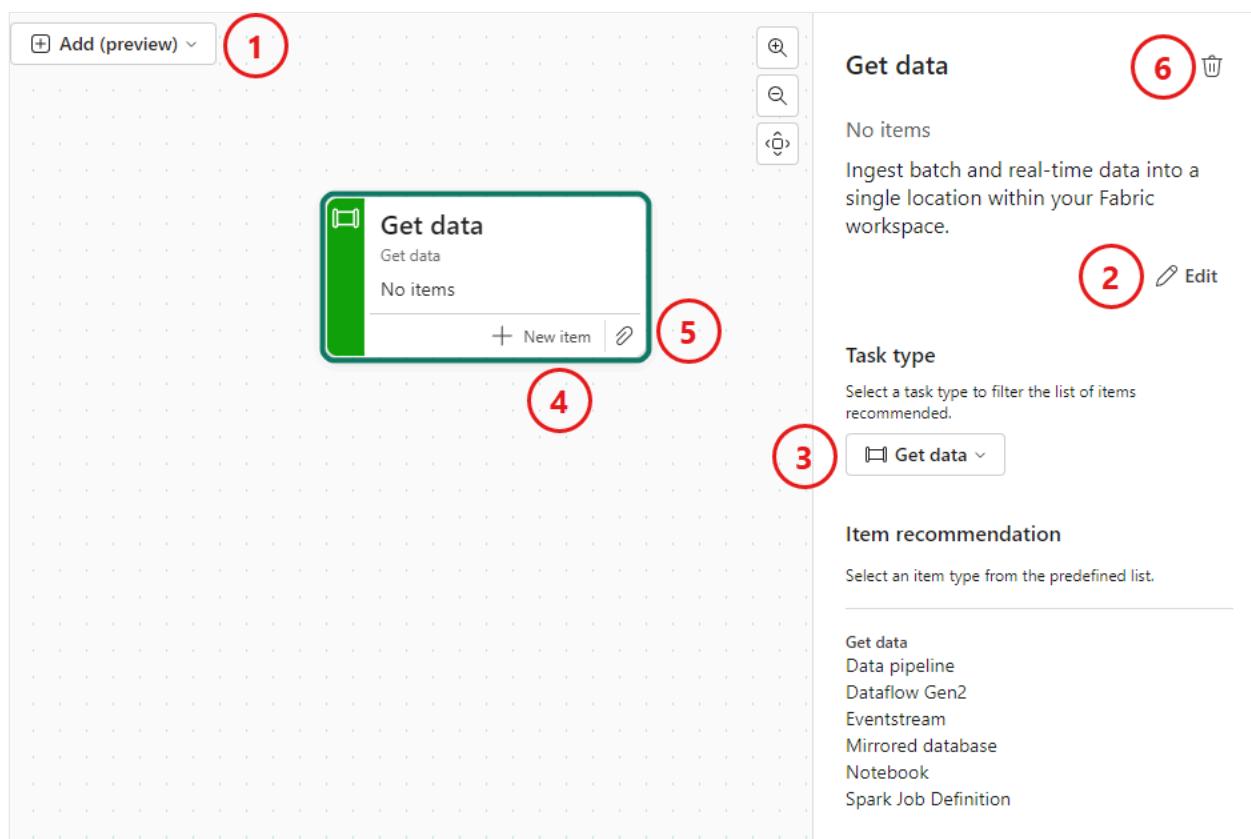
To create or edit the task flow, and to create items in the workspace via the task flow, you need to be an Admin, Member, or Contributor in the workspace.

Admins, Members, Contributors, and Viewers can use the task flow to [filter the items list](#).

Task controls

Much of the work with tasks is accomplished either in the task details pane or via controls on the task card or on the task flow canvas.

Select a task to display the task details pane. The following image shows the main controls for working with tasks.

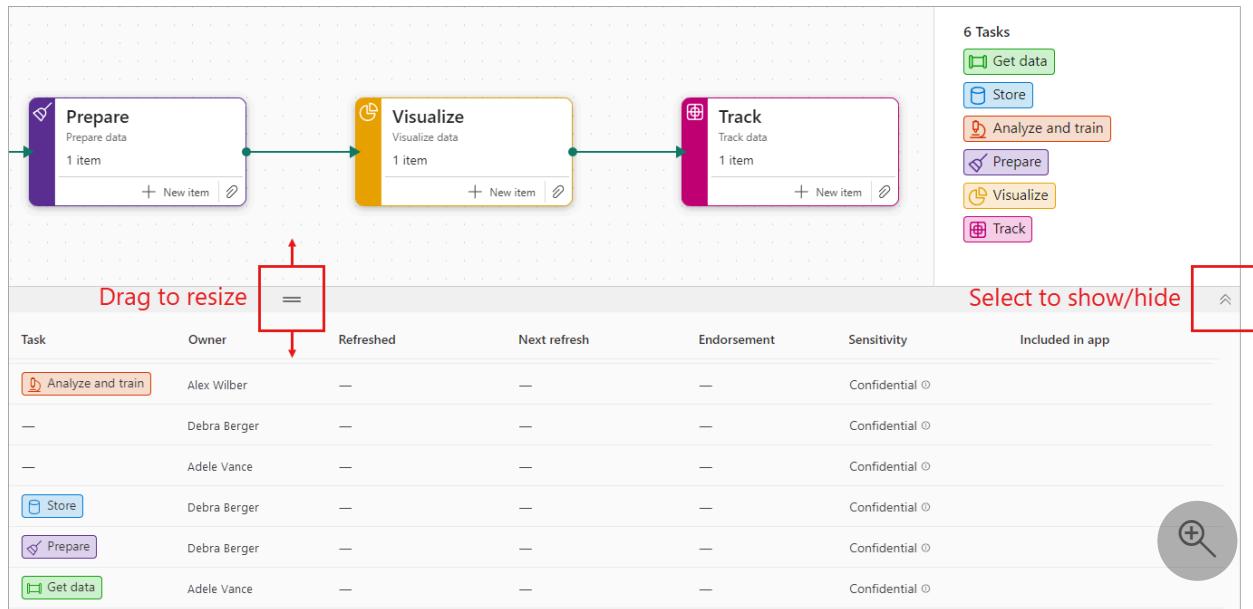


1. Add task or connector
2. Edit task name and description
3. Change task type
4. Create new item for task
5. Assign existing items to task
6. Delete task

Resize or hide the taskflow

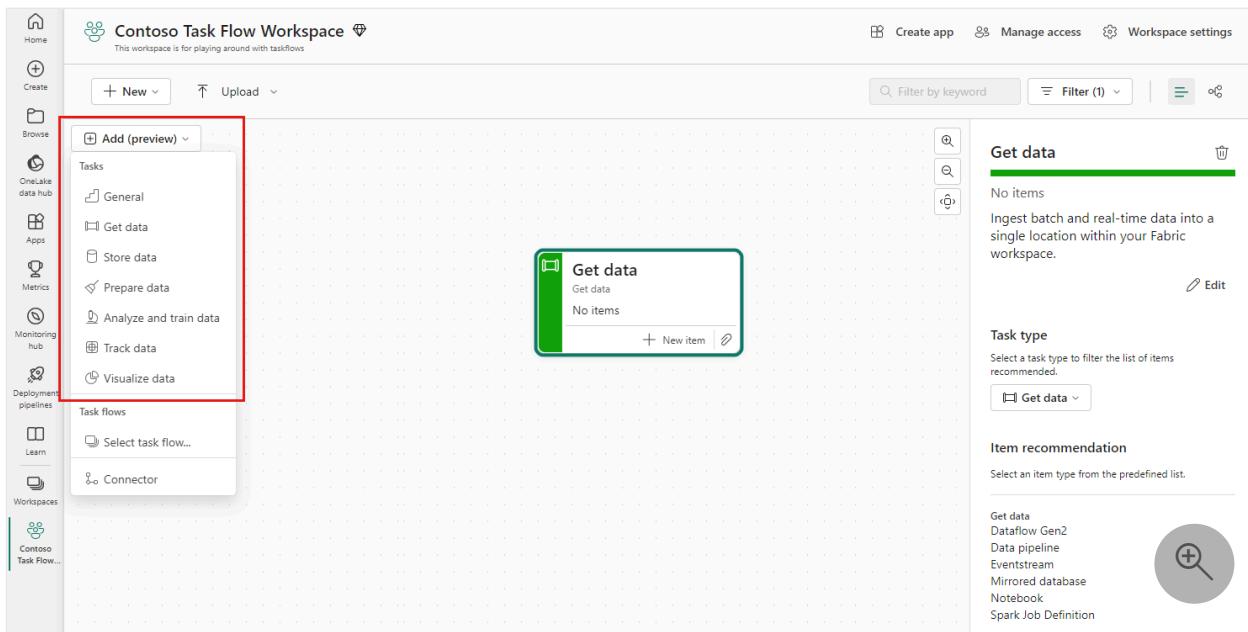
To resize the task flow, drag the resize bar on the horizontal separator up or down.

To show/hide the task flow, select the show/hide control at the right side of the separator.



Add a task

To add a new task to the task flow canvas, open the **Add** dropdown menu and select the desired task type.



The task of the selected task type is added onto the canvas. The name and description of the new task are the default name and description of the task type. Consider [changing the name and description](#) of the new task to better describe its purpose in the work flow. A good task name should identify the task and provide a clear indication of its intended use.

Edit task name and description

To edit a task's name or description:

1. Select the task on the canvas to open the [task details pane](#).
2. Select **Edit** and change the name and description fields as desired. When done, select **Save**.

Change task type

To change a task to a different type:

1. Select the task on the canvas to open the [task details pane](#).
2. Open the **Task type** dropdown menu and choose the new desired task type.

Note

Changing the task type doesn't change the task name or description. Consider changing these fields to suit the new task type.

Arrange tasks on the canvas

Part of building a task flow is arranging the tasks in the proper order. To arrange the tasks, select and drag each task to the desired position in the task flow.

💡 Tip

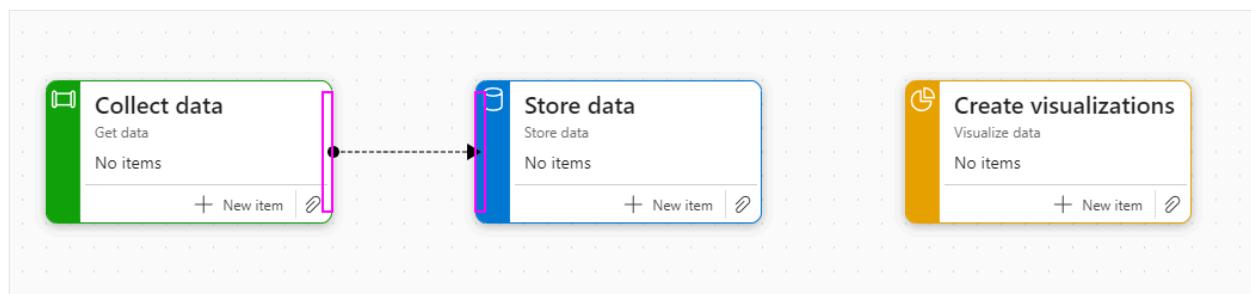
When you move tasks around on the canvas, they stay in the place where you put them. However, due to a known issue, when you add a new task to the canvas, any unconnected tasks will move back to their default positions. Therefore, to safeguard your arrangement of tasks, it's highly recommended to connect them all with connectors before adding any new tasks to the canvas.

Connect tasks

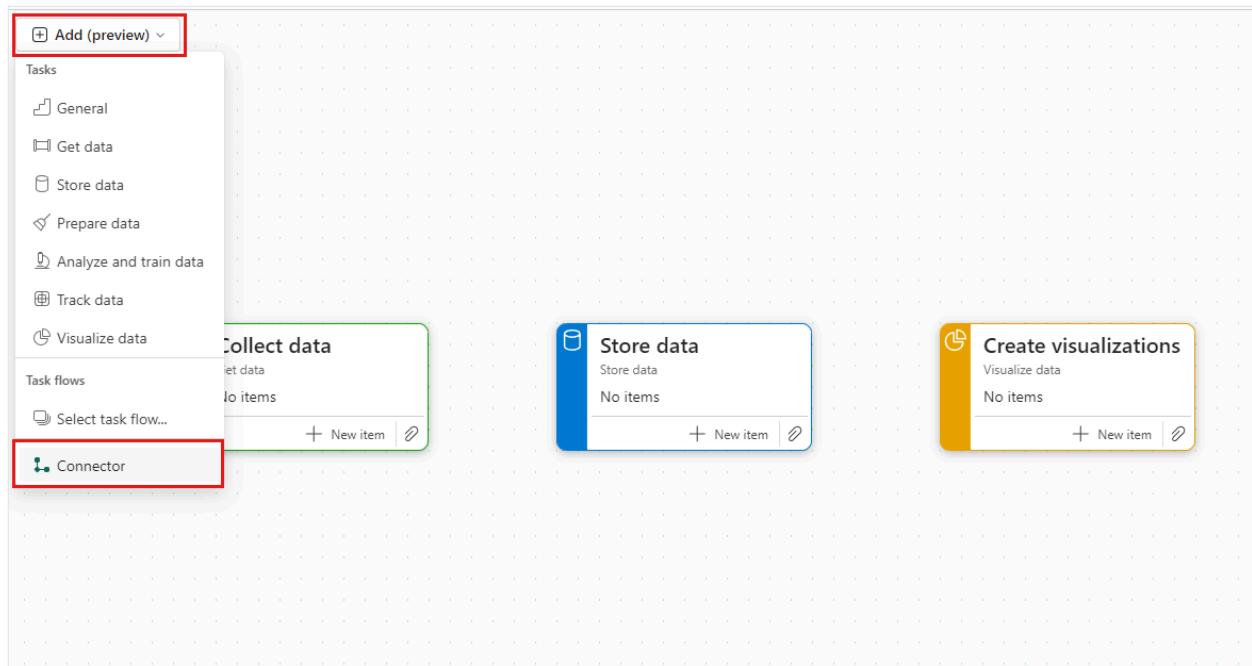
Connectors show the logical flow of work. They don't make or indicate any actual data connections - they are graphic representations of the flow of tasks only.

Add a connector

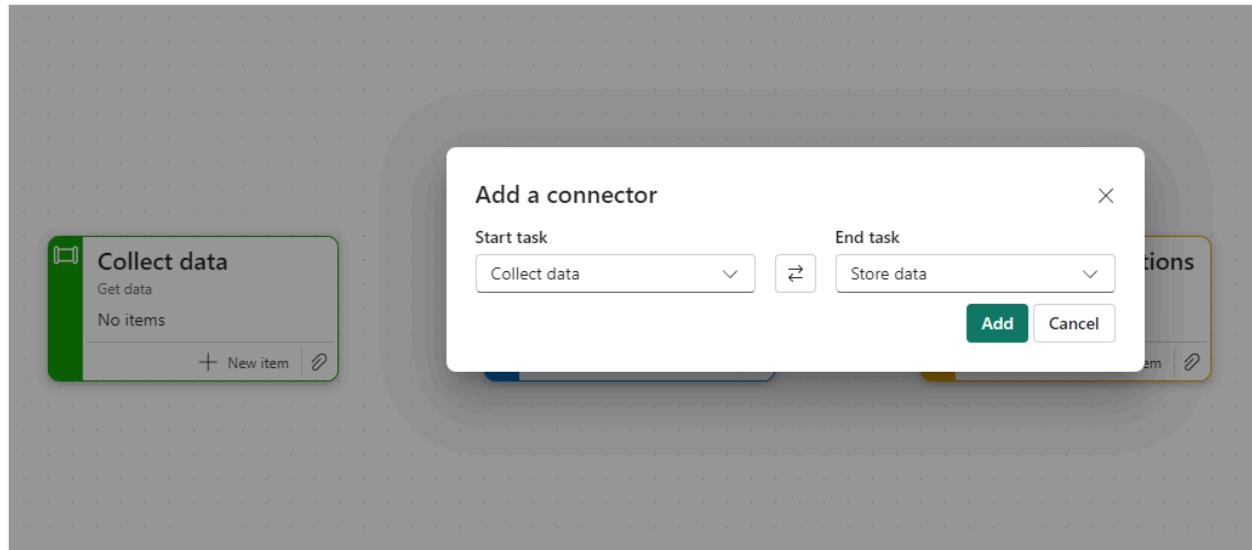
To connect two tasks, select the edge of the starting task and drag to an edge of the next task.



Alternatively, you can select **Add > Connector** from the **Add** dropdown on the canvas.



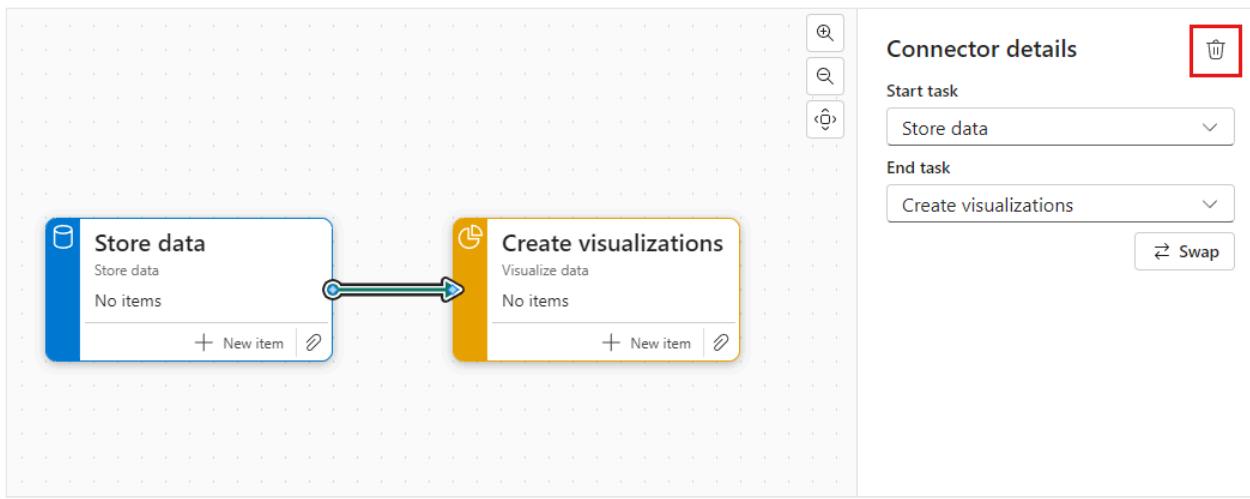
Then, in the **Add connector** dialog, select the start and end tasks, then select **Add**.



Delete a connector

To delete a connector, select it and press **Enter**.

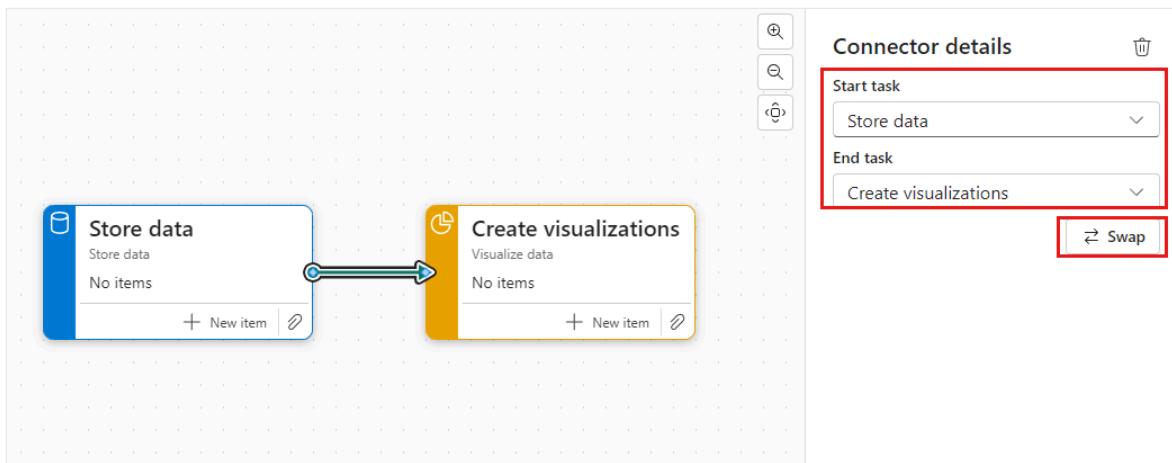
Alternatively, select the connector to open the connector details pane, then select the trash can icon.



Change connector start and end points or direction

To change a connector's start and end values, or switch its direction:

1. Select the connector to open the connector details pane.
2. In the details pane, change the start and end values as desired, or select **Swap** to change connector direction.



Assign items to a task

Once a task has been placed on the canvas, you can assign items to it to help structure and organize your work. You can [create new items to be assigned to the task](#), or you can [assign items that already exist in the workspace](#).

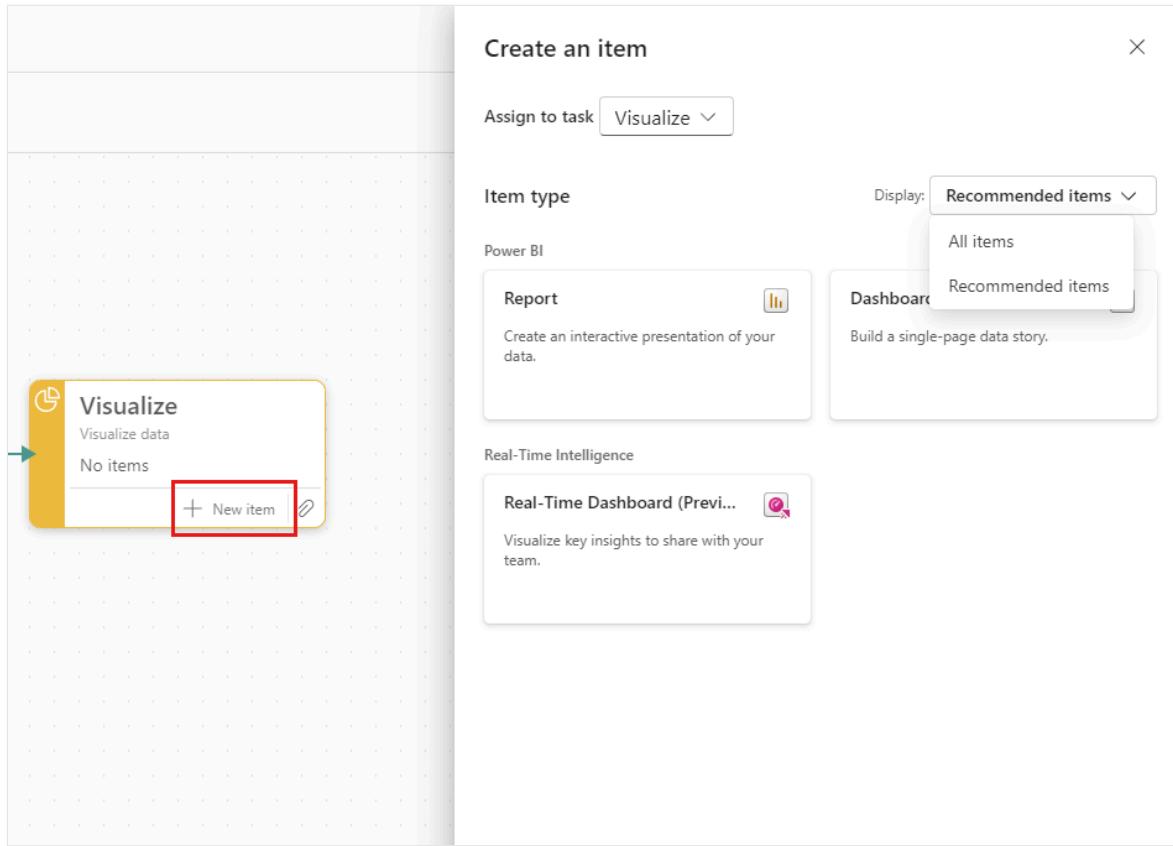
Note

An item can only be assigned to a single task. It can't be assigned to multiple tasks.

Create a new item for a task

To create a new item for a specific task:

1. Select **+ New item** on the task.



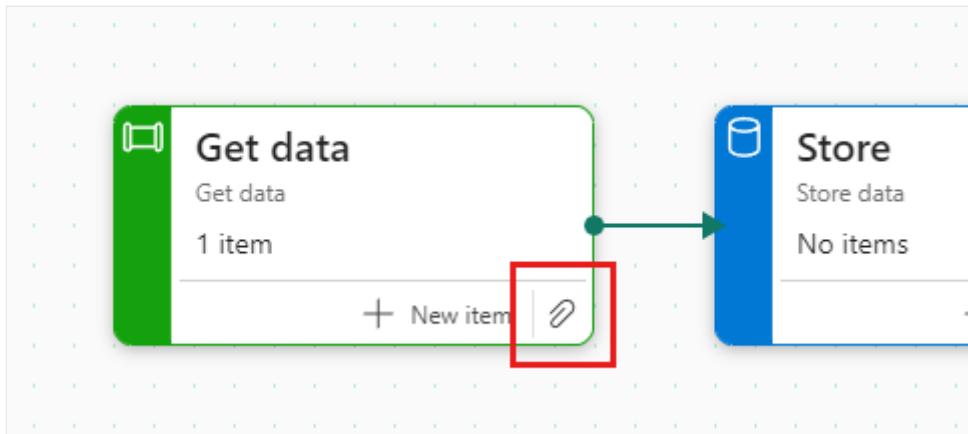
2. On the **Create an item** pane that opens, the recommended item types for the task are displayed by default. Choose one of the recommended types.

If you don't see the item type you want, change the **Display** selector from *Recommended items* to *All items*, and then choose the item type you want.

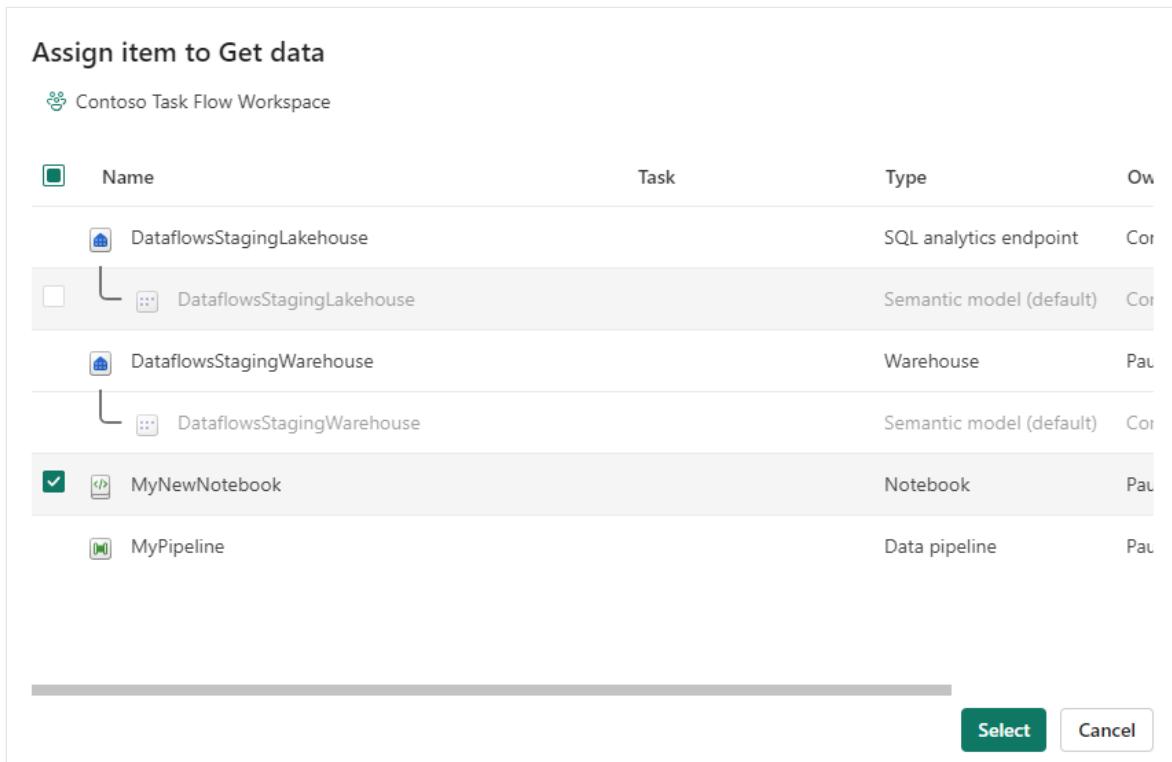
Assign existing items to a task

To assign existing items to a task:

1. Select the clip icon on the task.



2. In the **Assign item** dialog box that opens, hover over item you want to assign to the task and mark the checkbox. You can assign more than one item. When you're done choosing the items you want to assign to the task, choose **Select** to assign the selected items to the task.



The items you selected items are assigned to the task. In the item list, task assignments are shown in the **Task** column.

Unassign items from tasks

You can unassign items from a selected task or from multiple tasks.

Note

Unassigning items from tasks **does not** remove the items from the workspace.

Unassign items from a task

To unassign items from a task:

1. Select the task you want to unassign the items from. This filters the item list to show just the items that are assigned to the task.
2. In the item list, hover over the items you want to unassign and mark the checkboxes that appear.
3. On the workspace toolbar, choose **Unassign from task** (or **Unassign from all tasks**, if you've selected multiple items).

The screenshot shows the Contoso Task Flow Workspace interface. At the top, there's a toolbar with buttons for '1 Selected' (highlighted with a red box), 'Move', and 'X Unassign from task'. Below the toolbar is a preview section labeled '+ Add (preview)'. The main workspace contains three task cards connected by arrows: 'Get data' (green), 'Store' (blue), and 'Prepare' (purple). Below the workspace is a table listing items:

Name	Type	Task	Owner	Refreshed	Next refresh
DataflowsStagingLakehouse	SQL analytics end...	Contoso Task Flo...	—	N/A	
DataflowsStagingLakehouse	Semantic model (...)	Contoso Task Flo...	4/11/24, 1:01:41 AM	N/A	
DataflowsStagingWarehouse	Warehouse	Get data	Debra Berger	—	N/A
DataflowsStagingWarehouse	Semantic model (...)	Get data	Contoso Task Flo...	4/11/24, 1:01:42 AM	N/A
MyNewNotebook	Notebook	Get data	Debra Berger	—	—
<input checked="" type="checkbox"/> MyPipeline	Data pipeline	Get data	Debra Berger	—	—

Unassign items from multiple tasks

To unassign items from multiple tasks:

1. Select **Clear all** at the top of the items list to clear all filters so that you can see all the items in the workspace. Note that items that are assigned to tasks list the task name in the **Task** column.
2. Hover over the items you want to unassign and mark the checkboxes.

- When you've finished making your selections, select **Unassign from all tasks** in the workspace toolbar.

The screenshot shows the Contoso Task Flow Workspace interface. At the top, there's a header bar with the workspace name "Contoso Task Flow Workspace" and a "Create deployment pipeline" button. Below the header is a toolbar with buttons for "4 Selected", "Move", and "Unassign from all tasks" (the latter is highlighted with a red box). To the left is a sidebar with a "+ Add (preview)" button. The main area is the task flow canvas, which contains three tasks connected by arrows: "Get data" (green), "Store" (blue), and "Prepare" (purple). Below the canvas is a table titled "Tasks" listing various items. Several items in the list have checkboxes checked and are highlighted with a red box. The columns in the table are: Name, Type, Task, Owner, Refreshed, and Next refresh. A magnifying glass icon is located in the bottom right corner of the tasks list.

Name	Type	Task	Owner	Refreshed	Next refresh
DataflowsStagingLakehouse	SQL analytics end...	Store	Contoso Task Flo...	—	N/A
DataflowsStagingLakehouse	Semantic model (...)	Store	Contoso Task Flo...	4/11/24, 1:01:41 AM	N/A
DataflowsStagingWarehouse	Warehouse	Store	Debra Berger	—	N/A
DataflowsStagingWarehouse	Semantic model (...)	Store	Contoso Task Flo...	4/11/24, 1:01:42 AM	N/A
MyNewNotebook	Notebook	Get data	Debra Berger	—	—
MyPipeline	Data pipeline	Get data	Debra Berger	—	—

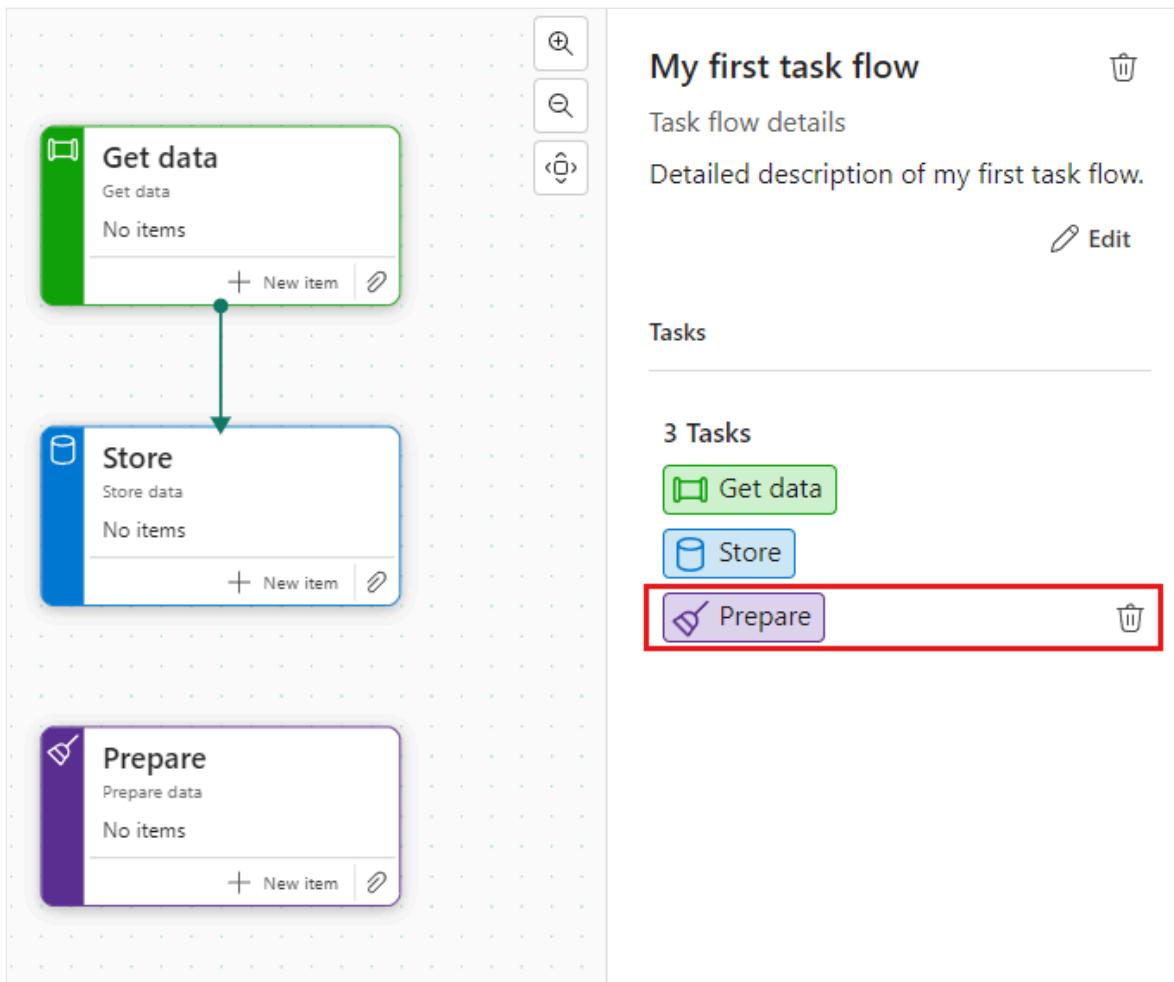
Delete a task

To delete a task:

- Select the task to open the [task details pane](#).
- Select the trash can icon.

Alternatively,

- Select the task flow canvas to open the task flow details pane.
- In the task flow details pane, hover over the task you want to delete in the Tasks list and select the trash can icon.



ⓘ Note

Deleting a task does not delete the items assigned to it. They remain in the workspace.

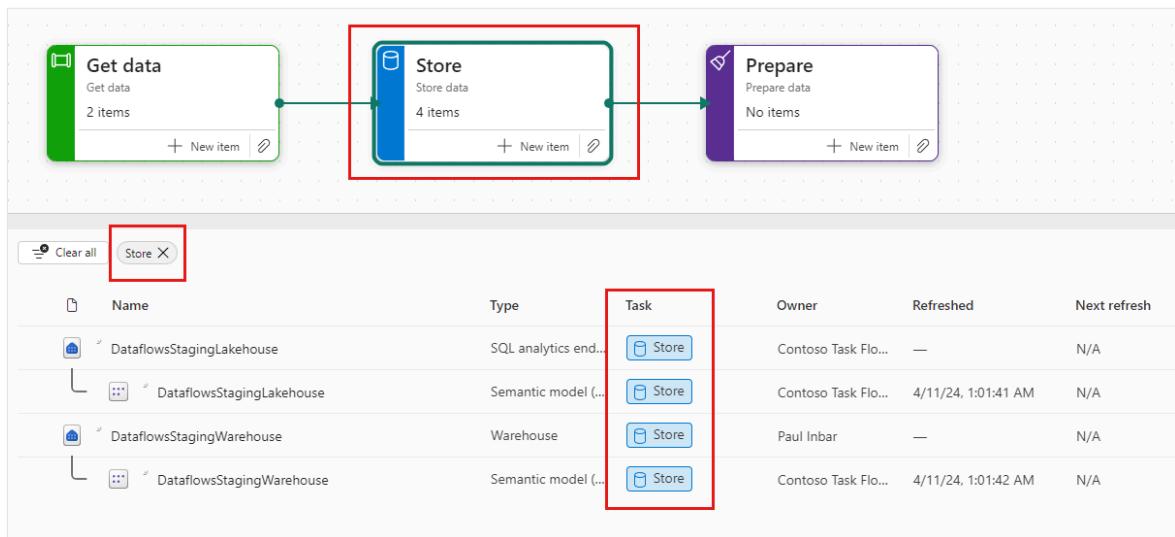
Navigate items with the task flow

With items assigned to tasks in a task flow, you can use the task flow to quickly understand how the items in the workspace work together, and get a clear picture of your work in the workspace.

- For each item that you see in the items list, you can see the item type and what task it's assigned to, if any.

Name	Type	Task	Owner	Refreshed
DataflowsStagingLakehouse	SQL analytics endpoint	Store	Contoso Task Flow Workspace	—
DataflowsStagingLakehouse	Semantic model (default)	Store	Contoso Task Flow Workspace	4/11/24, 1:01:41 AM
DataflowsStagingWarehouse	Warehouse	Store	Debra Berger	—
DataflowsStagingWarehouse	Semantic model (default)	Store	Contoso Task Flow Workspace	4/11/24, 1:01:42 AM
MyNewNotebook	Notebook	Get data	Debra Berger	—
MyPipeline	Data pipeline	Get data	Debra Berger	—

- When you select a task, the items list is filtered to show only the items that are assigned to that task.



ⓘ Note

Selecting a task filters the current items list only - it doesn't show items from subfolders.

Select a new predefined task flow

At any point, you can choose to apply one of the predefined task flows to the canvas.

To select one of the predefined task flows:

- Open the **Add** dropdown on the canvas and choose **Select task flow**. The predefined task flows pane will open.
- Choose one of the predefined task flows and the select **Select**. If there already is a task flow on the canvas, you'll be asked whether to overwrite the current task flow or to append the predefined task flow to the current task flow.

Edit task flow details

To edit the task flow name or description:

1. Open the task flow details pane by selecting the task flow canvas.
2. Select **Edit** and change the name and description fields as desired. When done, select **Save**.

ⓘ Note

A good task flow name and description should help others understand the intended purpose and use of the task flow.

Delete a task flow

To delete a task flow:

1. Select a blank area of the canvas to display the task flow details pane.
2. Select the trash icon to delete the task flow.

The screenshot shows the 'Task flow details' pane for a task flow named 'My first task flow'. On the left, there's a vertical toolbar with icons for search, filter, and other operations. The main area displays the task flow name, a 'Task flow details' section with a link to a detailed description, and an 'Edit' button. A large red box highlights the trash icon in the top right corner of the main pane. Below this, the 'Tasks' section shows three tasks: 'Get data' (green), 'Store' (blue), and 'Prepare' (purple).

Task	Description
Get data	Icon: Camera
Store	Icon: Bucket
Prepare	Icon: Checkmark

Deleting a task flow removes all tasks, the task list, and any item assignments, and resets the task flow to its original default empty state.

 **Note**

Items that were assigned to tasks in the deleted task flow remain in the workspace. When you create a new task flow, you need to assign them to the tasks in the new flow.

Related concepts

- [Task flow overview](#)
- [Set up a task flow](#)

Feedback

Was this page helpful?

 Yes

 No

[Provide product feedback ↗](#) | [Ask the community ↗](#)

Microsoft Fabric decision guide: copy activity, dataflow, or Spark

Article • 05/23/2023

Use this reference guide and the example scenarios to help you in deciding whether you need a copy activity, a dataflow, or Spark for your workloads using Microsoft Fabric.

ⓘ Important

Microsoft Fabric is in [preview](#).

Copy activity, dataflow, and Spark properties

	Pipeline copy activity	Dataflow Gen 2	Spark
Use case	Data lake and data warehouse migration, data ingestion, lightweight transformation	Data ingestion, data transformation, data wrangling, data profiling	Data ingestion, data transformation, data processing, data profiling
Primary developer persona	Data engineer, data integrator	Data engineer, data integrator, business analyst	Data engineer, data scientist, data developer
Primary developer skill set	ETL, SQL, JSON	ETL, M, SQL	Spark (Scala, Python, Spark SQL, R)
Code written	No code, low code	No code, low code	Code
Data volume	Low to high	Low to high	Low to high
Development interface	Wizard, canvas	Power query	Notebook, Spark job definition
Sources	30+ connectors	150+ connectors	Hundreds of Spark libraries

	Pipeline copy activity	Dataflow Gen 2	Spark
Destinations	18+ connectors	Lakehouse, Azure SQL database, Azure Data explorer, Azure Synapse analytics	Hundreds of Spark libraries
Transformation complexity	Low: lightweight - type conversion, column mapping, merge/split files, flatten hierarchy	Low to high: 300+ transformation functions	Low to high: support for native Spark and open-source libraries

Review the following three scenarios for help with choosing how to work with your data in Fabric.

Scenario1

Leo, a data engineer, needs to ingest a large volume of data from external systems, both on-premises and cloud. These external systems include databases, file systems, and APIs. Leo doesn't want to write and maintain code for each connector or data movement operation. He wants to follow the medallion layers best practices, with bronze, silver, and gold. Leo doesn't have any experience with Spark, so he prefers the drag and drop UI as much as possible, with minimal coding. And he also wants to process the data on a schedule.

The first step is to get the raw data into the bronze layer lakehouse from Azure data resources and various third party sources (like Snowflake Web, REST, AWS S3, GCS, etc.). He wants a consolidated lakehouse, so that all the data from various LOB, on-premises, and cloud sources reside in a single place. Leo reviews the options and selects **pipeline copy activity** as the appropriate choice for his raw binary copy. This pattern applies to both historical and incremental data refresh. With copy activity, Leo can load Gold data to a data warehouse with no code if the need arises and pipelines provide high scale data ingestion that can move petabyte-scale data. Copy activity is the best low-code and no-code choice to move petabytes of data to lakehouses and warehouses from varieties of sources, either ad-hoc or via a schedule.

Scenario2

Mary is a data engineer with a deep knowledge of the multiple LOB analytic reporting requirements. An upstream team has successfully implemented a solution to migrate multiple LOB's historical and incremental data into a common lakehouse. Mary has been tasked with cleaning the data, applying business logics, and loading it into multiple destinations (such as Azure SQL DB, ADX, and a lakehouse) in preparation for their respective reporting teams.

Mary is an experienced Power Query user, and the data volume is in the low to medium range to achieve desired performance. Dataflows provide no-code or low-code interfaces for ingesting data from hundreds of data sources. With dataflows, you can transform data using 300+ data transformation options, and write the results into multiple destinations with an easy to use, highly visual user interface. Mary reviews the options and decides that it makes sense to use **Dataflow Gen 2** as her preferred transformation option.

Scenario3

Adam is a data engineer working for a large retail company that uses a lakehouse to store and analyze its customer data. As part of his job, Adam is responsible for building and maintaining the data pipelines that extract, transform, and load data into the lakehouse. One of the company's business requirements is to perform customer review analytics to gain insights into their customers' experiences and improve their services.

Adam decides the best option is to use **Spark** to build the extract and transformation logic. Spark provides a distributed computing platform that can process large amounts of data in parallel. He writes a Spark application using Python or Scala, which reads structured, semi-structured, and unstructured data from OneLake for customer reviews and feedback. The application cleanses, transforms, and writes data to Delta tables in the lakehouse. The data is then ready to be used for downstream analytics.

Next steps

- [How to copy data using copy activity](#)
- [Quickstart: Create your first dataflow to get and transform data](#)
- [How to create an Apache Spark job definition in Fabric](#)

Microsoft Fabric decision guide: choose a data store

Article • 10/09/2024

Use this reference guide and the example scenarios to help you choose a data store for your Microsoft Fabric workloads.

Data store properties

This table compares data stores such as warehouse, lakehouse, Power BI datamart, and Eventhouse based on data volume, type, developer persona, skill set, operations, and other capabilities.

[Expand table](#)

	Warehouse	Lakehouse	Power BI Datamart	Eventhouse
Data volume	Unlimited	Unlimited	Up to 100 GB	Unlimited
Type of data	Structured	Unstructured, semi-structured, structured	Structured	Unstructured, semi-structured, structured
Primary developer persona	Data warehouse developer, SQL engineer	Data engineer, data scientist	Citizen developer	Citizen data scientist, data engineer, data scientist, SQL engineer
Primary dev skill	SQL	Spark(Scala, PySpark, Spark SQL, R)	No code, SQL	No code, KQL, SQL
Data organized by	Databases, schemas, and tables	Folders and files, databases, and tables	Database, tables, queries	Databases, schemas, and tables
Read operations	T-SQL, Spark*	Spark, T-SQL	Spark, T-SQL, Power BI	KQL, T-SQL, Spark, Power BI
Write operations	T-SQL	Spark(Scala, PySpark, Spark SQL, R)	Dataflows, T-SQL	KQL, Spark, connector ecosystem

	Warehouse	Lakehouse	Power BI Datamart	Eventhouse
Multi-table transactions	Yes	No	No	Yes, for multi-table ingestion
Primary development interface	SQL scripts	Spark notebooks, Spark job definitions	Power BI	KQL Queryset, KQL Database
Security	Object level, RLS, CLS, DDL/DML, dynamic data masking	RLS, CLS**, table level (T-SQL), none for Spark	Built-in RLS editor	RLS
Access data via shortcuts	Yes	Yes	No	Yes
Can be a source for shortcuts	Yes (tables)	Yes (files and tables)	No	Yes
Query across items	Yes	Yes	No	Yes
Advanced analytics	Interface for large-scale data processing, built-in data parallelism and fault tolerance	Interface for large-scale data processing, built-in data parallelism and fault tolerance	Interface for data processing with automated performance tuning	Time Series native elements, full geo-spatial storing and query capabilities
Advanced formatting support	Tables defined using PARQUET, CSV, AVRO, JSON, and any Apache Hive compatible file format	Tables defined using PARQUET, CSV, AVRO, JSON, and any Apache Hive compatible file format	Tables defined using PARQUET, CSV, AVRO, JSON, and any Apache Hive compatible file format	Full indexing for free text and semi-structured data like JSON
Ingestion latency	Available instantly for querying	Available instantly for querying	Available instantly for querying	Queued ingestion, streaming ingestion has a couple of seconds latency

* Spark supports reading from tables using shortcuts, doesn't yet support accessing views, stored procedures, functions etc.

** Column-level security available on the Lakehouse through a SQL analytics endpoint, using T-SQL.

Scenarios

Review these scenarios for help with choosing a data store in Fabric.

Scenario 1

Susan, a professional developer, is new to Microsoft Fabric. They're ready to get started cleaning, modeling, and analyzing data but need to decide to build a data warehouse or a lakehouse. After review of the details in the previous table, the primary decision points are the available skill set and the need for multi-table transactions.

Susan has spent many years building data warehouses on relational database engines, and is familiar with SQL syntax and functionality. Thinking about the larger team, the primary consumers of this data are also skilled with SQL and SQL analytical tools. Susan decides to use a **data warehouse**, which allows the team to interact primarily with T-SQL, while also allowing any Spark users in the organization to access the data.

Susan creates a new lakehouse and access the data warehouse capabilities with the lakehouse SQL analytics endpoint. Using the Fabric portal, creates shortcuts to the external data tables and places them in the `/Tables` folder. Susan now can write T-SQL queries that reference shortcuts to query Delta Lake data in the lakehouse. The shortcuts automatically appear as tables in the SQL analytics endpoint and can be queried with T-SQL using three-part names.

Scenario 2

Rob, a data engineer, needs to store and model several terabytes of data in Fabric. The team has a mix of PySpark and T-SQL skills. Most of the team running T-SQL queries are consumers, and therefore don't need to write INSERT, UPDATE, or DELETE statements. The remaining developers are comfortable working in notebooks, and because the data is stored in Delta, they're able to interact with a similar SQL syntax.

Rob decides to use a **lakehouse**, which allows the data engineering team to use their diverse skills against the data, while allowing the team members who are highly skilled in T-SQL to consume the data.

Scenario 3

Ash, a citizen developer, is a Power BI developer. They're familiar with Excel, Power BI, and Office. They need to build a data product for a business unit. They know they don't quite have the skills to build a data warehouse or a lakehouse, and those seem like too much for their needs and data volumes. They review the details in the previous table and see that the primary decision points are their own skills and their need for a self service, no code capability, and data volume under 100 GB.

Ash works with business analysts familiar with Power BI and Microsoft Office, and knows that they already have a Premium capacity subscription. As they think about their larger team, they realize the primary consumers of this data will be analysts, familiar with no-code and SQL analytical tools. Ash decides to use a **Power BI datamart**, which allows the team to interact build the capability fast, using a no-code experience. Queries can be executed via Power BI and T-SQL, while also allowing any Spark users in the organization to access the data as well.

Scenario 4

Daisy is business analyst experienced with using Power BI to analyze supply chain bottlenecks for a large global retail chain. They need to build a scalable data solution that can handle billions of rows of data and can be used to build dashboards and reports that can be used to make business decisions. The data comes from plants, suppliers, shippers, and other sources in various structured, semi-structured, and unstructured formats.

Daisy decides to use an **eventhouse** because of its scalability, quick response times, advanced analytics capabilities including time series analysis, geospatial functions, and fast direct query mode in Power BI. Queries can be executed using Power BI and KQL to compare between current and previous periods, quickly identify emerging problems, or provide geo-spatial analytics of land and maritime routes.

Related content

- [What is data warehousing in Microsoft Fabric?](#)
- [Create a warehouse in Microsoft Fabric](#)
- [Create a lakehouse in Microsoft Fabric](#)

Feedback

Was this page helpful?



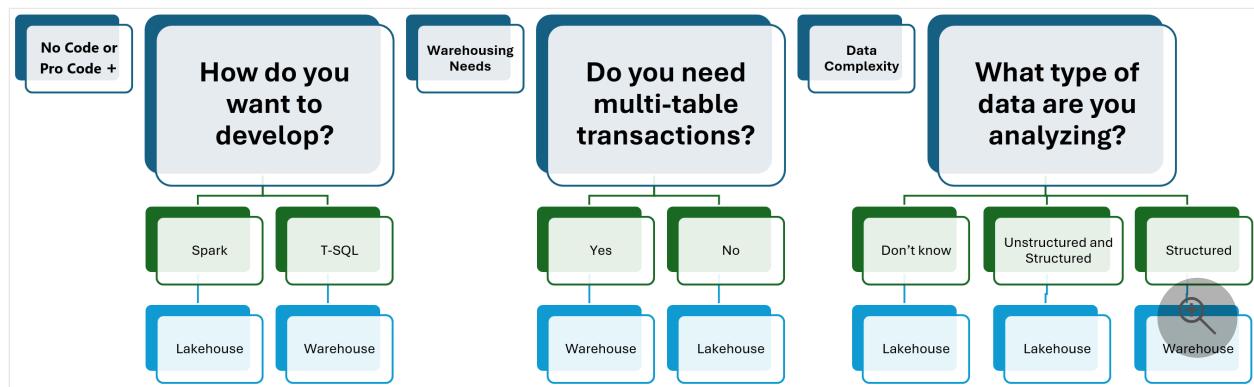
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Microsoft Fabric decision guide: Choose between Warehouse and Lakehouse

Article • 08/22/2024

Microsoft Fabric offers two enterprise-scale, open standard format workloads for data storage: [Warehouse](#) and [Lakehouse](#). This article compares the two platforms and the decision points for each.

Criterion



No Code or Pro Code solutions: How do you want to develop?

- Spark
 - Use **Lakehouse**
- T-SQL
 - Use **Warehouse**

Warehousing needs: Do you need multi-table transactions?

- Yes
 - Use **Warehouse**
- No
 - Use **Lakehouse**

Data complexity: What type of data are you analyzing?

- Don't know
 - Use **Lakehouse**
- Unstructured and structured data
 - Use **Lakehouse**
- Structured data only
 - Use **Warehouse**

Choose a candidate service

Perform a detailed evaluation of the service to confirm that it meets your needs.

The **Warehouse** item in Fabric Synapse Data Warehouse is an enterprise scale data warehouse with open standard format.

- No knobs performance with minimal set-up and deployment, no configuration of compute or storage needed.
- Simple and intuitive warehouse experiences for both beginner and experienced data professionals (no/pro code).
- Lake-centric warehouse stores data in OneLake in open Delta format with easy data recovery and management.
- Fully integrated with all Fabric workloads.
- Data loading and transforms at scale, with full multi-table transactional guarantees provided by the SQL engine.
- Virtual warehouses with cross-database querying and a fully integrated semantic layer.
- Enterprise-ready platform with end-to-end performance and usage visibility, with built-in governance and security.
- Flexibility to build data warehouse or data mesh based on organizational needs and choice of no-code, low-code, or T-SQL for transformations.

The **Lakehouse** item in Fabric Synapse Data Engineering

- Store, manage, and analyze structured and unstructured data in a single location to gain insights and make decisions faster and efficiently.
- Flexible and scalable solution that allows organizations to handle large volumes of data of all types and sizes.
- Easily ingest data from many different sources, which are converted into a unified Delta format
- Automatic table discovery and registration for a fully managed file-to-table experience for data engineers and data scientists.
- Automatic SQL analytics endpoint and default dataset that allows T-SQL querying of delta tables in the lake

Both are included in Power BI Premium or Fabric capacities.

Compare different warehousing capabilities

This table compares the Warehouse to the SQL analytics endpoint of the Lakehouse.

Microsoft Fabric offering

Warehouse

SQL analytics endpoint of the Lakehouse

Primary capabilities

ACID compliant, full data warehousing with transactions support in T-SQL.

Read only, system generated SQL analytics endpoint for Lakehouse for T-SQL querying and serving. Supports analytics on the Lakehouse Delta tables, and the Delta Lake folders referenced via [shortcuts](#).

Developer profile

SQL Developers or citizen developers

Data Engineers or SQL Developers

Data loading

SQL, pipelines, dataflows

Spark, pipelines, dataflows, shortcuts

Delta table support

Reads and writes Delta tables

Reads delta tables

Storage layer

Open Data Format - Delta

Open Data Format - Delta

Recommended use case

- Data Warehousing for enterprise use
- Data Warehousing supporting departmental, business unit or self service use
- Structured data analysis in T-SQL with tables, views, procedures and functions and Advanced SQL support for BI
- Exploring and querying delta tables from the lakehouse

- Staging Data and Archival Zone for analysis
 - [Medallion lakehouse architecture](#) with zones for bronze, silver and gold analysis
 - Pairing with Warehouse for enterprise analytics use cases
-

Development experience

- Warehouse Editor with full support for T-SQL data ingestion, modeling, development, and querying UI experiences for data ingestion, modeling, and querying
 - Read / Write support for 1st and 3rd party tooling
 - Lakehouse SQL analytics endpoint with limited T-SQL support for views, table valued functions, and SQL Queries
 - UI experiences for modeling and querying
 - Limited T-SQL support for 1st and 3rd party tooling
-

T-SQL capabilities

Full DQL, DML, and DDL T-SQL support, full transaction support

Full DQL, No DML, limited DDL T-SQL Support such as SQL Views and TVFs

Related content

- [Microsoft Fabric decision guide: choose a data store](#)
-

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Navigate to your items from Microsoft Fabric Home

Article • 07/30/2024

This article gives a high level view of navigating to your items and actions from Microsoft Fabric Home. Each product workload has its own Home, and there are similarities that they all share. Those similarities are described in this article. For detailed information about **Home** for a particular product workload, such as Data Factory Home, visit the relevant page for that product workload.

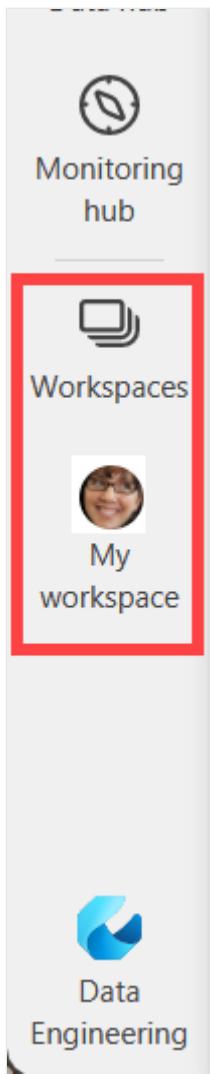
Overview of Home

On Home, you see items that you create and that you have permission to use. These items are from all the workspaces that you access. That means that the items available on everyone's Home are different. At first, you might not have much content, but that changes as you start to create and share Microsoft Fabric items.

Note

Home is not workspace-specific. For example, the **Recent workspaces** area on Home might include items from many different workspaces.

In Microsoft Fabric, the term *item* refers to: apps, lakehouses, warehouses, reports, and more. Your items are accessible and viewable in Microsoft Fabric, and often the best place to start working in Microsoft Fabric is from **Home**. However, once you create at least one new workspace, been granted access to a workspace, or you add an item to **My workspace**, you might find it more convenient to navigate directly to a workspace. One way to navigate to a workspace is by using the nav pane and workspace selector.



To open **Home**, select it from the top of your left navigation pane.

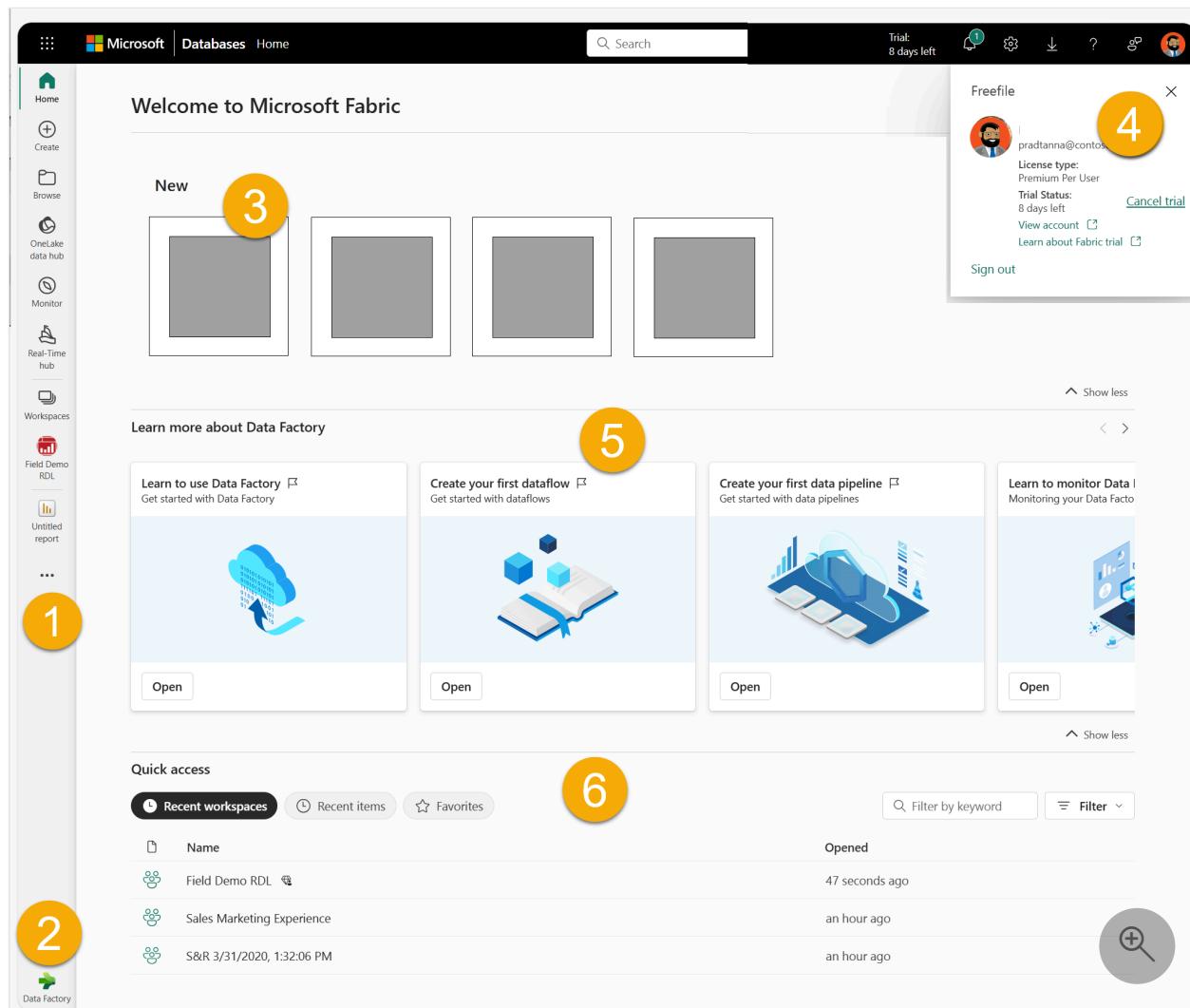


Most important content at your fingertips

The items that you can access appear on Home. If your Home canvas gets crowded, use [global search](#) to find what you need, quickly. The layout and content on Home is different for every user and every product workload, but there are numerous similarities as well. These similarities are listed here and discussed in more detail later in this article.

! Note

Power BI Home is different from the other product workloads. To learn more, visit [Power BI Home](#).



1. The left navigation pane (nav pane) for your product workload links you to different views of your items and to creator resources. You can [remove icons from the left nav](#) to suit your workflow.
2. The selector for switching product workloads.
3. Options for creating new items.
4. The top menu bar for orienting yourself in Fabric, finding items, help, and sending feedback to Microsoft. The Account manager control is a critical icon for looking up your account information and managing your Fabric trial.
5. Learning resources to get you started using the selected workload.
6. Your items organized by recent workspaces, recent items, and favorites. The items that appear here are the same across product workloads, except for the Power BI workload.

ⓘ Important

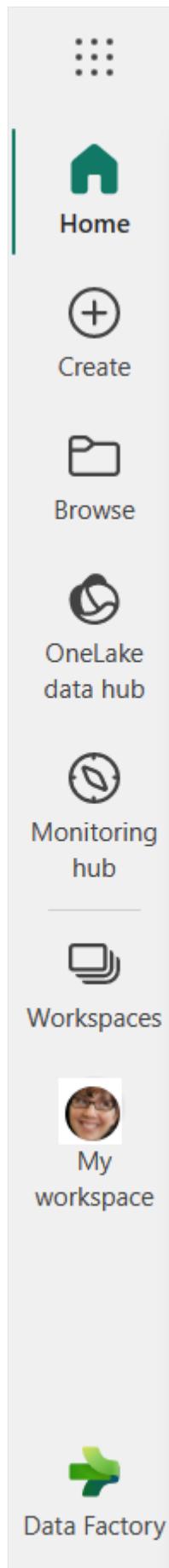
Only the content that you can access appears on your Home. For example, if you don't have permissions to a report, that report doesn't appear on Home. The

exception to this is if your subscription or license changes to one with less access, then you will receive a prompt asking you to start a trial or upgrade your license.

Locate items from Home

Microsoft Fabric offers many ways of locating and viewing your content. All approaches access the same pool of content in different ways. Searching is sometimes the easiest and quickest way to find something. While other times, using the nav pane to open a workspace or selecting a card on the Home canvas is your best option.

Use the navigation pane



Along the left side is a narrow vertical bar, referred to as the ***nav pane***. This example uses the Data factory nav pane. Notice that **My workspace** is the active workspace. The options in your nav pane depend on the product workload you select. The nav pane organizes actions you can take with your items in ways that help you get to where you

want to be quickly. Occasionally, using the nav pane is the quickest way to get to your items.

In the bottom section of the nav pane is where you find and open your workspaces. Use the [workspace selector](#) to view a list of your workspaces and select one to open. Below the workspace selector is the name of the currently open workspace.

- By default, you see the **Workspaces** selector and **My workspace**.
- When you open a workspace, its name replaces **My workspace**.
- Whenever you create a new item, it's added to the open workspace.

The nav pane is there when you open Home and remains there as you open other areas of Microsoft Fabric. Every Microsoft Fabric product workload nav pane includes **Home**, **Browse**, **OneLake data hub**, **Create**, and **Workspaces**.

Remove icons from the nav pane

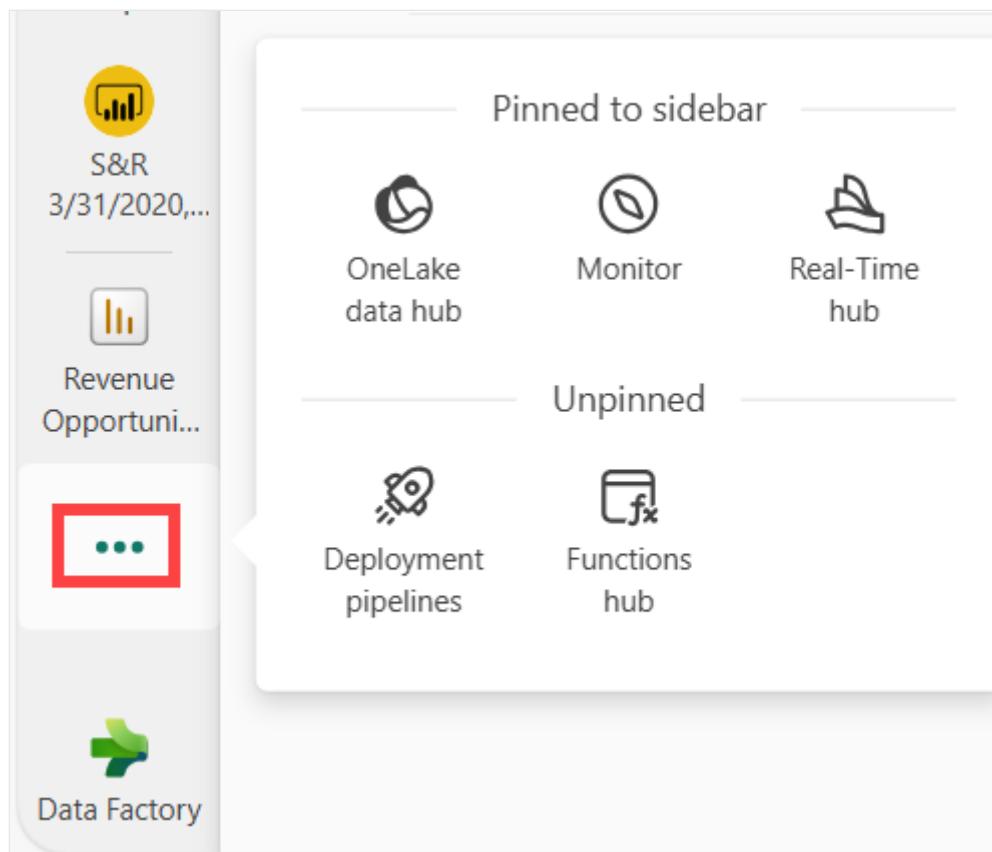
You can delete icons from the nav pane for products you don't think you need. You can always add them back later.

To remove an icon, right-click the icon and select **Unpin**.

Add icons back to the nav pane

You can add an icon back if you decide you need it.

Select **More ...**, then select the icon you want to return to the left nav.



Find and open workspaces

Workspaces are places to collaborate with colleagues to create collections of items such as lakehouses, warehouses, and reports.

There are different ways to find and open your workspaces. If you know the name or owner, you can search. Or you can select the **Workspaces** icon in the nav pane and choose which workspace to open.

The screenshot shows the Microsoft Fabric Data Factory Home page. On the left, there's a vertical navigation pane with icons for Home, Create, Browse, OneLake data hub, Monitoring hub, and Workspaces (which is highlighted with a red box). Below the navigation is a 'My workspace' section. The main content area is titled 'Workspaces' and contains a search bar (also highlighted with a red box) and a list of workspaces. The list includes 'My workspace' (selected), 'Cloud + AI TV Worldwide', 'Digital Transformation Plat...', 'Formatted Table Demo', 'PBICAT', 'Power BI Hackathon', 'POWER BI TEAM', and 'Pradtanna K'. At the bottom of the workspace list is a green button labeled '+ New workspace'. To the right of the workspace list is a sidebar with a video thumbnail titled 'View tutorial video Getting started with dataflows' and an 'Open' button. The top right corner features a search bar with a magnifying glass icon and the word 'Search'.

The workspace opens on your canvas, and the name of the workspace is listed on your nav pane. When you open a workspace, you can view its content. It includes items such as notebooks, pipelines, reports, and lake houses.

For more information, see [Workspaces](#).

Find and open other product workloads

In the bottom left corner is your workload selector. Select the icon to see all of the available Microsoft Fabric product workloads. Select a workload to open it and make it active.

Microsoft Fabric →



Data
Factory

Power BI

Data Factory

Synapse

Data Engineering

Data Science

Data Warehouse

Real-Time Analytics

Find your content using search, sort, and filter

To learn about the many ways to search from Microsoft Fabric, see [Searching and sorting](#). Global searching is available by item, name, keyword, workspace, and more.

Find answers in the context sensitive Help pane

Select the Help icon (?) to open and use the contextual Help pane and to search for answers to questions.

Microsoft Fabric provides context sensitive help in the right rail of your browser. In this example, we selected **Browse** from the nav pane and the Help pane automatically updates to show us articles about the features of the **Browse** screen. For example, the Help pane displays articles on *View recent content* and *See content that others shared with you*. If there are community posts related to the current view, they display under **Forum topics**.

Leave the Help pane open as you work, and use the suggested topics to learn how to use Microsoft Fabric features and terminology. Or, select the X to close the Help pane and save screen space.

The screenshot shows the Data Factory Browse interface. On the left, there's a sidebar with icons for Home, Create, Browse, OneLake data hub, Monitoring hub, Workspaces, and My workspace. The main area has a 'Recent' section with three items: 'Recent', 'Favorites', and 'Shared with me'. A red box highlights this section. To the right is a 'Help' pane with a red arrow pointing to its title. The 'Help' pane contains a search bar, a 'Recent' section with a 'Name' filter, a list of recent content items, and a 'Forum topics' section with a post about filtering values. A red box highlights the 'Forum topics' section. At the bottom of the 'Help' pane are links for 'Submit an idea', 'Ask the community', and 'Get help', along with links for 'About Data Factory' and 'Privacy & cookies'.

Browse

- Recent
- Favorites
- Shared with me

Recent

Name

- Sales and Marketing Sample
- Competitive Marketing Analysis
- Store Sales
- Corporate Spend
- Regional Sales Sample
- Revenue Opportunities
- Human Resources Sample
- POWER BI TEAM
- CUSTOMER METRICS
- Report Usage Metrics Report

Help

View recent content

View your Favorites

See content that others have sh...

Data Factory

Forum topics

How to filter values based on the most recent row

Hello PBI Community! 😊 I'm working with a database that has social media posts information... each row is a unique post, with an unique id...

Other Resources

Submit an idea

Ask the community

Get help

About Data Factory | Privacy & cookies

The Help pane is also a great place to search for answers to your questions. Type your question or keywords in the Search field.



Help

X



pipelines



Search results for "pipelines"

Filter ▾



All

Pipelines - Create Pipeline - REST API (Power BI Power BI REST

Microsoft docs (30)

operation Returns the operation performed on the specified deployment pipeline, including the...

[Pipelines - Create Pipeline - REST API \(Power BI Power BI REST APIs\)](#)

Microsoft doc - PipelineStage A Power BI deployment pipeline stage Name Type Description order integer The stage order, starting from zero. workspaceId string

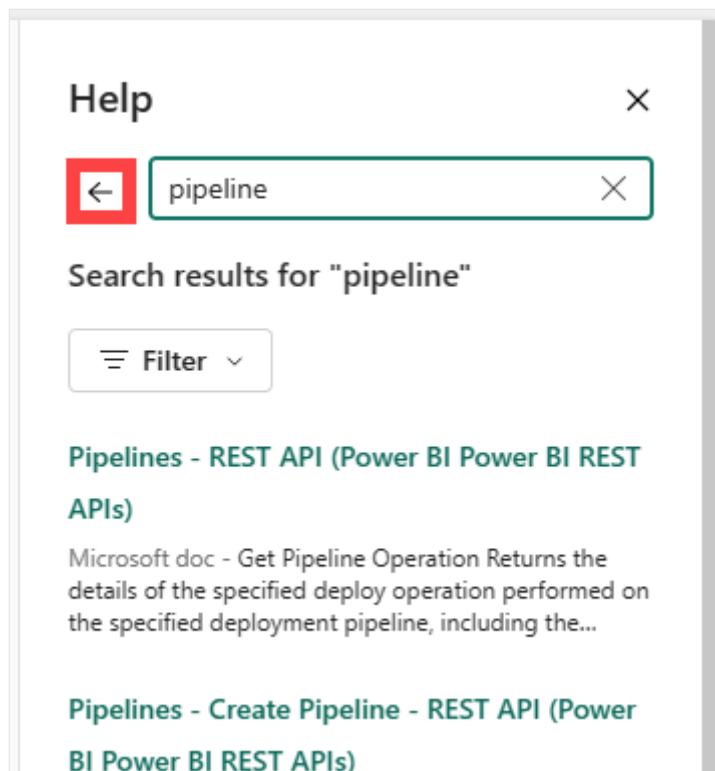
[Overview of Power BI deployment pipelines](#)

Microsoft doc - Pipeline structure Deployment pipelines is designed as a pipeline with three stages: Development This stage is used to design, build, and...

[Deployment pipeline - accidentally deleted a dataset in Dev pipeline](#)

Forum topic - Hi, all, I have one question about

To return to the default Help pane, select the left arrow.



For more information about searching, see [Searching and sorting](#).

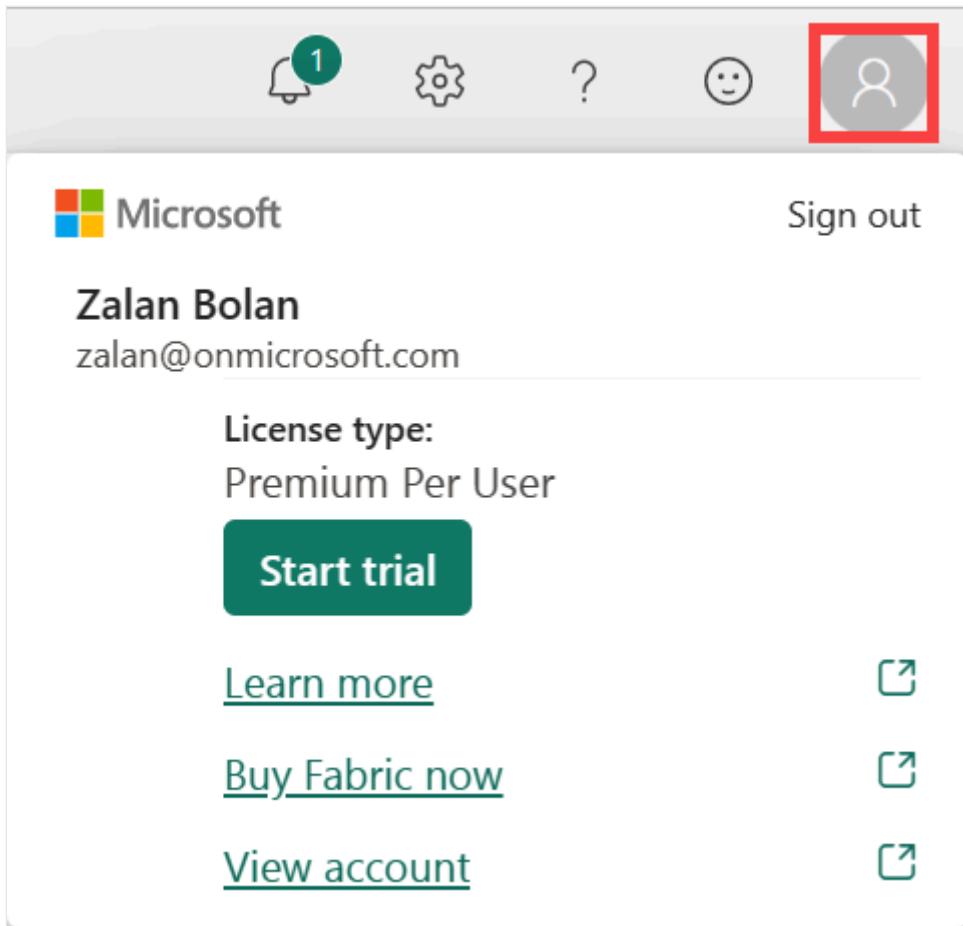
For more information about the Help pane, see [Get in-product help](#).

Find help and support

If the self-help answers don't resolve your issue, scroll to the bottom of the Help pane for more resources. Use the links to ask the community for help or to connect with Microsoft Fabric Support. For more information about contacting Support, see [Support options](#).

Find your account and license information

Information about your account and license is available from the Account manager. To open your Account manager, select the tiny photo from the upper-right corner of Microsoft Fabric.



For more information about licenses and trials, see [Licenses](#).

Find notifications, settings, and feedback

In the upper-right corner of Home are several helpful icons. Take time to explore your **Notifications center**, **Settings**, and **Feedback** options. The **?** icon displays your [Help and search options](#) and the [Account manager icon](#) displays information about your account and license. Both of these features are described in detail earlier in this article.

Find what you need on your Home canvas

The final section of Home is the center area, called the **canvas**. The content of your canvas updates as you select different items. By default, the Home canvas displays options for creating new items, recents, and getting started resources. To collapse a section on your canvas, select the **Show less** view.

When you create a new item, it saves in your **My workspace** unless you selected a workspace from **Workspaces**. To learn more about creating items in workspaces, see [create workspaces](#).

Note

Power BI Home is different from the other product workloads. To learn more, visit [Power BI Home](#).

Related content

- [Power BI Home](#)
 - [Start a Fabric trial](#)
-

Feedback

Was this page helpful?

 Yes

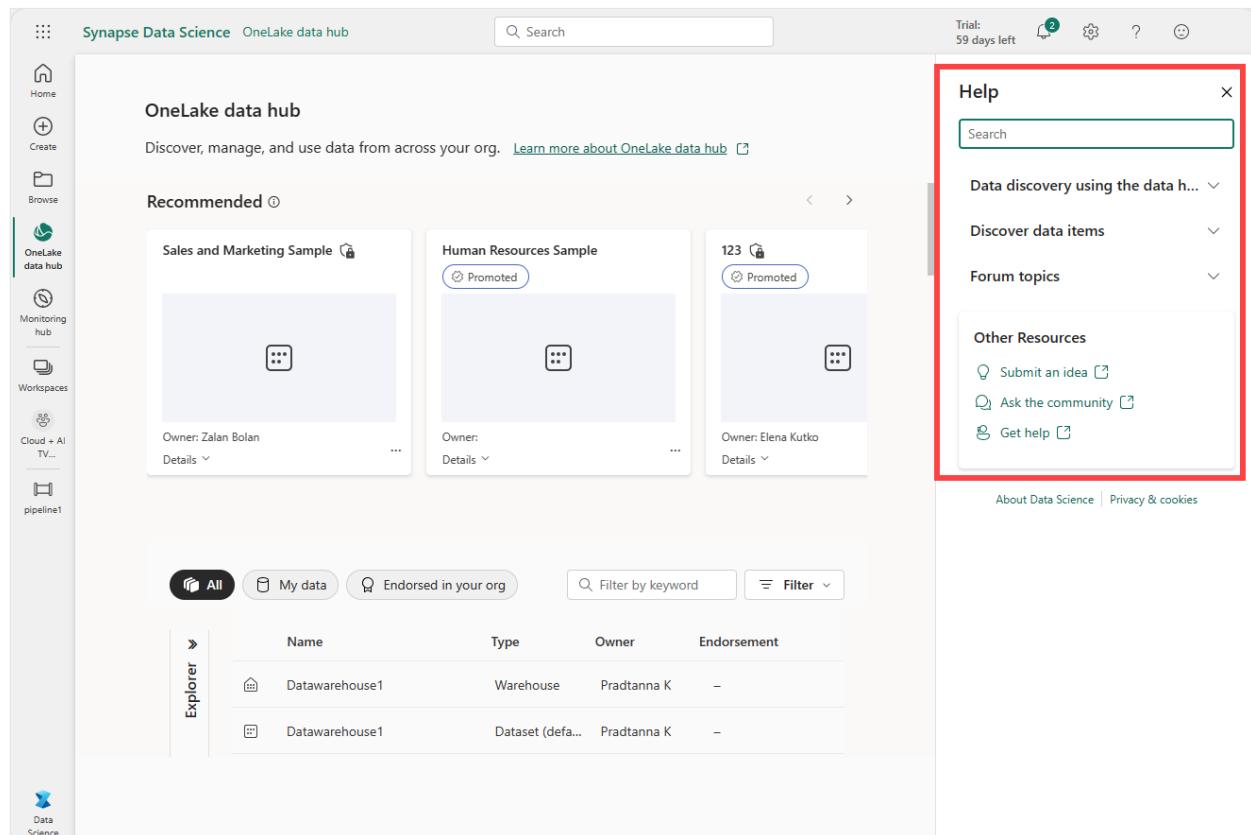
 No

[Provide product feedback ↗](#) | [Ask the community ↗](#)

Self-help with the Fabric contextual Help pane

Article • 05/23/2023

This article explains how to use the Fabric Help pane. The Help pane is feature-aware and displays articles about the actions and features available on the current Fabric screen. The Help pane is also a search engine that quickly finds answers to questions in the Fabric documentation and Fabric community forums.



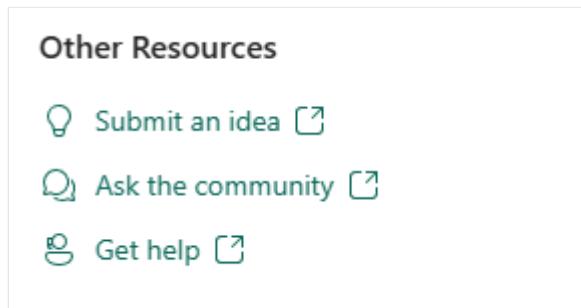
ⓘ Important

Microsoft Fabric is in [preview](#).

The Help pane is feature-aware

The feature-aware state is the default view of the Help pane when you open it without entering any search terms. The Help pane shows a list of recommended topics, resources that are relevant to your current context and location in Fabric, and a list of links for other resources. It has three sections:

- **Feature-aware documents:** This section groups the documents by the features that are available on the current screen. Select a feature in the Fabric screen and the Help pane updates with documents related to that feature. Select a document to open it in a separate browser tab.
- **Forum topics:** This section shows topics from the community forums that are related to the features on the current screen. Select a topic to open it in a separate browser tab.
- **Other resources:** This section has links for feedback and Support.



The Help pane is a search engine

The Help pane is also a search engine. Enter a keyword to find relevant information and resources from Microsoft documentation and community forum topics. Use the dropdown to filter the results.

The image shows a screenshot of the Microsoft Help pane. At the top, there's a search bar with the text "refresh data". Below the search bar, the title "Search results for \"refresh data\" " is displayed. A "Filter" button is shown with a dropdown menu open, containing the option "All" which is checked. To the right of the filter, a preview of a search result is visible, showing the title "dataflows refresh" and a snippet of text explaining what it does. Below the filter, there are two sections: "Microsoft docs (30)" and "Forum topics (10)". At the bottom of the pane, there are two blue links: "Refresh a dataset created from an Excel workbook - cloud" and "Refresh a dataset created from an Excel".

workbook - local

Microsoft doc - In Power BI, Refresh Now and Schedule Refresh is supported for datasets created from Excel workbooks imported from a local drive where Power...

How to refresh data from standalone mysql database in app.powerbi.com(Web services) without gateways

Forum topic - Hi, We have a strange requirement where we have to connect directly to standalone mysql database installed in our on-premises server for...

can't see power BI datasets using power pivot in excel

Forum topic - ...o longer see any datasets. If I open a workbook from a colleague, then I can refresh data. I can also see the datasets in power BI web. I can also...

Refresh datasets created from local Power BI Desktop files

Microsoft doc - Scheduled refresh When you set up a refresh schedule, Power BI connects directly to the data sources by using the connection information and...

Manage your data source - import and scheduled refresh

Microsoft doc - Add a data source Select a data source type. All of the data source types listed can be used for scheduled refresh with the on-premises data gateway...

Refresh summaries for Power BI

Microsoft doc - The Refresh time (hours, minutes)

The Help pane is perfect for learning and getting started

As you explore Fabric, the feature-aware documents update based on what you've selected and where you are in Fabric. This is a great way to learn how to use Fabric. Give yourself a guided tour by making selections in Fabric and reading the feature-aware documents. For example, in the Data Science experience, select **OneLake data hub**. The Help pane updates with articles that you can use to learn about the data hub.

The screenshot shows the OneLake data hub interface in Synapse Data Science. On the left, there's a sidebar with icons for Home, Create, Browse, OneLake data hub (which is highlighted with a red box), Monitoring hub, Workspaces, and My workspace. The main area displays three sample datasets: Sales and Marketing Sample, Human Resources Sample, and 123. Below these are filter buttons (All, My data, Endorsed in your org, Filter by keyword, Filter) and an Explorer table listing various datasets and warehouses. The Help pane, also highlighted with a red box, is open on the right, showing sections like Data discovery using the data hub, Discover data items, Forum topics, and Other Resources.

Open the Help pane

Follow the instructions to practice using the Help pane.

1. From the upper-right corner of Fabric, select the ? icon to open the Help pane.

The screenshot shows the Synapse Data Warehouse Home page. On the left, there's a sidebar with icons for Home (highlighted with a red box), Create, Browse, OneLake data hub, and Workspaces. The main area features a 'New Warehouse (Preview)' button and a 'Recommended' section with a 'Getting started with warehouse' card. In the top right corner, there are icons for a trial (59 days left), notifications (2), settings, and a help icon (highlighted with a red box).

2. Open Browse and select the Recent feature. The Fabric Help pane displays documents about the Recent feature. Select a document to learn more. The

document opens in a separate browser tab.

The screenshot shows the Microsoft Synapse Data Science interface. On the left, there's a sidebar with icons for Home, Create, Browse (which is selected and highlighted in green), OneLake data hub, Monitoring hub, Workspaces, and My workspace. The main area is titled 'Browse' and shows a 'Recent' list. A red arrow points to the 'Recent' tab in the sidebar. The 'Recent' list contains items like 'Sales and Marketing Sample' (Dataset), 'Datawarehouse1' (Dataset), 'Cloud + AI TV Worldwide' (Workspace), 'Digital Transformation Platform' (Workspace), 'My workspace' (Workspace), 'Sales and Marketing Sample' (Report), 'Competitive Marketing Analysis' (Report), 'Store Sales' (Report), 'Corporate Spend' (Report), 'Regional Sales Sample' (Report), and 'Revenue Opportunities' (Report). To the right of the main area is a 'Help' pane with a search bar. A red box highlights the 'View recent content' section, which includes a sub-section 'Display recently visited content in the Power BI service' with a note about finding recently visited dashboards, reports, and other content. Below this are sections for 'View your Favorites', 'See content that others have sh...', 'Data discovery using the data h...', and 'Forum topics'. Another red box highlights the 'Other Resources' section with links to 'Submit an idea', 'Ask the community', and 'Get help'.

3. Forum posts often provide interesting context. Select one that looks helpful or interesting.

This screenshot is similar to the previous one but shows forum posts in the 'Help' pane. A red box highlights a post from a user named 'Hello PBI Community!' asking about working with a database that has social media posts information. Another red box highlights a post from a user asking how to filter values based on the most recent row. A third red box highlights a post from a user asking about exporting paginated reports via URL and subscription PDF naming conventions. The 'Help' pane also includes sections for 'Forum topics', 'How to filter values based on the most recent row', 'Export Paginated Report via URL | Subscription PDF naming convention', 'recently viewed reports in App - can I mark them as favorites?', 'Other Resources', and links to 'Submit an idea', 'Ask the community', and 'Get help'.

4. Search the Microsoft documentation and community forums by entering a keyword in the search pane.

The screenshot shows the Microsoft Power BI service interface. On the left is a vertical navigation bar with icons for Home, Create, Browse, Data Hub, Monitoring hub, Metrics, Apps, Deployment pipelines, Learn, Workspaces, and Tenant. The main area has a title 'Build your first report' with three steps: 'Add and prepare your data', 'Generate a premade report', and 'Customize to suit your needs'. Below this is a section 'Add data to start building a report' with two options: 'Paste or manually enter data' and 'Pick a published dataset'. A note says 'Don't see the source you're looking for? Download the desktop app.' To the right of the main content is a 'Help' pane with a search bar containing 'customize report visuals'. The pane lists several articles: 'Search results for "customize report visuals"', 'Let users personalize visuals in a report', 'Customize visualization titles, backgrounds, and more in Power BI', 'Overview of report visualizations in Power BI service and Desktop', 'Create and use the paginated report visual', 'Main sources for acquiring Power BI custom visuals', 'Create modern visual tooltips (preview)', 'Understand how visuals interact in a report', 'Develop custom visuals in Power BI', and 'Tips and tricks for formatting in reports'. A red box highlights the search bar.

5. Return to the default display of the Help pane by selecting the arrow.

The screenshot shows the Microsoft Power BI service interface with the Help pane open. The search bar at the top contains 'pipeline'. The results show a single item: 'Pipelines - REST API (Power BI Power BI REST APIs)'. Below the title is a snippet of text: 'Microsoft doc - Get Pipeline Operation Returns the details of the specified deploy operation performed on the specified deployment pipeline, including the...'. A red box highlights the search bar.

6. Close the Help pane by selecting the X icon in the upper-right corner of the pane.

The screenshot shows the Microsoft Data Science Help center. At the top, there are icons for notifications (1), settings, help, and user profile. A red box highlights the close button ('X') in the top right corner of the main content area. Below the header is a search bar with the placeholder 'Search'. The main content area contains several sections: 'View recent content' (with a dropdown arrow), 'View your Favorites' (with a dropdown arrow), 'See content that others have sh...' (with a dropdown arrow), and 'Data discovery using the data h...' (with a dropdown arrow). The 'Data discovery using the data hub' section is expanded, showing a description: 'Learn how you can find, explore, and use the data items in your organization and their related reports.' Below this is a 'Forum topics' section (with a dropdown arrow) and an 'Other Resources' box containing links: 'Submit an idea', 'Ask the community', and 'Get help'.

Help

X

Search

View recent content

View your Favorites

See content that others have sh...

Data discovery using the data h...

Data discovery using the data hub

Learn how you can find, explore, and use the data items in your organization and their related reports.

Forum topics

Other Resources

Submit an idea

Ask the community

Get help

About Data Science | Privacy & cookies

Still need help?

If you still need help, select **Ask the community** and submit a question. If you have an idea for a new feature, let us know by selecting **Submit an idea**. To open the Support site, select **Get help** in **Other Resources**.

Global search

Article • 01/22/2024

When you're new to Microsoft Fabric, you have only a few items (workspaces, reports, apps, lakehouses). But as you begin creating and sharing items, you can end up with long lists of content. That's when searching, filtering, and sorting become helpful.

Search for content

At the top of Home, the global search box finds items by title, name, or keyword. Sometimes, the fastest way to find an item is to search for it. For example, if a dashboard you haven't used in a while isn't showing up on your Home canvas. Or, if your colleague shared something with you, but you don't remember what it's named or what type of content they shared. Sometimes, you might have so much content that it's easier to search for it rather than scrolling or sorting.

 **Note**

Global search is currently unavailable in sovereign clouds.

Search is available from Home and also most other areas of Microsoft Fabric. Just look for the search box or search icon .

In the **Search** field, type all or part of the name of an item, creator, keyword, or workspace. You can even enter your colleague's name to search for content that they've shared with you. The search finds matches in all the items that you own or have access to.

The screenshot shows the Microsoft Fabric canvas interface. At the top left is a search bar with the text "Sales" highlighted by a red box. To the right of the search bar are various icons: a bell, a gear, a download arrow, a question mark, and a user profile picture. Below the search bar is a list of results under the heading "Sales and Marketing". The results include:

- Sales and Marketing
- Sales and Marketing sample 11/...
- Sales and Marketing Sample from Workspace: Sales and Marketing
- Marketing and sales from App: Sales and Marketing sampl...
- Marketing and sales from Workspace: Sales and Marketing...

At the bottom of this list is a blue link "See more results for Sales". To the right of the search results is a sidebar with the message "You frequently open t..." followed by a large gray placeholder area.

In addition to the **Search** field, most experiences on the Microsoft Fabric canvas also include a **Filter by keyword** field. Similar to search, use **Filter by keyword** to narrow down the content on your canvas to find what you need. The keywords you enter in the **Filter by keyword** pane apply to the current view only. For example, if you open **Browse** and enter a keyword in the **Filter by keyword** pane, Microsoft Fabric searches only the content that appears on the **Browse** canvas.

The screenshot shows the Microsoft Fabric canvas Browse interface for the "Synapse Data Warehouse" workspace. On the left is a navigation sidebar with icons for Home, Create, Browse, OneLake data hub, Workspaces, My workspace, and Data Warehouse. The "Browse" icon is selected. The main area has a "Recent" section on the left and a "Recent" table on the right. The table has columns: Name, Type, Opened, Owner, and Endorsemen. A search bar at the top right contains the text "sample" highlighted by a red box. The table data is as follows:

	Name	Type	Opened	Owner	Endorsemen
1	Sales and Marketing Sample	Report	a month ago	Megan B	—
2	Regional Sales Sample	Report	a month ago	Megan B	—
3	Human Resources Sample	Report	a month ago	POWER BI TEAM	—

Sort content lists

If you have only a few items, sorting isn't necessary. But when you have long lists of items, sorting helps you find what you need. For example, this **Shared with me** content list has many items.

Power BI Browse

Home Create Browse Data hub Metrics Apps Deployment pipelines Learn

Browse

Recent Favorites Shared with me

Shared with me

Name ↓

	Name	Type	Shared	Owner
	Usage Metrics Report	Report	10/25/22, 1:24:56 PM	Sales and Marketing
	Sales and Marketing Sample PBIX	Report	11/3/22, 10:56:15 AM	Sales and Marketing
	Sales and Marketing Sample	Dashboard	11/11/22, 11:22:57 AM	Sales and Marketing
	Sales and Marketing Sample	Report	11/11/22, 11:22:57 AM	Sales and Marketing
	Report Usage Metrics Report	Report	10/25/22, 1:24:56 PM	Sales and Marketing
	Report Usage Metrics Report	Report	10/25/22, 1:24:56 PM	Mark 8 Project Team
	Operations Usage Metrics	Report	10/25/22, 1:24:56 PM	Mark 8 Project Team

Q, Filter by keyword Filter ▾

Right now, this content list is sorted alphabetical by name, from Z to A. To change the sort criteria, select the arrow to the right of **Name**.

Shared with me

Name ↓

Sorted: Z to A

	Usage Metrics Report
	Sales and Marketing Sample PBIX
	Sales and Marketing Sample
	Sales and Marketing Sample
	Report Usage Metrics Report
	Report Usage Metrics Report
	Operations Usage Metrics

Sorting is also available in other areas of Microsoft Fabric. In this example, the workspaces are sorted by the **Refreshed** date. To set sorting criteria for workspaces, select a column header, and then select again to change the sorting direction.

The screenshot shows the Microsoft Fabric Content Explorer interface. On the left is a sidebar with various navigation options: Home, Create, Browse, Data Hub, Metrics, Apps, Deployment pipelines, Learn, and Workspaces. The main area is titled "Sales and Marketing" and contains a list of items under "Content". The columns are "All", "Name", "Type", "Owner", "Refreshed", "Next refresh", "Endorsement", and "Sensitivity". One item, "Sales and Marketing Sample", has its "Refreshed" column highlighted with a red box. The "Refreshed" column contains a downward arrow icon.

Not all columns can be sorted. Hover over the column headings to discover which can be sorted.

Filter content lists

Another way to locate content quickly is to use the content list **Filter**. Display the filters by selecting **Filter** from the upper right corner. The filters available depend on your location in Microsoft Fabric. This example is from a **Recent** content list. It allows you to filter the list by content **Type**, **Time**, or **Owner**.

The screenshot shows the Microsoft Fabric Content Explorer interface with the "Filter" button highlighted with a red box. The "Filter" button is located in the top right corner of the content area. A dropdown menu is open, showing filtering options for "Type", "Time", and "Owner". The "Type" section is expanded, showing checkboxes for "Workspace", "Dashboard", "App", "Dataset", and "Report". The "Time" and "Owner" sections are collapsed, indicated by a downward arrow icon.

Related content

- [Find Fabric items from Home](#)
 - [Start a Fabric trial](#)
-

Feedback

Was this page helpful?

 Yes

 No

[Provide product feedback ↗](#) | [Ask the community ↗](#)

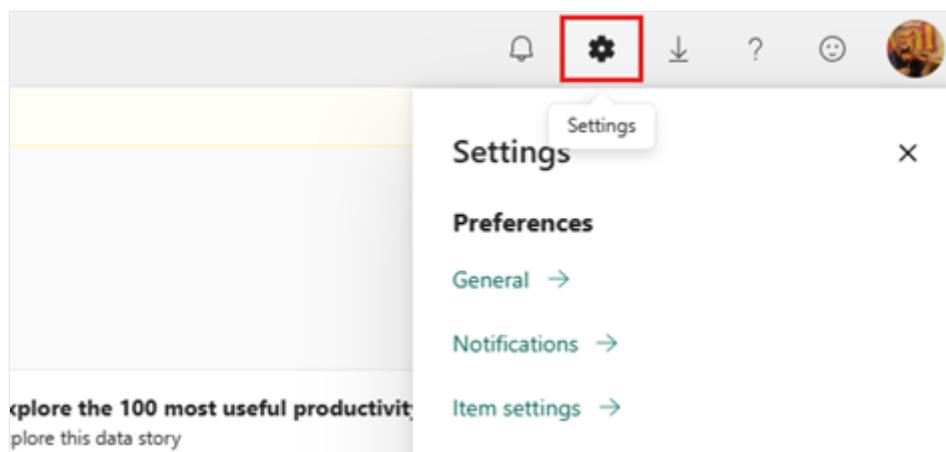
Fabric settings

Article • 11/08/2024

The Fabric settings pane provides links to various kinds of settings you can configure. This article shows how to open the Fabric settings pane and describes the kinds of settings you can access from there.

Open the Fabric settings pane

To open the Fabric settings pane, select the gear icon in the Fabric portal header.



Preferences

In the preferences section, individual users can set their user preferences, specify the language of the Fabric user interface, manage their account and notifications, and configure settings for their personal use throughout the system.

[] Expand table

Link	Description
General	Opens the generate settings page, where you can set the display language for the Fabric interface and parts of visuals.
Notifications	Opens the notifications settings page where you can view your subscriptions and alerts.
Item settings	Opens the item settings page, where you can configure per-item-type settings.
Developer settings	Opens the developer settings page, where you can configure developer mode settings.

Resources and extensions

The resources and extensions section provides links to pages where users can use following capabilities.

[+] [Expand table](#)

Link	Description
Manage personal/group storage	Opens the personal/group storage management page, where you can see and manage data items that you own or that have been shared with you.
Power BI settings	Opens the Power BI settings page, where you can get to the settings pages for the Power BI items (dashboards, semantic models, workbooks, reports, datamarts, and dataflows) that are in the current workspace.
Manage connections and gateways	Opens page where you can manage connections, on-premises data gateways, and virtual networks data gateways.
Manage embed codes	Opens a page where you can manage embed codes you have created.
Azure Analysis Services migrations	Opens up a page where you can migrate your Azure Analysis Services datasets to Power BI Premium .

Governance and insights settings

The governance and insights section provides links to help admins and users with their admin, governance, and compliance tasks.

[+] [Expand table](#)

Link	Description
Admin portal	Opens the Fabric admin portal where admins perform various management tasks and configure Fabric tenant settings. For more information about the admin portal, see What is the admin portal? . To learn how to open the admin portal, see How to get to the admin portal .
Microsoft Purview hub (preview)	Currently available to Fabric admins only. Opens the Microsoft Purview hub where you can view Purview insights about your organization's sensitive data. The Microsoft Purview hub also provides links to Purview governance and compliance capabilities and has links to documentation to help you get started with Microsoft Purview governance and compliance in Fabric.

Related content

- [What is Fabric](#)
 - [What is Microsoft Fabric admin?](#)
-

Feedback

Was this page helpful?

 Yes

 No

[Provide product feedback ↗](#) | [Ask the community ↗](#)

Workspaces in Microsoft Fabric and Power BI

Article • 10/21/2024

Workspaces are places to collaborate with colleagues to create collections of items such as lakehouses, warehouses, and reports, and to create task flows. This article describes workspaces, how to manage access to them, and what settings are available.

Ready to get started? Read [Create a workspace](#).

The screenshot shows the Microsoft Fabric workspace interface. At the top, there's a header with the workspace name "Contoso Sample Workspace" and links for "Create deployment pipeline", "Create app", "Manage access", and "Workspace settings". Below the header is a toolbar with buttons for "+ New", "Upload", and search/filter options. The main area features a large circular icon with a stack of documents and a plus sign, followed by the text "Select a task flow or build your own to get started (preview)". A callout box titled "Get started with a task flow" provides information about task flows. Below this is a table listing workspace items:

Name	Type	Task	Owner	Refreshed	Next refresh	Endorsement	Sensitivity	Included in app
Visualizations	Folder	—	—	—	—	—	—	—
DataflowsStagingLakehouse	Lakehouse	Debra Berger	—	—	—	—	Confidential ⓘ	—
DataflowsStagingLakehouse	Semantic model (...)	Contoso Sample ...	4/11/24, 1:01:41 AM	N/A	—	—	Confidential ⓘ	—
DataflowsStagingLakehouse	SQL analytics end...	Contoso Sample ...	—	N/A	—	—	Confidential ⓘ	—
DataflowsStagingWarehouse	Warehouse	Debra Berger	—	N/A	—	—	Confidential ⓘ	—
DataflowsStagingWarehouse	Semantic model (...)	Contoso Sample ...	4/11/24, 1:01:42 AM	N/A	—	—	Confidential ⓘ	—
MyNewNotebook	Notebook	Debra Berger	—	—	—	—	Confidential ⓘ	—
MyPipeline	Data pipeline	Debra Berger	—	—	—	—	Confidential ⓘ	—

A magnifying glass icon with a plus sign is located in the bottom right corner of the table area.

Work with workspaces

Here are some useful tips about working with workspaces.

- **Set up a task flow for the workspace** to organize your data project and to help others understand and work on your project. Read more about [task flows](#).
- **Pin workspaces** to the top of the workspace flyout list to quickly access your favorite workspaces. Read more about [pin workspaces](#).
- **Use granular workspace roles** for flexible permissions management in the workspaces: Admin, Member, Contributor, and Viewer. Read more about [workspace roles](#).

- **Create folders in the workspace:** Organize and manage artifacts in the workspace. Read more about [creating folders in workspaces](#).
- **Navigate to current workspace** from anywhere by selecting the icon on left nav pane. Read more about [current workspace](#) in this article.
- **Workspace settings:** As workspace admin, you can update and manage your workspace configurations in [workspace settings](#).
- **Manage a workspace in Git:** Git integration in Microsoft Fabric enables Pro developers to integrate their development processes, tools, and best practices straight into the Fabric platform. Learn how to [manage a workspace with Git](#).
- **Contact list:** Specify who receives notification about workspace activity. Read more about [workspace contact lists](#) in this article.

Current workspace

After you select and open a workspace, this workspace becomes your current workspace. You can quickly navigate to it from anywhere by selecting the workspace icon from left nav pane.

The screenshot shows the Microsoft Power BI Home page. On the left is a vertical sidebar with icons for Home, Create, Browse, Data hub, Apps, Metrics, Monitoring hub, Deployment pipelines, Learn, Workspaces, and a Sample-workspace1 icon, which is highlighted with a red box. The main area has a header with the Microsoft logo, 'Power BI' and 'Home', and a search bar. Below the header is a banner with a city skyline at night and a 'New report' button. The central part is titled 'Recommended' and shows two cards: 'Content Engagement Report' (frequently opened) and 'Customer Profitability Sample' (favorited). At the bottom is a toolbar with 'All' (selected), 'Recent', 'Shared', 'Favorites', and 'My apps'. A table below lists workspaces: Sample-workspace1 (Workspace).

	Name	Type
	Sample-workspace1	Workspace

Workspace layout

A workspace consists of a header, a toolbar, and a view area. There are two views that can appear in the view area: list view and lineage view. You select the view you want to see with controls on the toolbar. The following image shows these main workspace components, with list view selected.

The screenshot shows the Microsoft Power BI workspace interface. A red border highlights the main content area. Numbered callouts point to specific elements:

- ①** Top right corner: Create deployment pipeline, Create app, Manage access, Workspace settings.
- ②** Top left toolbar: New, Upload, Filter by keyword, Filter, List view selector (highlighted with a red circle), Lineage view selector.
- ③** Top right toolbar: Get started with a task flow, Task flow details, Task flows show the relationships between tasks, filter the list of item types, and make it easier for you to locate, organize, and manage the items you create. Choose from a predesigned set of task flows, or get started by selecting a task and gradually building your own.
- ④** Center top: Select a task flow button.

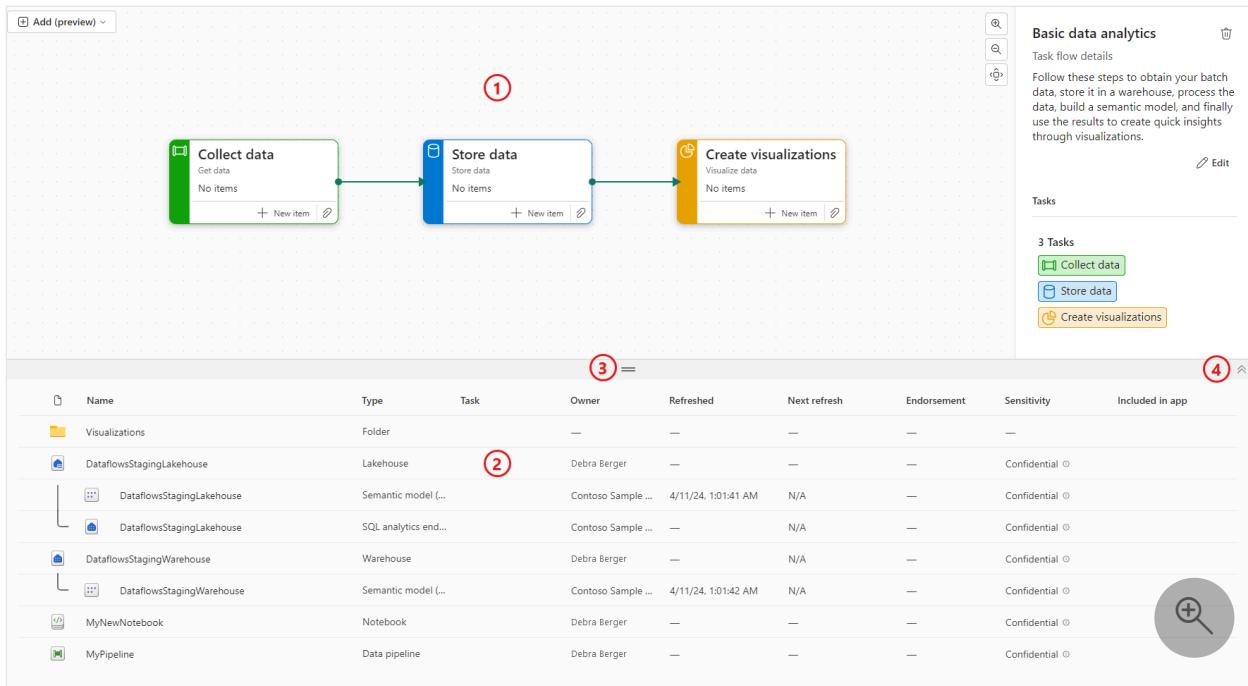
The main view displays a list of workspace items:

Name	Type	Task	Owner	Refreshed	Next refresh	Endorsement	Sensitivity	Included in app
Visualizations	Folder	—	—	—	—	—	—	
DataflowsStagingLakehouse	Lakehouse	Debra Berger	—	—	—	—	Confidential ⓘ	
DataflowsStagingLakehouse	Semantic model (..)	Contoso Sample ...	4/11/24, 1:01:41 AM	N/A	—	—	Confidential ⓘ	
DataflowsStagingLakehouse	SQL analytics end...	Contoso Sample ...	—	N/A	—	—	Confidential ⓘ	
DataflowsStagingWarehouse	Warehouse	Debra Berger	—	N/A	—	—	Confidential ⓘ	
DataflowsStagingWarehouse	Semantic model (..)	Contoso Sample ...	4/11/24, 1:01:42 AM	N/A	—	—	Confidential ⓘ	
MyNewNotebook	Notebook	Debra Berger	—	—	—	—	Confidential ⓘ	
MyPipeline	Data pipeline	Debra Berger	—	—	—	—	Confidential ⓘ	

- 1. Header:** The header contains the name and brief description of the workspace, and also links to other functionality.
- 2. Toolbar:** The toolbar contains controls for adding items to the workspace and uploading files. It also contains a search box, filter, and the list view and lineage view selectors.
- 3. List view and lineage view selectors:** The list view and lineage view selectors enable you to choose which view you want to see in the view area.
- 4. View area:** The view area displays either list view or lineage view.

List view

List view is divided into the task flow and the items list.



- Task flow:** The task flow is where you can create or view a graphical representation of your data project. The task flow shows the logical flow of the project - it doesn't show the flow of data. Read more about [task flows](#).
- Items list:** The items list is where you see the items and folders in the workspace. If you have tasks in the task flow, you can filter the items list by selecting the tasks.
- Resize bar:** You can resize the task flow and items list by dragging the resize bar up or down.
- Show/Hide task flow:** If you don't want to see the task flow, you can hide it using the hide/show arrows at the side of the separator bar.

Lineage view

Lineage view shows the flow of data between the items in the workspace. Read more about [lineage view](#).

Workspace settings

Workspace admins can use workspace settings to manage and update the workspace. The settings include general settings of the workspace, like the basic information of the workspace, contact list, SharePoint, license, Azure connections, storage, and other experiences' specific settings.

To open the workspace settings, you can select the workspace in the nav pane, then select **More options (...)** > **Workspace settings** next to the workspace name.

A screenshot of the Microsoft Power BI workspace settings menu. On the left, there's a sidebar with icons for Home, Create, Browse, Data hub, and Apps. The main area shows a search bar with 'sample-' and a list of workspaces under 'All'. A context menu is open over 'Sample-workspace1', with 'Workspace settings' highlighted by a red box. Other options in the menu include 'Manage access' and 'Workspace access'.

You can also open it from the workspace page.

A screenshot of the Microsoft Power BI workspace page for 'Sample-workspace1'. The top navigation bar includes 'Home', 'Create', 'Browse', and a search bar. Below the navigation is a toolbar with 'New', 'Upload', 'Create app', 'Manage access', and 'Workspace settings'. The 'Workspace settings' button is highlighted with a red box. The main content area shows a table with columns for Name, Type, and Owner, and a search icon.

Workspace contact list

The Contact list feature allows you to specify which users receive notification about issues occurring in the workspace. By default, the one who created the workspace is in the contact list. You can add others to that list while [creating workspace](#) or in workspace settings after creation. Users or groups in the contact list are also listed in the user interface (UI) of the workspace settings, so workspace users know whom to contact.

The screenshot shows the 'Workspace settings' page for a Microsoft Fabric workspace. On the left, there's a sidebar with a search bar and a list of integration options: Premium, Azure connections, System storage, Git integration, OneLake, and Other. Below that is a 'Power BI' section with a dropdown arrow. The main area is titled 'Workspace image' and contains fields for 'Name' (New Retail Analysis), 'Description' (Describe this workspace (Optional)), 'Domain' (Assign to a domain (optional)), and a 'Contact list' section where 'Sample User' is listed. A red box highlights the 'About' link in the sidebar and the 'Contact list' input field.

Microsoft 365 and SharePoint

The Workspace SharePoint feature allows you to configure a Microsoft 365 Group whose SharePoint document library is available to workspace users. You create the Group outside of Microsoft Fabric first, with one available method being from SharePoint. Read about creating a [SharePoint shared library](#).

! Note

Creating Microsoft 365 Groups may be restricted in your environment, or the ability to create them from your SharePoint site may be disabled. If this is the case, speak with your IT department.

Microsoft Fabric doesn't synchronize permissions between users or groups with workspace access, and users or groups with Microsoft 365 Group membership. A best practice is to [give access to the workspace](#) to the same Microsoft 365 Group whose file storage you configured. Then manage workspace access by managing membership of the Microsoft 365 Group.

You can configure SharePoint in workspace settings by typing in the name of the Microsoft 365 group that you created earlier. Type just the name, not the URL. Microsoft Fabric automatically picks up the SharePoint for the group.

The screenshot shows the 'Workspace settings' page. On the left, there's a sidebar with sections like 'About' (highlighted with a red box), 'Premium', 'Azure connections', 'System storage', 'Git integration', 'OneLake', and 'Other'. Below that is a 'Power BI' section with a dropdown arrow. The main area has tabs for 'Workspace image', 'Name', 'Description', 'Domain', 'Contact list', and 'Workspace OneDrive'. The 'About' tab is active. The 'Name' field contains 'New Retail Analysis'. The 'Description' field has 'Describe this workspace (Optional)'. The 'Domain' field says 'Assign to a domain (optional)'. The 'Contact list' field shows 'Sample User'. The 'Workspace OneDrive' field shows 'My files'. A red box highlights the 'About' tab and the 'My files' entry in the 'Workspace OneDrive' list.

License mode

By default, workspaces are created in your organization's shared capacity. When your organization has other capacities, workspaces including My Workspaces can be assigned to any capacity in your organization. You can configure it while creating a workspace or in **Workspace settings -> Premium**. Read more about [licenses](#).

The screenshot shows the 'Workspace settings' page in the Power BI service. On the left, there's a sidebar with various options like 'About', 'Premium' (which is highlighted with a red box), 'Azure connections', 'System storage', 'Git integration', 'OneLake', and 'Other'. Below that is a 'Power BI' section with a dropdown arrow. The main content area is titled 'Choose a license' and contains several sections: 'License mode' (with 'Pro' selected), 'Premium per-user' (selected), 'Premium capacity', 'Embedded', 'Fabric capacity', and 'Trial'. Each section has a description and a 'Learn more' link.

Choose a license

License mode **Pro**
Select Pro to use basic Power BI features and collaborate on reports, dashboards, and scorecards. To access a Pro workspace, users need Pro per-user licenses. [Learn more](#)

Premium per-user
Select Premium per-user to collaborate using Power BI Premium features, including paginated reports, dataflows, and datamarts. To collaborate and share content in a Premium per-user workspace, users need Premium per-user licenses. [Learn more](#)

Premium capacity
Select premium capacity if the workspace will be hosted in a premium capacity. When you share, collaborate on, and distribute Power BI and Microsoft Fabric content, users in the viewer role can access this content without needing a Pro or Premium per-user license. [Learn more](#)

Embedded
Select embedded if the workspace will be hosted in an Azure embedded capacity. ISVs and developers use Power BI Embedded to embed visuals and analytics in their applications. [Learn more](#)

Fabric capacity
Select Fabric capacity if the workspace will be hosted in a Microsoft Fabric capacity. With Fabric capacities, users can create Microsoft Fabric items and collaborate with others using Fabric features and experiences. Explore new capabilities in Power BI, Data Factory, Data Engineering, and Real-Time Analytics, among others. [Learn more](#)

Trial
Select the free trial per-user license to try all the new features and experiences in Microsoft Fabric for 60 days. A Microsoft Fabric trial license allows users to create Microsoft Fabric items and collaborate with others in a Microsoft Fabric trial capacity. Explore new capabilities in Power BI, Data Factory, Data Engineering, and Real-Time Analytics, among others. [Learn more](#)

Azure connections configuration

Workspace admins can configure dataflow storage to use Azure Data Lake Gen 2 storage and Azure Log Analytics (LA) connection to collect usage and performance logs for the workspace in workspace settings.

The screenshot shows the 'Workspace settings' page in the Power BI service. On the left, there's a sidebar with various options like 'About', 'Premium', 'Azure connections' (which is highlighted with a red box), 'System storage', 'Git integration', 'OneLake', 'Other', and 'Power BI'. The main content area has two sections: 'Azure Data Lake Gen2 Storage' and 'Azure Log Analytics'. Under 'Azure Data Lake Gen2 Storage', there's a note about connecting to an Azure Data Lake Gen2 storage account to store dataflows. A checkbox labeled 'Use the default Azure connection' is present. Below this is a button to 'Connect an Azure Data Lake Gen2 storage account.' Under 'Azure Log Analytics', there's a note about connecting to an Azure Log Analytics workspace to collect logs. A button to 'Configure Azure Log Analytics' is shown. At the bottom right of the main content area is a circular icon with a magnifying glass and a plus sign.

With the integration of Azure Data Lake Gen 2 storage, you can bring your own storage to dataflows, and establish a connection at the workspace level. Read [Configure dataflow storage to use Azure Data Lake Gen 2](#) for more detail.

After the connection with Azure Log Analytics (LA), activity log data is sent continuously and is available in Log Analytics in approximately 5 minutes. Read [Using Azure Log Analytics](#) for more detail.

System storage

System storage is the place to manage your semantic model storage in your individual or workspace account so you can keep publishing reports and semantic models. Your own semantic models, Excel reports, and those items that someone has shared with you, are included in your system storage.

In the system storage, you can view how much storage you have used and free up the storage by deleting the items in it.

Keep in mind that you or someone else may have reports and dashboards based on a semantic model. If you delete the semantic model, those reports and dashboards don't work anymore.

The screenshot shows the 'Workspace settings' pane. At the top, there's a search bar and a status bar indicating '0 MB used of 10 GB (0.00%)' and '10 GB available'. Below this, there are several sections: 'About', 'Premium', 'Azure connections', 'System storage' (which is highlighted with a red box), 'Git integration', 'OneLake', and 'Other'. Under 'Power BI', there's a dropdown menu. On the right side, there's a circular button with a magnifying glass icon. The 'System storage' section contains a table with columns 'Name', 'Size', 'Type', and 'Related objects'. It lists four items: 'Retail Analysis Sample small mul...', 'Retail Analysis Sample', 'Usage Metrics Report', and 'Power BI Content Engagement S...'. Each item has a delete icon next to it.

Remove the workspace

As an admin for a workspace, you can delete it. When you delete the workspace, everything contained within the workspace is deleted for all group members, and the associated app is also removed from AppSource.

In the Workspace settings pane, select **Other > Remove this workspace**.

The screenshot shows the 'Workspace settings' pane. The 'Other' section is highlighted with a red box. In the center, there's a button labeled 'Remove this workspace' with a trash icon, which is also highlighted with a red box. To the left of the button, there's a warning message: 'Delete this workspace and all data and items in it? This workspace will be permanently deleted after a retention period of 90 days, as defined by your Fabric administrator. Contact your Fabric administrator if you need to restore the workspace and recover the items in it during this retention period.' Below the 'Other' section, there's a 'Power BI' dropdown menu. On the right side, there's a circular button with a magnifying glass icon.

⚠️ Warning

If the workspace you're deleting has a workspace identity, that workspace identity will be irretrievably lost. In some scenarios this could cause Fabric items relying on the workspace identity for trusted workspace access or authentication to break. For more information, see [Delete a workspace identity](#).

Administering and auditing workspaces

Administration for workspaces is in the Microsoft Fabric admin portal. Microsoft Fabric admins decide who in an organization can create workspaces and distribute apps. Read about [managing users' ability to create workspaces](#) in the "Workspace settings" article.

Admins can also see the state of all the workspaces in their organization. They can manage, recover, and even delete workspaces. Read about [managing the workspaces themselves](#) in the "Admin portal" article.

Auditing

Microsoft Fabric audits the following activities for workspaces.

[] [Expand table](#)

Friendly name	Operation name
Created Microsoft Fabric folder	CreateFolder
Deleted Microsoft Fabric folder	DeleteFolder
Updated Microsoft Fabric folder	UpdateFolder
Updated Microsoft Fabric folder access	UpdateFolderAccess

Read more about [Microsoft Fabric auditing](#).

Considerations and limitations

Limitations to be aware of:

- Workspaces can contain a maximum of 1,000 Fabric and Power BI items.
- Certain special characters aren't supported in workspace names when using an XMLA endpoint. As a workaround, use URL encoding of special characters, for example, for a forward slash /, use %2F.
- A user or a [service principal](#) can be a member of up to 1,000 workspaces.

Related content

- [Create workspaces](#)
 - [Give users access to workspaces](#)
-

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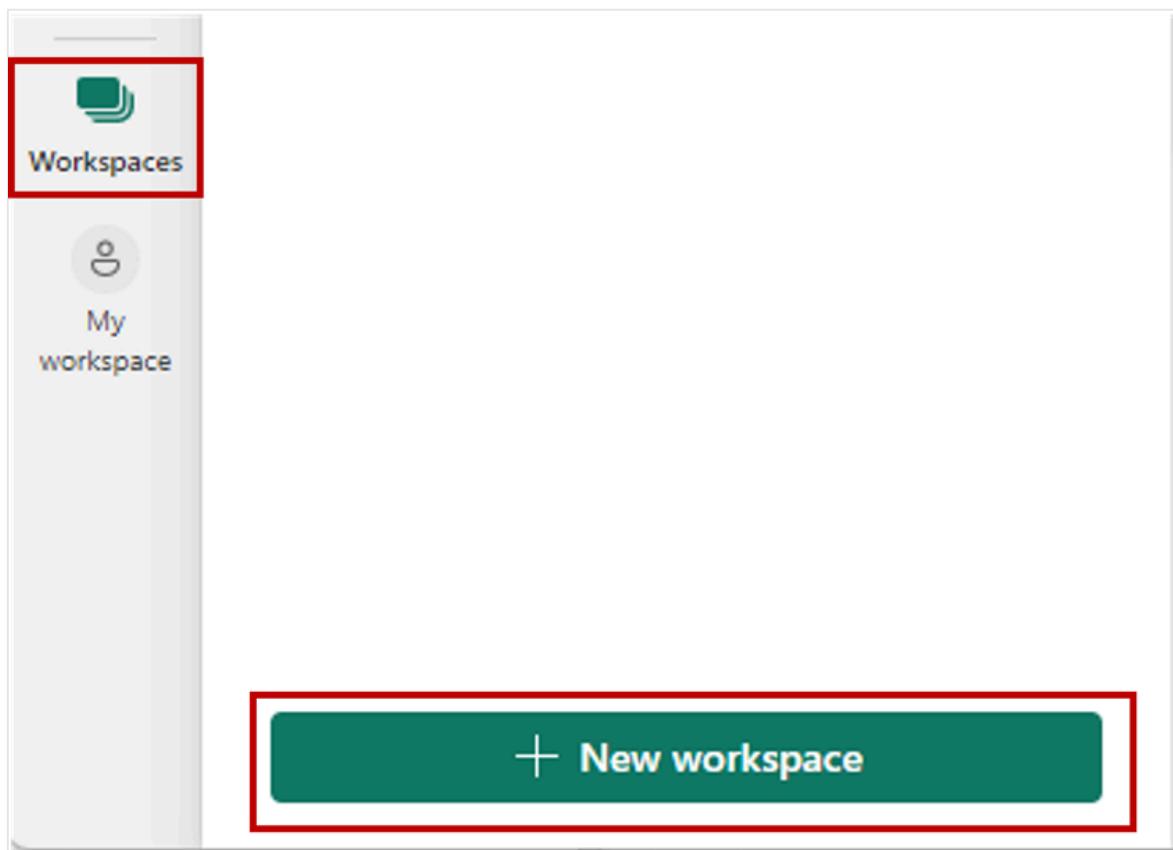
Create a workspace

Article • 04/15/2024

This article explains how to create *workspaces* in Microsoft Fabric. In workspaces, you create collections of items such as lakehouses, warehouses, and reports. For more background, see the [Workspaces](#) article.

To create a workspace:

1. Select **Workspaces > New workspace**. The Create a workspace pane opens.



2. The Create a workspace pane opens.

Create a workspace

Name *

Name this workspace

Description

Describe this workspace

Domain (preview) ⓘ

Assign to a domain (optional)



Learn more about workspace settings

Workspace image



Upload

Reset

Advanced

- Give the workspace a unique name (mandatory).
- Provide a description of the workspace (optional).
- Assign the workspace to a domain (optional).

If you are a domain contributor for the workspace, you can associate the workspace to a domain, or you can change an existing association. For information about domains, see [Domains in Fabric](#).

3. When done, either continue to the advanced settings, or select **Apply**.

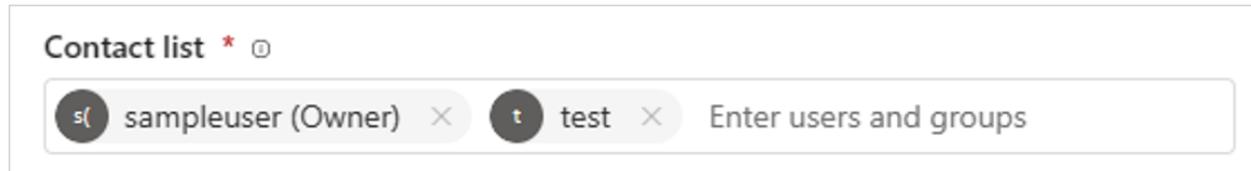
Advanced settings

Expand **Advanced** and you see advanced setting options:

Contact list

Contact list is a place where you can put the names of people as contacts for information about the workspace. Accordingly, people in this contact list receive system email notifications for workspace level changes.

By default, the first workspace admin who created the workspace is the contact. You can add other users or groups according to your needs. Enter the name in the input box directly, it helps you to automatically search and match users or groups in your org.



License mode

Different [license](#) mode provides different sets of feature for your workspace. After the creation, you can still change the workspace license type in workspace settings, but some migration effort is needed.

! Note

Currently, if you want to downgrade the workspace license type from Premium capacity to Pro (Shared capacity), you must first remove any non-Power BI Fabric items that the workspace contains. Only after you remove such items will you be allowed to downgrade the capacity. For more information, see [Moving data around](#).

Default storage format

Power BI semantic models can store data in a highly compressed in-memory cache for optimized query performance, enabling fast user interactivity. With Premium capacities, large semantic models beyond the default limit can be enabled with the Large semantic model storage format setting. When enabled, semantic model size is limited by the Premium capacity size or the maximum size set by the administrator. Learn more about [large semantic model storage format](#).

Template apps

[Power BI template apps](#) are developed for sharing outside your organization. If you check this option, a special type of workspace (template app workspace) is created. It's not possible to revert it back to a normal workspace after creation.

Dataflow storage (preview)

Data used with Power BI is stored in internal storage provided by Power BI by default. With the integration of dataflows and Azure Data Lake Storage Gen 2 (ADLS Gen2), you can store your dataflows in your organization's Azure Data Lake Storage Gen2 account. Learn more about [dataflows in Azure Data Lake Storage Gen2 accounts](#).

Give users access to your workspace

Now that you've created the workspace, you'll want to add other users to *roles* in the workspace, so you can collaborate with them. See these articles for more information:

- [Give users access to a workspace](#)
- [Roles in workspaces](#)

Pin workspaces

Quickly access your favorite workspaces by pinning them to the top of the workspace flyout list.

1. Open the workspace flyout from the nav pane and hover over the workspace you want to pin. Select the **Pin to top** icon.

Workspaces

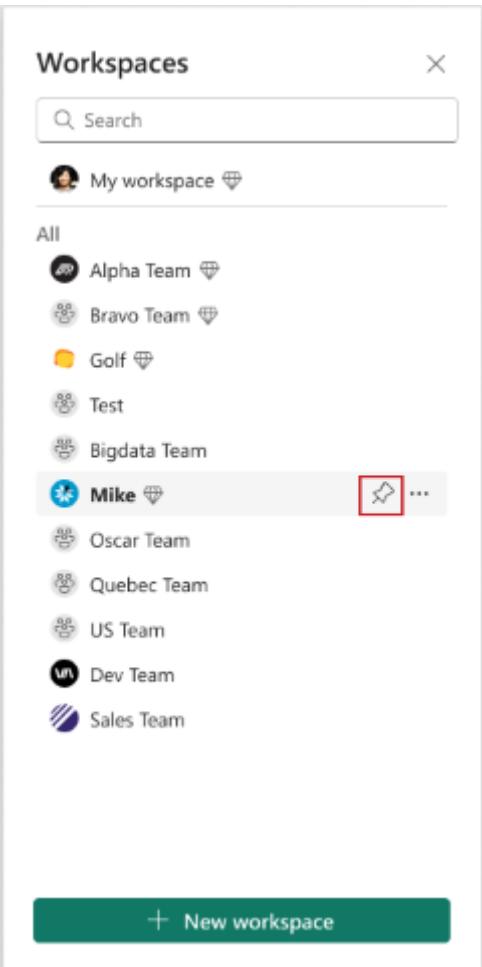
Search

My workspace

All

- Alpha Team
- Bravo Team
- Golf
- Test
- Bigdata Team
- Mike
- Oscar Team
- Quebec Team
- US Team
- Dev Team
- Sales Team

New workspace



2. The workspace is added in the Pinned list.

Workspaces

Search

My workspace

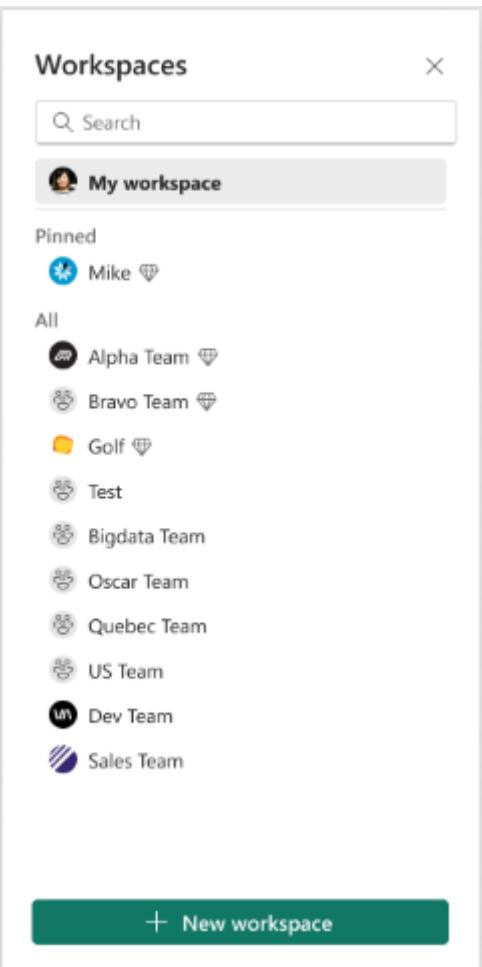
Pinned

- Mike

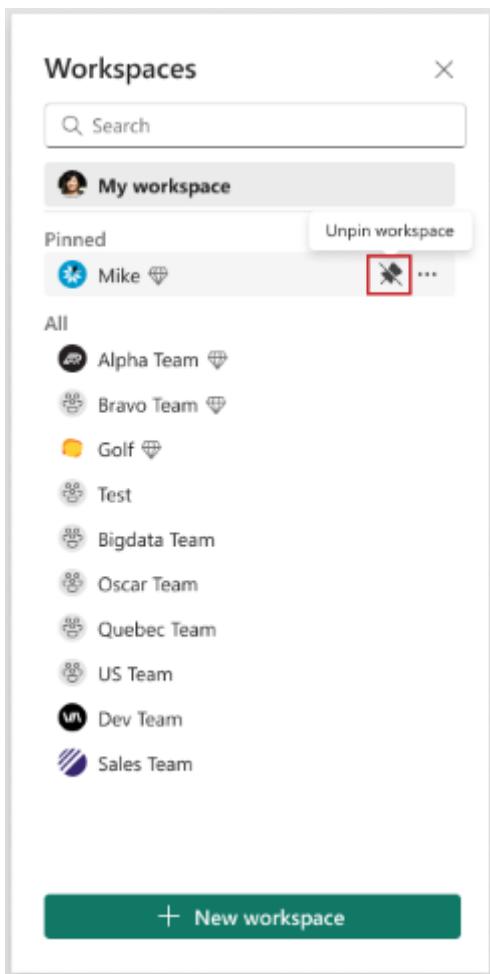
All

- Alpha Team
- Bravo Team
- Golf
- Test
- Bigdata Team
- Oscar Team
- Quebec Team
- US Team
- Dev Team
- Sales Team

New workspace



3. To unpin a workspace, select the unpin button. The workspace is unpinned.



Related content

- Read about [workspaces](#)

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Roles in workspaces in Microsoft Fabric

Article • 09/26/2024

Workspace roles let you manage who can do what in a Microsoft Fabric workspace. Microsoft Fabric workspaces sit on top of OneLake and divide the data lake into separate containers that can be secured independently. Workspace roles in Microsoft Fabric extend the Power BI workspace roles by associating new Microsoft Fabric capabilities such as data integration and data exploration with existing workspace roles. For more information on Power BI roles, see [Roles in workspaces in Power BI](#).

You can either assign roles to individuals or to security groups, Microsoft 365 groups, and distribution lists. To grant access to a workspace, assign those user groups or individuals to one of the workspace roles: Admin, Member, Contributor, or Viewer. Here's how to [give users access to workspaces](#).

To create a new workspace, see [Create a workspace](#).

Everyone in a user group gets the role that you assign. If someone is in several user groups, they get the highest level of permission that's provided by the roles that they're assigned. If you nest user groups and assign a role to a group, all the contained users have permissions.

Users in workspace roles have the following Microsoft Fabric capabilities, in addition to the existing Power BI capabilities associated with these roles.

Microsoft Fabric workspace roles

[+] Expand table

Capability	Admin	Member	Contributor	Viewer
Update and delete the workspace.	<input checked="" type="checkbox"/>			
Add or remove people, including other admins.	<input checked="" type="checkbox"/>			
Add members or others with lower permissions.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
Allow others to reshare items. ¹	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
Create or modify database mirroring items.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
View and read content of data pipelines, notebooks, Spark job definitions, ML models and experiments, and Event streams.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Capability	Admin	Member	Contributor	Viewer
View and read content of KQL databases, KQL query-sets, and real-time dashboards.	✓	✓	✓	✓
Connect to SQL analytics endpoint of Lakehouse or the Warehouse	✓	✓	✓	✓
Read Lakehouse and Data warehouse data and shortcuts ² with T-SQL through TDS endpoint.	✓	✓	✓	✓
Read Lakehouse and Data warehouse data and shortcuts ² through OneLake APIs and Spark.	✓	✓	✓	
Read Lakehouse data through Lakehouse explorer.	✓	✓	✓	
Write or delete data pipelines, notebooks, Spark job definitions, ML models, and experiments, and Event streams.	✓	✓	✓	
Write or delete Eventhouses ³ , KQL Querysets, Real-Time Dashboards, and schema and data of KQL Databases, Lakehouses, data warehouses, and shortcuts.	✓	✓	✓	
Execute or cancel execution of notebooks, Spark job definitions, ML models, and experiments.	✓	✓	✓	
Execute or cancel execution of data pipelines.	✓	✓	✓	
View execution output of data pipelines, notebooks, ML models and experiments.	✓	✓	✓	✓
Schedule data refreshes via the on-premises gateway. ⁴	✓	✓	✓	
Modify gateway connection settings. ⁴	✓	✓	✓	

¹ Contributors and Viewers can also share items in a workspace, if they have Reshare permissions.

² Other permissions are needed to read data from shortcut destination. Learn more about [shortcut security model](#).

³ Other permissions are needed to perform certain operations on data in an Eventhouse. Learn more about the [hybrid role-based access control model](#).

⁴ Keep in mind that you also need permissions on the gateway. Those permissions are managed elsewhere, independent of workspace roles and permissions.

Related content

- Roles in workspaces in Power BI
 - Create workspaces
 - Give users access to workspaces
 - Fabric and OneLake security
 - OneLake shortcuts
 - Data warehouse security
 - Data engineering security
 - Data science roles and permissions
 - Role-based access control in Eventhouse
-

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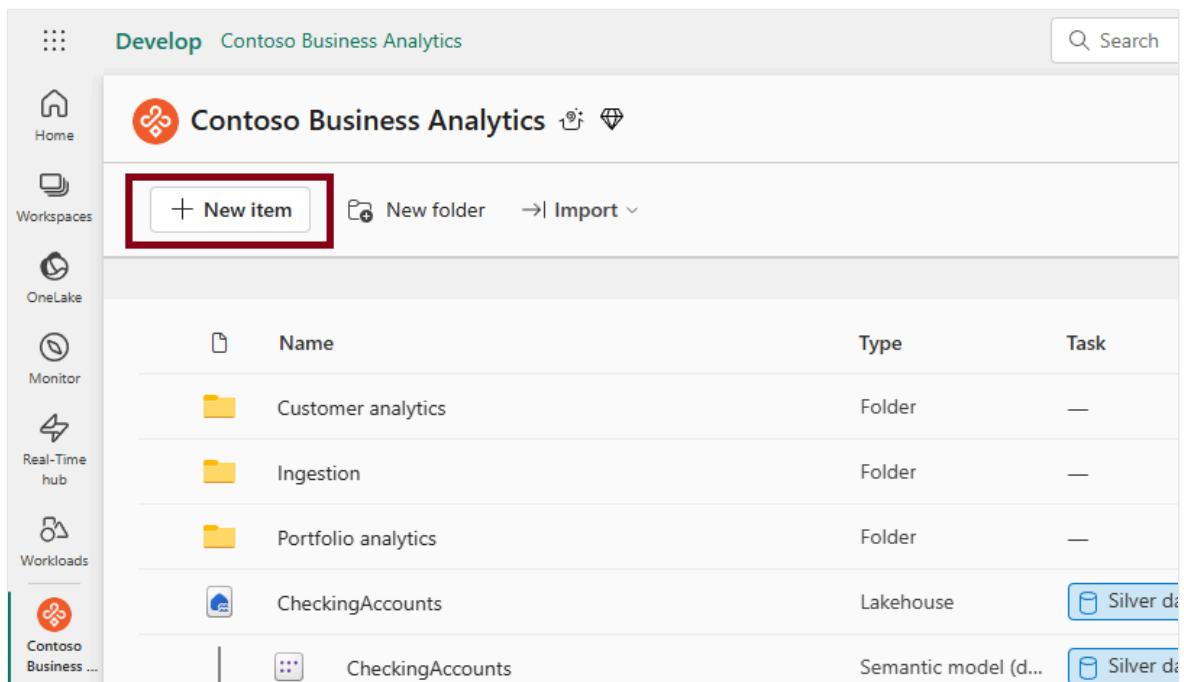
Create items in workspaces

Article • 10/22/2024

This article explains how to create items in workspaces in Microsoft Fabric. For more information about items and workspaces, see the [Microsoft Fabric terminology](#) and [Workspaces](#) article.

Create an item in a workspace

1. In a workspace, select **New item**



The screenshot shows the Microsoft Fabric workspace interface for 'Contoso Business Analytics'. On the left is a sidebar with icons for Home, Workspaces (selected), OneLake, Monitor, Real-Time hub, Workloads, and Contoso Business ... (selected). The main area has a title bar 'Develop Contoso Business Analytics' and a search bar. Below the title is a navigation bar with 'Contoso Business Analytics' and icons for New item (highlighted with a red box), New folder, Import, and a dropdown. The main content area is a table with columns: Name, Type, and Task. It lists several items: Customer analytics (Folder), Ingestion (Folder), Portfolio analytics (Folder), CheckingAccounts (Lakehouse), and another CheckingAccounts entry (Semantic model). The 'Task' column shows icons for Silver data and Gold data.

	Name	Type	Task
Customer analytics	Folder	—	
Ingestion	Folder	—	
Portfolio analytics	Folder	—	
CheckingAccounts	Lakehouse	Silver data	
CheckingAccounts	Semantic model (d...)	Silver data	

2. You can see all items are categorized by tasks. Each task represents daily job-to-be-done when you build a data solution: get data, store data, prepare data, analyze and train data, track data, visualize data, and develop data. Inside each category, item types are sorted alphabetically. You can scroll down and up to browse all item types which are available for you to create.

The screenshot shows the 'New item' dialog with the title 'New item' at the top left. Below it is a sub-header 'Select an item type'. There are two buttons: 'Favorites' (grayed out) and 'All items' (highlighted in black). To the right is a search bar with the placeholder 'Filter by item type'. A red box highlights the 'Get data' section. Inside this section, there is a sub-header 'Get data' and a sub-sub-header 'Ingest batch and real-time data into a single location within your Fabric workspace.' Below this are six cards arranged in a grid:

- Copy job (preview)**: Makes it easy to copy data in Fabric. Includes full copy, incremental copy, and event-based copy modes.
- Data pipeline**: Ingest data at scale and schedule data workflows.
- Dataflow Gen1**: Prep, clean, and transform data.
- Dataflow Gen2**: Prep, clean, and transform data.
- Dataflow Gen2 (CI/CD, preview)**: Prep, clean, and transform data with enhanced capabilities.
- Eventstream**: Capture, transform, and route real-time event stream to various destinations in desired format with no-code experience.

3. Select the card of item type you need to create, you can start the creation process of an item.

Search by item type

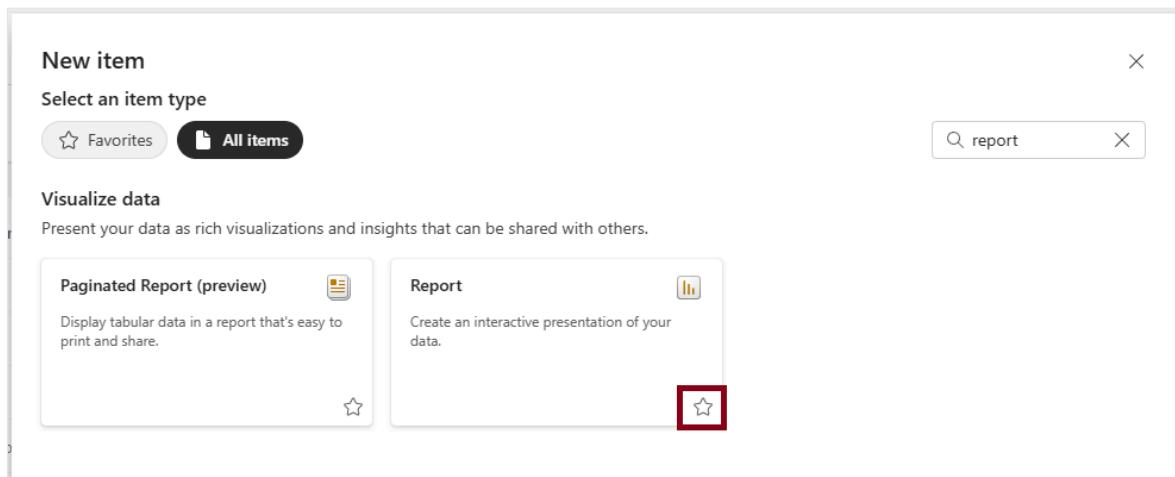
1. To find out the item type you need, enter the keyword of an item type, you can search in this panel.

The screenshot shows the 'New item' dialog with the title 'New item' at the top left. Below it is a sub-header 'Select an item type'. There are two buttons: 'Favorites' (grayed out) and 'All items' (highlighted in black). To the right is a search bar with the placeholder 'Filter by item type' containing the text 'notebook', which is highlighted with a red box. A red box also highlights the 'Notebook' card in the results list. Below the search bar is a sub-header 'Get data' and a sub-sub-header 'Ingest batch and real-time data into a single location within your Fabric workspace.' Below this are two cards:

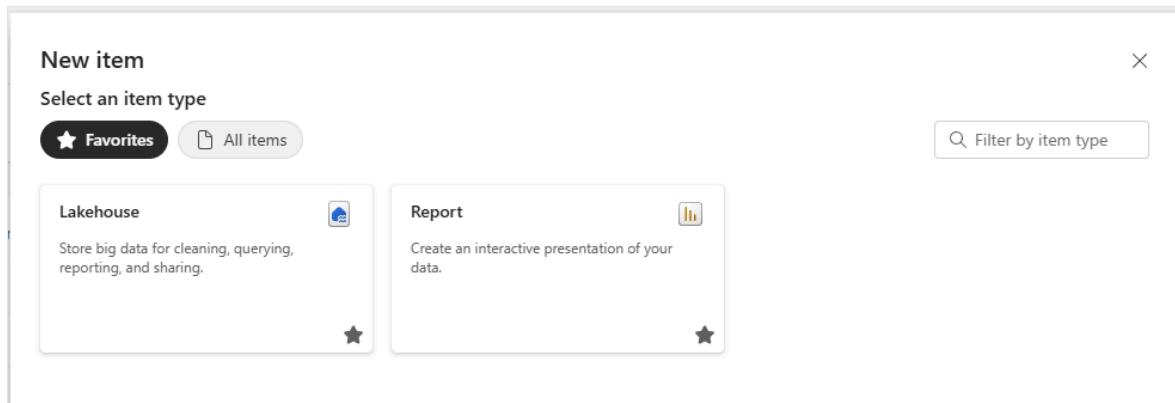
- Notebook**: Explore data and build machine learning solutions with Apache Spark applications.
- Notebook**: Explore data and build machine learning solutions with Apache Spark applications.

Add items to Favorites

1. Select the star button on a card of an item type, you can add this item type to your 'Favorites'

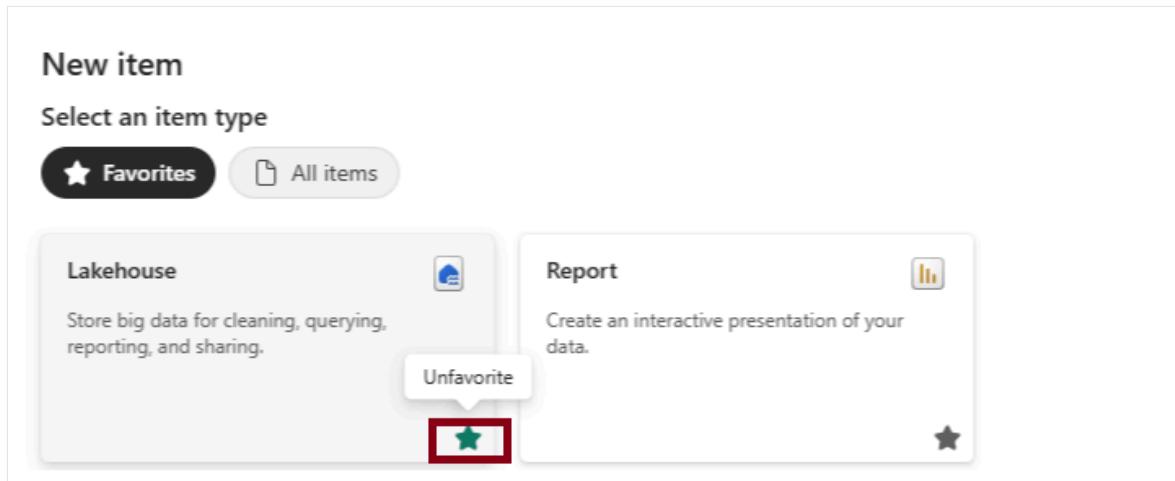


2. Select 'Favorite' and you can see all item types you added to 'Favorites'



3. Next time, when you select 'New item' button, 'Favorites' is shown by default so that you can quickly access the items you need to create most frequently

4. By clicking on the star button again, you can unfavorite the item types.



Related content

- [Create workspaces](#)

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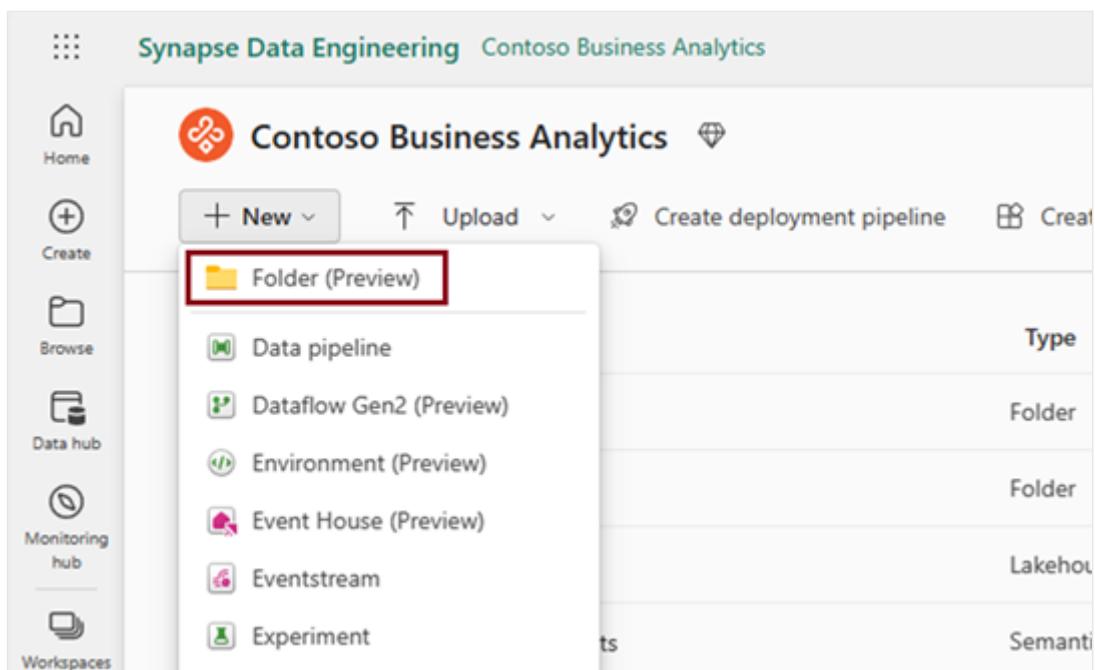
Create folders in workspaces (preview)

Article • 05/21/2024

This article explains what folders in workspaces are and how to use them in workspaces in Microsoft Fabric. Folders are organizational units inside a workspace that enable users to efficiently organize and manage artifacts in the workspace. For more information about workspaces, see the [Workspaces](#) article.

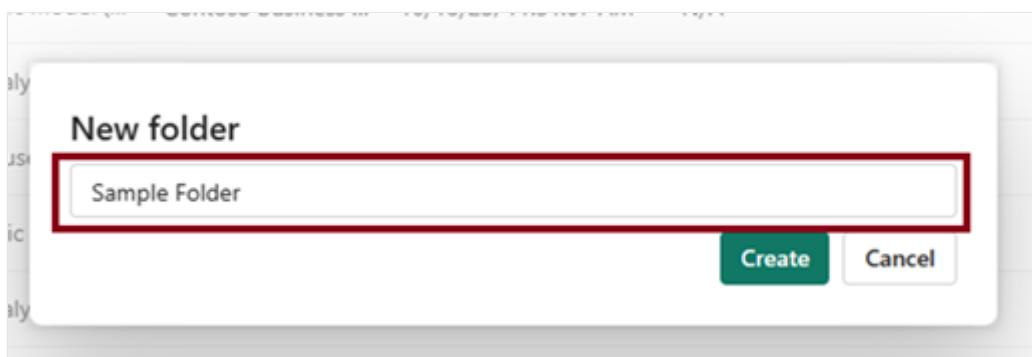
Create a folder in a workspace

1. In a workspace, select New > Folder.



The screenshot shows the Microsoft Fabric workspace interface. On the left, there's a sidebar with icons for Home, Create (which is selected), Browse, Data hub, Monitoring hub, and Workspaces. The main area has a title bar "Synapse Data Engineering Contoso Business Analytics". Below the title bar, there's a toolbar with "New", "Upload", "Create deployment pipeline", and "Create". A dropdown menu is open under "New", showing options: "Folder (Preview)" (which is highlighted with a red box), "Data pipeline", "Dataflow Gen2 (Preview)", "Environment (Preview)", "Event House (Preview)", "Eventstream", and "Experiment". To the right of the dropdown, there's a table with columns "Type" and "Name" (partially visible). The first two rows in the table are "Folder" and "Folder".

2. Enter a name for the folder in the [New folder dialog box](#). See [Folder name requirements](#) for naming restrictions.



3. The folder is created successfully.

Name	Type	Owner	Refreshed	Next review
Customer analytics	Folder	—	—	—
Portfolio analytics	Folder	—	—	—
Sample Folder	Folder	—	—	—
CheckingAccounts	Lakehouse	Yichao Wu	—	—
CheckingAccounts	Semantic model (...)	Contoso Business ...	10/18/23, 11:51:07 AM	N/A
CheckingAccounts	SQL analytics end...	Contoso Business ...	—	N/A
CustomerSegmentationData	Lakehouse	Yichao Wu	—	—

4. You can create nested subfolders in a folder in the same way. Maximum 10 level nested subfolders can be created.

ⓘ Note

You can nest up to 10 folders within the root folder.

Folder name requirements

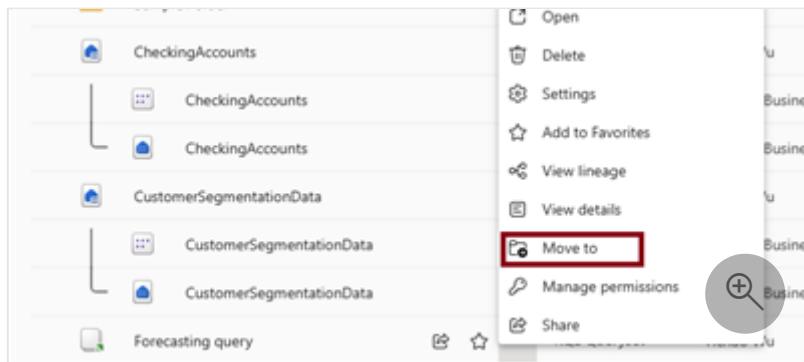
Folder names must follow certain naming conventions:

- The name can't include C0 and C1 control codes.
- The name can't contain leading or trailing spaces.
- The name can't contain these characters: ~"#.&*:;<>?/{|}.
- The name can't contain system-reserved names, including: \$recycle.bin, recycled, recycler.
- The name length can't exceed 255 characters.
- You can't have more than one folder with the same name in a folder or at the root level of the workspace.

Move items into a folder

Move a single item

1. Select the context menu (...) of the item you want to move, then select **Move to**.



2. Select the destination folder where you want to move this item.

Move 1 item

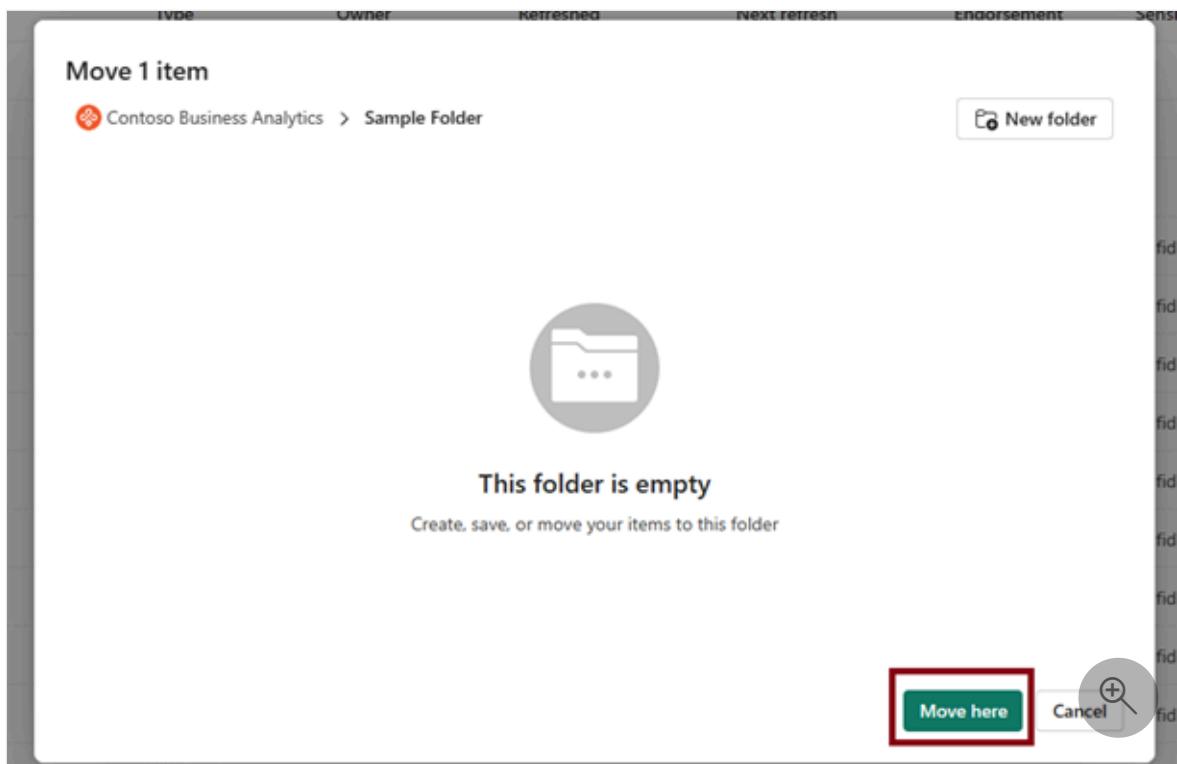
Contoso Business Analytics

New folder

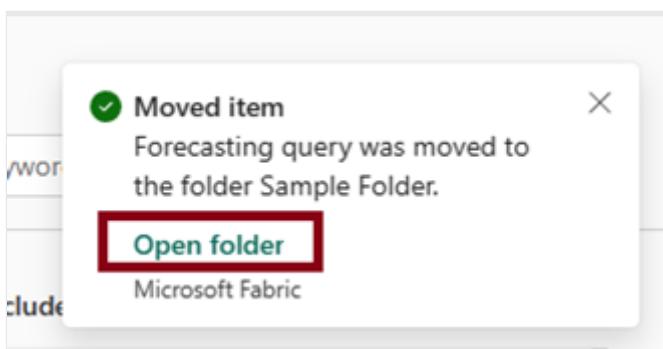
Name	Type	Owner
Customer analytics	Folder	-
Portfolio analytics	Folder	-
Sample Folder	Folder	-
CheckingAccounts	Lakehouse	Yichao Wu
CheckingAccounts	Semantic model (default)	Contoso Business Analytics
CheckingAccounts	SQL analytics endpoint	Contoso Business Analytics
CustomerSegmentationData	Lakehouse	Yichao Wu
CustomerSegmentationData	Semantic model (default)	Contoso Business Analytics

Move here Cancel

3. Select **Move here**.



4. By selecting **Open folder** in the notification or navigating to the folder directly, you can go to the destination folder to check if the item moved successfully.



Move multiple items

1. Select multiple items, then select **Move** from the command bar.

The screenshot shows the Synapse Data Engineering interface with the title "Synapse Data Engineering Contoso Business Analytics". On the left, there's a sidebar with icons for Home, Create, Browse, Data hub, Monitoring hub, Workspaces, and Contoso Business... The main area has a header "Contoso Business Analytics" with a "Move" button highlighted by a red box. Below is a table with columns: Name, Type, and Owner. Six items are selected, indicated by green checkmarks in the first column. A red vertical box highlights the first two selected items. The items listed are:

	Name	Type	Owner
<input checked="" type="checkbox"/>	Customer analytics	Folder	-
<input checked="" type="checkbox"/>	Portfolio analytics	Folder	-
<input checked="" type="checkbox"/>	Sample Folder	Folder	-
<input checked="" type="checkbox"/>	CheckingAccounts	Lakehouse	Yichao Wu
<input checked="" type="checkbox"/>	CheckingAccounts	Semantic model (...	Contoso Business .
<input checked="" type="checkbox"/>	CheckingAccounts	SQL analytics end...	Contoso Business .
<input checked="" type="checkbox"/>	CustomerSegmentationData	Lakehouse	Yichao Wu
<input checked="" type="checkbox"/>	CustomerSegmentationData	Semantic model (...	Contoso Business .
<input checked="" type="checkbox"/>	CustomerSegmentationData	SQL analytics end...	Contoso Business .
<input checked="" type="checkbox"/>	pipeline1	Data pipeline	Yichao Wu
<input checked="" type="checkbox"/>	pipeline2	Data pipeline	Yichao Wu

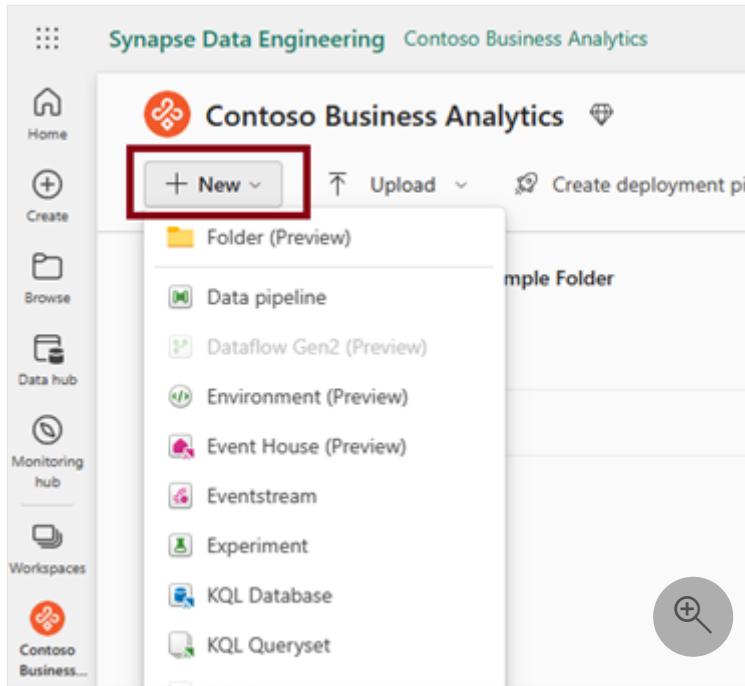
2. Select a destination where you want to move these items. You can also create a new folder if you need it.

The screenshot shows a modal dialog titled "Move 6 items". At the top, it says "Contoso Business Analytics" and has a "New folder" button highlighted by a red box. The main area is a table with columns: Name, Type, and Owner. It lists the same six items as the previous screenshot. At the bottom right are "Move here" and "Cancel" buttons, with a magnifying glass icon next to the "Move here" button.

Name	Type	Owner
Customer analytics	Folder	-
Portfolio analytics	Folder	-
Sample Folder	Folder	-
CheckingAccounts	Lakehouse	Yichao Wu
CheckingAccounts	Semantic model (default)	Contoso Business Analytics
CheckingAccounts	SQL analytics endpoint	Contoso Business Analytics
CustomerSegmentationData	Lakehouse	Yichao Wu
CustomerSegmentationData	Semantic model (default)	Contoso Business Analytics

Create an item in a folder

1. Go to a folder, select **New**, then select the item you want to create. The item is created in this folder.



ⓘ Note

Currently, you can't create certain items in a folder:

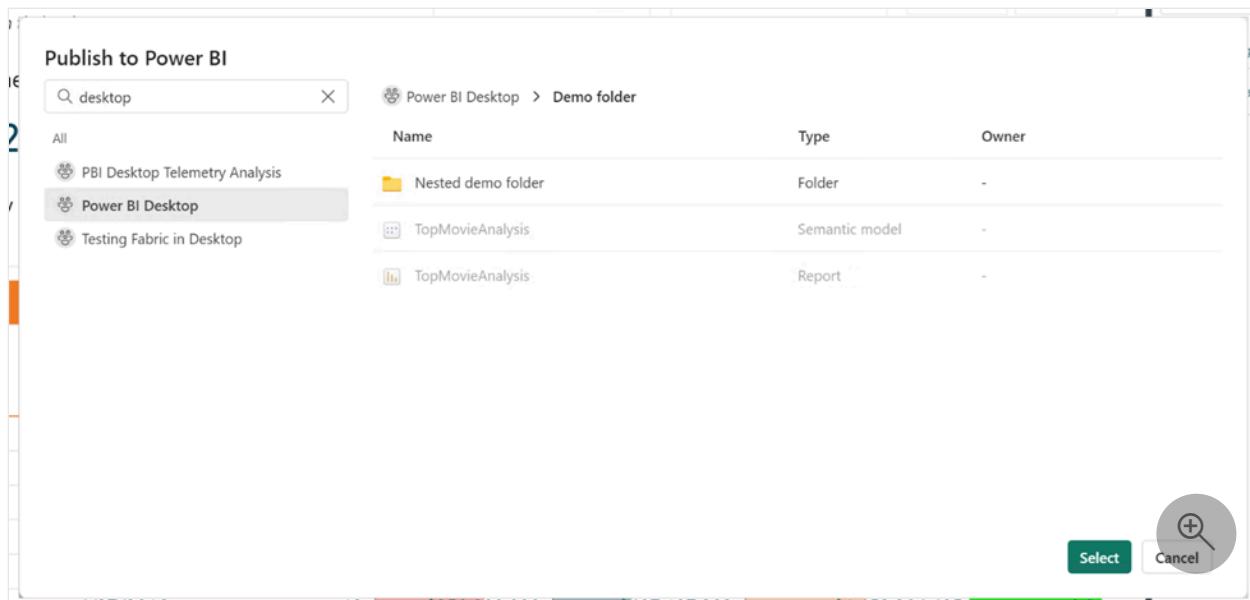
- dataflow gen2
- streaming semantic model
- streaming dataflow

If you create items from the home page or the **Create** hub, items are created in the root level of the workspace.

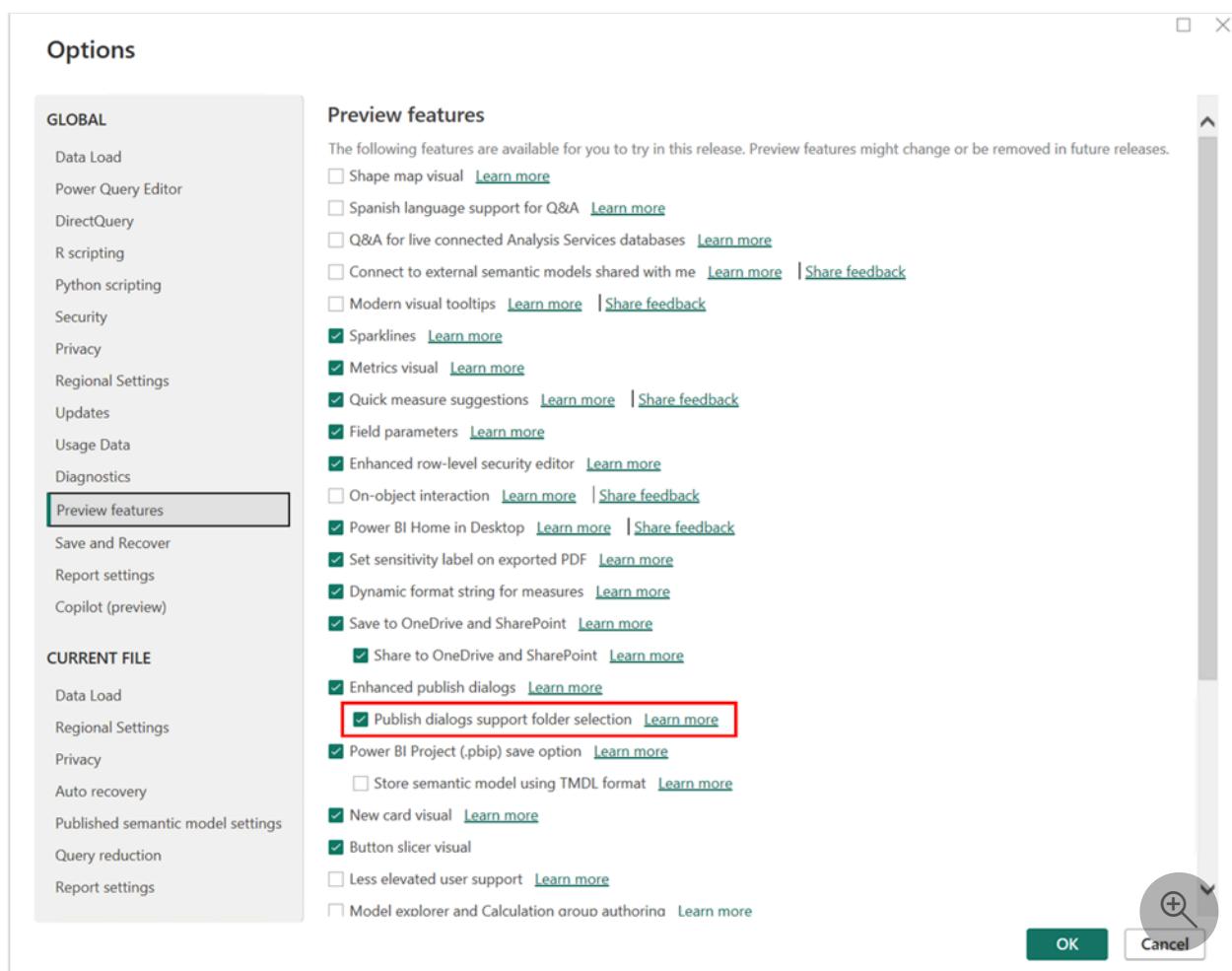
Publish to folder (preview)

You can now publish your Power BI reports to specific folders in your workspace.

When you publish a report, you can choose the specific workspace and folder for your report, seen below.



To publish reports to specific folders in the service, make sure the **Publish dialogs support folder selection** setting is enabled in the Preview features tab in the options menu.

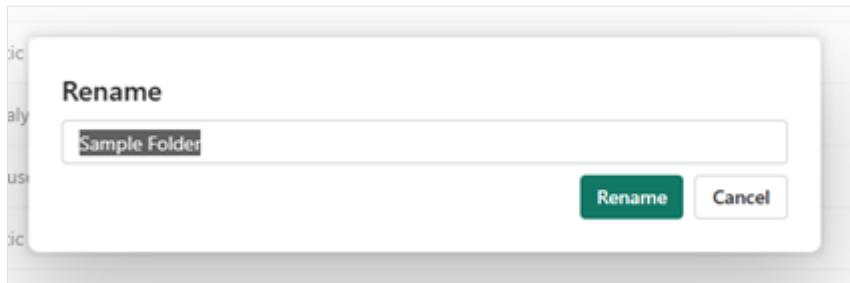


Rename a folder

1. Select the context (...) menu, then select **Rename**.



2. Give the folder a new name and select the **Rename** button.

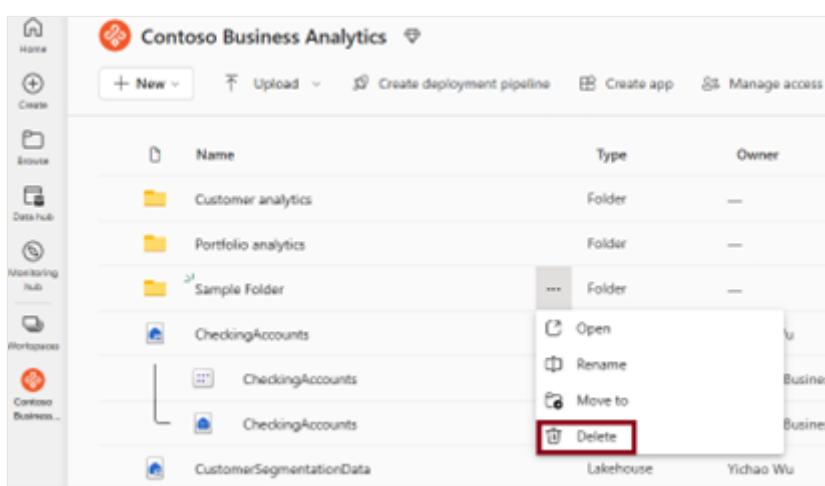


ⓘ Note

When renaming a folder, follow the same naming convention as when you're creating a folder. See [Folder name requirements](#) for naming restrictions.

Delete a folder

1. Make sure the folder is empty.
2. Select the context menu (...) and select **Delete**.



ⓘ Note

Currently you can only delete empty folders.

Permission model

Workspace admins, members, and contributors can create, modify, and delete folders in the workspace. Viewers can only view folder hierarchy and navigate in the workspace.

Currently folders inherit the permissions of the workspace where they're located.

[\[+\] Expand table](#)

Capability	Admin	Member	Contributor	Viewer
Create folder	✓	✓	✓	✗
Delete folder	✓	✓	✓	✗
Rename folder	✓	✓	✓	✗
Move folder and items	✓	✓	✓	✗
View folder in workspace list	✓	✓	✓	✓

Considerations and limitations

- Currently dataflow gen2, streaming semantic model, and streaming dataflow can't be created in folders.
- If you trigger item creation from the home page, create hub and industry solution, items are created at the root level of workspaces.
- In a workspace page, `Filter` and `Filter by` keywords only apply to items at the current level.
- Git doesn't support workspace folders yet.
- If **folders** is **enabled** in the Power BI service but **not enabled** in Power BI Desktop, republishing a report that is in a nested folder will replace the report in the nested folder.
- If Power BI Desktop **folders** is **enabled** in Power BI Desktop, but **not enabled** in the Service and you publish to a nested folder, the report will be published to the general workspace.
- When publishing reports to folders, report names must be unique throughout an entire workspace, regardless of its location. Therefore, when publishing a report to a workspace that has another report with the same name in a different folder, the report will publish to the location of the already existing report. If you want to move the report to a new folder location in the workspace you will need to make this change in the Power BI Service.

Related content

- Folders in deployment pipelines
 - Create workspaces
 - Give users access to workspaces
-

Feedback

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Give users access to workspaces

Article • 01/22/2024

After you [create a workspace](#) in Microsoft Fabric, or if you have an admin or member role in a workspace, you can give others access to it by adding them to the different roles. Workspace creators are automatically admins. For an explanation of the different roles, see [Roles in workspaces](#).

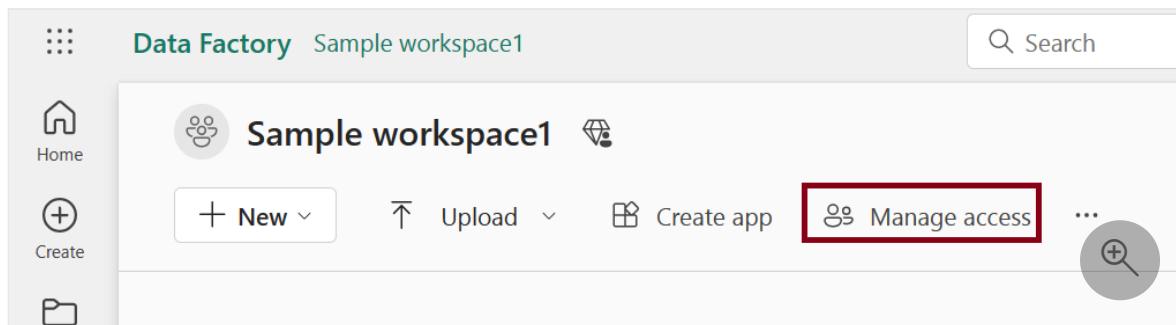
ⓘ Note

To enforce row-level security (RLS) on Power BI items for Microsoft Fabric Pro users who browse content in a workspace, assign them the Viewer Role.

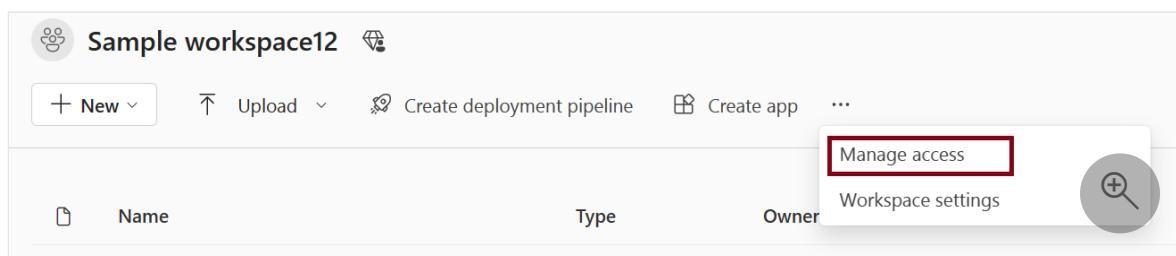
After you add or remove workspace access for a user or a group, the permission change only takes effect the next time the user logs into Microsoft Fabric.

Give access to your workspace

1. Because you have the Admin or Member role in the workspace, on the command bar of workspace page, you see **Manage Access**. Sometimes this entry is on the **More options (...)** menu.



Manage access on the More options menu.



2. Select **Add people or groups**.

Manage access

X

Sample workspace1

+ Add people or groups



Search within workspace

SU

Sample User ⓘ

Admin ▾

3. Enter name or email, select a **role**, and select **Add**. You can add security groups, distribution lists, Microsoft 365 groups, or individuals to these workspaces as admins, members, contributors, or viewers. If you have the member role, you can only add others to the member, contributor, or viewer roles.

Add people

Sample workspace1

 Admins, members, and contributors have edit and view access. Viewers only have view access. [Learn more](#) 

Enter name or email

 Viewer 

Add

 Admin

 Member

 Contributor

 Viewer

4. You can view and modify access later if needed. Use the **Search** box to search for people or groups who already have access of this workspace. To modify access, select drop-down arrow, and select a role.

Manage access

X

Sample workspace1

+ Add people or groups

Search within workspace

SU

Sample User ⓘ

Admin ▾

Su

Sample user2 ⓘ

Contributor ▾

Admin

Member

Viewer

Remove

Related content

- Read about [the workspace experience](#).
- [Create workspaces](#).
- [Roles in workspaces](#)

Feedback

Was this page helpful?

 Yes

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Get started with Git integration (preview)

Article • 07/11/2024

This article walks you through the following basic tasks in Microsoft Fabric's Git integration tool:

- [Connect to a Git repo](#)
- [Commit changes](#)
- [Update from Git](#)
- [Disconnect from Git](#)

It's recommended to read the [overview of Git integration](#) before you begin.

 **Important**

This feature is in [preview](#).

Prerequisites

To integrate Git with your Microsoft Fabric workspace, you need to set up the following prerequisites for both Fabric and Git.

Fabric prerequisites

To access the Git integration feature, you need one of the following:

- [Power BI Premium license](#). A Power BI premium license supports all Power BI items only.
- [Fabric capacity](#). A Fabric capacity is required to use all supported Fabric items. If you don't have one yet, [sign up for a free trial](#).

In addition, the following [tenant switches](#) must be enabled from the Admin portal:

- [Users can create Fabric items](#)
- [Users can synchronize workspace items with their Git repositories](#)
- For GitHub users only: [Users can synchronize workspace items with GitHub repositories](#)

These switches can be enabled by the tenant admin, capacity admin, or workspace admin, depending on your [organization's settings](#).

Git prerequisites

Git integration is currently supported for Azure DevOps and GitHub. To use Git integration with your Fabric workspace, you need the following in either Azure DevOps or GitHub:

Azure DevOps

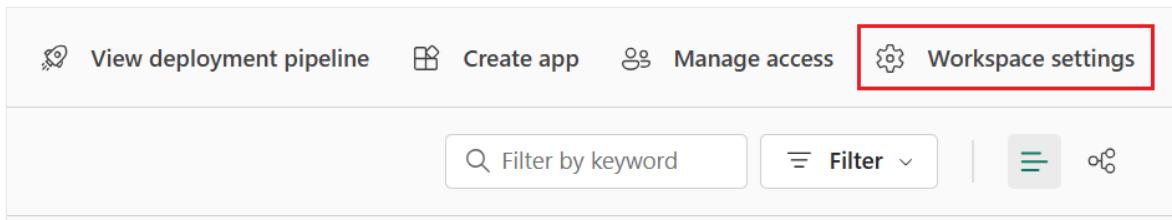
- An active Azure account registered to the same user that is using the Fabric workspace. [Create a free account ↗](#).
- Access to an existing repository.

Connect a workspace to a Git repo

Connect to a Git repo

Only a workspace admin can connect a workspace to a repository, but once connected, anyone with [permission](#) can work in the workspace. If you're not an admin, ask your admin for help with connecting. To connect a workspace to an Azure or GitHub Repo, follow these steps:

1. Sign into Fabric and navigate to the workspace you want to connect with.
2. Go to **Workspace settings**



3. Select **Git integration**.
4. Select your Git provider. Currently, Azure DevOps and GitHub are supported.

Azure DevOps Connect

If you select Azure DevOps, select **Connect** to automatically sign into the Azure Repos account registered to the Microsoft Entra user signed into Fabric.

Workspace settings

[Git integration \(Preview\)](#)
Connect to Git to manage your code and back up your work. [Learn more](#)

- General
- License info
- Azure connections
- System storage
- Git integration**
- OneLake
- Workspace identity
- Network security

- Power BI
- Extension API playground
- Data Engineering/Science
- Data Factory

Connect Git provider and account

Git provider

**Azure DevOps**

**GitHub**

Accounts

AAD account

Connect

Connect Git repository and branch

Connect to a workspace

If the workspace is already connected to GitHub, follow the instructions for [Connecting to a shared workspace](#).

Azure DevOps branch connect

- From the dropdown menu, specify the following details about the branch you want to connect to:

① Note

You can only connect a workspace to one branch and one folder at a time.

- Organization
- Project

- [Git repository](#).
- Branch (Select an existing branch using the drop-down menu, or select + **New Branch** to create a new branch. You can only connect to one branch at a time.)
- Folder (Type in the name of an existing folder or enter a name to create a new folder. If you leave the folder name blank, content will be created in the root folder. You can only connect to one folder at a time.)

Workspace settings

Connect to Git to manage your code and back up your work. [Learn more](#)

General

License info

Azure connections

System storage

Git integration

OneLake

Workspace identity

Network security

Connect Git provider and account

Provider
Azure DevOps
AAD account

[Log out](#)

Connect Git repository and branch

Organization *

Project *

Git repository * ⓘ

Branch * ⓘ

Git folder ⓘ

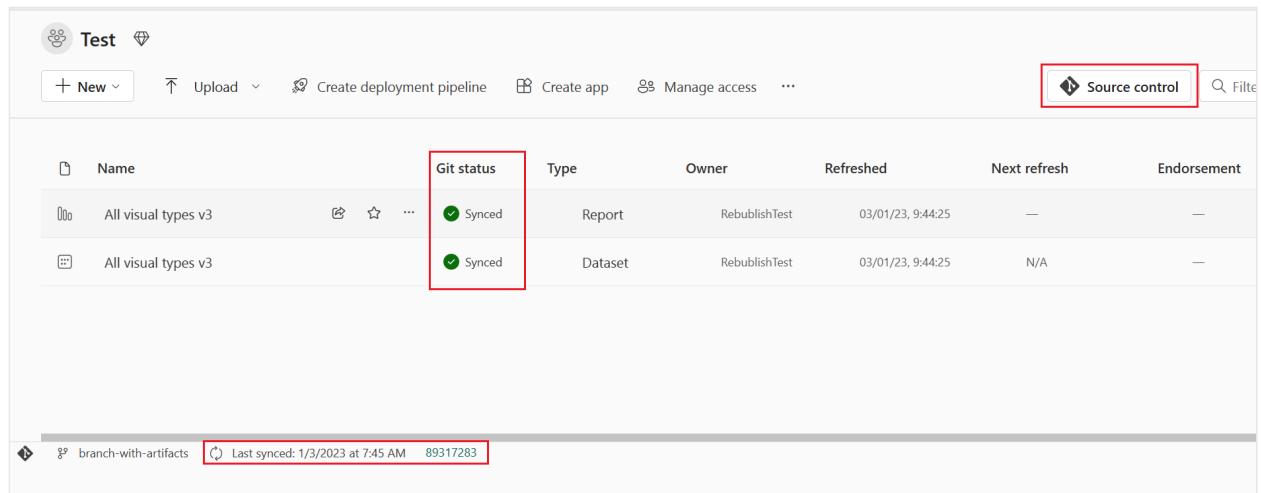
[Connect and sync](#) [Cancel](#)

Select **Connect and sync**.

During the initial sync, if either the workspace or Git branch is empty, content is copied from the nonempty location to the empty one. If both the workspace and Git branch have content, you're asked which direction the sync should go. For more information on this initial sync, see [Connect and sync](#).

After you connect, the Workspace displays information about source control that allows the user to view the connected branch, the status of each item in the branch and the

time of the last sync.

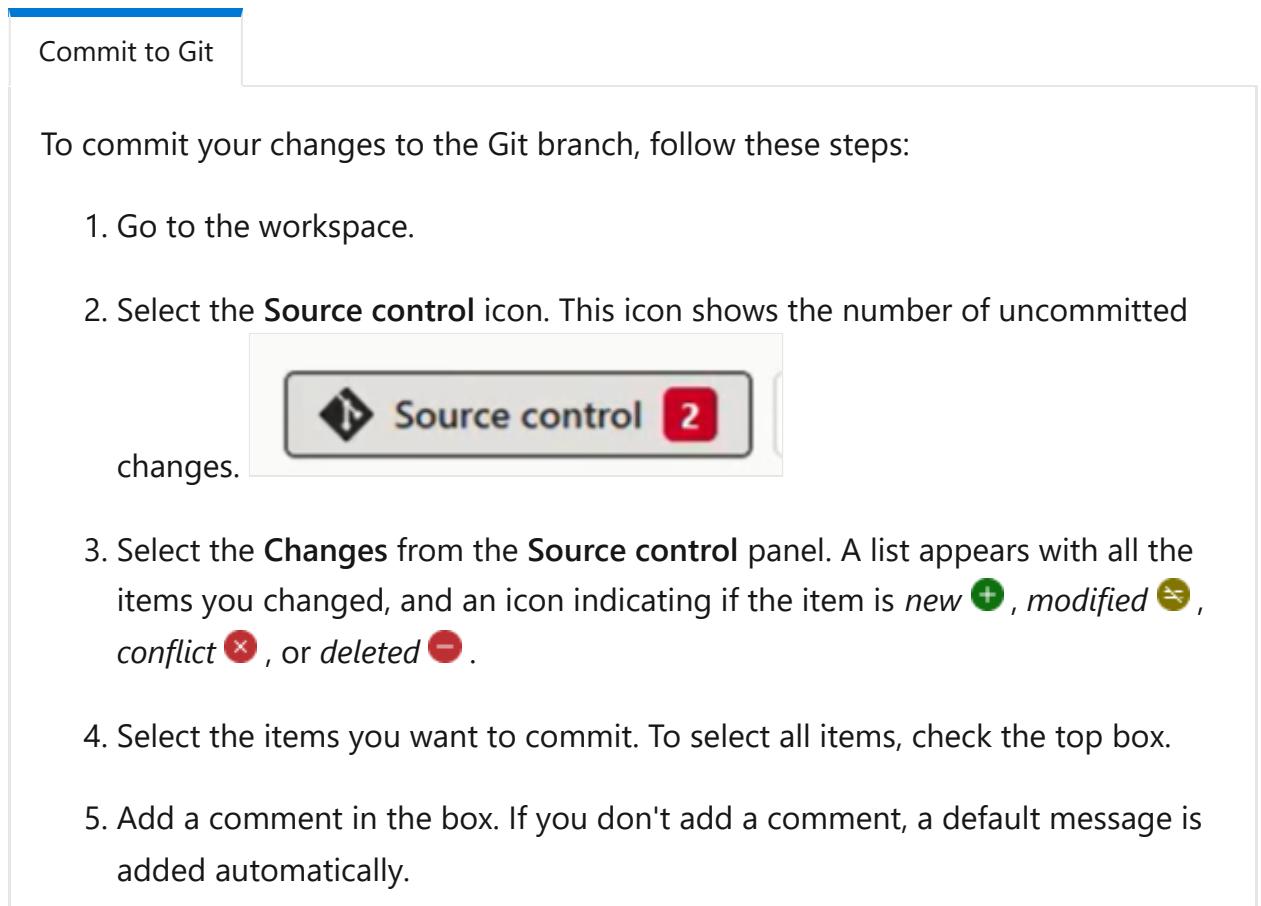


The screenshot shows the Power BI workspace interface. At the top, there's a navigation bar with options like '+ New', 'Upload', 'Create deployment pipeline', 'Create app', 'Manage access', and 'Source control'. The 'Source control' button is highlighted with a red border. Below the navigation bar is a table listing workspace items. The first item is 'All visual types v3' (Report) and the second is 'All visual types v3' (Dataset). Both items show a green checkmark icon next to the word 'Synced' under the 'Git status' column. A red box highlights the 'Git status' column header and the two 'Synced' entries. At the bottom of the table, there's a note: 'branch-with-artifacts' and 'Last synced: 1/3/2023 at 7:45 AM 89317283'.

To keep your workspace synced with the Git branch, [commit any changes](#) you make in the workspace to the Git branch, and [update your workspace](#) whenever anyone creates new commits to the Git branch.

Commit changes to git

Once you successfully connect to a Git folder, edit your workspace as usual. Any changes you save are saved in the workspace only. When you're ready, you can commit your changes to the Git branch, or you can undo the changes and revert to the previous status. Read more about [commits](#).



The screenshot shows the Source control panel. A button labeled 'Commit to Git' is visible. Below it, a section titled 'To commit your changes to the Git branch, follow these steps:' lists five steps:

1. Go to the workspace.
2. Select the **Source control** icon. This icon shows the number of uncommitted changes. 
3. Select the **Changes** from the **Source control** panel. A list appears with all the items you changed, and an icon indicating if the item is *new* (+), *modified* (–), *conflict* (x), or *deleted* (–).
4. Select the items you want to commit. To select all items, check the top box.
5. Add a comment in the box. If you don't add a comment, a default message is added automatically.

6. Select Commit.

The screenshot shows a user interface for committing changes. At the top, it says "Changes 4 • Updates". Below that is a "Commit message" field with the placeholder text: "Add details before committing or we'll add for you by default." A table follows, listing four items:

<input checked="" type="checkbox"/>	<input type="checkbox"/>	Item	Status
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Analysis	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Analytics v2	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Analysis	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Analytics v2	

At the bottom are two buttons: a green "Commit" button with a circular arrow icon, and a white "Undo" button with a circular arrow icon.

After the changes are committed, the items that were committed are removed from the list, and the workspace will point to the new commit that it synced to.

Source control

demo123

Changes Updates



You don't have any changes

Any uncommitted changes from Git will be listed here.

After the commit is completed successfully, the status of the selected items changes from **Uncommitted** to **Synced**.

Update workspace from Git

Whenever anyone commits a new change to the connected Git branch, a notification appears in the relevant workspace. Use the **Source control** panel to pull the latest changes, merges, or reverts into the workspace and update live items. Read more about [updating](#).

To update a workspace, follow these steps:

1. Go to the workspace.
2. Select the **Source control** icon.
3. Select **Updates** from the Source control panel. A list appears with all the items that were changed in the branch since the last update.
4. Select **Update all**.

Source control

X

Changes

Updates (1)

Items

Status

Cola Analysis



Update all

After it updates successfully, the list of items is removed, and the workspace will point to the new commit that it's synced to.

The screenshot shows the Source control interface. At the top, it says "Source control" and has a close button "X". Below that is a header bar with a branch icon and the text "branch-with-artifacts". Underneath the header, there are two tabs: "Changes 2" and "Updates", with "Updates" being underlined. In the center, there's a large gray circle containing a diamond shape with a key icon. Below this icon, the text "You don't have any updates" is displayed. Further down, a message states: "Any unsynced updates from Git will be listed here."

After the update is completed successfully, the status of the items changes to **Synced**.

Disconnect a workspace from Git

Only a workspace admin can disconnect a workspace from an Git Repo. If you're not an admin, ask your admin for help with disconnecting. If you're an admin and want to disconnect your repo, follow these steps:

1. Go to **Workspace settings**
2. Select **Git integration**
3. Select **Disconnect workspace**
4. Select **Disconnect** again to confirm.

Permissions

The actions you can take on a workspace depend on the permissions you have in both the workspace and the Git repo. For a more detailed discussion of permissions, see [Permissions](#).

Considerations and limitations

General Git integration limitations

- The [authentication method](#) in Fabric must be at least as strong as the authentication method for Git. For example, if Git requires multifactor authentication, Fabric needs to require multifactor authentication as well.
- Power BI Datasets connected to Analysis Services aren't supported at this time.
- Sovereign clouds aren't supported.

Azure DevOps limitations

- The Azure DevOps account must be registered to the same user that is using the Fabric workspace.
- The tenant admin must enable [cross-geo exports](#) if the workspace and Git repo are in two different geographical regions.
- The commit size is limited to 125 MB.

GitHub Enterprise limitations

Some GitHub Enterprise settings aren't supported. For example:

- IP allowlist
- Private networking

Workspace limitations

- Only the workspace admin can manage the connections to the [Git Repo](#) such as connecting, disconnecting, or adding a branch.
Once connected, anyone with [permission](#) can work in the workspace.
- The workspace folder structure isn't reflected in the Git repository. Workspace items in folders are exported to the root directory.

Branch and folder limitations

- Maximum length of branch name is 244 characters.
- Maximum length of full path for file names is 250 characters. Longer names fail.
- Maximum file size is 25 MB.

- You can't download a report/dataset as `.pbix` from the service after deploying them with Git integration.
- When naming a folder in Git, the logical ID (Guid) is added as a prefix before the type if the item's display name:
 - Has more than 256 characters
 - Ends with `.` or a space
 - Contains any of the following characters: `" / : < > \ * ? |`

Branching out limitations

- Branch out requires permissions listed in [permissions table](#).
- There must be an available capacity for this action.
- All [workspace](#) and [branch naming limitations](#) apply when branching out to a new workspace.
- When branching out, a new workspace is created and the settings from the original workspace aren't copied. Adjust any settings or definitions to ensure that the new workspace meets your organization's policies.
- Only [Git supported items](#) are available in the new workspace.
- The related branches list only shows branches and workspaces you have permission to view.
- [Git integration](#) must be enabled.

Sync and commit limitations

- You can only sync in one direction at a time. You can't commit and update at the same time.
- Sensitivity labels aren't supported and exporting items with sensitivity labels might be disabled. To commit items that have sensitivity labels without the sensitivity label, [ask your administrator](#) for help.
- Works with [limited items](#). Unsupported items in the folder are ignored.
- Duplicating names isn't allowed. Even if Power BI allows name duplication, the update, commit, or undo action fails.
- B2B isn't supported.
- [Conflict resolution](#) is partially done in Git.
- During the *Commit to Git* process, the Fabric service deletes files *inside the item folder* that aren't part of the item definition. Unrelated files not in an item folder aren't deleted.
- After you commit changes, you might notice some unexpected changes to the item that you didn't make. These changes are semantically insignificant and can happen for several reasons. For example:

- Manually changing the item definition file. These changes are valid, but might be different than if done through the editors. For example, if you rename a semantic model column in Git and import this change to the workspace, the next time you commit changes to the semantic model, the *bim* file will register as changed and the modified column pushed to the back of the `columns` array. This is because the AS engine that generates the *bim* files pushes renamed columns to the end of the array. This change doesn't affect the way the item operates.
- Committing a file that uses *CRLF* line breaks. The service uses *LF* (line feed) line breaks. If you had item files in the Git repo with *CRLF* line breaks, when you commit from the service these files are changed to *LF*. For example, if you open a report in desktop, save the *.pbip* project and upload it to Git using *CRLF*.
- Refreshing a semantic model using the [Enhanced refresh API](#) causes a Git diff after each refresh.

Related content

- [Understand the Git integration process](#)
- [Manage Git branches](#)
- [Git integration best practices](#)

Feedback

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Workspace identity

Article • 09/05/2024

A Fabric workspace identity is an automatically managed service principal that can be associated with a Fabric workspace. Fabric workspaces with a workspace identity can securely read or write to firewall-enabled Azure Data Lake Storage Gen2 accounts through [trusted workspace access](#) for OneLake shortcuts. In the future, Fabric items will be able to use the identity when connecting to resources that support Microsoft Entra authentication. Fabric will use workspace identities to obtain Microsoft Entra tokens without the customer having to manage any credentials.

Workspace identities can be created in the workspace settings of workspaces that are associated with a Fabric capacity. A workspace identity is automatically assigned the workspace contributor role and has access to workspace items.

When you create a workspace identity, Fabric creates a service principal in Microsoft Entra ID to represent the identity. An accompanying app registration is also created. Fabric automatically manages the credentials associated with workspace identities, thereby preventing credential leaks and downtime due to improper credential handling.

ⓘ Note

Fabric workspace identity is **generally available**. You can create a workspace identity in any workspace except **My workspace**.

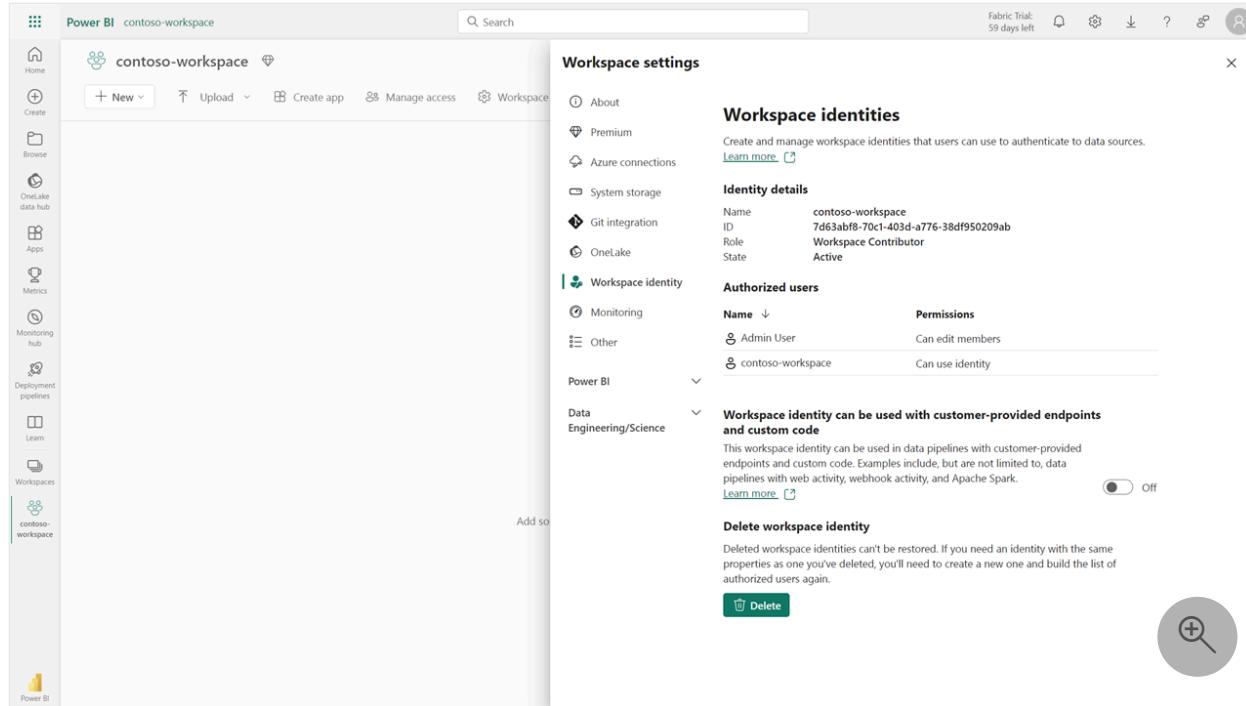
While Fabric workspace identities share some similarities with Azure managed identities, their lifecycle, administration, and governance are different. A workspace identity has an independent lifecycle that is managed entirely in Fabric. A Fabric workspace can optionally be associated with an identity. When the workspace is deleted, the identity gets deleted. The name of the workspace identity is always the same as the name of the workspace it's associated with.

Create and manage a workspace identity

You must be a workspace admin to be able to create and manage a workspace identity. The workspace you're creating the identity for can't be a **My Workspace**.

1. Navigate to the workspace and open the workspace settings.
2. Select the **Workspace identity** tab.
3. Select the **+ Workspace identity** button.

When the workspace identity has been created, the tab displays the workspace identity details and the list of authorized users.



The screenshot shows the Power BI workspace settings page for 'contoso-workspace'. On the left, there's a sidebar with various navigation options like Home, Create, Browse, OneLake data hub, Apps, Metrics, Monitoring hub, Deployment pipelines, Learn, Workspaces, and Power BI. The 'Workspaces' section is currently selected. The main area is titled 'Workspace settings' and contains sections for 'About', 'Premium', 'Azure connections', 'System storage', 'Git integration', 'OneLake', 'Workspace identity' (which is expanded), 'Monitoring', 'Other', and 'Power BI'. Under 'Workspace identity', it shows 'Identity details' with fields: Name (contoso-workspace), ID (7d63abf8-70c1-403d-a776-38df950209ab), Role (Workspace Contributor), and State (Active). It also lists 'Authorized users': Admin User (Can edit members) and contoso-workspace (Can use identity). A note about using workspace identities with customer-provided endpoints and custom code is present, along with a toggle switch set to 'Off'. A 'Delete workspace identity' button is available, and a 'Delete' button is located at the bottom right of the workspace identity section. A magnifying glass icon with a plus sign is also visible.

The sections of the workspace identity configuration are described in the following sections.

Identity details

[Expand table](#)

Detail	Description
Name	Workspace identity name. The workspace identity name is the same as the workspace name.
ID	The workspace identity GUID. This is a unique identifier for the identity.
Role	The workspace role assigned to the identity. Workspace identities are automatically assigned the contributor role upon creation.
State	The state of the workspace. Possible values: <i>Active</i> , <i>Inactive</i> , <i>Deleting</i> , <i>Unusable</i> , <i>Failed</i> , <i>DeleteFailed</i>

Authorized users

For information, see [Access control](#).

Delete a workspace identity

When an identity is deleted, Fabric items relying on the workspace identity for trusted workspace access or authentication will break. **Deleted workspace identities cannot be restored.**

Note

When a workspace is deleted, its workspace identity is deleted as well. If the workspace is restored after deletion, the workspace identity is not restored. If you want the restored workspace to have a workspace identity, you must create a new one.

How to use workspace identity

Shortcuts in a workspace that has a workspace identity can be used for trusted service access. For more information, see [trusted workspace access](#).

Security, administration, and governance of the workspace identity

The following sections describe who can use the workspace identity, and how you can monitor it in Microsoft Purview and Azure.

Access control

Workspace identity can be [created and deleted by workspace admins](#). The workspace identity has the workspace contributor role on the workspace.

Currently, workspace identity isn't supported for authentication to target resources in connections. Authentication to target resources in connections will be supported in the future. Admins, members, and contributors will be able to use workspace identity in authentication in connections in the future.

[Application Administrators](#) or users with higher roles can view, modify, and delete the service principal and app registration associated with the workspace identity in Azure.

Warning

Modifying or deleting the service principal or app registration in Azure is not recommended, as it will cause Fabric items relying on workspace identity to stop working.

Administer the workspace identity in Fabric

Fabric administrators can administer the workspace identities created in their tenant on the [Fabric identities tab](#) in the admin portal.

1. Navigate to the **Fabric identities** tab in the Admin portal.
2. Select a workspace identity, and then select **Details**.
3. In the Details tab, you can view additional information related to the workspace identity.
4. You can also delete a workspace identity.

Note

Workspace identities cannot be restored after deletion. Be sure to review the consequences of deleting a workspace identity described in [Delete a workspace identity](#).

Administer the workspace identity in Purview

You can view the audit events generated upon the creation and deletion of workspace identity in Purview Audit Log. To access the log

1. Navigate to the [Microsoft Purview hub](#).
2. Select the **Audit** tile.
3. In the audit search form that appears, use the **Activities - friendly names** field to search for *fabric identity* to find the activities related to workspace identities.

Currently, the following activities related to workspace identities are:

- Created Fabric Identity for Workspace
- Retrieved Fabric Identity for Workspace
- Deleted Fabric Identity for Workspace
- Retrieved Fabric Identity Token for Workspace

Administer the workspace identity in Azure

The application associated with the workspace identity can be viewed under both **Enterprise applications** and **App registrations** in the Azure portal.

Enterprise applications

The application associated with the workspace identity can be seen in **Enterprise Applications** in the Azure portal. Fabric Identity Management app is its configuration owner.

Warning

Modifications to the application made here will cause the workspace identity to stop working.

To view the audit logs and sign-in logs for this identity:

1. Sign in to the Azure portal.
2. Navigate to **Microsoft Entra ID > Enterprise Applications**.
3. Select either **Audit logs** or **Sign in logs**, as desired.

App registrations

The application associated with the workspace identity can be seen under **App registrations** in the Azure portal. No modifications should be made there, as this will cause the workspace identity to stop working.

Advanced scenarios

The following sections describe scenarios involving workspace identities that might occur.

Deleting the identity

The workspace identity can be deleted in the workspace settings. When an identity is deleted, Fabric items relying on the workspace identity for trusted workspace access or authentication will break. Deleted workspace identities can't be restored.

When a workspace is deleted, its workspace identity is deleted as well. If the workspace is restored after deletion, the workspace identity is **not** restored. If you want the restored workspace to have a workspace identity, you must create a new one.

Renaming the workspace

When a workspace gets renamed, the workspace identity is also renamed to match the workspace name. However its Entra application and service principal remain the same. Note that there can be multiple application and app registration objects with same name in a tenant.

Considerations and limitations

- A workspace identity can be created in any workspace except a **My Workspace**. You can only use trusted access in F SKUs.
- If a workspace with a workspace identity is migrated to a non-Fabric capacity or to a non-F SKU Fabric capacity, the identity won't be disabled or deleted, but Fabric items relying on the workspace identity will stop working.
- A maximum of 1,000 workspace identities can be created in a tenant. Once this limit is reached, workspace identities must be deleted to enable newer ones to be created.
- Azure Data Lake Storage Gen2 shortcuts in a workspace that has a workspace identity will be capable of trusted service access.

Troubleshooting issues with creating a workspace identity

- If you can't create a workspace identity because the creation button is disabled, make sure you have the workspace administrator role, and that the workspace is associated with a Fabric F SKU capacity.
- If you run into issues the first time you create a workspace identity in your tenant, try the following steps:
 1. If the workspace identity state is *failed*, wait for an hour and then delete the identity.
 2. After the identity has been deleted, wait 5 minutes and then create the identity again.

Related content

- [Trusted workspace access](#)
- [Fabric identities](#)

Feedback

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Discover data items in the OneLake data hub

Article • 01/25/2024

The OneLake data hub makes it easy to find, explore, and use the Fabric data items in your organization that you have access to. It provides information about the items and entry points for working with them.

The data hub provides:

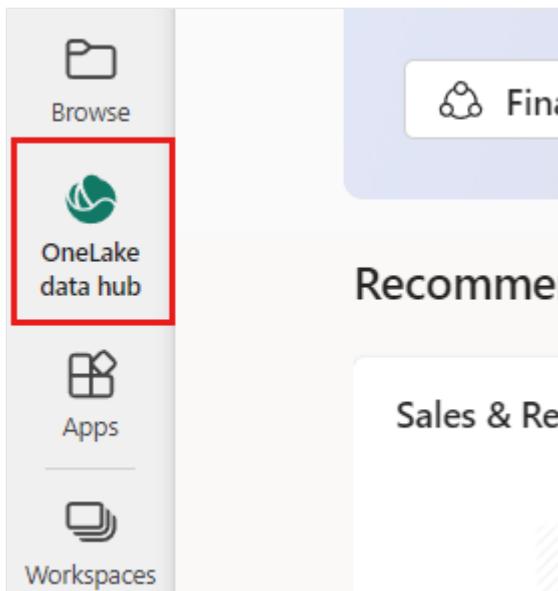
- A filterable list of all the data items you can access
- A gallery of recommended data items
- A way of finding data items by workspace
- A way to display only the data items of a selected domain
- An options menu of things you can do with the data item

This article explains what you see on the data hub and describes how to use it.

Name	Type	Refreshed	Owner	Location	Endorsement	Sensitivity
Sales FY21	Semantic model	7m ago	Tim Deboar	Contoso workspace	Certified	Highly Confidential\Contoso...
Marketing DB	Datamart	38m ago	Daichi Fukuda	New product insights	Certified	—
Client Logs Db	KQL Database	2h ago	Emiliano Ceballos	Azure data	Promoted	Confidential\Contoso FTE
Top Campaigns	Semantic model	7h ago	Mikhail Kotov	Azure data	—	Public
Dataflow for triggers	Semantic model	Yesterday at 11:12 AM	Marie Beaudouin	Contoso workspace	—	—
Daily Sales	Lakehouse	June 18 at 9:02 AM	Oscar Krogh	Contoso workspace	Certified	Non-Business
Contoso DB	Warehouse	May 23 at 3:00 PM	Marie Beaudouin	Big data	Promoted	—
Test datamart	Datamart	May 15 at 5:13 AM	Tim Deboar	Events	Certified	Public
Primary dataflow	KQL Database	April 29 at 8:45 PM	Oscar Krogh	Big data	—	—
Contoso DB	Lakehouse	April 11 at 11:56 AM	Ruth Bengtsson	Contoso workspace	Certified	Confidential\Contoso FTE

Open the data hub

To open the data hub, select the OneLake data hub icon in the navigation pane.



Find items in the data items list

The data items list displays all the data items you have access to. To shorten the list, you can filter by keyword or data-item type using the filters at the top of the list. If you select the name of an item, you'll get to the item's details page. If you hover over an item, you'll see three dots that open the [options menu](#) when you select them.

Name	Type	Refreshed	Owner	Location	Endorsement	Sensitivity
Sales FY21	Semantic model	7m ago	Tim Deboar	Contoso workspace	Certified	Highly Confidential\Contoso...
Marketing DB	Datamart	38m ago	Daichi Fukuda	New product insights	Certified	—
Client Logs Db	KQL Database	2h ago	Emiliano Ceballos	Azure data	Promoted	Confidential\Contoso FTE
Top Campaigns	Semantic model	7h ago	Mikhail Kotov	Azure data	—	Public
Dataflow for triggers	Semantic model	Yesterday at 11:12 AM	Marie Beaudouin	Contoso workspace	—	—
Order Sales	Table	June 19, at 8:07 AM	Oscar Knoch	Contoso workspace	Certified	Non-Business

The list has four tabs to narrow down the list of data items.

[Expand table](#)

Tab	Description
All data	Data items that you're allowed to find.
My data	Data items that you own.
Endorsed in your org	Endorsed data items in your organization that you're allowed to find. Certified data items are listed first, followed by promoted data items. For more information about endorsement, see the Endorsement overview
Favorites	Data items that you've marked as favorites.

The columns of the list are described below.

Column	Description
Name	The data item name. Select the name to open the item's details page.
Endorsement	Endorsement status.
Owner	Data item owner (listed in the <i>All</i> and <i>Endorsed in your org</i> tabs only).
Workspace	The workspace the data item is located in.
Refreshed	Last refresh time (rounded to hour, day, month, and year. See the details section on the item's detail page for the exact time of the last refresh).
Next refresh	The time of the next scheduled refresh (<i>My data</i> tab only).
Sensitivity	Sensitivity, if set. Select the info icon to view the sensitivity label description.

Find items by workspace

Related data items are often grouped together in a workspace. To see the data items by workspace, expand the **Explorer** pane and select the workspace you're interested in. The data items you're allowed to see in that workspace will be displayed in the data items list.

The screenshot shows the Microsoft Data Hub interface. At the top, there are four navigation tiles: 'All data' (selected), 'My data', 'Endorsed in your org', and 'Favorites'. Below these is the 'Explorer' pane, which includes a search bar and a list of workspaces: 'All workspaces' (selected), 'My Workspace', 'Contoso workspace', 'New product insights', 'RandomFolder', 'ShortcutLink Folder', and 'Azure data design'. To the right of the Explorer pane is a list of data items, ordered by name. A red box highlights the back arrow icon at the top of this list. The data items are:

- Sales FY21
- Marketing DB
- Client Logs Db
- Top Campaigns
- Daily Sales
- Contoso DB
- Test datamart
- Primary dataflow
- Contoso DB
- Primary dataflow

⚠ Note

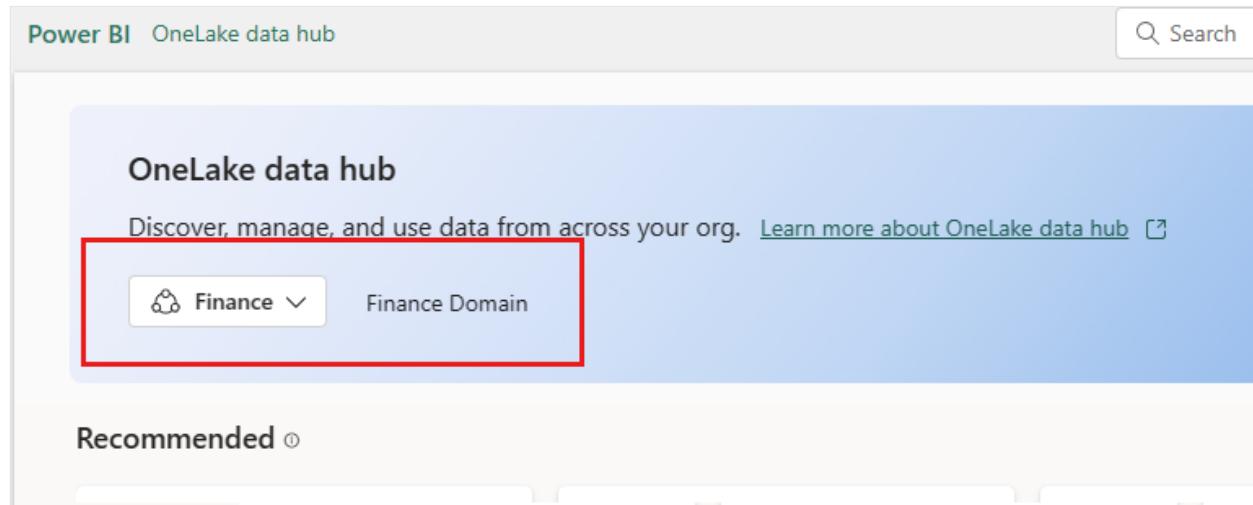
The Explorer pane may list workspaces that you don't have access to if the workspace contains items that you do have access to (through explicitly granted permissions, for example). If you select such a workspace, only the items you have access to will be displayed in the data items list.

Find recommended items

Use the tiles across the top of the data hub to find and explore recommended data items. Recommended data items are data items that have been [certified or promoted](#) by someone in your organization or have recently been refreshed or accessed. Each tile contains information about the item and an [options menu](#) for doing things with the item. When you select a recommended tile, you are taken to the item's details page.

Display only data items belonging to a particular domain

If [domains](#) have been defined in your organization, you can use the domain selector to select a domain so that only data items belonging to that domain will be displayed. If an image has been associated with the domain, you'll see that image on the data hub to remind you of the domain you're viewing.

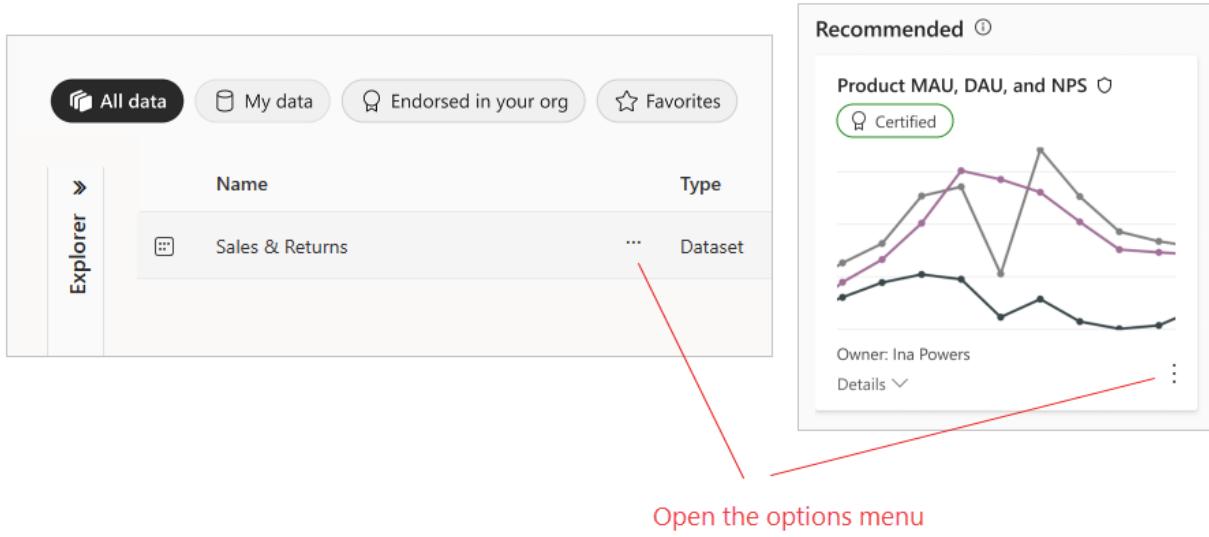


For more information about domains, see the [Domains overview](#).

Open an item's options menu

Each item shown in the data hub has an options menu that enables you to do things, such as open the item's settings, manage item permissions, etc. The options available depend on the item and your permissions on the item.

To display the options menu, select **More options (...)** on one of the items shown in the data items list or a recommended item. In the data items list, you need to hover over the item to reveal **More options**.



ⓘ Note

The Explorer pane may list workspaces that you don't have access to if the workspace contains items that you do have access to (through explicitly granted permissions, for example). If you select such a workspace, only the items you have access to will be displayed in the data items list.

Considerations and limitations

Streaming semantic models are not shown in the OneLake data hub.

Related content

- [Navigate to your items from Microsoft Fabric Home](#)
- [Endorsement](#)

Feedback

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Overview of Copilot in Fabric

Article • 08/22/2024

Copilot and other generative AI features in preview bring new ways to transform and analyze data, generate insights, and create visualizations and reports in Microsoft Fabric and Power BI.

Enable Copilot

Before your business can start using Copilot capabilities in Microsoft Fabric, you need to [enable Copilot](#).

Read on for answers to your questions about how it works in the different workloads, how it keeps your business data secure and adheres to privacy requirements, and how to use generative AI responsibly.

 Note

Copilot is not yet supported for sovereign clouds due to GPU availability.

Copilot for Data Science and Data Engineering

Copilot for Data Engineering and Data Science is an AI-enhanced toolset tailored to support data professionals in their workflow. It provides intelligent code completion, automates routine tasks, and supplies industry-standard code templates to facilitate building robust data pipelines and crafting complex analytical models. Utilizing advanced machine learning algorithms, Copilot offers contextual code suggestions that adapt to the specific task at hand, helping you code more effectively and with greater ease. From data preparation to insight generation, Microsoft Fabric Copilot acts as an interactive aide, lightening the load on engineers and scientists and expediting the journey from raw data to meaningful conclusions.

Copilot for Data Factory

Copilot for Data Factory is an AI-enhanced toolset that supports both citizen and professional data wranglers in streamlining their workflow. It provides intelligent code generation to transform data with ease and generates code explanations to help you better understand complex tasks.

Copilot for Data Warehouse

Microsoft Copilot for Synapse Data Warehouse is an AI assistant designed to streamline your data warehousing tasks. Key features of Copilot for Warehouse include Natural Language to SQL, code completion, quick actions, and intelligent insights. For more information, see [Copilot for Data Warehouse](#).

Copilot for Power BI

Power BI has introduced generative AI that allows you to create reports automatically by selecting the topic for a report or by prompting Copilot for Power BI on a particular topic. You can use Copilot for Power BI to generate a summary for the report page that you just created, and generate synonyms for better Q&A capabilities.

For more information on the features and how to use Copilot for Power BI, see [Overview of Copilot for Power BI](#).

Copilot for Real-Time Intelligence

Copilot for Real-Time Intelligence is an advanced AI tool designed to help you explore your data and extract valuable insights. You can input questions about your data, which are then automatically translated into Kusto Query Language (KQL) queries. Copilot streamlines the process of analyzing data for both experienced KQL users and citizen data scientists.

For more information, see [Copilot for Real-Time Intelligence overview](#).

AI solution accelerators

- **Build your own copilots:** Using the [client advisor AI accelerator](#) tool, you can build custom copilot with your enterprise data. The client advisor AI accelerator uses Azure OpenAI Service, Azure AI Search, and Microsoft Fabric to create custom Copilot solutions. This all-in-one custom copilot empowers client advisors to use generative AI across structured and unstructured data optimizing daily tasks and fostering better interactions with clients. To learn more, see the [GitHub repo](#).
- **Conversational knowledge mining solution accelerator:** A solution accelerator built on top of Microsoft Fabric, Azure OpenAI Service, and Azure AI Speech. It enables customers with large amounts of conversational data to use generative AI to find key phrases alongside the operational metrics. This way, you can discover valuable insights with business impact. To learn more, see the [GitHub repo](#).

How do I use Copilot responsibly?

Microsoft is committed to ensuring that our AI systems are guided by our [AI principles](#) and [Responsible AI Standard](#). These principles include empowering our customers to use these systems effectively and in line with their intended uses. Our approach to responsible AI is continually evolving to proactively address emerging issues.

The article [Privacy, security, and responsible use for Copilot \(preview\)](#) offers guidance on responsible use.

Copilot features in Fabric are built to meet the Responsible AI Standard, which means that they're reviewed by multidisciplinary teams for potential harms, and then refined to include mitigations for those harms.

Before you use Copilot, your admin needs to enable Copilot in Fabric. See the article [Overview of Copilot in Fabric](#) for details. Also, keep in mind the limitations of Copilot:

- Copilot responses can include inaccurate or low-quality content, so make sure to review outputs before using them in your work.
- Reviews of outputs should be done by people who are able to meaningfully evaluate the content's accuracy and appropriateness.
- Today, Copilot features work best in the English language. Other languages may not perform as well.

Available regions

Available regions for Azure OpenAI service

To access the prebuilt [Azure OpenAI Service](#), including the [Copilot in Fabric](#), you must have a paid SKU (F64 or higher, or P1 or higher) with capacity available in the following [Fabric regions](#). The Azure OpenAI Service isn't available on trial SKUs.

[Azure OpenAI Service](#) is powered by large language models that are currently only deployed to US datacenters (East US, East US2, South Central US, and West US) and EU datacenter (France Central). If your data is outside the US or EU, the feature is disabled by default unless your tenant admin enables **Data sent to Azure OpenAI can be processed outside your capacity's geographic region, compliance boundary, or national cloud instance** tenant setting. To learn how to get to the tenant settings, see [About tenant settings](#).

Data processing across geographic areas

The prebuilt [Azure OpenAI Service](#) and [Copilot in Fabric](#) may process your prompts and results (input and output when using Copilot) outside your capacity's geographic region, depending on where the Azure OpenAI service is hosted. The table below shows the mapping of where data is processed across geographic areas for Copilot in Fabric and Azure OpenAI features.

ⓘ Note

The data processed for Copilot interactions can include user prompts, meta prompts, structure of data (schema) and conversation history. No data, such as content in tables is sent to Azure OpenAI for processing unless it is included in the user prompts.

[\[+\] Expand table](#)

Geographic area where your Fabric Capacity is located	Geographic area where Azure OpenAI Service is hosted	Data processing outside your capacity's geographic region?	Actions required to use Fabric Copilot
US	US	No	Turn-on Copilot
EU Data Boundary	EU Data Boundary	No	Turn-on Copilot
UK	EU Data Boundary	Yes	Turn-on Copilot Enable cross-geo data processing
Australia Brazil Canada India Asia Japan Korea South Africa Southeast Asia United Arab Emirates	US	Yes	Turn-on Copilot Enable cross-geo data processing

Related content

- [What is Microsoft Fabric?](#)
- [Copilot in Fabric: FAQ](#)

- AI services in Fabric (preview)
 - Copilot tenant settings
-

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Enable Copilot in Fabric

Article • 11/07/2024

Copilot and other generative AI features in preview bring new ways to transform and analyze data, generate insights, and create visualizations and reports in Microsoft Fabric and Power BI.

Copilot capabilities in Microsoft Fabric are enabled by default in the Fabric admin portal. Copilot can be disabled if your organization isn't ready to adopt Copilot. Administrators can read the article [Copilot tenant settings \(preview\)](#) for details.

- Your F64 capacity needs to be in one of the regions listed in this article, [Fabric region availability](#).
- If your tenant or capacity is outside the US or France, Copilot is disabled by default unless your Fabric tenant admin enables the [Data sent to Azure OpenAI can be processed outside your tenant's geographic region, compliance boundary, or national cloud instance](#) tenant setting in the Fabric Admin portal.
- Copilot in Microsoft Fabric isn't supported on trial SKUs. Only paid SKUs (F64 or higher) are supported.

Copilot in Microsoft Fabric is rolling out in stages with the goal that all customers with a paid Fabric capacity (F64 or higher) have access to Copilot. It becomes available to you automatically as a new setting in the Fabric admin portal when it's rolled out to your tenant. When charging begins for the Copilot in Fabric experiences, you can count Copilot usage against your existing Fabric capacity.

See the article [Overview of Copilot in Fabric](#) for answers to your questions about how it works in the different workloads, how it keeps your business data secure and adheres to privacy requirements, and how to use generative AI responsibly.

Important

When scaling from a smaller capacity to F64 or above, allow up to 24 hours for Copilot for Power BI up to be enabled.

Related content

- [What is Microsoft Fabric?](#)
- [Copilot in Fabric: FAQ](#)
- [AI services in Fabric \(preview\)](#)

- Copilot tenant settings
 - Copilot in Power BI
-

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Copilot for Microsoft Fabric and Power BI: FAQ

FAQ

This article answers frequently asked questions about Copilot for Microsoft Fabric and Power BI.

Note

- Your administrator needs to enable the tenant switch before you start using Copilot. See the article [Copilot tenant settings](#) for details.
- Your F64 or P1 capacity needs to be in one of the regions listed in this article, [Fabric region availability](#).
- If your tenant or capacity is outside the US or France, Copilot is disabled by default unless your Fabric tenant admin enables the [Data sent to Azure OpenAI can be processed outside your tenant's geographic region, compliance boundary, or national cloud instance](#) tenant setting in the Fabric Admin portal.
- Copilot in Microsoft Fabric isn't supported on trial SKUs. Only paid SKUs (F64 or higher, or P1 or higher) are supported.
- Copilot in Fabric is currently rolling out in public preview and is expected to be available for all customers by end of March 2024.
- For more information, see the article [Overview of Copilot in Fabric and Power BI](#).

Power BI

Can Copilot be enabled for specific workspaces within a tenant?

Copilot is enabled at the tenant level and access can be restricted by security groups. If the workspace is tied to an F-64 or P1 capacity, Copilot experience will be enabled.

When you're using Copilot, who has access to what data?

The data that Copilot can access depends on your role-level security and user-based permission on Fabric.

If you don't have permission to access specific data, then prompting Copilot for it won't retrieve the information.

Can Copilot prompts be saved for future reference?

Copilot prompts can't be saved for future reference. The only experience where it's possible to view your prompts is by using the chat-magic function in Notebooks, under the Fabric Data Science view.

Does enabling Copilot and agreeing to the setting of "Data sent to Azure OpenAI can be processed outside your tenant's geographic region, compliance boundary, or national cloud instance" mean all my data is sent or processed outside my country?

Not exactly. While the prompt itself is sent to Azure OpenAI, it doesn't mean your data is sent or processed outside your country.

The prompt isn't used to train any models.

I loaded my semantic model, but it doesn't meet all the criteria listed in the data evaluation. What should I do?

The criteria listed in [Update your data model to work well with Copilot for Power BI](#) is important because it helps you get a better quality report. As long as you meet seven of the eight points, including Consistency, the quality of the reports generated should be good.

If your data doesn't meet that criteria, we recommend spending the time to bring it into compliance.

I was given a Copilot URL, but I can't see the Copilot button. Why is that?

First, check with your admin to see if they have enabled Copilot.

Next, when you select a Copilot-enabled URL, you have to initially load the semantic model. When you've completed loading the semantic model, then you see the Copilot button. See the [Create a report with Copilot for the Power BI service](#) article.

If you load a semantic model and still can't see the Copilot button, file a bug here: Copilot Bug Template.

I selected the Copilot button, and it's stuck on Analyzing your semantic model.

Depending upon the size of the semantic model, Copilot might take a while to analyze it. If you've waited longer than 15 minutes and you haven't received any errors, chances are that there's an internal server error.

Try restarting Copilot by closing the pane and selecting the Copilot button again.

I loaded the semantic model and Copilot generated a summary, but I don't think that it's accurate.

This inaccuracy could be because your semantic model has missing values. Because AI is generating the summary, it can try to fill the holes and fabricate data. If you can remove the rows with missing values, this situation could be avoided.

I generated the report visuals, but the quality of the visuals concern me. I wouldn't choose them myself.

We're continuously looking to improve the quality of the copilot generated visuals. For now, we recommend that you make the change by using the Power BI visualization tool.

The accuracy of the narrative visual concerns me.

We're continuously working to improve the accuracy of the narrative visual results. The Power BI team already has plans to improve the accuracy over the coming months. As a public preview, there might be mistakes. Know that we're working toward making the tool as accurate as possible. In the meantime, we recommend using the custom prompts as an extra tool to try to tweak the summary to meet your needs.

I want to disable Copilot immediately as I'm concerned with the data storage you mentioned.

Contact your help desk to get support from your IT admin.

I want to suggest new features. How can I do that?

First, thank you for the feedback. It's great that you found it useful. As part of the feedback sessions, we send you a form and you can add your suggestions there.

Data Factory

I'm a Fabric user. I opened the semantic model in Data Factory. Why can't I see Copilot?

Copilot is not yet enabled for Data Factory.

Real-Time Intelligence

Does Copilot respond to multiple questions in a conversation?

No, Copilot doesn't answer follow-up questions. You need to ask one question at a time.

How can I improve the quality of the Copilot answer?

Provide any tips or relevant information in your question. For example, if you're asking about a specific column, provide the column name and the type of data it contains. If you want to use specific operators or functions, this will also help. The more information you provide, the better the Copilot answer will be.

What access level do I need on a KQL queryset to use Copilot?

You need read access to the KQL queryset to use Copilot. In order to insert and execute the Copilot-generated query in the KQL queryset, you need to have write access to that KQL queryset.

What database does the Copilot-generated query run against?

The Copilot-generated query runs against the database that the KQL queryset is connected to. If you want to change the database, you can do so in the KQL queryset.

Related content

- [What is Microsoft Fabric?](#)
- [Privacy, security, and responsible use for Copilot](#)

Feedback

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Privacy, security, and responsible use of Copilot in Fabric

Article • 07/15/2024

Before your business starts using Copilot in Fabric, you may have questions about how it works, how it keeps your business data secure and adheres to privacy requirements, and how to use generative AI responsibly.

This article provides answers to common questions related to business data security and privacy to help your organization get started with Copilot in Fabric. The article [Privacy, security, and responsible use for Copilot in Power BI \(preview\)](#) provides an overview of Copilot in Power BI. Read on for details about Copilot for Fabric.

ⓘ Note

- Your administrator needs to enable the tenant switch before you start using Copilot. See the article [Copilot tenant settings](#) for details.
- Your F64 or P1 capacity needs to be in one of the regions listed in this article, [Fabric region availability](#).
- If your tenant or capacity is outside the US or France, Copilot is disabled by default unless your Fabric tenant admin enables the [Data sent to Azure OpenAI can be processed outside your tenant's geographic region, compliance boundary, or national cloud instance](#) tenant setting in the Fabric Admin portal.
- Copilot in Microsoft Fabric isn't supported on trial SKUs. Only paid SKUs (F64 or higher, or P1 or higher) are supported.
- Copilot in Fabric is currently rolling out in public preview and is expected to be available for all customers by end of March 2024.
- See the article [Overview of Copilot in Fabric and Power BI](#) for more information.

Your business data is secure

- Copilot features use [Azure OpenAI Service](#), which is fully controlled by Microsoft. Your data isn't used to train models and isn't available to other customers.
- You retain control over where your data is processed. Data processed by Copilot in Fabric stays within your tenant's geographic region, unless you explicitly allow data

to be processed outside your region—for example, to let your users use Copilot when Azure OpenAI isn't available in your region or availability is limited due to high demand. Learn more about [admin settings for Copilot](#).

- Copilot does not store your data for abuse monitoring. To enhance privacy and trust, we've updated our approach to abuse monitoring: previously, we retained data from Copilot in Fabric, containing prompt inputs and outputs, for up to 30 days to check for abuse or misuse. Following customer feedback, we've eliminated this 30-day retention. Now, we no longer store prompt related data, demonstrating our unwavering commitment to your privacy and security.

Check Copilot outputs before you use them

- Copilot responses can include inaccurate or low-quality content, so make sure to review outputs before you use them in your work.
- People who can meaningfully evaluate the content's accuracy and appropriateness should review the outputs.
- Today, Copilot features work best in the English language. Other languages may not perform as well.

Important

Review the [supplemental preview terms for Fabric](#), which includes terms of use for Microsoft Generative AI Service Previews.

How Copilot works

In this article, *Copilot* refers to a range of generative AI features and capabilities in Fabric that are powered by Azure OpenAI Service.

In general, these features are designed to generate natural language, code, or other content based on:

- (a) [inputs you provide](#), and,
- (b) [grounding data](#) that the feature has access to.

For example, Power BI, Data Factory, and data science offer Copilot chats where you can ask questions and get responses that are contextualized on your data. Copilot for Power BI can also create reports and other visualizations. Copilot for Data Factory can transform your data and explain what steps it has applied. Data science offers Copilot features outside of the chat pane, such as custom IPython magic commands in

notebooks. Copilot chats may be added to other experiences in Fabric, along with other features that are powered by Azure OpenAI under the hood.

This information is sent to Azure OpenAI Service, where it's processed and an output is generated. Therefore, data processed by Azure OpenAI can include:

- The user's [prompt or input](#).
- [Grounding data](#).
- The [AI response or output](#).

Grounding data may include a combination of dataset schema, specific data points, and other information relevant to the user's current task. Review each experience section for details on what data is accessible to Copilot features in that scenario.

Interactions with Copilot are specific to each user. This means that Copilot can only access data that the current user has permission to access, and its outputs are only visible to that user unless that user shares the output with others, such as sharing a generated Power BI report or generated code. Copilot doesn't use data from other users in the same tenant or other tenants.

Copilot uses Azure OpenAI—not the publicly available OpenAI services—to process all data, including user inputs, grounding data, and Copilot outputs. Copilot currently uses a combination of GPT models, including GPT 3.5. Microsoft hosts the OpenAI models in the Microsoft Azure environment, and the Service doesn't interact with any services by OpenAI, such as ChatGPT or the OpenAI API. Your data isn't used to train models and isn't available to other customers. Learn more about [Azure OpenAI](#).

The Copilot process

These features follow the same general process:

1. **Copilot receives a prompt from a user.** This prompt could be in the form of a question that a user types into a chat pane, or in the form of an action such as selecting a button that says "Create a report."
2. **Copilot preprocesses the prompt through an approach called grounding.** Depending on the scenario, this might include retrieving relevant data such as dataset schema or chat history from the user's current session with Copilot. Grounding improves the specificity of the prompt, so the user gets responses that are relevant and actionable to their specific task. Data retrieval is scoped to data that is accessible to the authenticated user based on their permissions. See the section [What data does Copilot use and how is it processed?](#) in this article for more information.

3. Copilot takes the response from Azure OpenAI and postprocesses it. Depending on the scenario, this postprocessing might include responsible AI checks, filtering with Azure content moderation, or additional business-specific constraints.
4. Copilot **returns a response** to the user in the form of natural language, code, or other content. For example, a response might be in the form of a chat message or generated code, or it might be a contextually appropriate form such as a Power BI report or a Synapse notebook cell.
5. **The user reviews the response before using it.** Copilot responses can include inaccurate or low-quality content, so it's important for subject matter experts to check outputs before using or sharing them.

Just as each experience in Fabric is built for certain scenarios and personas—from data engineers to data analysts—each Copilot feature in Fabric has also been built with unique scenarios and users in mind. For capabilities, intended uses, and limitations of each feature, review the section for the experience you're working in.

Definitions

Prompt or input

The text or action submitted to Copilot by a user. This could be in the form of a question that a user types into a chat pane, or in the form of an action such as selecting a button that says "Create a report."

Grounding

A preprocessing technique where Copilot retrieves additional data that's contextual to the user's prompt, and then sends that data along with the user's prompt to Azure OpenAI in order to generate a more relevant and actionable response.

Response or output

The content that Copilot returns to a user. For example, a response might be in the form of a chat message or generated code, or it might be contextually appropriate content such as a Power BI report or a Synapse notebook cell.

What data does Copilot use and how is it processed?

To generate a response, Copilot uses:

- The user's prompt or input and, when appropriate,
- Additional data that is retrieved through the grounding process.

This information is sent to Azure OpenAI Service, where it's processed and an output is generated. Therefore, data processed by Azure OpenAI can include:

- The user's prompt or input.
- Grounding data.
- The AI response or output.

Grounding data may include a combination of dataset schema, specific data points, and other information relevant to the user's current task. Review each experience section for details on what data is accessible to Copilot features in that scenario.

Interactions with Copilot are specific to each user. This means that Copilot can only access data that the current user has permission to access, and its outputs are only visible to that user unless that user shares the output with others, such as sharing a generated Power BI report or generated code. Copilot doesn't use data from other users in the same tenant or other tenants.

Copilot uses Azure OpenAI—not OpenAI's publicly available services—to process all data, including user inputs, grounding data, and Copilot outputs. Copilot currently uses a combination of GPT models, including GPT 3.5. Microsoft hosts the OpenAI models in Microsoft's Azure environment and the Service doesn't interact with any services by OpenAI (for example, ChatGPT or the OpenAI API). Your data isn't used to train models and isn't available to other customers. Learn more about [Azure OpenAI](#).

Data residency and compliance

You retain control over where your data is processed. Data processed by Copilot in Fabric stays within your tenant's geographic region, unless you explicitly allow data to be processed outside your region—for example, to let your users use Copilot when Azure OpenAI isn't available in your region or availability is limited due to high demand. (See [where Azure OpenAI is currently available](#).)

To allow data to be processed elsewhere, your admin can turn on the setting **Data sent to Azure OpenAI can be processed outside your tenant's geographic region, compliance boundary, or national cloud instance**. Learn more about [admin settings for Copilot](#).

What should I know to use Copilot responsibly?

Microsoft is committed to ensuring that our AI systems are guided by our [AI principles](#) and [Responsible AI Standard](#). These principles include empowering our customers to use these systems effectively and in line with their intended uses. Our approach to responsible AI is continually evolving to proactively address emerging issues.

Copilot features in Fabric are built to meet the Responsible AI Standard, which means that they're reviewed by multidisciplinary teams for potential harms, and then refined to include mitigations for those harms.

Before you use Copilot, keep in mind the limitations of Copilot:

- Copilot responses can include inaccurate or low-quality content, so make sure to review outputs before using them in your work.
- People who are able to meaningfully evaluate the content's accuracy and appropriateness should review the outputs.
- Currently, Copilot features work best in the English language. Other languages may not perform as well.

Copilot for Fabric workloads

Privacy, security, and responsible use for:

- [Copilot for Data Factory \(preview\)](#)
- [Copilot for data science \(preview\)](#)
- [Copilot for Data Warehouse \(preview\)](#)
- [Copilot for Power BI](#)
- [Copilot for Real-Time Intelligence \(preview\)](#)

Related content

- [What is Microsoft Fabric?](#)
- [Copilot in Fabric and Power BI: FAQ](#)

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Privacy, security, and responsible use of Copilot for Data Factory (preview)

Article • 06/10/2024

In this article, learn how [Copilot for Data Factory overview](#) works, how it keeps your business data secure and adheres to privacy requirements, and how to use generative AI responsibly. For an overview of these topics for Copilot in Fabric, see [Privacy, security, and responsible use for Copilot \(preview\)](#).

With Copilot for Data Factory in Microsoft Fabric and other generative AI features in preview, Microsoft Fabric brings a new way to transform and analyze data, generate insights, and create visualizations and reports in Data Science and the other workloads.

For considerations and limitations, see [Limitations of Copilot for Data Factory](#).

Data use of Copilot for Data Factory

- Copilot can only access data that is accessible to the user's current Gen2 dataflow session, and that is configured and imported into the data preview grid. Learn more about getting data in Power Query.

Evaluation of Copilot for Data Factory

- The product team has tested Copilot to see how well the system performs within the context of Gen2 dataflows, and whether AI responses are insightful and useful.
- The team also invested in other harms mitigations, including technological approaches to focusing Copilot's output on topics related to data integration.

Tips for working with Copilot for Data Factory

- Copilot is best equipped to handle data integration topics, so it's best to limit your questions to this area.
- If you include descriptions such as query names, column names, and values in the input, Copilot is more likely to generate useful outputs.
- Try breaking complex inputs into more granular tasks. This helps Copilot better understand your requirements and generate a more accurate output.

Related content

- Copilot for Data Factory overview
 - Copilot in Fabric: FAQ
-

Feedback

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Privacy, security, and responsible use of Copilot for Data Science

Article • 07/15/2024

In this article, learn how [Microsoft Copilot for Data Science](#) works, how it keeps your business data secure and adheres to privacy requirements, and how to use generative AI responsibly. For an overview of these topics for Copilot in Fabric, see [Privacy, security, and responsible use for Copilot \(preview\)](#).

With Copilot for Data Science in Microsoft Fabric and other generative AI features in preview, Microsoft Fabric brings a new way to transform and analyze data, generate insights, and create visualizations and reports in Data Science and the other workloads.

For considerations and limitations, see [Limitations](#).

Data use of Copilot for Data Science

- In notebooks, Copilot can only access data that is accessible to the user's current notebook, either in an attached lakehouse or directly loaded or imported into that notebook by the user. In notebooks, Copilot can't access any data that's not accessible to the notebook.
- By default, Copilot has access to the following data types:
 - Previous messages sent to and replies from Copilot for that user in that session.
 - Contents of cells that the user has executed.
 - Outputs of cells that the user has executed.
 - Schemas of data sources in the notebook.
 - Sample data from data sources in the notebook.
 - Schemas from external data sources in an attached lakehouse.

Evaluation of Copilot for Data Science

- The product team has tested Copilot to see how well the system performs within the context of notebooks, and whether AI responses are insightful and useful.
- The team also invested in additional harms mitigations, including technological approaches to focusing Copilot's output on topics related to data science.

Tips for working with Copilot for Data Science

- Copilot is best equipped to handle data science topics, so limit your questions to this area.
- Be explicit about the data you want Copilot to examine. If you describe the data asset, such as naming files, tables, or columns, Copilot is more likely to retrieve relevant data and generate useful outputs.
- If you want more granular responses, try loading data into the notebook as DataFrames or pinning the data in your lakehouse. This gives Copilot more context with which to perform analysis. If an asset is too large to load, pinning it's a helpful alternative.

AI Skill: Responsible AI FAQ

What is AI Skill?

AI Skill is a new tool in Fabric that brings a way to get answers from your tabular data in natural language.

What can AI Skill do?

A data analyst or engineer can prepare AI Skill for use by non-technical business users. They need to configure Fabric data source and can optionally provide additional context information that isn't obvious from the schema.

Non-technical users can then type questions and receive the results from the execution of an AI generated SQL query.

What is/are AI Skill's intended use(s)?

- Business users who aren't familiar with how the data is structured are able to ask descriptive questions such as "what are the 10 top products by sales volume last month?" on top of tabular data stored in Fabric Lakehouses and Fabric Warehouses.
- AI Skill isn't intended for use in cases where deterministic and 100% accurate results are required, which reflects the current LLM limitations.
- The AI Skill isn't intended for uses cases that require deep analytics or causal analytics. E.g. asking "why did our sales numbers drop last month?" is out of scope.

How was AI Skill evaluated? What metrics are used to measure performance?

The product team has tested the AI skill on a variety of public and private benchmarks for SQL tasks to ascertain the quality of SQL queries.

The team also invested in additional harms mitigations, including technological approaches to focusing the AI skill's output on the context of the chosen data sources.

What are the limitations of AI Skill? How can users minimize the impact of AI Skill's limitations when using the system?

- Make sure your column names are descriptive. Instead of using column names like "C1" or "ActCu," use "ActiveCustomer" or "IsCustomerActive." This is the most effective way to get more reliable queries out of the AI.
- Make use of the Notes for the model in the configuration panel in the UI. If the SQL queries that the AI Skill generates are incorrect, you can provide instructions to the model in plain English to improve upon future queries. The system will make use of these instructions with every query. Short and direct instructions are best.
- Provide examples in the model configuration panel in the UI. The system will leverage the most relevant examples when providing its answers.

What operational factors and settings allow for effective and responsible use of AI Skill?

- The AI skill only has access to the data that you provide. It makes use of the schema (table name and column name), as well as the Notes for the model and Examples that you provide in the UI.
- The AI skill only has access to data that the questioner has access to. If you use the AI skill, your credentials are used to access the underlying database. If you don't have access to the underlying data, the AI skill doesn't either. This holds true when you publish the AI skill to other destinations, such as Copilot for Microsoft 365 or Microsoft Copilot Studio, where the AI skill can be used by other questioners.

Related content

- [Privacy, security, and responsible use of Copilot for Data Factory \(preview\)](#)

- Overview of Copilot for Data Science and Data Engineering (preview)
 - Copilot for Data Factory overview
 - Copilot in Fabric: FAQ
-

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Privacy, security, and responsible use of Copilot for Data Warehouse (preview)

Article • 06/10/2024

Applies to:  Warehouse in Microsoft Fabric

In this article, learn how [Microsoft Copilot for Synapse Data Warehouse](#) works, how it keeps your business data secure and adheres to privacy requirements, and how to use generative AI responsibly. For more information on Copilot in Fabric, see [Privacy, security, and responsible use for Copilot in Microsoft Fabric \(preview\)](#).

With Copilot for Data Warehouse in Microsoft Fabric and other generative AI features, Microsoft Fabric brings a new way to transform and analyze data, generate insights, and create visualizations and reports in your warehouse and other workloads.

For considerations and limitations, see [Limitations](#).

Data use of Copilot for Data Warehouse

In warehouse, Copilot can only access the database schema that is accessible in the user's warehouse.

By default, Copilot has access to the following data types:

- Previous messages sent to and replies from Copilot for that user in that session.
- Contents of SQL query that the user has executed.
- Error messages of a SQL query that the user has executed (if applicable).
- Schemas of the warehouse.
- Schemas from attached warehouses or SQL analytics endpoints when cross-DB querying.

Tips for working with Copilot for Data Warehouse

- Copilot is best equipped to handle data warehousing topics, so limit your questions to this area.
- Be explicit about the data you want Copilot to examine. If you describe the data asset, with descriptive table and column names, Copilot is more likely to retrieve relevant data and generate useful outputs.

Evaluation of Copilot for Data Warehouse

The product team tested Copilot to see how well the system performs within the context of warehouses, and whether AI responses are insightful and useful.

The team also invested in additional harm mitigation, including technological approaches to focusing Copilot's output on topics related to data warehousing.

Related content

- [Privacy, security, and responsible use for Copilot in Microsoft Fabric \(preview\)](#)
- [Microsoft Copilot for Synapse Data Warehouse](#)

Feedback

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Privacy, security, and responsible use for Copilot in Power BI

Article • 10/20/2024

In this article, learn how [Microsoft Copilot for Power BI](#) works, how it keeps your business data secure and adheres to privacy requirements, and how to use generative AI responsibly. With Copilot and other generative AI features in preview, Power BI brings a new way to transform and analyze data, generate insights, and create visualizations and reports in Power BI and the other workloads.

For more information privacy and data security in Copilot, see [Privacy, security, and responsible use for Copilot in Microsoft Fabric \(preview\)](#).

For considerations and limitations with Copilot for Power BI, see [Considerations and Limitations](#).

Data use in Copilot for Power BI

- Copilot uses the data in a semantic model that you provide, combined with the prompts you enter, to create visuals. Learn more about [semantic models](#).
- To answer data questions from the semantic model, Copilot requires that Q&A be enabled in the semantic model's dataset settings. For more information, see [Update your data model to work well with Copilot for Power BI](#).
- To create measure descriptions in a semantic model, Copilot uses the DAX formula and table name of the selected measure. DAX comments and text in double-quotes of the DAX formula are not used. For more information, see [Use Copilot to create measure descriptions](#).
- To create DAX queries, explain DAX queries, or explain DAX topics, Copilot uses the semantic model metadata, such as table and column names and properties, with any DAX query selected in the DAX query editor combined with the request you enter, to respond. For more information, see [Use Copilot to create DAX queries](#).

Tips for working with Copilot for Power BI

Review [FAQ for Copilot for Power BI](#) for tips and suggestions to help you work with Copilot in this experience.

Evaluation of Copilot for Data Warehouse

The product team invested in harm mitigation, including technological approaches to focusing Copilot's output on topics related to reporting and data warehousing.

Related content

- [Microsoft Copilot for Power BI](#)
 - [Enable Fabric Copilot for Power BI](#)
 - [Copilot in Fabric and Power BI: FAQ](#)
-

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Privacy, security, and responsible use of Copilot for Real-Time Intelligence (preview)

Article • 09/11/2024

In this article, learn how [Copilot for Real-Time Intelligence \(preview\)](#) works, how it keeps your business data secure and adheres to privacy requirements, and how to use generative AI responsibly. For an overview of these topics for Copilot in Fabric, see [Privacy, security, and responsible use for Copilot \(preview\)](#).

This feature leverages the power of OpenAI to seamlessly translate natural language queries into Kusto Query Language (KQL), a specialized language for querying large datasets. In essence, it acts as a bridge between users' everyday language and the technical intricacies of KQL removing adoption barriers for users unfamiliar with the language. By harnessing OpenAI's advanced language understanding, this feature empowers users to submit business questions in a familiar, natural language format, which are then converted into KQL queries.

Copilot accelerates productivity by simplifying the query creation process but also provides a user-friendly and efficient approach to data analysis.

Copilot for Real-Time Intelligence intended use

Kusto Copilot accelerates data scientists' and analysts' data exploration process, by translating natural language business questions into KQL queries, based on the underlying dataset column names / schema.

What can Copilot for Real-Time Intelligence do?

Kusto Copilot is powered by generative AI models developed by OpenAI and Microsoft. Specifically, it uses OpenAI's Embedding and Completion APIs to build the natural language prompt and to generate KQL queries.

Data use of Copilot for Real-Time Intelligence

Copilot for Real-Time Intelligence has access to data that is accessible to the Copilot user, for example the database schema, user-defined functions, and data sampling of the connected database. The Copilot refers to whichever database is currently connected to the KQL queryset. The Copilot doesn't store any data.

Evaluation of Copilot for Real-Time Intelligence

- Following a thorough research period in which several configurations and methods have been tested, the OpenAI integration method had been proven to generate highest accuracy KQL queries. Copilot doesn't automatically run the generated KQL query, and users are advised to run the queries at their own discretion.
- Kusto Copilot doesn't automatically run any generated KQL query, and users are advised to run the queries at their own discretion.

Limitations of Copilot for Real-Time Intelligence

- Complex and long user input might be misunderstood by Copilot, resulting in potentially inaccurate or misleading suggested KQL queries.
- User input which directs to database entities which are not KQL tables or materialized views (for example, a KQL function), may result in potentially inaccurate or misleading suggested KQL queries.
- More than 10,000 concurrent users within an org will most likely fail or result in major performance hit.
- The KQL query should be validated by user before executing for preventing insecure KQL query execution.

Tips for working with Copilot for Real-Time Intelligence

- We recommend you provide detailed and relevant natural language queries. Furthermore, you should provide concise and simple requests to the copilot to avoid inaccurate or misleading suggested KQL queries. You should also restrict questions to databases which are KQL tables or materialized views.
- For example, if you're asking about a specific column, provide the column name and the type of data it contains. If you want to use specific operators or functions, this will also help. The more information you provide, the better the Copilot answer will be.

Related content

- [What is Microsoft Fabric?](#)
 - [Copilot in Fabric: FAQ](#)
-

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Copilot for Data Factory overview

Article • 06/10/2024

ⓘ Important

This feature is in [preview](#).

Copilot in Fabric enhances productivity, unlocks profound insights, and facilitates the creation of custom AI experiences tailored to your data. As a component of the Copilot in Fabric experience, Copilot in Data Factory empowers customers to use natural language to articulate their requirements for creating data integration solutions using [Dataflow Gen2](#). Essentially, Copilot in Data Factory operates like a subject-matter expert (SME) collaborating with you to design your dataflows.

Copilot for Data Factory is an AI-enhanced toolset that supports both citizen and professional data wranglers in streamlining their workflow. It provides intelligent [Mashup](#) code generation to transform data using natural language input and generates code explanations to help you better understand earlier generated complex queries and tasks.

Before your business can start using Copilot capabilities in Fabric, your administrator needs to [enable Copilot in Microsoft Fabric](#).

ⓘ Note

- Your administrator needs to enable the tenant switch before you start using Copilot. See the article [Copilot tenant settings](#) for details.
- Your F64 or P1 capacity needs to be in one of the regions listed in this article, [Fabric region availability](#).
- If your tenant or capacity is outside the US or France, Copilot is disabled by default unless your Fabric tenant admin enables the [Data sent to Azure](#), [OpenAI can be processed outside your tenant's geographic region](#), [compliance boundary](#), or [national cloud instance](#) tenant setting in the Fabric Admin portal.
- Copilot in Microsoft Fabric isn't supported on trial SKUs. Only paid SKUs (F64 or higher, or P1 or higher) are supported.
- Copilot in Fabric is currently rolling out in public preview and is expected to be available for all customers by end of March 2024.

- See the article [Overview of Copilot in Fabric and Power BI](#) for more information.

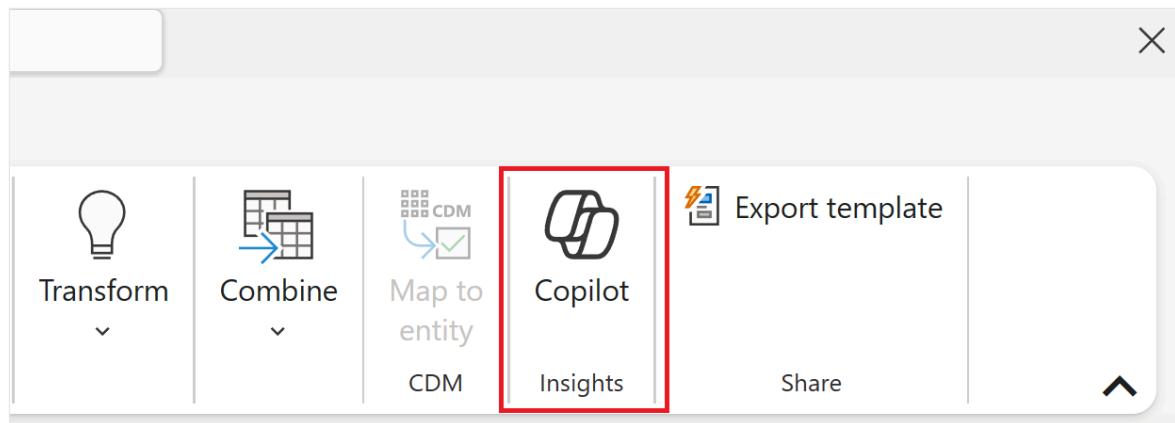
Supported capabilities

With Dataflow Gen2, you can:

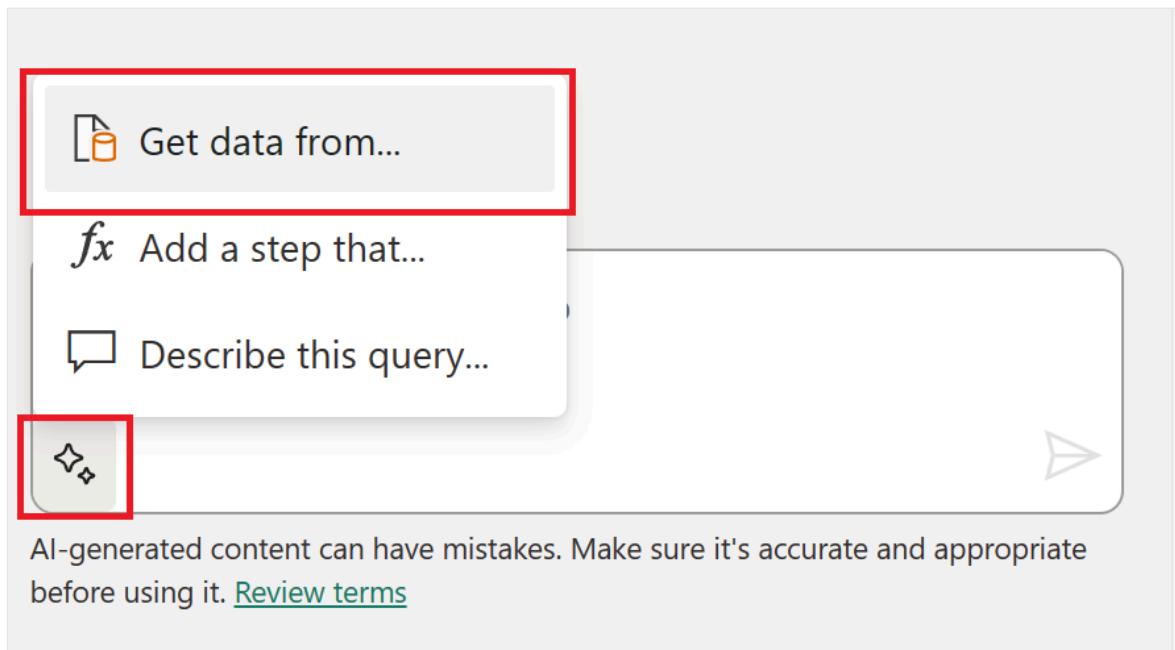
- Generate new transformation steps for an existing query.
- Provide a summary of the query and the applied steps.
- Generate a new query that may include sample data or a reference to an existing query.

Get started

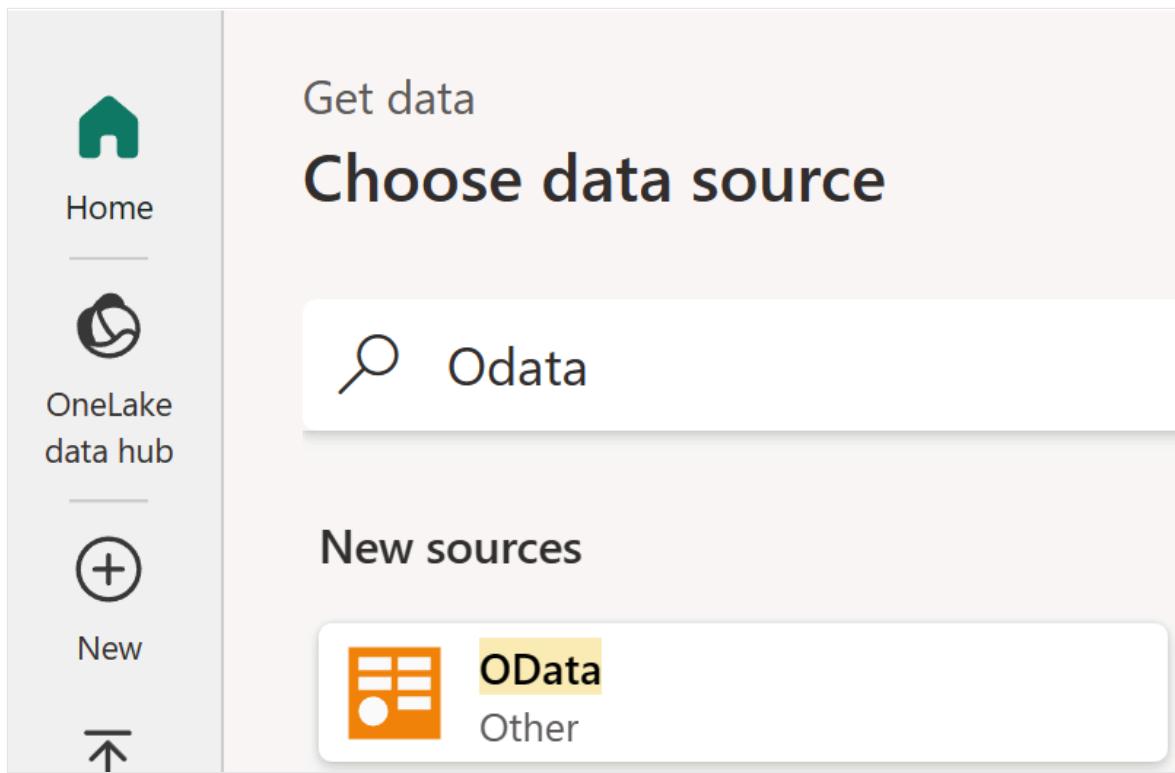
1. Create a new [Dataflows Gen2](#).
2. On the Home tab in Dataflows Gen2, select the **Copilot** button.



3. In the bottom left of the Copilot pane, select the starter prompt icon, then the **Get data from** option.



4. In the **Get data** window, search for OData and select the **OData** connector.



5. In the Connect to data source for the OData connector, input the following text into the URL field:

The screenshot shows a single-line text input field containing the URL: `https://services.odata.org/V4/Northwind/Northwind.svc/`.

Get data

Connect to data source

 OData
Other
[Learn more](#)

Connection settings

URL *

Connection

↻

Authentication kind: Anonymous [Edit connection](#)

Back
Cancel
Next

6. From the navigator, select the Orders table and then **Select related tables**. Then select **Create** to bring multiple tables into the Power Query editor.

Get data

Choose data

Display options ▾

OData [26]

- Alphabetical_list_of_products
- Categories
- Category_Sales_for_1997
- Current_Product_Lists
- Customer_and_Suppliers_b...
- CustomerDemographics
- Customers
- Employees
- Invoices
- Order_Details
- Order_Details_Extendeds
- Order_Subtotals
- Orders
- Orders_Qries
- Product_Sales_for_1997
- Products
- Products_Above_Average ... ▾

[Select related tables](#)

OrderID	CustomerID	EmployeeID	OrderDate	RequiredDate	ShippedDate	ShipVia	Freight	ShipName	ShipAddress
10248	VINET	5	7/4/1996, 12:00:00	8/1/1996, 12:00:00	7/16/1996, 12:00:00	3	32.88	Vins et alcools Chevalier	59 rue de l'Abbaye
10249	TOMSP	6	7/5/1996, 12:00:00	8/16/1996, 12:00:00	7/10/1996, 12:00:00	1	11.67	Toms Spezialitäten	Luisenstr. 48
10250	HANAR	4	7/8/1996, 12:00:00	8/5/1996, 12:00:00	7/12/1996, 12:00:00	2	65.83	Hanari Carnes	Rua do Paco, 67
10251	VICTE	3	7/8/1996, 12:00:00	8/5/1996, 12:00:00	7/15/1996, 12:00:00	1	41.34	Virtuailles en stock	2, rue du Commerce
10252	SUPRD	4	7/9/1996, 12:00:00	8/6/1996, 12:00:00	7/11/1996, 12:00:00	2	51.3	Suprêmes délices	Boulevard Tirou, 25
10253	HANAR	3	7/10/1996, 12:00:00	7/24/1996, 12:00:00	7/16/1996, 12:00:00	2	58.17	Hanari Carnes	Rua do Paco, 67
10254	CHOPS	5	7/11/1996, 12:00:00	8/8/1996, 12:00:00	7/23/1996, 12:00:00	2	22.98	Chop-suey Chinese	Hauptstr. 31
10255	RICSU	9	7/12/1996, 12:00:00	8/9/1996, 12:00:00	7/15/1996, 12:00:00	3	148.33	Richter Supermarkt	Starenweg 5
10256	WELLI	3	7/15/1996, 12:00:00	8/12/1996, 12:00:00	7/17/1996, 12:00:00	2	13.97	Wellington Importadora	Rua do Mercado, 1
10257	HILAA	4	7/16/1996, 12:00:00	8/13/1996, 12:00:00	7/22/1996, 12:00:00	3	81.91	HILARIOON-Abastos	Carrera 22 con Ave
10258	ERNSH	1	7/17/1996, 12:00:00	8/14/1996, 12:00:00	7/23/1996, 12:00:00	1	140.51	Ernst Handel	Kirchgasse 6
10259	CENTC	4	7/18/1996, 12:00:00	8/15/1996, 12:00:00	7/25/1996, 12:00:00	3	3.25	Centro comercial Moctezuma	Sierras de Granada
10260	OTTIK	4	7/19/1996, 12:00:00	8/16/1996, 12:00:00	7/29/1996, 12:00:00	1	55.09	Ottiles Käseladen	Mehrheimerstr. 365
10261	QUEDE	4	7/19/1996, 12:00:00	8/16/1996, 12:00:00	7/30/1996, 12:00:00	2	3.05	Que Delícia	Rua da Panificadora,
10262	RATTG	8	7/22/1996, 12:00:00	8/19/1996, 12:00:00	7/25/1996, 12:00:00	3	48.29	Rattlesnake Canyon Grocery	2817 Milton Dr.
10263	ERNSH	9	7/23/1996, 12:00:00	8/20/1996, 12:00:00	7/31/1996, 12:00:00	3	146.06	Ernst Handel	Kirchgasse 6
10264	FOLKO	6	7/24/1996, 12:00:00	8/21/1996, 12:00:00	8/23/1996, 12:00:00	3	3.67	Folk och fa HB	Åkergratan 24
10265	BLONP	2	7/25/1996, 12:00:00	8/22/1996, 12:00:00	8/12/1996, 12:00:00	1	55.28	Blondel père et fils	24, place Kléber
10266	WARTH	3	7/26/1996, 12:00:00	9/6/1996, 12:00:00	7/31/1996, 12:00:00	3	25.73	Wartian Herku	Torikatu 38
10267	FRANK	4	7/29/1996, 12:00:00	8/26/1996, 12:00:00	8/6/1996, 12:00:00	1	208.58	Frankenversand	Berliner Platz 43
10268	GROSR	8	7/30/1996, 12:00:00	8/27/1996, 12:00:00	8/2/1996, 12:00:00	3	66.29	GROSELLA-Restaurante	5 th Ave, Los Palos G.
10269	WHITC	5	7/31/1996, 12:00:00	8/14/1996, 12:00:00	8/9/1996, 12:00:00	1	4.56	White Clover Markets	1029 - 12th Ave. S.
10270	WARTH	1	8/1/1996, 12:00:00	8/28/1996, 12:00:00	8/2/1996, 12:00:00	1	126.64	Western Wholes...	Torikatu 38

Back
Cancel
Create

7. Select the Customers query, and in the Copilot pane type this text: **Only keep European customers**, then press **Enter** or select the **Send message** icon.

Your input is now visible in the Copilot pane along with a returned response card. You can validate the step with the corresponding step title in the **Applied steps** list and review the formula bar or the data preview window for accuracy of your results.

The screenshot shows the Power BI Data Editor interface. On the left, there's a tree view of queries: Customers, Employees, Order_Details, and Orders. The Customers query is selected, showing a table with columns: CustomerID, CompanyName, ContactName, Address, City, Region, PostalCode, and Country. The table contains 12 rows of data from the Northwind database. On the right, the 'Copilot Preview' pane is open. It shows a message: 'What would you like to do? I can transform your data or explain how it's being transformed. Please try starting with this option to connect to your data: Get data'. Below this, a card says 'Only keep European customers.' A note at the bottom of the Copilot pane says 'All generated content can have mistakes. Make sure it's accurate and appropriate before using it. Review items.'

8. Select the Employees query, and in the Copilot pane type this text: `Count the total number of employees by City`, then press **Enter** or select the **Send message** icon. Your input is now visible in the Copilot pane along with a returned response card and an **Undo** button.

9. Select the column header for the Total Employees column and choose the option **Sort descending**. The **Undo** button disappears because you modified the query.

The screenshot shows the Power BI Data Editor. The Employees query is selected. In the 'Transform' tab, a 'Sort' dialog is open with 'Sort ascending' selected. A red box highlights the 'Sort descending' button. Below the dialog, a table shows data grouped by City, with a column labeled 'Total Employees'. The Copilot pane on the right has a message: 'What would you like to do? I can transform your data or explain how it's being transformed. Here are some things I can currently do: Create a new query that references an existing query or includes sample data, Add a step to an existing query, Describe an existing query or steps'. A card below says 'Count the total number of employees by City'. A note at the bottom says 'All generated content can have mistakes. Make sure it's accurate and appropriate before using it. Review items.'

10. Select the Order_Details query, and in the Copilot pane type this text: `Only keep orders whose quantities are above the median value`, then press **Enter** or select the **Send message** icon. Your input is now visible in the Copilot pane along with a returned response card.

11. Either select the **Undo** button or type the text `Undo` (any text case) and press **Enter** in the Copilot pane to remove the step.

3:09 PM

Only keep orders whose quantities are above the median value.

3:09 PM

📎 Here's a suggested step for your query "Order_Details":

fx Custom

Undo

Only keep orders whose quantities are above the median value.



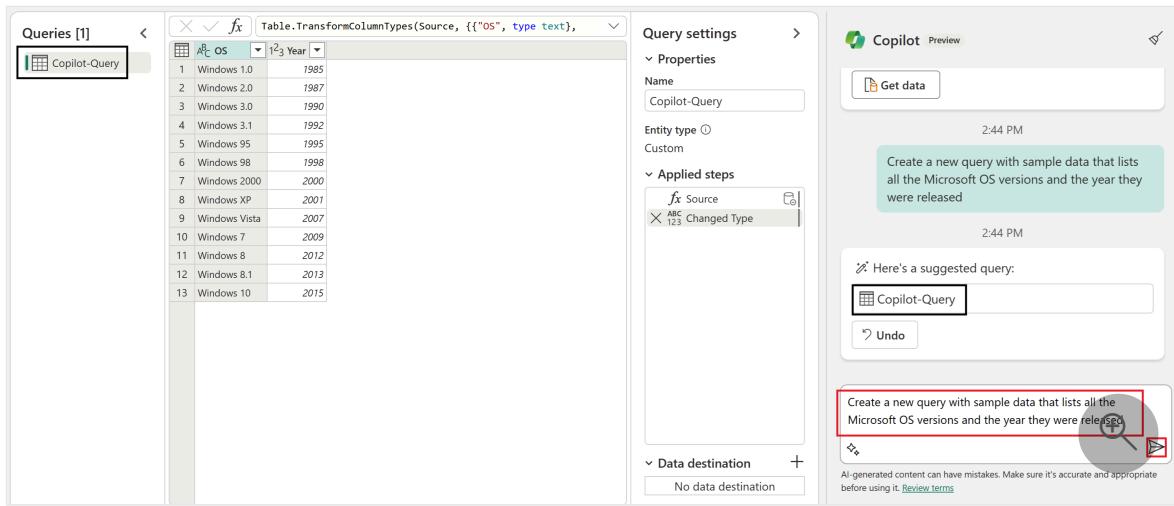
AI-generated content can have mistakes. Make sure it's accurate and appropriate before using it. [Review terms](#)



12. To leverage the power of Azure OpenAI when creating or transforming your data, ask Copilot to create sample data by typing this text:

```
Create a new query with sample data that lists all the Microsoft OS versions  
and the year they were released
```

Copilot adds a new query to the Queries pane list, containing the results of your input. At this point, you can either transform data in the user interface, continue to edit with Copilot text input, or delete the query with an input such as `Delete my current query`.



Limitations of Copilot for Data Factory

Here are the current limitations of Copilot for Data Factory:

- Copilot can't perform transformations or explanations across multiple queries in a single input. For instance, you can't ask Copilot to "Capitalize all the column headers for each query in my dataflow."
- Copilot doesn't understand previous inputs and can't undo changes after a user commits a change when authoring, either via user interface or the chat pane. For example, you can't ask Copilot to "Undo my last 5 inputs." However, users can still use the existing user interface options to delete unwanted steps or queries.
- Copilot can't make layout changes to queries in your session. For example, if you tell Copilot to create a new group for queries in the editor, it doesn't work.
- Copilot may produce inaccurate results when the intent is to evaluate data that isn't present within the sampled results imported into the sessions data preview.
- Copilot doesn't produce a message for the skills that it doesn't support. For example, if you ask Copilot to "Perform statistical analysis and write a summary over the contents of this query", it doesn't complete the instruction successfully as mentioned previously. Unfortunately, it doesn't give an error message either.

Related content

- [Privacy, security, and responsible use of Copilot for Data Factory \(preview\)](#)

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Overview of Copilot for Data Science and Data Engineering (preview)

Article • 10/30/2024

ⓘ Important

This feature is in [preview](#).

Copilot for Data Science and Data Engineering is an AI assistant that helps analyze and visualize data. It works with Lakehouse tables and files, Power BI Datasets, and pandas/spark/fabric dataframes, providing answers and code snippets directly in the notebook. The most effective way of using Copilot is to add your data as a dataframe. You can ask your questions in the chat panel, and the AI provides responses or code to copy into your notebook. It understands your data's schema and metadata, and if data is loaded into a dataframe, it has awareness of the data inside of the data frame as well. You can ask Copilot to provide insights on data, create code for visualizations, or provide code for data transformations, and it recognizes file names for easy reference. Copilot streamlines data analysis by eliminating complex coding.

ⓘ Note

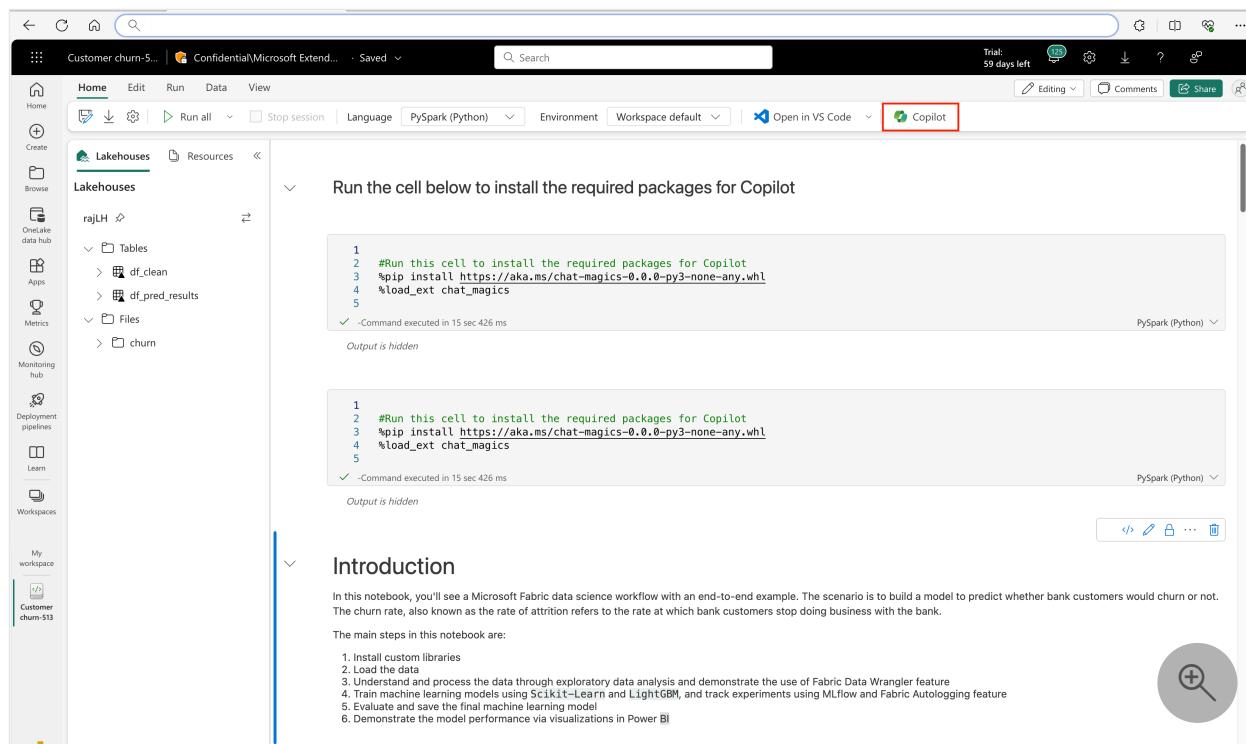
- Your administrator needs to enable the tenant switch before you start using Copilot. See the article [Copilot tenant settings](#) for details.
- Your F64 or P1 capacity needs to be in one of the regions listed in this article, [Fabric region availability](#).
- If your tenant or capacity is outside the US or France, Copilot is disabled by default unless your Fabric tenant admin enables the [Data sent to Azure OpenAI can be processed outside your tenant's geographic region, compliance boundary, or national cloud instance](#) tenant setting in the Fabric Admin portal.
- Copilot in Microsoft Fabric isn't supported on trial SKUs. Only paid SKUs (F64 or higher, or P1 or higher) are supported.
- Copilot in Fabric is currently rolling out in public preview and is expected to be available for all customers by end of March 2024.
- See the article [Overview of Copilot in Fabric and Power BI](#) for more information.

Introduction to Copilot for Data Science and Data Engineering for Fabric Data Science

With Copilot for Data Science and Data Engineering, you can chat with an AI assistant that can help you handle your data analysis and visualization tasks. You can ask the Copilot questions about lakehouse tables, Power BI Datasets, or Pandas/Spark dataframes inside notebooks. Copilot answers in natural language or code snippets. Copilot can also generate data-specific code for you, depending on the task. For example, Copilot for Data Science and Data Engineering can generate code for:

- Chart creation
- Filtering data
- Applying transformations
- Machine learning models

First select the Copilot icon in the notebooks ribbon. The Copilot chat panel opens, and a new cell appears at the top of your notebook. This cell must run each time a Spark session loads in a Fabric notebook. Otherwise, the Copilot experience won't properly operate. We are in the process of evaluating other mechanisms for handling this required initialization in future releases.



Run the cell at the top of the notebook, with this code:

```
#Run this cell to install the required packages for Copilot
%pip install https://aka.ms/chat-magics-0.0.0-py3-none-any.whl
```

```
%load_ext chat_magics
```

After the cell successfully executes, you can use Copilot. You must rerun the cell at the top of the notebook each time your session in the notebook closes.

The screenshot shows the Microsoft Fabric Data Science workspace interface. On the left, there's a sidebar with various options like Home, Create, Browse, and Workspaces. In the center, there's a notebook editor with two cells. The first cell contains the command `%load_ext chat_magics`. The second cell contains the same command, followed by the message "Run the cell below to install the required packages for Copilot". Below this message, the code to install the package is shown: `#Run this cell to install the required packages for Copilot`, `%pip install https://aka.ms/chat-magics-0.0.0-py3-none-any.whl`, and `%load_ext chat_magics`. A note indicates that the command was executed in 15 seconds. The notebook is set to PySpark (Python). To the right of the notebook, there's an "Introduction" section with a brief overview of the scenario and main steps, and a search icon.

To maximize Copilot effectiveness, load a table or dataset as a dataframe in your notebook. This way, the AI can access the data and understand its structure and content. Then, start chatting with the AI. Select the chat icon in the notebook toolbar, and type your question or request in the chat panel. For example, you can ask:

- "What is the average age of customers in this dataset?"
- "Show me a bar chart of sales by region"

And more. Copilot responds with the answer or the code, which you can copy and paste it your notebook. Copilot for Data Science and Data Engineering is a convenient, interactive way to explore and analyze your data.

As you use Copilot, you can also invoke the magic commands inside of a notebook cell to obtain output directly in the notebook. For example, for natural language answers to responses, you can ask questions using the "%chat" command, such as:

```
%chat  
What are some machine learning models that may fit this dataset?
```

The screenshot shows the Microsoft Copilot interface integrated into the Power BI workspace. A user has asked for logistic regression model code on a DataFrame. The Copilot has generated the following Python code:

```

1 # Import the necessary libraries
2 from sklearn.linear_model import LogisticRegression
3 from sklearn.model_selection import train_test_split
4 from sklearn.metrics import accuracy_score, confusion_matrix, classification_report
5
6 # Define the features and the target
7 X = df.drop('Exited', axis=1) # All columns except Exited
8 y = df['Exited'] # The target variable
9
10 # Split the data into train and test sets
11 X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=42)
12
13 # Create and fit a logistic regression model
14 log_reg = LogisticRegression(max_iter=1000) # Increase the max_iter to avoid convergence warning
15 log_reg.fit(X_train, y_train)
16
17 # Make predictions on the test set
18 y_pred = log_reg.predict(X_test)
19
20 # Evaluate the model performance using various metrics
21 print('Accuracy:', accuracy_score(y_test, y_pred))
22 print('Confusion matrix:\n', confusion_matrix(y_test, y_pred))
23 print('Classification report:\n', classification_report(y_test, y_pred))

```

Below the code, another snippet is shown:

```

1 Split the dataframe into features and target
2 = df.drop('Exited', axis=1) # Drop the target column from the dataframe
3 = df['Exited'] # Select the target column from the dataframe
4

```

The Copilot interface includes a sidebar with options like "Load data from my lakehouse into a DataFrame", "Generate insights from data", and "Suggest data visualizations". It also features a "Copilot Preview" section and a "Type a request or click the sparkle icon for ideas" input field.

Or

The screenshot shows a generated code snippet for logistic regression:

```
%code
Can you generate code for a logistic regression that fits this data?
```

The screenshot shows a generated list of steps for analyzing a pandas DataFrame and recommending machine learning models:

- 1. Data Exploration:** Begin by exploring the DataFrame to understand its structure, features, and target variable(s). Use methods like `df.head()`, `df.info()`, and `df.describe()` to get an overview of the data.
- 2. Data Preprocessing:** Preprocess the data by handling missing values, encoding categorical variables, and scaling numerical features if necessary. You can use techniques like one-hot encoding or label encoding for categorical variables and standardization or normalization for numerical variables.
- 3. Feature Selection/Engineering:** Analyze the importance of features and perform feature selection or engineering techniques to improve model performance. Techniques like correlation analysis, recursive feature elimination, or principal component analysis (PCA) can be used.
- 4. Model Selection:** Based on the type of problem (regression or classification) and the available data, select appropriate machine learning models. For regression problems, models like linear regression, decision trees, random forests, or gradient boosting algorithms (e.g., XGBoost or LightGBM) can be considered. For classification problems, logistic regression, support vector machines (SVM), random forests, or neural networks (e.g., deep learning models) can be suitable options.
- 5. Model Evaluation:** Split your dataset into training and testing sets using techniques like train-test split or cross-validation. Train your selected models on the training set and evaluate their performance using appropriate evaluation metrics such as mean squared error (MSE), root mean squared error (RMSE), accuracy, precision, recall, F1-score, etc.
- 6. Hyperparameter Tuning:** Fine-tune your selected models by optimizing their hyperparameters using techniques like grid search or random search. This step helps in finding the best combination of hyperparameters that maximizes model performance.
- 7. Model Comparison:** Compare the performance of different models based on evaluation metrics to identify the best-performing model for your specific problem.

Remember that these steps are general guidelines for analyzing a pandas DataFrame and selecting machine learning models. The specific approach may vary depending on your dataset's characteristics and problem requirements.

Copilot for Data Science and Data Engineering also has schema and metadata awareness of tables in the lakehouse. Copilot can provide relevant information in context of your data in an attached lakehouse. For example, you can ask:

- "How many tables are in the lakehouse?"
- "What are the columns of the table customers?"

Copilot responds with the relevant information if you added the lakehouse to the notebook. Copilot also has awareness of the names of files added to any lakehouse attached to the notebook. You can refer to those files by name in your chat. For example, if you have a file named `sales.csv` in your lakehouse, you can ask "Create a dataframe from sales.csv". Copilot generates the code and displays it in the chat panel. With Copilot for notebooks, you can easily access and query your data from different sources. You don't need the exact command syntax to do it.

Tips

- "Clear" your conversation in the Copilot chat panel with the broom located at the top of the chat panel. Copilot retains knowledge of any inputs or outputs during the session, but this helps if you find the current content distracting.
- Use the chat magics library to configure settings about Copilot, including privacy settings. The default sharing mode is designed to maximize the context sharing Copilot has access to, so limiting the information provided to copilot can directly and significantly impact the relevance of its responses.
- When Copilot first launches, it offers a set of helpful prompts that can help you get started. They can help kickstart your conversation with Copilot. To refer to prompts later, you can use the sparkle button at the bottom of the chat panel.
- You can "drag" the sidebar of the copilot chat to expand the chat panel, to view code more clearly or for readability of the outputs on your screen.

Limitations

Copilot features in the Data Science experience are currently scoped to notebooks. These features include the Copilot chat pane, IPython magic commands that can be used within a code cell, and automatic code suggestions as you type in a code cell. Copilot can also read Power BI semantic models using an integration of semantic link.

Copilot has two key intended uses:

- One, you can ask Copilot to examine and analyze data in your notebook (for example, by first loading a DataFrame and then asking Copilot about data inside the DataFrame).
- Two, you can ask Copilot to generate a range of suggestions about your data analysis process, such as what predictive models might be relevant, code to

perform different types of data analysis, and documentation for a completed notebook.

Keep in mind that code generation with fast-moving or recently released libraries might include inaccuracies or fabrications.

Related content

- [How to use Chat-magics](#)
 - [How to use the Copilot Chat Pane](#)
-

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Overview of Chat-magics in Microsoft Fabric Notebooks

Article • 01/18/2024

ⓘ Important

This feature is in **preview**.

The Chat-magics Python library enhances your data science and engineering workflow in Microsoft Fabric notebooks. It seamlessly integrates with the Fabric environment, and allows execution of specialized IPython magic commands in a notebook cell, to provide real-time outputs. IPython magic commands and more background on usage can be found here: <https://ipython.readthedocs.io/en/stable/interactive/magics.html#>.

ⓘ Note

- Your administrator needs to enable the tenant switch before you start using Copilot. See the article **Copilot tenant settings** for details.
- Your F64 or P1 capacity needs to be in one of the regions listed in this article, **Fabric region availability**.
- If your tenant or capacity is outside the US or France, Copilot is disabled by default unless your Fabric tenant admin enables the **Data sent to Azure OpenAI can be processed outside your tenant's geographic region, compliance boundary, or national cloud instance** tenant setting in the Fabric Admin portal.
- Copilot in Microsoft Fabric isn't supported on trial SKUs. Only paid SKUs (F64 or higher, or P1 or higher) are supported.
- Copilot in Fabric is currently rolling out in public preview and is expected to be available for all customers by end of March 2024.
- See the article **Overview of Copilot in Fabric and Power BI** for more information.

Capabilities of Chat-magics

Instant query and code generation

The `%%chat` command allows you to ask questions about the state of your notebook.

The `%%code` enables code generation for data manipulation or visualization.

Dataframe descriptions

The `%%describe` command provides summaries and descriptions of loaded dataframes.

This simplifies the data exploration phase.

Commenting and debugging

The `%%add_comments` and `%%fix_errors` commands help add comments to your code and fix errors respectively. This helps make your notebook more readable and error-free.

Privacy controls

Chat-magics also offers granular privacy settings, which allows you to control what data is shared with the Azure OpenAI Service. The `%set_sharing_level` and `%configure_privacy_settings` commands, for example, provide this functionality.

How can Chat-magics help you?

Chat-magics enhances your productivity and workflow in Microsoft Fabric notebooks. It accelerates data exploration, simplifies notebook navigation, and improves code quality. It adapts to multilingual code environments, and it prioritizes data privacy and security. Through cognitive load reductions, it allows you to more closely focus on problem-solving. Whether you're a data scientist, data engineer, or business analyst, Chat-magics seamlessly integrates robust, enterprise-level Azure OpenAI capabilities directly into your notebooks. This makes it an indispensable tool for efficient and streamlined data science and engineering tasks.

Get started with Chat-magics

1. Open a new or existing Microsoft Fabric notebook.
2. Select the **Copilot** button on the notebook ribbon to output the Chat-magics initialization code into a new notebook cell.
3. Run the cell when it is added at the top of your notebook.

Verify the Chat-magics installation

1. Create a new cell in the notebook, and run the `%chat_magics` command to display the help message. This step verifies proper Chat-magics installation.

Introduction to basic commands: `%%chat` and `%%code`

Using `%%chat` (Cell Magic)

1. Create a new cell in your notebook.
2. Type `%%chat` at the top of the cell.
3. Enter your question or instruction below the `%%chat` command - for example, **What variables are currently defined?**
4. Execute the cell to see the Chat-magics response.

Using `%%code` (Cell Magic)

1. Create a new cell in your notebook.
2. Type `%%code` at the top of the cell.
3. Below this, specify the code action you'd like - for example, **Load my_data.csv into a pandas dataframe.**
4. Execute the cell, and review the generated code snippet.

Customizing output and language settings

1. Use the `%set_output` command to change the default for how magic commands provide output. The options can be viewed by running `%set_output?`
2. Choose where to place the generated code, from options like
 - current cell
 - new cell
 - cell output
 - into a variable

Advanced commands for data operations

`%%describe`, `%%add_comments`, and `%%fix_errors`

1. Use `%%describe DataFrameName` in a new cell to obtain an overview of a specific dataframe.
2. To add comments to a code cell for better readability, type `%%add_comments` to the top of the cell you want to annotate and then execute. Be sure to validate the code is correct
3. For code error fixing, type `%%fix_errors` at the top of the cell that contained an error and execute it.

Privacy and security settings

1. By default, your privacy configuration shares previous messages sent to and from the Language Learning Model (LLM). However, it doesn't share cell contents, outputs, or any schemas or sample data from data sources.
2. Use `%set_sharing_level` in a new cell to adjust the data shared with the AI processor.
3. For more detailed privacy settings, use `%configure_privacy_settings`.

Context and focus commands

Using `%pin`, `%new_task`, and other context commands

1. Use `%pin DataFrameName` to help the AI focus on specific dataframes.
2. To clear the AI to focus on a new task in your notebook, type `%new_task` followed by a task that you are about to undertake. This clears the execution history that copilot knows about to this point and can make future responses more relevant.

Next steps

- [How to use Copilot Pane](#)

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Use the Copilot for Data Science and Data Engineering chat panel

Article • 01/18/2024

ⓘ Important

This feature is in [preview](#).

Copilot for Data Science and Data Engineering notebooks is an AI assistant that helps you analyze and visualize data. It works with lakehouse tables, Power BI Datasets, and pandas/spark dataframes, providing answers and code snippets directly in the notebook. The most effective way of using Copilot is to load your data as a dataframe. You can use the chat panel to ask your questions, and the AI provides responses or code to copy into your notebook. It understands your data's schema and metadata, and if data is loaded into a dataframe, it has awareness of the data inside of the data frame as well. You can ask Copilot to provide insights on data, create code for visualizations, or provide code for data transformations, and it recognizes file names for easy reference. Copilot streamlines data analysis by eliminating complex coding.

ⓘ Note

- Your administrator needs to enable the tenant switch before you start using Copilot. See the article [Copilot tenant settings](#) for details.
- Your F64 or P1 capacity needs to be in one of the regions listed in this article, [Fabric region availability](#).
- If your tenant or capacity is outside the US or France, Copilot is disabled by default unless your Fabric tenant admin enables the [Data sent to Azure OpenAI can be processed outside your tenant's geographic region, compliance boundary, or national cloud instance](#) tenant setting in the Fabric Admin portal.
- Copilot in Microsoft Fabric isn't supported on trial SKUs. Only paid SKUs (F64 or higher, or P1 or higher) are supported.
- Copilot in Fabric is currently rolling out in public preview and is expected to be available for all customers by end of March 2024.
- See the article [Overview of Copilot in Fabric and Power BI](#) for more information.

Azure OpenAI enablement

- Azure OpenAI must be enabled within Fabric at the tenant level.

⚠ Note

If your workspace is provisioned in a region without GPU capacity, and your data is not enabled to flow cross-geo, Copilot will not function properly and you will see errors.

Successful execution of Chat-Magics installation cell

1. To use the Copilot pane, The installation cell for chat-magics must successfully execute within your Spark session.

The screenshot shows a Microsoft Fabric Data Science workspace interface. On the left, there's a sidebar with various options like Home, Create, Browse, OneLake data hub, Apps, Metrics, Monitoring Hub, Deployment pipelines, Learn, Workspaces, and My workspace. In the center, there's a notebook editor. A red box highlights a code cell in PySpark (Python) that contains the following code:

```
1 #Run this cell to install the required packages for Copilot
2 %pip install https://aka.ms/chat-magics-0.0.0-py3-none-any.whl
3 %load_ext chat_magics
4
5 -Command executed in 15 sec 426 ms
Output is hidden
```

Below this cell, another code cell is partially visible:

```
1 #Run this cell to install the required packages for Copilot
2 %pip install https://aka.ms/chat-magics-0.0.0-py3-none-any.whl
3 %load_ext chat_magics
4
5 -Command executed in 15 sec 426 ms
Output is hidden
```

At the bottom of the notebook, there's an "Introduction" section with some descriptive text and a list of main steps:

In this notebook, you'll see a Microsoft Fabric data science workflow with an end-to-end example. The scenario is to build a model to predict whether bank customers would churn or not. The churn rate, also known as the rate of attrition refers to the rate at which bank customers stop doing business with the bank.

The main steps in this notebook are:

1. Install custom libraries
2. Load the data
3. Understand and process the data through exploratory data analysis and demonstrate the use of Fabric Data Wrangler feature
4. Train machine learning models using Scikit-Learn and LightGBM, and track experiments using MLflow and Fabric Autologging feature
5. Evaluate and save the final machine learning model
6. Demonstrate the model performance via visualizations in Power BI

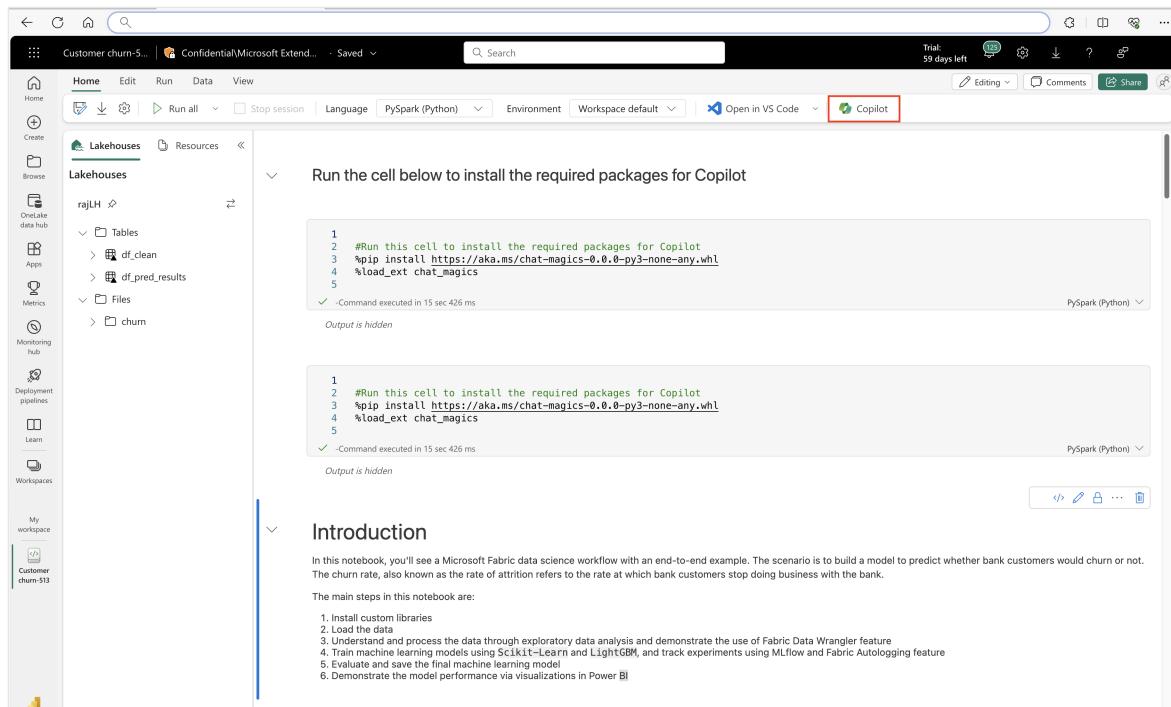
ⓘ Important

If your Spark session terminates, the context for chat-magics will also terminate, also wiping the context for the Copilot pane.

2. Verify that all these conditions are met before proceeding with the Copilot Chat Pane.

Open Copilot chat panel inside the notebook

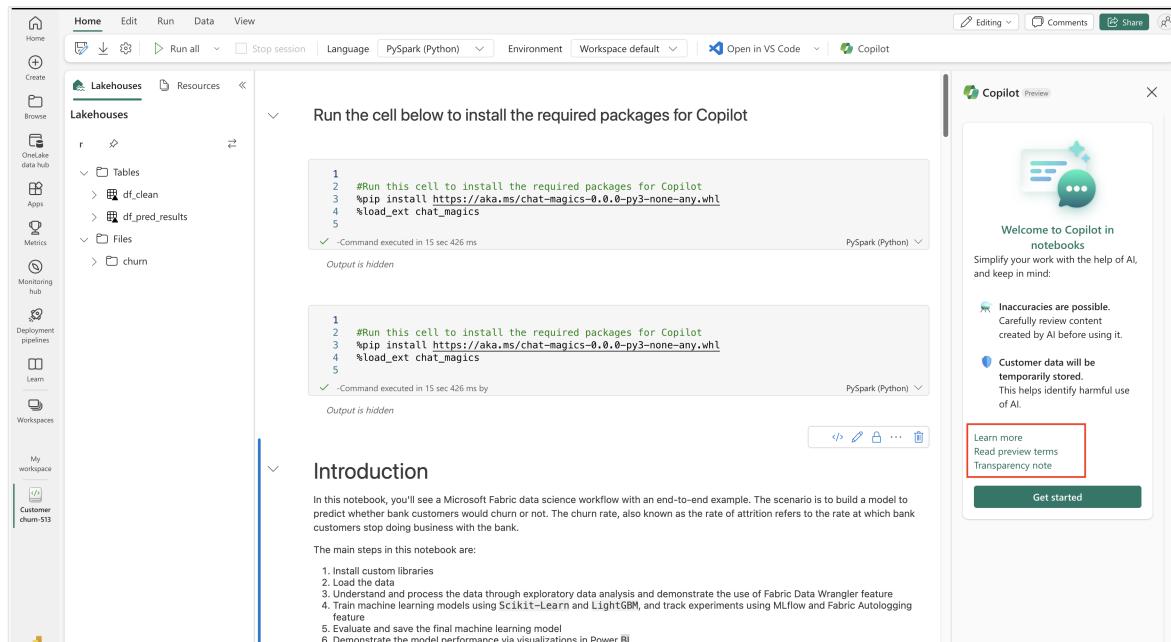
1. Select the Copilot button on the notebook ribbon



2. To open Copilot, select the **Copilot** button at the top of the Notebook.

3. The Copilot chat panel opens on the right side of your notebook.

4. A panel opens, to provide overview information and helpful links.



Key capabilities

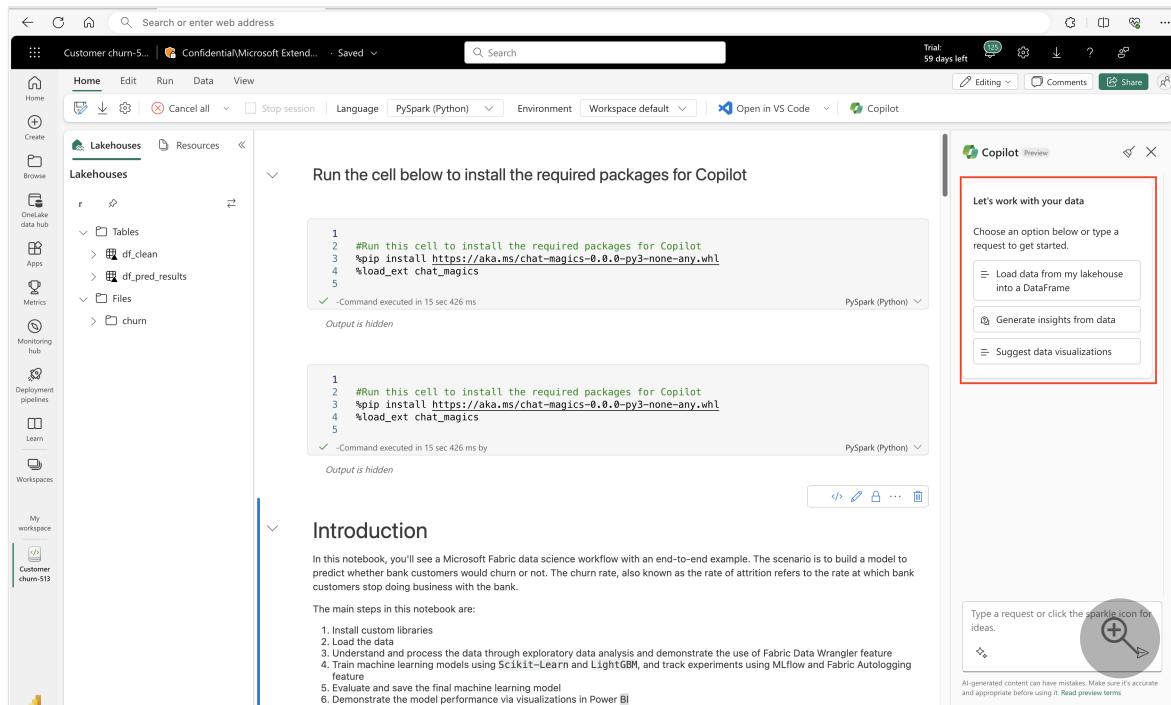
- **AI assistance:** Generate code, query data, and get suggestions to accelerate your workflow.
- **Data insights:** Quick data analysis and visualization capabilities.
- **Explanations:** Copilot can provide natural language explanations of notebook cells, and can provide an overview for notebook activity as it runs.
- **Fixing errors:** Copilot can also fix notebook run errors as they arise. Copilot shares context with the notebook cells (executed output) and can provide helpful suggestions.

Important notices

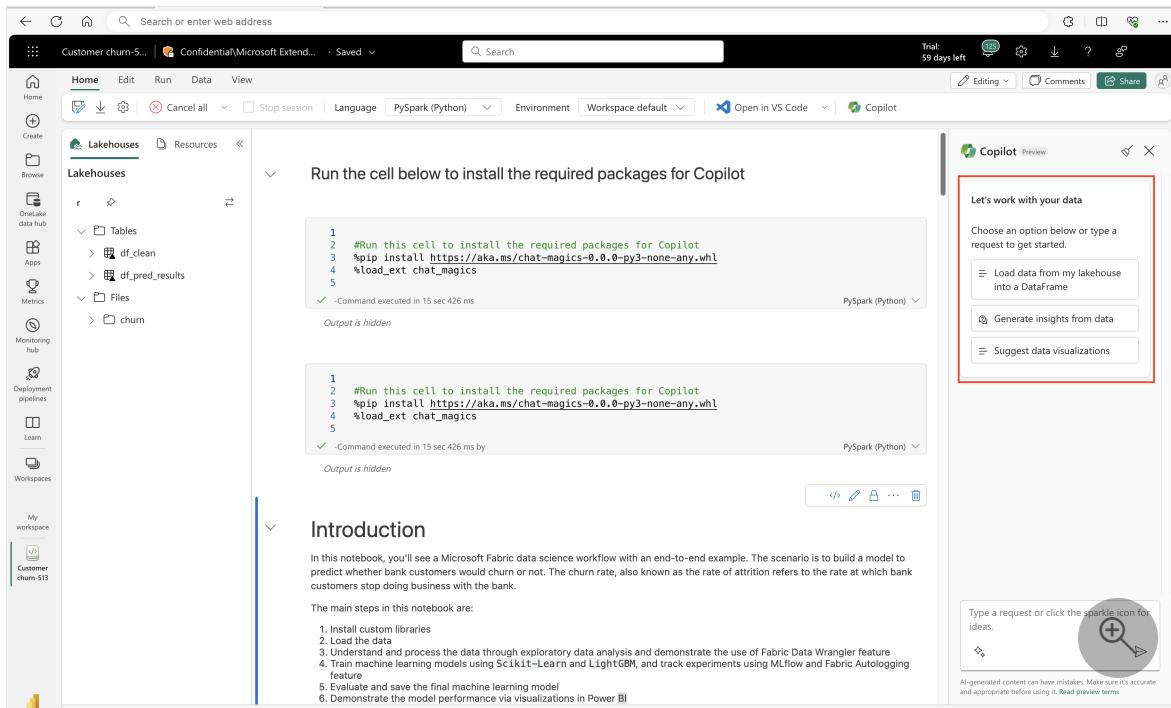
- **Inaccuracies:** Potential for inaccuracies exists. Review AI-generated content carefully.
- **Data storage:** Customer data is temporarily stored, to identify harmful use of AI.

Getting started with Copilot chat in notebooks

1. Copilot for Data Science and Data Engineering offers helpful starter prompts to get started. For example, "Load data from my lakehouse into a dataframe", or "Generate insights from data".



2. Each of these selections outputs chat text in the text panel. As the user, you must fill out the specific details of the data you'd like to use.
3. You can then input any type of request you have in the chat box.



Regular usage of the Copilot chat panel

- The more specifically you describe your goals in your chat panel entries, the more accurate the Copilot responses.
- You can "copy" or "insert" code from the chat panel. At the top of each code block, two buttons allow input of items directly into the notebook.
- To clear your conversation, select the **Broom** icon at the top to remove your conversation from the pane. It clears the pane of any input or output, but the context remains in the session until it ends.
- Configure the Copilot privacy settings with the `%configure_privacy_settings` command, or the `%set_sharing_level` command in the chat magics library.
- Transparency: Read our Transparency Note for details on data and algorithm use.

Next steps

- [How to use Chat-magics](#)

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Overview of Copilot for Data Warehouse

Article • 09/25/2024

Applies to:  Warehouse in Microsoft Fabric

Microsoft Copilot for Synapse Data Warehouse is an AI assistant designed to streamline your data warehousing tasks. Copilot integrates seamlessly with your Fabric warehouse, providing intelligent insights to help you along each step of the way in your T-SQL explorations.

Introduction to Copilot for Data Warehouse

Copilot for Data Warehouse utilizes table and view names, column names, primary key, and foreign key metadata to generate T-SQL code. Copilot for Data Warehouse does not use data in tables to generate T-SQL suggestions.

Key features of Copilot for Warehouse include:

- **Natural Language to SQL:** Ask Copilot to generate SQL queries using simple natural language questions.
- **Code completion:** Enhance your coding efficiency with AI-powered code completions.
- **Quick actions:** Quickly fix and explain SQL queries with readily available actions.
- **Intelligent Insights:** Receive smart suggestions and insights based on your warehouse schema and metadata.

There are three ways to interact with Copilot in the Fabric Warehouse editor.

- **Chat Pane:** Use the chat pane to ask questions to Copilot through natural language. Copilot will respond with a generated SQL query or natural language based on the question asked.
 - [How to: Use the Copilot chat pane for Synapse Data Warehouse](#)
- **Code completions:** Start writing T-SQL in the SQL query editor and Copilot will automatically generate a code suggestion to help complete your query. The **Tab** key accepts the code suggestion, or keep typing to ignore the suggestion.
 - [How to: Use Copilot code completion for Synapse Data Warehouse](#)
- **Quick Actions:** In the ribbon of the SQL query editor, the **Fix** and **Explain** options are quick actions. Highlight a SQL query of your choice and select one of the quick action buttons to perform the selected action on your query.
 - **Explain:** Copilot can provide natural language explanations of your SQL query and warehouse schema in comments format.

- **Fix:** Copilot can fix errors in your code as error messages arise. Error scenarios can include incorrect/unsupported T-SQL code, wrong spellings, and more. Copilot will also provide comments that explain the changes and suggest SQL best practices.
- [How to: Use Copilot quick actions for Synapse Data Warehouse](#)

Use Copilot effectively

Here are some tips for maximizing productivity with Copilot.

- When crafting prompts, be sure to start with a clear and concise description of the specific information you're looking for.
- Natural language to SQL depends on expressive table and column names. If your table and columns aren't expressive and descriptive, Copilot might not be able to construct a meaningful query.
- Use natural language that is applicable to your table and view names, column names, primary keys, and foreign keys of your warehouse. This context helps Copilot generate accurate queries. Specify what columns you wish to see, aggregations, and any filtering criteria as explicitly as possible. Copilot should be able to correct typos or understand context given your schema context.
- Create relationships in the model view of the warehouse to increase the accuracy of JOIN statements in your generated SQL queries.
- When using code completions, leave a comment at the top of the query with `--` to help guide the Copilot with context about the query you are trying to write.
- Avoid ambiguous or overly complex language in your prompts. Simplify the question while maintaining its clarity. This editing ensures Copilot can effectively translate it into a meaningful T-SQL query that retrieves the desired data from the associated tables and views.
- Currently, natural language to SQL supports English language to T-SQL.
- The following example prompts are clear, specific, and tailored to the properties of your schema and data warehouse, making it easier for Copilot to generate accurate T-SQL queries:
 - `Show me all properties that sold last year`
 - `Count all the products, group by each category`
 - `Show all agents who sell properties in California`
 - `Show agents who have listed more than two properties for sale`
 - `Show the rank of each agent by property sales and show name, total sales, and rank`

Enable Copilot

- Your administrator needs to enable the tenant switch before you start using Copilot. For more information, see [Copilot tenant settings](#).
- Your F64 or P1 capacity needs to be in one of the regions listed in this article, [Fabric region availability](#).
- If your tenant or capacity is outside the US or France, Copilot is disabled by default unless your Fabric tenant admin enables the [Data sent to Azure OpenAI can be processed outside your tenant's geographic region, compliance boundary, or national cloud instance](#) tenant setting in the Fabric Admin portal.
- Copilot in Microsoft Fabric isn't supported on trial SKUs. Only paid SKUs (F64 or higher, or P1 or higher) are supported.
- For more information, see [Overview of Copilot in Fabric and Power BI](#).

What should I know to use Copilot responsibly?

Microsoft is committed to ensuring that our AI systems are guided by our [AI principles](#) and [Responsible AI Standard](#). These principles include empowering our customers to use these systems effectively and in line with their intended uses. Our approach to responsible AI is continually evolving to proactively address emerging issues.

Copilot features in Fabric are built to meet the Responsible AI Standard, which means that they're reviewed by multidisciplinary teams for potential harms, and then refined to include mitigations for those harms.

For more information, see [Privacy, security, and responsible use of Copilot for Data Warehouse \(preview\)](#).

Limitations of Copilot for Data Warehouse

Here are the current limitations of Copilot for Data Warehouse:

- Copilot doesn't understand previous inputs and can't undo changes after a user commits a change when authoring, either via user interface or the chat pane. For example, you can't ask Copilot to "Undo my last 5 inputs." However, users can still use the existing user interface options to delete unwanted changes or queries.
- Copilot can't make changes to existing SQL queries. For example, if you ask Copilot to edit a specific part of an existing query, it doesn't work.
- Copilot might produce inaccurate results when the intent is to evaluate data. Copilot only has access to the warehouse schema, none of the data inside.

- Copilot responses can include inaccurate or low-quality content, so make sure to review outputs before using them in your work.
- People who are able to meaningfully evaluate the content's accuracy and appropriateness should review the outputs.

Related content

- [Copilot tenant settings \(preview\)](#)
 - [How to: Use the Copilot chat pane for Synapse Data Warehouse](#)
 - [How to: Use Copilot quick actions for Synapse Data Warehouse](#)
 - [How to: Use Copilot code completion for Synapse Data Warehouse](#)
 - [Privacy, security, and responsible use of Copilot for Data Warehouse \(preview\)](#)
-

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Copilot for Real-Time Intelligence (preview)

Article • 09/24/2024

Copilot for Real-Time Intelligence is an advanced AI tool designed to help you explore your data and extract valuable insights. You can input questions about your data, which are then automatically translated into Kusto Query Language (KQL) queries. Copilot streamlines the process of analyzing data for both experienced KQL users and citizen data scientists.

ⓘ Important

This feature is in [preview](#).

For billing information about Copilot, see [Announcing Copilot in Fabric pricing ↗](#).

Prerequisites

- A [workspace](#) with a Microsoft Fabric-enabled [capacity](#)
- Read or write access to a [KQL queryset](#)

ⓘ Note

- Your administrator needs to enable the tenant switch before you start using Copilot. See the article [Copilot tenant settings](#) for details.
- Your F64 or P1 capacity needs to be in one of the regions listed in this article, [Fabric region availability](#).
- If your tenant or capacity is outside the US or France, Copilot is disabled by default unless your Fabric tenant admin enables the [Data sent to Azure OpenAI can be processed outside your tenant's geographic region, compliance boundary, or national cloud instance](#) tenant setting in the Fabric Admin portal.
- Copilot in Microsoft Fabric isn't supported on trial SKUs. Only paid SKUs (F64 or higher, or P1 or higher) are supported.
- Copilot in Fabric is currently rolling out in public preview and is expected to be available for all customers by end of March 2024.

- See the article [Overview of Copilot in Fabric and Power BI](#) for more information.

Capabilities of Copilot for Real-Time Intelligence

Copilot for Real-Time Intelligence lets you effortlessly translate natural language queries into Kusto Query Language (KQL). The copilot acts as a bridge between everyday language and KQL's technical intricacies, and in doing so removes adoption barriers for data analysts and citizen data scientists. By harnessing OpenAI's advanced language understanding, this feature allows you to submit business questions in a familiar, natural language format, which are then converted into KQL queries. Copilot accelerates productivity by simplifying the query creation process with a user-friendly and efficient approach to data analysis.

Copilot supports **conversational interactions** which allows you to clarify, adapt, and extend your queries dynamically, all while maintaining the context of your previous inputs. You can refine queries and ask follow-up questions without starting over:

- Dynamic query refinement: You can refine the initial KQL generated by Copilot by refining your prompt to remove ambiguity, specify tables or columns, or provide more context.
- Seamless follow-up questions: If the generated KQL is correct but you want to explore the data more deeply, you can ask follow-up questions related to the same task. You can expand the scope of your query, add filters, or explore related data points by building on previous dialogue.

Access the Real-Time Intelligence Copilot

1. To access Copilot for Real-Time Intelligence, navigate to a new or existing KQL queryset.
2. Connect to a database. For more information, see [Select a database](#)
3. Select the **Copilot** button.
4. In the Copilot pane, enter your business question in natural language.
5. Press **Enter**. After a few seconds, Copilot will generate a KQL query based on your input. You can copy the query to the clipboard, or **Insert** it directly in the KQL query editor. To run the query in the query editor, you must have write access to the KQL queryset.
6. Select the **Run** button to execute the query.

The screenshot shows the Kusto Query Editor interface. At the top, there's a navigation bar with 'Home' and 'Help' buttons, followed by a 'Save' button and a 'Copilot' button highlighted with a red box. Below the navigation is a 'Samples' section with a dropdown menu. The main area contains a code editor with the following KQL query:

```

1 // how many storm events happened in 2004
2 //
3 StormEvents
4 | where StartTime between (datetime(2004-01-01) .. datetime(2004-12-31))
5 | summarize EventCount = count()
6
7 // how many of those were in CALIFORNIA
8 //
9 StormEvents
10 | where StartTime between (datetime(2004-01-01) .. datetime(2004-12-31))
11 | where State == "CALIFORNIA"
12 | summarize EventCount = count()

```

Below the code editor is a table named 'Table 1' with one row and one column labeled 'EventCount' containing the value '0'. To the right of the table is a preview pane titled 'Copilot Preview' which contains three generated queries:

- how many storm events happened in 2004
- how many of those were in CALIFORNIA
- how many storm events happened in 2004

Each query has an 'Insert' button and a note about AI-generated content.

① Note

- Copilot doesn't generate control commands.
- Copilot doesn't automatically run the generated KQL query. Users are advised to run the queries at their own discretion.

You can continue to ask follow-up questions or further refine your query. To start a new chat, select the speech bubble on the top right of the Copilot pane (1).

Hover over a previous question (2) and select the pencil icon to copy it to the question box to edit it, or copy it to your clipboard.



Copilot

Preview

2



1



how many storm events happened in 2004

Insert this query into your editor:

```
StormEvents | where StartTime between (datetime(2004-01-01) .. datetime(2004-12-31)) | summarize EventCount = count()
```

AI-generated content may be incorrect [Review terms](#)

how many of those were in CALIFORNIA

Insert this query into your editor:

```
StormEvents | where StartTime between (datetime(2004-01-01) .. datetime(2004-12-31)) | where State == "CALIFORNIA" | summarize EventCount = count()
```

AI-generated content may be incorrect [Review terms](#)

how many storm events happened in 2004

0 / 500



Improve the accuracy of Copilot for Real-Time Intelligence

Here are some tips that can help improve the accuracy of the KQL queries generated by Copilot:

- Start with simple natural language prompts, to learn the current capabilities and limitations. Then, gradually proceed to more complex prompts.
- State the task precisely, and avoid ambiguity. Imaging you shared the natural language prompt with few KQL experts from your team without adding oral instructions - would they be able to generate the correct query?

- To generate the most accurate query, supply any relevant information that can help the model. If you can, specify tables, operators, or functions that are critical to the query.
- Prepare your database: Add docstring properties to describe common tables and columns. This might be redundant for descriptive names (for example, timestamp) but is critical to describe tables or columns with meaningless names. You don't have to add docstring to tables or columns that are rarely used. For more information, see [.alter table column-docstrings command](#).
- To improve Copilot results, select either the **like** or **dislike** icon to submit your comments in the **Submit feedback** form.

 **Note**

The **Submit feedback** form submits the name of the database, its url, the KQL query generated by copilot, and any free text response you include in the feedback submission. Results of the executed KQL query aren't sent.

Limitations

- Copilot might suggest potentially inaccurate or misleading suggested KQL queries due to:
 - Complex and long user input.
 - User input that directs to database entities that aren't KQL Database tables or materialized views (for example KQL function.)
- More than 10,000 concurrent users within an organization can result in failure or a major performance hit.

Related content

- [Privacy, security, and responsible use of Copilot for Real-Time Intelligence \(preview\)](#)
- [Copilot for Microsoft Fabric: FAQ](#)
- [Overview of Copilot in Fabric \(preview\)](#)
- [Query data in a KQL queryset](#)

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Copilot in Fabric consumption

Article • 06/17/2024

This page contains information on how the Fabric Copilot usage is billed and reported. Copilot usage is measured by the number of tokens processed. Tokens can be thought of as pieces of words. Approximately 1,000 tokens are about 750 words. Prices are calculated per 1,000 tokens, and input and output tokens are consumed at different rates.

ⓘ Note

The Copilot for Fabric billing will become effective on March 1st, 2024, as part of your existing Power BI Premium or Fabric Capacity.

Consumption rate

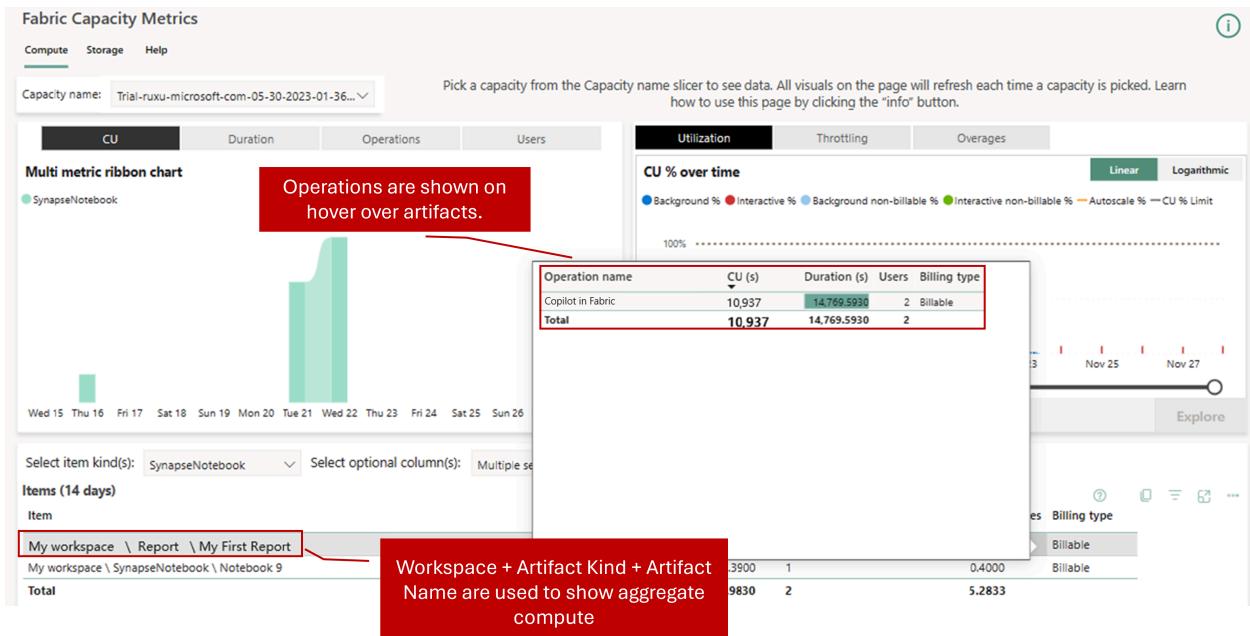
Requests to Copilot consume Fabric Capacity Units. This table defines how many capacity units (CU) are consumed when Copilot is used. For example, when user using [Copilot for Power BI](#), [Copilot for Data Factory](#), or [Copilot for Data Science and Data Engineering](#).

[+] Expand table

Operation in Metrics App	Description	Operation Unit of Measure	Consumption rate
Copilot in Fabric	The input prompt	Per 1,000 Tokens	400 CU seconds
Copilot in Fabric	The output completion	Per 1,000 Tokens	1,200 CU seconds

Monitor the usage

The [Fabric Capacity Metrics app](#) displays the total capacity usage for Copilot operations under the name "Copilot in Fabric." Additionally, Copilot users are able to view a summary of their billing charges for Copilot usage under the invoicing item "Copilot in Fabric."



Capacity utilization type

Fabric Copilots are classified as "background job" as the capacity utilization type to handle a higher volume of Copilot requests during peak hours.

Fabric is designed to provide lightning-fast performance by allowing operations to access more CU (Capacity Units) resources than are allocated to capacity. Fabric smooths or averages the CU usage of an "interactive job" over a minimum of 5 minutes, "background job" over a 24-hour period. According to the [Fabric throttling policy](#), the first phase of throttling begins when a capacity consumed all its available CU resources for the next 10 minutes.

For example, assume each Copilot request has 2,000 input tokens and 500 output tokens. The price for one Copilot request = $(2,000 * 400 + 500 * 1,200) / 1,000 = 1,400$ CU seconds = 23.33 CU minutes.

Copilot is a background job, each Copilot request (~24 CU minute job) consume only one CU minute of each hour of a capacity. For a customer on F64 who has $64 * 24$ CU Hours (1,536) in a day and each Copilot job consume $(24 \text{ CU mins} / 60 \text{ mins}) = 0.4$ CU Hours. Customers can run over 3.8k requests before they exhaust the capacity, but then everything shuts down.

Region mapping

Fabric Copilot is powered by Azure OpenAI large language models that are currently deployed to [limited data centers](#). However, customers can [enable cross-geo process tenant settings](#) to use Copilots by processing their data in another region where Azure

OpenAI Service is available. This region could be outside of the user's geographic region, compliance boundary, or national cloud instance. While performing region mapping, we prioritize data residency as the foremost consideration and attempt to map to a region within the same geographic area whenever feasible.

The cost of Fabric Capacity Units can vary depending on the region. Regardless of the consumption region where GPU capacity is utilized, customers are billed based on the Fabric Capacity Units pricing in their billing region. For example, if a customer's requests are mapped from `region 1` to `region 2`, with `region 1` being the billing region and `region 2` being the consumption region, the customer is charged based on the pricing in `region 1`.

Changes to Copilot in Fabric consumption rate

Consumption rates are subject to change at any time. Microsoft uses reasonable efforts to provide notice via email or through in-product notification. Changes shall be effective on the date stated in Microsoft's Release Notes or Microsoft Fabric Blog. If any change to a Copilot in Fabric Consumption Rate materially increases the Capacity Units (CU) required to use Copilot in Fabric, customers can use the cancellation options available for the chosen payment method.

Related content

- [Overview of Copilot in Fabric](#)
- [Copilot in Fabric: FAQ](#)
- [AI services in Fabric \(preview\)](#)

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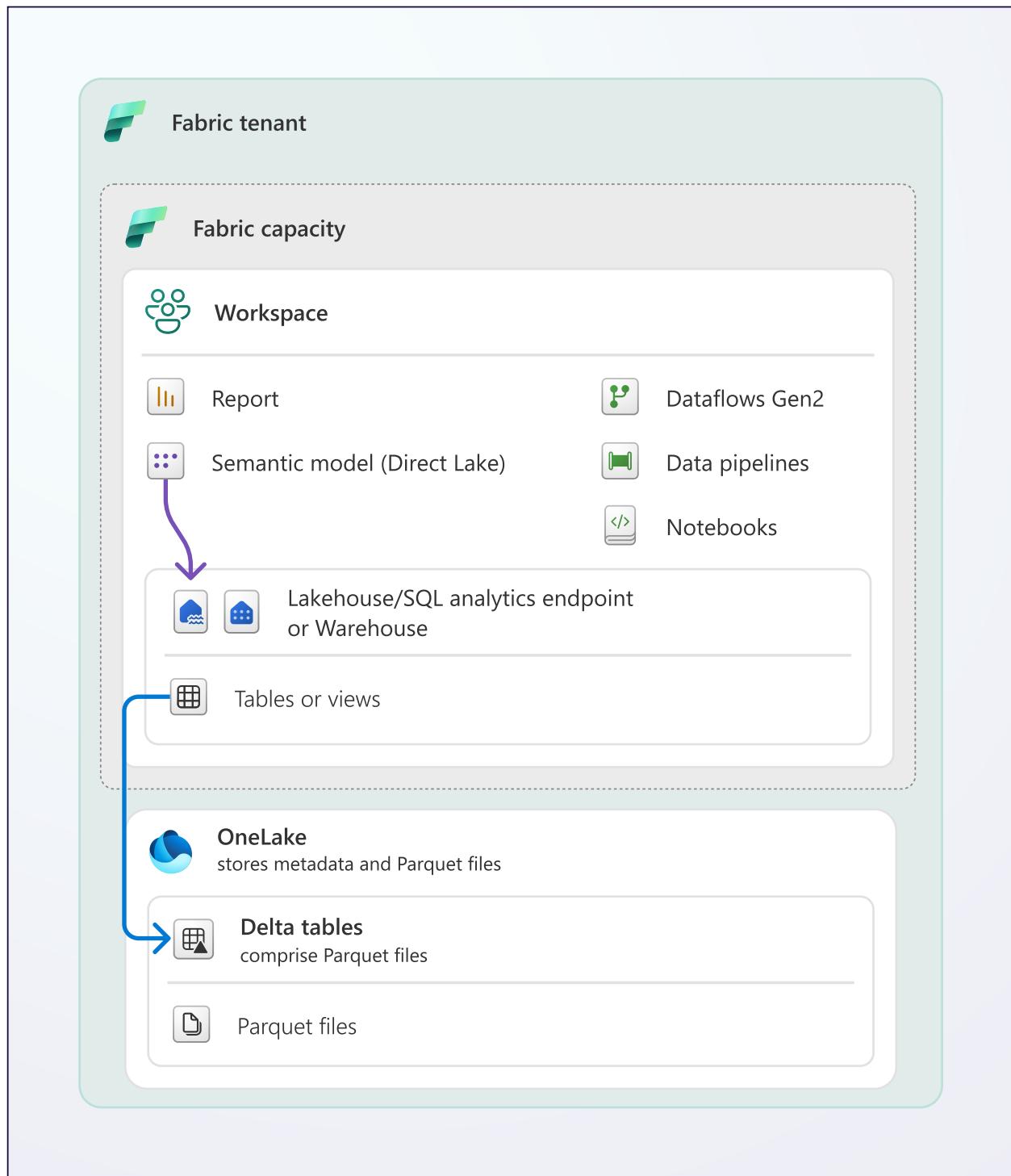
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Direct Lake overview

Article • 09/24/2024

Direct Lake is a storage mode option for tables in a Power BI semantic model that's stored in a Microsoft Fabric workspace. It's optimized for large volumes of data that can be quickly loaded into memory from [Delta tables](#), which store their data in Parquet files in [OneLake](#)—the single store for all analytics data. Once loaded into memory, the semantic model enables high performance queries. Direct Lake eliminates the slow and costly need to import data into the model.

You can use Direct Lake storage mode to connect to the tables or views of a single [Fabric lakehouse](#) or [Fabric warehouse](#). Both of these Fabric items and Direct Lake semantic models require a [Fabric capacity license](#).



In some ways, a Direct Lake semantic model is similar to an [Import semantic model](#). That's because model data is loaded into memory by the VertiPaq engine for fast query performance (except in the case of [DirectQuery fallback](#), which is explained later in this article).

However, a Direct Lake semantic model differs from an Import semantic model in an important way. That's because a refresh operation for a Direct Lake semantic model is conceptually different to a refresh operation for an Import semantic model. For a Direct Lake semantic model, a refresh involves a [framing](#) operation (described later in this article), which can take a few seconds to complete. It's a low-cost operation where the semantic model analyzes the metadata of the latest version of the Delta tables and is updated to reference the latest files in OneLake. In contrast, for an Import semantic

model, a refresh produces a copy of the data, which can take considerable time and consume significant data source and capacity resources (memory and CPU).

 **Note**

[Incremental refresh](#) for an Import semantic model can help to reduce refresh time and use of capacity resources.

When should you use Direct Lake storage mode?

The primary use case for a Direct Lake storage mode is typically for IT-driven analytics projects that leverage lake-centric architectures. In this scenario, you have—or expect to accumulate—large volumes of data in OneLake. The fast loading of that data into memory, frequent and fast refresh operations, efficient use of capacity resources, and fast query performance are all important for this use case.

 **Note**

Import and DirectQuery semantic models are still relevant in Fabric, and they're the right choice of semantic model for some scenarios. For example, Import storage mode often works well for a self-service analyst who needs the freedom and agility to act quickly, and without dependency on IT to add new data elements.

Also, [OneLake integration](#) automatically writes data for tables in Import storage mode to [Delta tables](#) in OneLake without involving any migration effort. By using this option, you can realize many of the benefits of Fabric that are made available to Import semantic model users, such as integration with lakehouses through shortcuts, SQL queries, notebooks, and more. We recommend that you consider this option as a quick way to reap the benefits of Fabric without necessarily or immediately re-designing your existing data warehouse and/or analytics system.

Direct Lake storage mode is also suitable for minimizing data latency to quickly make data available to business users. If your Delta tables are modified intermittently (and assuming you've already done data preparation in the data lake), you can depend on [automatic updates](#) to reframe in response to those modifications. In this case, queries sent to the semantic model will return the latest data. This capability works well in partnership with the [automatic page refresh](#) feature of Power BI reports.

Keep in mind that Direct Lake depends on data preparation being done in the data lake. Data preparation can be done by using various tools, such as Spark jobs for Fabric lakehouses, T-SQL DML statements for Fabric warehouses, dataflows, pipelines, and others. This approach helps ensure data preparation logic is performed as low as possible in the architecture to maximize reusability. However, if the semantic model author doesn't have the ability to modify the source item, for example, in the case of a self-service analyst who might not have write permissions on a lakehouse that is managed by IT, then Import storage mode might be a better choice. That's because it supports data preparation by using Power Query, which is defined as part of semantic model.

Be sure to factor in your current [Fabric capacity license](#) and the [Fabric capacity guardrails](#) when you consider Direct Lake storage mode. Also, factor in the [considerations and limitations](#), which are described later in this article.

💡 Tip

We recommend that you produce a [prototype](#)—or proof of concept (POC)—to determine whether a Direct Lake semantic model is the right solution, and to mitigate risk.

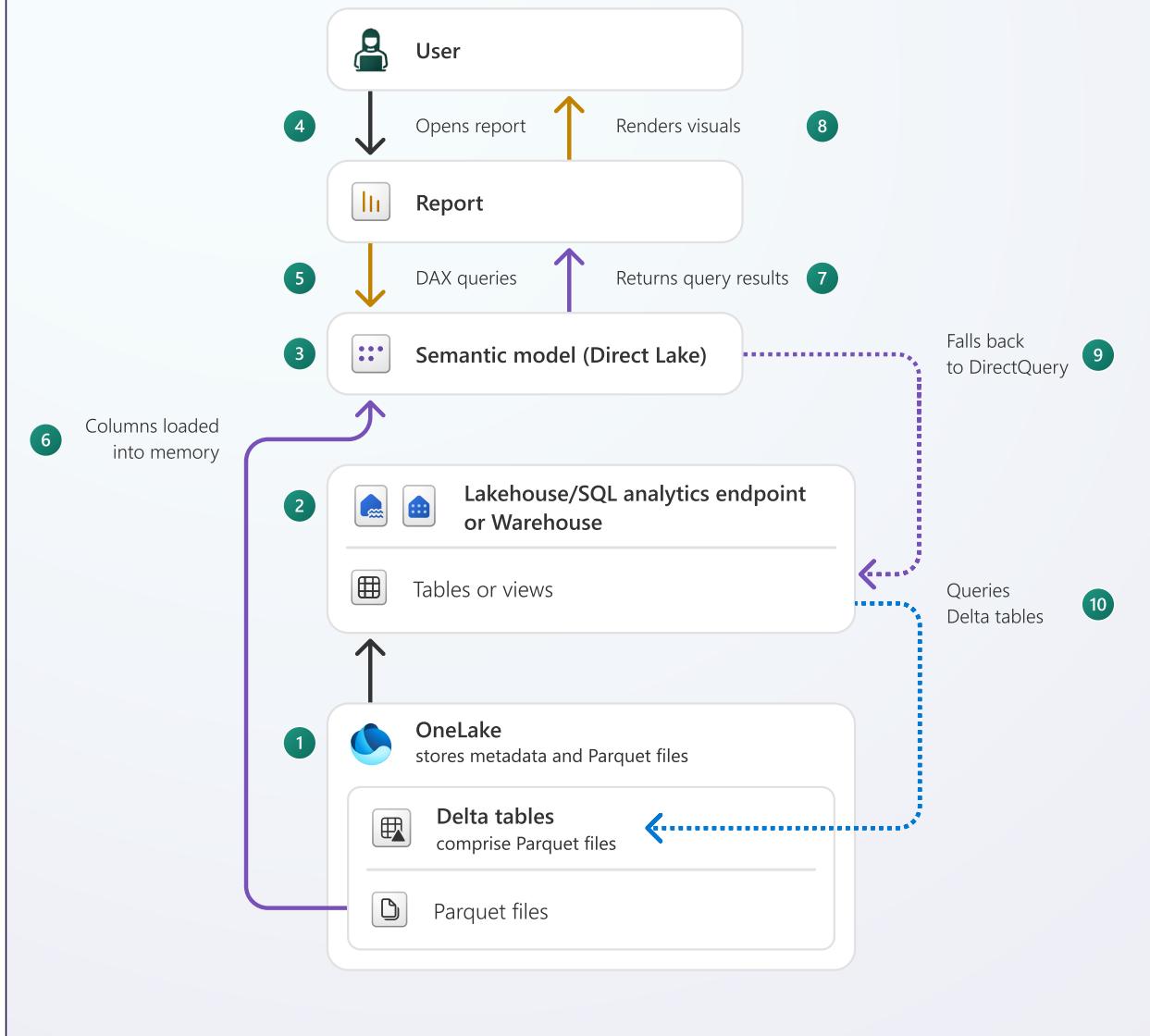
How Direct Lake works

Typically, queries sent to a Direct Lake semantic model are handled from an in-memory cache of the columns sourced from Delta tables. The underlying storage for a Delta table is one or more Parquet files in OneLake. Parquet files organize data by columns rather than rows. Semantic models load entire columns from Delta tables into memory as they're required by queries.

A Direct Lake semantic model might also use *DirectQuery fallback*, which involves seamlessly switching to [DirectQuery mode](#). DirectQuery fallback retrieves data directly from the [SQL analytics endpoint of the lakehouse](#) or the warehouse. For example, fallback might occur when a Delta table contains more rows of data than supported by your Fabric capacity ([described later](#) in this article). In this case, a DirectQuery operation sends a query to the SQL analytics endpoint. Fallback operations might result in slower query performance.

The following diagram shows how Direct Lake works by using the scenario of a user who opens a Power BI report.

Direct Lake semantic model



The diagram depicts the following user actions, processes, and features.

[Expand table](#)

Item	Description
1	OneLake is a data lake that stores analytics data in Parquet format. This file format is optimized for storing data for Direct Lake semantic models.
2	A Fabric lakehouse or Fabric warehouse exists in a workspace that's on Fabric capacity. The lakehouse has a SQL analytics endpoint, which provides a SQL-based experience for querying. Tables (or views) provide a means to query the Delta tables in OneLake by using Transact-SQL (T-SQL).
3	A Direct Lake semantic model exists in a Fabric workspace. It connects to tables or views in either the lakehouse or warehouse.

Item	Description
4	A user opens a Power BI report.
5	The Power BI report sends Data Analysis Expressions (DAX) queries to the Direct Lake semantic model.
6	When possible (and necessary), the semantic model loads columns into memory directly from the Parquet files stored in OneLake. Queries achieve in-memory performance, which is very fast.
7	The semantic model returns query results.
8	The Power BI report renders the visuals.
9	In certain circumstances, such as when the semantic model exceeds the guardrails of the capacity, semantic model queries automatically fall back to DirectQuery mode. In this mode, queries are sent to the SQL analytics endpoint of the lakehouse or warehouse.
10	DirectQuery queries sent to the SQL analytics endpoint in turn query the Delta tables in OneLake. For this reason, query performance might be slower than in-memory queries.

The following sections describe Direct Lake concepts and features, including column loading, framing, automatic updates, and DirectQuery fallback.

Column loading (transcoding)

Direct Lake semantic models only load data from OneLake as and when columns are queried for the first time. The process of loading data on-demand from OneLake is known as *transcoding*.

When the semantic model receives a DAX (or Multidimensional Expressions—MDX) query, it first determines what columns are needed to produce a query result. Columns needed include any columns that are directly used by the query, and also columns required by relationships and measures. Typically, the number of columns needed to produce a query result is much smaller than the number of columns defined in the semantic model.

Once it's understood which columns are needed, the semantic model determines which columns are already in memory. If any columns needed for the query aren't in memory, the semantic model loads all data for those columns from OneLake. Loading column data is typically a very fast operation, however it can depend on factors such as the cardinality of data stored in the columns.

Columns loaded into memory are then *resident* in memory. Future queries that involve only resident columns don't need to load any more columns into memory.

A column remains resident until there's reason for it to be removed (evicted) from memory. Reasons that columns might get removed include:

- The model or table has been refreshed (see [Framing](#) in the next section).
- No query has used the column for some time.
- Other memory management reasons, including memory pressure in the capacity due to other, concurrent operations.

Your choice of Fabric SKU determines the maximum available memory for each Direct Lake semantic model on the capacity. For more information about resource guardrails and maximum memory limits, see [Fabric capacity guardrails and limitations](#) later in this article.

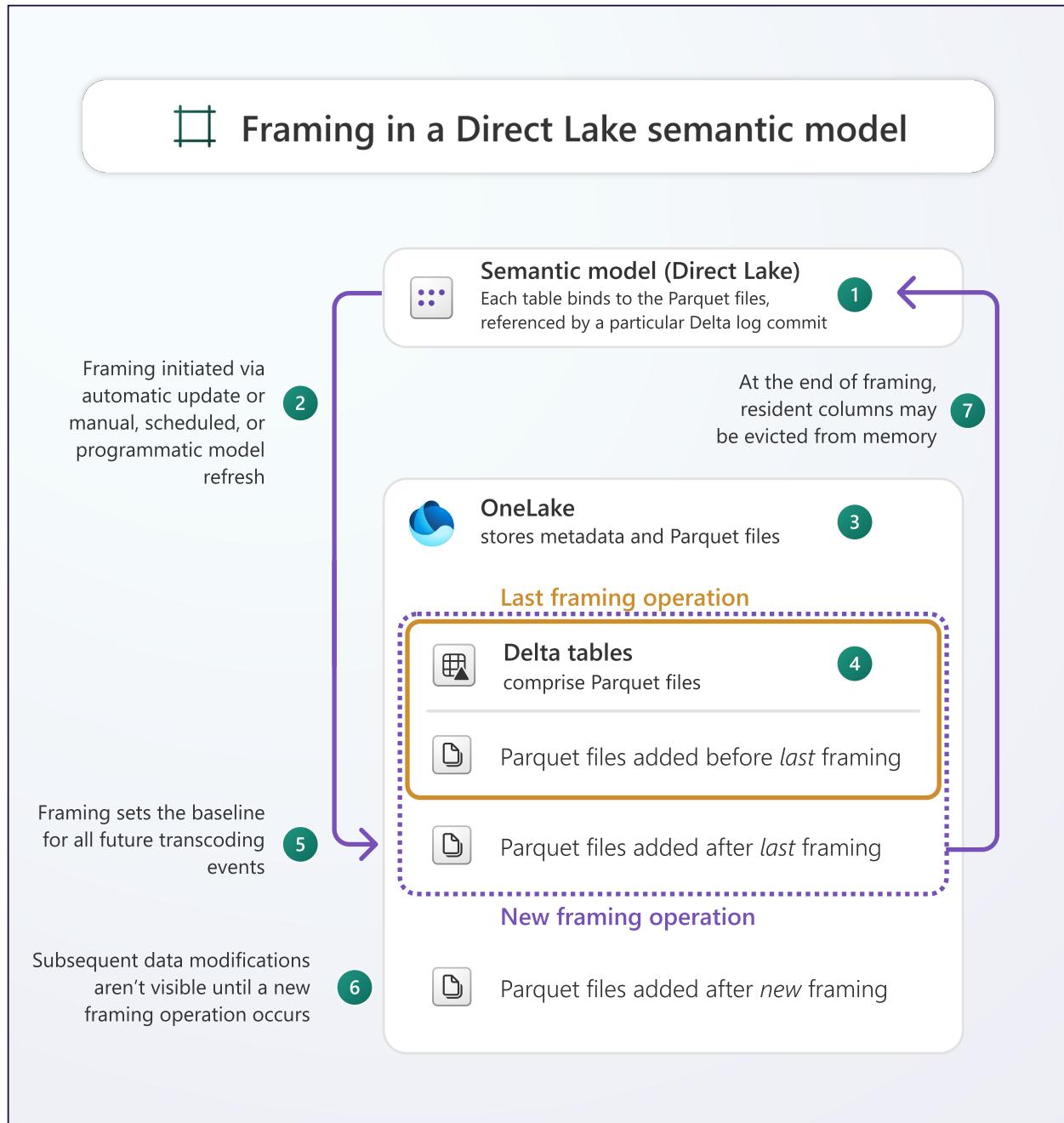
Framing

Framing provides model owners with point-in-time control over what data is loaded into the semantic model. Framing is a Direct Lake operation that's triggered by a refresh of a semantic model, and in most cases takes only a few seconds to complete. That's because it's a low-cost operation where the semantic model analyzes the metadata of the latest version of the Delta Lake tables and is updated to reference the latest Parquet files in OneLake.

When framing occurs, resident columns might be evicted from memory and the point in time of the refresh becomes the new baseline for all future transcoding events. From this point, Direct Lake queries only consider data in the Delta tables as of the time of the most recent framing operation. For that reason, Direct Lake tables are queried to return data based on the state of the Delta table *at the point of the most recent framing operation*. That time isn't necessarily the latest state of the Delta tables.

The following diagram shows how Direct Lake framing operations work.

Framing in a Direct Lake semantic model



The diagram depicts the following processes and features.

 Expand table

Item	Description
1	A semantic model exists in a Fabric workspace.
2	Framing operations take place periodically, and they set the baseline for all future transcoding events. Framing operations can happen automatically, manually, on schedule, or programmatically.
3	OneLake stores metadata and Parquet files, which are represented as Delta tables.
4	The last framing operation includes Parquet files related to the Delta tables, and specifically the Parquet files that were added before the <i>last</i> framing operation.

Item	Description
5	A later framing operation includes Parquet files added after the <i>last</i> framing operation.
6	Resident columns in the Direct Lake semantic model might be evicted from memory, and the point in time of the refresh becomes the new baseline for all future transcoding events.
7	Subsequent data modifications, represented by new Parquet files, aren't visible until the next framing operation occurs.

It's not always desirable to have data representing the latest state of any Delta table when a transcoding operation takes place. Consider that framing can help you provide consistent query results in environments where data in Delta tables is transient. Data can be transient for several reasons, such as when long-running extract, transform, and load (ETL) processes occur.

Refresh for a Direct Lake semantic model can be done manually, automatically, or programmatically. For more information, see [Refresh Direct Lake semantic models](#).

For more information about Delta table versioning and framing, see [Understand storage for Direct Lake semantic models](#).

Automatic updates

There's a semantic model-level setting to automatically update Direct Lake tables. It's enabled by default. It ensures that data changes in OneLake are automatically reflected in the Direct Lake semantic model. You should disable automatic updates when you want to control data changes by framing, which was explained in the previous section. For more information, see [Manage Direct Lake semantic models](#).

Tip

You can set up [automatic page refresh](#) in your Power BI reports. It's a feature that automatically refreshes a specific report page providing that the report connects to a Direct Lake semantic model (or other types of semantic model).

DirectQuery fallback

A query sent to a Direct Lake semantic model can fall back to [DirectQuery mode](#). In this case, it retrieves data directly from the SQL analytics endpoint of the lakehouse or

warehouse. Such queries always return the latest data because they're not constrained to the point in time of the last framing operation.

A query *always* falls back when the semantic model queries a view in the SQL analytics endpoint, or a table in the SQL analytics endpoint that [enforces row-level security \(RLS\)](#).

Also, a query might fall back when the semantic model [exceeds the guardrails of the capacity](#).

ⓘ Important

If possible, you should always design your solution—or size your capacity—to avoid DirectQuery fallback. That's because it might result in slower query performance.

You can control fallback of your Direct Lake semantic models by setting its *DirectLakeBehavior* property. For more information, see [Set the Direct Lake behavior property](#).

Fabric capacity guardrails and limitations

Direct Lake semantic models require a [Fabric capacity license](#). Also, there are capacity guardrails and limitations that apply to your Fabric capacity subscription (SKU), as presented in the following table.

ⓘ Important

The first column in the following table also includes Power BI Premium capacity subscriptions (P SKUs). Be aware that Microsoft is consolidating purchase options and retiring the Power BI Premium per capacity SKUs. New and existing customers should consider purchasing Fabric capacity subscriptions (F SKUs) instead.

For more information, see [Important update coming to Power BI Premium licensing](#) and [Power BI Premium](#).

[+] Expand table

Fabric SKU	Parquet files per table	Row groups per table	Rows per table (millions)	Max model size on disk/OneLake (GB)	Max memory (GB) ¹
F2	1,000	1,000	300	10	3
F4	1,000	1,000	300	10	3
F8	1,000	1,000	300	10	3
F16	1,000	1,000	300	20	5
F32	1,000	1,000	300	40	10
F64/FT1/P1	5,000	5,000	1,500	Unlimited	25
F128/P2	5,000	5,000	3,000	Unlimited	50
F256/P3	5,000	5,000	6,000	Unlimited	100
F512/P4	10,000	10,000	12,000	Unlimited	200
F1024/P5	10,000	10,000	24,000	Unlimited	400
F2048	10,000	10,000	24,000	Unlimited	400

¹ For Direct Lake semantic models, *Max Memory* represents the upper memory resource limit for how much data can be paged in. For this reason, it's not a guardrail because exceeding it doesn't result in a fallback to DirectQuery mode; however, it can have a performance impact if the amount of data is large enough to cause excessive paging in and out of the model data from the OneLake data.

If exceeded, the *Max model size on disk/OneLake* will cause all queries to the semantic model to fall back to DirectQuery mode. All other guardrails presented in the table are evaluated per query. It's therefore important that you [optimize your Delta tables](#) and [Direct Lake semantic model](#) to avoid having to unnecessarily scale up to a higher Fabric SKU (resulting in increased cost).

Additionally, *Capacity unit* and *Max memory per query limits* apply to Direct Lake semantic models. For more information, see [Capacities and SKUs](#).

Considerations and limitations

Direct Lake semantic models present some considerations and limitations.

Note

The capabilities and features of Direct Lake semantic models are evolving. Be sure to check back periodically to review the latest list of considerations and limitations.

- When a Direct Lake semantic model table connects to a table in the SQL analytics endpoint that enforces row-level security (RLS), queries that involve that model table will always fall back to DirectQuery mode. Query performance might be slower.
- When a Direct Lake semantic model table connects to a view in the SQL analytics endpoint, queries that involve that model table will always fall back to DirectQuery mode. Query performance might be slower.
- Composite modeling isn't supported. That means Direct Lake semantic model tables can't be mixed with tables in other storage modes, such as Import, DirectQuery, or Dual (except for special cases, including [calculation groups](#), [what-if parameters](#), and [field parameters](#)).
- Calculated columns and calculated tables aren't supported (calculation groups, what-if parameters, and field parameters, which implicitly create calculated tables, are supported).
- Direct Lake storage mode tables don't support complex Delta table column types. Binary and GUID semantic types are also unsupported. You must convert these data types into strings or other supported data types.
- Table relationships require the data types of related columns to match.
- One-side columns of relationships must contain unique values. Queries will fail if duplicate values are detected in a one-side column.
- Columns with a **datetime** data type can't be used to create relationships.
- The length of string column values is limited to 32,764 Unicode characters.
- The floating point value *Nan* (not a number) isn't supported.
- Embedding scenarios that use the [For your customer](#) usage scenario aren't supported.
- [Publish to web from Power BI](#) is only supported when using a [fixed identity for the Direct Lake semantic model](#).
- In the [web modeling experience](#), validation is limited for Direct Lake semantic models. User selections are assumed to be correct, and no queries are issued to validate cardinality or cross filter selections for relationships, or for the selected date column in a marked date table.
- In the Fabric portal, the *Direct Lake* tab in the refresh history lists only Direct Lake-related refresh failures. Successful refresh (framing) operations aren't listed.
- Your Fabric SKU determines the maximum available memory per Direct Lake semantic model for the capacity. When the limit is exceeded, queries to the semantic model might be slower due to excessive paging in and out of the model data.

Comparison to other storage modes

The following table compares Direct Lake storage mode to Import and DirectQuery storage modes.

[Expand table](#)

Capability	Direct Lake	Import	DirectQuery
Licensing	Fabric capacity subscription (SKUs) only	Any Fabric or Power BI license (including Microsoft Fabric Free licenses)	Any Fabric or Power BI license (including Microsoft Fabric Free licenses)
Data source	Only lakehouse or warehouse tables (or views)	Any connector	Any connector that supports DirectQuery mode
Connect to SQL analytics endpoint views	Yes – but will automatically fall back to DirectQuery mode	Yes	Yes
Composite models	No ¹	Yes – can combine with DirectQuery or Dual storage mode tables	Yes – can combine with Import or Dual storage mode tables
Single sign-on (SSO)	Yes	Not applicable	Yes
Calculated tables	No – except calculation groups , what-if parameters , and field parameters , which implicitly create calculated tables	Yes	No – calculated tables use Import storage mode even when they refer to other tables in DirectQuery mode
Calculated columns	No	Yes	Yes
Hybrid tables	No	Yes	Yes
Model table partitions	No – however partitioning can be done at the Delta table level	Yes – either automatically created by incremental refresh, or manually created by using the XMLA endpoint	No

Capability	Direct Lake	Import	DirectQuery
User-defined aggregations	No	Yes	Yes
SQL analytics endpoint object-level security or column-level security	Yes – but queries might produce errors when permission is denied	Yes – but must duplicate permissions with semantic model object-level security	Yes – but queries might produce errors when permission is denied
SQL analytics endpoint row-level security (RLS)	Yes – but queries will fall back to DirectQuery mode	Yes – but must duplicate permissions with semantic model RLS	Yes
Semantic model row-level security (RLS)	Yes – but it's strongly recommended to use a fixed identity cloud connection	Yes	Yes
Semantic model object-level security (OLS)	Yes	Yes	Yes
Large data volumes without refresh requirement	Yes	Less suited – a larger capacity size might be required for querying and refreshing	Yes
Reduce data latency	Yes – when automatic updates is enabled, or programmatic reframing; however, data preparation must be done upstream first	No	Yes

¹ You can't combine Direct Lake storage mode tables with DirectQuery or Dual storage mode tables *in the same semantic model*. However, you can use Power BI Desktop to create a composite model on a Direct Lake semantic model and then extend it with new tables (by using Import, DirectQuery, or Dual storage mode) or calculations. For more information, see [Build a composite model on a semantic model](#).

Related content

- [Develop Direct Lake semantic models](#)
- [Manage Direct Lake semantic models](#)

- Understand storage for Direct Lake semantic models
 - Create a lakehouse for Direct Lake
 - Analyze query processing for Direct Lake semantic models
-

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Develop Direct Lake semantic models

Article • 10/15/2024

This article describes design topics relevant to developing Direct Lake semantic models.

Create the model

You use the Fabric portal to create a Direct Lake semantic model in a workspace. It's a simple process that involves selecting which tables from a single lakehouse or warehouse to add to the semantic model.

You can then use the [web modeling experience](#) to further develop the semantic model. This experience allows you to create relationships between tables, create measures and calculation groups, mark date tables, and set properties for model and its objects (like column formats). You can also set up model [row-level security \(RLS\)](#) by defining roles and rules, and by adding members (Microsoft Entra user accounts or security groups) to those roles.

Alternatively, you can continue the development of your model by using an XMLA-compliant tool, like SQL Server Management Studio (SSMS) (version 19.1 or later) or open-source, community tools. For more information, see [Model write support with the XMLA endpoint](#) later in this article.

Tip

You can learn how to create a lakehouse, a Delta table, and a basic Direct Lake semantic model by completing [this tutorial](#).

Model tables

Model tables are based on either a table or a view of the SQL analytics endpoint. However, avoid using views whenever possible. That's because queries to a model table based on a view will always [fall back to DirectQuery mode](#), which might result in slower query performance.

Tables should include columns for filtering, grouping, sorting, and summarizing, in addition to columns that support model relationships. While unnecessary columns don't affect semantic model query performance (because they won't be loaded into memory), they result in a larger storage size in OneLake and require more compute resources to load and maintain.

Warning

Using columns that apply [dynamic data masking \(DDM\)](#) in Direct Lake semantic models is not supported.

To learn how to select which tables to include in your Direct Lake semantic model, see [Edit tables for Direct Lake semantic models](#).

For more information about columns to include in your semantic model tables, see [Understand storage for Direct Lake semantic models](#).

Enforce data-access rules

When you have requirements to deliver subsets of model data to different users, you can enforce data-access rules. You enforce rules by setting up object-level security (OLS) and/or row-level security (RLS) in the [SQL analytics endpoint](#) or in the semantic model.

Note

The topic of *enforcing data-access rules* is different, yet related, to *setting permissions* for content consumers, creators, and users who will manage the semantic model (and related Fabric items). For more information about setting permissions, see [Manage Direct Lake semantic models](#).

Object-level security (OLS)

OLS involves restricting access to discover and query objects or columns. For example, you might use OLS to limit the users who can access the `Salary` column from the `Employee` table.

For a SQL analytics endpoint, you can set up OLS to [control access to the endpoint objects](#), such as tables or views, and column-level security (CLS) to [control access to endpoint table columns](#).

For a semantic model, you can set up OLS to [control access to model tables or columns](#). You need to use open-source, community tools like Tabular Editor to set up OLS.

Row-level security (RLS)

RLS involves restricting access to subsets of data in tables. For example, you might use RLS to ensure that salespeople can only access sales data for customers in their sales region.

For a SQL analytics endpoint, you can set up RLS to [control access to rows in an endpoint table](#).

Important

When a query uses any table that has RLS in the SQL analytics endpoint, it will fall back to DirectQuery mode. Query performance might be slower.

For a semantic model, you can set up RLS to [control access to rows in model tables](#). RLS can be set up in the [web modeling experience](#) or by using a third-party tool.

How queries are evaluated

The [reason to develop Direct Lake semantic models](#) is to achieve high performance queries over large volumes of data in OneLake. Therefore, you should strive to design a solution that maximizes the chances of in-memory querying.

The following steps approximate how queries are evaluated (and whether they fail). The benefits of Direct Lake storage mode are only possible when the fifth step is achieved.

1. If the query contains any table or column that's restricted by semantic model OLS, an error result is returned (report visual will fail to render).
2. If the query contains any column that's restricted by SQL analytics endpoint CLS (or the table is denied), an error result is returned (report visual will fail to render).
 - a. If the cloud connection uses SSO (default), CLS is determined by the access level of the report consumer.
 - b. If the cloud connection uses a fixed identity, CLS is determined by the access level of the fixed identity.
3. If the query contains any table in the SQL analytics endpoint that enforces RLS or a view is used, the query falls back to DirectQuery mode.
 - a. If the cloud connection uses SSO (default), RLS is determined by the access level of the report consumer.
 - b. If the cloud connection uses a fixed identity, RLS is determined by the access level of the fixed identity.
4. If the query [exceeds the guardrails of the capacity](#), it falls back to DirectQuery mode.

5. Otherwise, the query is satisfied from the in-memory cache. Column data is [loaded into memory](#) as and when it's required.

Source item permissions

The account used to access data is one of the following.

- If the cloud connection uses SSO (default), it is the report consumer.
- If the cloud connection uses a fixed identity, it is the fixed identity.

The account must at least have *Read* and *ReadData* permissions on the source item (lakehouse or warehouse). Item permissions can be inherited from workspace roles or assigned explicitly for the item as described in [this article](#).

Assuming this requirement is met, Fabric grants the necessary access to the semantic model to read the Delta tables and associated Parquet files (to load column data into memory) and data-access rules can be applied.

Data-access rule options

You can set up data-access rules in:

- The semantic model only.
- The SQL analytics endpoint only.
- In both the semantic model and the SQL analytics endpoint.

Rules in the semantic model

If you must enforce data-access rules, you should do so in the semantic model whenever viable. That's because RLS enforced by the semantic model is achieved by filtering the in-memory cache of data to achieve high performance queries.

It's also a suitable approach when report consumers aren't granted permission to query the lakehouse or warehouse.

In either case, it's strongly recommended that the cloud connection uses a fixed identity instead of SSO. SSO would imply that end users can access the SQL analytics endpoint directly and might therefore bypass security rules in the semantic model.

Important

Semantic model item permissions can be [set explicitly](#) via [Power BI apps](#), or [acquired implicitly](#) via workspace roles.

Notably, semantic model data-access rules are not enforced for users who have *Write* permission on the semantic model. Conversely, data-access rules do apply to users who are assigned to the *Viewer* workspace role. However, users assigned to the *Admin*, *Member*, or *Contributor* workspace role implicitly have *Write* permission on the semantic model and so data-access rules are not enforced. For more information, see [Roles in workspaces](#).

Rules in the SQL analytics endpoint

It's appropriate to enforce data-access rules in the SQL analytics endpoint when the semantic model [cloud connection](#) uses [single sign-on \(SSO\)](#). That's because the identity of the user is delegated to query the SQL analytics endpoint, ensuring that queries return only the data the user is allowed to access. It's also appropriate to enforce data-access rules at this level when users will query the SQL analytics endpoint directly for other workloads (for example, to create a Power BI paginated report, or export data).

Notably, however, a semantic model query will fall back to DirectQuery mode when it includes any table that enforces RLS in the SQL analytics endpoint. Consequently, the semantic model might never cache data into memory to achieve high performance queries.

Rules at both layers

Data-access rules can be enforced at both layers. However, this approach involves extra complexity and management overhead. In this case, it's strongly recommended that the cloud connection uses a fixed identity instead of SSO.

Comparison of data-access rule options

The following table compares data data-access setup options.

[] Expand table

Apply data-access rules to	Comment
Semantic model only	Use this option when users aren't granted item permissions to query the lakehouse or warehouse. Set up the cloud connection to use a fixed identity. High query performance can be achieved from the in-memory cache.

Apply data-access rules to	Comment
SQL analytics endpoint only	Use this option when users need to access data from either the warehouse or the semantic model, and with consistent data-access rules. Ensure SSO is enabled for the cloud connection. Query performance might be slow.
Lakehouse or warehouse <i>and</i> semantic model	This option involves extra management overhead. Set up the cloud connection to use a fixed identity.

Recommended practices for enforcing data-access rules

Here are recommended practices related to enforcing data-access rules:

- If different users must be restricted to subsets of data, whenever viable, enforce RLS only at the semantic model layer. That way, users will benefit from high performance in-memory queries. In this case, it's strongly recommended that the cloud connection uses a fixed identity instead of SSO.
- If possible, avoid enforcing OLS and CLS at either layer because it results in errors in report visuals. Errors can lead to confusion or concern for users. For summarizable columns, consider creating measures that return BLANK in certain conditions instead of CLS (if possible).

Model write support with the XMLA endpoint

Direct Lake semantic models support write operations with the XMLA endpoint by using tools such as SSMS (19.1 or later), and open-source, community tools.

Tip

For more information about using third-party tools to develop, manage, or optimize semantic models, see the [advanced data model management](#) usage scenario.

Before you can perform write operations, the XMLA read-write option must be enabled for the capacity. For more information, see [Enable XMLA read-write](#).

Model write operations with the XMLA endpoint support:

- Customizing, merging, scripting, debugging, and testing Direct Lake model metadata.

- Source and version control, continuous integration and continuous deployment (CI/CD) with Azure DevOps and GitHub. For more information, see [Content lifecycle management](#).
- Automation tasks like semantic model refresh, and applying changes to Direct Lake semantic models by using PowerShell and the REST APIs.

When changing a semantic model using XMLA, you must update the *ChangedProperties* and *PBI_RemovedChildren* collection for the changed object to include any modified or removed properties. If you don't perform that update, Power BI modeling tools might overwrite any changes the next time the schema is synchronized.

The supported models for changing a semantic model using XMLA are the following:

- Table/Column rename (*ChangeProperty* = name)
- Remove table (add table to *PBI_RemovedChildren* annotation in the query expression)

Important

Direct Lake tables created by using XMLA applications will initially be in an unprocessed state until the application sends a refresh command. Queries that involve unprocessed tables will always fall back to DirectQuery mode. So, when you create a new semantic model, be sure to refresh the model to process its tables.

For more information, see [Semantic model connectivity with the XMLA endpoint](#).

Direct Lake model metadata

When you connect to a Direct Lake semantic model with the XMLA endpoint, the metadata looks like that of any other model. However, Direct Lake models show the following differences:

- The `compatibilityLevel` property of the database object is 1604 (or higher).
- The `mode` property of Direct Lake partitions is set to `directLake`.
- Direct Lake partitions use shared expressions to define data sources. The expression points to the SQL analytics endpoint of the lakehouse or warehouse. Direct Lake uses the SQL analytics endpoint to discover schema and security information, but it loads the data directly from OneLake (unless it [falls back to DirectQuery mode](#) for any reason).

Post-publication tasks

After you publish a Direct Lake semantic model, you should complete some setup tasks. For more information, see [Manage Direct Lake semantic models](#).

Unsupported features

The following model features aren't supported by Direct Lake semantic models:

- Calculated tables
- Calculated columns
- Hybrid tables
- User-defined aggregations
- Composite models, in that you can't combine Direct Lake storage mode tables with DirectQuery or Dual storage mode tables *in the same model*. However, it's technically possible to use Power BI Desktop to create a live connection to a Direct Lake semantic model and then extend it with new tables (using Import, DirectQuery, or Dual storage mode) or calculations. For more information, see [Build a composite model on a semantic model](#).
- Columns based on SQL analytics endpoint columns that apply dynamic data masking.

Related content

- [Direct Lake overview](#)
- [Manage Direct Lake semantic models](#)
- [Understand storage for Direct Lake semantic models](#)
- [Create a lakehouse for Direct Lake](#)
- [Edit tables for Direct Lake semantic models](#)
- [OneLake integration for semantic models](#)

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Manage Direct Lake semantic models

Article • 09/24/2024

This article describes design topics relevant to managing Direct Lake semantic models.

Post-publication tasks

After you first publish a Direct Lake semantic model ready for reporting, you should immediately complete some post-publication tasks. These tasks can also be adjusted at any time during the lifecycle of the semantic model.

- [Set up the cloud connection](#)
- [Manage security role membership](#)
- [Set Fabric item permissions](#)
- [Set up scheduled refresh](#)

Optionally, you can also set up [data discovery](#) to allow report creators to read metadata, helping them to discover data in the [OneLake data hub](#) and request access to it. You can also [endorse](#) (certified or promoted) the semantic model to communicate that it represents quality data fit for use.

Set up the cloud connection

A Direct Lake semantic model uses a cloud connection to connect to the SQL analytics endpoint. It enables access to source data, which is either the Parquet files in OneLake (Direct Lake storage mode, which involves loading column data into memory) or the SQL analytics endpoint (when queries [fall back](#) to DirectQuery mode).

Default cloud connection

When you create a Direct Lake semantic model, the default cloud connection is used. It leverages single sign-on (SSO), which means that the identity that queries the semantic model (often a report user) is used to query the SQL analytics endpoint data.

Sharable cloud connection

Optionally, you can create a sharable cloud connection (SCC) so that connections to the data source can be made with a fixed identity. It can help enterprise customers protect

their organizational data stores. The IT department can manage credentials, create SCCs, and share them with the intended creators for centralized access management.

To set up a fixed identity, see [Specify a fixed identity for a Direct Lake semantic model](#).

Authentication

The fixed identity can authenticate either by using *OAuth 2.0* or *Service principal*.

① Note

Only Microsoft Entra authentication is supported. Therefore, *Basic* authentication isn't supported for Direct Lake semantic models.

OAuth 2.0

When you use OAuth 2.0, you can authenticate with a Microsoft Entra user account. The user account must have permission to query the SQL analytics endpoint tables and views, and schema metadata.

Using a specific user account isn't a recommended practice. That's because semantic model queries will fail should the password change or the user account be deleted (like when an employee leaves the organization).

Service principal

Authenticating with a service principal is the recommended practice because it's not dependent on a specific user account. The security principal must have permission to query the SQL analytics endpoint tables and views, and schema metadata.

For continuity, the service principal credentials can be managed by secret/certificate rotation.

① Note

The Fabric tenant settings must allow service principals, and the service principal must belong to a declared security group.

Single sign-on

When you create a sharable cloud connection, the *Single Sign-On* checkbox is unchecked by default. That's the correct setup when using a fixed identity.

You can enable SSO when you want the identity that queries the semantic model to also query the SQL analytics endpoint. In this configuration, the Direct Lake semantic model will use the fixed identity to refresh the model and the user identity to query data.

When using a fixed identity, it's common practice to disable SSO so that the fixed identity is used for both refreshes and queries, but there's no technical requirement to do so.

Recommended practices for cloud connections

Here are recommended practices related to cloud connections:

- When all users can access the data (and have permission to do so), there's no need to create a shared cloud connection. Instead, the default cloud connection settings can be used. In this case, the identity of the user who queries the model will be used should queries fall back to DirectQuery mode.
- Create a shared cloud connection when you want to use a fixed identity to query source data. That could be because the users who query the semantic model aren't granted permission to read the lakehouse or warehouse. This approach is especially relevant when the semantic model enforces RLS.
- If you use a fixed identity, use the *Service principal* option because it's more secure and reliable. That's because it doesn't rely on a single user account or their permissions, and it won't require maintenance (and disruption) should they change their password or leave the organization.
- If different users must be restricted to access only subsets of data, if viable, enforce RLS at the semantic model layer only. That way, users will benefit from high performance in-memory queries.
- If possible, avoid OLS and CLS because it results in errors in report visuals. Errors can create confusion or concern for users. For summarizable columns, consider creating measures that return BLANK in certain conditions instead of CLS (if possible).

Manage security role membership

If your Direct Lake semantic model enforces [row-level security \(RLS\)](#), you might need to manage the members that are assigned to the security roles. For more information, see [Manage security on your model](#).

Set Fabric item permissions

Direct Lake semantic models adhere to a layered security model. They perform permission checks via the SQL analytics endpoint to determine whether the identity attempting to access the data has the necessary data access permissions.

You must grant permissions to users so that they can use or manage the Direct Lake semantic model. In short, report consumers need *Read* permission, and report creators need *Build* permission. Semantic model permissions can be [assigned directly](#) or [acquired implicitly via workspace roles](#). To manage the semantic model settings (for refresh and other configurations), you must be the [semantic model owner](#).

Depending on the cloud connection set up, and whether users need to query the lakehouse or the warehouse SQL analytics endpoint, you might need to grant other permissions (described in the table in this section).

Note

Notably, users don't ever require permission to read data in OneLake. That's because Fabric grants the necessary permissions to the semantic model to read the Delta tables and associated Parquet files (to [load column data](#) into memory). The semantic model also has the necessary permissions to periodically read the SQL analytics endpoint to perform permission checks to determine what data the querying user (or fixed identity) can access.

Consider the following scenarios and permission requirements.

 [Expand table](#)

Scenario	Required permissions	Comments
Users can view reports	<ul style="list-style-type: none">Grant <i>Read</i> permission for the reports and <i>Read</i> permission for the semantic model.If the cloud connection uses SSO, grant at least <i>Read</i> permission for the lakehouse or warehouse.	Reports don't need to belong to the same workspace as the semantic model. For more information, see Strategy for read-only consumers .
Users can create reports	<ul style="list-style-type: none">Grant <i>Build</i> permission for the semantic model.If the cloud connection uses SSO, grant at least	For more information, see Strategy for content creators .

Scenario	Required permissions	Comments
	<i>Read</i> permission for the lakehouse or warehouse.	
Users can query the semantic model but are denied querying the lakehouse or SQL analytics endpoint	• Don't grant any permission for the lakehouse or warehouse.	Only suitable when the cloud connection uses a fixed identity.
Users can query the semantic model and the SQL analytics endpoint but are denied querying the lakehouse	• Grant <i>Read</i> and <i>ReadData</i> permissions for the lakehouse or warehouse.	Important: Queries sent to the SQL analytics endpoint will bypass data access permissions enforced by the semantic model.
Manage the semantic model, including refresh settings	• Requires semantic model ownership.	For more information, see Semantic model ownership .

 **Important**

You should always thoroughly test permissions before releasing your semantic model and reports into production.

For more information, see [Semantic model permissions](#).

Refresh Direct Lake semantic models

A refresh of a Direct Lake semantic model results in a [framing](#) operation. A refresh operation can be triggered:

- Manually, by doing an [on-demand refresh](#) in the Fabric portal, or by executing the Tabular Model Scripting Language (TMSL) [Refresh command](#) from a script in [SQL Server Management Studio \(SSMS\)](#), or by using a third-party tool that connects via the XMLA endpoint.
- Automatically, by setting up a [refresh schedule](#) in the Fabric portal.
- Automatically, when changes are detected in the underlying Delta tables—for more information, see [Automatic updates](#) (described next).
- Programmatically, by triggering a refresh by using the [Power BI REST API](#) or [TOM](#). You might trigger a programmatic refresh as a final step of an extract, transform, and load (ETL) process.

Automatic updates

There's a semantic model-level setting named *Keep your Direct Lake data up to date* that does automatic updates of Direct Lake tables. It's enabled by default. It ensures that data changes in OneLake are automatically reflected in the Direct Lake semantic model. The setting is available in the Fabric portal, in the *Refresh* section of the semantic model settings.

When the setting is enabled, the semantic model performs a framing operation whenever data modifications in underlying Delta tables are detected. The framing operation is always specific to only those tables where data modifies are detected.

We recommend that you leave the setting on, especially when you have a small or medium-sized semantic model. It's especially useful when you have low-latency reporting requirements and Delta tables are modified regularly.

In some situations, you might want to disable automatic updates. For example, you might need to allow completion of data preparation jobs or the ETL process before exposing any new data to consumers of the semantic model. When disabled, you can trigger a refresh by using a programmatic method (described earlier).

ⓘ Note

Power BI suspends automatic updates when a *non-recoverable error* is encountered during refresh. A non-recoverable error can occur, for example, when a refresh fails after several attempts. So, make sure your semantic model can be refreshed successfully. Power BI automatically resumes automatic updates when a subsequent on-demand refresh completes without errors.

Warm the cache

A Direct Lake semantic model refresh operation might evict all resident columns from memory. That means the first queries after a refresh of a Direct Lake semantic model could experience some delay as [columns are loaded into memory](#). Delays might only be noticeable when you have extremely large volumes of data.

To avoid such delays, consider warming the cache by programmatically [sending a query](#) to the semantic model. A convenient way to send a query is to use [semantic link](#). This operation should be done immediately after the refresh operation finishes.

ⓘ Important

Warming the cache might only make sense when delays are unacceptable. Take care not to unnecessarily load data into memory that could place pressure on other capacity workloads, causing them to throttle or become deprioritized.

Set the Direct Lake behavior property

You can control fallback of your Direct Lake semantic models by setting its `DirectLakeBehavior` property. It can be set to:

- **Automatic:** (Default) Queries [fall back to DirectQuery mode](#) if the required data can't be efficiently loaded into memory.
- **DirectLakeOnly:** All queries use Direct Lake storage mode only. Fall back to DirectQuery mode is disabled. If data can't be loaded into memory, an error is returned.
- **DirectQueryOnly:** All queries use DirectQuery mode only. Use this setting to test fallback performance, where, for instance, you can observe the query performance in connected reports.

You can set the property in the [web modeling experience](#), or by using [Tabular Object Model \(TOM\)](#) or [Tabular Model Scripting Language \(TMSL\)](#).

Tip

Consider disabling DirectQuery fallback when you want to process queries in Direct Lake storage mode only. We recommend that you disable fallback when you don't want to fall back to DirectQuery. It can also be helpful when you want to analyze query processing for a Direct Lake semantic model to identify if and how often fallback occurs.

Monitor Direct Lake semantic models

You can monitor a Direct Lake semantic model to determine the performance of report visual DAX queries, or to determine when it falls back to DirectQuery mode.

You can use Performance Analyzer, SQL Server Profiler, Azure Log Analytics, or an open-source, community tool, like DAX Studio.

Performance Analyzer

You can use [Performance Analyzer](#) in Power BI Desktop to record the processing time required to update report elements initiated as a result of any user interaction that results in running a query. If the monitoring results show a *Direct query* metric, it means the DAX queries were processed in DirectQuery mode. In the absence of that metric, the DAX queries were processed in Direct Lake mode.

For more information, see [Analyze by using Performance Analyzer](#).

SQL Server Profiler

You can use [SQL Server Profiler](#) to retrieve details about query performance by tracing query events. It's installed with [SQL Server Management Studio \(SSMS\)](#). Before starting, make sure you have the latest version of SSMS installed.

For more information, see [Analyze by using SQL Server Profiler](#).

Important

In general, Direct Lake storage mode provides fast query performance unless a fallback to DirectQuery mode is necessary. Because fallback to DirectQuery mode can impact query performance, it's important to analyze query processing for a Direct Lake semantic model to identify if, how often, and why fallbacks occur.

Azure Log Analytics

You can use [Azure Log Analytics](#) to collect, analyze, and act on telemetry data associated with a Direct Lake semantic model. It's a service within [Azure Monitor](#), which Power BI uses to save activity logs.

For more information, see [Using Azure Log Analytics in Power BI](#).

Related content

- [Direct Lake overview](#)
- [Develop Direct Lake semantic models](#)
- [Understand storage for Direct Lake semantic models](#)
- [Create a lakehouse for Direct Lake](#)
- [Analyze query processing for Direct Lake semantic models](#)
- [Specify a fixed identity for a Direct Lake semantic model](#)

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Understand storage for Direct Lake semantic models

Article • 09/24/2024

This article introduces [Direct Lake](#) storage concepts. It describes Delta tables and Parquet files. It also describes how you can optimize Delta tables for Direct Lake semantic models, and how you can maintain them to help deliver reliable, fast query performance.

Delta tables

Delta tables exist in OneLake. They organize file-based data into rows and columns and are available to Microsoft Fabric compute engines such as [notebooks](#), [Kusto](#), and the [lakehouse](#) and [warehouse](#). You can query Delta tables by using Data Analysis Expressions (DAX), Multidimensional Expressions (MDX), T-SQL (Transact-SQL), Spark SQL, and even Python.

Note

Delta—or *Delta Lake*—is an open-source storage format. That means Fabric can also query Delta tables created by other tools and vendors.

Delta tables store their data in Parquet files, which are typically stored in a lakehouse that a Direct Lake semantic model uses to load data. However, Parquet files can also be stored externally. External Parquet files can be referenced by using a [OneLake shortcut](#), which points to a specific storage location, such as [Azure Data Lake Storage \(ADLS\) Gen2](#), Amazon S3 storage accounts, or [Dataverse](#). In almost all cases, compute engines access the Parquet files by querying Delta tables. However, typically Direct Lake semantic models load column data directly from optimized Parquet files in OneLake by using a process known as [transcoding](#).

Data versioning

Delta tables comprise one or more Parquet files. These files are accompanied by a set of JSON-based link files, which track the order and nature of each Parquet file that's associated with a Delta table.

It's important to understand that the underlying Parquet files are incremental in nature. Hence the name *Delta* as a reference to incremental data modification. Every time a

write operation to a Delta table takes place—such as when data is inserted, updated, or deleted—new Parquet files are created that represent the data modifications as a *version*. Parquet files are therefore *immutable*, meaning they're never modified. It's therefore possible for data to be duplicated many times across a set of Parquet files for a Delta table. The Delta framework relies on link files to determine which physical Parquet files are required to produce the correct query result.

Consider a simple example of a Delta table that this article uses to explain different data modification operations. The table has two columns and stores three rows.

[] Expand table

ProductID	StockOnHand
A	1
B	2
C	3

The Delta table data is stored in a single Parquet file that contains all data, and there's a single link file that contains metadata about when the data was inserted (appended).

- Parquet file 1:
 - **ProductID:** A, B, C
 - **StockOnHand:** 1, 2, 3
- Link file 1:
 - Contains the timestamp when `Parquet file 1` was created, and records that data was appended.

Insert operations

Consider what happens when an insert operation occurs: A new row for product `c` with a stock on hand value of `4` is inserted. This operations results in the creation of a new Parquet file and link file, so there's now two Parquet files and two link files.

- Parquet file 1:
 - **ProductID:** A, B, C
 - **StockOnHand:** 1, 2, 3
- Parquet file 2:
 - **ProductID:** D
 - **StockOnHand:** 4
- Link file 1:

- Contains the timestamp when `Parquet file 1` was created, and records that data was appended.
- Link file 2:
 - Contains the timestamp when `Parquet file 2` was created, and records that data was appended.

At this point, a query of the Delta table returns the following result. It doesn't matter that the result is sourced from multiple Parquet files.

[\[\] Expand table](#)

ProductID	StockOnHand
A	1
B	2
C	3
D	4

Every subsequent insert operation creates new Parquet files and link files. That means the number of Parquet files and link files grows with every insert operation.

Update operations

Now consider what happens when an update operation occurs: The row for product `D` has its stock on hand value changed to `10`. This operation results in the creation of a new Parquet file and link file, so there are now three Parquet files and three link files.

- Parquet file 1:
 - **ProductID:** A, B, C
 - **StockOnHand:** 1, 2, 3
- Parquet file 2:
 - **ProductID:** D
 - **StockOnHand:** 4
- Parquet file 3:
 - **ProductID:** C
 - **StockOnHand:** 10
- Link file 1:
 - Contains the timestamp when `Parquet file 1` was created, and records that data was appended.
- Link file 2:

- Contains the timestamp when `Parquet file 2` was created, and records that data was appended.
- Link file 3:
 - Contains the timestamp when `Parquet file 3` was created, and records that data was updated.

At this point, a query of the Delta table returns the following result.

 Expand table

ProductID	StockOnHand
A	1
B	2
C	10
D	4

Data for product `C` now exists in multiple Parquet files. However, queries to the Delta table combine the link files to determine what data should be used to provide the correct result.

Delete operations

Now consider what happens when a delete operation occurs: The row for product `B` is deleted. This operation results in a new Parquet file and link file, so there are now four Parquet files and four link files.

- Parquet file 1:
 - **ProductID:** A, B, C
 - **StockOnHand:** 1, 2, 3
- Parquet file 2:
 - **ProductID:** D
 - **StockOnHand:** 4
- Parquet file 3:
 - **ProductID:** C
 - **StockOnHand:** 10
- Parquet file 4:
 - **ProductID:** A, C, D
 - **StockOnHand:** 1, 10, 4
- Link file 1:

- Contains the timestamp when `Parquet file 1` was created, and records that data was appended.
- Link file 2:
 - Contains the timestamp when `Parquet file 2` was created, and records that data was appended.
- Link file 3:
 - Contains the timestamp when `Parquet file 3` was created, and records that data was updated.
- Link file 4:
 - Contains the timestamp when `Parquet file 4` was created, and records that data was deleted.

Notice that `Parquet file 4` no longer contains data for product `B`, but it does contain data for all other rows in the table.

At this point, a query of the Delta table returns the following result.

[\[+\] Expand table](#)

ProductID	StockOnHand
A	1
C	10
D	4

ⓘ Note

This example is simple because it involves a small table, just a few operations, and only minor modifications. Large tables that experience many write operations and that contain many rows of data will generate more than one Parquet file per version.

ⓘ Important

Depending on how you define your Delta tables and the frequency of data modification operations, it might result in many Parquet files. Be aware that each Fabric capacity license has [guardrails](#). If the number of Parquet files for a Delta table exceeds the limit for your SKU, queries will [fall back to DirectQuery](#), which might result in slower query performance.

To manage the number of Parquet files, see [Delta table maintenance](#) later in this article.

Delta time travel

Link files enable querying data as of an earlier point in time. This capability is known as *Delta time travel*. The earlier point in time could be a timestamp or version.

Consider the following query examples.

SQL

```
SELECT * FROM Inventory TIMESTAMP AS OF '2024-04-28T09:15:00.000Z';
SELECT * FROM Inventory AS OF VERSION 2;
```

Tip

You can also query a table by using the @ shorthand syntax to specify the timestamp or version as part of the table name. The timestamp must be in yyyyMMddHHmmssSSS format. You can specify a version after @ by prepending a v to the version.

Here are the previous query examples rewritten with shorthand syntax.

SQL

```
SELECT * FROM Inventory@20240428091500000;
SELECT * FROM Inventory@v2;
```

Important

Table versions accessible with time travel are determined by a combination of the retention threshold for transaction log files and the frequency and specified retention for VACUUM operations (described later in the [Delta table maintenance](#) section). If you run VACUUM daily with the default values, seven days of data will be available for time travel.

Framing

Framing is a Direct Lake operation that sets the version of a Delta table that should be used to load data into a semantic model column. Equally important, the version also determines what should be excluded when data is loaded.

A framing operation stamps the timestamp/version of each Delta table into the semantic model tables. From this point, when the semantic model needs to load data from a Delta table, the timestamp/version associated with the most recent framing operation is used to determine what data to load. Any subsequent data modifications that occur for the Delta table since the latest framing operation are ignored (until the next framing operation).

Important

Because a framed semantic model references a particular Delta table version, the source must ensure it keeps that Delta table version until framing of a new version is completed. Otherwise, users will encounter errors when the Delta table files need to be accessed by the model and have been vacuumed or otherwise deleted by the producer workload.

For more information about framing, see [Direct Lake overview](#).

Table partitioning

Delta tables can be partitioned so that a subset of rows are stored together in a single set of Parquet files. Partitions can speed up queries as well as write operations.

Consider a Delta table that has a billion rows of sales data for a two-year period. While it's possible to store all the data in a single set of Parquet files, for this data volume it's not optimal for read and write operations. Instead, performance can be improved by spreading the billion rows of data across multiple series of Parquet files.

A *partition key* must be defined when setting up table partitioning. The partition key determines which rows to store in which series. For Delta tables, the partition key can be defined based on the distinct values of a specified column (or columns), such as a month/year column of a date table. In this case, two years of data would be distributed across 24 partitions (2 years x 12 months).

Fabric compute engines are unaware of table partitions. As they insert new partition key values, new partitions are created automatically. In OneLake, you'll find one subfolder for each unique partition key value, and each subfolder stores its own set of Parquet files and link files. At least one Parquet file and one link file must exist, but the actual number of files in each subfolder can vary. As data modification operations take place,

each partition maintains its own set of Parquet files and link files to keep track of what to return for a given timestamp or version.

If a query of a partitioned Delta table is filtered to only the most recent three months of sales data, the subset of Parquet files and link files that need to be accessed can be quickly identified. That then allows skipping many Parquet files altogether, resulting in better read performance.

However, queries that don't filter on the partition key might not always perform better. That can be the case when a Delta table stores all data in a single large set of Parquet files and there's file or row group fragmentation. While it's possible to parallelize the data retrieval from multiple Parquet files across multiple cluster nodes, many small Parquet files can adversely affect file I/O and therefore query performance. For this reason, it's best to avoid partitioning Delta tables in most cases—unless write operations or extract, transform, and load (ETL) processes would clearly benefit from it.

Partitioning benefits insert, update, and delete operations too, because file activity only takes place in subfolders matching the partition key of the modified or deleted rows. For example, if a batch of data is inserted into a partitioned Delta table, the data is assessed to determine what partition key values exist in the batch. Data is then directed only to the relevant folders for the partitions.

Understanding how Delta tables use partitions can help you design optimal ETL scenarios that reduce the write operations that need to take place when updating large Delta tables. Write performance improves by reducing the number and size of any new Parquet files that must be created. For a large Delta table partitioned by month/year, as described in the previous example, new data only adds new Parquet files to the latest partition. Subfolders of previous calendar months remain untouched. If any data of previous calendar months must be modified, only the relevant partition folders receive new partition and link files.

Important

If the main purpose of a Delta table is to serve as a data source for semantic models (and secondarily, other query workloads), it's usually better to avoid partitioning in preference for optimizing the [load of columns into memory](#).

For Direct Lake semantic models or the [SQL analytics endpoint](#), the best way to optimize Delta table partitions is to let Fabric automatically manage the Parquet files for each version of a Delta table. Leaving the management to Fabric should result in high query performance through parallelization, however it might not necessarily provide the best write performance.

If you must optimize for write operations, consider using partitions to optimize write operations to Delta tables based on the partition key. However, be aware that over partitioning a Delta table can negatively impact on read performance. For this reason, we recommend that you test the read and write performance carefully, perhaps by creating multiple copies of the same Delta table with different configurations to compare timings.

Warning

If you partition on a high cardinality column, it can result in an excessive number of Parquet files. Be aware that every Fabric capacity license has [guardrails](#). If the number of Parquet files for a Delta table exceeds the limit for your SKU, queries will [fall back to DirectQuery](#), which might result in slower query performance.

Parquet files

The underlying storage for a Delta table is one or more Parquet files. Parquet file format is generally used for *write-once, read-many* applications. New Parquet files are created every time data in a Delta table is modified, whether by an insert, update, or delete operation.

Note

You can access Parquet files that are associated with Delta tables by using a tool, like [OneLake file explorer](#). Files can be downloaded, copied, or moved to other destinations as easily as moving any other files. However, it's the combination of Parquet files and the JSON-based link files that allow compute engines to issue queries against the files as a Delta table.

Parquet file format

The internal format of a Parquet file differs from other common data storage formats, such as CSV, TSV, XMLA, and JSON. These formats organize data *by rows*, while Parquet organizes data *by columns*. Also, Parquet file format differs from these formats because it organizes rows of data into one or more *row groups*.

The internal data structure of a Power BI semantic model is column-based, which means Parquet files share a lot in common with Power BI. This similarity means that a Direct Lake semantic model can efficiently load data from the Parquet files directly into memory. In fact, very large volumes of data can be loaded in seconds. Contrast this

capability with the refresh of an Import semantic model which must retrieve blocks or source data, then process, encode, store, and then load it into memory. An Import semantic model refresh operation can also consume significant amounts of compute (memory and CPU) and take considerable time to complete. However, with Delta tables, most of the effort to prepare the data suitable for direct loading into a semantic model takes place when the Parquet file is generated.

How Parquet files store data

Consider the following example set of data.

[] Expand table

Date	ProductID	StockOnHand
2024-09-16	A	10
2024-09-16	B	11
2024-09-17	A	13
...		

When stored in Parquet file format, conceptually, this set of data might look like the following text.

HTML

```
Header:  
RowGroup1:  
    Date: 2024-09-16, 2024-09-16, 2024-09-17...  
    ProductID: A, B, A...  
    StockOnHand: 10, 11, 13...  
RowGroup2:  
    ...  
Footer:
```

Data is compressed by substituting dictionary keys for common values, and by applying *run-length encoding (RLE)*. RLE strives to compress a series of same values into a smaller representation. In the following example, a dictionary mapping of numeric keys to values is created in the header, and the smaller key values are used in place of the data values.

HTML

```
Header:  
  Dictionary: [  
    (1, 2024-09-16), (2, 2024-09-17),  
    (3, A), (4, B),  
    (5, 10), (6, 11), (7, 13)  
    ...  
  ]  
RowGroup1:  
  Date: 1, 1, 2...  
  ProductID: 3, 4, 3...  
  StockOnHand: 5, 6, 7...  
Footer:
```

When the Direct Lake semantic model needs data to compute the sum of the `StockOnHand` column grouped by `ProductID`, only the dictionary and data associated with the two columns is required. In large files that contain many columns, substantial portions of the Parquet file can be skipped to help speed up the read process.

ⓘ Note

The contents of a Parquet file aren't human readable and so it isn't suited to opening in a text editor. However, there are many open-source tools available that can open and reveal the contents of a Parquet file. These tools can also let you inspect metadata, such as the number of rows and row groups contained in a file.

V-Order

Fabric supports an additional optimization called [V-Order](#). V-Order is a write-time optimization to the Parquet file format. Once V-Order is applied, it results in a smaller and therefore faster file to read. This optimization is especially relevant for a Direct Lake semantic model because it prepares the data for fast loading into memory, and so it makes less demands on capacity resources. It also results in faster query performance because less memory needs to be scanned.

Delta tables created and loaded by Fabric items such as [data pipelines](#), [dataflows](#), and [notebooks](#) automatically apply V-Order. However, Parquet files uploaded to a Fabric lakehouse, or that are referenced by a [shortcut](#), might not have this optimization applied. While non-optimized Parquet files can still be read, the read performance likely won't be as fast as an equivalent Parquet file that's had V-Order applied.

ⓘ Note

Parquet files that have V-Order applied still conform to the open-source Parquet file format. Therefore, they can be read by non-Fabric tools.

For more information, see [Delta Lake table optimization and V-Order](#).

Delta table optimization

This section describes various topics for optimizing Delta tables for semantic models.

Data volume

While Delta tables can grow to store extremely large volumes of data, [Fabric capacity guardrails](#) impose limits on semantic models that query them. When those limits are exceeded, queries will [fall back to DirectQuery](#), which might result in slower query performance.

Therefore, consider limiting the row count of a large [fact table](#) by raising its granularity (store summarized data), reducing dimensionality, or storing less history.

Also, ensure that [V-Order](#) is applied because it results in a smaller and therefore faster file to read.

Column data type

Strive to reduce cardinality (the number of unique values) in every column of each Delta table. That's because all columns are compressed and stored by using *hash encoding*. Hash encoding requires V-Order optimization to assign a numeric identifier to each unique value contained in the column. It's the numeric identifier, then, that's stored, requiring a hash lookup during storage and querying.

When you use [approximate numeric data types](#) (like **float** and **real**), consider rounding values and using a lower precision.

Unnecessary columns

As with any data table, Delta tables should only store columns that are required. In the context of this article, that means required by the semantic model, though there could be other analytic workloads that query the Delta tables.

Delta tables should include columns required by the semantic model for filtering, grouping, sorting, and summarizing, in addition to columns that support model

relationships. While unnecessary columns don't affect semantic model query performance (because they won't be loaded into memory), they result in a larger storage size and so require more compute resources to load and maintain.

Because Direct Lake semantic models don't support calculated columns, you should materialize such columns in the Delta tables. Note that this design approach is an anti-pattern for Import and DirectQuery semantic models. For example, if you have `FirstName` and `LastName` columns, and you need a `FullName` column, materialize the values for this column when inserting rows into the Delta table.

Consider that some semantic model summarizations might depend on more than one column. For example, to calculate sales, the measure in the model sums the product of two columns: `Quantity` and `Price`. If neither of these columns is used independently, it would be more efficient to materialize the sales calculation as a single column than store its component values in separate columns.

Row group size

Internally, a Parquet file organizes rows of data into multiple row groups within each file. For example, a Parquet file that contains 30,000 rows might chunk them into three row groups, each having 10,000 rows.

The number of rows in a row group influences how quickly Direct Lake can read the data. A higher number of row groups with fewer rows is likely to negatively impact loading column data into a semantic model due to excessive I/O.

Generally, we don't recommend that you change the default row group size. However, you might consider changing the row group size for large Delta tables. Be sure to test the read and write performance carefully, perhaps by creating multiple copies of the same Delta tables with different configurations to compare timings.

ⓘ Important

Be aware that every Fabric capacity license has [guardrails](#). If the number of row groups for a Delta table exceeds the limit for your SKU, queries will [fall back to DirectQuery](#), which might result in slower query performance.

Delta table maintenance

Over time, as write operations take place, Delta table versions accumulate. Eventually, you might reach a point at which a negative impact on read performance becomes

noticeable. Worse, if the number of Parquet files per table, or row groups per table, or rows per table exceeds the [guardrails for your capacity](#), queries will fall back to [DirectQuery](#), which might result in slower query performance. It's therefore important that you maintain Delta tables regularly.

OPTIMIZE

You can use [OPTIMIZE](#) to optimize a Delta table to coalesce smaller files into larger ones. You can also set the `WHERE` clause to target only a filtered subset of rows that match a given partition predicate. Only filters involving partition keys are supported. The [OPTIMIZE](#) command can also apply V-Order to compact and rewrite the Parquet files.

We recommend that you run this command on large, frequently updated Delta tables on a regular basis, perhaps every day when your ETL process completes. Balance the trade-off between better query performance and the cost of resource usage required to optimize the table.

VACUUM

You can use [VACUUM](#) to remove files that are no longer referenced and/or that are older than a set retention threshold. Take care to set an appropriate retention period, otherwise you might lose the ability to [time travel](#) back to a version older than the frame stamped into semantic model tables.

Important

Because a framed semantic model references a particular Delta table version, the source must ensure it keeps that Delta table version until framing of a new version is completed. Otherwise, users will encounter errors when the Delta table files need to be accessed by the model and have been vacuumed or otherwise deleted by the producer workload.

REORG TABLE

You can use [REORG TABLE](#) to reorganize a Delta table by rewriting files to purge soft-deleted data, such as when you drop a column by using [ALTER TABLE DROP COLUMN](#).

Automate table maintenance

To automate table maintenance operations, you can use the Lakehouse API. For more information, see [Manage the Lakehouse with Microsoft Fabric REST API](#).

💡 Tip

You can also use the lakehouse [Table maintenance feature](#) in the Fabric portal to simplify management of your Delta tables.

Related content

- [Direct Lake overview](#)
- [Develop Direct Lake semantic models](#)
- [Manage Direct Lake semantic models](#)
- [Delta Lake table optimization and V-Order](#)

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Was this page helpful?

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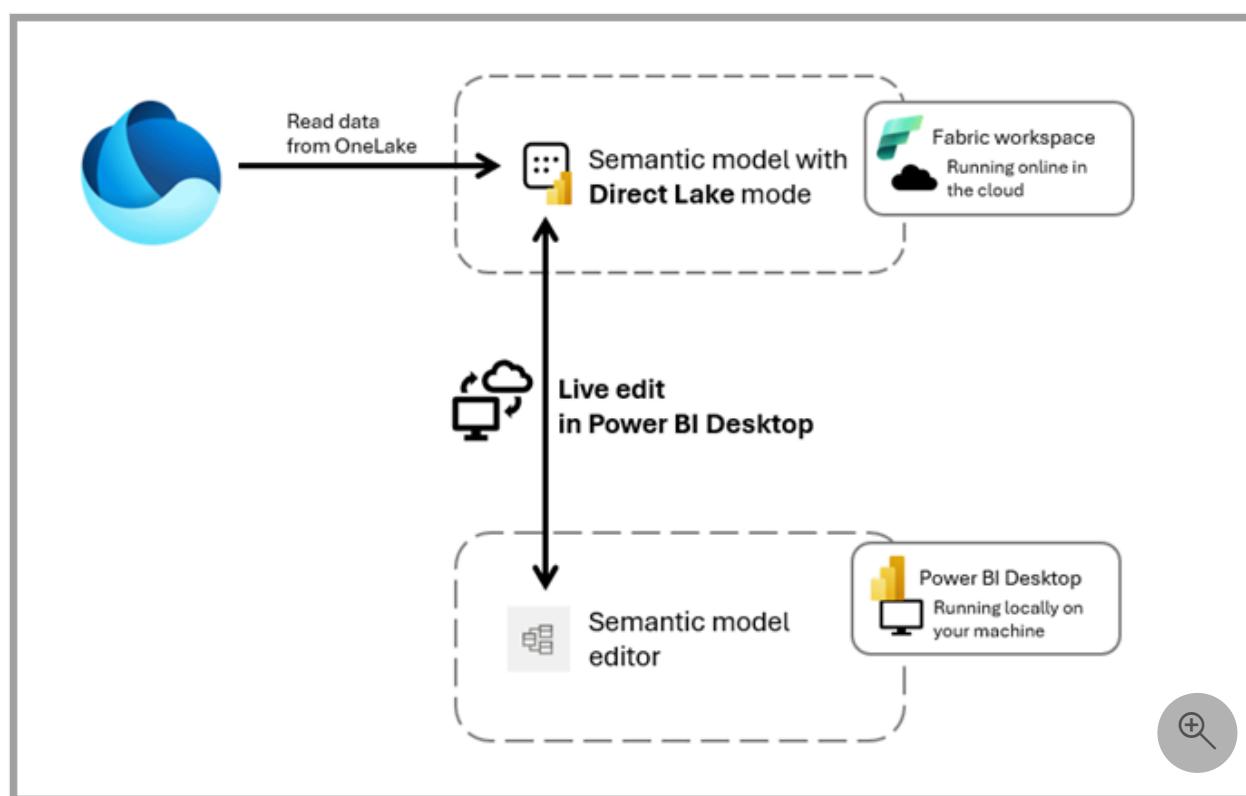
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Direct Lake in Power BI Desktop (preview)

Article • 09/24/2024

Semantic models using Direct Lake mode access OneLake data directly, which requires running the Power BI Analysis Services engine in a workspace with a Fabric capacity. Semantic models using import or DirectQuery mode can have the Power BI Analysis Services engine running locally on your computer by using Power BI Desktop for creating and editing the semantic model. Once published, such models operate using Power BI Analysis Services in the workspace.

To facilitate editing Direct Lake semantic models in Power BI Desktop, you can now perform a **live edit** of a semantic model in Direct Lake mode, enabling Power BI Desktop to make changes to the model by using the Power BI Analysis Services engine in the Fabric workspace.



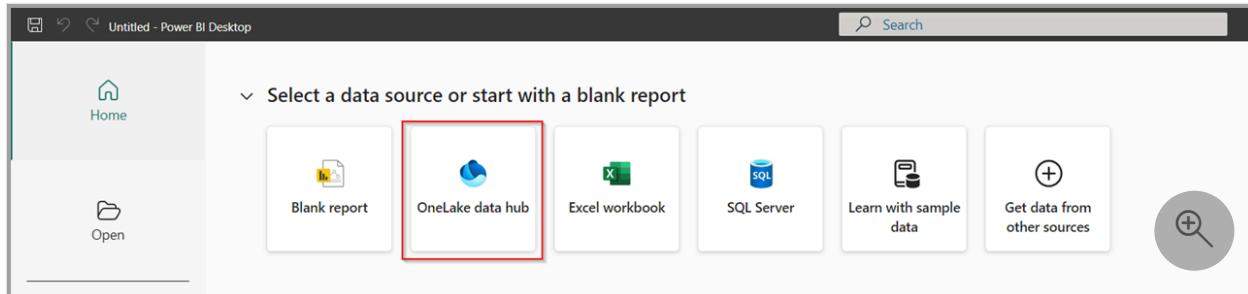
Enable preview feature

To live edit a semantic model in Direct Lake mode, you must enable it the preview feature by selecting the following from Power BI Desktop: **File > Options and settings > Options > Preview features**. Select **Live edit of Power BI semantic models in Direct Lake mode**, which enables the feature after Power BI Desktop is restarted.

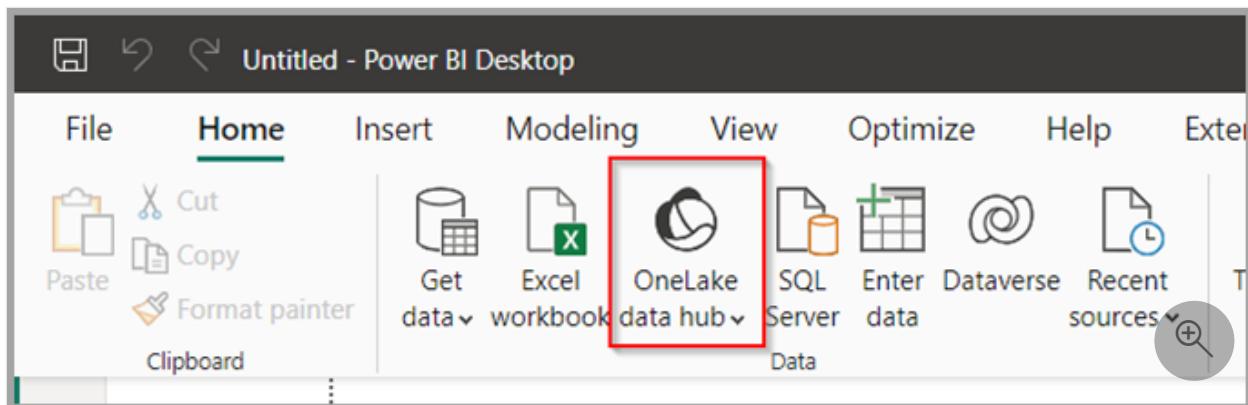
Live edit a semantic model in Direct Lake mode

To perform a live edit of a semantic model in Direct Lake mode, take the following steps.

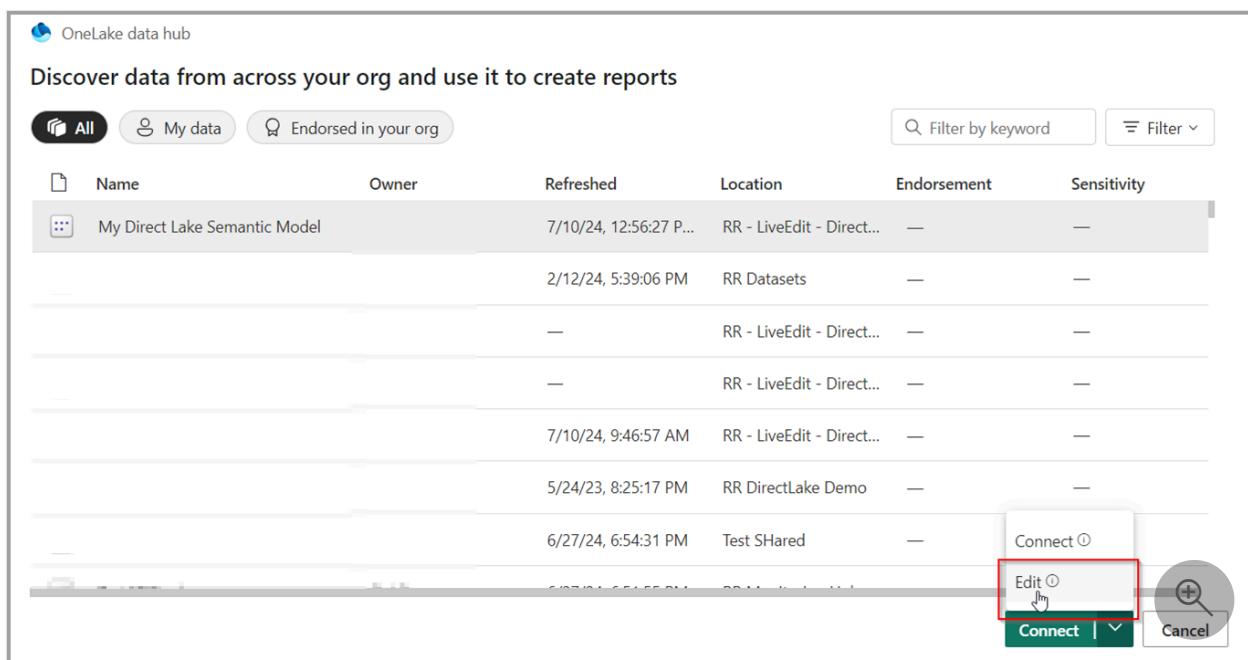
1. Open Power BI Desktop and select OneLake data hub:



You can also open the **OneLake data hub** from a blank report, as shown in the following image:



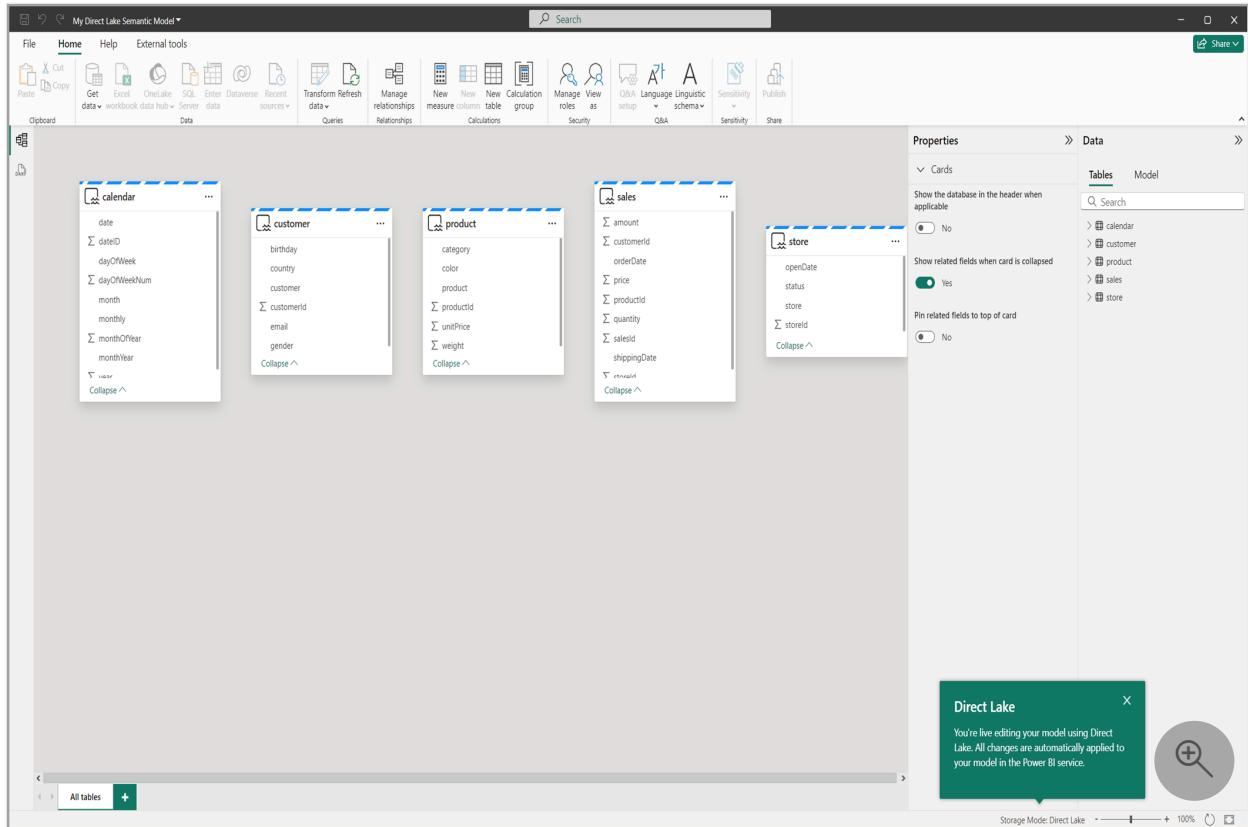
2. Search for a semantic model in Direct Lake mode, expand the **Connect** button and select **Edit**.



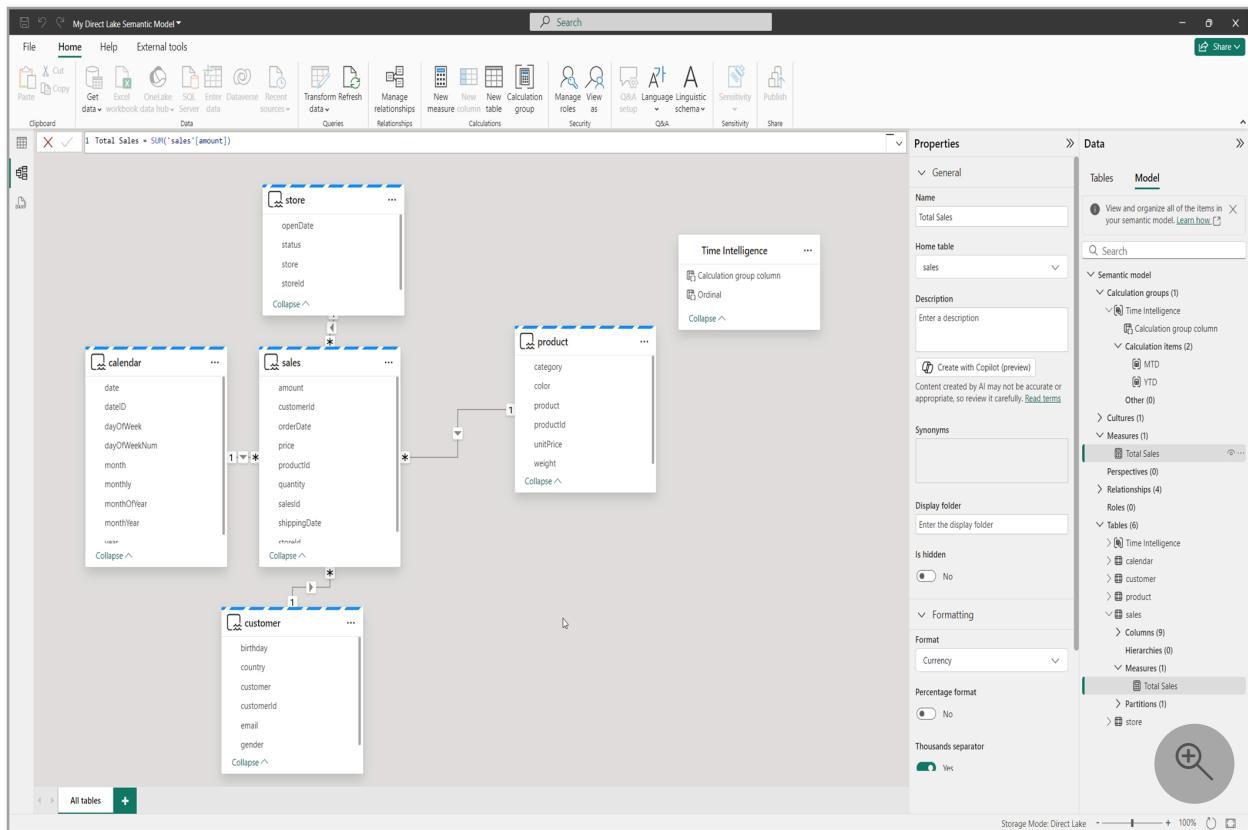
(!) Note

Selecting a semantic model that is not in Direct Lake mode will result in an error.

3. The selected semantic model opens for editing at which point you are in live edit mode, as demonstrated in the following screenshot.



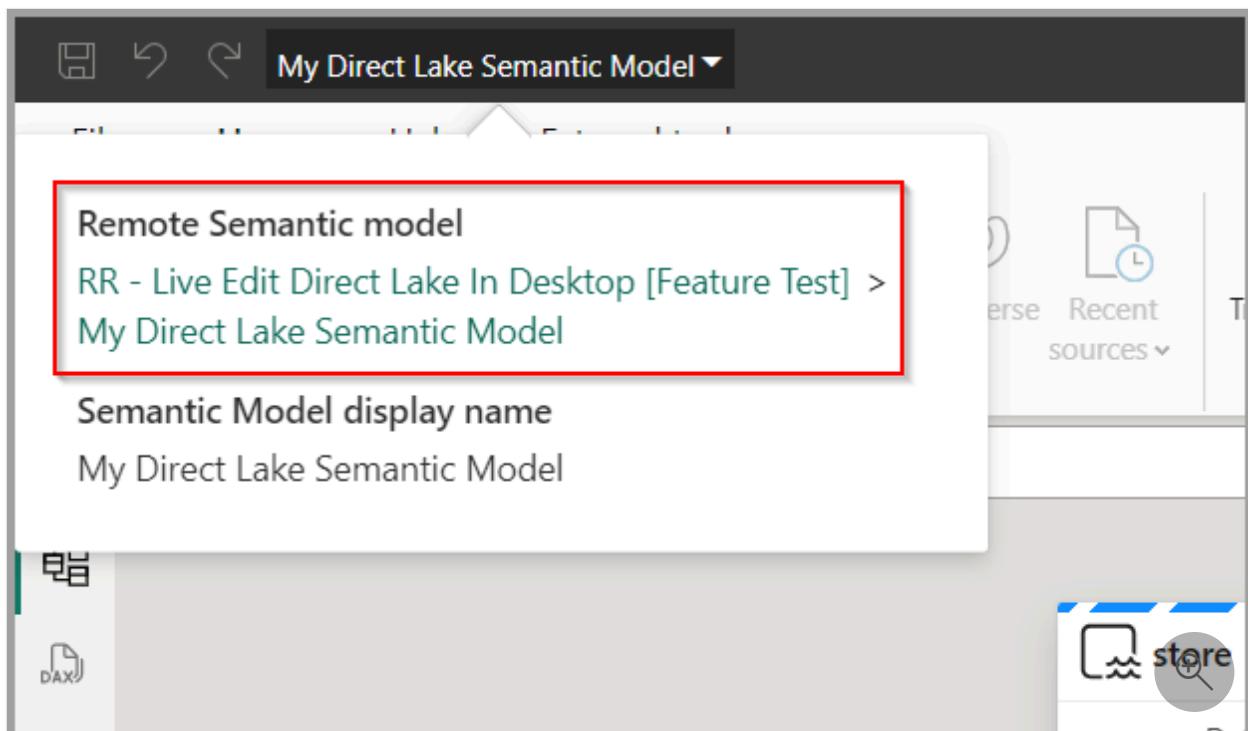
4. You can edit your semantic model using Power BI Desktop, enabling you to make changes directly to the selected semantic model. Changes include all modeling tasks, such as renaming tables/columns, [creating measures](#), and [creating calculation groups](#). [DAX query view](#) is available to run DAX queries to preview data and test measures before saving them to the model.



ⓘ Note

Notice that the **Save** option is disabled, because you don't need to save. Every change you make is immediately applied to the selected semantic model in the workspace.

In the title bar, you can see the workspace and semantic model name with links to open these items in the Fabric portal.

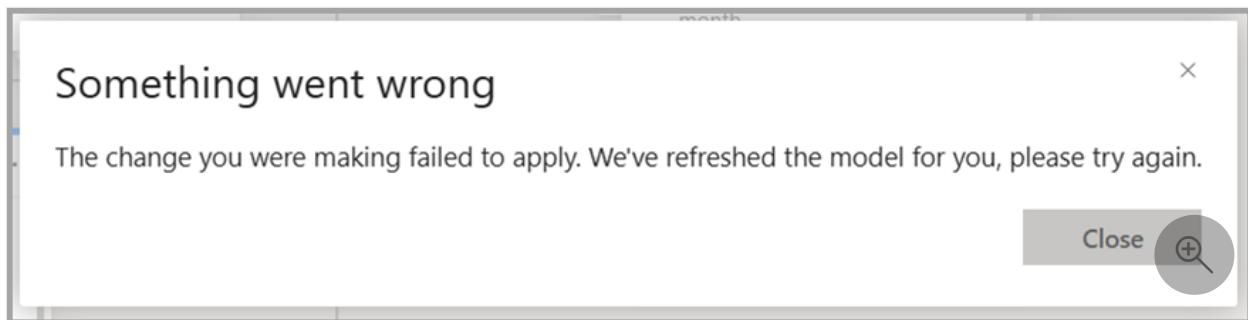


When you connect and live edit a semantic model. During the preview it's not possible to select an existing report to edit, and the **Report view** is hidden. You can open an existing report or create a new one by live connecting to this semantic model in another instance of Power BI Desktop or in the workspace. You can write DAX queries in the workspace with DAX query view in the web. And you can visually explore the data with the new [explore your data](#) feature in the workspace.

Automatically save your changes

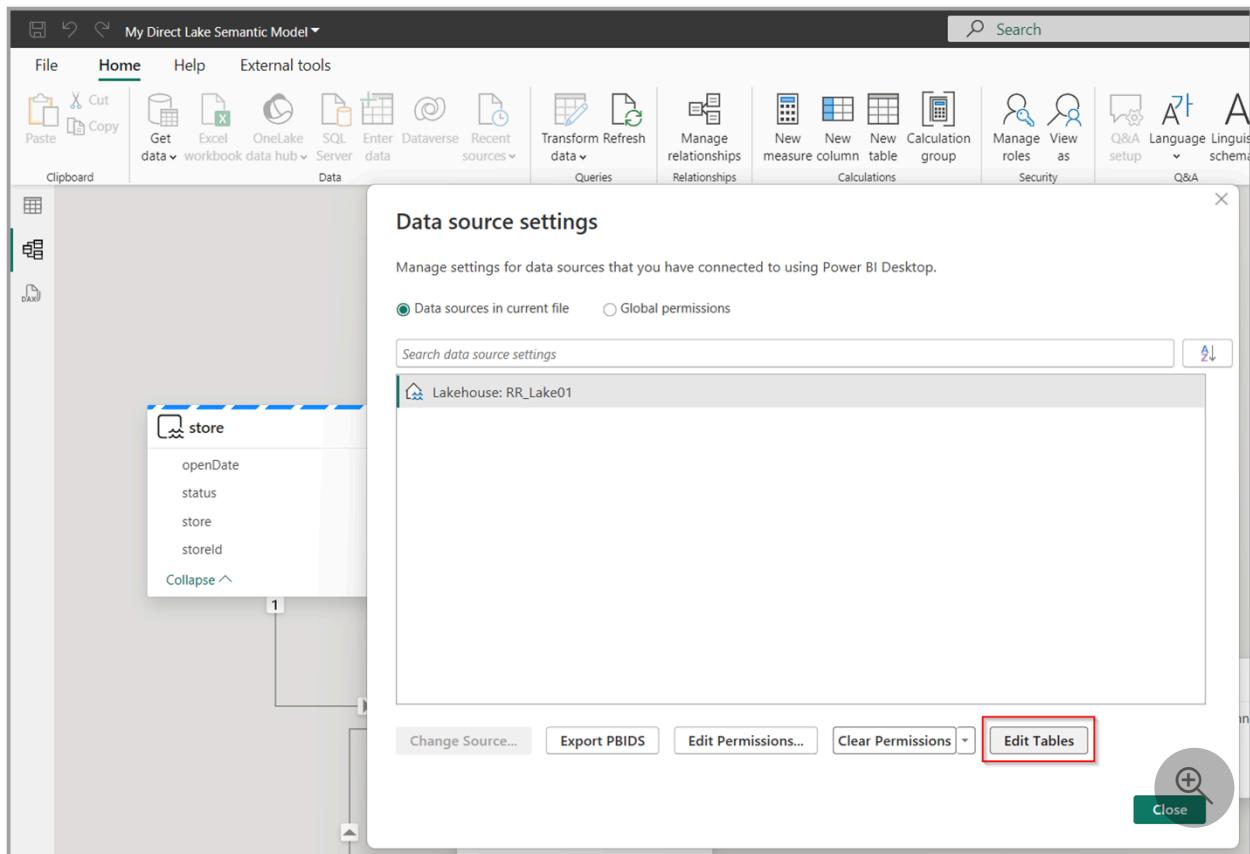
As you make changes to your semantic model, your changes are automatically saved and the **Save** button is disabled when in Live edit mode. Changes are permanent with no option to undo.

If two or more users are live editing the same semantic model and a conflict occurs, Power BI Desktop alerts one of the users, shown in the following image, and refreshes the model to the latest version. Any changes you were trying to make will need to be performed again after the refresh.



Edit tables

Changes to the tables and columns in the OneLake data source, typically a Lakehouse or Warehouse, like import or DirectQuery data sources, aren't automatically reflected in the semantic model. To update the semantic model with the latest schema, such as getting column changes in existing tables or to add or remove tables, go to **Transform data > Data source settings > Edit Tables**.



Learn more about [Edit tables for Direct Lake semantic models](#).

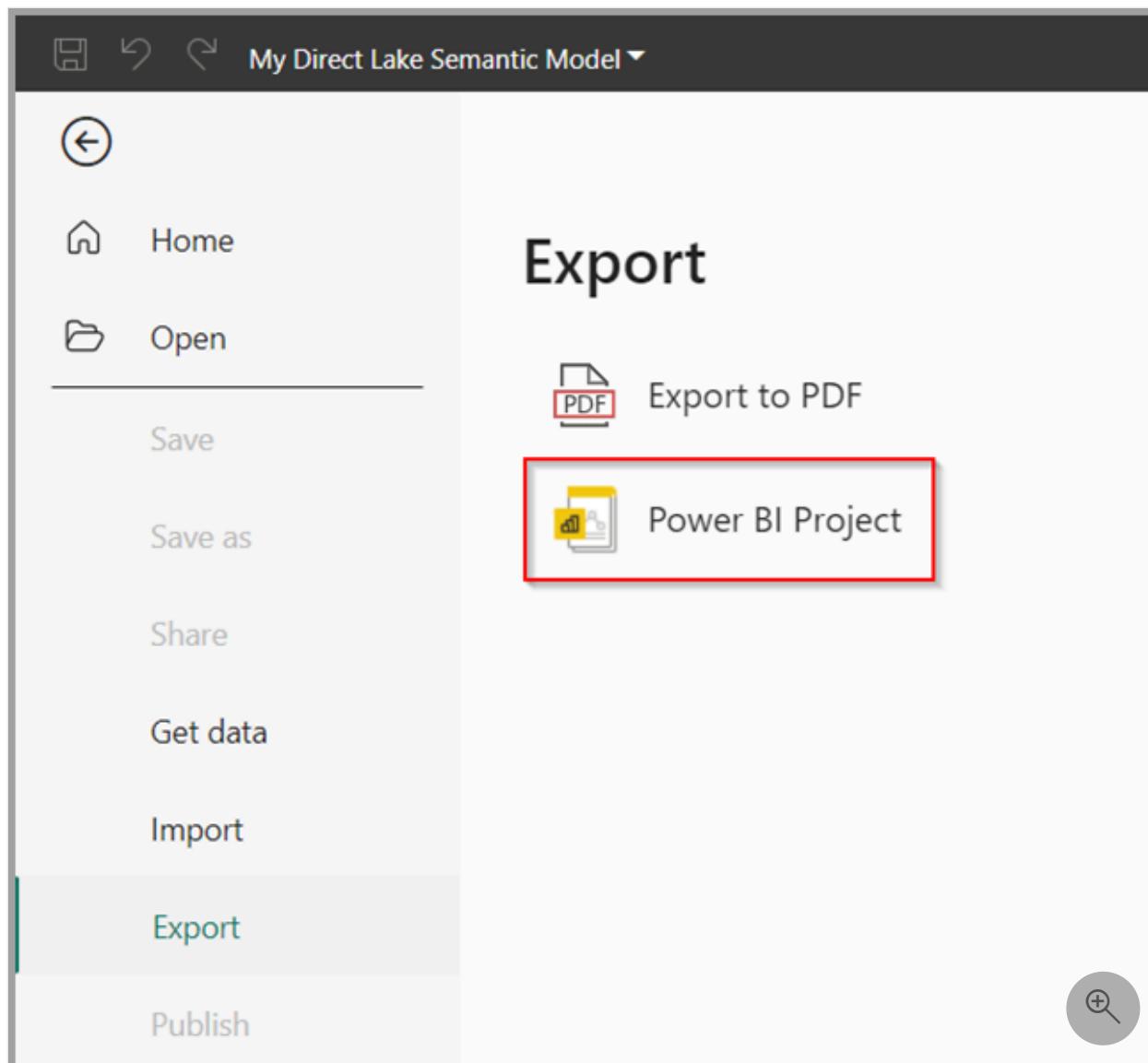
Use refresh

Semantic models in Direct Lake mode automatically reflect the latest data changes in the delta tables when *Keep your direct Lake data up to date* is enabled. When disabled, you can manually refresh your semantic model using Power BI Desktop Refresh button to ensure it targets the latest version of your data. This is also sometimes called *reframing*.

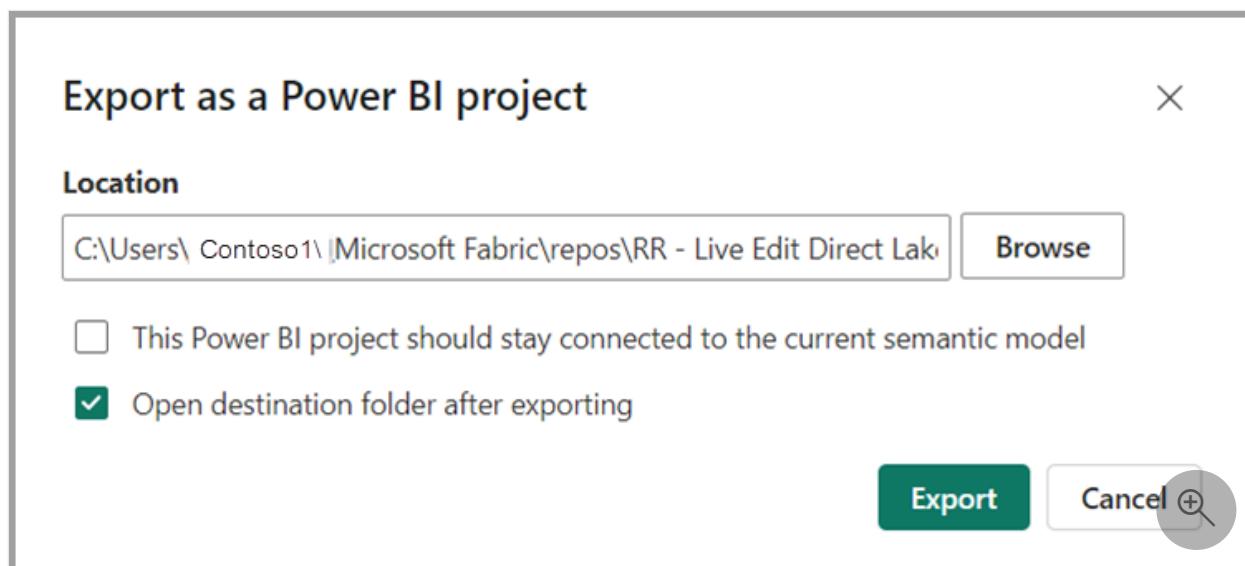
Export to a Power BI Project

To support professional enterprise development workflows of semantic models in Direct Lake mode, you can export the definition of your semantic model after opening it for editing, which provides a local copy of the semantic model and report metadata that you can use with Fabric deployment mechanisms such as [Fabric Git Integration](#). The Power BI Desktop report view becomes enabled letting you view and edit the local report, publish directly from Power BI Desktop isn't available but you can publish using Git integration. The **Save** button is also enabled to save the local model metadata and report in the Power BI Project folder.

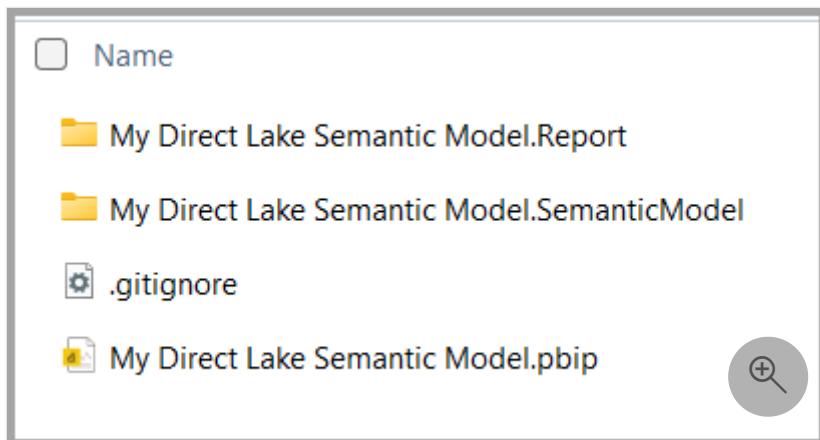
Navigate to **File > Export > Power BI Project** and export it as a [Power BI Project file \(PBIP\)](#).



By default, the PBIP file is exported to the `%USERPROFILE%\Microsoft Fabric\repos\[Workspace Name]` folder. However, you can choose a different location during the export process.



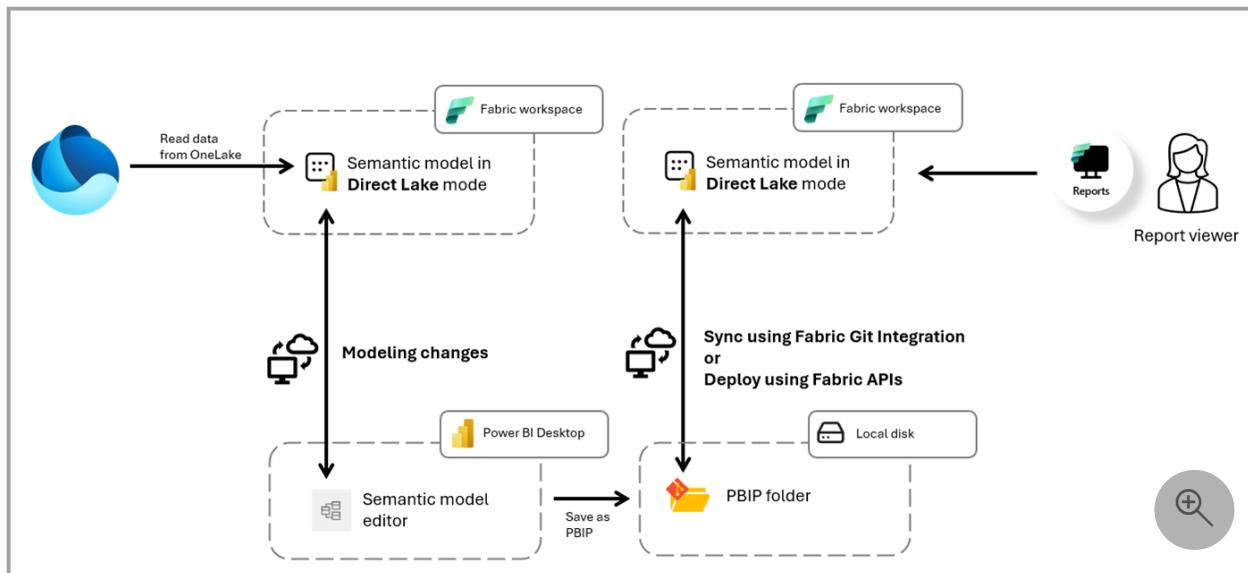
Selecting **Export** opens the folder containing the PBIP files of the exported semantic model along with an empty report.



After exporting you should open a new instance of Power BI Desktop and open the exported PBIP file to continue editing with a Power BI Project. When you open the PBIP file, Power BI Desktop prompts you to either create a new semantic model in a Fabric workspace, or select an existing semantic model for **remote modeling**.

Remote modeling with a Power BI Project

When working on a Power BI Project (PBIP) with a semantic model that can't run on the local Power BI Analysis Services engine, such as Direct Lake mode, Power BI Desktop requires to be connected to a semantic model in a Fabric workspace, a remote semantic model. Like *live edit*, all changes you make are immediately applied to the semantic model in the workspace. However, unlike live edit, you can save your semantic model and report definitions to local PBIP files that can later be deployed to a Fabric workspace using a deployment mechanism such as [Fabric Git Integration](#).

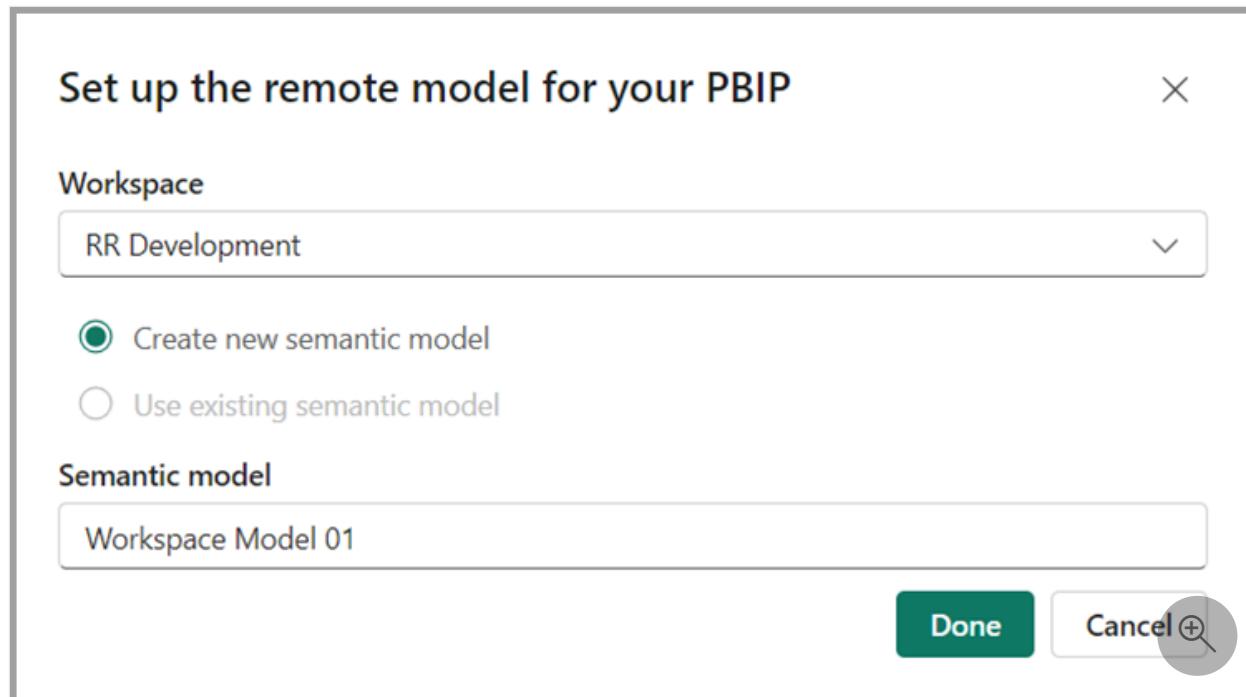


① Note

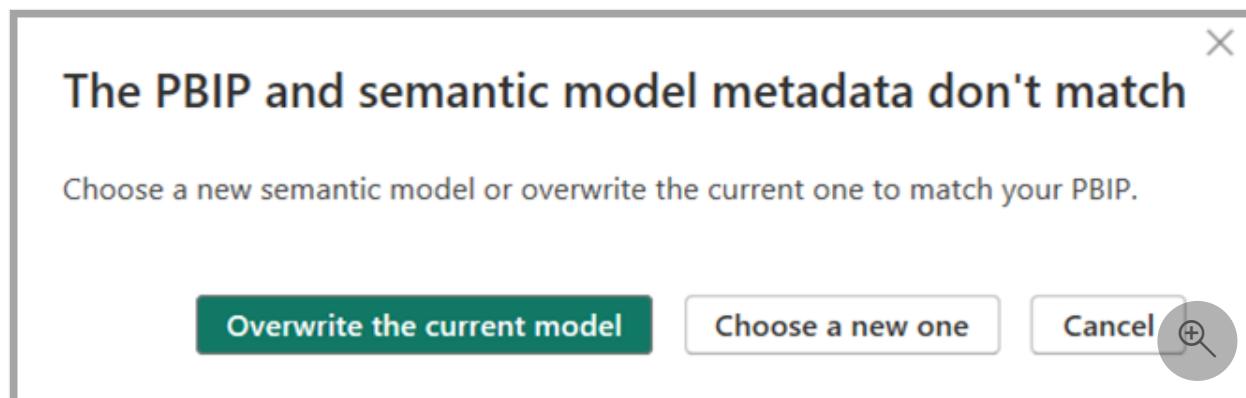
Semantic models in Direct Lake mode, when exported to a Git repository using [Fabric Git Integration](#), can be edited using Power BI Desktop. To do so, make sure at least one report is connected to the semantic model, then open the report's exported [definition.pbir](#) file to edit both the report and the semantic model.

Open your Power BI Project

When opening a Power BI Project (PBIP) that require a remote semantic model, Power BI Desktop prompts you to either create a new semantic model or select an existing semantic model in a Fabric workspace.



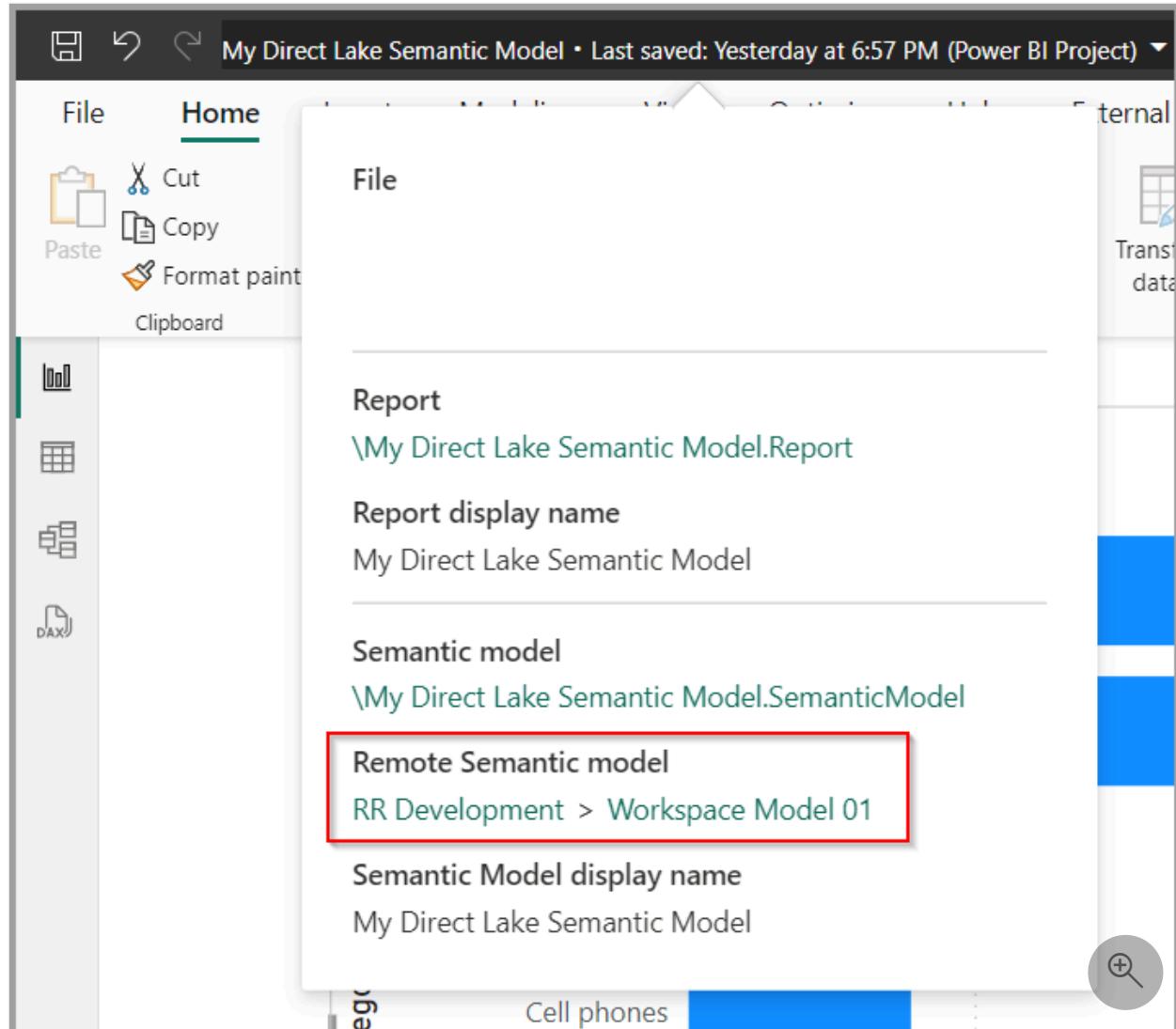
If you select an existent semantic model and the definition differs, Power BI Desktop warns you before overwriting, as shown in the following image.



ⓘ Note

You can select the same semantic model you exported the PBIP from. However, the best practice when working with a PBIP that requires a remote semantic model is for each developer to work on their own private remote semantic model to avoid conflicts with changes from other developers.

Selecting the title bar displays both the PBIP file location and the remote semantic model living in a Fabric workspace, shown in the following image.

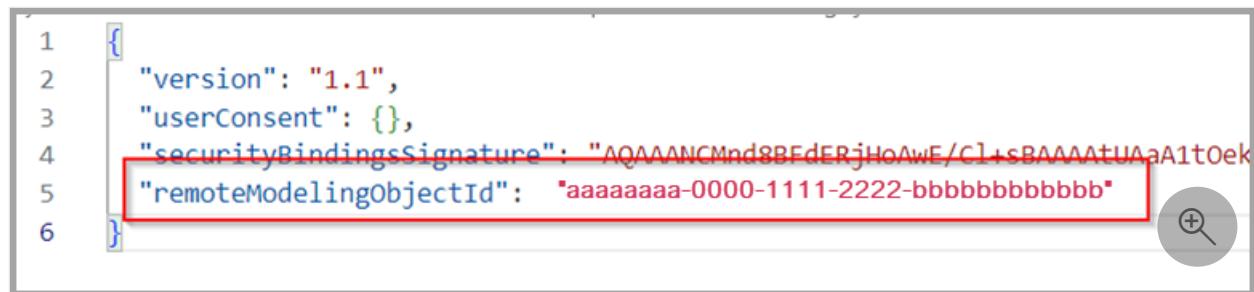


A local setting will be saved in the Power BI Project files with the configured semantic model, next time you open the PBIP, you won't see the prompt, and Fabric semantic model will be overwritten with the metadata from the semantic model in the Power BI Project files.

Change remote semantic model

During the preview, if you wish to switch the remote semantic model in the PBIP you must navigate to the `*.SemanticModel\localSettings.json` file. There, you can either modify the `remoteModelingObjectId` property to the ID of the semantic model you

want to connect to, or remove the property altogether. Upon reopening the PBIP, Power BI Desktop connects to the new semantic model or prompts you to create or select an existing semantic model.



```
1  {
2    "version": "1.1",
3    "userConsent": {},
4    "securityBindingSignature": "AQAAANCMnd8BFdERjHoAwE/C1+sBAAAAtUAaA1tOek",
5    "remoteModelingObjectId": "aaaaaaaa-0000-1111-2222-bbbbbbbbbbbb"
6 }
```

A screenshot of a code editor showing a JSON configuration file. The file contains several fields: 'version' (1.1), 'userConsent' (an empty object), 'securityBindingSignature' (a long base64 string), and 'remoteModelingObjectId' (a GUID). The 'remoteModelingObjectId' field is highlighted with a red rectangular box. In the top right corner of the code editor, there is a circular icon with a magnifying glass and a plus sign.

Note

The configuration described in this section is intended solely for local development and should not be used for deployment across different environments.

Common uses for Direct Lake in Power BI Desktop

Scenario: I'm getting errors when opening the Direct Lake semantic model for Edit with Power BI Desktop.

Solution: Review all the [requirements and permissions](#). If you met all the requirements, check whether you can edit the semantic modeling using [web modeling](#).

Scenario: I lost the connection to the remote semantic model and can't recover it. Have I lost my changes?

Solution: All your changes are immediately applied to the remote semantic model. You can always close Power BI Desktop and restart the editing session with the semantic model you were working on.

Scenario: I exported to Power BI Project (PBIP). Can I select the same semantic model I was live editing?

Solution: You can, but you should be careful. If each developer is working on their local PBIP and all select the same semantic model as a remote model, they'll overwrite each other's changes. The best practice when working with a PBIP is for each developer to have their own isolated copy of the Direct Lake semantic model.

Scenario: I'm live editing the Direct Lake semantic model and can't create field parameters.

Solution: When live editing a semantic model, Report View isn't available, which is required for the field parameters UI. You can export to a Power BI Project (PBIP) and open it to access Report View and the field parameters UI.

Scenario: I made changes to the semantic model using an external tool, but I don't see those changes reflected in Power BI Desktop.

Solution: Changes made by external tools are applied to the remote semantic model, but these changes will only become visible in Power BI Desktop after either the next modeling change is made within Power BI Desktop, or the semantic model is refreshed.

Requirements and permissions

- XMLA Endpoint must be enabled on the tenant. Learn more in the [XMLA endpoint article](#).
- XMLA Endpoint with *Read Write* access must be enabled at the capacity. Learn more in the [tools article](#).
- User must have *Write* permission on the semantic model. Learn more in the [permissions article](#).
- User must have *Viewer* permission on the lakehouse. Learn more in the [Lakehouse article](#).
- This feature is unavailable for users with a free license.

Considerations and limitations

Live edit of semantic models in Direct Lake mode in Power BI Desktop is currently in preview. Keep the following in mind:

- You can't edit default semantic models.
- You can't transform data using Power Query editor. In the Lakehouse you can use a dataflow to perform Power Query transformations.
- You can't have multiple data sources. You can shortcut to or add additional data to Lakehouse or Warehouse data sources to use in the semantic model.
- You can't publish the Power BI Project (PBIP) from Power BI Desktop. You can use Fabric Deployment mechanisms such as Fabric Git Integration or Fabric Item APIs to publish your local PBIP files to a Fabric workspace.
- You can't validate RLS roles from Power BI Desktop. You can validate the role in the service.
- Service-created model diagram layouts aren't displayed in Power BI Desktop, and layouts created in Power BI Desktop aren't persisted in the Power BI service.
- Signing off during editing could lead to unexpected errors.

- You can open external tools, but the external tool must manage authentication to the remote semantic model.
- Changing the data category to *barcode* won't allow reports linked to the semantic model to be filtered by barcodes.

Additionally, please consider the current known issues and limitations of Direct Lake.

Related content

- [Direct Lake overview](#)
- [Power BI Project files](#)

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Edit tables for Direct Lake semantic models

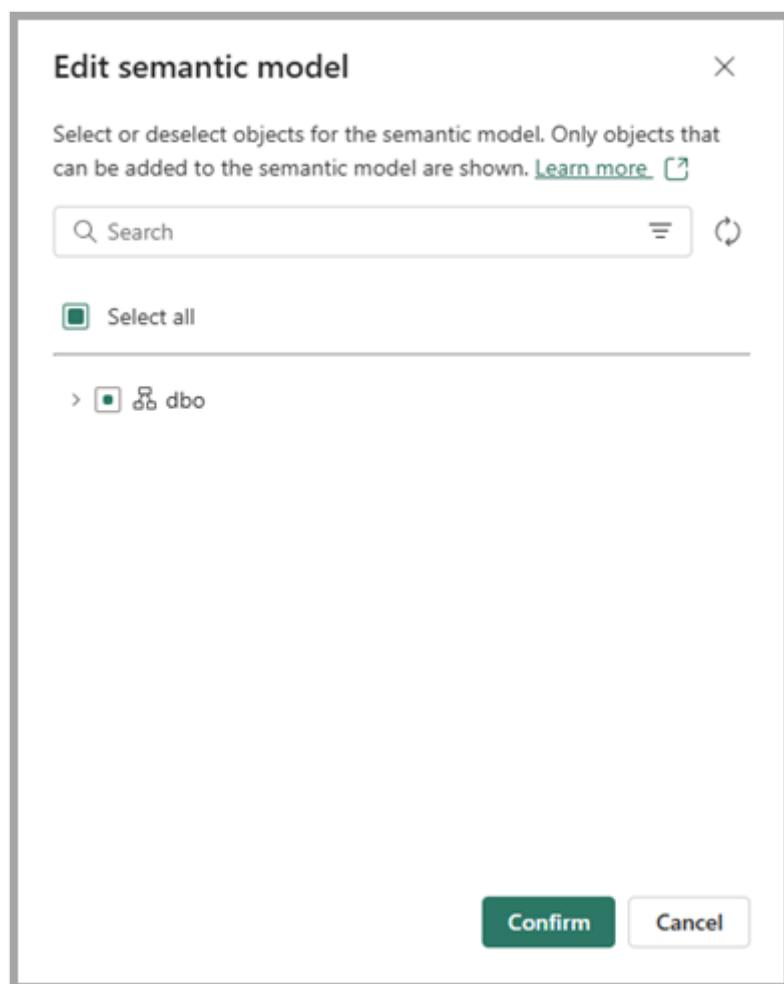
Article • 09/03/2024

Semantic models in Direct Lake mode's tables come from Microsoft Fabric and OneLake data. Instead of the **transform data** experience of Power BI import and DirectQuery, Direct Lake mode uses the **Edit tables** experience, allowing you to decide which tables you want the semantic model in Direct Lake mode to use.

Use and features of Edit tables

The purpose of **Edit tables** is to add or remove tables in the semantic model in Direct Lake mode. Such tables reside in a single Fabric item that writes data to the OneLake, such as a Lakehouse or Warehouse.

The following image shows the Edit tables initial dialog:



The areas in the Edit tables dialog are the following:

- **Title** displays whether you're editing or creating.

- **Information** text and **learn more** link to the Direct Lake documentation.
- **Search** to find the specific table or view from the data source.
- **Filter** to limit the schema or object type (table or view) that is displayed.
- **Reload** to sync the SQL analytics endpoint of a Lakehouse or a warehouse (requires write permission on the Lakehouse or warehouse). Not available in all scenarios.
- **Tree view** organizes the available tables or views:
 - Schema name
 - Object type (table or view)
 - Table or view name
- **Check boxes** allow you to select or unselect tables or views to use in the semantic model.
- **Confirm or Cancel** button let you decide whether to make the change to the semantic model.

In the semantic model, tables and columns can be renamed to support reporting expectations. Edit tables still show the data source table names, and schema sync doesn't impact the semantic model renames.

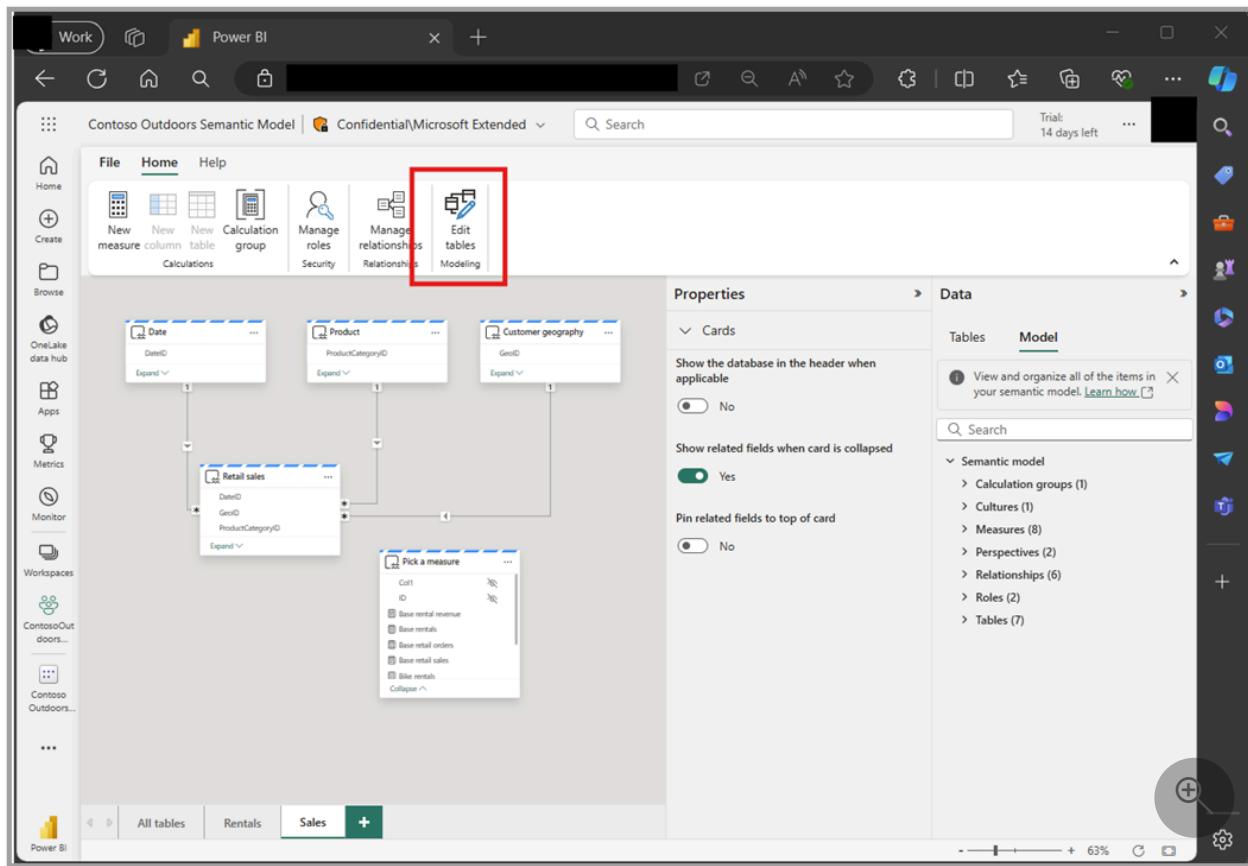
In the Lakehouse, tables and views can also be renamed. If the upstream data source renames a table or column after the table was added to the semantic model, the semantic model schema sync will still be looking for the table using the previous name, so the table will be removed from the model on schema sync. The table with the new name will show in the **Edit tables** dialog as unchecked, and must be explicitly checked again and added again to the semantic model. Measures can be moved to the new table, but relationships and column property updates need to be reapplied to the table.

Entry points

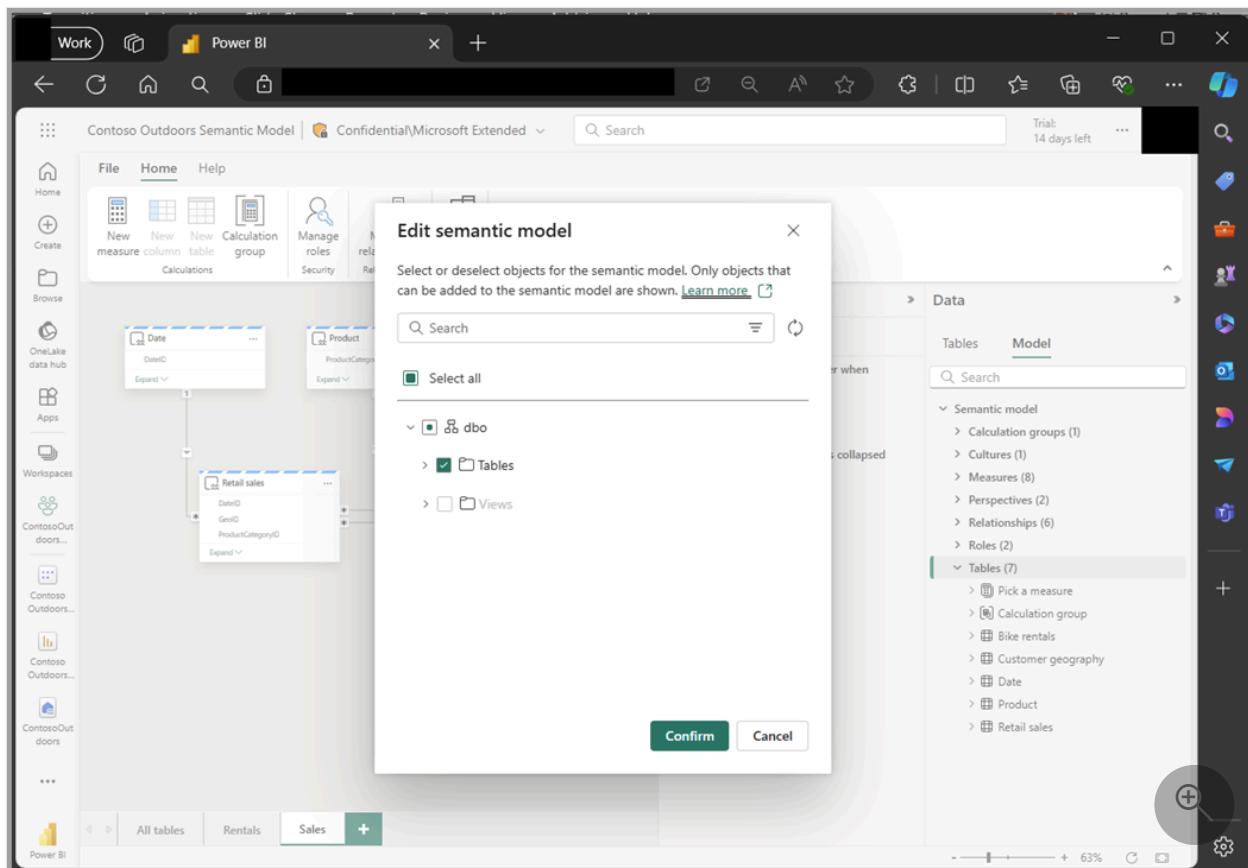
The following sections describe the multiple ways you can edit semantic models in Direct Lake.

Editing a semantic model in Direct Lake mode in web modeling

When editing a semantic model in the browser, there's a ribbon button to launch **Edit tables**, as shown in the following image.



Selecting the ribbon button launches the **Edit tables** dialog, as shown in the following image.



You can perform many actions that impact the tables in the semantic model:

- Selecting the **Confirm** button with no changes initiates a schema sync. Any table changes in the data source, such as an added or removed column, are applied to the semantic model.
- Selecting the **Cancel** button returns to editing the model without applying any updates.
- **Selecting** tables or views previously unselected adds the selected items to the semantic model.
- **Unselecting** tables or views previously selected removes them from the semantic model.

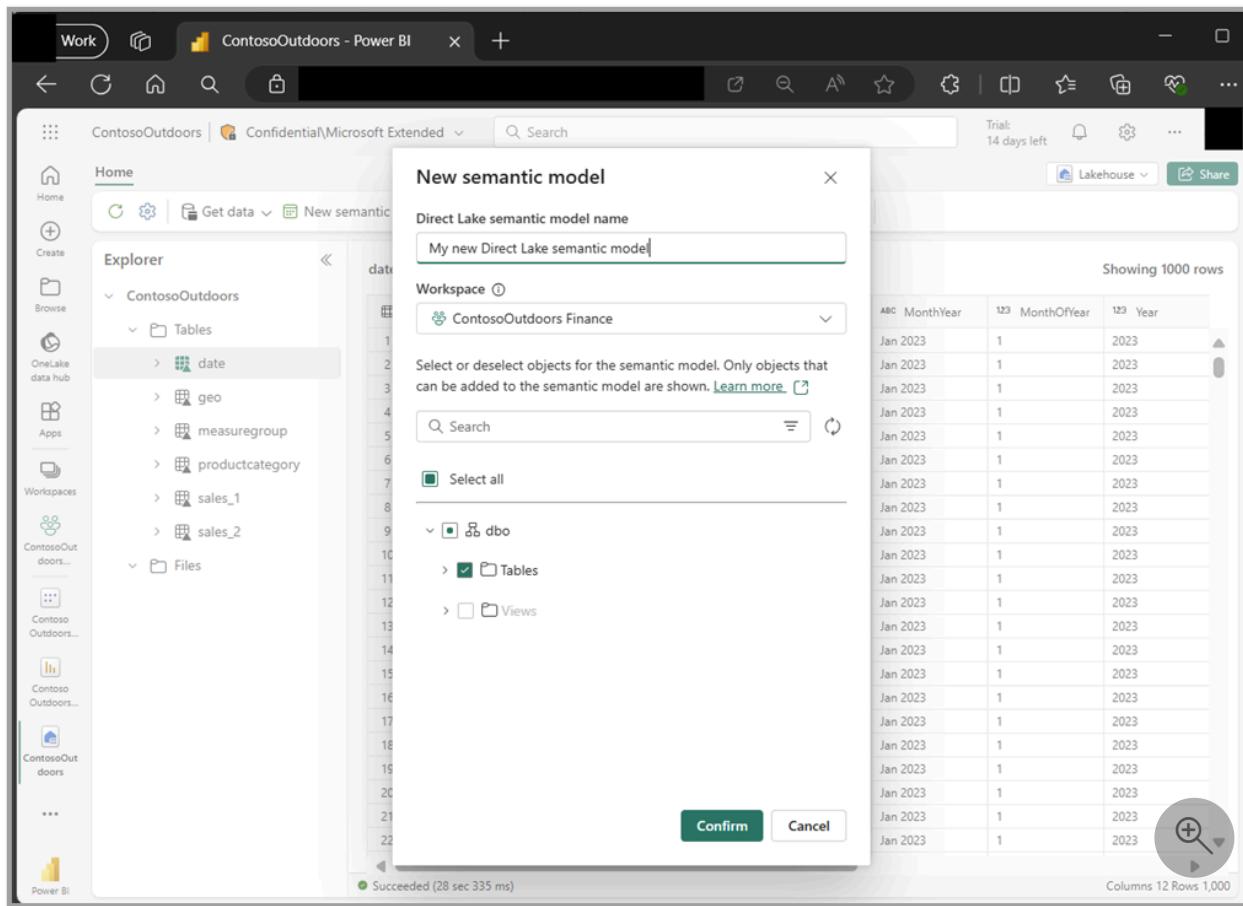
Tables that have measures can be unselected but will still show in the model with columns removed and only showing measures. The measures can be either deleted or moved to a different table. When all measures have been moved or deleted, go back to Edit tables and click Confirm to no longer show the empty table in the model.

Creating a new semantic model from Lakehouse and Warehouse

When creating a semantic model, you must specify two properties:

- **Direct Lake semantic model:** The name of the semantic model in the workspace, which can be changed later. If the semantic model with the same name already exists in the workspace, a number is automatically appended to the end of the model name.
- **Workspace:** The workspace where the semantic model is saved. By default the workspace you're currently working in is selected, but you can change it to another Fabric workspace.

The following image shows the **New semantic model** dialog.



Default semantic model

There are some differences for the default Power BI semantic model in Direct Lake mode. Refer to the [default Power BI semantic models in Microsoft Fabric](#) article for more information about the differences.

Related content

- [Direct Lake overview](#)
- [Create a lakehouse for Direct Lake](#)
- [Analyze query processing for Direct Lake semantic models](#)

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Create a lakehouse for Direct Lake

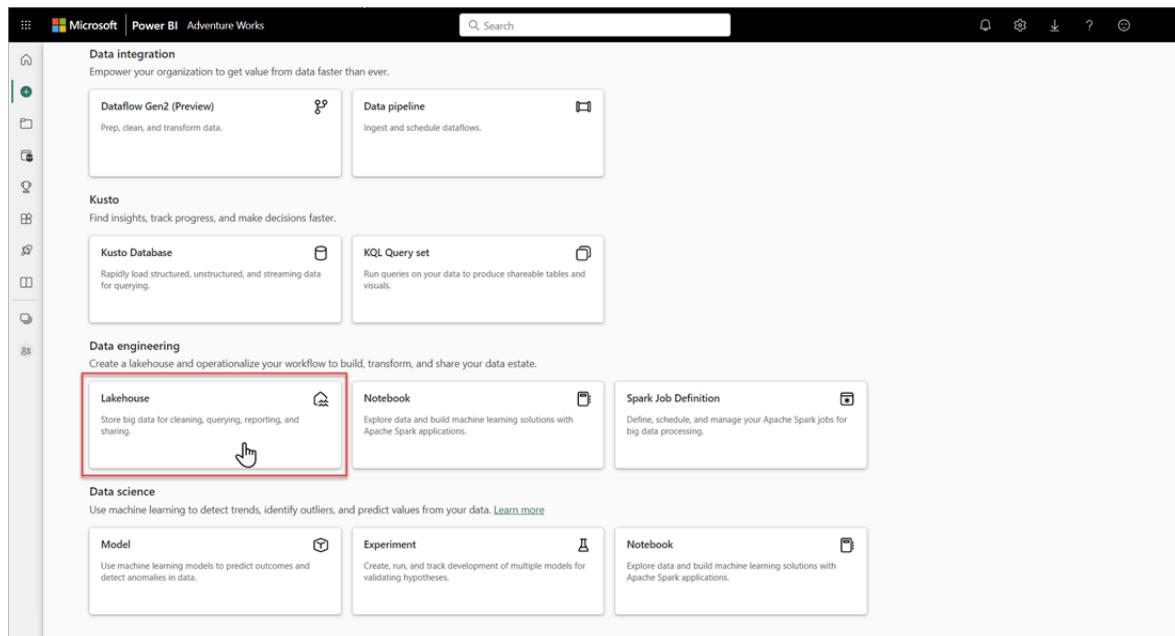
Article • 04/26/2024

This article describes how to create a lakehouse, create a Delta table in the lakehouse, and then create a basic semantic model for the lakehouse in a Microsoft Fabric workspace.

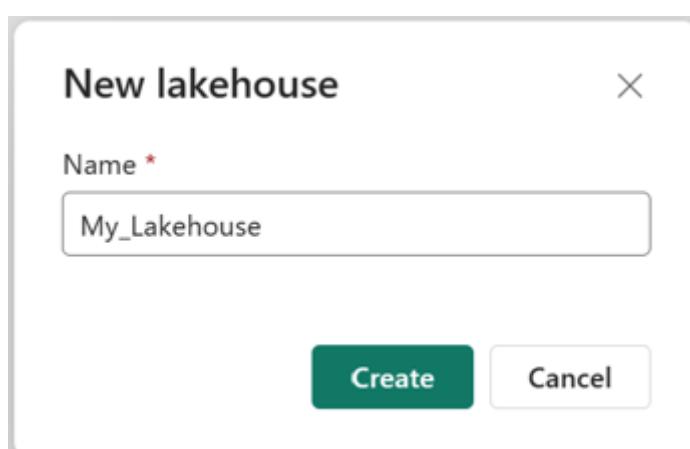
Before getting started creating a lakehouse for Direct Lake, be sure to read [Direct Lake overview](#).

Create a lakehouse

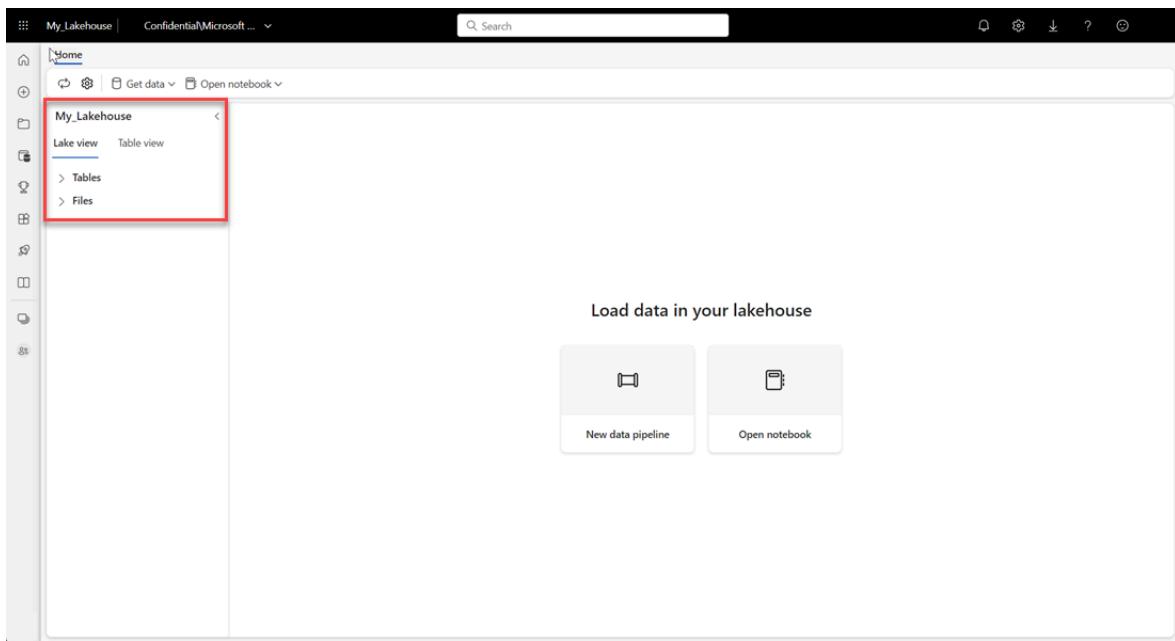
1. In your Microsoft Fabric workspace, select **New > More options**, and then in **Data Engineering**, select the **Lakehouse** tile.



2. In the **New lakehouse** dialog box, enter a name, and then select **Create**. The name can only contain alphanumeric characters and underscores.



3. Verify the new lakehouse is created and opens successfully.

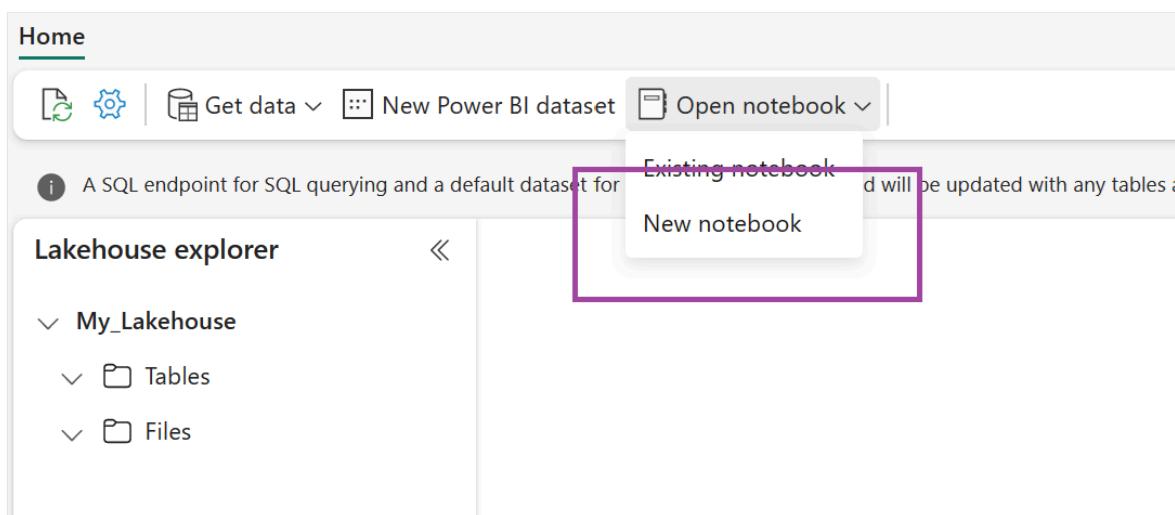


Create a Delta table in the lakehouse

After creating a new lakehouse, you must then create at least one Delta table so Direct Lake can access some data. Direct Lake can read parquet-formatted files, but for the best performance, it's best to compress the data by using the VORDER compression method. VORDER compresses the data using the Power BI engine's native compression algorithm. This way the engine can load the data into memory as quickly as possible.

There are multiple options to load data into a lakehouse, including data pipelines and scripts. The following steps use PySpark to add a Delta table to a lakehouse based on an [Azure Open Dataset](#):

1. In the newly created lakehouse, select **Open notebook**, and then select **New notebook**.



2. Copy and paste the following code snippet into the first code cell to let SPARK access the open model, and then press **Shift + Enter** to run the code.

```
Python

# Azure storage access info
blob_account_name = "azureopendatastorage"
blob_container_name = "holidaydatacontainer"
blob_relative_path = "Processed"
blob_sas_token = r""

# Allow SPARK to read from Blob remotely
wasbs_path = 'wasbs://{}@{}.blob.core.windows.net/{}'.format(blob_container_name, blob_account_name, blob_relative_path)
spark.conf.set(
    'fs.azure.sas.{}.{}.blob.core.windows.net'.format(blob_container_name, blob_account_name),
    blob_sas_token)
print('Remote blob path: ' + wasbs_path)
```

3. Verify the code successfully outputs a remote blob path.

The screenshot shows the Azure Synapse Analytics workspace interface. On the left, there's a sidebar with various navigation options like Home, Create, Data hub, Monitoring hub, Metrics, Apps, Deployment pipelines, Learn, Workspaces, See-through test, and Notebook 1. The main area is titled 'Lakehouse explorer' and shows a folder named 'My_Lakehouse' containing 'Tables' and 'Files'. In the center, a code editor window is open with a Python script. The script sets up Azure storage access and defines a remote blob path. Below the code, the output of the cell shows a green checkmark and the message '16 sec - Apache Spark session started in 14 sec 67 ms. Command executed in 1 sec 915 ms by Kay Unkroth on 11:35:28 AM, 4/19/23'. A purple box highlights the output text: '... Remote blob path: wasbs://holidaydatacontainer@azureopendatastorage.blob.core.windows.net/Processed'. At the bottom right of the code editor, it says '1 of 1 cell'.

```
1 # Azure storage access info
2 blob_account_name = "azureopendatastorage"
3 blob_container_name = "holidaydatacontainer"
4 blob_relative_path = "Processed"
5 blob_sas_token = r""
6
7 # Allow SPARK to read from Blob remotely
8 wasbs_path = 'wasbs://{}@{}.blob.core.windows.net/{}'.format(blob_container_name, blob_account_name, blob_relative_path)
9 spark.conf.set(
10     'fs.azure.sas.{}.{}.blob.core.windows.net'.format(blob_container_name, blob_account_name),
11     blob_sas_token)
12 print('Remote blob path: ' + wasbs_path)
13
14
```

[1] ✓ 16 sec - Apache Spark session started in 14 sec 67 ms. Command executed in 1 sec 915 ms by Kay Unkroth on 11:35:28 AM, 4/19/23

... Remote blob path: wasbs://holidaydatacontainer@azureopendatastorage.blob.core.windows.net/Processed

4. Copy and paste the following code into the next cell, and then press **Shift + Enter**.

```
Python

# Read Parquet file into a DataFrame.
df = spark.read.parquet(wasbs_path)
print(df.printSchema())
```

5. Verify the code successfully outputs the DataFrame schema.

```

1 # Azure storage access info
2 blob_account_name = "azureopendatastorage"
3 blob_container_name = "holidaydatacontainer"
4 blob_relative_path = "Processed"
5 blob_sas_token = ""
6
7 # Allow SPARK to read from Blob remotely
8 wasbs_path = 'wasbs://{}.blob.core.windows.net/{}'.format(blob_container_name, blob_account_name, blob_relative_path)
9 spark.conf.set(
10     'fs.azure.sas.{0}'.format(blob_container_name), blob_sas_token)
11 print('Remote blob path: ' + wasbs_path)
12
13
14
[1] ✓ 16 sec - Apache Spark session started in 14 sec 67 ms. Command executed in 1 sec 915 ms by Kay Unkroth on 11:35:28 AM, 4/19/23
Remote blob path: wasbs://holidaydatacontainer@azureopendatastorage.blob.core.windows.net/Processed

[2] ✓ 2 sec - Command executed in 1 sec 733 ms by Kay Unkroth on 11:38:58 AM, 4/19/23
> [1] Spark jobs (1 of 1 succeeded)
...
  root
  |-- countryOrRegion: string (nullable = true)
  |-- holidayName: string (nullable = true)
  |-- normalizeHolidayName: string (nullable = true)
  |-- isPaidTimeOff: boolean (nullable = true)
  |-- countryRegionCode: string (nullable = true)
  |-- date: timestamp (nullable = true)

None
+ Code + Markdown

```

6. Copy and paste the following lines into the next cell, and then press Shift + Enter.

The first instruction enables the VORDER compression method, and the next instruction saves the DataFrame as a Delta table in the lakehouse.

```

# Save as delta table
spark.conf.set("spark.sql.parquet.vorder.enabled", "true")
df.write.format("delta").saveAsTable("holidays")

```

7. Verify all SPARK jobs complete successfully. Expand the SPARK jobs list to view more details.

ID	Description	Status	Stages	Tasks	Duration	Rows	Data read	Data written
Job 2	\$anon\$fun\$recordDeltaOperation\$5 at SynapseLoggingShim.scala:86	Succeeded	1/1	1/1 succeeded	13 sec	139114	323.91 KB	230.86 KB
Job 3	\$anon\$fun\$recordDeltaOperation\$5 at SynapseLoggingShim.scala:86	Succeeded	1/1	1/1 succeeded	1 sec	8	1.92 KB	1.63 KB
Job 4	\$anon\$fun\$recordDeltaOperation\$5 at SynapseLoggingShim.scala:86	Succeeded	1/0	50/50 succeeded	6 sec	54	1.63 KB	4.3 KB
Job 5	\$anon\$fun\$recordDeltaOperation\$5 at SynapseLoggingShim.scala:86	Succeeded	1/-1	1/1 succeeded	< 1 ms	50	4.3 KB	0 B

8. To verify a table has been created successfully, in the upper left area, next to **Tables**, select the ellipsis (...), then select **Refresh**, and then expand the **Tables** node.

9. Using either the same method as above or other supported methods, add more Delta tables for the data you want to analyze.

Create a basic Direct Lake model for your lakehouse

1. In your lakehouse, select **New semantic model**, and then in the dialog, select tables to be included.

2. Select **Confirm** to generate the Direct Lake model. The model is automatically saved in the workspace based on the name of your lakehouse, and then opens the model.

The screenshot shows the Power BI service workspace. On the left, there's a navigation bar with icons for Home, Create, Browse, Data view, Monitoring hub, Metrics, Apps, Deployment pipelines, Notebooks, and Workspaces. The 'My_Lakehouse' workspace is selected. In the center, there's a summary card for 'My_Lakehouse (1)'. It shows the location as 'SeeThroughTest', refreshed on '4/19/23, 12:00:13 PM'. Below this, a section titled 'See what already exists' lists 'My_Lakehouse' as an 'Upstream' dataset. To the right, there are two cards: 'Visualize this data' (Create an interactive report, or a table, to discover and share business insights) and 'Share this data' (Give people access to the dataset and set their permissions to work with it). A 'Tables' pane on the right lists several tables: customer, holidays, inventory, product, and sales. A note at the top of the pane says: 'Select a table and/or columns from this dataset to view and export the underlying data. [Learn more](#)'.

3. Select **Open data model** to open the Web modeling experience where you can add table relationships and DAX measures.

The screenshot shows the Power BI Web modeling experience for the 'My_Lakehouse' dataset. The main area displays a diagram of four tables: 'product', 'segment', 'customer', and 'fact'. Relationships are shown between 'product' and 'segment', 'customer' and 'segment', and 'customer' and 'fact'. The 'Properties' pane on the right has sections for 'Cards' (Show related fields when card is collapsed: Yes) and 'Fields' (List of fields for each table: business, pricing_level, product, sales, segment). The 'Fields' pane also includes a search bar and a list of fields for each table. The 'Fields' section for 'business' includes: business, pricing_level, product, sales, segment. The 'Fields' section for 'product' includes: product. The 'Fields' section for 'sales' includes: sales. The 'Fields' section for 'segment' includes: segment.

When you're finished adding relationships and DAX measures, you can then create reports, build a composite model, and query the model through XMLA endpoints in much the same way as any other model.

Related content

- Specify a fixed identity for a Direct Lake model
 - Direct Lake overview
 - Analyze query processing for Direct Lake semantic models
-

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Specify a fixed identity for a Direct Lake semantic model

Article • 04/26/2024

Follow these steps to specify a fixed identity connection for a Direct Lake semantic model.

1. In your Direct Lake model's settings, expand **Gateway and cloud connections**.

Note that your Direct Lake model has a SQL Server data source pointing to a lakehouse or data warehouse in Fabric.

The screenshot shows the 'Gateway and cloud connections' settings for a Direct Lake model. Under 'Cloud connections', there is a list of data sources. One specific entry is highlighted with a red box: 'SqlServer"server": "x6eps4xrq2xudenlfv6naeo3i4-dptd5zfuxa cefmiecygfwbhnm.datawarehouse.pbidicated.windows.net", "database": "aw_lakehouse"'. To the right of this entry is a 'Maps to:' dropdown menu, which is also highlighted with a red box and contains the option 'Single Sign-On (Azure A)'. At the bottom of the screen, there are 'Apply' and 'Discard' buttons.

2. In the **Maps to** listbox, select **Create a connection**. A New connection pane appears with some data source information already entered for you. Specify a connection name.
3. In **Authentication method**, select **OAuth 2.0 or Service Principal**, and then specify credentials for the fixed identity you want to use.

New connection X

Connection name *
Adventure Works Lakehouse DS

Connection type *
SQL Server

Server *
X6EPS4XRQ2XUDENLFV6NAEO3I4-DPTD5ZFUXACEFMIEC...

Database *
AW_Lakehouse

Authentication

Authentication method *
Service Principal

Tenant ID *

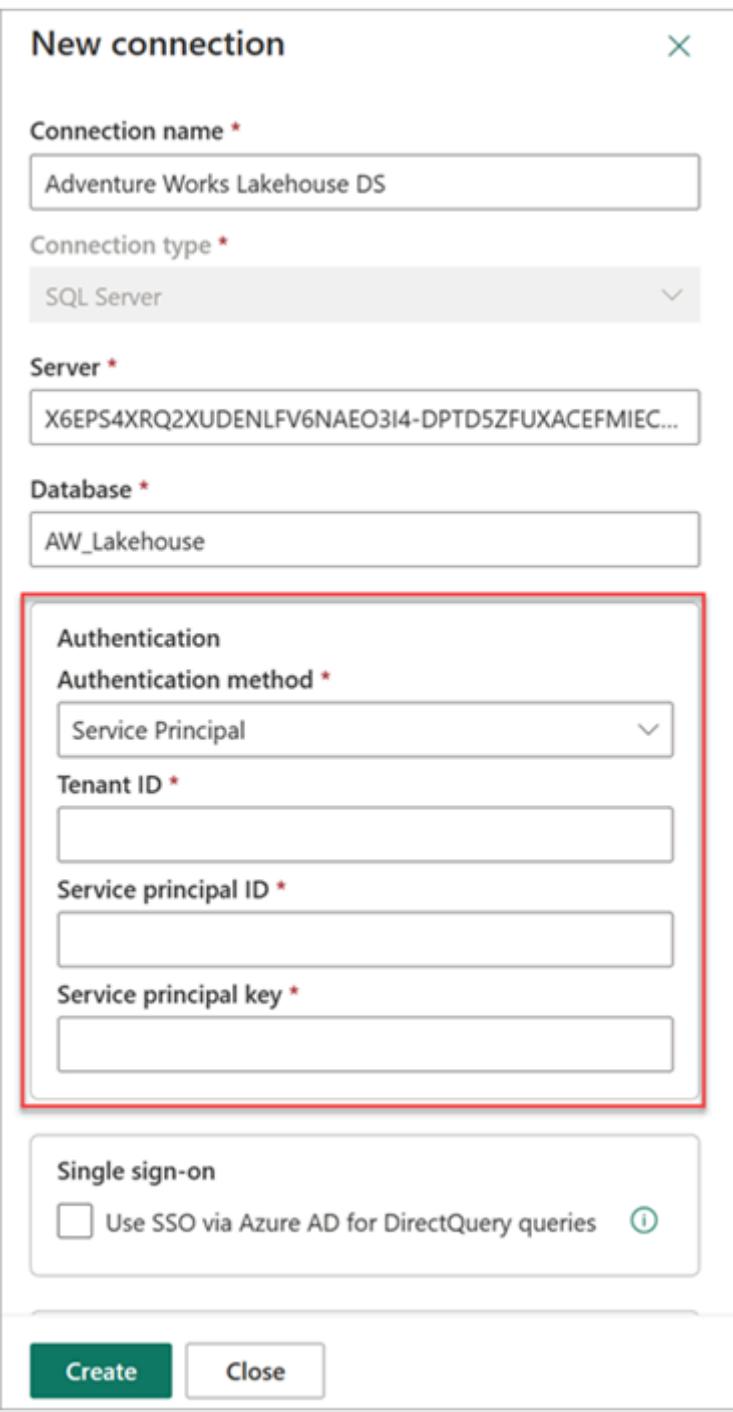
Service principal ID *

Service principal key *

Single sign-on

Use SSO via Azure AD for DirectQuery queries (i)

Create Close

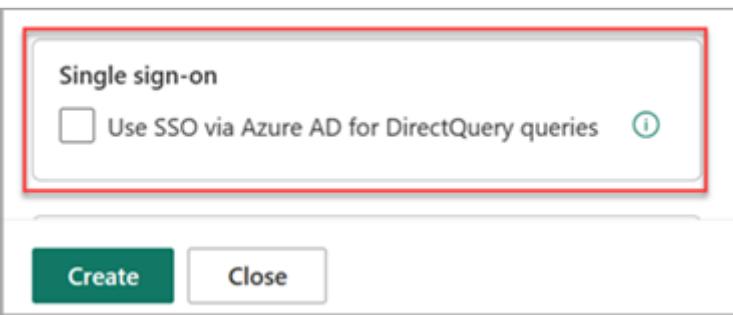


4. In **Single sign-on**, ensure **SSO via Microsoft Entra ID for DirectQuery queries** is *not* selected.

Single sign-on

Use SSO via Azure AD for DirectQuery queries (i)

Create Close



5. Configure any additional parameters if needed and then click **Create**.

6. In the Direct Lake model settings, verify the data source is now associated with the non-SSO cloud connection.

Related content

- [Direct Lake overview](#)
 - [Analyze query processing for Direct Lake semantic models](#)
-

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Analyze query processing for Direct Lake semantic models

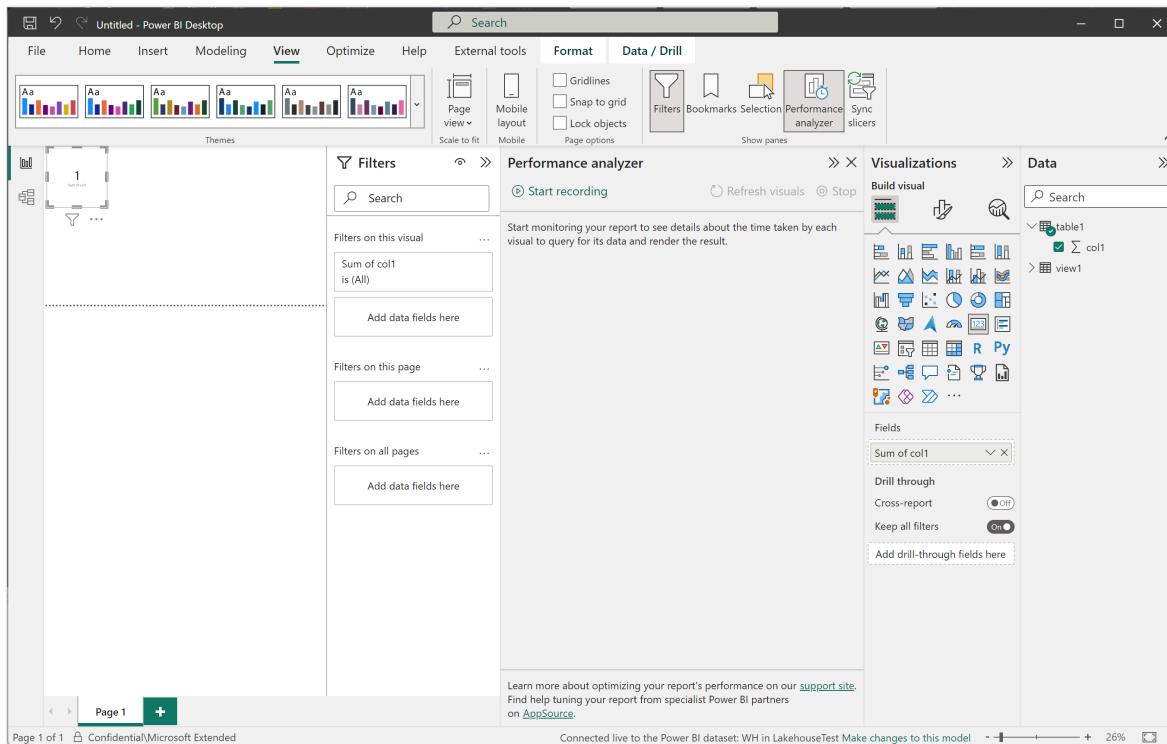
Article • 04/26/2024

Power BI semantic models in *Direct Lake* mode read Delta tables directly from OneLake — unless they have to fall back to *DirectQuery* mode. Typical fallback reasons include memory pressures that can prevent loading of columns required to process a DAX query, and certain features at the data source might not support Direct Lake mode, like SQL views in a Warehouse and Lakehouse. In general, Direct Lake mode provides the best DAX query performance unless a fallback to DirectQuery mode is necessary. Because fallback to DirectQuery mode can impact DAX query performance, it's important to analyze query processing for a Direct Lake semantic model to identify if and how often fallbacks occur.

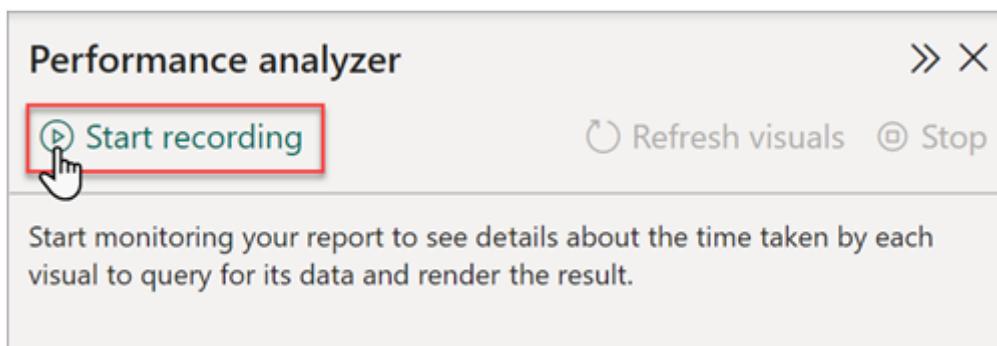
Analyze by using Performance analyzer

Performance analyzer can provide a quick and easy look into how a visual queries a data source, and how much time it takes to render a result.

1. Start Power BI Desktop. On the startup screen, select **New > Report**.
2. Select **Get Data** from the ribbon, then select **Power BI semantic models**.
3. In the **OneLake data hub** page, select the Direct Lake semantic model you want to connect to, and then select **Connect**.
4. Place a card visual on the report canvas, select a data column to create a basic report, and then on the **View** menu, select **Performance analyzer**.

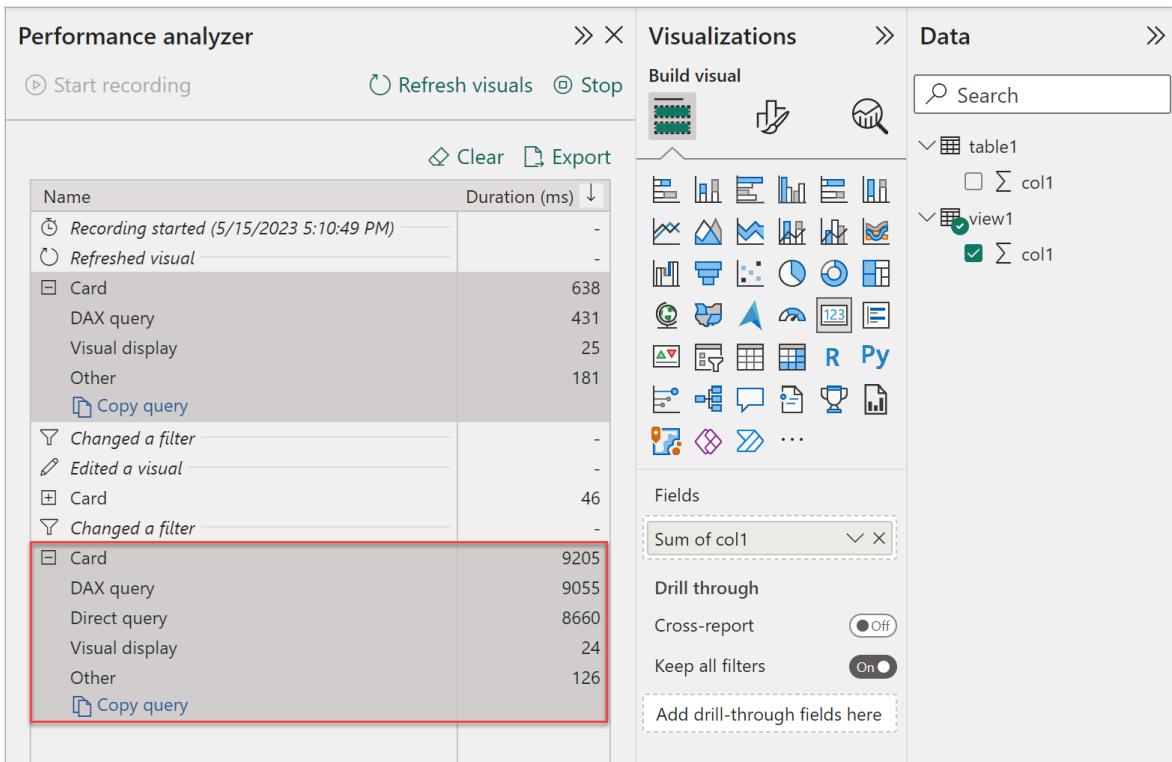


5. In the Performance analyzer pane, select Start recording.



6. In the Performance analyzer pane, select Refresh visuals, and then expand the Card visual. The card visual doesn't cause any DirectQuery processing, which indicates the semantic model was able to process the visual's DAX queries in Direct Lake mode.

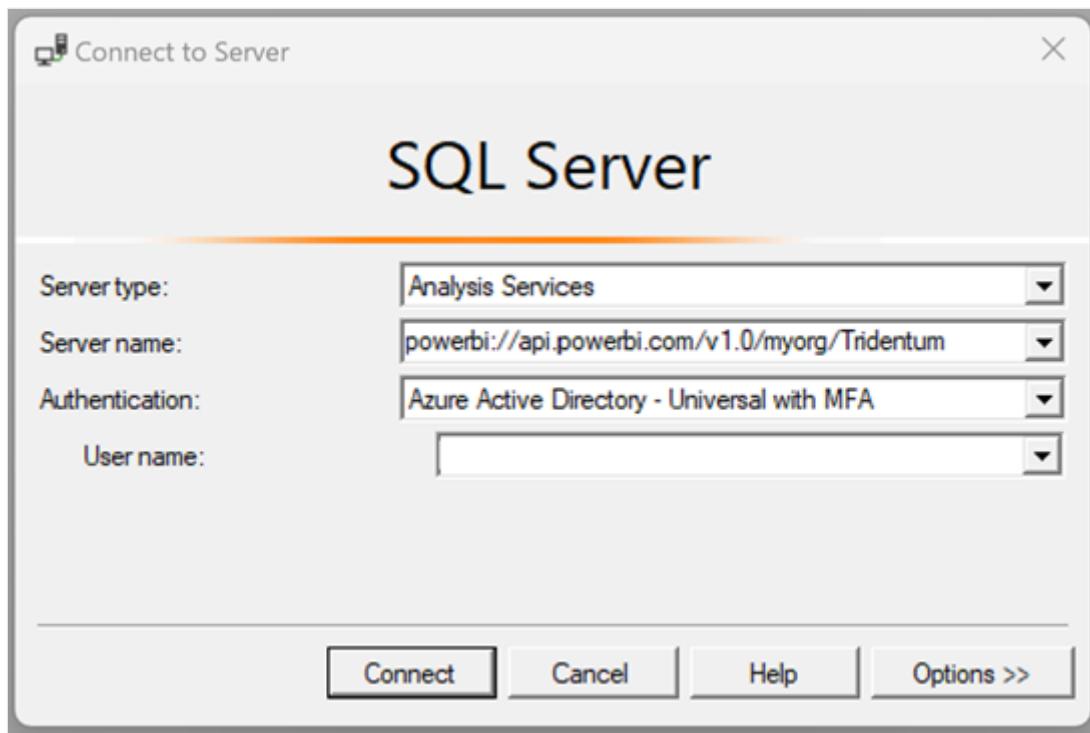
If the semantic model falls back to DirectQuery mode to process the visual's DAX query, you see a **Direct query** performance metric, as shown in the following image:



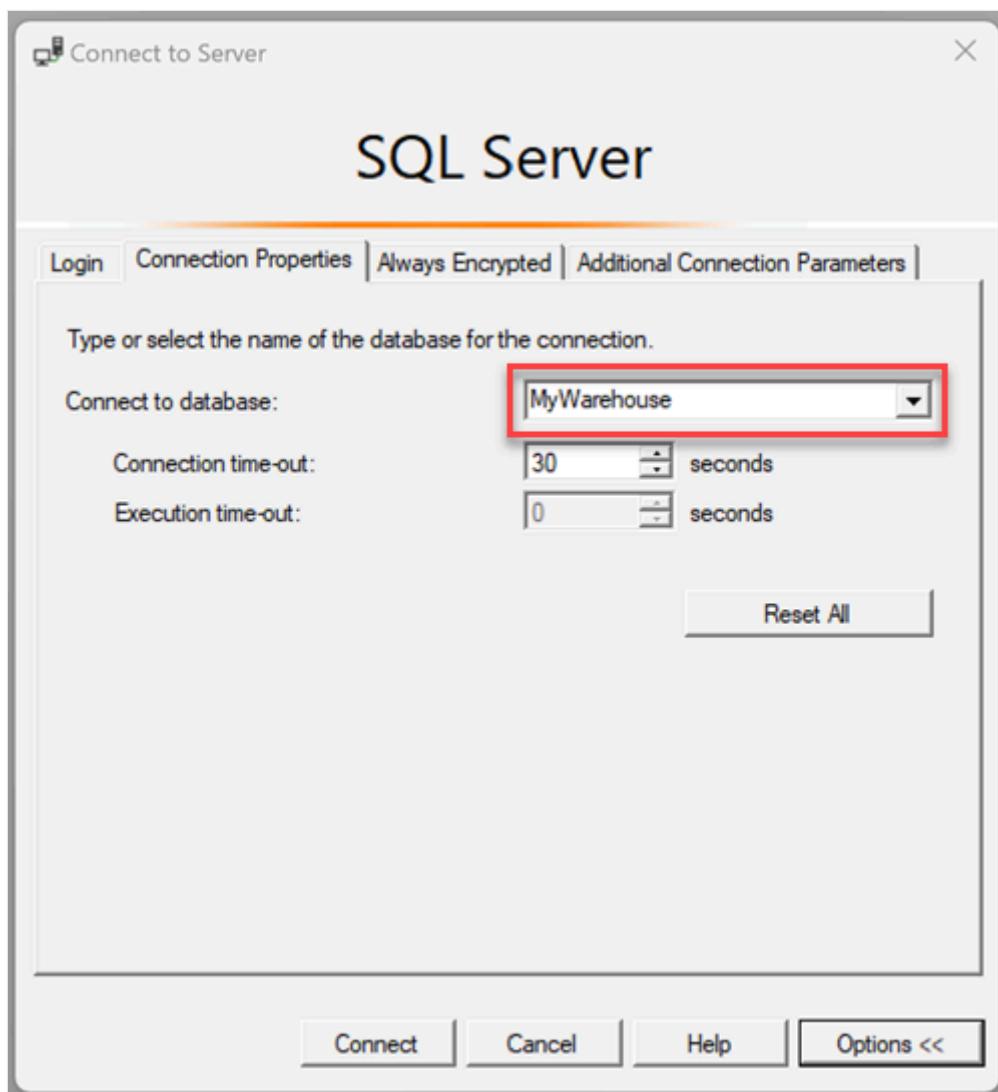
Analyze by using SQL Server Profiler

SQL Server Profiler can provide more details about query performance by tracing query events. It's installed with [SQL Server Management Studio \(SSMS\)](#). Before starting, make sure you have the latest version of SSMS installed.

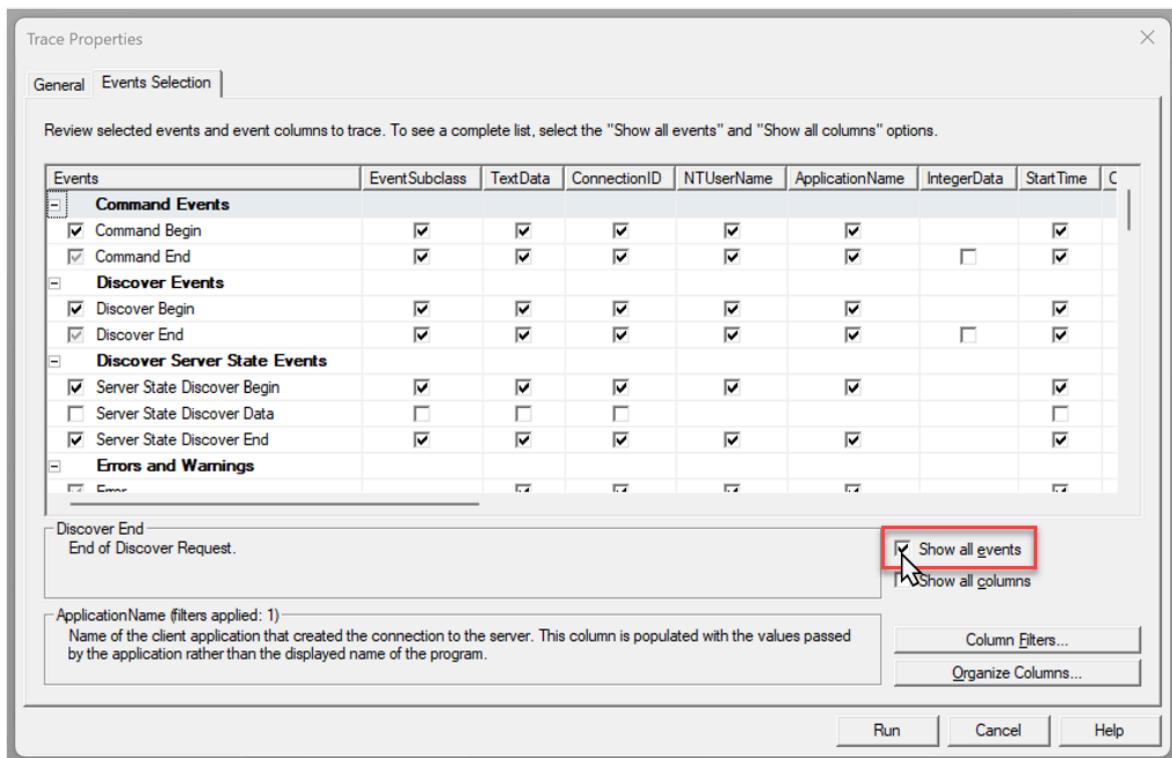
1. Start SQL Server Profiler from the Windows menu.
2. In SQL Server Profiler, select **File > New Trace**.
3. In **Connect to Server > Server type**, select **Analysis Services**, then in **Server name**, enter the URL to your workspace, then select an authentication method, and then enter a username to sign in to the workspace.



4. Select Options. In **Connect to database**, enter the name of your semantic model and then select **Connect**. Sign in to Microsoft Entra ID.



5. In **Trace Properties > Events Selection**, select the **Show all events** checkbox.

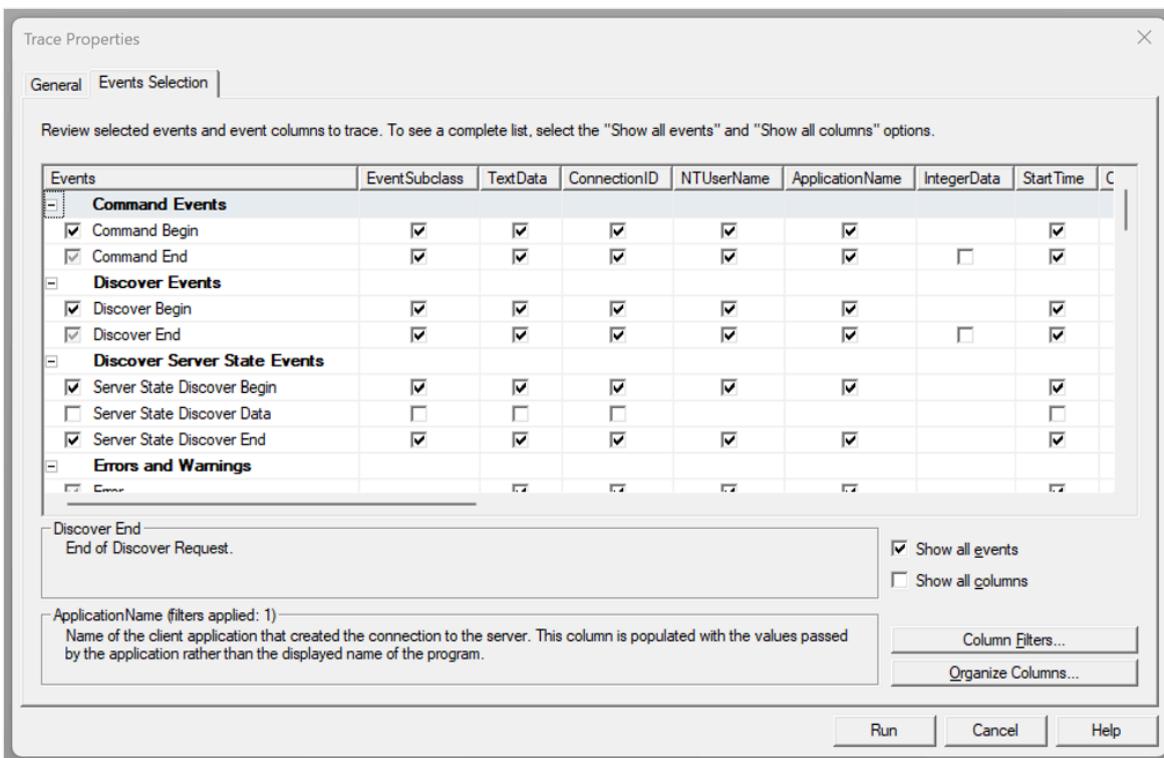


6. Scroll to **Query Processing**, and then select checkboxes for the following events:

[Expand table](#)

Event	Description
DirectQuery_Begin DirectQuery_End	If DirectQuery Begin/End events appear in the trace, the semantic model might have fallen back to DirectQuery mode. However, note that the presence of EngineEdition queries and possibly queries to check Object-Level Security (OLS) do not represent a fallback because the engine always uses DirectQuery mode for these non-query processing related checks.
VertiPaq_SE_Query_Begin VertiPaq_SE_Query_Cache_Match VertiPaq_SE_Query_Cache_Miss VertiPaq_SE_Query_End	VertiPaq storage engine (SE) events in Direct Lake mode are the same as for import mode.

It should look like this:



7. Select Run. In Power BI Desktop, create a new report or interact with an existing report to generate query events. Review the SQL Server Profiler trace report for query processing events.

The following image shows an example of query processing events for a DAX query. In this trace, the VertiPaq storage engine (SE) events indicate that the query was processed in Direct Lake mode.

EventClass	EventSubclass	TextData	ConnectionID	NTUserName	Application
Discover Begin	26 - DISCO...	<ccon><RestrictionList xmlns="urn:sc...	8341	Power B...	PowerBI
Discover End	26 - DISCO...	<ccon><RestrictionList xmlns="urn:sc...	8341	Power B...	PowerBI
Discover Begin	54 - DISCO...	<ccon><RestrictionList xmlns="urn:sc...	8341	Power B...	PowerBI
DirectQuery Begin		SELECT 'EngineEdition', SERVERPROPE...	8341	Power B...	PowerBI
DirectQuery End		SELECT 'EngineEdition', SERVERPROPE...	8341	Power B...	PowerBI
Discover End	54 - DISCO...	<ccon><RestrictionList xmlns="urn:sc...	8341	Power B...	PowerBI
Query Begin	3 - DAXQuery	DEFINE VAR __DSOCore = DISTINCT...	8341	Power B...	PowerBI
VertiPaq SE Query Begin	0 - VertiP...	SET DC_KIND="AUTO"; SELECT [<ccon>...	8341	Power B...	
VertiPaq SE Query Begin	10 - Inter...	SET DC_KIND="DENSE"; SELECT [<ccon...	8341	Power B...	
VertiPaq SE Query End	10 - Inter...	SET DC_KIND="DENSE"; SELECT [<ccon...	8341	Power B...	
VertiPaq SE Query End	0 - VertiP...	SET DC_KIND="AUTO"; SELECT [<ccon>...	8341	Power B...	
Query End	3 - DAXQuery	DEFINE VAR __DSOCore = DISTINCT...	8341	Power B...	PowerBI

```

DEFINE
    VAR __DSOCore =
        DISTINCT('Geography'[city])
    VAR __DSOBodyLimited =
        TOPN(3502, __DSOCore, 'Geography'[city], 1)
EVALUATE
    __DSOBodyLimited
ORDER BY
  
```

Trace is running. | Ln 98, Col 1 | Rows: 103

Related content

- [Create a lakehouse for Direct Lake](#)
- [Direct Lake overview](#)

Feedback

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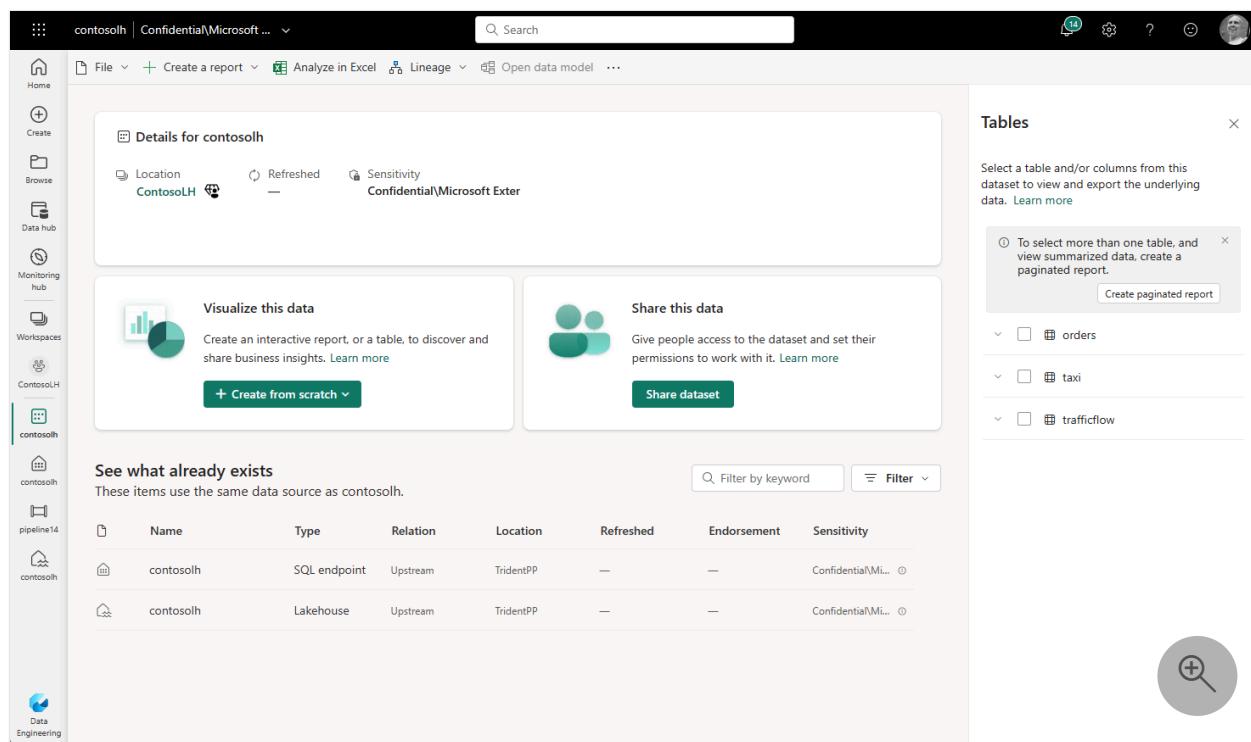
How Direct Lake mode works with Power BI reporting

Article • 08/01/2024

In Microsoft Fabric, when the user creates a lakehouse, the system also provisions the associated SQL analytics endpoint and default semantic model in Direct Lake mode. You can add tables from the lakehouse into the default semantic model by going to the SQL analytics endpoint and clicking the **Manage default semantic model** button in the **Reporting** ribbon. You can also create a non-default Power BI semantic model in Direct Lake mode by clicking **New semantic model** in the lakehouse or SQL analytics endpoint. The non-default semantic model is created in Direct Lake mode and allows Power BI to consume data by creating Power BI reports, explores, and running user-created DAX queries in Power BI Desktop or the workspace itself. The default semantic model created in the SQL analytics endpoint can be used to create Power BI reports but has some [other limitations](#).

When a Power BI report shows data in visuals, it requests it from the semantic model. Next, the semantic model accesses a lakehouse to consume data and return it to the Power BI report. For efficiency, the semantic model can keep some data in the cache and refresh it when needed. [Direct Lake overview](#) has more details.

Lakehouse also applies V-order optimization to delta tables. This optimization gives unprecedented performance and the ability to quickly consume large amounts of data for Power BI reporting.



contosolh | Confidential\Microsoft ...

Home

Create

Browse

Data hub

Monitoring hub

Workspaces

ContosoLH

contosolh

pipeline14

contosolh

Data Engineering

File

Create a report

Analyze in Excel

Lineage

Open data model

Search

Details for contosolh

Location: ContosoLH

Refreshed: —

Sensitivity: Confidential\Microsoft Exter

Visualize this data

Share this data

See what already exists

These items use the same data source as contosolh.

Name	Type	Relation	Location	Refreshed	Endorsement	Sensitivity
contosolh	SQL endpoint	Upstream	TridentPP	—	—	Confidential\Mi...
contosolh	Lakehouse	Upstream	TridentPP	—	—	Confidential\Mi...

Tables

Select a table and/or columns from this dataset to view and export the underlying data. [Learn more](#)

To select more than one table, and view summarized data, create a paginated report.

Create paginated report

orders

taxi

trafficflow

Setting permissions for report consumption

The semantic model in Direct Lake mode is consuming data from a lakehouse on demand. To make sure that data is accessible for the user that is viewing Power BI report, necessary permissions on the underlying lakehouse need to be set.

One option is to give the user the *Viewer* role in the workspace to consume all items in the workspace, including the lakehouse, if in this workspace, semantic models, and reports. Alternatively, the user can be given the *Admin*, *Member*, or *Contributor* role to have full access to the data and be able to create and edit the items, such as lakehouses, semantic models, and reports.

In addition, non-default semantic models can utilize a [fixed identity](#) to read data from the lakehouse, without giving report users any access to the lakehouse, and users be given permission to access the report through an [app](#). Also, with fixed identity, non-default semantic models in Direct Lake mode can have row-level security defined in the semantic model to limit the data the report user sees while maintaining Direct Lake mode. SQL-based security at the SQL analytics endpoint can also be used, but Direct Lake mode will fall back to DirectQuery, so this should be avoided to maintain the performance of Direct Lake.

Related content

- [Default Power BI semantic models in Microsoft Fabric](#)
-

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Endorse Fabric and Power BI items

Article • 07/11/2024

Fabric provides three ways to endorse valuable, high-quality items to increase their visibility: **promotion** and **certification** and designating them as **master data**.

- **Promotion:** Promotion is a way to highlight items you think are valuable and worthwhile for others to use. It encourages the collaborative use and spread of content within an organization.

Any item owner, as well as anyone with write permissions on the item, can promote the item when they think it's good enough for sharing.

- **Certification:** Certification means that the item meets the organization's quality standards and can be regarded as reliable, authoritative, and ready for use across the organization.

Only [authorized reviewers \(defined by the Fabric administrator\)](#) can certify items. Item owners who wish to see their item certified and aren't authorized to certify it themselves need to follow their organization's guidelines about getting items certified.

- **Master data:** Being labeled as master data means that the data item is regarded by the organization as being core, single-source-of-truth data, such as customer lists or product codes.

Only [authorized reviewers \(defined by the Fabric administrator\)](#) can label data items as master data. Item owners who wish to see their item endorsed as master data and aren't authorized to apply the **Master data** badge themselves need to follow their organization's guidelines about getting items labeled as master data.

Currently it's possible to promote or certify all Fabric and Power BI items except Power BI dashboards.

Master data badges can only be applied to items that contain data, such as lakehouses and semantic models.

This article describes:

- How to [promote items](#).
- How to [certify items](#) if you're an authorized reviewer, or [request certification](#) if you're not.

- How to [apply the Master data badge to a data item](#) if you are authorized to do so, or [request master data designation](#) if you're not.

See the [endorsement overview](#) to learn more about endorsement.

Promote items

To promote an item, you must have write permissions on the item you want to promote.

1. Go to the settings of the item you want to promote.
2. Expand the endorsement section and select **Promoted**.

If you're promoting a Power BI semantic model and see a **Make discoverable** checkbox, it means you can make it possible for users who don't have access to the semantic model to find it. See [semantic model discovery](#) for more detail.

3. Select **Apply**.

Certify items

Item certification is a significant responsibility, and you should only certify an item if you feel qualified to do so and have reviewed the item.

To certify an item:

- You must be [authorized by the Fabric administrator](#).

 **Note**

If you aren't authorized to certify an item yourself, you can [request item certification](#).

- You must have write permissions on the item you want to apply the **Certified** badge to.
1. Carefully review the item and determine whether it meets your organization's certification standards.
 2. If you decide to certify the item, go to the workspace where it resides, and open the settings of the item you want to certify.
 3. Expand the endorsement section and select **Certified**.

If you're certifying a Power BI semantic model and see a **Make discoverable** checkbox, it means you can make it possible for users who don't have access to the semantic model to find it. See [semantic model discovery](#) for more detail.

4. Select **Apply**.

Label data items as master data

Labeling data items as master data is a significant responsibility, and you should perform this task only if you feel you are qualified to do so.

To label a data item as master data:

- You must be [authorized by the Fabric administrator](#).

 **Note**

If you aren't authorized to designate a data item as master data yourself, you can [the master data designation](#).

- You must have write permissions on the item you want to apply the **Master data** badge to.
1. Carefully review the data item and determine whether it is truly core, single-source-of-truth data that your organization wants users to find and use for the kind of data it contains.
 2. If you decide to label the item as master data, go to the workspace where it located, and open the settings of the item's settings..
 3. Expand the endorsement section and select **Master data**.
 4. Select **Apply**.

Request certification or master data designation

If you would like to certify your item or get it labeled as master data but aren't authorized to do so, follow the steps below.

1. Go to the workspace where the item you want endorsed as certified or master data is located, and then open the settings of that item.

2. Expand the endorsement section. The **Certified** or **Master data** button will be greyed if you're not authorized to endorse items as certified or as master data.
3. Select relevant link, **How do I get content certified** or **How do I get content endorsed as Master data** to find out how to get your item endorsed the way you want it to be:

The screenshot shows a user interface for managing endorsement settings. On the left, there's a sidebar with options like 'About', 'Sensitivity label', and 'Endorsement'. The 'Endorsement' section is currently selected and expanded. It contains three radio buttons: 'None' (selected), 'Promoted', and 'Certified'. Below each option is a brief description and a link: 'Learn more about endorsement' for 'None', 'How do I get content certified?' for 'Certified', and 'How do I get content endorsed as master data?' for 'Master Data'. The 'How do I get content certified?' and 'How do I get content endorsed as master data?' links are highlighted with red boxes.

Note

If you clicked one of the links but got redirected back to this note, it means that your Fabric admin has not made any information available. In this case, contact the Fabric admin directly.

Related content

- [Read more about endorsement](#)
- [Enable item certification \(Fabric admins\)](#)
- [Enable master data endorsement \(Fabric admins\)](#)
- [Read more about semantic model discoverability](#)

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Share items in Microsoft Fabric

Article • 09/06/2023

Workspaces are the central places where you collaborate with your colleagues in Microsoft Fabric. Besides assigning workspace roles, you can also use item sharing to grant and manage item-level permissions in scenarios where:

- You want to collaborate with colleagues who don't have a role in the workspace.
- You want to grant additional item level-permissions for colleagues who already have a role in the workspace.

This document describes how to share an item and manage its permissions.

Share an item via link

1. In the list of items, or in an open item, select the **Share** button .
2. The **Create and send link** dialog opens. Select **People in your organization can view**.

Create and send link



test-KQL-Queryset



People in your organization can
view >

Enter a name or email address

Add a message (optional)

Send



Copy link



by Email



by Teams



by PowerPoint

3. The **Select permissions** dialog opens. Choose the audience for the link you're going to share.

Select permissions

X

test-KQL-Queryset

People who can view this KQL Queryset

-  People in your organization
-  People with existing access
-  Specific people

Additional permissions

Authorized users can view this KQL Queryset by default. Select additional permissions.

- Share
- Edit

 Share first the database, then the queryset

Apply

Back

You have the following options:

- **People in your organization** This type of link allows people in your organization to access this item. It doesn't work for external users or guest users. Use this link type when:
 - You want to share with someone in your organization.
 - You're comfortable with the link being shared with other people in your organization.
 - You want to ensure that the link doesn't work for external or guest users.
- **People with existing access** This type of link generates a URL to the item, but it doesn't grant any access to the item. Use this link type if you just want to send a link to somebody who already has access.
- **Specific people** This type of link allows specific people or groups to access the report. If you select this option, enter the names or email addresses of the people you wish to share with. This link type also lets you share to guest

users in your organization's Azure Active Directory (Azure AD). You can't share to external users who aren't guests in your organization.

ⓘ Note

If your admin has disabled shareable links to **People in your organization**, you can only copy and share links using the **People with existing access** and **Specific people** options.

4. Choose the permissions you want to grant via the link.

The image shows two identical 'Select permissions' dialog boxes side-by-side. Both boxes have a title 'Select permissions' and a subtitle 'test-KQL-Queryset'. They both show a list of people who can view the KQL Queryset: 'People in your organization' (selected), 'People with existing access' (not selected), and 'Specific people' (not selected). A red box highlights the 'People in your organization' option. Below this, there's a section for 'Additional permissions' with two checkboxes: 'Share' (selected) and 'Edit' (selected). A red box highlights the 'Share' checkbox. At the bottom, there's a note: 'Share first the database, then the queryset' and two buttons: 'Apply' (green) and 'Back' (white).

Links that give access to **People in your organization** or **Specific people** always include at least read access. However, you can also specify if you want the link to include additional permissions as well.

ⓘ Note

The **Additional permissions** settings vary for different items. Learn more about the [item permission model](#).

Links for **People with existing access** don't have additional permission settings because these links don't give access to the item.

Select **Apply**.

5. In the **Create and send link** dialog, you have the option to copy the sharing link, generate an email with the link, or share it via Teams.

Create and send link



test-KQL-Queryset



People in your organization can
view >

Enter a name or email address

Add a message (optional)

Send



Copy link



by Email



by Teams



by PowerPoint

- **Copy link:** This option automatically generates a shareable link. Select **Copy** in the **Copy link** dialog that appears to copy the link to your clipboard.

Copy link

test-KQL-Queryset



Link ready!

Link

<https://daily.powerbi.com/links/...>

Copy



People in your organization can view,
edit, and share

- **by Email:** This option opens the default email client app on your computer and creates an email draft with the link in it.
 - **by Teams:** This option opens Teams and creates a new Teams draft message with the link in it.
6. You can also choose to send the link directly to **Specific people** or groups (distribution groups or security groups). Enter their name or email address, optionally type a message, and select **Send**. An email with the link is sent to your specified recipients.

Create and send link



test-KQL-Queryset



People in your organization can
view and share



Malik Barden



Corey Gray



Add a message (optional)

Send



Copy link



By Email



To Teams



To PowerPoint

When your recipients receive the email, they can access the report through the shareable link.

Manage item links

1. To manage links that give access to the item, in the upper right of the sharing dialog, select the **Manage permissions** icon:

Create and send link



X

test-KQL-Queryset



People in your organization can
view



2. The **Manage permissions** pane opens, where you can copy or modify existing links or grant users direct access. To modify a given link, select **Edit**.

Manage permissions

X

Sample item

Links that give access

<https://msit.powerbi.com/group...>



People in your organization can view and share.

<https://msit.powerbi.com/group...>



Specific people can view and share.



People with direct access



Malik Barden

owner



Corey Gray



Shawn Hughes

[Advanced](#)

3. In the **Edit link** pane, you can modify the permissions included in the link, people who can use this link, or delete the link. Select **Apply** after your modification.

This image shows the **Edit link** pane when the selected audience is **People in your organization can view and share**.

Edit link

Sample item

Link details

<https://msit.powerbi.com/groups/me...>



 People in your organization can view and share.

Sample item permissions

Select the permissions you want to grant to this Sample item

Share

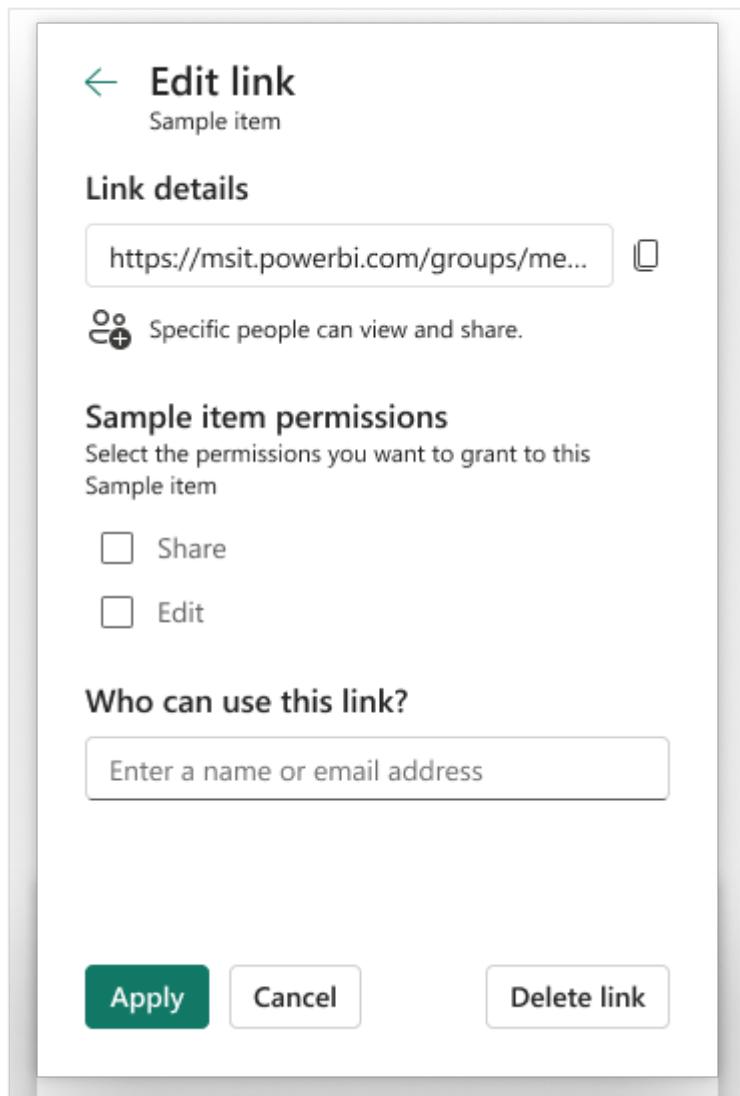
Edit

Apply

Cancel

Delete link

This image shows the **Edit link** pane when the selected audience is **Specific people can view and share**. Note that the pane enables you to modify who can use the link.



4. For more access management capabilities, select the **Advanced** option in the footer of the Manage permissions pane. On the management page that opens, you can:

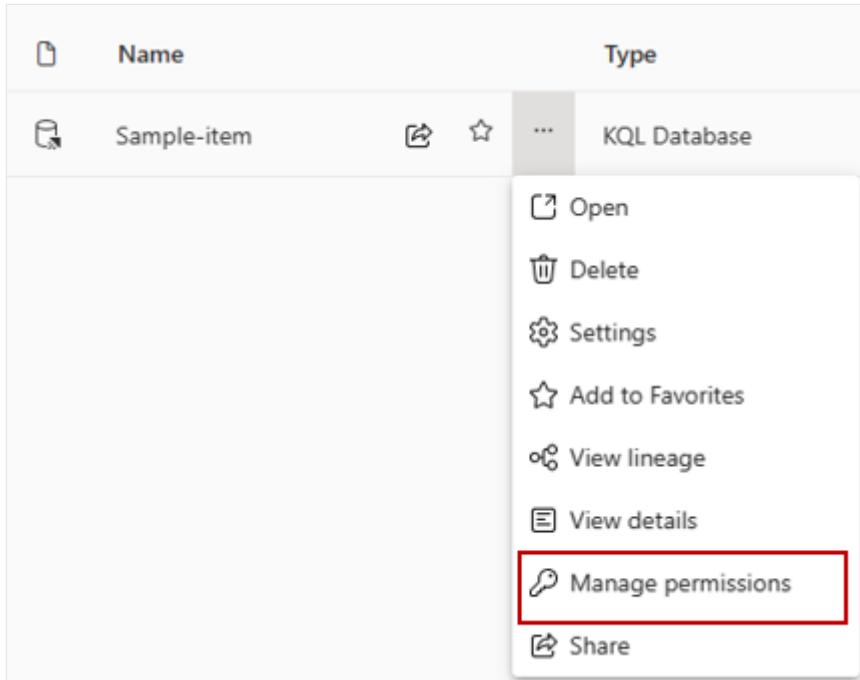
- View, manage, and create links.
- View and manage who has direct access and grant people direct access.
- Apply filters or search for specific links or people.

Fabric		Search		
Sample item				
Add link				
Links	Direct access	Link name	Who has access	Permissions
		https://contoso.com/groups/prepre/inten...	... HS +2	Read, reshare, build
		https://contoso.com/groups/prepre/inten...	... HS +2	Read, reshare, build
		http://contoso.com/groups/prepre/inten...	... HS +2	Read, reshare, build

Grant and manage access directly

In some cases, you need to grant permission directly instead of sharing link, such as granting permission to service account, for example.

1. Select **Manage permission** from the context menu.



2. Select **Direct access**.

A screenshot of the 'Fabric' interface. On the left, there's a sidebar with icons for Home, Add link, and a search bar. The main area shows a list of links under 'Sample-item'. The 'Links' tab is selected, while the 'Direct access' tab is highlighted with a red box. The table lists three links, each with columns for Link name, Who has access, Permissions, and Created by. A magnifying glass icon is in the bottom right corner.

Link name	Who has access	Permissions	Created by
https://contoso.com/groups/prepre/inten...	... (with icons)	Read, reshare, build	Malik Barden
https://contoso.com/groups/prepre/inten...	... (with icons)	Read, reshare, build	Malik Barden
http://contoso.com/groups/prepre/inten...	... (with icons)	Read, reshare, build	Malik Barden

3. Select **Add user**.

The screenshot shows the Microsoft Fabric interface. In the top left, it says "Fabric". A search bar is at the top right. Below the header, there's a sidebar with icons for Home, Add, Copy, Paste, and others. The main area has a title "Sample-item" and a button "+ Add user" which is highlighted with a red box. Below this, there are two tabs: "Links" and "Direct access", with "Direct access" being selected. A table lists users with access:

People and groups with access	Email Address	Role	Permissions
Malik Barden	malikbarde@contoso.com	Workspace Admin	Read, reshare, build
Cory Gray	corygr@contoso.com	-	Read, reshare

A magnifying glass icon is in the bottom right corner of the main area.

4. Enter the names of people or accounts that you need to grant access to directly.

Select the permissions that you want to grant. You can also optionally notify recipients by email.

5. Select **Grant**.

The dialog box is titled "Grant people access" and shows "Sample item". It contains the following text: "You are granting read permissions to this kql database to the following recipients." Below this is a text input field "Enter a name or email address". Under "Additional permissions", there are two checkboxes: "Share" and "Edit", neither of which is checked. Under "Notification Options", there is a checked checkbox "Notify recipients by email". Below this is a text input field "Add a message (optional)". At the bottom are two buttons: "Grant" and "Back".

6. You can see all the people, groups, and accounts with access in the list on the permission management page. You can also see their workspace roles, permissions, and so on. By selecting the context menu, you can modify or remove the permissions.

ⓘ Note

You can't modify or remove permissions that are inherited from a workspace role in the permission management page. Learn more about [workspace roles](#) and the [item permission model](#).

Item permission model

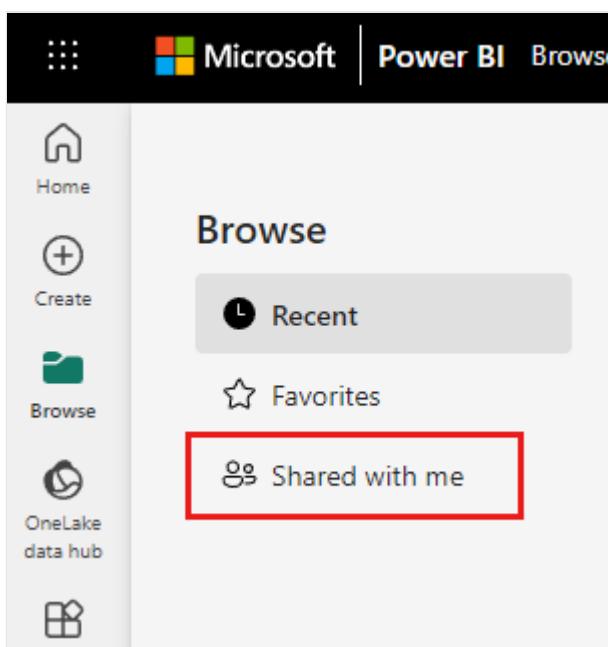
Depending on the item being shared, you may find a different set of permissions that you can grant to recipients when you share. Read permission is always granted during sharing, so the recipient can discover the shared item in the OneSource data hub and open it.

Permission granted while sharing	Effect
Read	Recipient can discover the item in the data hub and open it. Connect to SQL endpoints of Lakehouse and Data warehouse.
Edit	Recipient can edit the item or its content.
Share	Recipient can share the item and grant permissions up to the permissions that they have. For example, if the original recipient has <i>Share</i> , <i>Edit</i> , and <i>Read</i> permissions, they can at most grant <i>Share</i> , <i>Edit</i> , and <i>Read</i> permissions to the next recipient.
Read All with SQL endpoint	Read Lakehouse or Data warehouse data through SQL endpoints.
Read all with Apache Spark	Read Lakehouse or Data warehouse data through OneLake APIs and Spark. Read Lakehouse data through Lakehouse explorer.
Build	Build new content on the dataset.

Permission	Effect
granted while sharing	
Execute	Execute or cancel execution of the item.

Considerations and limitations

- When a user's permission on an item is revoked through the manage permissions experience, it can take up to two hours for the change to take effect if the user is signed-in. If the user is not signed in, their permissions will be evaluated the next time they sign in, and any changes will only take effect at that time.
- The **Shared with me** option in the **Browse** pane currently only displays Power BI items that have been shared with you. It doesn't show you non-Power BI Fabric items that have been shared with you.



Next steps

[Workspace roles](#)

Feedback

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Apply sensitivity labels to Fabric items

Article • 01/22/2024

Sensitivity labels from Microsoft Purview Information Protection on items can guard your sensitive content against unauthorized data access and leakage. They're a key component in helping your organization meet its governance and compliance requirements. Labeling your data correctly with sensitivity labels ensures that only authorized people can access your data. This article shows you how to apply sensitivity labels to your Microsoft Fabric items.

ⓘ Note

For information about applying sensitivity labels in Power BI Desktop, see [Apply sensitivity labels in Power BI Desktop](#).

Prerequisites

Requirements needed to apply sensitivity labels to Fabric items:

- Power BI Pro or Premium Per User (PPU) license
- Edit permissions on the item you wish to label.

ⓘ Note

If you can't apply a sensitivity label, or if the sensitivity label is greyed out in the sensitivity label menu, you may not have permissions to use the label. Contact your organization's tech support.

Apply a label

There are two common ways of applying a sensitivity label to an item: from the flyout menu in the item header, and in the item settings.

- From the flyout menu - select the sensitivity indication in the header to display the flyout menu:

The screenshot shows the 'Lakehouse_For_Dataflows' item settings in the Azure portal. A red box highlights the 'Sensitivity' dropdown menu. The dropdown is open, showing 'Confidential' selected. A tooltip explains: 'Sensitivity is automatically applied to downstream items created from this Lakehouse.' Below the dropdown, there are sections for 'Owner' (Debra Berger), 'Description' (Primary component), and a 'Show more' link.

Sensitivity	SQL connection strin...
Confidential\Microsoft Ext...	x6eps4xrq2xudenlfv

Type	Relati...
SQL endpoint	Downst...
Dataset (default)	Downst...

- In items settings - open the item's settings, find the sensitivity section, and then choose the desired label:

The screenshot shows the 'My KQL Database' settings page. A red box highlights the 'Sensitivity label' input field, which contains 'Confidential'. To the right, there is a 'Search' bar, a 'Sensitivity' dropdown (also set to 'Confidential'), and an 'About' section. The 'About' section includes a 'Sensitivity label' input field, a 'Apply to downstream items' toggle switch (set to 'On'), and an 'Endorsement' section with a toggle switch (set to 'On').

Related content

- [Sensitivity label overview](#)

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Delta Lake table format interoperability

Article • 09/25/2024

In Microsoft Fabric, the Delta Lake table format is the standard for analytics. [Delta Lake](#) is an open-source storage layer that brings ACID (Atomicity, Consistency, Isolation, Durability) transactions to big data and analytics workloads.

All Fabric experiences generate and consume Delta Lake tables, driving interoperability and a unified product experience. Delta Lake tables produced by one compute engine, such as Synapse Data warehouse or Synapse Spark, can be consumed by any other engine, such as Power BI. When you ingest data into Fabric, Fabric stores it as Delta tables by default. You can easily integrate external data containing Delta Lake tables by using OneLake shortcuts.

Delta Lake features and Fabric experiences

To achieve interoperability, all the Fabric experiences align on the Delta Lake features and Fabric capabilities. Some experiences can only write to Delta Lake tables, while others can read from it.

- **Writers:** Data warehouses, eventstreams, and exported Power BI semantic models into OneLake
- **Readers:** SQL analytics endpoint and Power BI direct lake semantic models
- **Writers and readers:** Fabric Spark runtime, dataflows, data pipelines, and Kusto Query Language (KQL) databases

The following matrix shows key Delta Lake features and their support on each Fabric capability.

[+] Expand table

Fabric capability	Name-based column mappings	Deletion vectors	V-order writing	Table optimization and maintenance	Write partitions	Read partitions	Liquid Clustering	TIMESTAMP_NTZ	Delta reader/writer version and default table features
Data warehouse Delta Lake export	No	Yes	Yes	Yes	No	Yes	No	No	Reader: 3 Writer: 7 Deletion Vectors
SQL analytics endpoint	Yes	Yes	N/A (not applicable)	N/A (not applicable)	N/A (not applicable)	Yes	Yes	No	N/A (not applicable)
Fabric Spark Runtime 1.3	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Reader: 1 Writer: 2
Fabric Spark Runtime 1.2	Yes	Yes	Yes	Yes	Yes	Yes	Yes, read only	Yes	Reader: 1 Writer: 2
Fabric Spark Runtime 1.1	Yes	No	Yes	Yes	Yes	Yes	Yes, read only	No	Reader: 1 Writer: 2
Dataflows	Yes	Yes	Yes	No	Yes	Yes	Yes, read only	No	Reader: 1 Writer: 2
Data pipelines	No	No	Yes	No	Yes, overwrite only	Yes	Yes, read only	No	Reader: 1 Writer: 2
Power BI direct lake semantic models	Yes	Yes	N/A (not applicable)	N/A (not applicable)	N/A (not applicable)	Yes	Yes	No	N/A (not applicable)
Export Power BI semantic models into OneLake	Yes	N/A (not applicable)	Yes	No	Yes	N/A (not applicable)	No	No	Reader: 2 Writer: 5

Fabric capability	Name-based column mappings	Deletion vectors	V-order writing	Table optimization and maintenance	Write partitions	Read partitions	Liquid Clustering	TIMESTAMP_NTZ	Delta reader/writer version and default table features
KQL databases	Yes	Yes	No	No*	Yes	Yes	No	No	Reader: 1 Writer: 1
Eventstreams	No	No	No	No	Yes	N/A (not applicable)	No	No	Reader: 1 Writer: 2

* KQL databases provide certain table maintenance capabilities such as [retention](#). Data is removed at the end of the retention period from OneLake. For more information, see [One Logical copy](#).

ⓘ Note

- Fabric doesn't write name-based column mappings by default. The default Fabric experience generates tables that are compatible across the service. Delta lake, produced by third-party services, may have incompatible table features.
- Some Fabric experiences do not have inherited table optimization and maintenance capabilities, such as bin-compaction, V-order, and clean up of old unreferenced files. To keep Delta Lake tables optimal for analytics, follow the techniques in [Use table maintenance feature to manage delta tables in Fabric](#) for tables ingested using those experiences.

Current limitations

Currently, Fabric doesn't support these Delta Lake features:

- Delta Lake 3.x Uniform
- Identity columns writing (proprietary Databricks feature)
- Delta Live Tables (proprietary Databricks feature)
- RLE (Run Length Encoding) enabled on the checkpoint file

Related content

- [What is Delta Lake?](#)
- Learn more about [Delta Lake tables](#) in Fabric Lakehouse and Synapse Spark.
- [Learn about Direct Lake in Power BI and Microsoft Fabric](#).
- Learn more about [querying tables from the Warehouse through its published Delta Lake Logs](#).

Feedback

Was this page helpful?



Provide product feedback [↗](#) | Ask the community [↗](#)

Learn about Microsoft Fabric feedback

Article • 04/30/2024

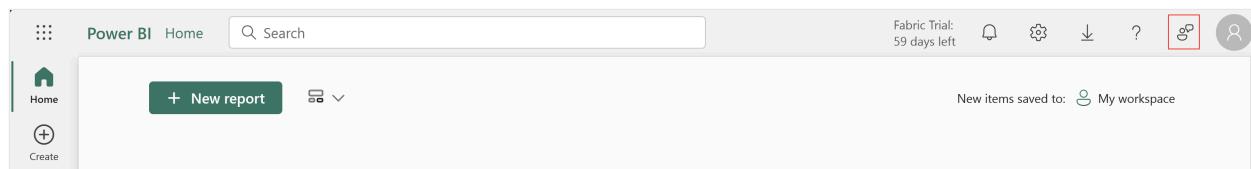
Your feedback is important to us. We want to hear about your experiences with Microsoft Fabric. Your feedback is used to improve the product and shape the way it evolves. This article describes how you can give feedback about Microsoft Fabric, how the feedback is collected, and how we handle this information.

Feedback types

There are three ways to give feedback about Microsoft Fabric, *in-product feedback*, *in-product surveys*, and *community feedback*.

In-product feedback

Give in-product feedback by selecting the **Feedback** button next to your profile picture in the Microsoft Fabric portal.



In-product surveys

From time to time, Microsoft Fabric initiates in-product surveys to collect feedback from users. When you see a prompt, you can choose to give feedback or dismiss the prompt. If you dismiss the prompt, you won't see it again for some time.

Community feedback

There are a few ways you can give feedback while engaging with the Microsoft Fabric community:

- [Ideas](#) - Submit and vote on ideas for Microsoft Fabric.
- [Issues](#) - Discuss issues and workarounds with the community.
- [Community Feedback](#) - Give feedback about Microsoft Fabric and vote for publicly submitted feedback. Top known feedback items remain available in the new portal.

What kind of feedback is best?

Try to give detailed and actionable feedback. If you have issues, or suggestions for how we can improve, we'd like to hear it.

- **Descriptive title** - Descriptive and specific titles help us understand the issue being reported.
- **One issue** - Providing feedback for one issue ensures the correct logs and data are received with each submission and can be assigned for follow-up. If you want to give feedback for multiple issues, give feedback for each issue separately. Giving feedback for separate issues helps us identify the volume of feedback we're receiving for a particular issue. If you have more than one issue, submit a new feedback request for each issue.
- **Give details** - Give details about your issue in the description box. Information about your device, operating system, and apps are automatically included in each reported feedback. Add any additional information you think is important. Include detailed steps to reproduce the issue.

How Microsoft uses feedback

Microsoft uses feedback to improve Microsoft products. We get user feedback in the form of questions, problems, compliments, and suggestions. We make sure this feedback makes it back to the appropriate teams, who use feedback to identify, prioritize and make improvements to Microsoft products. Feedback is essential for our product teams to understand our user's experiences, and directly influences the priority of fixes and improvements.

What do we collect?

Here are the most common items collected or calculated.

- **Comments User** - Submitted comments in the original language.
- **Submission date** - Date and time we got the feedback.
- **Language** - The original language the comment was submitted in.
- **Feedback type** - The type of feedback: Survey feedback or in-product feedback.
- **Survey questions** - Questions that we asked the user during the survey.

- **Survey responses** - User responses to survey questions.
- **App language** - The language of the Microsoft product that was captured on submission.
- **Tenant ID** - When the feedback is submitted from a Microsoft Entra account.
- **User ID** - Microsoft Entra ID or email address of the authenticated user submitting the feedback.

Data handling and privacy

We understand that when you use our cloud services, you're entrusting us with one of your most valuable assets: your data. We make sure the feedback we receive is stored and handled under Microsoft governance rules, and that it can only be accessed for approved uses. We don't use your email, chat, files, or other personal content to target ads to you. When we collect data, we use it to make your experiences better.

To learn more about how we protect the privacy and confidentiality of your data, and how we ensure that it will be used only in a way that is consistent with your expectations, review our privacy principles at the [Microsoft Trust Center](#).

Feedback

Was this page helpful?



[Provide product feedback](#) | [Ask the community](#)

Microsoft Fabric adoption roadmap

Article • 11/17/2023

The goal of this series of articles is to provide a roadmap. The roadmap presents a series of strategic and tactical considerations and action items that lead to the successful adoption of [Microsoft Fabric](#), and help build a data culture in your organization.

Advancing adoption and cultivating a data culture is about more than implementing technology features. Technology can assist an organization in making the greatest impact, but a healthy data culture involves many considerations across the spectrum of people, processes, and technology.

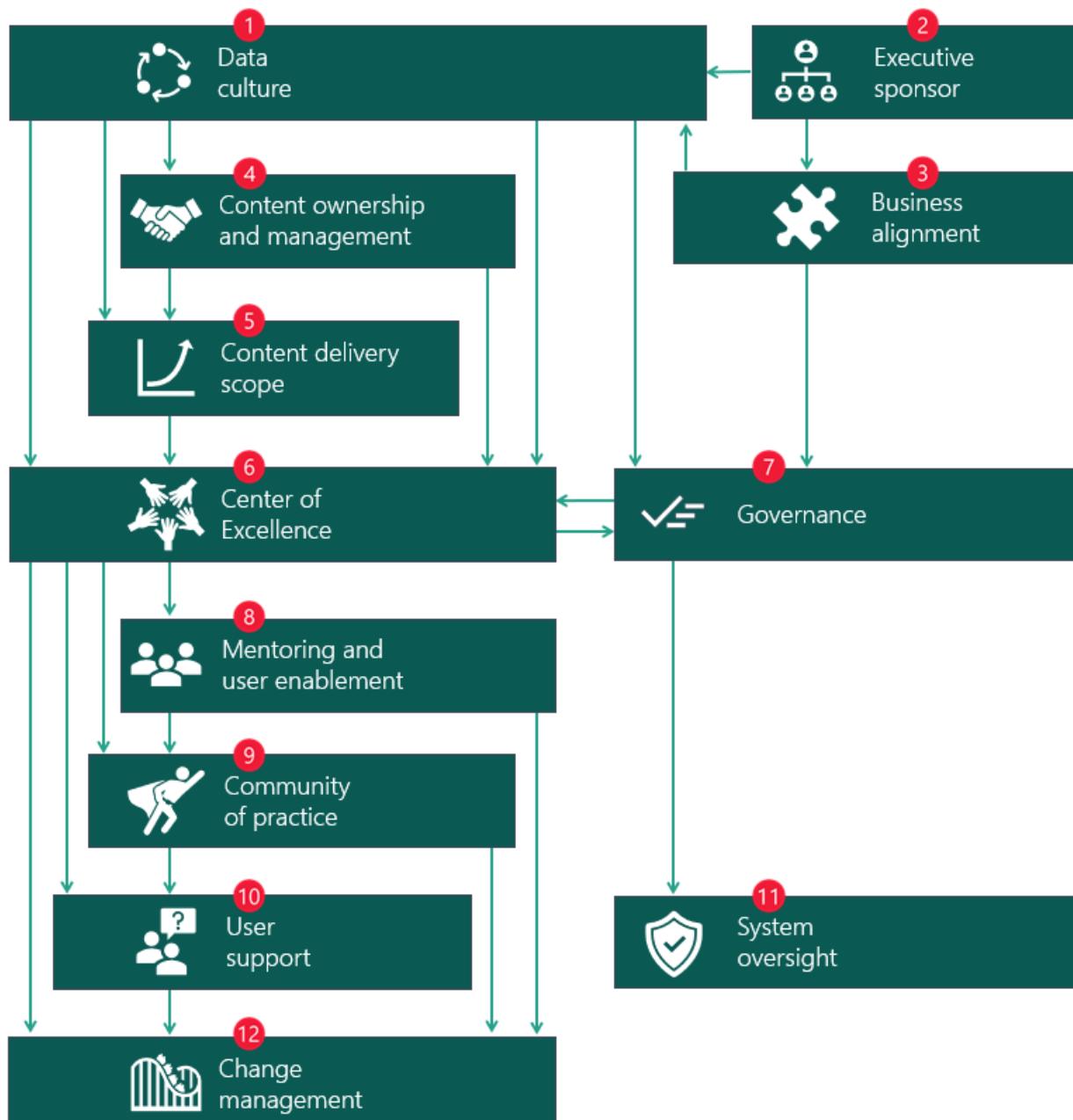
Note

While reading this series of articles, we recommended that you also take into consideration [Power BI implementation planning](#) guidance. After you're familiar with the concepts in the Microsoft Fabric adoption roadmap, consider reviewing the [usage scenarios](#). Understanding the diverse ways Power BI is used can influence your implementation strategies and decisions for all of Microsoft Fabric.

The diagram depicts the following areas of the Microsoft Fabric adoption roadmap.



Microsoft Fabric adoption roadmap



The areas in the above diagram include:

Area	Description
1	Data culture: Data culture refers to a set of behaviors and norms in the organization that encourages a data-driven culture. Building a data culture is closely related to adopting Fabric, and it's often a key aspect of an organization's digital transformation.
2	Executive sponsor: An executive sponsor is someone with credibility, influence, and authority throughout the organization. They advocate for building a data culture and adopting Fabric.
3	Business Alignment: How well the data culture and data strategy enable business users to achieve business objectives. An effective BI data strategy aligns with the business strategy.

Area	Description
4	Content ownership and management: There are three primary strategies for how business intelligence (BI) and analytics content is owned and managed: business-led self-service BI, managed self-service BI, and enterprise BI. These strategies have a significant influence on adoption, governance, and the Center of Excellence (COE) operating model.
5	Content delivery scope: There are four primary strategies for content and data delivery: personal, team, departmental, and enterprise. These strategies have a significant influence on adoption, governance, and the COE operating model.
6	Center of Excellence: A Fabric COE is an internal team of technical and business experts. These experts actively assist others who are working with data within the organization. The COE forms the nucleus of the broader community to advance adoption goals that are aligned with the data culture vision.
7	Governance: Data governance is a set of policies and procedures that define the ways in which an organization wants data to be used. When adopting Fabric, the goal of governance is to empower the internal user community to the greatest extent possible, while adhering to industry, governmental, and contractual requirements and regulations.
8	Mentoring and user enablement: A critical objective for adoption efforts is to enable users to accomplish as much as they can within the guardrails established by governance guidelines and policies. The act of mentoring users is one of the most important responsibilities of the COE. It has a direct influence on adoption efforts.
9	Community of practice: A community of practice comprises a group of people with a common interest, who interact with and help each other on a voluntary basis. An active community is an indicator of a healthy data culture. It can significantly advance adoption efforts.
10	User support: User support includes both informally organized and formally organized methods of resolving issues and answering questions. Both formal and informal support methods are critical for adoption.
11	System oversight: System oversight includes the day-to-day administration responsibilities to support the internal processes, tools, and people.
12	Change management: Change management involves procedures to address the impact of change for people in an organization. These procedures safeguard against disruption and productivity loss due to changes in solutions or processes. An effective data strategy describes who is responsible for managing this change and the practices and resources needed to realize it.

The relationships in the above diagram can be summarized as follows.

- Your organizational **data culture** vision will strongly influence the strategies that you follow for self-service and enterprise **content ownership and management** and **content delivery scope**.

- These strategies will, in turn, have a big impact on the operating model for your **Center of Excellence** and governance decisions.
- The established **governance** guidelines, policies, and processes affect the implementation methods used for **mentoring and enablement**, the **community of practice**, and **user support**.
- Governance decisions will dictate the day-to-day **system oversight** (administration) activities.
- Adoption and governance decisions are implemented alongside **change management** to mitigate the impact and disruption of change on existing business processes.
- All data culture and adoption-related decisions and actions are accomplished more easily with guidance and leadership from an **executive sponsor**, who facilitates **business alignment** between the business strategy and data strategy. This alignment in turn informs data culture and governance decisions.

Each individual article in this series discusses key topics associated with the items in the diagram. Considerations and potential action items are provided. Each article concludes with a set of **maturity levels** to help you assess your current state so you can decide what action to take next.

Microsoft Fabric adoption

Successful adoption of analytical tools like Fabric involves making effective processes, support, tools, and data available and integrated into regular ongoing patterns of usage for content creators, consumers, and stakeholders in the organization.

Important

This series of adoption articles is focused on *organizational* adoption. See [Microsoft Fabric adoption maturity levels](#) for an introduction to the three types of adoption: organizational, user, and solution.

A common misconception is that adoption relates primarily to usage or the number of users. There's no question that usage statistics are an important factor. However, usage isn't the only factor. Adoption isn't just about *using* the technology regularly; it's about using it *effectively*. Effectiveness is much more difficult to define and measure.

Whenever possible, adoption efforts should be aligned across analytics platforms and BI services.

Note

Individuals—and the organization itself—are continually learning, changing, and improving. That means there's no formal end to adoption-related efforts.

The remaining articles in this Power BI adoption series discuss the following aspects of adoption.

- Adoption maturity levels
- Data culture
- Executive sponsorship
- Business alignment
- Content ownership and management
- Content delivery scope
- Center of Excellence
- Governance
- Mentoring and enablement
- Community of practice
- User support
- System oversight
- Change management
- Conclusion and additional resources

Important

You might be wondering how this Fabric adoption roadmap is different from the [Power BI adoption framework](#). The adoption framework was created primarily to support Microsoft partners. It's a lightweight set of resources to help partners deploy Power BI solutions for their customers.

This adoption series is more current. It's intended to guide any person or organization that is using—or considering using—Fabric. If you're seeking to improve your existing Power BI or Fabric implementation, or planning a new Power BI or Fabric implementation, this adoption roadmap is a great place to start.

Target audience

The intended audience of this series of articles is interested in one or more of the following outcomes.

- Improving their organization's ability to effectively use analytics.
- Increasing their organization's maturity level related to the delivery of analytics.
- Understanding and overcoming adoption-related challenges faced when scaling and growing.
- Increasing their organization's return on investment (ROI) in data and analytics.

This series of articles will be most helpful to those who work in an organization with one or more of the following characteristics.

- Power BI or other Fabric workloads are deployed with some successes.
- There are pockets of viral adoption, but analytics isn't being purposefully governed across the entire organization.
- Analytics solutions are deployed with some meaningful scale, but there remains a need to determine:
 - What is effective and what should be maintained.
 - What should be improved.
 - How future deployments could be more strategic.
- An expanded implementation of analytics is under consideration or is planned.

This series of articles will also be helpful for:

- Organizations that are in the early stages of an analytics implementation.
- Organizations that have had success with adoption and now want to evaluate their current maturity level.

Assumptions and scope

The primary focus of this series of articles is on the Microsoft Fabric platform.

To fully benefit from the information provided in these articles, you should have an understanding of [Power BI foundational concepts](#) and [Fabric foundational concepts](#).

Next steps

In the [next article in this series](#), learn about the Fabric adoption maturity levels. The maturity levels are referenced throughout the entire series of articles. Also, see the [conclusion article](#) for additional adoption-related resources.

Other helpful resources include:

- [Power BI implementation planning](#)
- Questions? Try asking the [Microsoft Fabric community](#).

- Suggestions? [Contribute ideas to improve Microsoft Fabric](#).

Experienced partners are available to help your organization succeed with adoption initiatives. To engage with a partner, visit the [Power BI partner portal](#).

Acknowledgments

The Microsoft Fabric adoption roadmap articles are written by Melissa Coates, Kurt Buhler, and Peter Myers. Matthew Roche, from the Fabric Customer Advisory Team, provides strategic guidance and feedback to the subject matter experts. Reviewers include Cory Moore, James Ward, Timothy Bindas, Greg Moir, and Chuy Varela.

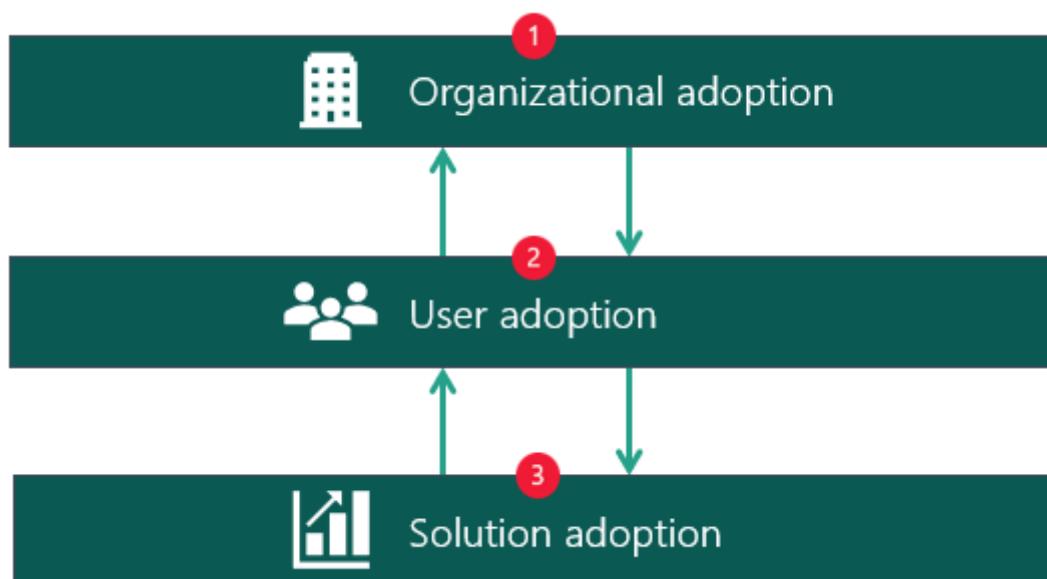
Microsoft Fabric adoption roadmap maturity levels

Article • 11/14/2023

ⓘ Note

This article forms part of the *Microsoft Fabric adoption roadmap* series of articles. For an overview of the series, see [Microsoft Fabric adoption roadmap](#).

There are three inter-related perspectives to consider when adopting an analytics technology like Microsoft Fabric.



The three types of adoption depicted in the above diagram include:

Type	Description
1	Organizational adoption: Organizational adoption refers to the effectiveness of your analytics governance processes. It also refers to data management practices that support and enable analytics and business intelligence (BI) efforts.
2	User adoption: User adoption is the extent to which consumers and creators continually increase their knowledge. It's concerned with whether they're actively using analytics tools, and whether they're using them in the most effective way.
3	Solution adoption: Solution adoption refers to the impact and business value achieved for individual requirements and analytical solutions.

As the four arrows in the previous diagram indicate, the three types of adoption are all strongly inter-related:

- **Solution adoption affects user adoption.** A well-designed and well-managed solution—which could be many things, such as a set of reports, a Power BI app, a semantic model ([previously known as a dataset](#)) or a Fabric lakehouse—impacts and guides users on how to use analytics in an optimal way.
- **User adoption impacts organizational adoption.** The patterns and practices used by individual users influence organizational adoption decisions, policies, and practices.
- **Organizational adoption influences user adoption.** Effective organizational practices—including mentoring, training, support, and community—encourage users to do the right thing in their day-to-day workflow.
- **User adoption affects solution adoption.** Stronger user adoption, because of the effective use of analytics by educated and informed users, contributes to stronger and more successful individual solutions.

The remainder of this article introduces the three types of adoption in more detail.

Organizational adoption maturity levels

Organizational adoption measures the state of analytics governance and data management practices. There are several organizational adoption goals:

- Effectively support the community of creators, consumers, and stakeholders
- Enable and empower users
- Right-sized governance of analytics, BI, and data management activities
- Oversee information delivery via enterprise BI and self-service BI with continuous improvement cycles

It's helpful to think about organizational adoption from the perspective of a maturity model. For consistency with the [Power CAT adoption maturity model](#) and the [maturity model for Microsoft 365](#), this Microsoft Fabric adoption roadmap aligns with the five levels from the [Capability Maturity Model](#), which were later enhanced by the Data Management Maturity (DMM) model from ISACA (note that the DMM was a paid resource that has since been retired).

Every organization has limited time, funding, and people. So, it requires them to be selective about where they prioritize their efforts. To get the most from your investment in analytics, seek to attain at least maturity level 300 or 400, as discussed below. It's common that different business units in the organization evolve and mature at different

rates, so be conscious of the organizational state as well as progress for key business units.

① Note

Organizational adoption maturity is a long journey. It takes time, effort, and planning to progress to the higher levels.

Maturity level 100 – Initial

Level 100 is referred to as *initial* or *performed*. It's the starting point for new data-related investments that are new, undocumented, and without any process discipline.

Common characteristics of maturity level 100 include:

- Pockets of success and experimentation with Fabric exist in one or more areas of the organization.
- Achieving quick wins has been a priority, and solutions have been delivered with some success.
- Organic growth has led to the lack of a coordinated strategy or [governance](#) approach.
- Practices are undocumented, with significant reliance on tribal knowledge.
- There are few formal processes in place for effective data management.
- Risk exists due to a lack of awareness of how data is used throughout the organization.
- The potential for a strategic investment with analytics is acknowledged. However, there's no clear path forward for purposeful, organization-wide execution.

Maturity level 200 – Repeatable

Level 200 is referred to as *repeatable* or *managed*. At this point on the maturity curve, data management is planned and executed. Defined processes exist, though these processes might not apply uniformly throughout the organization.

Common characteristics of maturity level 200 include:

- Certain analytics content is now critical in importance and/or it's broadly used by the organization.
- There are attempts to document and define repeatable practices. These efforts are siloed, reactive, and deliver varying levels of success.

- There's an over-reliance on individuals having good judgment and adopting healthy habits that they learned on their own.
- Analytics adoption continues to grow organically and produces value. However, it takes place in an uncontrolled way.
- Resources for an internal community are established, such as a Teams channel or Yammer group.
- Initial planning for a consistent analytics governance strategy is underway.
- There's recognition that a [Center of Excellence \(COE\)](#) can deliver value.

Maturity level 300 – Defined

Level 300 is referred to as *defined*. At this point on the maturity curve, a set of standardized data management processes are established and consistently applied across organizational boundaries.

Common characteristics of maturity level 300 include:

- Measurable success is achieved for the effective use of analytics.
- Progress is made on the standardization of repeatable practices. However, less-than-optimal aspects could still exist due to early uncontrolled growth.
- The [COE](#) is established. It has clear goals and scope of responsibilities.
- The internal [community of practice](#) gains traction with the participation of a growing number of users.
- [Champions](#) emerge in the internal user community.
- Initial investments in [training](#), [documentation](#), and resources (such as [template files](#)) are made.
- An initial [governance](#) model is in place.
- There's an active and engaged [executive sponsor](#).
- [Roles and responsibilities](#) for all analytics stakeholders are well understood.

Maturity level 400 – Capable

Level 400 is known as *capable* or *measured*. At this point on the maturity curve, data is well-managed across its entire lifecycle.

Common characteristics of maturity level 400 include:

- Analytics and business intelligence efforts deliver significant value.
- Approved tools are commonly used for delivering critical content throughout the organization.
- There's an established and accepted [governance](#) model with cooperation from all key business units.

- Training, documentation, and resources are readily available for, and actively used by, the internal community of users.
- Standardized processes are in place for the oversight and monitoring of analytics usage and practices.
- The [COE](#) includes representation from all key business units.
- A [champions network](#) supports the internal community. The champions actively work with their colleagues as well as the COE.

Maturity level 500 – Efficient

Level 500 is known as *efficient* or *optimizing* because at this point on the maturity curve, the emphasis is now on automation and continuous improvement.

Common characteristics of maturity level 500 include:

- The value of analytics solutions is prevalent in the organization. Fabric is widely accepted throughout the organization.
- Analytics skillsets are highly valued in the organization, and they're recognized by leadership.
- The internal user community is self-sustaining, with support from the COE. The community isn't over-reliant on key individuals.
- The COE reviews key performance indicators regularly to measure success of implementation and adoption goals.
- Continuous improvement is a continual priority.
- Use of automation adds value, improves productivity, or reduces risk for error.

Note

The characteristics above are generalized. When considering maturity levels and designing a plan, you'll want to consider each topic or goal independently. In reality, it's probably not possible to reach level 500 maturity level for every aspect of Fabric adoption for the entire organization. So, assess maturity levels independently per goal. That way, you can prioritize your efforts where they will deliver the most value. The remainder of the articles in this Fabric adoption series present maturity levels on a per-topic basis.

Individuals—and the organization itself—continually learn, change, and improve. That means there's no formal end to adoption-related efforts. However, it's common that effort is reduced as higher maturity levels are reached.

The remainder of this article introduces the second and third types of adoption: [user adoption](#) and [solution adoption](#).

ⓘ Note

The remaining articles in this series focus primarily on organizational adoption.

User adoption stages

User adoption measures the extent to which content consumers and self-service content creators are actively and effectively using analytics tools such as Fabric. Usage statistics alone don't indicate successful user adoption. User adoption is also concerned with individual user behaviors and practices. The aim is to ensure users engage with solutions, tools, and processes in the correct way and to their fullest extent.

User adoption encompasses how consumers view content, as well as how self-service creators generate content for others to consume.

User adoption occurs on an individual user basis, but it's measured and analyzed in the aggregate. Individual users progress through the four stages of user adoption at their own pace. An individual who adopts a new technology will take some time to achieve proficiency. Some users will be eager; others will be reluctant to learn yet another tool, regardless of the promised productivity improvements. Advancing through the user adoption stages involves time and effort, and it involves behavioral changes to become aligned with organizational adoption objectives. The extent to which the organization supports users advancing through the user adoption stages has a direct correlation to the organizational-level adoption maturity.

User adoption stage 1 – Awareness

Common characteristics of stage 1 user adoption include:

- An individual has heard of, or been initially exposed to, analytics in some way.
- An individual might have access to a tool, such as Fabric, but isn't yet actively using it.

User adoption stage 2 – Understanding

Common characteristics of stage 2 user adoption include:

- An individual develops understanding of the benefits of analytics and how it can support decision-making.
- An individual shows interest and starts to use analytics tools.

User adoption stage 3 – Momentum

Common characteristics of stage 3 user adoption include:

- An individual actively gains analytics skills by attending formal training, self-directed learning, or experimentation.
- An individual gains basic competency by using or creating analytics relevant to their role.

User adoption stage 4 – Proficiency

Common characteristics of stage 4 user adoption include:

- An individual actively uses analytics regularly.
- An individual understands how to use analytic tools in the way in which they were intended, as relevant for their role.
- An individual modifies their behavior and activities to align with organizational governance processes.
- An individual's willingness to support organizational processes and change efforts is growing over time, and they become an advocate for analytics in the organization.
- An individual makes the effort to continually improve their skills and stay current with new product capabilities and features.

It's easy to underestimate the effort it takes to progress from stage 2 (understanding) to stage 4 (proficiency). Typically, it takes the longest time to progress from stage 3 (momentum) to stage 4 (proficiency).

ⓘ Important

By the time a user reaches the momentum and proficiency stages, the organization needs to be ready to support them in their efforts. You can consider some proactive efforts to encourage users to progress through stages. For more information, see the [community of practice](#) and the [user support](#) articles.

Solution adoption phases

Solution adoption is concerned with measuring the impact of content that's been deployed. It's also concerned with the level of value solutions provide. The scope for evaluating solution adoption is for one set of requirements, like a set of reports, a lakehouse, or a single Power BI app.

ⓘ Note

In this series of articles, *content* is synonymous with *solution*.

As a solution progresses to phases 3 or 4, expectations to operationalize the solution are higher.

💡 Tip

The importance of scope on expectations for governance is described in the [content delivery scope](#) article. That concept is closely related to this topic, but this article approaches it from a different angle. It considers when you already have a solution that is operationalized and distributed to many users. That doesn't immediately equate to phase 4 solution adoption, as the concept of solution adoption focuses on how much value the content delivers.

Solution phase 1 – Exploration

Common characteristics of phase 1 solution adoption include:

- Exploration and experimentation are the main approaches to testing out new ideas. Exploration of new ideas can occur through informal self-service efforts, or through a formal proof of concept (POC), which is purposely narrow in scope. The goal is to confirm requirements, validate assumptions, address unknowns, and mitigate risks.
- A small group of users test the proof of concept solution and provide useful feedback.
- For simplicity, all exploration—and initial feedback—could occur within local user tools (such as Power BI Desktop or Excel) or within a single Fabric workspace.

Solution phase 2 – Functional

Common characteristics of phase 2 solution adoption include:

- The solution is functional and meets the basic set of user requirements. There are likely plans to iterate on improvements and enhancements.
- The solution is deployed to the Fabric portal.
- All necessary supporting components are in place (for example, a gateway to support scheduled data refresh).
- Target users are aware of the solution and show interest in using it. Potentially, it could be a limited preview release, and might not yet be ready to promote to a production [workspace](#).

Solution phase 3 – Valuable

Common characteristics of phase 3 solution adoption include:

- Target users find the solution to be valuable and experience tangible benefits.
- The solution is promoted to a production [workspace](#) that's managed, secured, and audited.
- Validations and testing occur to ensure data quality, accurate presentation, accessibility, and acceptable performance.
- Content is [endorsed](#), when appropriate.
- Usage metrics for the solution are actively monitored.
- User feedback loops are in place to facilitate suggestions and improvements that can contribute to future releases.
- Solution documentation is generated to support the needs of information consumers (such as data sources used or how metrics are calculated). The documentation helps future content creators (for example, for documenting any future maintenance or planned enhancements).
- Ownership and subject matter experts for the content are clear.
- Report branding and theming are in place and in line with governance guidelines.

Solution phase 4 – Essential

Common characteristics of phase 4 solution adoption include:

- Target users actively and routinely use the solution, and it's considered essential for decision-making purposes.
- The solution resides in a [production workspace](#) well separated from development and test content. [Change management](#) and release management are carefully controlled due to the impact of changes.
- A subset of users regularly provides feedback to ensure the solution continues to meet evolving requirements.
- Expectations for the success of the solution are clear and are measured.

- Expectations for support of the solution are clear, especially if there are service level agreements.
- The solution aligns with organizational [governance](#) guidelines and practices.
- Most content is [certified](#) due to its critical nature.
- Formal user acceptance testing for new changes might occur, particularly for IT-managed content.

Next steps

In the [next article](#) in the Microsoft Fabric adoption roadmap series, learn about the organizational data culture and its impact on adoption efforts.

Microsoft Fabric adoption roadmap: Data culture

Article • 11/14/2023

ⓘ Note

This article forms part of the *Microsoft Fabric adoption roadmap* series of articles. For an overview of the series, see [Microsoft Fabric adoption roadmap](#).

Building a data culture is closely related to adopting analytics, and it's often a key aspect of an organization's digital transformation. The term *data culture* can be defined in different ways by different organizations. In this series of articles, data culture means a set of behaviors and norms in an organization. It encourages a culture that regularly employs informed data decision-making:

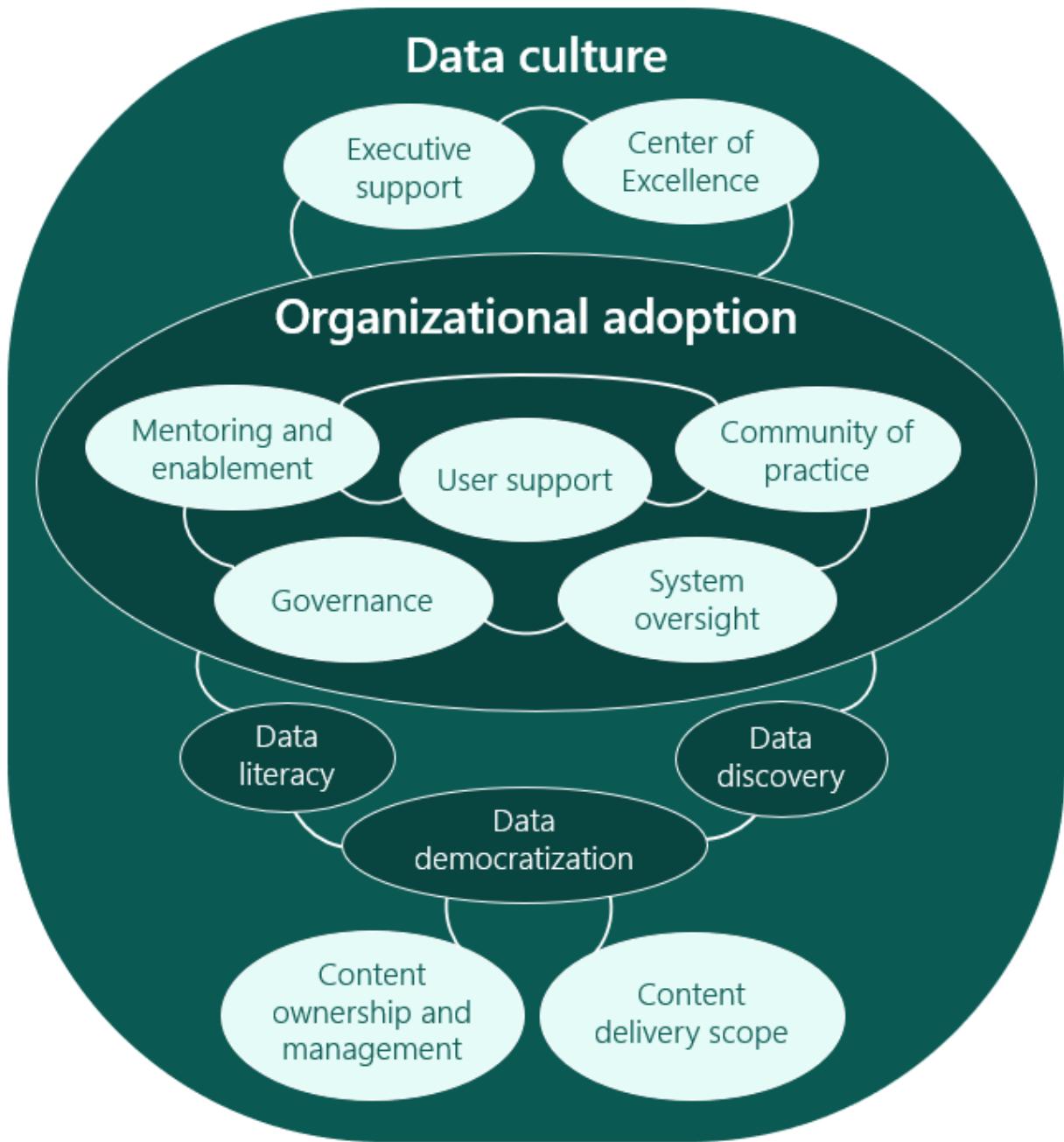
- By more stakeholders throughout more areas of the organization.
- Based on analytics, not opinion.
- In an effective, efficient way that's based on best practices approved by the [Center of Excellence \(COE\)](#).
- Based on trusted data.
- That reduces reliance on undocumented tribal knowledge.
- That reduces reliance on hunches and gut decisions.

ⓘ Important

Think of data culture as what you do, not what you say. Your data culture is not a set of rules (that's governance). So, data culture is a somewhat abstract concept. It's the behaviors and norms that are allowed, rewarded, and encouraged—or those that are disallowed and discouraged. Bear in mind that a healthy data culture motivates employees at all levels of the organization to generate and distribute actionable knowledge.

Within an organization, certain business units or teams are likely to have their own behaviors and norms for getting things done. The specific ways to achieve data culture objectives can vary across organizational boundaries. What's important is that they should all align with the organizational data culture objectives. You can think of this structure as *aligned autonomy*.

The following circular diagram conveys the interrelated aspects that influence your data culture:



The diagram depicts the somewhat ambiguous relationships among the following items:

- Data culture is the outer circle. All topics within it contribute to the state of the data culture.
- **Organizational adoption** (including the implementation aspects of **mentoring and user enablement**, **user support**, **community of practice**, **governance**, and **system oversight**) is the inner circle. All topics are major contributors to the **data culture**.
- **Executive support** and the **Center of Excellence** are drivers for the success of organizational adoption.
- **Data literacy**, **data democratization**, and **data discovery** are data culture aspects that are heavily influenced by organizational adoption.

- Content ownership and management, and [content delivery scope](#), are closely related to [data democratization](#).

The elements of the diagram are discussed throughout this series of articles.

Data culture vision

The concept of data culture can be difficult to define and measure. Even though it's challenging to articulate data culture in a way that's meaningful, actionable, and measurable, you need to have a well-understood definition of what a healthy data culture means to your organization. This vision of a healthy data culture should:

- Originate from the executive level.
- [Align](#) with organizational objectives.
- Directly influence your adoption strategy.
- Serve as the high-level guiding principles for enacting governance policies and guidelines.

Data culture outcomes aren't specifically mandated. Rather, the state of the data culture is the result of following the governance rules as they're enforced (or the lack of governance rules). Leaders at all levels need to actively demonstrate through their actions what's important to them, including how they praise, recognize, and reward staff members who take initiative.

💡 Tip

If you can take for granted that your efforts to develop a data solution (such as a semantic model—[previously known as a dataset](#), a lakehouse, or a report) will be valued and appreciated, that's an excellent indicator of a healthy data culture. Sometimes, however, it depends on what your immediate manager values most.

The initial motivation for establishing a data culture often comes from a specific strategic business problem or initiative. It might be:

- A reactive change, such as responding to new agile competition.
- A proactive change, such as starting a new line of business or expanding into new markets to seize a "green field" opportunity. Being data driven from the beginning can be relatively easier when there are fewer constraints and complications, compared with an established organization.
- Driven by external changes, such as pressure to eliminate inefficiencies and redundancies during an economic downturn.

In each of these situations, there's often a specific area where the data culture takes root. The specific area could be a scope of effort that's smaller than the entire organization, even if it's still significant. After necessary changes are made at this smaller scope, they can be incrementally replicated and adapted for the rest of the organization.

Although technology can help advance the goals of a data culture, implementing specific tools or features isn't the objective. This series of articles covers a lot of topics that contribute to adoption of a healthy data culture. The remainder of this article addresses three essential aspects of data culture: [data discovery](#), [data democratization](#), and [data literacy](#).

Data discovery

A successful data culture depends on users working with the right data in their day-to-day activities. To achieve this goal, users need to find and access data sources, reports, and other items.

Data discovery is the ability to effectively locate relevant data assets across the organization. Primarily, data discovery is concerned with improving awareness that data exists, which can be particularly challenging when data is siloed in departmental systems.

Data discovery is a slightly different concept from *search*, because:

- Data discovery allows users to see metadata for an item, like the name of a semantic model, even if they don't currently have access to it. After a user is aware of its existence, that user can go through the standard process to request access to the item.
- Search allows users to locate an existing item when they already have security access to the item.

Tip

It's important to have a clear and simple process so users can request access to data. Knowing that data exists—but being unable to access it within the guidelines and processes that the domain owner has established—can be a source of frustration for users. It can force them to use inefficient workarounds instead of requesting access through the proper channels.

Data discovery contributes to adoption efforts and the implementation of governance practices by:

- Encouraging the use of trusted high-quality data sources.
- Encouraging users to take advantage of existing investments in available data assets.
- Promoting the use and enrichment of existing data items (such as a lakehouse, data warehouse, data pipeline, dataflow, or semantic model) or reporting items (such as reports, dashboards, or metrics).
- Helping people understand who owns and manages data assets.
- Establishing connections between consumers, creators, and owners.

The [OneLake data hub](#) and the [use of endorsements](#) are key ways to promote data discovery in your organization.

Furthermore, data catalog solutions are extremely valuable tools for data discovery. They can record metadata tags and descriptions to provide deeper context and meaning. For example, [Microsoft Purview](#) can scan and catalog items from a Fabric tenant (as well as many other sources).

Questions to ask about data discovery



Use questions like those found below to assess data discovery.

- Is there a data hub where business users can search for data?
- Is there a metadata catalog that describes definitions and data locations?
- Are high-quality data sources endorsed by [certifying](#) or [promoting](#) them?
- To what extent do redundant data sources exist because people can't find the data they need? What roles are expected to create data items? What roles are expected to create reports or perform ad hoc analysis?
- Can end users find and use existing reports, or do they insist on data exports to create their own?
- Do end users know which reports to use to address specific business questions or find specific data?
- Are people using the appropriate data sources and tools, or resisting them in favor of legacy ones?
- Do analysts understand how to enrich existing certified semantic models with new data—for example, by using a [Power BI composite model](#)?

- How consistent are data items in their quality, completeness, and naming conventions?
- Can data item owners follow [data lineage](#) to perform impact analysis of data items?

Maturity levels of data discovery



The following maturity levels can help you assess your current state of data discovery.

Level	State of Fabric data discovery
100: Initial	<ul style="list-style-type: none"> • Data is fragmented and disorganized, with no clear structures or processes to find it. • Users struggle to find and use data they need for their tasks.
200: Repeatable	<ul style="list-style-type: none"> • Scattered or organic efforts to organize and document data are underway, but only in certain teams or departments. • Content is occasionally endorsed, but these endorsements aren't defined and the process isn't managed. Data remains siloed and fragmented, and it's difficult to access.
300: Defined	<ul style="list-style-type: none"> • A central repository, like the OneLake data hub, is used to make data easier to find for people who need it. • An explicit process is in place to endorse quality data and content. • Basic documentation includes catalog data, definitions, and calculations, as well as where to find them.
400: Capable	<ul style="list-style-type: none"> • Structured, consistent processes guide users how to endorse, document, and find data from a central hub. Data silos are the exception instead of the rule. • Quality data assets are consistently endorsed and easily identified. • Comprehensive data dictionaries are maintained and improve data discovery.
500: Efficient	<ul style="list-style-type: none"> • Data and metadata is systematically organized and documented with a full view of the data lineage. • Quality assets are endorsed and easily identified.

Level	State of Fabric data discovery
	<ul style="list-style-type: none">Cataloging tools, like Microsoft Purview, are used to make data discoverable for both use and governance.

Data democratization

Data democratization refers to putting data into the hands of more users who are responsible for solving business problems. It's about enabling more users to make better data-driven decisions.

Note

The concept of data democratization doesn't imply a lack of security or a lack of justification based on job role. As part of a healthy data culture, data democratization helps reduce *shadow IT* by providing semantic models that:

- Are secured, governed, and well managed.
- Meet business needs in cost-effective and timely ways.

Your organization's position on data democratization will have a wide-reaching impact on adoption and governance-related efforts.

Warning

If access to data or the ability to perform analytics is limited to a select number of individuals in the organization, that's typically a warning sign because the ability to work with data is a key characteristic of a healthy data culture.

Questions to ask about data democratization



Use questions like those found below to assess data democratization.

- Is data and analytics readily accessible, or restricted to limited roles and individuals?

- Is an effective process in place for people to request access to new data and tools?
- Is data readily shared between teams and business units, or is it siloed and closely guarded?
- Who is permitted to have Power BI Desktop installed?
- Who is permitted to have Power BI Pro or Power BI Premium Per User (PPU) licenses?
- Who is permitted to create assets in Fabric workspaces?
- What's the desired level of self-service analytics and business intelligence (BI) user enablement? How does this level vary depending on business unit or job role?
- What's the desired balance between enterprise and self-service analytics, and BI?
- What data sources are strongly preferred for what topics and business domains? What's the allowed use of unsanctioned data sources?
- Who can manage content? Is this decision different for data versus reports? Is the decision different for enterprise BI users versus decentralized users? Who can own and manage self-service BI content?
- Who can consume content? Is this decision different for external partners, customers, or suppliers?

Maturity levels of data democratization



The following maturity levels can help you assess your current state of data democratization.

Level	State of data democratization
100: Initial	<ul style="list-style-type: none"> • Data and analytics are limited to a small number of roles, who gatekeep access to others. • Business users must request access to data or tools to complete tasks. They struggle with delays or bottlenecks. • Self-service initiatives are taking place with some success in various areas of the organization. These activities are occurring in a somewhat chaotic manner, with few formal processes and no strategic plan. There's a lack of oversight and visibility into these self-service activities. The success or failure of each solution isn't well understood. • The enterprise data team can't keep up with the needs of the business. A significant backlog of requests exists for this team.

Level	State of data democratization
200: Repeatable	<ul style="list-style-type: none"> • There are limited efforts underway to expand access to data and tools. • Multiple teams have had measurable success with self-service solutions. People in the organization are starting to pay attention. • Investments are being made to identify the ideal balance of enterprise and self-service solutions.
300: Defined	<ul style="list-style-type: none"> • Many people have access to the data and tools they need, although not all users are equally enabled or held accountable for the content they create. • Effective self-service data practices are incrementally and purposely replicated throughout more areas of the organization.
400: Capable	<ul style="list-style-type: none"> • Healthy partnerships exist among enterprise and self-service solution creators. Clear, realistic user accountability and policies mitigate risk of self-service analytics and BI. • Clear and consistent processes are in place for users to request access to data and tools. • Individuals who take initiative in building valuable solutions are recognized and rewarded.
500: Efficient	<ul style="list-style-type: none"> • User accountability and effective governance give central teams confidence in what users do with data. • Automated, monitored processes enable people to easily request access to data and tools. Anyone with the need or interest to use data can follow these processes to perform analytics.

Data literacy

Data literacy refers to the ability to interpret, create, and communicate with data and analytics accurately and effectively.

Training efforts, as described in the [mentoring and user enablement](#) article, often focus on how to use the technology itself. Technology skills are important to producing high-quality solutions, but it's also important to consider how to purposely advance data literacy throughout the organization. Put another way, successful adoption takes a lot more than merely providing software and licenses to users.

How you go about improving data literacy in your organization depends on many factors, such as current user skillsets, complexity of the data, and the types of analytics

that are required. You might choose to focus on these types of activities related to data literacy:

- Interpreting charts and graphs
- Assessing the validity of data
- Performing root cause analysis
- Discerning correlation from causation
- Understanding how context and outliers affect how results are presented
- Using storytelling to help consumers quickly understand and act

💡 Tip

If you're struggling to get data culture or governance efforts approved, focusing on tangible benefits that you can achieve with data discovery ("find the data"), data democratization ("use the data"), or data literacy ("understand the data") can help. It can also be helpful to focus on specific problems that you can solve or mitigate through data culture advancements.

Getting the right stakeholders to agree on the problem is usually the first step. Then, it's a matter of getting the stakeholders to agree on the strategic approach to a solution, along with the solution details.

Questions to ask about data literacy



Use questions like those found below to assess data literacy.

- Does a common analytical vocabulary exist in the organization to talk about data and BI solutions? Alternatively, are definitions fragmented and different across silos?
- How comfortable are people with making decisions based on data and evidence compared to intuition and subjective experience?
- When people who hold an opinion are confronted with conflicting evidence, how do they react? Do they critically appraise the data, or do they dismiss it? Can they alter their opinion, or do they become entrenched and resistant?

- Do training programs exist to support people in learning about data and analytical tools?
- Is there significant resistance to visual analytics and interactive reporting in favor of static spreadsheets?
- Are people open to new analytical methods and tools to potentially address their business questions more effectively? Alternatively, do they prefer to keep using existing methods and tools to save time and energy?
- Are there methods or programs to assess or improve data literacy in the organization? Does leadership have an accurate understanding of the data literacy levels?
- Are there roles, teams, or departments where data literacy is particularly strong or weak?

Maturity levels of data literacy



The following maturity levels can help you assess your current state of data literacy.

Level	State of data literacy
100: Initial	<ul style="list-style-type: none"> Decisions are frequently made based on intuition and subjective experience. When confronted with data that challenges existing opinions, data is often dismissed. Individuals have low confidence to use and understand data in decision-making processes or discussions. Report consumers have a strong preference for static tables. These consumers dismiss interactive visualizations or sophisticated analytical methods as "fancy" or unnecessary.
200: Repeatable	<ul style="list-style-type: none"> Some teams and individuals inconsistently incorporate data into their decision making. There are clear cases where misinterpretation of data has led to flawed decisions or wrong conclusions. There's some resistance when data challenges pre-existing beliefs. Some people are skeptical of interactive visualizations and sophisticated analytical methods, though their use is increasing.
300: Defined	<ul style="list-style-type: none"> The majority of teams and individuals understand data relevant to their business area and use it implicitly to inform decisions.

Level	State of data literacy
	<ul style="list-style-type: none"> When data challenges pre-existing beliefs, it produces critical discussions and sometimes motivates change. Visualizations and advanced analytics are more widely accepted, though not always used effectively.
400: Capable	<ul style="list-style-type: none"> Data literacy is recognized explicitly as a necessary skill in the organization. Some training programs address data literacy. Specific efforts are taken to help departments, teams, or individuals that have particularly weak data literacy. Most individuals can effectively use and apply data to make objectively better decisions and take actions. Visual and analytical best practices are documented and followed in strategically important data solutions.
500: Efficient	<ul style="list-style-type: none"> Data literacy, critical thinking, and continuous learning are strategic skills and values in the organization. Effective programs monitor progress to improve data literacy in the organization.
	<ul style="list-style-type: none"> Decision making is driven by data across the organization. Decision intelligence or prescriptive analytics are used to recommend key decisions and actions.
	<ul style="list-style-type: none"> Visual and analytical best practices are seen as essential to generate business value with data.

Considerations and key actions



Checklist - Here are some considerations and key actions that you can take to strengthen your data culture.

- ✓ **Align your data culture goals and strategy:** Give serious consideration to the type of data culture that you want to cultivate. Ideally, it's more from a position of user empowerment than a position of command and control.
- ✓ **Understand your current state:** Talk to stakeholders in different business units to understand which analytics practices are currently working well and which practices aren't working well for data-driven decision-making. Conduct a series of workshops to understand the current state and to formulate the desired future state.
- ✓ **Speak with stakeholders:** Talk to stakeholders in IT, BI, and the COE to understand which **governance** constraints need consideration. These conversations can present

an opportunity to educate teams on topics like security and infrastructure. You can also use the opportunity to educate stakeholders on the features and capabilities included in Fabric.

- ✓ **Verify executive sponsorship:** Verify the level of [executive sponsorship](#) and support that you have in place to advance data culture goals.
- ✓ **Make purposeful decisions about your data strategy:** Decide what the ideal balance of business-led self-service, managed self-service, and enterprise data, analytics and BI use cases should be for the key business units in the organization (covered in the [content ownership and management](#) article). Also consider how the data strategy relates to the extent of published content for personal, team, departmental, and enterprise analytics and BI (described in the [content delivery scope](#) article). Define your high-level goals and priorities for this strategic planning. Determine how these decisions affect your tactical planning.
- ✓ **Create a tactical plan:** Begin creating a tactical plan for immediate, short-term, and long-term action items. Identify business groups and problems that represent "quick wins" and can make a visible difference.
- ✓ **Create goals and metrics:** Determine how you'll measure effectiveness for your data culture initiatives. Create key performance indicators (KPIs) or objectives and key results (OKRs) to validate the results of your efforts.

Questions to ask about data culture



Use questions like those found below to assess data culture.

- Is data regarded as a strategic asset in the organization?
- Is there a vision of a healthy data culture that originates from executive leadership and aligns with organizational objectives?
- Does the data culture guide creation of governance policies and guidelines?
- Are organizational data sources trusted by content creators and consumers?
- When justifying an opinion, decision, or choice, do people use data as evidence?
- Is knowledge about analytics and data use documented or is there a reliance on undocumented tribal knowledge?
- Are efforts to develop a data solution valued and appreciated by the user community?

Maturity levels of data culture



The following maturity levels will help you assess the current state of your data culture.

Level	State of data culture
100: Initial	<ul style="list-style-type: none">• Enterprise data teams can't keep up with the needs of the business. A significant backlog of requests exists.• Self-service data and BI initiatives are taking place with some success in various areas of the organization. These activities occur in a somewhat chaotic manner, with few formal processes and no strategic plan.• There's a lack of oversight and visibility into self-service BI activities. The successes or failures of data and BI solutions aren't well understood.
200: Repeatable	<ul style="list-style-type: none">• Multiple teams have had measurable successes with self-service solutions. People in the organization are starting to pay attention.• Investments are being made to identify the ideal balance of enterprise and self-service data, analytics, and BI.
300: Defined	<ul style="list-style-type: none">• Specific goals are established for advancing the data culture. These goals are implemented incrementally.• Learnings from what works in individual business units is shared.• Effective self-service practices are incrementally and purposely replicated throughout more areas of the organization.
400: Capable	<ul style="list-style-type: none">• The data culture goals to employ informed decision-making are aligned with organizational objectives. They're actively supported by the executive sponsor, the COE, and they have a direct impact on adoption strategies.• A healthy and productive partnership exists between the executive sponsor, COE, business units, and IT. The teams are working towards shared goals.• Individuals who take initiative in building valuable data solutions are recognized and rewarded.
500: Efficient	<ul style="list-style-type: none">• The business value of data, analytics, and BI solutions is regularly evaluated and measured. KPIs or OKRs are used to track data culture goals and the results of these efforts.• Feedback loops are in place, and they encourage ongoing data culture

Level	State of data culture
	<p>improvements.</p> <ul style="list-style-type: none">• Continual improvement of organizational adoption, user adoption, and solution adoption is a top priority.

Next steps

In the [next article](#) in the Microsoft Fabric adoption roadmap series, learn about the importance of an executive sponsor.

Microsoft Fabric adoption roadmap: Executive sponsorship

Article • 11/14/2023

ⓘ Note

This article forms part of the *Microsoft Fabric adoption roadmap* series of articles. For an overview of the series, see [Microsoft Fabric adoption roadmap](#).

When planning to advance the [data culture](#) and the state of [organizational adoption](#) for data and analytics, it's crucial to have executive support. An executive sponsor is imperative because analytics adoption is far more than just a technology project.

Although some successes can be achieved by a few determined individual contributors, the organization is in a significantly better position when a senior leader is engaged, supportive, informed, and available to assist with the following activities.

- Formulating a strategic vision, goals, and priorities for data, analytics, and business intelligence (BI).
- Providing top-down guidance and reinforcement for the data strategy by regularly promoting, motivating, and investing in strategic and tactical planning.
- Leading by example by actively using data and analytics in a way that's consistent with data culture and adoption goals.
- Allocating staffing and prioritizing resources.
- Approving funding (for example, [Fabric licenses](#)).
- Removing barriers to enable action.
- Communicating announcements that are of critical importance, to help them gain traction.
- Decision-making, particularly for strategic-level [governance](#) decisions.
- Dispute resolution (for escalated issues that can't be resolved by operational or tactical personnel).
- Supporting organizational change initiatives (for example, creating or expanding the [Center of Excellence](#)).

ⓘ Important

The ideal executive sponsor has sufficient credibility, influence, and authority throughout the organization. They also have an invested stake in data efforts and

the data strategy. When the BI strategy is successful, the ideal executive sponsor also experiences success in their role.

Identifying an executive sponsor

There are multiple ways to identify an executive sponsor.

Top-down pattern

An executive sponsor might be selected by a more senior executive. For example, the Chief Executive Officer (CEO) could hire a Chief Data Officer (CDO) or Chief Analytics Officer (CAO) to explicitly advance the organization's data culture objectives or lead digital transformation efforts. The CDO or CAO then becomes the ideal candidate to serve as the executive sponsor for Fabric (or for data and analytics in general).

Here's another example: The CEO might empower an existing executive, such as the Chief Financial Officer (CFO), because they have a good track record leading data and analytics in their organization. As the new executive sponsor, the CFO could then lead efforts to replicate the finance team's success to other areas of the organization.

ⓘ Note

Having an executive sponsor at the C-level is an excellent leading indicator. It indicates that the organization recognizes the importance of data as a strategic asset and is advancing its data culture in a positive direction.

Bottom-up pattern

Alternatively, a candidate for the executive sponsor role could emerge due to the success they've experienced with creating data solutions. For example, a business unit within the organization, such as Finance, has organically achieved great success with their use of data and analytics. Essentially, they've successfully formed their own data culture on a smaller scale. A junior-level leader who hasn't reached the executive level (such as a director) might then grow into the executive sponsor role by sharing successes with other business units across the organization.

The bottom-up approach is more likely to occur in smaller organizations. It might be because the return on investment and strategic imperative of a data culture (or digital transformation) isn't yet an urgent priority for C-level executives.

The success for a leader using the bottom-up pattern depends on being recognized by senior leadership.

With a bottom-up approach, the sponsor might be able to make some progress, but they won't have formal authority over other business units. Without clear authority, it's only a matter of time until challenges occur that are beyond their level of authority. For this reason, the top-down approach has a higher probability of success. However, initial successes with a bottom-up approach can convince leadership to increase their level of sponsorship, which might start a healthy competition across other business units in the adoption of data and BI.

Considerations and key actions



Checklist - Here's a list of considerations and key actions you can take to establish or strengthen executive support for analytics.

- ✓ **Identify an executive sponsor with broad authority:** Find someone in a sufficient position of influence and authority (across organizational boundaries) who understands the value and impact of BI. It is important that the individual has a vested interest in the success of analytics in the organization.
- ✓ **Involve your executive sponsor:** Consistently involve your executive sponsor in all strategic-level governance decisions involving data management, BI, and analytics. Also involve your sponsor in all governance data culture initiatives to ensure alignment and consensus on goals and priorities.
- ✓ **Establish responsibilities and expectation:** Formalize the arrangement with documented responsibilities for the executive sponsor role. Ensure that there's no uncertainty about expectations and time commitments.
- ✓ **Identify a backup for the sponsor:** Consider naming a backup executive sponsor. The backup can attend meetings in the sponsor's absence and make time-sensitive decisions when necessary.
- ✓ **Identify business advocates:** Find influential advocates in each business unit. Determine how their cooperation and involvement can help you to accomplish your objectives. Consider involving advocates from various levels in the organization chart.

Questions to ask



Use questions like those found below to assess data literacy.

- Has an executive sponsor of Fabric or other analytical tools been identified?
- If so, who is the executive sponsor?
- If not, is there an informal executive sponsor? Who is the closest to this role? Can you define the business impact of having no executive sponsor?
- To what extent is the strategic importance of Fabric and analytics understood and endorsed by executives?
- Are executives using Fabric and the results of data and BI initiatives? What's the sentiment among executives for the effectiveness of data solutions?
- Is the executive sponsor leading by example in the effective use of data and BI tools?
- Does the executive sponsor provide the appropriate resources for data initiatives?
- Is the executive sponsor involved in dispute resolution and change management?
- Does the executive sponsor engage with the user community?
- Does the executive sponsor have sufficient credibility and healthy relationships across organizational boundaries (particularly the business and IT)?

Maturity levels



The following maturity levels will help you assess your current state of executive support.

Level	State of executive support
100: Initial	<ul style="list-style-type: none">• There might be awareness from at least one executive about the strategic importance of how analytics can advance the organization's data culture goals. However, neither a sponsor nor an executive-level decision-maker is identified.
200: Repeatable	<ul style="list-style-type: none">• Informal executive support exists for analytics through informal channels and relationships.

Level	State of executive support
300: Defined	<ul style="list-style-type: none"> An executive sponsor is identified. Expectations are clear for the role.
400: Capable	<ul style="list-style-type: none"> An executive sponsor is well established with someone with sufficient authority across organizational boundaries. A healthy and productive partnership exists between the executive sponsor, COE, business units, and IT. The teams are working towards shared data culture goals.
500: Efficient	<ul style="list-style-type: none"> The executive sponsor is highly engaged. They're a key driver for advancing the organization's data culture vision. The executive sponsor is involved with ongoing organizational adoption improvements. KPIs (key performance indicators) or OKRs (objectives and key results) are used to track data culture goals and the results of data, analytics, and BI efforts.

Next steps

In the [next article](#) in the Microsoft Fabric adoption roadmap series, learn about the importance of business alignment with organizational goals.

Microsoft Fabric adoption roadmap: Business alignment

Article • 11/14/2023

ⓘ Note

This article forms part of the *Microsoft Fabric adoption roadmap* series of articles. For an overview of the series, see [Microsoft Fabric adoption roadmap](#).

Business intelligence (BI) activities and solutions have the best potential to deliver value when they're well aligned to organizational business goals. In general, effective business alignment helps to improve adoption. With effective business alignment, the [data culture](#) and [data strategy](#) enable business users to achieve their business objectives.

You can achieve effective business alignment with data activities and solutions by having:

- An understanding of the strategic importance of data and analytics in achieving measurable progress toward business goals.
- A shared awareness of the business strategy and key business objectives among content owners, creators, consumers, and administrators. A common understanding should be integral to the data culture and decision-making across the organization.
- A clear and unified understanding of the business data needs, and how meeting these needs helps content creators and content consumers achieve their objectives.
- A [governance strategy](#) that effectively balances user enablement with risk mitigation.
- An engaged [executive sponsor](#) who provides top-down guidance to regularly promote, motivate, and support the data strategy and related activities and solutions.
- Productive and solution-oriented discussions between business teams and technical teams that address business data needs and problems.
- Effective and flexible requirements gathering processes to design and [plan solutions](#).
- Structured and consistent processes to [validate](#), [deploy](#), and [support](#) solutions.
- Structured and sustainable processes to regularly update existing solutions so that they remain relevant and valuable, despite changes in technology or business objectives.

Effective business alignment brings significant benefits to an organization. Here are some benefits of effective business alignment.

- Improved adoption, because content consumers are more likely to use solutions that enable them to achieve their objectives.
- Increased business return on investment (ROI) for analytics initiatives and solutions, because these initiatives and solutions will be more likely to directly advance progress toward business goals.
- Less effort and fewer resources spent on [change management](#) and changing business requirements, due to an improved understanding of business data needs.

Achieve business alignment

There are multiple ways to achieve business alignment of data activities and initiatives.

Communication alignment

Effective and consistent communication is critical to aligning processes. Consider the following actions and activities when you want to improve communication for successful business alignment.

- Make and follow a plan for central teams and the user community to follow.
- Plan regular alignment meetings between different teams and groups. For example, central teams can plan regular planning and priority alignments with business units. Another example is when central teams schedule regular meetings to mentor and enable self-service users.
- Set up a [centralized portal](#) to consolidate communication and documentation for user communities. For strategic solutions and initiatives, consider using a [communication hub](#).
- Limit complex business and technical terminology in cross-functional communications.
- Strive for concise communication and documentation that's formatted and well organized. That way, people can easily find the information that they need.
- Consider maintaining a visible roadmap that shows the planned solutions and activities relevant to the user community in the next quarter.
- Be transparent when communicating policies, decisions, and changes.
- Create a process for people to provide feedback, and review that feedback regularly as part of regular [planning activities](#).

 **Important**

To achieve effective business alignment, you should make it a priority to identify and dismantle any communication barriers between business teams and technical teams.

Strategic alignment

Your business strategy should be well aligned with your data and BI strategy. To incrementally achieve this alignment, we recommend that you commit to following structured, iterative planning processes.

- **Strategic planning:** Define data, analytics, and BI goals and priorities based on the business strategy and current state of adoption and implementation. Typically, strategic planning occurs every 12-18 months to iteratively define high-level desired outcomes. You should synchronize strategic planning with key business planning processes.
- **Tactical planning:** Define objectives, action plans, and a backlog of solutions that help you to achieve your data and BI goals. Typically, tactical planning occurs quarterly to iteratively re-evaluate and align the data strategy and activities to the business strategy. This alignment is informed by business feedback and changes to business objectives or technology. You should synchronize tactical planning with key project planning processes.
- **Solution planning:** Design, develop, test, and deploy solutions that support content creators and consumers in achieving their business objectives. Both centralized content creators and self-service content creators conduct solution planning to ensure that the solutions they create are well aligned with business objectives. You should synchronize solution planning with key adoption and governance planning processes.

Important

Effective business alignment is a key prerequisite for a successful [data strategy](#).

Governance and compliance alignment

A key aspect of effective business alignment is balancing user enablement and risk mitigation. This balance is an important aspect of your [governance strategy](#), together with other activities related to compliance, security and privacy, that can include:

- Transparently document and justify compliance criteria, [key governance decisions](#), and [policies](#) so that content creators and consumers know what's expected of

them.

- Regularly [audit and assess](#) activities to identify risk areas or strong deviations from the desired behaviors.
- Provide mechanisms for content owners, content creators, and content consumers to request clarification or provide feedback about existing policies.

⊗ Caution

A governance strategy that's poorly aligned with business objectives can result in more conflicts and compliance risk, because users will often pursue workarounds to complete their tasks.

Executive alignment

Executive leadership plays a key role in defining the business strategy and business goals. To this end, executive engagement is an important part of achieving top-down business alignment.

To achieve executive alignment, consider the following key considerations and activities.

- Work with your [executive sponsor](#) to organize short, quarterly executive feedback sessions about the use of data in the organization. Use this feedback to identify changes in business objectives, re-assess the data strategy, and inform future actions to improve business alignment.
- Schedule regular alignment meetings with the executive sponsor to promptly identify any potential changes in the business strategy or data needs.
- Deliver monthly executive summaries that highlight relevant information, including:
 - [Key performance indicators \(KPIs\)](#) that measure progress toward data, analytics, and BI goals.
 - Fabric adoption and implementation milestones.
 - Technology changes that might impact organizational business goals.

ⓘ Important

Don't underestimate the importance of the role your [executive sponsor](#) has in achieving and maintaining effective business alignment.

Maintain business alignment

Business alignment is a continual process. To maintain business alignment, consider the following factors.

- **Assign a responsible team:** A working team reviews feedback and organizes re-alignment sessions. This team is responsible for the alignment of planning and priorities between the business and data strategy.
- **Create and support a feedback process:** Your user community requires the means to provide feedback. Examples of feedback can include requests to change existing solutions, or to create new solutions and initiatives. This feedback is essential for bottom-up business user alignment, and it drives iterative and continuous improvement cycles.
- **Measure the success of business alignment:** Consider using surveys, sentiment analysis, and usage metrics to assess the success of business alignment. When combined with other concise feedback mechanisms, this can provide valuable input to help define future actions and activities to improve business alignment and Fabric adoption.
- **Schedule regular re-alignment sessions:** Ensure that data strategic planning and tactical planning occur alongside relevant business strategy planning (when business leadership review business goals and objectives).

Note

Because business objectives continually evolve, you should understand that solutions and initiatives will change over time. Don't assume that requirements for data and BI projects are rigid and can't be altered. If you struggle with changing requirements, it might be an indication that your requirements-gathering process is ineffective or inflexible, or that your development workflows don't sufficiently incorporate regular feedback.

Important

To effectively maintain business alignment, it's essential that user feedback be promptly and directly addressed. Regularly review and analyze feedback, and consider how you can integrate it into iterative strategic planning, tactical planning, and solution planning processes.

Questions to ask



Use questions like those found below to assess [business alignment](#).

- Can people articulate the goals of the organization and the business objectives of their team?
- To what extent do descriptions of organizational goals align across the organization? How do they align between the business user community and leadership community? How do they align between business teams and technical teams?
- Does executive leadership understand the strategic importance of data in achieving business objectives? Does the user community understand the strategic importance of data in helping them succeed in their jobs?
- Are changes in the business strategy reflected promptly in changes to the data strategy?
- Are changes in business user data needs addressed promptly in data and BI solutions?
- To what extent do data policies support or conflict with existing business processes and the way that users work?
- Do solution requirements focus more on technical features than addressing business questions? Is there a structured requirements gathering process? Do content owners and creators interact effectively with stakeholders and content consumers during requirements gathering?
- How are decisions about data or BI investments made? Who makes these decisions?
- How well do people trust existing data and BI solutions? Is there a single version of truth, or are there regular debates about who has the correct version?
- How are data and BI initiatives and strategy communicated across the organization?

Maturity levels



A business alignment assessment evaluates integration between the business strategy and data strategy. Specifically, this assessment focuses on whether or not data and BI initiatives and solutions support business users to achieve business strategic objectives.

The following maturity levels will help you assess your current state of business alignment.

Level	State of data and business alignment
100: Initial	<ul style="list-style-type: none">Business and data strategies lack formal alignment, which leads to reactive implementation and misalignment between data teams and business users.Misalignment in priorities and planning hinders productive discussions and effectiveness.Executive leadership doesn't recognize data as a strategic asset.
200: Repeatable	<ul style="list-style-type: none">There are efforts to align data and BI initiatives with specific data needs without a consistent approach or understanding of their success.Alignment discussions focus on immediate or urgent needs and focus on features, solutions, tools or data, rather than strategic alignment.People have a limited understanding of the strategic importance of data in achieving business objectives.
300: Defined	<ul style="list-style-type: none">Data and BI initiatives are prioritized based on their alignment with strategic business objectives. However, alignment is siloed and typically focuses on local needs.Strategic initiatives and changes have a clear, structured involvement of both the business and data strategic decision makers. Business teams and technical teams can have productive discussions to meet business and governance needs.
400: Capable	<ul style="list-style-type: none">There's a consistent, organization-wide view of how data initiatives and solutions support business objectives.Regular and iterative strategic alignments occur between the business and technical teams. Changes to the business strategy result in clear actions that are reflected by changes to the data strategy to better support business needs.Business and technical teams have healthy, productive relationships.
500: Efficient	<ul style="list-style-type: none">The data strategy and the business strategy are fully integrated. Continuous improvement processes drive consistent alignment, and they are themselves data driven.Business and technical teams have healthy, productive relationships.

Next steps

In the [next article](#) in the Microsoft Fabric adoption roadmap series, learn more about content ownership and management, and its effect on business-led self-service BI, managed self-service BI, and enterprise BI.

Microsoft Fabric adoption roadmap: Content ownership and management

Article • 11/14/2023

ⓘ Note

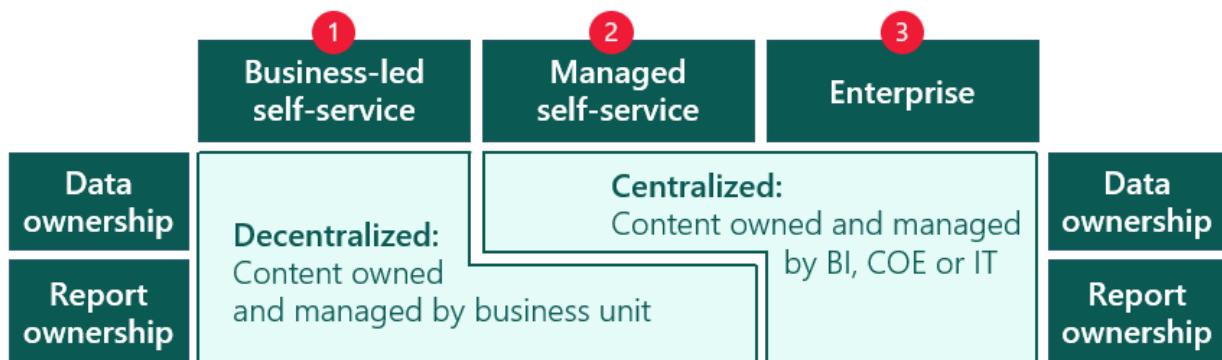
This article forms part of the *Microsoft Fabric adoption roadmap* series of articles. For an overview of the series, see [Microsoft Fabric adoption roadmap](#).

ⓘ Note

The Power BI implementation planning [usage scenarios](#) explore many concepts discussed in this article, focusing on the Power BI workload in **Microsoft Fabric**. The usage scenario articles include detailed diagrams that you might find helpful to support your planning and decision making.

There are three primary strategies for how data, analytics, and business intelligence (BI) content is owned and managed: business-led self-service, managed self-service, and enterprise. For the purposes of this series of articles, the term *content* refers to any type of data item (like a notebook, semantic model—[previously known as a dataset](#), report, or dashboard).

The organization's data culture is the driver for why, how, and by whom each of these three content ownership strategies is implemented.



The areas in the above diagram include:

Area	Description
1	Business-led self-service: All content is owned and managed by the creators and subject matter experts within a business unit. This ownership strategy is also known as a

Area	Description
	<i>decentralized or bottom-up strategy.</i>
2	Managed self-service: The data is owned and managed by a centralized team, whereas business users take responsibility for reports and dashboards. This ownership strategy is also known as <i>discipline at the core and flexibility at the edge</i> .
3	Enterprise: All content is owned and managed by a centralized team such as IT, enterprise BI, or the Center of Excellence (COE).

It's unlikely that an organization operates exclusively with one content ownership and management strategy. Depending on your data culture, one strategy might be far more dominant than the others. The choice of strategy could differ from solution to solution, or from team to team. In fact, a single team can actively use multiple strategies if it's both a consumer of enterprise content and a producer of its own self-service content. The strategy to pursue depends on factors such as:

- Requirements for a solution (such as a collection of reports, a Power BI app, or a lakehouse).
- User skills.
- Ongoing commitment for training and skills growth.
- Flexibility required.
- Complexity level.
- Priorities and leadership commitment level.

The organization's [data culture](#)—particularly its position on [data democratization](#)—has considerable influence on the extent of which of the three content ownership strategies are used. While there are common patterns for success, there's no one-size-fits-all approach. Each organization's governance model and approach to content ownership and management should reflect the differences in data sources, applications, and business context.

How content is owned and managed has a significant effect on [governance](#), the extent of [mentoring and user enablement](#), needs for [user support](#), and the [COE](#) operating model.

As discussed in the [governance](#) article, the level of governance and oversight depends on:

- Who owns and manages the content.
- The [scope of content delivery](#).
- The data subject area and sensitivity level.
- The importance of the data, and whether it's used for critical decision making.

In general:

- Business-led self-service content is subject to the least stringent governance and oversight controls. It often includes [personal BI](#) and [team BI](#) solutions.
- Managed self-service content is subject to moderately stringent governance and oversight controls. It frequently includes [team BI](#) and [departmental BI](#) solutions.
- [Enterprise](#) solutions are subject to more rigorous governance controls and oversight.

As stated in the [adoption maturity levels](#) article, organizational adoption measures the state of data management processes and governance. The choices made for content ownership and management significantly affect how organizational adoption is achieved.

Ownership and stewardship

There are many roles related to data management. Roles can be defined in many ways and can be easily misunderstood. The following table presents possible ways you might conceptually define these roles:

Role	Description
Data steward	Responsible for defining and/or managing acceptable data quality levels as well as master data management (MDM).
Subject matter expert (SME)	Responsible for defining what the data means, what it's used for, who might access it, and how the data is presented to others. Collaborates with domain owner as needed and supports colleagues in their use of data.
Technical owner	Responsible for creating, maintaining, publishing, and securing access to data and reporting items.
Domain owner	Higher-level decision-maker who collaborates with governance teams on data management policies, processes, and requirements. Decision-maker for defining appropriate and inappropriate uses of the data. Participates on the data governance board, as described in the governance article.

Assigning ownership for a data domain tends to be more straightforward when managing transactional source systems. In analytics and BI solutions, data is integrated from multiple domain areas, then transformed and enriched. For downstream analytical solutions, the topic of ownership becomes more complex.

Note

Be clear about who is responsible for managing data items. It's crucial to ensure a good experience for content consumers. Specifically, clarity on ownership is helpful for:

- Who to contact with questions.
- Feedback.
- Enhancement requests.
- Support requests.

In the Fabric portal, content owners can set the **contact list property** for many types of items. The contact list is also used in security workflows. For example, when a user is sent a URL to open a **Power BI app** but they don't have permission, they will be presented with an option to make a request for access.

Guidelines for being successful with ownership:

- Define how ownership and stewardship terminology is used in your organization, including expectations for these roles.
- Set [contacts for each workspace](#) and for individual items to communicate ownership and/or support responsibilities.
- Specify between two and four [workspace administrators](#) and conduct an [audit](#) of workspace admins regularly (perhaps twice a year). Workspace admins might be directly responsible for managing workspace content, or it could be that those tasks are assigned to colleagues who do the hands-on work. In all cases, workspace admins should be able to easily contact owners of specific content.
- Include consistent branding on reports to indicate who produced the content and who to contact for help. A small image or text label located in the report footer is valuable, especially when the report is exported from the Fabric portal. A standard [template file](#) can encourage and simplify the consistent use of branding.
- Make use of [best practices reviews](#) and [co-development projects](#) with the [COE](#).

The remainder of this article covers considerations related to the three content ownership and management strategies.

Business-led self-service

With a business-led self-service approach to data and BI, all content is owned and managed by creators and subject matter experts. Because responsibility is retained within a business unit, this strategy is often described as the *bottom-up*, or *decentralized*, approach. Business-led self-service is often a good strategy for [personal BI](#) and [team BI](#) solutions.

Important

The concept of business-led self-service isn't the same as shadow IT. In both scenarios, data and BI content is created, owned, and managed by business users. However, shadow IT implies that the business unit is circumventing IT and so the solution is not sanctioned. With business-led self-service BI solutions, the business unit has full authority to create and manage content. Resources and support from the **COE** are available to self-service content creators. It's also expected that the business unit will comply with all established data governance guidelines and policies.

Business-led self-service is most suitable when:

- Decentralized data management aligns with the organization's data culture, and the organization is prepared to support these efforts.
- Data exploration and freedom to innovate is a high priority.
- The business unit wants to have the most involvement and retain the highest level of control.
- The business unit has skilled users capable of—and fully committed to—supporting solutions through the entire lifecycle. It covers all types of items, including the data (such as a lakehouse, data warehouse, data pipeline, dataflow, or semantic model), the visuals (such as reports and dashboards), and Power BI apps.
- The flexibility to respond to changing business conditions and react quickly outweighs the need for stricter governance and oversight.

Here are some guidelines to help become successful with business-led self-service data and BI.

- Teach your creators to use the same techniques that IT would use, like **shared semantic models** and **dataflows**. Make use of a well-organized **OneLake**. Centralize data to reduce maintenance, improve consistency, and reduce risk.
- Focus on providing mentoring, training, resources, and documentation (described in the **Mentoring and user enablement** article). The importance of these efforts can't be overstated. Be prepared for skill levels of self-service content creators to vary significantly. It's also common for a solution to deliver excellent business value yet be built in such a way that it won't scale or perform well over time (as historic data volumes increase). Having the **COE** available to help when these situations arise is very valuable.
- Provide guidance on the best way to use endorsements. The **promoted endorsement** is for content produced by self-service creators. Consider reserving

use of the [certified endorsement](#) for enterprise BI content and managed self-service BI content (described next).

- Analyze the [activity log](#) to discover situations where the COE could proactively contact self-service owners to offer helpful information. It's especially useful when a suboptimal usage pattern is detected. For example, log activity could reveal overuse of individual item sharing when [Power BI app audiences](#) or [workspace roles](#) might be a better choice. The data from the activity log allows the COE to offer support and advice to the business units. In turn, this information can help increase the quality of solutions, while allowing the business to retain full ownership and control of their content. For more information, see [Auditing and monitoring](#).

Managed self-service

Managed self-service BI is a blended approach to data and BI. The data is owned and managed by a centralized team (such as IT, enterprise BI, or the COE), while responsibility for reports and dashboards belongs to creators and subject matter experts within the business units. Managed self-service BI is frequently a good strategy for [team BI](#) and [departmental BI](#) solutions.

This approach is often called [discipline at the core and flexibility at the edge](#). It's because the data architecture is maintained by a single team with an appropriate level of discipline and rigor. Business units have the flexibility to create reports and dashboards based on centralized data. This approach allows report creators to be far more efficient because they can remain focused on delivering value from their data analysis and visuals.

Managed self-service BI is most suitable when:

- Centralized data management aligns with the organization's data culture.
- The organization has a team of BI experts who manage the data architecture.
- There's value in the reuse of data by many self-service report creators across organizational boundaries.
- Self-service report creators need to produce analytical content at a pace faster than the centralized team can accommodate.
- Different users are responsible for handling data preparation, data modeling, and report creation.

Here are some guidelines to help you become successful with managed self-service BI.

- Teach users to [separate model and report development](#). They can use [live connections](#) to create reports based on existing semantic models. When the

semantic model is decoupled from the report, it promotes data reuse by many reports and many authors. It also facilitates the separation of duties.

- Use [dataflows](#) to centralize data preparation logic and to share commonly used data tables—like date, customer, product, or sales—with many semantic model creators. Refine the dataflow as much as possible, using friendly column names and correct data types to reduce the downstream effort required by semantic model authors, who consume the dataflow as a source. Dataflows are an effective way to reduce the time involved with data preparation and improve data consistency across semantic models. The use of dataflows also reduces the number of data refreshes on source systems and allows fewer users who require direct access to source systems.
- When self-service creators need to augment an existing semantic model with departmental data, educate them to create [composite models](#). This feature allows for an ideal balance of self-service enablement while taking advantage of the investment in data assets that are centrally managed.
- Use the [certified endorsement](#) for semantic models and dataflows to help content creators identify trustworthy sources of data.
- Include consistent branding on all reports to indicate who produced the content and who to contact for help. Branding is particularly helpful to distinguish content that is produced by self-service creators. A small image or text label in the report footer is valuable when the report is exported from the Fabric portal.
- Consider implementing separate [workspaces](#) for storing data and reports. This approach allows for better clarity on who is responsible for content. It also allows for more restrictive [workspace roles](#) assignments. That way, report creators can only publish content to their reporting workspace; and, read and build semantic model permissions allow creators to create new reports with row-level security (RLS) in effect, when applicable. For more information, see [Workspace-level planning](#). For more information about RLS, see [Content creator security planning](#).
- Use the [Power BI REST APIs](#) to compile an inventory of Power BI items. Analyze the ratio of semantic models to reports to evaluate the extent of semantic model reuse.

Enterprise

[Enterprise](#) is a centralized approach to delivering data and BI solutions in which all solution content is owned and managed by a centralized team. This team is usually IT, enterprise BI, or the COE.

Enterprise is the most suitable when:

- Centralizing content management with a single team aligns with the organization's data culture.
- The organization has data and BI expertise to manage all items end-to-end.
- The content needs of consumers are well-defined, and there's little need to customize or explore data beyond the reporting solution that's delivered.
- Content ownership and direct access to data needs to be limited to a small number of experts and owners.
- The data is highly sensitive or subject to regulatory requirements.

Here are some guidelines to help you become successful with enterprise data and BI.

- Implement a rigorous process for use of the [certified endorsement](#) for content. Not all enterprise content needs to be certified, but much of it probably should be. Certified content should indicate that data quality has been validated. Certified content should also follow change management rules, have formal support, and be fully documented. Because certified content has passed rigorous standards, the expectations for trustworthiness are higher.
- Include consistent branding on enterprise BI reports to indicate who produced the content, and who to contact for help. A small image or text label in the report footer is valuable when the report is exported by a user.
- If you use specific report branding to indicate enterprise BI content, be careful with the *save a copy* functionality that would allow a user to download a copy of a report and personalize it. Although this functionality is an excellent way to bridge enterprise BI with managed self-service BI, it dilutes the value of the branding. A more seamless solution is to provide a separate [Power BI Desktop template file](#) for self-service authors. The template defines a starting point for report creation with a live connection to an existing semantic model, and it doesn't include branding. The template file can be shared as a link within a Power BI app, or from the [community portal](#).

Ownership transfers

Occasionally, the ownership of a particular solution might need to be transferred to another team. An ownership transfer from a business unit to a centralized team can happen when:

- A business-led solution is used by a significant number of users, or it now supports critical business decisions. In these cases, the solution should be managed by a team with processes in place to implement higher levels of governance and support.

- A business-led solution is a candidate to be used far more broadly throughout the organization, so it needs to be managed by a team who can set security and deploy content widely throughout the organization.
- A business unit no longer has the expertise, budget, or time available to continue managing the content, but the business need for the content remains.
- The size or complexity of a solution has grown to a point where a different data architecture or redesign is required.
- A proof of concept is ready to be operationalized.

The COE should have well-documented procedures for identifying when a solution is a candidate for ownership transfer. It's very helpful if help desk personnel know what to look for as well. Having a customary pattern for self-service creators to build and grow a solution, and hand it off in certain circumstances, is an indicator of a productive and healthy data culture. A simple ownership transfer could be addressed during COE [office hours](#); a more complex transfer could warrant a small project managed by the COE.

Note

There's potential that the new owner will need to do some refactoring and data validations before they're willing to take full ownership. Refactoring is most likely to occur with the less visible aspects of data preparation, data modeling, and calculations. If there are any manual steps or flat file sources, now is an ideal time to apply those enhancements. The branding of reports and dashboards might also need to change (for example, if there's a footer indicating report contact or a text label indicating that the content is certified).

It's also possible for a centralized team to transfer ownership to a business unit. It could happen when:

- The team with domain knowledge is better equipped to own and manage the content going forward.
- The centralized team has created the solution for a business unit that doesn't have the skills to create it from scratch, but it can maintain and extend the solution going forward.

Tip

Don't forget to recognize and reward the work of the original creator, particularly if ownership transfers are a common occurrence.

Considerations and key actions



Checklist - Here's a list of considerations and key actions you can take to strengthen your approach to content ownership and management.

- ✓ **Gain a full understanding of what's currently happening:** Ensure you deeply understand how content ownership and management is happening throughout the organization. Recognize that there likely won't be a one-size-fits-all approach to apply uniformly across the entire organization. Review the implementation planning [usage scenarios](#) to understand how Power BI and Fabric can be used in diverse ways.
- ✓ **Conduct discussions:** Determine what is currently working well, what isn't working well, and what the desired balance is between the three ownership strategies. If necessary, schedule discussions with specific people on various teams. Develop a plan for moving from the current state to the desired state.
- ✓ **Perform an assessment:** If your enterprise data team currently has challenges related to scheduling and priorities, do an assessment to determine if a managed self-service strategy can be put in place to empower more content creators throughout the organization. Managed self-service data and BI can be extremely effective on a global scale.
- ✓ **Clarify terminology:** Clarify terms used in your organization for owner, data steward, and subject matter expert.
- ✓ **Assign clear roles and responsibilities:** Make sure roles and responsibilities for owners, stewards, and subject matter experts are documented and well understood by everyone involved. Include backup personnel.
- ✓ **Ensure community involvement:** Ensure that all your content owners—from both the business and IT—are part of your [community of practice](#).
- ✓ **Create user guidance for owners and contacts in Fabric:** Determine how you will use the contacts feature in Fabric. Communicate with content creators about how it should be used, and why it's important.
- ✓ **Create a process for handling ownership transfers:** If ownership transfers occur regularly, create a process for how it will work.
- ✓ **Support your advanced content creators:** Determine your strategy for using [external tools](#) for advanced authoring capabilities and increased productivity.

Questions to ask



Use questions like those found below to assess content ownership and management.

- Do central teams that are responsible for Fabric have a clear understanding of who owns what BI content? Is there a distinction between report and data items, or different item types (like Power BI semantic models, data science notebooks, or lakehouses)?
- Which [usage scenarios](#) are in place, such as [personal BI](#), [team BI](#), [departmental BI](#), or [enterprise BI](#)? How prevalent are they in the organization, and how do they differ between key business units?
- What activities do business analytical teams perform (for example, data integration, data modeling, or reporting)?
- What kinds of roles in the organizations are expected to create and own content? Is it limited to central teams, analysts, or also functional roles, like sales?
- Where does the organization sit on the spectrum of [business-led self-service](#), [managed self-service](#), or [enterprise](#)? Does it differ between key business units?
- Do strategic data and BI solutions have [ownership](#) roles and stewardship roles that are clearly defined? Which are missing?
- Are content creators and owners also responsible for supporting and updating content once it's released? How effective is the ownership of content support and updates?
- Is a clear process in place to [transfer ownership](#) of solutions (where necessary)? An example is when an external consultant creates or updates a solution.
- Do data sources have data stewards or subject matter experts (SMEs) who serve as a special point of contact?
- If your organization is already using Fabric or Power BI, does the current [workspace setup](#) comply with the content ownership and delivery strategies that are in place?

Maturity levels



The following maturity levels will help you assess the current state of your content ownership and management.

Level	State of content ownership and management
100: Initial	<ul style="list-style-type: none"> Self-service content creators own and manage content in an uncontrolled way, without a specific strategy. A high ratio of semantic models to reports exists. When many semantic models exist only support one report, it indicates opportunities to improve data reusability, improve trustworthiness, reduce maintenance, and reduce the number of duplicate semantic models. Discrepancies between different reports are common, causing distrust of content produced by others.
200: Repeatable	<ul style="list-style-type: none"> A plan is in place for which content ownership and management strategy to use and in which circumstances. Initial steps are taken to improve the consistency and trustworthiness levels for self-service efforts. Guidance for the user community is available that includes expectations for self-service versus enterprise content. Roles and responsibilities are clear and well understood by everyone involved.
300: Defined	<ul style="list-style-type: none"> Managed self-service is a priority and an area of investment to further advance the data culture. The priority is to allow report creators the flexibility they need while using well-managed, secure, and trustworthy data sources. Report branding is consistently used to indicate who produced the content. A mentoring program exists to educate self-service content creators on how to apply best practices and make good decisions.
400: Capable	<ul style="list-style-type: none"> Criteria are defined to align governance requirements for self-service versus enterprise content. There's a plan in place for how to request and handle ownership transfers. Managed self-service—and techniques for the reuse of data—are commonly used and well-understood.
500: Efficient	<ul style="list-style-type: none"> Proactive steps to communicate with users occur when any concerning activities are detected in the activity log. Education and information are provided to make gradual improvements or reduce risk. Third-party tools are used by highly proficient content creators to improve productivity and efficiency.

Next steps

In the [next article](#) in the Microsoft Fabric adoption roadmap series, learn about the scope of content delivery.

Microsoft Fabric adoption roadmap: Content delivery scope

Article • 11/14/2023

ⓘ Note

This article forms part of the *Microsoft Fabric adoption roadmap* series of articles. For an overview of the series, see [Microsoft Fabric adoption roadmap](#).

The four delivery scopes described in this article include [personal](#), [team](#), [departmental](#), and [enterprise](#). To be clear, focusing on the scope of a delivered data and business intelligence (BI) solution does refer to the number of people who might view the solution, though the impact is much more than that. The scope strongly influences best practices for not only content distribution, but also [content management](#), [security](#), and [information protection](#). The scope has a direct correlation to the level of [governance](#) (such as requirements for change management, support, or documentation), the extent of [mentoring and user enablement](#), and needs for [user support](#). It also influences [user licensing](#) decisions.

The related [content ownership and management](#) article makes similar points. Whereas the focus of that article was on the content creator, the focus of this article is on the target content usage. Both inter-related aspects need to be considered to arrive at governance decisions and the [Center of Excellence \(COE\)](#) operating model.

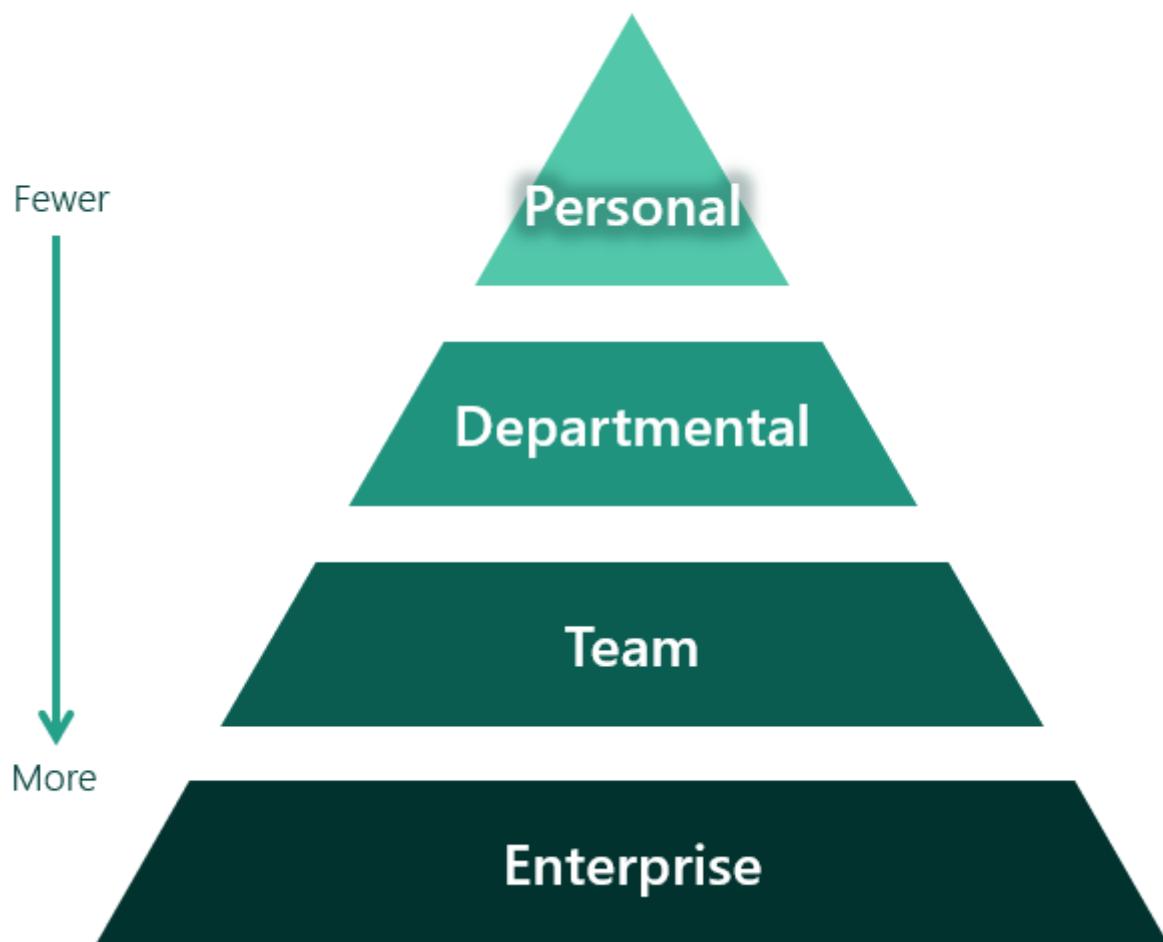
ⓘ Important

Not all data and solutions are equal. Be prepared to apply different levels of data management and governance to different teams and various types of content. Standardized rules are easier to maintain. However, flexibility or customization is often necessary to apply the appropriate level of oversight for particular circumstances. Your [executive sponsor](#) can prove invaluable by reaching consensus across stakeholder groups when difficult situations arise.

Scope of content delivery

The following diagram focuses on the number of *target consumers* who will consume the content.

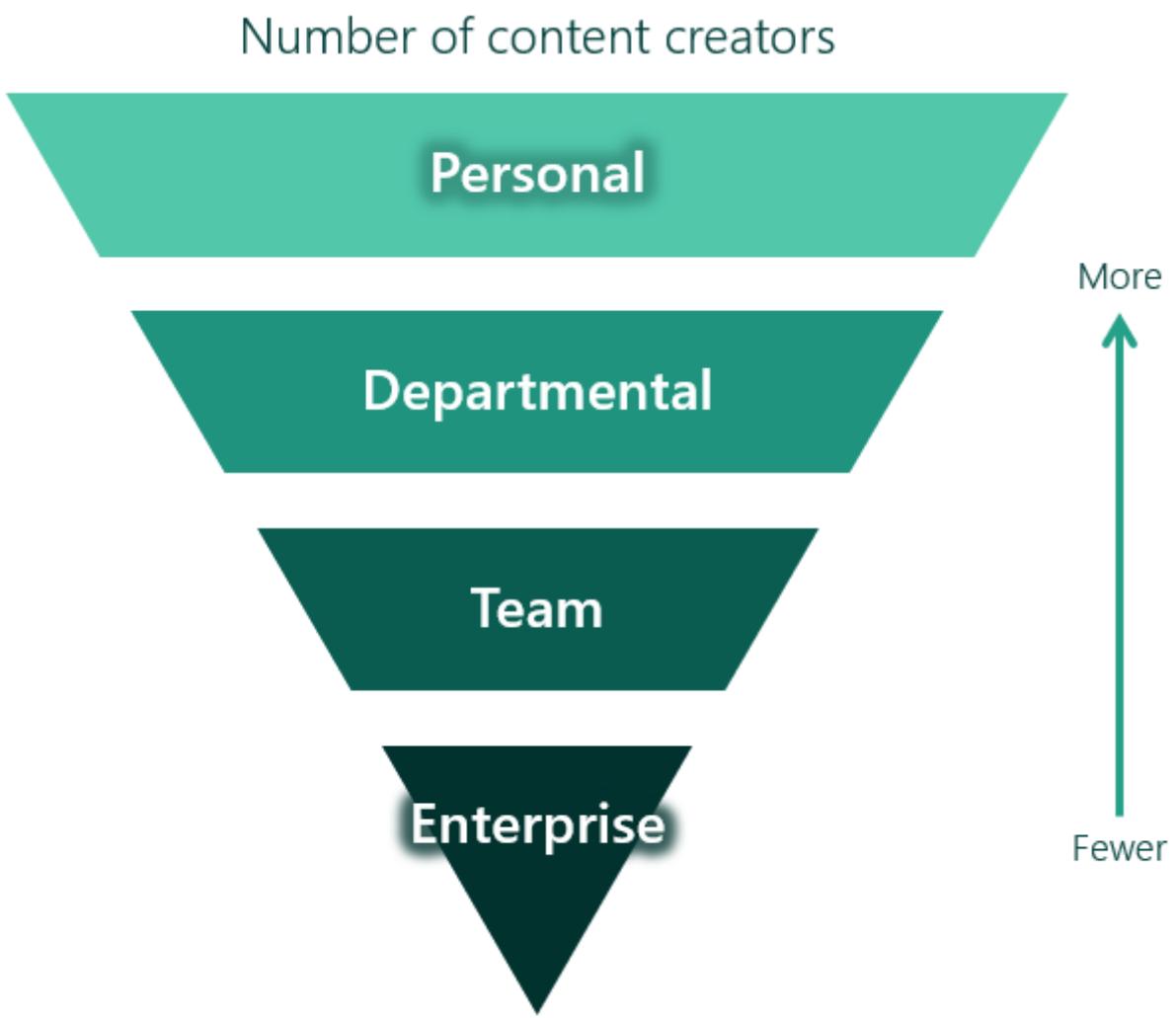
Number of target consumers



The four scopes of content delivery shown in the above diagram include:

- **Personal:** Personal solutions are, as the name implies, intended for use by the creator. Sharing content with others isn't an objective. Therefore, a personal data and BI solution has the fewest number of target consumers.
- **Team:** Collaborates and shares content with a relatively small number of colleagues who work closely together.
- **Departmental:** Delivers content to a large number of consumers, who can belong to a department or business unit.
- **Enterprise:** Delivers content broadly across organizational boundaries to the largest number of target consumers. Enterprise content is most often managed by a centralized team and is subject to additional [governance](#) requirements.

Contrast the above four scopes of content delivery with the following diagram, which has an inverse relationship with respect to the number of *content creators*.



The four scopes of content creators shown in the above diagram include:

- **Personal:** Represents the largest number of creators because the [data culture](#) encourages any user to work with data using business-led self-service data and BI methods. Although managed self-service BI methods can be used, it's less common with personal data and BI efforts.
- **Team:** Colleagues within a team collaborate and share with each other by using [business-led self-service](#) patterns. It has the next largest number of creators in the organization. [Managed self-service](#) patterns could also begin to emerge as skill levels advance.
- **Departmental:** Involves a smaller population of creators. They're likely to be considered power users who are using sophisticated tools to create sophisticated solutions. [Managed self-service](#) practices are very common and highly encouraged.
- **Enterprise:** Involves the smallest number of content creators because it typically includes only professional data and BI developers who work in the BI team, the COE, or in IT.

The [content ownership and management](#) article introduced the concepts of business-led self-service, managed self-service, and enterprise. The most common alignment between ownership and delivery scope is:

- **Business-led self-service ownership:** Commonly deployed as personal and team solutions.
- **Managed self-service ownership:** Can be deployed as personal, team, or departmental solutions.
- **Enterprise ownership:** Typically deployed as enterprise-scoped solutions.

Some organizations also equate self-service content with community-based support. It's the case when self-service content creators and owners are responsible for supporting the content they publish. The [user support](#) article describes multiple informal and formal levels for support.

Note

The term *sharing* can be interpreted two ways: It's often used in a general way related to sharing content with colleagues, which could be implemented multiple ways. It can also reference a **specific feature in Fabric**, which is a specific implementation where a user or group is granted access to a single item. In this article, the term *sharing* is meant in a general way to describe sharing content with colleagues. When the per-item permissions are intended, this article will make a clear reference to that feature. For more information, see [Report consumer security planning](#).

Personal

The [Personal](#) delivery scope is about enabling an individual to gain analytical value. It's also about allowing them to more efficiently perform business tasks through the effective personal use of data, information, and analytics. It could apply to any type of information worker in the organization, not just data analysts and developers.

Sharing content with others isn't the objective. Personal content can reside in Power BI Desktop or in a personal workspace in the Fabric portal.

Here are the characteristics of creating content for a personal delivery scope.

- The creator's primary intention is data exploration and analysis, rather than report delivery.
- The content is intended to be analyzed and consumed by one person: the creator.
- The content might be an exploratory proof of concept that may, or may not, evolve into a project.

Here are a few guidelines to help you become successful with content developed for personal use.

- Consider personal data and BI solutions to be like an *analytical sandbox* that has little formal governance and oversight from the governance team or COE. However, it's still appropriate to educate content creators that some general governance guidelines could still apply to personal content. Valid questions to ask include: Can the creator export the personal report and email it to others? Can the creator store a personal report on a non-organizational laptop or device? What limitations or requirements exist for content that contains sensitive data?
- See the techniques described for business-led self-service, and managed self-service in the [content ownership and management](#) article. They're highly relevant techniques that help content creators create efficient and personal data and BI solutions.
- Analyze data from the [activity log](#) to discover situations where personal solutions appear to have expanded beyond the original intended usage. It's usually discovered by detecting a significant amount of content sharing from a personal workspace.

💡 Tip

For information about how users progress through the stages of user adoption, see the [Microsoft Fabric adoption roadmap maturity levels](#). For more information about using the activity log, see [Tenant-level auditing](#).

Team

The [Team](#) delivery scope is focused on a team of people who work closely together, and who are tasked with solving closely related problems using the same data. Collaborating and sharing content with each other in a workspace is usually the primary objective.

Content is often shared among the team more informally as compared to departmental or enterprise content. For instance, the workspace is often sufficient for consuming content within a small team. It doesn't require the formality of publishing the workspace to distribute it as an app. There isn't a specific number of users when team-based delivery is considered too informal; each team can find the right number that works for them.

Here are the characteristics of creating content for a team delivery scope.

- Content is created, managed, and viewed among a group of colleagues who work closely together.
- Collaboration and co-management of content is the highest priority.
- Formal delivery of content might occur for report viewers (especially for managers of the team), but it's usually a secondary priority.
- Reports aren't always highly sophisticated or attractive; functionality and accessing the information is what matters most.

Here are some guidelines to help you become successful with content developed for team use.

- Ensure the COE is prepared to support the efforts of self-service creators publishing content for their team.
- Make purposeful decisions about how [workspace management](#) will be handled. The workspace is a place to organize related content, a permissions boundary, and the scope for a Power BI app. It's tempting to start with one workspace per team, but that might not be flexible enough to satisfy all needs.
- See the techniques described for business-led self-service and managed self-service in the [content ownership and management](#) article. They're highly relevant techniques that help content creators create efficient and effective team data and BI solutions.

Tip

For more information, see [Workspace-level planning](#).

Departmental

Content is delivered to members of a department or business unit. Content distribution to a larger number of consumers is a priority for [departmental](#) delivery scopes.

Here are the characteristics of departmental content delivery.

- A few content creators typically publish content for colleagues to consume.
- Formal delivery of reports by using Power BI apps is a high priority to ensure consumers have the best experience.
- Additional effort is made to deliver more sophisticated and polished reports. Following best practices for data preparation and higher quality data modeling is also expected.
- Needs for change management and [lifecycle management](#) begin to emerge to ensure release stability and a consistent experience for consumers.

Here are a few guidelines to help you become successful with departmental BI delivery.

- Ensure that the COE is prepared to support the efforts of self-service creators. Creators who publish content used throughout their department or business unit might emerge as candidates to become champions. Or, they might become candidates to join the COE as a [satellite member](#).
- Make purposeful decisions about how [workspace management](#) will be handled. The workspace is a place to organize related content, a permissions boundary, and the scope for an app. Several workspaces will likely be required to meet all the needs of a large department or business unit.
- Plan how [Power BI apps](#) will distribute content to the enterprise. An app can provide a significantly better user experience for consuming content. In many cases, content consumers can be granted permissions to view content via the app only, reserving workspace permissions management for content creators and reviewers only. The use of app audience groups allows you to *mix and match* content and target audience in a flexible way.
- Be clear about what data quality validations have occurred. As the importance and criticality level grows, expectations for trustworthiness grow too.
- Ensure that adequate training, mentoring, and documentation is available to support content creators. Best practices for data preparation, data modeling, and data presentation will result in better quality solutions.
- Provide guidance on the best way to use the [promoted endorsement](#), and when the [certified endorsement](#) could be permitted for departmental solutions.
- Ensure that the owner is identified for all departmental content. Clarity on ownership is helpful, including who to contact with questions, feedback, enhancement requests, or support requests. In the Fabric portal, content owners can set the [contact list property](#) for many types of items (like reports and dashboards). The contact list is also used in security workflows. For example, when a user is sent a URL to open an app but they don't have permission, they'll be presented with an option to make a request for access.
- Consider using [deployment pipelines](#) in conjunction with separate [workspaces](#). Deployment pipelines can support development, test, and production environments, which provide more stability for consumers.
- Consider enforcing the use of [sensitivity labels](#) to implement [information protection](#) on all content.
- Include consistent branding on reports by:
 - Using departmental colors and styling to indicate who produced the content.
For more information, see [Content ownership and management](#).
 - Adding a small image or text label to the report footer, which is valuable when the report is exported from the Fabric portal.

- Using a standard Power BI Desktop template file. For more information, see [Mentoring and user enablement](#).
- Apply the techniques described for business-led self-service and managed self-service content delivery in the [Content ownership and management](#) article. They're highly relevant techniques that can help content creators to create efficient and effective departmental solutions.

Enterprise

[Enterprise](#) content is typically managed by a centralized team and is subject to additional governance requirements. Content is delivered broadly across organizational boundaries.

Here are the characteristics of enterprise content delivery.

- A centralized team of experts manages the content end-to-end and publishes it for others to consume.
- Formal delivery of data solutions like reports, lakehouses, and Power BI apps is a high priority to ensure consumers have the best experience.
- The content is highly sensitive, subject to regulatory requirements, or is considered extremely critical.
- Published enterprise-level semantic models ([previously known as datasets](#)) and dataflows might be used as a source for self-service creators, thus creating a chain of dependencies to the source data.
- Stability and a consistent experience for consumers are highly important. Application lifecycle management, such as [deployment pipelines](#) and [DevOps techniques](#), is commonly used. Change management processes to review and approve changes before they're deployed are commonly used for enterprise content, for example, by a change review board or similar group.
- Processes exist to gather requirements, prioritize efforts, and plan for new projects or enhancements to existing content.
- Integration with other enterprise-level data architecture and management services could exist, possibly with other Azure services and Power Platform products.

Here are some guidelines to help you become successful with enterprise content delivery.

- Governance and oversight techniques described in the [governance](#) article are relevant for managing an enterprise solution. Techniques primarily include change management and [lifecycle management](#).
- Plan for how to effectively use [Premium Per User](#) or [Fabric capacity](#) licensing per workspace. Align your workspace management strategy, like how [workspaces](#) will

be organized and secured, to the planned [licensing](#) strategy.

- Plan how Power BI apps will distribute enterprise content to consumers. An app can provide a significantly better user experience for consuming content. Align the app distribution strategy with your workspace management strategy.
- Consider enforcing the use of [sensitivity labels](#) to implement [information protection](#) on all content.
- Implement a rigorous process for use of the [certified endorsement](#) for enterprise reports and apps. Data assets can be certified, too, when there's the expectation that self-service creators will build solutions based on them. Not all enterprise content needs to be certified, but much of it probably will be.
- Make it a common practice to announce when changes will occur. For more information, see the [community of practice](#) article for a description of communication types.
- Include consistent branding on reports, by:
 - Using specific colors and styling, which can also indicate who produced the content. For more information, see [Content ownership and management](#).
 - Adding a small image or text label to the report footer, which can be valuable when the report is exported from the Fabric portal.
 - Using a standard Power BI Desktop template file. For more information, see [Mentoring and user enablement](#).
- Actively use the [lineage view](#) to understand dependencies, perform impact analysis, and communicate to downstream content owners when changes will occur.
- See the techniques described for enterprise content delivery in the [content ownership and management](#) article. They're highly relevant techniques that help content creators create efficient and effective enterprise solutions.
- See the techniques described in the [system oversight](#) article for auditing, governing, and the oversight of enterprise content.

Considerations and key actions



Checklist - Considerations and key actions you can take to strengthen your approach to content delivery.

- ✓ **Align goals for content delivery:** Ensure that guidelines, documentation, and other resources align with the strategic goals defined for Fabric adoption.

- ✓ **Clarify the scopes for content delivery in your organization:** Determine who each scope applies to, and how each scope aligns with governance decisions. Ensure that decisions and guidelines are consistent with how [content ownership and management](#) is handled.
- ✓ **Consider exceptions:** Be prepared for how to handle situations when a smaller team wants to publish content for an enterprise-wide audience.
 - Will it require the content be owned and managed by a centralized team? For more information, see the [Content ownership and management](#) article, which describes an inter-related concept with content delivery scope.
 - Will there be an approval process? [Governance](#) can become more complicated when the content delivery scope is broader than the owner of the content. For example, when an app that's owned by a divisional sales team is distributed to the entire organization.
- ✓ **Create helpful documentation:** Ensure that you have sufficient training documentation and support so that your content creators understand when it's appropriate to use [workspaces, apps](#), or [per-item sharing \(direct access or link\)](#).
- ✓ **Create a licensing strategy:** Ensure that you have a specific strategy in place to handle [Fabric licensing](#) considerations. Create a process for how workspaces could be assigned each license type, and the prerequisites required for the type of content that could be assigned to Premium.

Questions to ask



Use questions like those found below to assess content delivery scope.

- Do central teams that are responsible for Fabric have a clear understanding of who creates and delivers content? Does it differ by business area, or for different content item types?
- Which [usage scenarios](#) are in place, such as [personal BI](#), [team BI](#), [departmental BI](#), or [enterprise BI](#)? How prevalent are they in the organization? Are there advanced scenarios, like [advanced data preparation](#) or [advanced data model management](#), or niche scenarios, like [self-service real-time analytics](#)?
- For the identified content delivery scopes in place, to what extent are guidelines being followed?

- Are there trajectories for helpful self-service content to be "promoted" from personal to team content delivery scopes and beyond? What systems and processes enable sustainable, bottom-up scaling and distribution of useful self-service content?
- What are the guidelines for publishing content to, and using, personal workspaces?
- Are personal workspaces assigned to dedicated [Fabric capacity](#)? In what circumstances are personal workspaces intended to be used?
- On average, how many reports does someone have access to? How many reports does an executive have access to? How many reports does the CEO have access to?
- If your organization is using Fabric or Power BI today, does the current [workspace setup](#) comply with the content ownership and delivery strategies that are in place?
- Is there a clear licensing strategy? How many licenses are used today? How many tenants and capacities exist, who uses them, and why?
- How do central teams decide what gets published to Premium (or Fabric) dedicated capacity, and what uses shared capacity? Do development workloads use separate Premium Per User (PPU) licensing to avoid affecting production workloads?

Maturity levels



The following maturity levels will help you assess the current state of your content delivery.

Level	State of content delivery
100: Initial	<ul style="list-style-type: none"> Content is published for consumers by self-service creators in an uncontrolled way, without a specific strategy.
200: Repeatable	<ul style="list-style-type: none"> Pockets of good practices exist. However, good practices are overly dependent on the knowledge, skills, and habits of the content creator.
300: Defined	<ul style="list-style-type: none"> Clear guidelines are defined and communicated to describe what can and can't occur within each delivery scope. These guidelines are followed by some—but not all—groups across the organization.
400: Capable	<ul style="list-style-type: none"> Criteria are defined to align governance requirements for self-service versus enterprise content.

Level	State of content delivery
	<ul style="list-style-type: none">• Guidelines for content delivery scope are followed by most, or all, groups across the organization.• Change management requirements are in place to approve critical changes for content that's distributed to a larger-sized audience.• Changes are announced and follow a communication plan. Content creators are aware of the downstream effects on their content. Consumers are aware of when reports and apps are changed.
500: Efficient	<ul style="list-style-type: none">• Proactively take steps to communicate with users occur when any concerning activities are detected in the activity log. Education and information are provided to make gradual improvements or reduce risk.• The business value that's achieved for deployed solutions is regularly evaluated.

Next steps

In the [next article](#) in the Microsoft Fabric adoption roadmap series, learn about the Center of Excellence (COE).

Microsoft Fabric adoption roadmap: Center of Excellence

Article • 11/14/2023

ⓘ Note

This article forms part of the *Microsoft Fabric adoption roadmap* series of articles. For an overview of the series, see [Microsoft Fabric adoption roadmap](#).

A data or analytics Center of Excellence (COE) is an internal team of technical and business experts. The team actively assists others within the organization who are working with data. The COE forms the nucleus of the broader community to advance adoption goals, which align with the data culture vision.

A COE might also be known as *competency center*, *capability center*, or a *center of expertise*. Some organizations use the term *squad*. Many organizations perform the COE responsibilities within their data, analytics, or business intelligence (BI) team.

ⓘ Note

Having a COE team formally recognized in your organizational chart is recommended, but not required. What's most important is that the COE roles and responsibilities are identified, prioritized, and assigned. It's common for a centralized data or analytics team to take on many of the COE responsibilities; some responsibilities might also reside within IT. For simplicity, in this series of articles, COE means a *specific group of people*, although you might implement it differently. It's also very common to implement the COE with a scope broader than Fabric or Power BI alone: for instance, a Power Platform COE, a data COE, or an analytics COE.

Goals for a COE

Goals for a COE include:

- Evangelizing a data-driven culture.
- Promoting the adoption of analytics.
- Nurturing, mentoring, guiding, and educating internal users to increase their skills and level of self-reliance.

- Coordinating efforts and disseminating knowledge across organizational boundaries.
- Creating consistency and transparency for the user community, which reduces friction and pain points related to finding relevant data and analytics content.
- Maximizing the benefits of self-service BI, while reducing the risks.
- Reducing technical debt by helping users make good decisions that increase consistency and result in fewer inefficiencies.

Important

One of the most powerful aspects of a COE is the cross-departmental insight into how analytics tools like Fabric are used by the organization. This insight can reveal which practices work well and which don't, that can facilitate a bottom-up approach to governance. A primary goal of the COE is to learn which practices work well, share that knowledge more broadly, and replicate best practices across the organization.

Scope of COE responsibilities

The scope of COE responsibilities can vary significantly between organizations. In a way, a COE can be thought of as a consultancy service because its members routinely provide expert advice to the internal community of users. To varying degrees, most COEs handle hands-on work too.

Common COE responsibilities include:

- Mentoring and facilitating [knowledge sharing](#) within the internal Fabric community.
- Holding [office hours](#) to engage with the internal Fabric community.
- Conducting [co-development projects](#) and [best practices reviews](#) in order to actively help business units deliver solutions.
- Managing the [centralized portal](#).
- Producing, curating, and promoting [training materials](#).
- Creating [documentation](#) and other resources, such as [template files](#), to encourage consistent use of standards and best practices.
- Applying, communicating, and assisting with [governance](#) guidelines.
- Handling and assisting with [system oversight](#) and Fabric administration.
- Responding to [user support](#) issues escalated from the help desk.
- Developing solutions and/or proofs of concept.
- Establishing and maintaining the BI platform and data architecture.

- Communicating regularly with the internal community of users.

Staffing a COE

People who are good candidates as COE members tend to be those who:

- Understand the analytics vision for the organization.
- Have a desire to continually improve analytics practices for the organization.
- Have a deep interest in, and expertise with, analytics tools such as Fabric.
- Are interested in seeing Fabric used effectively and adopted successfully throughout the organization.
- Take the initiative to continually learn, adapt, and grow.
- Readily share their knowledge with others.
- Are interested in repeatable processes, standardization, and governance with a focus on user enablement.
- Are hyper-focused on collaboration with others.
- Are comfortable working in an agile fashion.
- Have an inherent interest in being involved and helping others.
- Can effectively translate business needs into solutions.
- Communicate well with both technical and business colleagues.

💡 Tip

If you have self-service content creators in your organization who constantly push the boundaries of what can be done, they might be a great candidate to become a recognized **champion**, or perhaps even a satellite member of the COE.

When recruiting for the COE, it's important to have a mix of complementary analytical skills, technical skills, and business skills.

Roles and responsibilities

Very generalized roles within a COE are listed below. It's common for multiple people to overlap roles, which is useful from a backup and cross-training perspective. It's also common for the same person to serve multiple roles. For instance, most COE members also serve as a coach or mentor.

Role	Description
COE leader	Manages the day-to-day operations of the COE. Interacts with the executive sponsor and other organizational teams, such as the data governance board, as necessary.

Role	Description
	For an overview of additional roles and responsibilities, see the Governance article.
Coach	Coaches and educates others on data and BI skills via office hours (community engagement), best practices reviews , or co-development projects . Oversees and participates in the discussion channel of the internal community. Interacts with, and supports, the champions network .
Trainer	Develops, curates, and delivers internal training materials, documentation, and resources.
Data analyst	Domain-specific subject matter expert. Acts as a liaison between the COE and the business unit. Content creator for the business unit. Assists with content certification. Works on co-development projects and proofs of concept.
Data modeler	Creates and manages data assets (such as shared semantic model— previously known as a dataset —and dataflows) to support other self-service content creators.
Report creator	Creates and publishes reports, dashboards, and metrics.
Data engineer	Plans for deployment and architecture, including integration with other services and data platforms. Publishes data assets which are utilized broadly across the organization (such as a lakehouse, data warehouse, data pipeline, dataflow, or semantic model).
User support	Assists with the resolution of data discrepancies and escalated help desk support issues.

As mentioned previously, the scope of responsibilities for a COE can vary significantly between organizations. Therefore, the roles found for COE members can vary too.

Structuring a COE

The selected COE structure can vary among organizations. It's also possible for multiple structures to exist inside of a single large organization. That's particularly true when there are subsidiaries or when acquisitions have occurred.

Note

The following terms might differ to those defined for your organization, particularly the meaning of *federated*, which tends to have many different IT-related meanings.

Centralized COE

A centralized COE comprises a single shared services team.

Pros:

- There's a single point of accountability for a single team that manages standards, best practices, and delivery end-to-end.
- The COE is one group from an organizational chart perspective.
- It's easy to start with this approach and then evolve to the unified or federated model over time.

Cons:

- A centralized team might have an authoritarian tendency to favor one-size-fits-all decisions that don't always work well for all business units.
- There can be a tendency to prefer IT skills over business skills.
- Due to the centralized nature, it might be more difficult for the COE members to sufficiently understand the needs of all business units.

Unified COE

A unified COE is a single, centralized, shared services team that has been expanded to include embedded team members. The embedded team members are dedicated to supporting a specific functional area or business unit.

Pros:

- There's a single point of accountability for a single team that includes cross-functional involvement from the embedded COE team members. The embedded COE team members are assigned to various areas of the business.
- The COE is one group from an organizational chart perspective.
- The COE understands the needs of business units more deeply due to dedicated members with domain expertise.

Cons:

- The embedded COE team members, who are dedicated to a specific business unit, have a different organizational chart responsibility than the people they serve directly within the business unit. The organizational structure could potentially lead to complications, differences in priorities, or necessitate the involvement of the executive sponsor. Preferably, the executive sponsor has a scope of authority that includes the COE and all involved business units to help resolve conflicts.

Federated COE

A federated COE comprises a shared services team (the core COE members) plus satellite members from each functional area or major business unit. A federated team works in coordination, even though its members reside in different business units. Typically, satellite members are primarily focused on development activities to support their business unit while the shared services personnel support the entire community.

Pros:

- There's cross-functional involvement from satellite COE members who represent their specific functional area and have domain expertise.
- There's a balance of centralized and decentralized representation across the core and satellite COE members.
- When distributed data ownership situations exist—as could be the case when business units take direct responsibility for data management activities—this model is effective.

Cons:

- Since core and satellite members span organizational boundaries, the federated COE approach requires strong leadership, excellent communication, robust project management, and ultra-clear expectations.
- There's a higher risk of encountering competing priorities due to the federated structure.
- This approach typically involves part-time people and/or *dotted line* organizational chart accountability that can introduce competing time pressures.

💡 Tip

Some organizations have success by using a *rotational program*. It involves federated members joining the core COE for a period of time, such as six months. This type of program allows federated members to learn best practices and understand more deeply how and why things are done. Although each federated member remains focused on their specific business unit, they gain a deeper understanding of the organization's challenges. This deeper understanding leads to a more productive partnership over time.

Decentralized COE

Decentralized COEs are independently managed by business units.

Pros:

- A specialized data culture exists that's focused on the business unit, making it easier to learn quickly and adapt.
- Policies and practices are tailored to each business unit.
- Agility, flexibility, and priorities are focused on the individual business unit.

Cons:

- There's a risk that decentralized COEs operate in isolation. As a result, they might not share best practices and lessons learned outside of their business unit.
- Collaboration with a centralized team might be informal and/or inconsistent.
- Inconsistent policies are created and applied across business units.
- It's difficult to scale a decentralized model.
- There's potential rework to bring one or more decentralized COEs in alignment with organizational-wide policies.
- Larger business units with significant funding might have more resources available to them, which might not serve cost optimization goals from an organizational-wide perspective.

Important

A highly centralized COE tends to be more *authoritarian*, while highly decentralized COEs tend to be more *siloed*. Each organization will need to weigh the pros and cons that apply to them to determine the best choice. For most organizations, the most effective approach tends to be the unified or federated, which bridges organizational boundaries.

Funding the COE

The COE might obtain its operating budget in multiple ways:

- Cost center.
- Profit center with project budget(s).
- A combination of cost center and profit center.

When the COE operates as a cost center, it absorbs the operating costs. Generally, it involves an approved annual budget. Sometimes this is called a *push* engagement model.

When the COE operates as a profit center (for at least part of its budget), it could accept projects throughout the year based on funding from other business units. Sometimes this is called a *pull* engagement model.

Funding is important because it impacts the way the COE communicates and engages with the internal community. As the COE experiences more and more successes, they might receive more requests from business units for help. It's especially the case as awareness grows throughout the organization.

💡 Tip

The choice of funding model can determine how the COE actively grows its influence and ability to help. The funding model can also have a big impact on where authority resides and how decision-making works. Further, it impacts the types of services a COE can offer, such as co-development projects and/or best practices reviews. For more information, see the [Mentoring and user enablement](#) article.

Some organizations cover the COE operating costs with chargebacks to business units based on the usage goals of Fabric. For a shared capacity, this could be based on number of active users. For Premium capacity, chargebacks could be allocated based on which business units are using the capacity. Ideally, chargebacks are directly correlated to the business value gained.

Considerations and key actions



Checklist - Considerations and key actions you can take to establish or improve your COE.

- ✓ **Define the scope of responsibilities for the COE:** Ensure that you're clear on what activities the COE can support. Once the scope of responsibilities is known, identify the skills and competencies required to fulfill those responsibilities.
- ✓ **Identify gaps in the ability to execute:** Analyze whether the COE has the required systems and infrastructure in place to meet its goals and scope of responsibilities.
- ✓ **Determine the best COE structure:** Identify which COE structure is most appropriate (centralized, unified, federated, or decentralized). Verify that staffing, roles and responsibilities, and appropriate organizational chart relationships (HR reporting) are in place.
- ✓ **Plan for future growth:** If you're starting out with a centralized or decentralized COE, consider how you will scale the COE over time by using the unified or

federated approach. Plan for any actions that you can take now that'll facilitate future growth.

- ✓ **Identify customers:** Identify the internal community members, and any external customers, to be served by the COE. Decide how the COE will generally engage with those customers, whether it's a push model, pull model, or both models.
- ✓ **Verify the funding model for the COE:** Decide whether the COE is purely a cost center with an operating budget, whether it will operate partially as a profit center, and/or whether chargebacks to other business units will be required.
- ✓ **Create a communication plan:** Create your [communications strategy](#) to educate the internal community of users about the services the COE offers, and how to engage with the COE.
- ✓ **Create goals and metrics:** Determine how you'll measure effectiveness for the COE. Create KPIs (key performance indicators) or OKRs (objectives and key results) to validate that the COE consistently provides value to the user community.

Questions to ask



Use questions like those found below to assess the effectiveness of a COE.

- Is there a COE? If so, who is in the COE and what's the structure?
- If there isn't a COE, is there a central team that performs a similar function? Do data decision makers in the organization understand what a COE does?
- If there isn't a COE, does the organization aspire to create one? Why or why not?
- Are there opportunities for federated or decentralized COE models due to a mix of [enterprise](#) and [departmental](#) solutions?
- Are there any missing roles and responsibilities from the COE?
- To what extent does the COE engage with the user community? Do they mentor users? Do they curate a centralized portal? Do they maintain centralized resources?
- Is the COE recognized in the organization? Does the user community consider them to be credible and helpful?
- Do business users see central teams as enabling or restricting their work with data?
- What's the COE funding model? Do COE customers financially contribute in some way to the COE?
- How consistent and transparent is the COE with their communication?

Maturity levels



The following maturity levels will help you assess the current state of your COE.

Level	State of the Center of Excellence
100: Initial	<ul style="list-style-type: none">One or more COEs exist, or the activities are performed within the data team, BI team, or IT. There's no clarity on the specific goals nor expectations for responsibilities.Requests for assistance from the COE are handled in an unplanned manner.
200: Repeatable	<ul style="list-style-type: none">The COE is in place with a specific charter to mentor, guide, and educate self-service users. The COE seeks to maximize benefits of self-service approaches to data and BI while reducing the risks.The goals, scope of responsibilities, staffing, structure, and funding model are established for the COE.
300: Defined	<ul style="list-style-type: none">The COE operates with active involvement from all business units in a unified or federated mode.
400: Capable	<ul style="list-style-type: none">The goals of the COE align with organizational goals, and they are reassessed regularly.The COE is well-known throughout the organization, and consistently proves its value to the internal user community.
500: Efficient	<ul style="list-style-type: none">Regular reviews of KPIs or OKRs evaluate COE effectiveness in a measurable way.Agility and implementing continual improvements from lessons learned (including scaling out methods that work) are top priorities for the COE.

Next steps

In the [next article](#) in the Microsoft Fabric adoption roadmap series, learn about implementing governance guidelines, policies, and processes.

Microsoft Fabric adoption roadmap: Governance

Article • 11/14/2023

ⓘ Note

This article forms part of the *Microsoft Fabric adoption roadmap* series of articles. For an overview of the series, see [Microsoft Fabric adoption roadmap](#).

Data governance is a broad and complex topic. This article introduces key concepts and considerations. It identifies important actions to take when adopting Microsoft Fabric, but it's not a comprehensive reference for data governance.

As defined by the [Data Governance Institute](#), data governance is "a system of decision rights and accountabilities for information-related processes, executed according to agreed-upon models which describe who can take what actions, with what information, and when, under what circumstances, using what methods."

The term *data governance* is a misnomer. The primary focus for governance isn't on the data itself. The focus is on governing *what users do with the data*. Put another way: the true focus is on governing user's behavior to ensure organizational data is well managed.

When focused on self-service data and business intelligence (BI), the primary goals of governance are to achieve the proper balance of:

- **User empowerment:** Empower the internal user community to be productive and efficient, within requisite guardrails.
- **Regulatory compliance:** Comply with the organization's industry, governmental, and contractual regulations.
- **Internal requirements:** Adhere to the organization's internal requirements.

The optimal balance between control and empowerment will differ between organizations. It's also likely to differ among different business units within an organization. You'll be most successful with a platform like Fabric when you put as much emphasis on user empowerment as on clarifying its practical usage within established guardrails.

💡 Tip

Think of governance as a set of established guidelines and formalized policies. All governance guidelines and policies should align with your organizational **data culture** and adoption objectives. Governance is enacted on a day-to-day basis by your **system oversight** (administration) activities.

Governance strategy

When considering data governance in any organization, the best place to start is by defining a governance strategy. By focusing first on the strategic goals for data governance, all detailed decisions when implementing governance policies and processes can be informed by the strategy. In turn, the governance strategy will be defined by the organization's **data culture**.

Governance decisions are implemented with documented guidance, policies, and processes. Objectives for governance of a self-service data and BI platform, such as Fabric, include:

- Empowering users throughout the organization to use data and make decisions, within the defined boundaries.
- Improving the user experience by providing clear and transparent guidance (with minimal friction) on what actions are permitted, why, and how.
- Ensuring that the data usage is appropriate for the needs of the business.
- Ensuring that content ownership and stewardship responsibilities are clear. For more information, see the [Content ownership and management](#) article.
- Enhancing the consistency and standardization of working with data across organizational boundaries.
- Reducing risk of data leakage and misuse of data. For more information, see the [information protection and data loss prevention series of articles](#) article.
- Meeting regulatory, industry, and internal requirements for the proper use of data.

💡 Tip

A well-executed data governance strategy makes it easier for more users to work with data. When governance is approached from the perspective of user empowerment, users are more likely to follow the documented processes. Accordingly, the users become a trusted partner too.

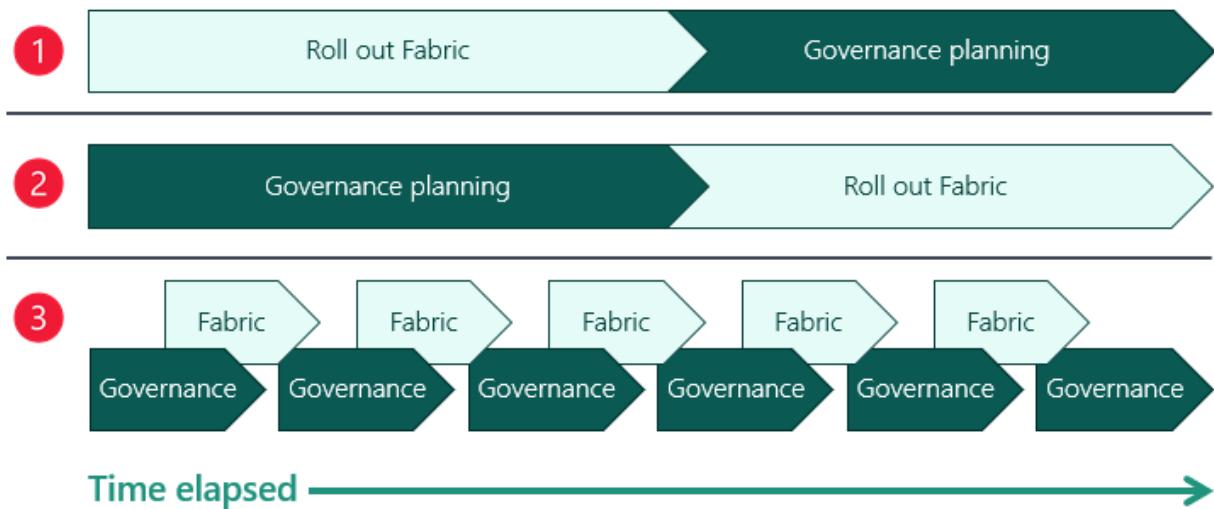
Governance success factors

Governance isn't well-received when it's enacted with top-down mandates that are focused more on control than empowerment. Governing Fabric is most successful when:

- The most lightweight governance model that accomplishes required objectives is used.
- Governance is approached on an iterative basis and doesn't significantly impede productivity.
- A bottom-up approach to formulating governance guidelines is used whenever practical. The [Center of Excellence \(COE\)](#) and/or the data governance team observes successful behaviors that are occurring within a business unit. The COE then takes action to scale out to other areas of the organization.
- Governance decisions are co-defined with input from different business units before they're enacted. Although there are times when a specific directive is necessary (particularly in heavily regulated industries), mandates should be the exception rather than the rule.
- Governance needs are balanced with flexibility and the ability to be productive.
- Governance requirements can be satisfied as part of users' regular workflow, making it easier for users to do the right thing in the right way with little friction.
- The answer to new requests for data isn't "no" by default, but rather "yes and" with clear, simple, transparent rules for what governance requirements are for data access, usage, and sharing.
- Users that need access to data have incentive to do so through normal channels, complying with governance requirements, rather than circumventing them.
- Governance decisions, policies, and requirements for users to follow are in alignment with organizational data culture goals as well as other existing data governance initiatives.
- Decisions that affect what users can—and can't—do aren't made solely by a system administrator.

Introduce governance to your organization

There are three primary timing methods organizations take when introducing Fabric governance to an organization.



The methods in the above diagram include:

Method	Strategy followed
1	Roll out Fabric first, then introduce governance: Fabric is made widely available to users in the organization as a new self-service data and BI tool. Then, at some time in the future, a governance effort begins. This method prioritizes agility.
2	Full governance planning first, then roll out Fabric: Extensive governance planning occurs prior to permitting users to begin using Fabric. This method prioritizes control and stability.
3	Iterative governance planning with rollouts of Fabric in stages: Just enough governance planning occurs initially. Then Fabric is iteratively rolled out in stages to individual teams while iterative governance enhancements occur. This method equally prioritizes agility and governance.

Choose method 1 when Fabric is already used for self-service scenarios, and you're ready to start working in a more efficient manner.

Choose method 2 when your organization already has a well-established approach to governance that can be readily expanded to include Fabric.

Choose method 3 when you want to have a balance of control agility. This balanced approach is the best choice for most organizations and most scenarios.

Each method is described in the following sections.

Method 1: Roll out Fabric first

Method 1 prioritizes agility and speed. It allows users to quickly get started creating solutions. This method occurs when Fabric has been made widely available to users in the organization as a new self-service data and BI tool. Quick wins and some successes

are achieved. At some point in the future, a governance effort begins, usually to bring order to an unacceptable level of chaos since the self-service user population didn't receive sufficient guidance.

Pros:

- Fastest to get started
- Highly capable users can get things done quickly
- Quick wins are achieved

Cons:

- Higher effort to establish governance once Fabric is used prevalently throughout the organization
- Resistance from self-service users who are asked to change what they've been doing
- Self-service users need to figure out things on their own, which is inefficient and results in inconsistencies
- Self-service users need to use their best judgment, which produces technical debt to be resolved

See other possible cons in the [Governance challenges](#) section below.

Method 2: In-depth governance planning first

Method 2 prioritizes control and stability. It lies at the opposite end of the spectrum from method 1. Method 2 involves doing extensive governance planning before rolling out Fabric. This situation is most likely to occur when the implementation of Fabric is led by IT. It's also likely to occur when the organization operates in a highly regulated industry, or when an existing data governance board imposes significant prerequisites and up-front requirements.

Pros:

- More fully prepared to meet regulatory requirements
- More fully prepared to support the user community

Cons:

- Favors enterprise content development more than self-service
- Slower to allow the user population to begin to get value and improve decision-making
- Encourages poor habits and workarounds when there's a significant delay in allowing the use of data for decision-making

Method 3: Iterative governance with rollouts

Method 3 seeks a balance between agility and governance. It's an ideal scenario that does *just enough* governance planning upfront. Frequent and continual governance improvements iteratively occur over time alongside Fabric development projects that deliver value.

Pros:

- Puts equal priority on governance and user productivity
- Emphasizes a *learning as you go* mentality
- Encourages iterative releases to groups of users in stages

Cons:

- Requires a high level of communication to be successful with agile governance practices
- Requires additional discipline to keep documentation and training current
- Introducing new governance guidelines and policies too often causes a certain level of user disruption

For more information about up-front planning, see the [Preparing to migrate to Power BI](#) article.

Governance challenges

If your organization has implemented Fabric without a governance approach or strategic direction (as described above by method 1), there could be numerous challenges requiring attention. Depending on the approach that you've taken and your current state, some of the following challenges could be applicable to your organization.

Strategy challenges

- Lack of a cohesive data governance strategy that aligns with the business strategy
- Lack of executive support for governing data as a strategic asset
- Insufficient adoption planning for advancing adoption and the maturity level of BI and analytics

People challenges

- Lack of aligned priorities between centralized teams and business units

- Lack of identified champions with sufficient expertise and enthusiasm throughout the business units to advance organizational adoption objectives
- Lack of awareness of self-service best practices
- Resistance to following newly introduced governance guidelines and policies
- Duplicate effort spent across business units
- Lack of clear accountability, roles, and responsibilities

Process challenges

- Lack of clearly defined processes resulting in chaos and inconsistencies
- Lack of standardization or repeatability
- Insufficient ability to communicate and share lessons learned
- Lack of documentation and over-reliance on tribal knowledge
- Inability to comply with security and privacy requirements

Data quality and data management challenges

- Sprawl of data and reports
- Inaccurate, incomplete, or outdated data
- Lack of trust in the data, especially for content produced by self-service content creators
- Inconsistent reports produced without sufficient data validation
- Valuable data not used or difficult to access
- Fragmented, siloed, and duplicated data
- Lack of data catalog, inventory, glossary, or lineage
- Unclear data ownership and stewardship

Skills and data literacy challenges

- Varying levels of ability to interpret, create, and communicate with data effectively
- Varying levels of technical skillsets and skill gaps
- Lack of ability to confidently manage data diversity and volume
- Underestimating the level of complexity for BI solution development and management throughout its entire lifecycle
- Short tenure with continual staff transfers and turnover
- Coping with the speed of change for cloud services

 Tip

Identifying your current challenges—as well as your strengths—is essential to do proper governance planning. There's no single straightforward solution to the challenges listed above. Each organization needs to find the right balance and approach that solves the challenges that are most important to them. The challenges presented above will help you identify how they might affect your organization, so you can start thinking about what the right solution is for your circumstances.

Governance planning

Some organizations have implemented Fabric without a governance approach or clear strategic direction (as described above by method 1). In this case, the effort to begin governance planning can be daunting.

If a formal governance body doesn't currently exist in your organization, then the focus of your governance planning and implementation efforts will be broader. If, however, there's an existing data governance board in the organization, then your focus is primarily to integrate with existing practices and customize them to accommodate the objectives for self-service and enterprise data and BI scenarios.

ⓘ Important

Governance is a big undertaking, and it's never completely *done*. Relentlessly prioritizing and iterating on improvements will make the scope more manageable. If you track your progress and accomplishments each week and each month, you'll be amazed at the impact over time. The **maturity levels** at the end of each article in this series can help you to assess where you are currently.

Some potential governance planning activities and outputs that you might find valuable are described next.

Strategy

Key activities:

- Conduct a series of workshops to gather information and assess the current state of data culture, adoption, and data and BI practices. For guidance about how to gather information and define the current state of BI adoption, including governance, see [BI strategic planning](#).

- Use the current state assessment and information gathered to define the desired future state, including governance objectives. For guidance about how to use this current state definition to decide on your desired future state, see [BI tactical planning](#).
- Validate the focus and scope of the governance program.
- Identify existing bottom-up initiatives in progress.
- Identify immediate pain points, issues, and risks.
- Educate senior leadership about governance, and ensure [executive sponsorship](#) is sufficient to sustain and grow the program.
- Clarify where Power BI fits in to the overall [BI and analytics strategy](#) for the organization.
- Assess internal factors such as organizational readiness, maturity levels, and key challenges.
- Assess external factors such as risk, exposure, regulatory, and legal requirements—including regional differences.

Key output:

- Business case with cost/benefit analysis
- Approved governance objectives, focus, and priorities that are in alignment with high-level business objectives
- Plan for short-term goals and priorities (quick wins)
- Plan for long-term and deferred goals and priorities
- Success criteria and measurable key performance indicators (KPIs)
- Known risks documented with a mitigation plan
- Plan for meeting industry, governmental, contractual, and regulatory requirements that impact BI and analytics in the organization
- Funding plan

People

Key activities:

- Establish a governance board and identify key stakeholders.
- Determine focus, scope, and a set of responsibilities for the governance board.
- Establish a COE.
- Determine focus, scope, and a set of responsibilities for COE.
- Define roles and responsibilities.
- Confirm who has decision-making, approval, and veto authority.

Key output:

- Charter for the governance board
- Charter and priorities for the COE
- Staffing plan
- Roles and responsibilities
- Accountability and decision-making matrix
- Communication plan
- Issue management plan

Policies and processes

Key activities:

- Analyze immediate pain points, issues, risks, and areas to improve the user experience.
- Prioritize data policies to be addressed by order of importance.
- Identify existing processes in place that work well and can be formalized.
- Determine how new data policies will be socialized.
- Decide to what extent data policies might differ or be customized for different groups.

Key output:

- Process for how data policies and documentation will be defined, approved, communicated, and maintained
- Plan for requesting valid exceptions and departures from documented policies

Project management

The implementation of the governance program should be planned and managed as a series of projects.

Key activities:

- Establish a timeline with priorities and milestones.
- Identify related initiatives and dependencies.
- Identify and coordinate with existing bottom-up initiatives.
- Create an iterative project plan that's aligned with high-level prioritization.
- Obtain budget approval and funding.
- Establish a tangible way to track progress.

Key output:

- Project plan with iterations, dependencies, and sequencing

- Cadence for retrospectives with a focus on continual improvements

ⓘ Important

The scope of activities listed above that will be useful to take on will vary considerably between organizations. If your organization doesn't have existing processes and workflows for creating these types of outputs, refer to the guidance found in the [adoption roadmap conclusion](#) for some helpful resources, as well as the [implementation planning BI strategy articles](#).

Governance policies

Decision criteria

All governance decisions should be in alignment with the established goals for [organizational adoption](#). Once the strategy is clear, more tactical governance decisions will need to be made which affect the day-to-day activities of the self-service user community. These types of tactical decisions correlate directly to the data policies that get created.

How we go about making governance decisions depends on:

- **Who owns and manages the data and BI content?** The [Content ownership and management](#) article introduced three types of strategies: business-led self-service, managed self-service, and enterprise. Who owns and manages the content has a significant impact on governance requirements.
- **What is the scope for delivery of the data and BI content?** The [Content delivery scope](#) article introduced four scopes for delivery of content: personal, team, departmental, and enterprise. The scope of delivery has a considerable impact on governance requirements.
- **What is the data subject area?** The data itself, including its sensitivity level, is an important factor. Some data domains inherently require tighter controls. For instance, personally identifiable information (PII), or data subject to regulations, should be subject to stricter governance requirements than less sensitive data.
- **Is the data, and/or the BI solution, considered critical?** If you can't make an informed decision easily without this data, you're dealing with critical data elements. Certain reports and apps could be deemed critical because they meet a set of predefined criteria. For instance, the content is delivered to executives. Predefined criteria for what's considered *critical* helps everyone have clear expectations. Critical data is usually subject to stricter governance requirements.

💡 Tip

Different combinations of the above four criteria will result in different governance requirements for Fabric content.

Key Fabric governance decisions

As you explore your goals and objectives and pursue more tactical data governance decisions as described above, it will be important to determine what the highest priorities are. Deciding where to focus your efforts can be challenging.

The following list includes items that you might choose to prioritize when introducing governance for Fabric.

- Recommendations and requirements for [content ownership and management](#)
- Recommendations and requirements for [content delivery scope](#)
- Recommendations and requirements for content [distribution and sharing](#) with colleagues, as well as for [external users](#), such as customers, partners, or vendors
- How users are permitted to work with regulated data and highly sensitive data
- Allowed use of unverified data sources that are unknown to IT
- When manually maintained data sources, such as Excel or flat files, are permitted
- Who is permitted to [create a workspace](#)
- How to manage [workspaces](#) effectively
- How [personal workspaces](#) are effectively used
- Which workspaces are assigned to [Fabric capacity](#)
- Who is allowed to be a [Fabric administrator](#)
- [Security](#), privacy, and data protection requirements, and allowed actions for content assigned to each [sensitivity label](#)
- Allowed or encouraged use of [personal gateways](#)
- Allowed or encouraged use of [self-service purchasing](#) of user licenses
- Requirements for who can [certify](#) content, as well as requirements that must be met
- Application lifecycle management for managing content through its entire lifecycle, including [development, test, and production stages](#)
- Additional requirements applicable to critical content, such as data quality verifications and documentation
- Requirements to use standardized master data and common data definitions to improve consistency across data assets
- Recommendations and requirements for use of [external tools](#) by advanced content creators

If you don't make governance decisions and communicate them well, users will use their own judgment for how things should work—and that often results in inconsistent approaches to common tasks.

Although not every governance decision needs to be made upfront, it's important that you identify the areas of greatest risk in your organization. Then, incrementally implement governance policies and processes that will deliver the most impact.

Data policies

A data policy is a document that defines what users can and can't do. You might call it something different, but the goal remains the same: when decisions—such as those discussed in the previous section—are made, they're documented for use and reference by the community of users.

A data policy should be as short as possible. That way, it's easy for people to understand what is being asked of them.

A data policy should include:

- Policy name, purpose, description, and details
- Specific responsibilities
- Scope of the policy (organization-wide versus departmental-specific)
- Audience for the policy
- Policy owner, approver, and contact
- How to request an exception
- How the policy will be audited and enforced
- Regulatory or legal requirements met by the policy
- Reference to terminology definitions
- Reference to any related guidelines or policies
- Effective date, last revision date, and change log

Note

Locate, or link to, data policies from your centralized portal.

Here are three common data policy examples you might choose to prioritize.

Policy	Description
Data ownership policy	Specifies when an owner is required for a data asset, and what the data owner's responsibilities include, such as: supporting colleagues who view the

Policy	Description
	content, maintaining appropriate confidentiality and security, and ensuring compliance.
Data certification (endorsement) policy	Specifies the process that is followed to certify content. Requirements might include activities such as: data accuracy validation, data source and lineage review, technical review of the data model, security review, and documentation review.
Data classification and protection policy	Specifies activities that are allowed and not allowed per classification (sensitivity level). It should specify activities such as: allowed sharing with external users, with or without a non-disclosure agreement (NDA), encryption requirements, and ability to download the data. Sometimes, it's also called a <i>data handling policy</i> or a <i>data usage policy</i> . For more information, see the Information protection for Power BI article.

⊗ Caution

Having a lot of documentation can lead to a false sense that everything is under control, which can lead to complacency. The level of engagement that the **COE** has with the user community is one way to improve the chances that governance guidelines and policies are consistently followed. Auditing and monitoring activities are also important.

Scope of policies

Governance decisions will rarely be one-size-fits-all across the entire organization. When practical, it's wise to start with standardized policies, and then implement exceptions as needed. Having a clearly defined strategy for how policies will be handled for centralized and decentralized teams will make it much easier to determine how to handle exceptions.

Pros of organization-wide policies:

- Much easier to manage and maintain
- Greater consistency
- Encompasses more use cases
- Fewer policies overall

Cons of organization-wide policies:

- Inflexible
- Less autonomy and empowerment

Pros of departmental-scope policies:

- Expectations are clearer when tailored to a specific group
- Customizable and flexible

Cons of departmental-scope policies:

- More work to manage
- More policies that are siloed
- Potential for conflicting information
- Difficult to scale more broadly throughout the organization

💡 Tip

Finding the right balance of standardization and customization for supporting self-service data and BI across the organization can be challenging. However, by starting with organizational policies and mindfully watching for exceptions, you can make meaningful progress quickly.

Staffing and accountability

The organizational structure for data governance varies substantially between organizations. In larger organizations there might be a data governance office with dedicated staff. Some organizations have a data governance board, council, or steering committee with assigned members coming from different business units. Depending on the extent of the data governance body within the organization, there could be an executive team separate from a functional team of people.

ⓘ Important

Regardless of how the governance body is structured, it's important that there's a person or group with sufficient influence over data governance decisions. This person should have authority to enforce those decisions across organizational boundaries.

Checks and balances

Governance accountability is about checks and balances.

4

Strategic:

Executive sponsor and steering committee

3

Tactical:

Audit and compliance

2

Tactical:

Supporting teams

1

Operational:

Business units

Starting at the bottom, the levels in the above diagram include:

Level	Description
1	Operational - Business units: Level 1 is the foundation of a well-governed system, which includes users within the business units performing their work. Self-service data and BI creators have a lot of responsibilities related to authoring, publishing, sharing, security, and data quality. Self-service data and BI consumers also have responsibilities for the proper use of data.
2	Tactical - Supporting teams: Level 2 includes several groups that support the efforts of the users in the business units. Supporting teams include the COE, enterprise data and BI, the data governance office, as well as other ancillary teams. Ancillary teams can include IT, security, HR, and legal. A change control board is included here as well.
3	Tactical - Audit and compliance: Level 3 includes internal audit, risk management, and compliance teams. These teams provide guidance to levels 1 and 2. They also provide enforcement when necessary.
4	Strategic - Executive sponsor and steering committee: The top level includes the executive-level oversight of strategy and priorities. This level handles any escalated issues that couldn't be solved at lower levels. Therefore, it's important to have a leadership team with sufficient authority to be able to make decisions when necessary.

 **Important**

Everyone has a responsibility to adhere to policies for ensuring that organizational data is secure, protected, and well-managed as an organizational asset. Sometimes this is cited as *everyone is a data steward*. To make this a reality, start with the users in the business units (level 1 described above) as the foundation.

Roles and responsibilities

Once you have a sense for your governance strategy, roles and responsibilities should be defined to establish clear expectations.

Governance team structure, roles (including terminology), and responsibilities vary widely among organizations. Very generalized roles are described in the table below. In some cases, the same person could serve multiple roles. For instance, the Chief Data Officer (CDO) could also be the executive sponsor.

Role	Description
Chief Data Officer or Chief Analytics Officer	Defines the strategy for use of data as an enterprise asset. Oversees enterprise-wide governance guidelines and policies.
Data governance board	Steering committee with members from each business unit who, as domain owners, are empowered to make enterprise governance decisions. They make decisions on behalf of the business unit <i>and</i> in the best interest of the organization. Provides approvals, decisions, priorities, and direction to the enterprise data governance team and working committees.
Data governance team	Creates governance policies, standards, and processes. Provides enterprise-wide oversight and optimization of data integrity, trustworthiness, privacy, and usability. Collaborates with the COE to provide governance education, support, and mentoring to data owners and content creators.
Data governance working committees	Temporary or permanent teams that focus on individual governance topics, such as security or data quality.
Change management board	Coordinates the requirements, processes, approvals, and scheduling for release management processes with the objective of reducing risk and minimizing the impact of changes to critical applications.
Project management office	Manages individual governance projects and the ongoing data governance program.
Fabric executive sponsor	Promotes adoption and the successful use of Fabric. Actively ensures that Fabric decisions are consistently aligned with business objectives, guiding principles, and policies across organizational boundaries. For more information, see the Executive sponsorship article.
Center of Excellence	Mentors the community of creators and consumers to promote the effective use of Fabric for decision-making. Provides cross-departmental coordination of Fabric activities to improve practices, increase consistency, and reduce inefficiencies. For more information, see the Center of Excellence article.

Role	Description
Fabric champions	A subset of content creators found within the business units who help advance the adoption of Fabric. They contribute to data culture growth by advocating the use of best practices and actively assisting colleagues. For more information, see the Community of practice article.
Fabric administrators	Day-to-day-system oversight responsibilities to support the internal processes, tools, and people. Handles monitoring, auditing, and management. For more information, see the System oversight article.
Information technology	Provides occasional assistance to Fabric administrators for services related to Fabric, such as Microsoft Entra ID (previously known as Azure Active Directory), Microsoft 365, Teams, SharePoint, or OneDrive.
Risk management	Reviews and assesses data sharing and security risks. Defines ethical data policies and standards. Communicates regulatory and legal requirements.
Internal audit	Auditing of compliance with regulatory and internal requirements.
Data steward	Collaborates with governance committee and/or COE to ensure that organizational data has acceptable data quality levels.
All BI creators and consumers	Adheres to policies for ensuring that data is secure, protected, and well-managed as an organizational asset.

💡 Tip

Name a backup for each person in key roles, for example, members of the data governance board. In their absence, the backup person can attend meetings and make time-sensitive decisions when necessary.

Considerations and key actions



Checklist - Considerations and key actions you can take to establish or strengthen your governance initiatives.

- ✓ **Align goals and guiding principles:** Confirm that the high-level goals and guiding principles of the data culture goals are clearly documented and communicated. Ensure that alignment exists for any new governance guidelines or policies.

- ✓ **Understand what's currently happening:** Ensure that you have a deep understanding of how Fabric is currently used for self-service and enterprise data and BI scenarios. Document opportunities for improvement. Also, document strengths and good practices that would be helpful to scale out more broadly.
- ✓ **Prioritize new governance guidelines and policies:** For prioritizing which new guidelines or policies to create, select an important pain point, high priority need, or known risk for a data domain. It should have significant benefit and can be achieved with a feasible level of effort. When you implement your first governance guidelines, choose something users are likely to support because the change is low impact, or because they are sufficiently motivated to make a change.
- ✓ **Create a schedule to review policies:** Determine the cadence for how often data policies are reevaluated. Reassess and adjust when needs change.
- ✓ **Decide how to handle exceptions:** Determine how conflicts, issues, and requests for exceptions to documented policies will be handled.
- ✓ **Understand existing data assets:** Confirm that you understand what critical data assets exist. Create an inventory of ownership and lineage, if necessary. Keep in mind that you can't govern what you don't know about.
- ✓ **Verify executive sponsorship:** Confirm that you have support and sufficient attention from your [executive sponsor](#), as well as from business unit leaders.
- ✓ **Prepare an action plan:** Include the following key items:
 - **Initial priorities:** Select one data domain or business unit at a time.
 - **Timeline:** Work in iterations long enough to accomplish meaningful progress, yet short enough to periodically adjust.
 - **Quick wins:** Focus on tangible, tactical, and incremental progress.
 - **Success metrics:** Create measurable metrics to evaluate progress.

Questions to ask



Use questions like those found below to assess governance.

- At a high level, what's the current governance strategy? To what extent is the purpose and importance of this governance strategy clear to both end users and the central data and BI teams?
- In general, is the current governance strategy effective?

- What are the key regulatory and compliance criteria that the organization (or specific business units) must adhere to? Where's this criteria documented? Is this information readily available to people who work with data and share data items as a part of their role?
- How well does the current governance strategy align to the user's way of working?
- Is a specific role or team responsible for governance in the organization?
- Who has the authority to create and change governance policies?
- Do governance teams use [Microsoft Purview](#) or another tool to support governance activities?
- What are the prioritized governance risks, such as risks to [security](#), [information protection](#), and [data loss prevention](#)?
- What's the potential business impact of the identified governance risks?
- How frequently is the governance strategy re-evaluated? What metrics are used to evaluate it, and what mechanisms exist for business users to provide feedback?
- What types of user behaviors create risk when users work with data? How are those risks mitigated?
- What sensitivity labels are in place, if any? Are data and BI decision makers aware of sensitivity labels and the benefits to the business?
- What data loss prevention policies are in place, if any?
- How is "Export to Excel" handled? What steps are taken to prevent data loss prevention? What's the prevalence of "Export to Excel"? What do people do with data once they have it in Excel?
- Are there practices or solutions that are out of regulatory compliance that must be urgently addressed? Are these examples justified with an explanation of the potential business impact, should they not be addressed?

Tip

"Export to Excel" is typically a controversial topic. Often, business users focus on the requirement to have "Export to Excel" possible in BI solutions. Enabling "Export to Excel" can be counter-productive because a business objective isn't to get data into Excel. Instead, define why end users need the data in Excel. Ask what they do with the data once it's in Excel, which business questions they try to answer, what decisions they make, and what actions they take with the data.

Focusing on business decisions and actions helps steer focus away from tools and features and toward helping people achieve their business objectives.

Maturity levels



The following maturity levels will help you assess the current state of your governance initiatives.

Level	State of governance
100: Initial	<ul style="list-style-type: none">• Due to a lack of governance planning, the good data management and informal governance practices that are occurring are overly reliant on judgment and experience level of individuals.• There's a significant reliance on undocumented tribal knowledge.
200: Repeatable	<ul style="list-style-type: none">• Some areas of the organization have made a purposeful effort to standardize, improve, and document their data management and governance practices.• An initial governance approach exists. Incremental progress is being made.
300: Defined	<ul style="list-style-type: none">• A complete governance strategy with focus, objectives, and priorities is enacted and broadly communicated.• Specific governance guidelines and policies are implemented for the top few priorities (pain points or opportunities). They're actively and consistently followed by users.• Roles and responsibilities are clearly defined and documented.
400: Capable	<ul style="list-style-type: none">• All Fabric governance priorities align with organizational goals and business objectives. Goals are reassessed regularly.• Processes exist to customize policies for decentralized business units, or to handle valid exceptions to standard governance policies.• It's clear where Fabric fits into the overall data and BI strategy for the organization.• Fabric activity log and API data is actively analyzed to monitor and audit Fabric activities. Proactive action is taken based on the data.
500: Efficient	<ul style="list-style-type: none">• Regular reviews of KPIs or OKRs evaluate measurable governance goals. Iterative, continual progress is a priority.• Agility and implementing continual improvements from lessons learned (including scaling out methods that work) are top priorities for the COE.• Fabric activity log and API data is actively used to inform and improve adoption and governance efforts.

Next steps

In the [next article](#) in the Microsoft Fabric adoption roadmap series, learn about mentoring and user enablement.

Microsoft Fabric adoption roadmap: Mentoring and user enablement

Article • 11/14/2023

ⓘ Note

This article forms part of the *Microsoft Fabric adoption roadmap* series of articles. For an overview of the series, see [Microsoft Fabric adoption roadmap](#).

A critical objective for adoption efforts is to enable users to accomplish as much as they can within the requisite guardrails established by [governance guidelines and policies](#). For this reason, the act of mentoring users is one of the most important responsibilities of the [Center of Excellence](#) (COE), and it has a direct influence on how user adoption occurs. For more information about user adoption, see [Microsoft Fabric adoption maturity levels](#).

Skills mentoring

Mentoring and helping users in the Fabric community become more effective can take on various forms, such as:

- [Office hours](#)
- [Co-development projects](#)
- [Best practices reviews](#)
- [Extended support](#)

Office hours

Office hours are a form of ongoing community engagements managed by the COE. As the name implies, office hours are times of regularly scheduled availability where members of the community can engage with experts from the COE to receive assistance with minimal process overhead. Office hours are usually group-based, so Fabric champions and other members of the community can also help solve an issue if a topic is in their area of expertise.

Office hours are a very popular and productive activity in many organizations. Some organizations call them *drop-in hours* or even a fun name such as *Power Hour* or *Fabric Fridays*. The primary goal is usually to get questions answered, solve problems, and

remove blockers. Office hours can also be used as a platform for the user community to share ideas, suggestions, and even complaints.

The COE publishes the times for regular office hours when one or more COE members are available. Ideally, office hours are held on a regular and frequent basis. For instance, it could be every Tuesday and Thursday. Consider offering different time slots or rotating times if you have a global workforce.

💡 Tip

One option is to set specific office hours each week. However, users might not show up, so that can end up being inefficient. Alternatively, consider leveraging [Microsoft Bookings](#) to schedule office hours. It shows the blocks of time when each COE expert is available, with Outlook integration ensuring availability is up to date.

Office hours are an excellent user enablement approach because:

- Content creators and the COE actively collaborate to answer questions and solve problems together.
- Real work is accomplished while learning and problem solving.
- Others might observe, learn, and participate.
- Individual groups can head to a breakout room to solve a specific problem.

Office hours benefit the COE as well because:

- They're a great way for the COE to identify champions or users with specific skills that the COE didn't previously know about.
- The COE can learn what users throughout the organization are struggling with. It helps inform whether additional resources, documentation, or training might be required.

💡 Tip

It's common for some tough issues to come up during office hours that cannot be solved quickly, such as getting a complex DAX calculation to work, or addressing performance challenges in a complex solution. Set clear expectations for what's in scope for office hours, and if there's any commitment for follow up.

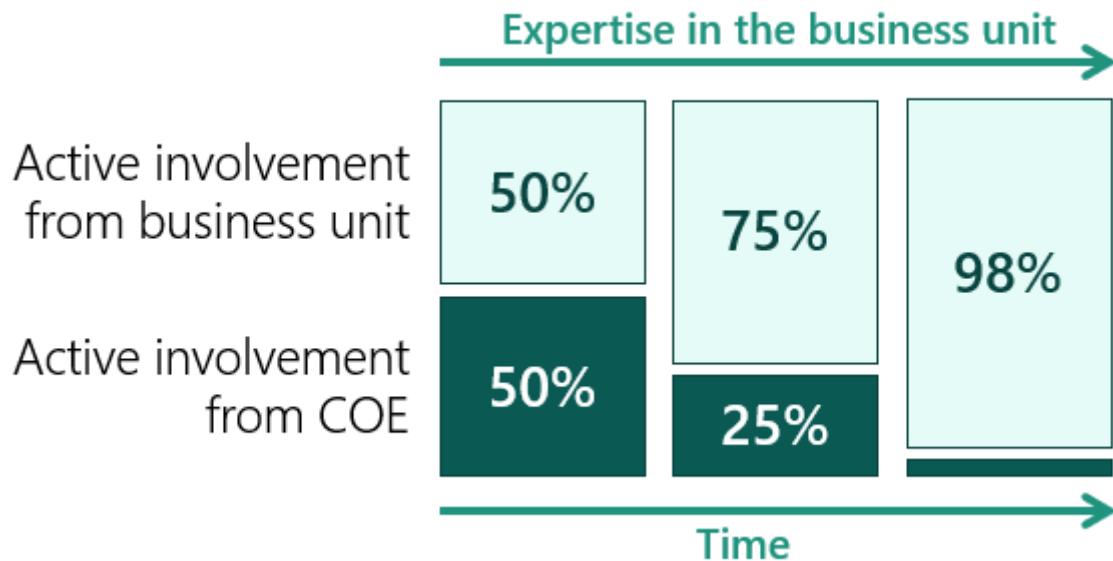
Co-development projects

One way the COE can provide mentoring services is during a *co-development project*. A co-development project is a form of assistance offered by the COE where a user or business unit takes advantage of the technical expertise of the COE to solve business problems with data. Co-development involves stakeholders from the business unit and the COE working in partnership to build a high-quality self-service analytics or business intelligence (BI) solution that the business stakeholders couldn't deliver independently.

The goal of co-development is to help the business unit develop expertise over time while also delivering value. For example, the sales team has a pressing need to develop a new set of commission reports, but the sales team doesn't yet have the knowledge to complete it on their own.

A co-development project forms a partnership between the business unit and the COE. In this arrangement, the business unit is fully invested, deeply involved, and assumes ownership of the project.

Time involvement from the COE reduces over time until the business unit gains expertise and becomes self-reliant.



The active involvement shown in the above diagram changes over time, as follows:

- **Business unit:** 50% initially, up to 75%, finally at 98%-100%.
- **COE:** 50% initially, down to 25%, finally at 0%-2%.

Ideally, the period for the gradual reduction in involvement is identified up-front in the project. This way, both the business unit and the COE can sufficiently plan the timeline and staffing.

Co-development projects can deliver significant short- and long-term benefits. In the short term, the involvement from the COE can often result in a better-designed and better-performing solution that follows best practices and aligns with organizational

standards. In the long term, co-development helps increase the knowledge and capabilities of the business stakeholder, making them more self-sufficient, and more confident to deliver quality self-service data and BI solutions in the future.

Important

Essentially, a co-development project helps less experienced users learn the right way to do things. It reduces the risk that refactoring might be needed later, and it increases the ability for a solution to scale and grow over time.

Best practices reviews

The COE could also offer *best practices reviews*. A best practices review can be extremely helpful for content creators who would like to validate their work. They might also be known as *advisory services*, *internal consulting time*, or *technical reviews*. Unlike a co-development project (described previously), a best practices review occurs after the solution has been developed.

During a review, an expert from the COE evaluates self-service Fabric content developed by a member of the community and identifies areas of risk or opportunities for improvement.

Here are some examples of when a best practices review could be beneficial.

- The sales team has a [Power BI app](#) that they intend to distribute to thousands of users throughout the organization. Since the app represents high priority content distributed to a large audience, they'd like to have it [certified](#). The standard process to certify content includes a best practices review.
- The finance team would like to [assign a workspace to a capacity](#). A review of the workspace content is required to ensure sound development practices are followed. This type of review is common when the capacity is shared among multiple business units. (A review might not be required when the capacity is assigned to only one business unit.)
- The operations team is creating a new Fabric solution they expect to be widely used. They would like to request a best practices review before it goes into user acceptance testing (UAT), or before a request is submitted to the change management board.

A best practices review is most often focused on the semantic model ([previously known as a dataset](#)) design, though the review can encompass all types of data items (such as a

lakehouse, data warehouse, data pipeline, dataflow, or semantic model). The review can also encompass reporting items (such as reports, dashboards, or metrics).

Before content is deployed, a best practices review can be used to verify other design decisions, like:

- Code in notebooks follows organizational standards and best practices.
- The appropriate data preparation approach (dataflows, pipelines, notebooks, and others) are used where needed.
- **Data sources** used are appropriate and **query folding** is invoked whenever possible where Power Query and dataflows are used.
- **Data preparation** steps are clean, orderly, and **efficient**.
- **Connectivity mode** and **storage mode** choices (for example, Direct Lake, import, live connection, DirectQuery, and composite model frameworks) are appropriate.
- Location for data sources, like flat files, and original Power BI Desktop files are suitable (preferably stored in a backed-up location with versioning and appropriate security, such as **Teams files or a SharePoint shared library**).
- **Semantic models** are well-designed, clean, and understandable, and use a **star schema** design.
- **Relationships** are configured correctly.
- **DAX calculations** use efficient coding practices (particularly if the data model is large).
- The semantic model size is within a reasonable limit and **data reduction techniques** are applied.
- **Row-level security (RLS)** appropriately enforces data permissions.
- Data is accurate and has been validated against the authoritative source(s).
- Approved common definitions and terminology are used.
- Good **data visualization** ↗ practices are followed, including **designing for accessibility**.

Once the content has been deployed, the best practices review isn't necessarily complete yet. Completing the remainder of the review could also include items such as:

- The target **workspace** is suitable for the content.
- **Workspace security roles** are appropriate for the content.
- Other permissions (such as **app audience permissions**, **Build permission**, or use of the **individual item sharing feature**) are correctly and appropriately configured.
- **Contacts** are identified, and correctly correlate to the **owners of the content**.
- **Sensitivity labels** are correctly assigned.
- Fabric item **endorsement** (certified or promoted) is appropriate.
- **Data refresh** is configured correctly, failure notifications include the proper users, and uses the appropriate **data gateway** in standard mode (if applicable).

- All appropriate semantic model [best practices rules](#) are followed and, preferably, are automated via a community tool called Best Practices Analyzer for maximum efficiency and productivity.

Extended support

From time to time, the COE might get involved with complex issues escalated from the help desk. For more information, see the [User support](#) article.

Note

Offering mentoring services might be a culture shift for your organization. Your reaction might be that users don't usually ask for help with a tool like Excel, so why would they with Power BI? The answer lies in the fact that Power BI and Fabric are extraordinarily powerful tools. They provide data preparation and data modeling capabilities in addition to data visualization. Having the ability to aid and enable users can significantly improve their skills and increase the quality of their solutions—it reduces risks too.

Centralized portal

A single centralized portal, or hub, is where the user community can find:

- Access to the community Q&A forum.
- Announcements of interest to the community, such as new features and release plan updates.
- Schedules and registration links for office hours, lunch and learns, training sessions, and user group meetings.
- Announcements of key changes to content and change log (if appropriate).
- How to request help or support.
- Training materials.
- Documentation, onboarding materials, and frequently asked questions (FAQ).
- Governance guidance and approaches recommended by the COE.
- Report templates.
- Examples of best practices solutions.
- Recordings of knowledge sharing sessions.
- Entry points for accessing managed processes, such as license acquisition, access requests, and gateway configuration.

Tip

In general, only 10%-20% of your community will go out of their way to actively seek out training and educational information. These types of users might naturally evolve to become your **champions**. Everyone else is usually just trying to get the job done as quickly as possible, because their time, focus, and energy are needed elsewhere. Therefore, it's crucial to make information easy for your community users to find.

The goal is to consistently direct users in the community to the centralized portal to find information. The corresponding obligation for the COE is to ensure that the information users need is available in the centralized portal. Keeping the portal updated requires discipline when everyone is busy.

In larger organizations, it can be difficult to implement one single centralized portal. When it's not practical to consolidate into a single portal, a centralized hub can serve as an aggregator, which contains links to the other locations.

Important

Although saving time finding information is important, the goal of a centralized portal is more than that. It's about making information readily available to help your user community do the right thing. They should be able to find information during their normal course of work, with as little friction as possible. Until it's easier to complete a task within the guardrails established by the COE and data governance team, some users will continue to complete their tasks by circumventing policies that are put in place. The recommended path must become the path of least resistance. Having a centralized portal can help achieve this goal.

It takes time for community users to think of the centralized portal as their natural first stop for finding information. It takes consistent redirection to the portal to change habits. Sending someone a link to an original document location in the portal builds better habits than, for instance, including the answer in an email response. It's the same challenge described in the [User support](#) article.

Training

A key factor for successfully enabling self-service users in a Fabric community is training. It's important that the right training resources are readily available and easily discoverable. While some users are so enthusiastic about analytics that they'll find information and figure things out on their own, it isn't true for most of the user community.

Making sure your self-service users (particularly content creators and owners) have access to the training resources they need to be successful doesn't mean that you need to develop your own training content. Developing training content is often counterproductive due to the rapidly evolving nature of the product. Fortunately, an abundance of training resources is available in the worldwide community. A curated set of links goes a long way to help users organize and focus their training efforts, especially for tool training, which focuses on the technology. All external links should be validated by the COE for accuracy and credibility. It's a key opportunity for the COE to add value because COE stakeholders are in an ideal position to understand the learning needs of the community, and to identify and locate trusted sources of quality learning materials.

You'll find the greatest return on investment with creating custom training materials for *organizational-specific* processes, while relying on content produced by others for everything else. It's also useful to have a short training class that focuses primarily on topics like how to find documentation, getting help, and interacting with the community.

Tip

One of the goals of training is to help users learn new skills while helping them avoid bad habits. It can be a balancing act. For instance, you don't want to overwhelm new users by adding in a lot of complexity and friction to a beginner-level class for report creators. However, it's a great investment to make newer content creators aware of things that could otherwise take them a while to figure out. An ideal example is teaching the ability to use a **live connection** to report from an existing semantic model. By teaching this concept at the earliest logical time, you can save a less experienced creator thinking they always need one semantic model for every report (and encourage the good habit of reusing existing semantic models across reports).

Some larger organizations experience continual employee transfers and turnover. Such frequent change results in an increased need for a repeatable set of training resources.

Training resources and approaches

There are many training approaches because people learn in different ways. If you can monitor and measure usage of your training materials, you'll learn over time what works best.

Some training might be delivered more formally, such as classroom training with hands-on labs. Other types of training are less formal, such as:

- Lunch and learn presentations
- Short how-to videos targeted to a specific goal
- Curated set of online resources
- Internal user group presentations
- One-hour, one-week, or one-month challenges
- Hackathon-style events

The advantages of encouraging knowledge sharing among colleagues are described in the [Community of practice](#) article.

💡 Tip

Whenever practical, learning should be correlated with building something meaningful and realistic. However, simple demo data does have value during a training course. It allows a learner to focus on how to use the technology rather than the data itself. After completion of introductory session(s), consider offering a *bring your own data* type of session. These types of sessions encourage the learner to apply their new technical skills to an actual business problem. Try to include multiple facilitators from the COE during this type of follow-up session so questions can be answered quickly.

The types of users you might target for training include:

- Content owners, subject matter experts (SMEs), and workspace administrators
- Data creators (for example, users who create semantic models for report creators to use, or who create dataflows, lakehouses, or warehouses for other semantic model creators to use)
- Report creators
- Content consumers and viewers
- Satellite COE members and the [champions network](#)
- Fabric administrators

ⓘ Important

Each type of user represents a different audience that has different training needs. The COE will need to identify how best to meet the needs of each audience. For instance, one audience might find a standard introductory Power BI Desktop class overwhelming, whereas another will want more challenging information with depth and detail for end-to-end solutions that include multiple Fabric workloads. If you

have a diverse population of Fabric content creators, consider creating personas and tailoring the experience to an extent that's practical.

The completion of training can be a leading indicator for success with [user adoption](#). Some organizations add an element of fun by granting badges, like *blue belt* or *black belt*, as users progress through the training programs.

Give some consideration to how you want to handle users at various stages of [user adoption](#). Training needs are very different for:

- Onboarding new users (sometimes referred to as *training day zero*).
- Users with minimal experience.
- More experienced users.

How the COE invests its time in creating and curating training materials will change over time as adoption and maturity grows. You might also find over time that some community champions want to run their own tailored set of training classes within their functional business unit.

Sources for trusted Fabric training content

A curated set of online resources is valuable to help community members focus and direct their efforts on what's important. Some publicly available training resources you might find helpful include:

- [Microsoft Learn training for Power BI](#)
- [Microsoft Learn training for Fabric](#)
- [Power BI courses and "in a day" training materials ↗](#)
- [LinkedIn Learning for Power BI ↗](#)
- [LinkedIn Learning for Fabric ↗](#)

Consider using [Microsoft Viva Learning ↗](#), which is integrated into Microsoft Teams. It includes content from sources such as [Microsoft Learn](#) and [LinkedIn Learning ↗](#). Custom content produced by your organization can be included as well.

In addition to Microsoft content and custom content produced by your organization, you might choose to provide your user community with a curated set of recommended links to trusted online sources. There's a wide array of videos, blogs, and articles produced by the worldwide community. The community comprises Fabric and Power BI experts, [Microsoft Most Valued Professions \(MVPs\) ↗](#), and enthusiasts. Providing a curated learning path that contains specific, reputable, current, and high-quality resources will provide the most value to your user community.

If you do make the investment to create custom in-house training, consider creating short, targeted content that focuses on solving one specific problem. It makes the training easier to find and consume. It's also easier to maintain and update over time.

💡 Tip

The *Help and Support* menu in the Fabric portal is customizable. When your centralized location for training documentation is operational, update the **tenant setting in the Admin portal** with the link. The link can then be accessed from menu when users select the *Get Help* option. Also, be sure to teach users about the *Help* ribbon tab in Power BI Desktop. It includes links to guided learning, training videos, documentation, and more.

Documentation

Concise, well-written documentation can be a significant help for users trying to get things done. Your needs for documentation, and how it's delivered, will depend on how Fabric is managed in your organization. For more information, see the [Content ownership and management](#) article.

Certain aspects of Fabric tend to be managed by a centralized team, such as the COE. The following types of documentation are helpful in these situations:

- How to request a Power BI license (and whether there are requirements for manager approval)
- How to request a new capacity
- How to request a new workspace
- How to request a workspace be added to an existing capacity
- How to request access to a gateway data source
- How to request software installation

💡 Tip

For certain activities that are repeated over and over, consider automating them using Power Apps and Power Automate. In this case, your documentation will also include how to access and use the Power Platform functionality.

Different aspects of your documentation can be managed by self-service users, decentralized teams, or by a centralized team. The following types of documentation might differ based on who owns and manages the content:

- How to request a new report
- How to request a report enhancement
- How to request access to data
- How to request new data be prepared and made available for use
- How to request an enhancement to existing data or visualizations

💡 Tip

When planning for a centralized portal, as described earlier in this article, plan how to handle situations when guidance or governance policies need to be customized for one or more business units.

There are also going to be some [governance](#) decisions that have been made and should be documented, such as:

- How to request content be certified
- What are the approved file storage locations
- What are the data retention and purge requirements
- What are the requirements for handling sensitive data and personally identifiable information (PII)

Documentation should be located in your centralized portal, which is a searchable location where, preferably, users already work. Either [Teams](#) or [SharePoint](#) work very well. Creating documentation in either wiki pages or in documents can work equally well, provided that the content is organized well and is easy to find. Shorter documents that focus on one topic are usually easier to consume than long, comprehensive documents.

ⓘ Important

One of the most helpful pieces of documentation you can publish for the community is a description of the [tenant settings](#), and the group memberships required for each tenant setting. Users read about features and functionality online, and sometimes find that it doesn't work for them. When they are able to quickly look up your organization's tenant settings, it can save them from becoming frustrated and attempting workarounds. Effective documentation can reduce the number of help desk tickets that are submitted. It can also reduce the number of people who need to be assigned the Fabric administrator role (who might have this role solely for the purpose of viewing settings).

Over time, you might choose to allow certain types of documentation to be maintained by the community if you have willing volunteers. In this case, you might want to introduce an approval process for changes.

When you see questions repeatedly arise in the Q&A forum (as described in the [User support](#) article), during office hours, or during lunch and learns, it's a great indicator that creating new documentation might be appropriate. When the documentation exists, it allows colleagues to reference it when needed. Documentation contributes to user enablement and a self-sustaining community.

💡 Tip

When creating custom documentation or training materials, reference existing Microsoft sites using links whenever possible. Most community bloggers don't keep blog posts or videos up to date.

Power BI template files

A [Power BI template](#) is a .pbtt file. It can be provided as a starting point for content creators. It's the same as a .pbix file, which can contain queries, a data model, and a report, but with one exception: the template file doesn't contain any data. Therefore, it's a smaller file that can be shared with content creators and owners, and it doesn't present a risk of inappropriately sharing data.

Providing Power BI template files for your community is a great way to:

- Promote consistency.
- Reduce learning curve.
- Show good examples and best practices.
- Increase efficiency.

Power BI template files can improve efficiency and help people learn during the normal course of their work. A few ways that template files are helpful include:

- Reports can use examples of good visualization practices
- Reports can incorporate organizational branding and design standards
- Semantic models can include the structure for commonly used tables, like a date table
- Helpful DAX calculations can be included, like a year-over-year (YoY) calculation
- Common parameters can be included, like a data source connection string
- An example of report and/or semantic model documentation can be included

Note

Providing templates not only saves your content creators time, it also helps them move quickly beyond a blank page in an empty solution.

Power BI project files

A [Power BI project](#) is a .pbip file. Like a template file (previously described), a project file doesn't contain any data. It's a file format that advanced content creators can use for [advanced data model](#) and report management scenarios. For example, you can use project files to save time in development by sharing common model patterns, like date tables, DAX measure expressions, or calculation groups.

You can use Power BI project files with [Power BI Desktop developer mode](#) for:

- Advanced editing and authoring (for example, in a code editor such as Visual Studio Code).
- Purposeful separation of semantic model and report items (unlike the .pbix or .pbit files).
- Enabling multiple content creators and developers to work on the same project concurrently.
- Integrating with source control (such as by using Fabric Git integration).
- Using continuous integration and continuous delivery (CI/CD) techniques to automate integration, testing and deployment of changes, or versions of content.

Note

Power BI includes capabilities such as .pbit template files and .pbip project files that make it simple to share starter resources with authors. Other Fabric workloads provide different approaches to content development and sharing. Having a set of starter resources is important regardless of the items being shared. For example, your portal might include a set of SQL scripts or notebooks that present tested approaches to solve common problems.

Considerations and key actions



Checklist - Considerations and key actions you can take to establish, or improve, mentoring and user enablement.

- ✓ **Consider what mentoring services the COE can support:** Decide what types of mentoring services the COE is capable of offering. Types can include office hours, co-development projects, and best practices reviews.
- ✓ **Communicate regularly about mentoring services:** Decide how you will communicate and advertise mentoring services, such as office hours, to the user community.
- ✓ **Establish a regular schedule for office hours:** Ideally, hold office hours at least once per week (depending on demand from users as well as staffing and scheduling constraints).
- ✓ **Decide what the expectations will be for office hours:** Determine what the scope of allowed topics or types of issues users can bring to office hours. Also, determine how the queue of office hours requests will work, whether any information should be submitted ahead of time, and whether any follow up afterwards can be expected.
- ✓ **Create a centralized portal:** Ensure that you have a well-supported centralized hub where users can easily find training materials, documentation, and resources. The centralized portal should also provide links to other community resources such as the Q&A forum and how to find help.
- ✓ **Create documentation and resources:** In the centralized portal, create, compile, and publish useful documentation. Identify and promote the top 3-5 resources that will be most useful to the user community.
- ✓ **Update documentation and resources regularly:** Ensure that content is reviewed and updated on a regular basis. The objective is to ensure that the information available in the portal is current and reliable.
- ✓ **Compile a curated list of reputable training resources:** Identify training resources that target the training needs and interests of your user community. Post the list in the centralized portal and create a schedule to review and validate the list.
- ✓ **Consider whether custom in-house training will be useful:** Identify whether custom training courses, developed in-house, will be useful and worth the time investment. Invest in creating content that's specific to the organization.
- ✓ **Provide templates and projects:** Determine how you'll use templates including Power BI template files and Power BI project files. Include the resources in your centralized portal, and in training materials.
- ✓ **Create goals and metrics:** Determine how you'll measure effectiveness of the mentoring program. Create KPIs (key performance indicators) or OKRs (objectives and key results) to validate that the COE's mentoring efforts strengthen the community and its ability to provide self-service BI.

Questions to ask



Use questions like those found below to assess mentoring and user enablement.

- Is there an effective process in place for users to request training?
- Is there a process in place to evaluate user skill levels (such as beginner, intermediate, or advanced)? Can users study for and achieve Microsoft certifications by using company resources?
- What's the onboarding process to introduce new people in the user community to data and BI solutions, tools, and processes?
- Have all users followed the appropriate Microsoft Learn learning paths for their roles during onboarding?
- What kinds of challenges do users experience due to lack of training or mentorship?
- What impact does lack of enablement have on the business?
- When users exhibit behavior that creates governance risks, are they punished or do they undergo education and mentorship?
- What training materials are in place to educate people about governance processes and policies?
- Where's the central documentation maintained? Who maintains it?
- Do central resources exist, like organizational design guidelines, [themes](#), or [template files](#)?

Maturity levels



The following maturity levels will help you assess the current state of your mentoring and user enablement.

Level	State of mentoring and user enablement
100: Initial	<ul style="list-style-type: none">• Some documentation and resources exist. However, they're siloed and inconsistent.

Level	State of mentoring and user enablement
	<ul style="list-style-type: none"> Few users are aware of, or take advantage of, available resources.
200: Repeatable	<ul style="list-style-type: none"> A centralized portal exists with a library of helpful documentation and resources. A curated list of training links and resources are available in the centralized portal. Office hours are available so the user community can get assistance from the COE.
300: Defined	<ul style="list-style-type: none"> The centralized portal is the primary hub for community members to locate training, documentation, and resources. The resources are commonly referenced by champions and community members when supporting and learning from each other. The COE's skills mentoring program is in place to assist users in the community in various ways.
400: Capable	<ul style="list-style-type: none"> Office hours have regular and active participation from all business units in the organization. Best practices reviews from the COE are regularly requested by business units. Co-development projects are repeatedly executed with success by the COE and members of business units.
500: Efficient	<ul style="list-style-type: none"> Training, documentation, and resources are continually updated and improved by the COE to ensure the community has current and reliable information. Measurable and tangible business value is gained from the mentoring program by using KPIs or OKRs.

Next steps

In the [next article](#) in the Microsoft Fabric adoption roadmap series, learn about the community of practice.

Microsoft Fabric adoption roadmap: Community of practice

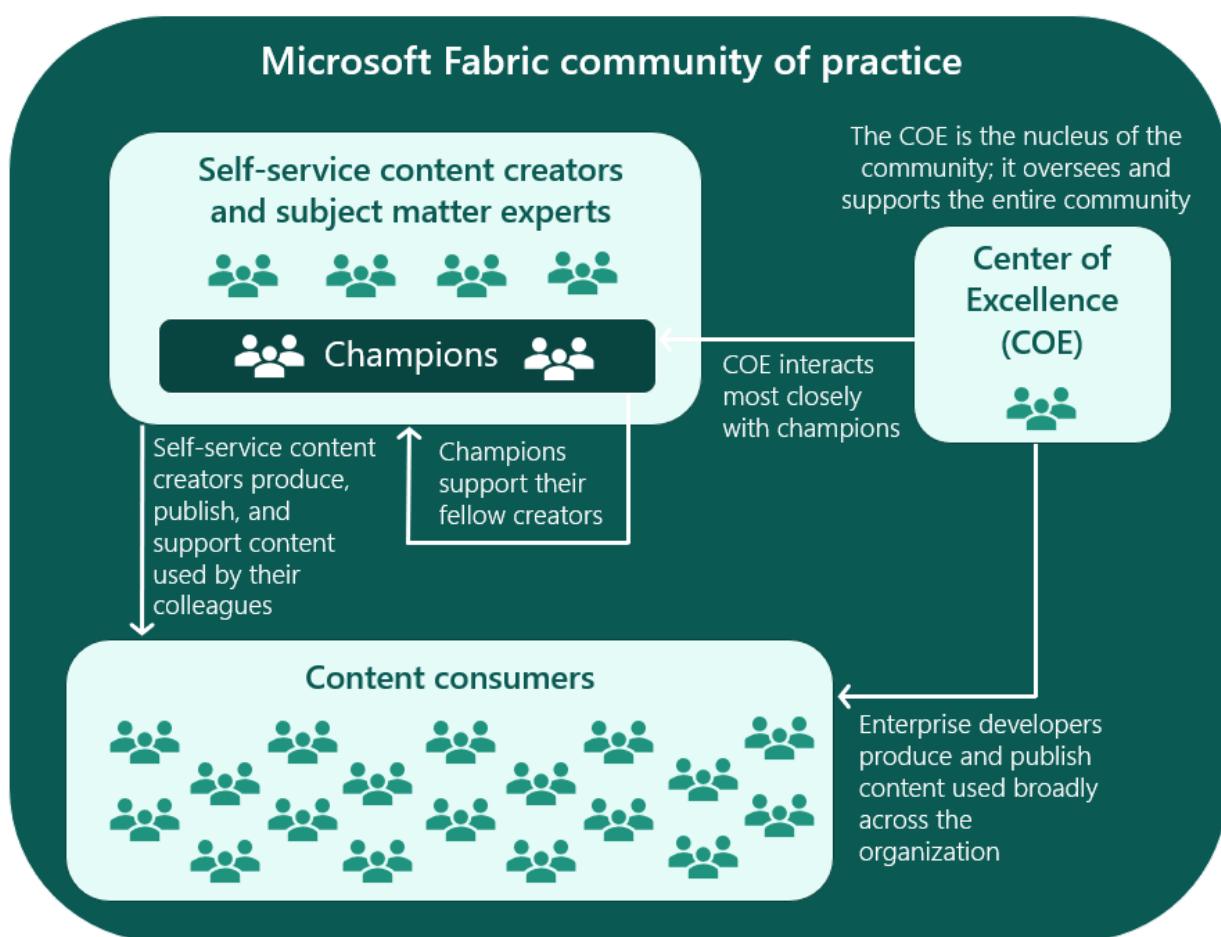
Article • 11/14/2023

ⓘ Note

This article forms part of the *Microsoft Fabric adoption roadmap* series of articles. For an overview of the series, see [Microsoft Fabric adoption roadmap](#).

A *community of practice* is a group of people with a common interest that interacts with, and helps, each other on a voluntary basis. Using a tool such as Microsoft Fabric to produce effective analytics is a common interest that can bring people together across an organization.

The following diagram provides an overview of an internal community.



The above diagram shows the following:

- The **community of practice** includes everyone with an interest in Fabric.

- The **Center of Excellence (COE)** forms the nucleus of the community. The **COE** oversees the entire community and interacts most closely with its champions.
- **Self-service content creators and subject matter experts (SMEs)** produce, publish, and support content that's used by their colleagues, who are consumers.
- **Content consumers** view content produced by both self-service creators and enterprise business intelligence (BI) developers.
- **Champions** are a subset of the self-service content creators. Champions are in an excellent position to support their fellow content creators to generate effective analytics solutions.

Champions are the smallest group among creators and SMEs. Self-service content creators and SMEs represent a larger number of people. Content consumers represent the largest number of people in most organizations.

Note

All references to the Fabric community in this adoption series of articles refer to internal users, unless explicitly stated otherwise. There's an active and vibrant worldwide community of bloggers and presenters who produce a wealth of knowledge about Fabric. However, internal users are the focus of this article.

For information about related topics including resources, documentation, and training provided for the Fabric community, see the [Mentoring and user enablement](#) article.

Champions network

One important part of a community of practice is its *champions*. A champion is a self-service content creator who works in a business unit that engages with the COE. A champion is recognized by their peers as the *go-to* expert. A champion continually builds and shares their knowledge even if it's not an official part of their job role. Champions influence and help their colleagues in many ways including solution development, learning, skills improvement, troubleshooting, and keeping up to date.

Champions emerge as leaders of the community of practice who:

- Have a deep interest in analytics being used effectively and adopted successfully throughout the organization.
- Possess strong technical skills as well as domain knowledge for their functional business unit.
- Have an inherent interest in getting involved and helping others.
- Are early adopters who are enthusiastic about experimenting and learning.

- Can effectively translate business needs into solutions.
- Communicate well with colleagues.

💡 Tip

To add an element of fun, some organizations refer to their champions network as *ambassadors*, *Jedis*, *ninjas*, or *rangers*. Microsoft has an internal community called *BI Champs*.

Often, people aren't directly asked to become champions. Commonly, champions are identified by the COE and recognized for the activities they're already doing, such as frequently answering questions on an internal discussion channel or participating in lunch and learn sessions.

Different approaches will be more effective for different organizations, and each organization will find what works best for them as their maturity level increases.

ⓘ Important

Someone very well might be acting in the role of a champion without even knowing it, and without any formal recognition. The COE should always be on the lookout for champions. COE members should actively monitor the discussion channel to see who is particularly helpful. The COE should deliberately encourage and support potential champions, and when appropriate, invite them into a champions network to make the recognition formal.

Knowledge sharing

The overriding objective of a community of practice is to facilitate knowledge sharing among colleagues and across organizational boundaries. There are many ways knowledge sharing occurs. It could be during the normal course of work. Or, it could be during a more structured activity, such as:

Activity	Description
Discussion channel	A Q&A forum where anyone in the community can post and view messages. Often used for help and announcements. For more information, see the User support article.
Lunch and learn sessions	Regularly scheduled sessions where someone presents a short session about something they've learned or a solution they've created. The goal is to get a

Activity	Description
	variety of presenters involved, because it's a powerful message to hear firsthand what colleagues have achieved.
Office hours with the COE	Regularly scheduled times when COE experts are available so the community can engage with them. Community users can receive assistance with minimal process overhead. For more information, see the Mentoring and user enablement article.
Internal blog posts or wiki posts	Short blog posts, usually covering technical how-to topics.
Internal analytics user group	A subset of the community that chooses to meet as a group on a regularly scheduled basis. User group members often take turns presenting to each other to share knowledge and improve their presentation skills.
Book club	A subset of the community select a book to read on a schedule. They discuss what they've learned and share their thoughts with each other.
Internal analytics conferences or events	An annual or semi-annual internal conference that delivers a series of sessions focused on the needs of self-service content creators, subject matter experts, and stakeholders.

💡 Tip

Inviting an external presenter can reduce the effort level and bring a fresh viewpoint for learning and knowledge sharing.

Incentives

A lot of effort goes into forming and sustaining a successful community. It's advantageous to everyone to empower and reward users who work for the benefit of the community.

Rewarding community members

Incentives that the entire community (including champions) find particularly rewarding can include:

- **Contests with a small gift card or time off:** For example, you might hold a performance tuning event with the winner being the person who successfully reduced the size of their data model the most.
- **Ranking based on help points:** The more frequently someone participates in Q&A, they achieve a change in status on a leaderboard. This type of gamification

promotes healthy competition and excitement. By getting involved in more conversations, the participant learns and grows personally in addition to helping their colleagues.

- **Leadership communication:** Reach out to a manager when someone goes above and beyond so that their leader, who might not be active in the community, sees the value that their staff member provides.

Rewarding champions

Different types of incentives will appeal to different types of people. Some community members will be highly motivated by praise and feedback. Some will be inspired by gamification and a bit of fun. Others will highly value the opportunity to improve their level of knowledge.

Incentives that champions find particularly rewarding can include:

- **More direct access to the COE:** The ability to have *connections* in the COE is valuable. It's depicted in the diagram shown earlier in this article.
- **Champion of the month:** Publicly thank one of your champions for something outstanding they did recently. It could be a fun tradition at the beginning of a monthly lunch and learn.
- **A private experts discussion area:** A private area for the champions to share ideas and learn from each other is usually highly valued.
- **Specialized or deep dive information and training:** Access to additional information to help champions grow their skillsets (as well as help their colleagues) will be appreciated. It could include attending advanced training classes or conferences.

Communication plan

Communication with the community occurs through various types of communication channels. Common communication channels include:

- Internal discussion channel or forum.
- Announcements channel.
- Organizational newsletter.

The most critical communication objectives include ensuring your community members know that:

- The COE exists.
- How to get help and support.

- Where to find resources and documentation.
- Where to find governance guidelines.
- How to share suggestions and ideas.

💡 Tip

Consider requiring a simple quiz before a user is granted a Power BI or Fabric license. This *quiz* is a misnomer because it doesn't focus on any technical skills. Rather, it's a short series of questions to verify that the user knows where to find help and resources. It sets them up for success. It's also a great opportunity to have users acknowledge any governance policies or data privacy and protection agreements you need them to be aware of. For more information, see the [System oversight](#) article.

Types of communication

There are generally four types of communication to plan for:

- **New employee communications** can be directed to new employees (and contractors). It's an excellent opportunity to provide onboarding materials for how to get started. It can include articles on topics like how to get Power BI Desktop installed, how to request a license, and where to find introductory training materials. It can also include general data governance guidelines that all users should be aware of.
- **Onboarding communications** can be directed to employees who are just acquiring a license or are getting involved with the community of practice. It presents an excellent opportunity to provide the same materials as given to new employee communications (as mentioned above).
- **Ongoing communications** can include regular announcements and updates directed to all users, or subsets of users, like:
 - Announcements about changes that are planned to key organizational content. For example, changes are to be published for a critical shared semantic model ([previously known as a dataset](#)) that's used heavily throughout the organization. It can also include the announcement of new features. For more information about planning for change, see the [Tenant-level monitoring](#) article.
 - Feature announcements, which are more likely to receive attention from the reader if the message includes meaningful context about why it's important. (Although an RSS feed can be a helpful technique, with the frequent pace of change, it can become noisy and might be ignored.)

- **Situational communications** can be directed to specific users or groups based on a specific occurrence discovered while [monitoring the platform](#). For example, perhaps you notice a significant amount of sharing from the personal workspace a particular user, so you choose to send them some information about the benefits of workspaces and Power BI apps.

💡 Tip

One-way communication to the user community is important. Don't forget to also include bidirectional communication options to ensure the user community has an opportunity to provide feedback.

Community resources

Resources for the internal community, such as documentation, templates, and training, are critical for adoption success. For more information about resources, see the [Mentoring and user enablement](#) article.

Considerations and key actions



Checklist - Considerations and key actions you can take for the community of practice follow.

Initiate, grow, and sustain your champions network:

- ✓ **Clarify goals:** Clarify what your specific goals are for cultivating a champions network. Make sure these goals align with your overall data and BI strategy, and that your executive sponsor is on board.
- ✓ **Create a plan for the champions network:** Although some aspects of a champions network will always be informally led, determine to what extent the COE will purposefully cultivate and support champion efforts throughout individual business units. Consider how many champions is ideal for each functional business area. Usually, 1-2 champions per area works well, but it can vary based on the size of the team, the needs of the self-service community, and how the COE is structured.
- ✓ **Decide on commitment level for champions:** Decide what level of commitment and expected time investment will be required of champions. Be aware that the

time investment will vary from person to person, and team to team due to different responsibilities. Plan to clearly communicate expectations to people who are interested in getting involved. Obtain manager approval when appropriate.

- ✓ **Decide how to identify champions:** Determine how you will respond to requests to become a champion, and how the COE will seek out champions. Decide if you will openly encourage interested employees to self-identify as a champion and ask to learn more (less common). Or, whether the COE will observe efforts and extend a private invitation (more common).
- ✓ **Determine how members of the champions network will be managed:** One excellent option for managing who the champions are is with a security group. Consider:
 - How you will communicate with the champions network (for example, in a Teams channel, a Yammer group, and/or an email distribution list).
 - How the champions network will communicate and collaborate with each other directly (across organizational boundaries).
 - Whether a private and exclusive discussion forum for champions and COE members is appropriate.
- ✓ **Plan resources for champions:** Ensure members of the champions network have the resources they need, including:
 - Direct access to COE members.
 - Influence on data policies being implemented (for example, requirements for a semantic model certification policy).
 - Influence on the creation of best practices and guidance (for example, recommendations for accessing a specific source system).
- ✓ **Involve champions:** Actively involve certain champions as satellite members of the COE. For more information about ways to structure the COE, see the [Center of Excellence](#) article.
- ✓ **Create a feedback loop for champions:** Ensure that members of the champions network can easily provide information or submit suggestions to the COE.
- ✓ **Routinely provide recognition and incentives for champions:** Not only is praise an effective motivator, but the act of sharing examples of successful efforts can motivate and inspire others.

Improve knowledge sharing:

- ✓ **Identify knowledge sharing activities:** Determine what kind of activities for knowledge sharing fit well into the organizational data culture. Ensure that all planned knowledge sharing activities are supportable and sustainable.
- ✓ **Confirm roles and responsibilities:** Verify who will take responsibility for coordinating all knowledge sharing activities.

Introduce incentives:

- ✓ **Identify incentives for champions:** Consider what type of incentives you could offer to members of your champions network.
- ✓ **Identify incentives for community members:** Consider what type of incentives you could offer to your broader internal community.

Improve communications:

- ✓ **Establish communication methods:** Evaluate which methods of communication fit well in your data culture. Set up different ways to communicate, including history retention and search.
- ✓ **Identify responsibility:** Determine who will be responsible for different types of communication, how, and when.

Questions to ask



Use questions like those found below to assess the community of practice.

- Is there a centralized portal for a community of practice to engage in knowledge sharing?
- Do technical questions and requests for support always go through central teams like the COE or support? Alternatively, to what extent is the community of practice engaging in knowledge sharing?
- Do any incentives exist for people to engage in knowledge sharing or improve their skills with data and BI tools?
- Is there a system of recognition to acknowledge significant self-service efforts in teams?
- Are champions recognized among the user community? If so, what explicit recognition do they get for their expertise? How are they identified?
- If no champions are recognized, are there any potential candidates?
- What role do central teams envision that champions play in community of practice?
- How often do central data and BI teams engage with the user community? What medium do these interactions take? Are they bidirectional discussions or unidirectional communications?
- How are changes and announcements communicated within the community of practice?

- Among the user community, who is the most enthusiastic about analytics and BI tools? Who is the least enthusiastic, or the most negative, and why?

Maturity levels



The following maturity levels will help you assess the current state of your community of practice.

Level	State of the community of practice
100: Initial	<ul style="list-style-type: none"> • Some self-service content creators are doing great work throughout the organization. However, their efforts aren't recognized. • Efforts to purposefully share knowledge across the organizational boundaries are rare and unstructured. • Communication is inconsistent, without a purposeful plan.
200: Repeatable	<ul style="list-style-type: none"> • The first set of champions are identified. • The goals for a champions network are identified. • Knowledge sharing practices are gaining traction.
300: Defined	<ul style="list-style-type: none"> • Knowledge sharing in multiple forms is a normal occurrence. Information sharing happens frequently and purposefully. • Goals for transparent communication with the user community are defined.
400: Capable	<ul style="list-style-type: none"> • Champions are identified for all business units. They actively support colleagues in their self-service efforts. • Incentives to recognize and reward knowledge sharing efforts are a common occurrence. • Regular and frequent communication occurs based on a predefined communication plan.
500: Efficient	<ul style="list-style-type: none"> • Bidirectional feedback loops exist between the champions network and the COE. • Key performance indicators measure community engagement and satisfaction.

Level	State of the community of practice
	<ul style="list-style-type: none">• Automation is in place when it adds direct value to the user experience (for example, automatic access to a group that provides community resources).

Next steps

In the [next article](#) in the Microsoft Fabric adoption roadmap series, learn about user support.

Microsoft Fabric adoption roadmap: User support

Article • 11/14/2023

ⓘ Note

This article forms part of the *Microsoft Fabric adoption roadmap* series of articles. For an overview of the series, see [Microsoft Fabric adoption roadmap](#).

This article addresses user support. It focuses primarily on the resolution of issues.

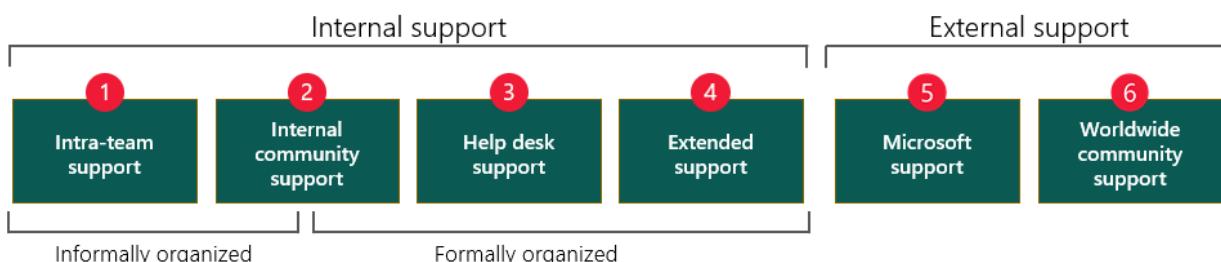
The first sections of this article focus on user support aspects you have control over internally within your organization. The final topics focus on external resources that are available.

For a description of related topics, including skills mentoring, training, documentation, and co-development assistance provided to the internal Fabric user community, see the [Mentoring and user enablement](#) article. The effectiveness of those activities can significantly reduce the volume of formal user support requests and increase user experience overall.

Types of user support

If a user has an issue, do they know what their options are to resolve it?

The following diagram shows some common types of user support that organizations employ successfully:



The six types of user support shown in the above diagram include:

Type	Description
1	Intra-team support (internal) is very informal. Support occurs when team members learn from each other during the natural course of their job.

Type	Description
2	Internal community support (internal) can be organized informally, formally, or both. It occurs when colleagues interact with each other via internal community channels.
3	Help desk support (internal) handles formal support issues and requests.
4	Extended support (internal) involves handling complex issues escalated by the help desk.
5	Microsoft support (external) includes support for licensed users and Fabric administrators. It also includes comprehensive documentation .
6	Community support (external) includes the worldwide community of experts, Microsoft Most Valued Professionals (MVPs) , and enthusiasts who participate in forums and publish content.

In some organizations, intra-team and internal community support are most relevant for self-service data and business intelligence (BI)—content is owned and managed by creators and owners in decentralized business units. Conversely, the help desk and extended support are reserved for technical issues and enterprise data and BI (content is owned and managed by a centralized BI team or [Center of Excellence](#)). In some organizations, all four types of support could be relevant for any type of content.

Tip

For more information about business-led self-service, managed self-service, and enterprise data and BI concepts, see the [Content ownership and management](#) article.

Each of the six types of user support introduced above are described in further detail in this article.

Intra-team support

Intra-team support refers to when team members learn from and help each other during their daily work. Self-service content creators who emerge as your [champions](#) tend to take on this type of informal support role voluntarily because they have an intrinsic desire to help. Although it's an informal support mode, it shouldn't be undervalued. Some estimates indicate that a large percentage of learning at work is peer learning, which is particularly helpful for analysts who are creating domain-specific analytics solutions.

Note

Intra-team support does not work well for individuals who are the only data analyst within a department. It's also not effective for those who don't have very many connections yet in their organization. When there aren't any close colleagues to depend on, other types of support, as described in this article, become more important.

Internal community support

Assistance from your fellow community members often takes the form of messages in a discussion channel, or a forum set up specifically for the [community of practice](#). For example, someone posts a message that they're having problems getting a DAX calculation to work or are looking for the right Python module to import. They then receive a response from someone in the organization with suggestions or links.

Tip

The goal of an internal Fabric community is to be self-sustaining, which can lead to reduced formal support demands and costs. It can also facilitate managed self-service content creation occurring on a broader scale versus a purely centralized approach. However, there will always be a need to monitor, manage, and nurture the internal community. Here are two specific tips:

- Be sure to cultivate multiple experts in the more difficult topics like **T-SQL**, **Python**, **Data Analysis eXpressions (DAX)** and the **Power Query M formula language**. When a community member becomes a recognized expert, they could become overburdened with too many requests for help.
- A greater number of community members might readily answer certain types of questions (for example, report visualizations), whereas a smaller number of members will answer others (for example, complex T-SQL or DAX). It's important for the COE to allow the community a chance to respond yet also be willing to promptly handle unanswered questions. If users repeatedly ask questions and don't receive an answer, it will significantly hinder growth of the community. In this case, a user is likely to leave and never return if they don't receive any responses to their questions.

An internal community discussion channel is commonly set up as a Teams channel or a Yammer group. The technology chosen should reflect where users already work, so that the activities occur within their natural workflow.

One benefit of an internal discussion channel is that responses can come from people that the original requester has never met before. In larger organizations, a [community of practice](#) brings people together based on a common interest. It can offer diverse perspectives for getting help and learning in general.

Use of an internal community discussion channel allows the [Center of Excellence \(COE\)](#) to monitor the kind of questions people are asking. It's one way the COE can understand the issues users are experiencing (commonly related to content creation, but it could also be related to consuming content).

Monitoring the discussion channel can also reveal additional analytics experts and potential champions who were previously unknown to the COE.

Important

It's a best practice to continually identify emerging champions, and to engage with them to make sure they're equipped to support their colleagues. As described in the [Community of practice](#) article, the COE should actively monitor the discussion channel to see who is being helpful. The COE should deliberately encourage and support community members. When appropriate, invite them into the champions network.

Another key benefit of a discussion channel is that it's searchable, which allows other people to discover the information. It is, however, a change of habit for people to ask questions in an open forum rather than private messages or email. Be sensitive to the fact that some individuals aren't comfortable asking questions in such a public way. It openly acknowledges what they don't know, which might be embarrassing. This reluctance might reduce over time by promoting a friendly, encouraging, and helpful discussion channel.

Tip

You might be tempted to create a bot to handle some of the most common, straightforward questions from the community. A bot can work for uncomplicated questions such as "How do I request a license?" or "How do I request a workspace?" Before taking this approach, consider if there are enough routine and predictable questions that would make the user experience better rather than

worse. Often, a well-created FAQ (frequently asked questions) works better, and it's faster to develop and easier to maintain.

Help desk support

The help desk is usually operated as a shared service, staffed by the IT department. Users who will likely rely on a more formal support channel include those who are:

- Less experienced users.
- Newer to the organization.
- Reluctant to post a message to the internal discussion community.
- Lacking connections and colleagues within the organization.

There are also certain technical issues that can't be fully resolved without IT involvement, like software installation and upgrade requests when machines are IT-managed.

Busy help desk personnel are usually dedicated to supporting multiple technologies. For this reason, the easiest types of issues to support are those which have a clear resolution and can be documented in a knowledgebase. For instance, software installation prerequisites or requirements to get a license.

Some organizations ask the help desk to handle only very simple break-fix issues. Other organizations have the help desk get involved with anything that is repeatable, like new workspace requests, managing [gateway data sources](#), or requesting a new capacity.

Important

Your Fabric governance decisions will directly impact the volume of help desk requests. For example, if you choose to limit [workspace creation permissions in the tenant settings](#), it will result in users submitting help desk tickets. While it's a legitimate decision to make, you must be prepared to satisfy the request very quickly. Respond to this type of request within 1-4 hours, if possible. If you delay too long, users will use what they already have or find a way to work around your requirements. That might not be the ideal scenario. Promptness is critical for certain help desk requests. Consider that automation by using [Power Apps](#) and [Power Automate](#) can help make some processes more efficient. For more information, see [Tenant-level workspace planning](#).

Over time, troubleshooting and problem resolution skills become more effective as help desk personnel expand their knowledgebase and experience with supporting Fabric. The

best help desk personnel are those who have a good grasp of what users need to accomplish.

💡 Tip

Purely technical issues, for example **data refresh** failure or the need to **add a new user to a gateway data source**, usually involve straightforward responses associated with a service-level agreement (SLA). For instance, there could be an SLA to respond to blocking issues within one hour and resolve them within eight hours. It's generally more difficult to define SLAs for troubleshooting issues, like data discrepancies.

Extended support

Since the **COE** has deep insight into how Fabric is used throughout the organization, they're a great option for extended support should a complex issue arise. Involving the COE in the support process should be by an escalation path.

Managing requests as purely an escalation path from the help desk gets difficult to enforce since COE members are often well-known to business users. To encourage the habit of going through the proper channels, COE members should redirect users to submit a help desk ticket. It will also improve the data quality for analyzing help desk requests.

Microsoft support

In addition to the internal user support approaches discussed in this article, there are valuable **external support options** directly available to users and Fabric administrators that shouldn't be overlooked.

Microsoft documentation

Check the [Fabric support website](#) for high-priority issues that broadly affect all customers. Global Microsoft 365 administrators have access to additional support issue details within the Microsoft 365 portal.

Refer to the comprehensive [Fabric documentation](#). It's an authoritative resource that can aid troubleshooting and search for information. You can prioritize results from the documentation site. For example, enter a site-targeted search request into your web search engine, like `power bi gateway site:learn.microsoft.com`.

Power BI Pro and Premium Per User end-user support

Licensed users are eligible to [log a support ticket with Microsoft](#).

Tip

Make it clear to your internal user community whether you prefer technical issues to be reported to the internal help desk. If your help desk is equipped to handle the workload, having a centralized internal area collect user issues can provide a superior user experience versus every user trying to resolve issues on their own. Having visibility and analyzing support issues is also helpful for the **COE**.

Administrator support

There are several support options available for [Fabric administrators](#).

For customers who have a [Microsoft Unified Support](#) contract, consider granting help desk and COE members access to the [Microsoft Services Hub](#). One advantage of the Microsoft Services Hub is that your help desk and COE members can be set up to [submit and view support requests](#).

Worldwide community support

In addition to the internal user support approaches described in this article, and Microsoft support options described previously, you can leverage the worldwide Fabric community.

The worldwide community is useful when a question can be easily understood by someone without domain knowledge, and when it doesn't involve confidential data or sensitive internal processes.

Publicly available community forums

There are several [public community forums](#) where users can post issues and receive responses from any user in the world. Getting answers from anyone, anywhere, can be very powerful and exceedingly helpful. However, as is the case with any public forum, it's important to validate the advice and information posted on the forum. The advice posted on the internet might not be suitable for your situation.

Publicly available discussion areas

It's very common to see people posting Fabric technical questions on social media platforms. You might find discussions, post announcements, and users helping each other.

Community documentation

The Fabric global community is vibrant. Every day, there are a great number of Fabric blog posts, articles, webinars, and videos published. When relying on community information for troubleshooting, watch out for:

- How recent the information is. Try to verify when it was published or last updated.
- Whether the situation and context of the solution found online truly fits your circumstance.
- The credibility of the information being presented. Rely on reputable blogs and sites.

Considerations and key actions



Checklist - Considerations and key actions you can take for user support follow.

Improve your intra-team support:

- ✓ **Provide recognition and encouragement:** Provide incentives to your champions as described in the [Community of practice](#) article.
- ✓ **Reward efforts:** Recognize and praise meaningful grassroots efforts when you see them happening.
- ✓ **Create formal roles:** If informal intra-team efforts aren't adequate, consider formalizing the roles you want to enact in this area. Include the expected contributions and responsibilities in the HR job description, when appropriate.

Improve your internal community support:

- ✓ **Continually encourage questions:** Encourage users to ask questions in the designated community discussion channel. As the habit builds over time, it will become normalized to use that as the first option. Over time, it will evolve to become more self-supporting.
- ✓ **Actively monitor the discussion area:** Ensure that the appropriate COE members actively monitor this discussion channel. They can step in if a question remains

unanswered, improve upon answers, or make corrections when appropriate. They can also post links to additional information to raise awareness of existing resources. Although the goal of the community is to become self-supporting, it still requires dedicated resources to monitor and nurture it.

- ✓ **Communicate options available:** Make sure your user population knows the internal community support area exists. It could include the prominent display of links. You can include a link in regular communications to your user community. You can also [customize the help menu links](#) in the Fabric portal to direct users to your internal resources.
- ✓ **Set up automation:** Ensure that all licensed users automatically have access to the community discussion channel. It's possible to automate license setup by using [group-based licensing](#).

Improve your internal help desk support:

- ✓ **Determine help desk responsibilities:** Decide what the initial scope of Fabric support topics that the help desk will handle.
- ✓ **Assess the readiness level:** Determine whether your help desk is prepared to handle Fabric support. Identify whether there are readiness gaps to be addressed.
- ✓ **Arrange for additional training:** Conduct knowledge transfer sessions or training sessions to prepare the help desk staff.
- ✓ **Update the help desk knowledgebase:** Include known questions and answers in a searchable knowledgebase. Ensure someone is responsible for regular updates to the knowledgebase to reflect new and enhanced features over time.
- ✓ **Set up a ticket tracking system:** Ensure a good system is in place to track requests submitted to the help desk.
- ✓ **Decide whether anyone will be on-call for any issues related to Fabric:** If appropriate, ensure the expectations for 24/7 support are clear.
- ✓ **Determine what SLAs will exist:** When a specific service level agreement (SLA) exists, ensure that expectations for response and resolution are clearly documented and communicated.
- ✓ **Be prepared to act quickly:** Be prepared to address specific common issues extremely quickly. Slow support response will result in users finding workarounds.

Improve your internal COE extended support:

- ✓ **Determine how escalated support will work:** Decide what the escalation path will be for requests the help desk cannot directly handle. Ensure that the COE (or equivalent personnel) is prepared to step in when needed. Clearly define where help desk responsibilities end, and where COE extended support responsibilities begin.

- ✓ **Encourage collaboration between COE and system administrators:** Ensure that COE members and Fabric administrators have a direct escalation path to reach global administrators for Microsoft 365 and Azure. It's critical to have a communication channel when a widespread issue arises that's beyond the scope of Fabric.
- ✓ **Create a feedback loop from the COE back to the help desk:** When the COE learns of new information, the IT knowledgebase should be updated. The goal is for the primary help desk personnel to continually become better equipped at handling more issues in the future.
- ✓ **Create a feedback loop from the help desk to the COE:** When support personnel observe redundancies or inefficiencies, they can communicate that information to the COE, who might choose to improve the knowledgebase or get involved (particularly if it relates to governance or security).

Questions to ask



Use questions like those found below to assess user support.

- Who is responsible for supporting enterprise data and BI solutions? What about self-service solutions?
- How are the business impact and urgency of issues identified to effectively detect and prioritize critical issues?
- Is there a clear process for business users to report issues with data and BI solutions? How does this differ between enterprise and self-service solutions? What are the escalation paths?
- What types of issues do content creators and consumers typically experience? For example, do they experience data quality issues, performance issues, access issues, and others?
- Are any issues closed without them being resolved? Are there "known issues" in data items or reports today?
- Is a process in place for data asset owners to escalate issues with self-service BI solutions to central teams like the COE?
- How frequent are issues in the data and existing solutions? What proportion of these issues are found before they impact business end users?

- How long does it typically take to resolve issues? Is this timing sufficient for business users?
- What are examples of recent issues and the concrete impact on the business?
- Do enterprise teams and content creators know how to report Fabric issues to Microsoft? Can enterprise teams effectively leverage community resources to unblock critical issues?

 **Caution**

When assessing user support and describing risks or issues, be careful to use neutral language that doesn't place blame on individuals or teams. Ensure everyone's perspective is fairly represented in an assessment. Focus on objective facts to accurately understand and describe the context.

Maturity levels



The following maturity levels will help you assess the current state of your Power BI user support.

Level	State of user support
100: Initial	<ul style="list-style-type: none"> • Individual business units find effective ways of supporting each other. However, the tactics and practices are siloed and not consistently applied. • An internal discussion channel is available. However, it's not monitored closely. Therefore, the user experience is inconsistent.
200: Repeatable	<ul style="list-style-type: none"> • The COE actively encourages intra-team support and growth of the champions network. • The internal discussion channel gains traction. It's become known as the default place for questions and discussions. • The help desk handles a small number of the most common technical support issues.
300: Defined	<ul style="list-style-type: none"> • The internal discussion channel is popular and largely self-sustaining. The COE actively monitors and manages the discussion channel to ensure that all questions are answered quickly and correctly.

Level	State of user support
	<ul style="list-style-type: none">• A help desk tracking system is in place to monitor support frequency, response topics, and priorities.• The COE provides appropriate extended support when required.
400: Capable	<ul style="list-style-type: none">• The help desk is fully trained and prepared to handle a broader number of known and expected technical support issues.• SLAs are in place to define help desk support expectations, including extended support. The expectations are documented and communicated so they're clear to everyone involved.
500: Efficient	<ul style="list-style-type: none">• Bidirectional feedback loops exist between the help desk and the COE.• Key performance indicators measure satisfaction and support methods.• Automation is in place to allow the help desk to react faster and reduce errors (for example, use of APIs and scripts).

Next steps

In the [next article](#) in the Microsoft Fabric adoption roadmap series, learn about system oversight and administration activities.

Microsoft Fabric adoption roadmap: System oversight

Article • 11/24/2023

ⓘ Note

This article forms part of the *Microsoft Fabric adoption roadmap* series of articles. For an overview of the series, see [Microsoft Fabric adoption roadmap](#).

System oversight—also known as Fabric administration—is the ongoing, day-to-day, administrative activities. It's specifically concerned with:

- **Governance:** Enact governance guidelines and policies to support self-service and enterprise data and business intelligence (BI) scenarios.
- **User empowerment:** Facilitate and support the internal processes and systems that empower the internal user community to the extent possible, while adhering to the organization's regulations and requirements.
- **Adoption:** Allow for broader organizational adoption of Fabric with effective governance and data management practices.

ⓘ Important

Your organizational **data culture** objectives provide direction for your **governance** decisions, which in turn dictate how **Fabric administration** activities take place and by whom.

System oversight is a broad and deep topic. The goal of this article is to introduce some of the most important considerations and actions to help you become successful with your **organizational adoption** objectives.

Fabric administrators

The Fabric administrator role is a defined role in Microsoft 365, which delegates a **subset** of management activities. Global Microsoft 365 administrators are implicitly Fabric administrators. Power Platform administrators are also implicitly Fabric administrators.

A key governance decision is who to assign as a Fabric administrator. It's a centralized role that affects your entire **tenant**. Ideally, there are **two to four people in the**

organization who are capable of managing Fabric. Your administrators should operate in close coordination with the [Center of Excellence \(COE\)](#).

High privilege role

The Fabric administrator role is a high privilege role because:

- **User experience:** Settings that are managed by a Fabric administrator have a significant effect on user capabilities and user experience. For more information, see [Govern tenant settings](#).
- **Full security access:** Fabric administrators can update access permissions for workspaces in the tenant. The result is that an administrator can allow permission to view or download data and reports as they see fit. For more information, see [Govern tenant settings](#).
- **Personal workspace access:** Fabric administrators can access contents and govern the [personal workspace](#) of any user.
- **Metadata:** Fabric administrators can view all tenant metadata, including all user activities that occur in the Fabric portal (described in the [Auditing and monitoring](#) section below).

Important

Having too many Fabric administrators is a risk. It increases the probability of unapproved, unintended, or inconsistent management of the tenant.

Roles and responsibilities

The types of activities that an administrator will do on a day-to-day basis will differ between organizations. What's important, and given priority in your data culture, will heavily influence [what an administrator does](#) to support business-led self-service, managed self-service, and enterprise data and BI scenarios. For more information, see the [Content ownership and management](#) article.

Tip

The best type of person to serve as a Fabric administrator is one who has enough knowledge about the tools and workloads to understand what self-service users need to accomplish. With this understanding, the administrator can balance user empowerment and governance.

In addition to the [Fabric administrator](#), there are other roles which use the term *administrator*. The following table describes the roles that are commonly and regularly used.

Role	Scope	Description
Fabric administrator	Tenant	Manages tenant settings and other settings in the Fabric portal. All general references to <i>administrator</i> in this article refer to this type of administrator.
Capacity administrator	One capacity	Manages workspaces and workloads, and monitors the health of a Fabric capacity.
Data gateway administrator	One gateway	Manages gateway data source configuration, credentials, and users assignments. Might also handle gateway software updates (or collaborate with infrastructure team on updates).
Workspace administrator	One workspace	Manages workspace settings and access.

The Fabric ecosystem of workloads is broad and deep. There are many ways that Fabric integrates with other systems and platforms. From time to time, it'll be necessary to work with other administrators and IT professionals. For more information, see [Collaborate with other administrators](#).

The remainder of this article provides an overview of the most common activities that a Fabric administrator does. It focuses on activities that are important to carry out effectively when taking a strategic approach to [organizational adoption](#).

Service management

Overseeing the tenant is a crucial aspect to ensure that all users have a good experience with Power BI. A few of the key governance responsibilities of a Fabric administrator include:

- **Tenant settings:** Control which Power BI features and capabilities are enabled, and for which users in your organization.
- **Domains:** Group together two or more workspaces that have similar characteristics.
- **Workspaces:** Review and manage workspaces in the tenant.
- **Embed codes:** Govern which reports have been published publicly on the internet.
- **Organizational visuals:** Register and manage organizational visuals.
- **Azure connections:** Integrate with Azure services to provide additional functionality.

For more information, see [Tenant administration](#).

User machines and devices

The adoption of Fabric depends directly on content creators and consumers having the tools and applications they need. Here are some important questions to consider.

- How will users request access to new tools? Will access to licenses, data, and training be available to help users use tools effectively?
- How will content consumers view content that's been published by others?
- How will content creators develop, manage, and publish content? What's your criteria for deciding which tools and applications are appropriate for which use cases?
- How will you install and set up tools? Does that include related prerequisites and data connectivity components?
- How will you manage ongoing updates for tools and applications?

For more information, see [User tools and devices](#).

Architecture

In the context of Fabric, architecture relates to data architecture, capacity management, and data gateway architecture and management.

Data architecture

Data architecture refers to the principles, practices, and methodologies that govern and define what data is collected, and how it's ingested, stored, managed, integrated, modeled, and used.

There are many data architecture decisions to make. Frequently the COE engages in data architecture design and planning. It's common for administrators to get involved as well, especially when they manage databases or Azure infrastructure.

Important

Data architecture decisions have a significant impact on Fabric adoption, user satisfaction, and individual project success rates.

A few data architecture considerations that affect adoption include:

- Where does Fabric fit into the organization's entire data architecture? Are there other existing components such as an enterprise data warehouse (EDW) or a data lake that will be important to factor into plans?
- Is Fabric used end-to-end for data preparation, data modeling, and data presentation or is Fabric used for only some of those capabilities?
- Are [managed self-service](#) patterns followed to find the best balance between data reusability and report creator flexibility?
- Where will users consume the content? Generally, the three main ways to deliver content are: the Fabric portal, Power BI Report Server, and embedded in custom applications. Additionally, [Microsoft Teams](#) is a convenient alternative for users who spend a lot of time in Teams.
- Who is responsible for managing and maintaining the data architecture? Is it a centralized team, or a decentralized team? How is the [COE](#) represented in this team? Are certain skillsets required?
- What [data sources](#) are the most important? What types of data will we be acquiring?
- What [semantic model connectivity mode](#) and [storage mode](#) choices (for example, Direct Lake, import, live connection, DirectQuery, or composite model frameworks) are the best fit for the use cases?
- To what extent is data reusability encouraged using [lakehouses](#), [warehouses](#), and [shared semantic models](#)?
- To what extent is the reusability of data preparation logic and advanced data preparation encouraged by using [data pipelines](#), [notebooks](#), and [dataflows](#)?

It's important for administrators to become fully aware of Fabric's technical capabilities—as well as the needs and goals of their stakeholders—before they make architectural decisions.

Tip

Get into the good habit of completing a technical proof of concept (POC) to test out assumptions and ideas. Some organizations also call them *micro-projects* when the goal is to deliver a small unit of work. The goal of a POC is to address unknowns and reduce risk as early as possible. A POC doesn't have to be throwaway work, but it should be narrow in scope. Best practices reviews, as described in the [Mentoring and user enablement](#) article, are another useful way to help content creators with important architectural decisions.

Capacity management

Capacity includes features and capabilities to deliver analytics solutions at scale. There are two types of Fabric [organizational licenses](#): Premium per User (PPU) and capacity. There are several types of [capacity licenses](#). The type of capacity license determines which Fabric workloads are supported.

The use of capacity can play a significant role in your strategy for creating, managing, publishing, and distributing content. A few of the top reasons to invest in capacity include:

- [Unlimited Power BI content distribution](#) to large numbers of read-only users. Content consumption by users with a free Power BI license is available in Premium capacity only, not PPU. Content consumption by free users is also available with an F64 Fabric capacity license or higher.
- Access to [Fabric experiences](#) for producing end-to-end analytics.
- [Deployment pipelines](#) to manage the publication of content to development, test, and production workspaces. They're highly recommended for critical content to improve release stability.
- [XMLA endpoint](#), which is an industry standard protocol for managing and publishing a semantic model, or querying the semantic model from any XMLA-compliant tool.
- Increased model size limits, including [large semantic model](#) support.
- More frequent [data refreshes](#).
- [Storage of data](#) in a specific geographic area that's different from the home region.

The above list isn't all-inclusive. For a complete list, see [Power BI Premium features](#).

Manage Fabric capacity

Overseeing the health of Fabric capacity is an essential ongoing activity for administrators. Each capacity SKU includes a set of resources. Capacity units (CUs) are used to measure compute resources for each SKU.

Caution

Lack of management, and consistently exceeding the limits of your capacity resources can often result in performance challenges and user experience challenges. Both challenges, if not managed correctly, can contribute to negative impact on adoption efforts.

Suggestions for managing Fabric capacity:

- Define who is responsible for managing the capacity. Confirm the roles and responsibilities so that it's clear what action will be taken, why, when, and by whom.
- Create a specific set of criteria for content that will be published to capacity. It's especially relevant when a single capacity is used by multiple business units because the potential exists to disrupt other users if the capacity isn't well-managed. Consider requiring a [best practices review](#) (such as reasonable semantic model size and efficient calculations) before publishing new content to a production capacity.
- Regularly use the [Fabric capacity metrics app](#) to understand resource utilization and patterns for the capacity. Most importantly, look for consistent patterns of overutilization, which will contribute to user disruptions. An analysis of usage patterns should also make you aware if the capacity is underutilized, indicating more value could be gained from the investment.
- Set the [tenant setting](#) so Fabric notifies you if the [capacity becomes overloaded ↗](#), or if an outage or incident occurs.

Autoscale

[Autoscale](#) is intended to handle occasional or unexpected bursts in capacity usage levels. Autoscale can respond to these bursts by automatically increasing CPU resources to support the increased workload.

Automated scaling up reduces the risk of performance and user experience challenges in exchange for a financial impact. If the capacity isn't well-managed, autoscale might trigger more often than expected. In this case, the [metrics app](#) can help you to determine underlying issues and do capacity planning.

Decentralized capacity management

Capacity administrators are responsible for [assigning workspaces](#) to a specific capacity.

Be aware that workspace administrators can also assign a workspace to PPU if the workspace administrator possesses a PPU license. However, it would require that all other workspace users must also have a PPU license to collaborate on, or view, Power BI content in the workspace. Other Fabric workloads can't be included in a workspace assigned to PPU.

It's possible to set up multiple capacities to facilitate decentralized management by different business units. Decentralizing management of certain aspects of Fabric is a great way to balance agility and control.

Here's an example that describes one way you could manage your capacity.

- [Purchase](#) a P3 capacity node in Microsoft 365. It includes 32 virtual cores (v-cores).
- Use 16 v-cores to create the first capacity. It will be used by the Sales team.
- Use 8 v-cores to create the second capacity. It will be used by the Operations team.
- Use the remaining 8 v-cores to create the third capacity. It will support general use.

The previous example has several advantages.

- Separate [capacity administrators](#) can be set up for each capacity. Therefore, it facilitates decentralized management situations.
- If a capacity isn't well-managed, the effect is confined to that capacity only. The other capacities aren't impacted.
- Billing and chargebacks to other business units are straightforward.
- Different workspaces can be easily assigned to the separate capacities.

However, the previous example has disadvantages, too.

- The [limits per capacity](#) are lower. The maximum memory size allowed for semantic models isn't the entire P3 capacity node size that was purchased. Rather, it's the assigned capacity size where the semantic model is hosted.
- It's more likely one of the smaller capacities will need to be scaled up at some point in time.
- There are more capacities to manage in the tenant.

Note

Resources for Power BI Premium per Capacity are referred to as v-cores. However, a Fabric capacity refers to them as capacity units (CUs). The scale for CUs and v-cores is different for each SKU. For more information, see the [Fabric licensing](#) documentation.

Data gateway architecture and management

A [data gateway](#) facilitates the secure and efficient transfer of data between organizational data sources and the Fabric service. A data gateway is needed for data connectivity to on-premises or cloud services when a data source is:

- Located within the enterprise data center.
- Configured behind a firewall.
- Within a virtual network.
- Within a virtual machine.

There are three types of gateways.

- **On-premises data gateway (standard mode)** is a gateway service that supports connections to registered data sources for many users to use. The gateway software installations and updates are installed on a machine that's managed by the customer.
- **On-premises data gateway (personal mode)** is a gateway service that supports data refresh only. This gateway mode is typically installed on the PC of a content creator. It supports use by one user only. It doesn't support live connection or DirectQuery connections.
- **Virtual network data gateway** is a Microsoft managed service that supports connectivity for many users. Specifically, it supports connectivity for semantic models and dataflows stored in workspaces assigned to Premium capacity or Premium Per User.

💡 Tip

The decision of **who can install gateway software** is a governance decision. For most organizations, use of the data gateway in standard mode, or a virtual network data gateway, should be strongly encouraged. They're far more scalable, manageable, and auditable than data gateways in personal mode.

Decentralized gateway management

The On-premises data gateway (standard mode) and Virtual network data gateway support specific data source types that can be registered, together with connection details and how credentials are stored. Users can be granted permission to use the gateway data source so that they can schedule a refresh or run DirectQuery queries.

Certain aspects of gateway management can be done effectively on a decentralized basis to balance agility and control. For example, the Operations group might have a gateway dedicated to its team of self-service content creators and data owners.

Decentralized gateway management works best when it's a joint effort as follows.

Managed by the decentralized data owners:

- Departmental data source [connectivity information and privacy levels](#).
- Departmental data source [stored credentials](#) (including responsibility for updating routine password changes).
- Departmental data source [users](#) who are permitted to use each data source.

Managed by centralized data owners (includes data sources that are used broadly across the organization; management is centralized to avoid duplicated data sources):

- Centralized data source [connectivity information and privacy levels](#).
- Centralized data source [stored credentials](#) (including responsibility for updating routine password changes).
- Centralized data source [users](#) who are permitted to use each data source.

Managed by IT:

- Gateway software updates (gateway updates are usually released monthly).
- Installation of drivers and custom connectors (the same ones that are installed on [user machines](#)).
- Gateway cluster management (number of machines in the gateway cluster for high availability, disaster recovery, and to eliminate a single point of failure, which can cause significant user disruptions).
- Server management (for example, operating system, RAM, CPU, or networking connectivity).
- Management and backup of gateway encryption keys.
- Monitoring of gateway logs to assess when scale-up or scale-out is necessary.
- Alerting of downtime or persistent low resources on the gateway machine.

💡 Tip

Allowing a decentralized team to manage certain aspects of the gateway means they can move faster. The tradeoff of decentralized gateway management does mean running more gateway servers so that each can be dedicated to a specific area of the organization. If gateway management is handled entirely by IT, it's imperative to have a good process in place to quickly handle requests to add data sources and apply user updates.

User licenses

Every user needs a commercial license, which is integrated with a Microsoft Entra identity. The user license could be Free, Pro, or Premium Per User (PPU).

A user license is obtained via a subscription, which authorizes a certain number of licenses with a start and end date.

ⓘ Note

Although each user requires a license, a Pro or PPU license is only required to share Power BI content. Users with a free license can create and share Fabric content other than Power BI items.

There are two approaches to procuring subscriptions.

- **Centralized:** Microsoft 365 billing administrator purchases a subscription for [Pro or PPU](#). It's the most common way to manage subscriptions and assign licenses.
- **Decentralized:** Individual departments purchase a subscription via [self-service purchasing](#).

Self-service purchasing

An important [governance](#) decision relates to what extent self-service purchasing will be allowed or encouraged.

Self-service purchasing is useful for:

- Larger organizations with decentralized business units that have purchasing authority and want to handle payment directly with a credit card.
- Organizations that intend to make it as easy as possible to purchase subscriptions on a monthly commitment.

Consider disabling self-service purchasing when:

- Centralized procurement processes are in place to meet regulatory, security, and governance requirements.
- Discounted pricing is obtained through an Enterprise Agreement (EA).
- Existing processes are in place to handle intercompany chargebacks.
- Existing processes are in place to handle [group-based](#) licensing assignments.
- Prerequisites are required for obtaining a license, such as approval, justification, training, or a governance policy requirement.
- There's a valid need, such as a regulatory requirement, to control access closely.

User license trials

Another important governance decision is whether user license trials are allowed. By default, trials are enabled. That means when content is shared with a colleague, if the recipient doesn't have a Pro or PPU license, they'll be prompted to start a trial to view the content (if the content doesn't reside within a workspace backed by capacity). The trial experience is intended to be a convenience that allows users to continue with their normal workflow.

Generally, disabling trials isn't recommended. It can encourage users to seek workarounds, perhaps by exporting data or working outside of supported tools and processes.

Consider disabling trials only when:

- There are serious cost concerns that would make it unlikely to grant full licenses at the end of the trial period.
- Prerequisites are required for obtaining a license (such as approval, justification, or a training requirement). It's not sufficient to meet this requirement during the trial period.
- There's a valid need, such as a regulatory requirement, to control access to the Fabric service closely.

Tip

Don't introduce too many barriers to obtaining a Fabric license. Users who need to get work done will find a way, and that way might involve workarounds that aren't ideal. For instance, without a license to use Fabric, people might rely far too much on sharing files on a file system or via email when significantly better approaches are available.

Cost management

Managing and optimizing the cost of cloud services, like Fabric, is an important activity. Here are several activities you can consider.

- Analyze who is using—and, more to the point, not using—their allocated Fabric licenses and make necessary adjustments. Fabric usage is analyzed using the [activity log](#).
- Analyze the cost effectiveness of [capacity](#) or [Premium Per User](#). In addition to the [additional features](#), perform a cost/benefit analysis to determine whether capacity licensing is more cost-effective when there are a large number of consumers.
- Carefully [monitor and manage Fabric capacity](#). Understanding usage patterns over time will allow you to predict when to purchase [more capacity](#). For example, you might choose to scale up a single capacity from a P1 to P2, or scale out from one P1 capacity to two P1 capacities.
- If there are occasional spikes in the level of usage, use of [autoscale](#) with Fabric is recommended to ensure the user experience isn't interrupted. Autoscale will scale up capacity resources for 24 hours, then scale them back down to normal levels (if sustained activity isn't present). Manage autoscale cost by constraining the

maximum number of v-cores, and/or with spending limits set in Azure. Due to the pricing model, autoscale is best suited to handle occasional unplanned increases in usage.

- For Azure data sources, co-locate them in the same region as your Fabric tenant whenever possible. It will avoid incurring [Azure egress charges](#). Data egress charges are minimal, but at scale can add up to be considerable unplanned costs.

Security, information protection, and data loss prevention

Security, information protection, and data loss prevention (DLP) are joint responsibilities among all content creators, consumers, and administrators. That's no small task because there's sensitive information everywhere: personal data, customer data, or customer-authored data, protected health information, intellectual property, proprietary organizational information, just to name a few. Governmental, industry, and contractual regulations could have a significant impact on the [governance](#) guidelines and policies that you create related to security.

The [Power BI security whitepaper](#) is an excellent resource for understanding the breadth of considerations, including aspects that Microsoft manages. This section will introduce several topics that customers are responsible for managing.

User responsibilities

Some organizations ask Fabric users to accept a self-service user acknowledgment. It's a document that explains the user's responsibilities and expectations for safeguarding organizational data.

One way to automate its implementation is with a [Microsoft Entra terms of use policy](#). The user is required to view and agree to the policy before they're permitted to visit the Fabric portal for the first time. You can also require it to be acknowledged on a recurring basis, like an annual renewal.

Data security

In a [cloud shared responsibility model](#), securing the data is always the responsibility of the customer. With a self-service data platform, self-service content creators have responsibility for properly securing the content that they shared with colleagues.

The COE should provide [documentation and training](#) where relevant to assist content creators with best practices (particularly situations for dealing with ultra-sensitive data).

Administrators can be help by following best practices themselves. Administrators can also raise concerns when they see issues that could be discovered when [managing workspaces](#), [auditing user activities](#), or managing [gateway credentials and users](#). There are also several [tenant settings](#) that are usually restricted except for a few users (for instance, the ability to [publish to web](#) or the ability to [publish apps to the entire organization](#)).

External guest users

External users—such as partners, customers, vendors, and consultants—are a common occurrence for some organizations, and rare for others. How you handle external users is a governance decision.

External user access is controlled by [tenant settings](#) and certain Microsoft Entra ID settings. For details of external user considerations, review the [Distribute Power BI content to external guest users using Microsoft Entra B2B](#) whitepaper.

Information protection and data loss prevention

Fabric supports capabilities for information protection and data loss prevention (DLP) in the following ways.

- **Information protection:** [Microsoft Purview Information Protection](#) (formerly known as Microsoft Information Protection) includes capabilities for discovering, classifying, and protecting data. A key principle is that data can be better protected once it's been classified. The key building block for classifying data is [sensitivity labels](#). For more information, see [Information protection for Power BI planning](#).
- **Data loss prevention for Power BI:** Microsoft Purview Data Loss Prevention (formerly known as Office 365 Data Loss Prevention) supports [DLP policies for Power BI](#). By using sensitivity labels or sensitive information types, DLP policies for Power BI help an organization locate sensitive semantic models. For more information, see [Data loss prevention for Power BI planning](#).
- **Microsoft Defender for Cloud Apps:** [Microsoft Defender for Cloud Apps](#) (formerly known as Microsoft Cloud App Security) supports policies that help protect data, including real-time controls when users interact with the Power BI service. For more information, see [Defender for Cloud Apps for Power BI planning](#).

Data residency

For organizations with requirements to store data within a geographic region, Fabric capacity can be [set for a specific region](#) that's different from the home region of the

Fabric tenant.

Encryption keys

Microsoft handles encryption of *data at rest* in Microsoft data centers with transparent server-side encryption and auto-rotation of certificates. For customers with regulatory requirements to [manage the Premium encryption key themselves](#), Premium capacity can be configured to use [Azure Key Vault](#). Using customer-managed keys—also known as *bring-your-own-key* or *BYOK*—is a precaution to ensure that, in the event of a human error by a service operator, customer data can't be exposed.

Be aware that [Premium Per User \(PPU\)](#) only supports BYOK when it's enabled for the entire Fabric tenant.

Auditing and monitoring

It's critical that you make use of auditing data to analyze adoption efforts, understand usage patterns, educate users, support users, mitigate risk, improve compliance, manage license costs, and monitor performance. For more information about why auditing your data is valuable, see [Auditing and monitoring overview](#).

There are different ways to approach auditing and monitoring depending on your role and your objectives. The following articles describe various considerations and planning activities.

- **Report-level auditing:** Techniques that report creators can use to understand which users are using the reports that they create, publish, and share.
- **Data-level auditing:** Methods that data creators can use to track the performance and usage patterns of data assets that they create, publish, and share.
- **Tenant-level auditing:** Key decisions and actions administrators can take to create an end-to-end auditing solution.
- **Tenant-level monitoring:** Tactical actions administrators can take to monitor the Power BI service, including updates and announcements.

REST APIs

The [Power BI REST APIs](#) and the [Fabric REST APIs](#) provide a wealth of information about your Fabric tenant. Retrieving data by using the REST APIs should play an important role in managing and governing a Fabric implementation. For more information about planning for the use of REST APIs for auditing, see [Tenant-level auditing](#).

You can retrieve auditing data to build an auditing solution, manage content programmatically, or increase the efficiency of routine actions. The following table presents some actions you can perform with the REST APIs.

Action	Documentation resource(s)
Audit user activities	REST API to get activity events
Audit workspaces, items, and permissions	Collection of asynchronous metadata scanning REST APIs to obtain a tenant inventory
Audit content shared to entire organization	REST API to check use of widely shared links
Audit tenant settings	REST API to check tenant settings
Publish content	REST API to deploy items from a deployment pipeline or clone a report to another workspace
Manage content	REST API to refresh a semantic model or take over ownership of a semantic model
Manage gateway data sources	REST API to update credentials for a gateway data source
Export content	REST API to export a report
Create workspaces	REST API to create a new workspace
Manage workspace permissions	REST API to assign user permissions to a workspace
Update workspace name or description	REST API to update workspace attributes
Restore a workspace	REST API to restore a deleted workspace
Programmatically retrieve a query result from a semantic model	REST API to run a DAX query against a semantic model
Assign workspaces to capacity	REST API to assign workspaces to capacity
Programmatically change a data model	Tabular Object Model (TOM) API
Embed Power BI content in custom applications	Power BI embedded analytics client APIs

💡 Tip

There are many other Power BI REST APIs. For a complete list, see [Using the Power BI REST APIs](#).

Planning for change

Every month, Microsoft releases new Fabric features and capabilities. To be effective, it's crucial that everyone involved with system oversight stays current. For more information, see [Tenant-level monitoring](#).

ⓘ Important

Don't underestimate the importance of staying current. If you get a few months behind on announcements, it can become difficult to properly manage Fabric and support your users.

Considerations and key actions



Checklist - Considerations and key actions you can take for system oversight follow.

Improve system oversight:

- ✓ **Verify who is permitted to be a Fabric administrator:** If possible, reduce the number of people granted the Fabric administrator role if it's more than a few people.
- ✓ **Use PIM for occasional administrators:** If you have people who *occasionally* need Fabric administrator rights, consider implementing [Privileged Identity Management](#) (PIM) in Microsoft Entra ID. It's designed to assign just-in-time role permissions that expire after a few hours.
- ✓ **Train administrators:** Check the status of cross-training and documentation in place for handling Fabric administration responsibilities. Ensure that a backup person is trained so that needs can be met timely, in a consistent way.

Improve management of the Fabric service:

- ✓ **Review tenant settings:** Conduct a review of all tenant settings to ensure they're aligned with [data culture](#) objectives and [governance](#) guidelines and policies. Verify which groups are assigned for each setting.
- ✓ **Document the tenant settings:** Create documentation of your tenant settings for the internal Fabric community and post it in the centralized portal. Include which groups a user would need to request to be able to use a feature. Use the [Get Tenant](#)

[Settings REST API](#) to make the process more efficient, and to create snapshots of the settings on a regular basis.

- ✓ **Customize the *Get Help* links:** When user resources are established, as described in the [Mentoring and user enablement](#) article, update the [tenant setting](#) to customize the links under the *Get Help* menu option. It will direct users to your documentation, community, and help.

Improve management of user machines and devices:

- ✓ **Create a consistent onboarding process:** Review your process for how onboarding of new content creators is handled. Determine if new requests for software, such as Power BI Desktop, and user licenses (Free, Pro, or PPU) can be handled together. It can simplify onboarding since new content creators won't always know what to ask for.
- ✓ **Handle user machine updates:** Ensure an automated process is in place to install and update software, drivers, and settings to ensure all users have the same version.

Data architecture planning:

- ✓ **Assess what your end-to-end data architecture looks like:** Make sure you're clear on:
 - How Fabric is currently used by the different business units in your organization versus how you want Fabric to be used. Determine if there's a gap.
 - If there are any risks that should be addressed.
 - If there are any high-maintenance situations to be addressed.
 - What data sources are important for Fabric users, and how they're documented and discovered.
- ✓ **Review existing data gateways:** Find out what gateways are being used throughout your organization. Verify that gateway administrators and users are set correctly. Verify who is supporting each gateway, and that there's a reliable process in place to keep the gateway servers up to date.
- ✓ **Verify use of personal gateways:** Check the number of personal gateways that are in use, and by whom. If there's significant usage, take steps to move towards use of the standard mode gateway.

Improve management of user licenses:

- ✓ **Review the process to request a user license:** Clarify what the process is, including any prerequisites, for users to obtain a license. Determine whether there are improvements to be made to the process.
- ✓ **Determine how to handle self-service license purchasing:** Clarify whether self-service licensing purchasing is enabled. Update the settings if they don't match your intentions for how licenses can be purchased.

- ✓ **Confirm how user trials are handled:** Verify user license trials are enabled or disabled. Be aware that all user trials are Premium Per User. They apply to Free licensed users signing up for a trial, and Pro users signing up for a Premium Per User trial.

Improve cost management:

- ✓ **Determine your cost management objectives:** Consider how to balance cost, features, usage patterns, and effective utilization of resources. Schedule a routine process to evaluate costs, at least annually.
- ✓ **Obtain activity log data:** Ensure you have access to the activity log data to assist with cost analysis. It can be used to understand who is—or isn't—using the license assigned to them.

Improve security and data protection:

- ✓ **Clarify exactly what the expectations are for data protection:** Ensure the expectations for data protection, such as how to use sensitivity labels, are documented and communicated to users.
- ✓ **Determine how to handle external users:** Understand and document the organizational policies around sharing Fabric content with external users. Ensure that settings in Fabric support your policies for external users.
- ✓ **Set up monitoring:** Investigate the use of Microsoft Defender for Cloud Apps to monitor user behavior and activities in Fabric.

Improve auditing and monitoring:

- ✓ **Plan for auditing needs:** Collect and document the key business requirements for an auditing solution. Consider your priorities for auditing and monitoring. Make key decisions related to the type of auditing solution, permissions, technologies to be used, and data needs. Consult with IT to clarify what auditing processes currently exist, and what preferences of requirements exist for building a new solution.
- ✓ **Consider roles and responsibilities:** Identify which teams will be involved in building an auditing solution, as well as the ongoing analysis of the auditing data.
- ✓ **Extract and store user activity data:** If you aren't currently extracting and storing the raw data, begin retrieving [user activity data](#).
- ✓ **Extract and store snapshots of tenant inventory data:** Begin retrieving metadata to build a [tenant inventory](#), which describes all workspaces and items.
- ✓ **Extract and store snapshots of users and groups data:** Begin retrieving metadata about [users, groups, and service principals](#).
- ✓ **Create a curated data model:** Perform data cleansing and transformations of the raw data to create a curated data model that'll support analytical reporting for your auditing solution.

- ✓ **Analyze auditing data and act on the results:** Create analytic reports to analyze the curated auditing data. Clarify what actions are expected to be taken, by whom, and when.
- ✓ **Include additional auditing data:** Over time, determine whether other auditing data would be helpful to complement the activity log data, such as [security data](#).

💡 Tip

For more information, see [Tenant-level auditing](#).

Use the REST APIs:

- ✓ **Plan for your use of the REST APIs:** Consider what data would be most useful to retrieve from the Power BI REST APIs and the Fabric REST APIs.
- ✓ **Conduct a proof of concept:** Do a small proof of concept to validate data needs, technology choices, and permissions.

Questions to ask



Use questions like those found below to assess system oversight.

- Are there atypical administration settings enabled or disabled? For example, is the entire organization allowed to publish to web (we strongly advise restricting this feature).
- Do administration settings and policies align with, or inhibit, business the way user work?
- Is there a process in place to critically appraise new settings and decide how to set them? Alternatively, are only the most restrictive settings set as a precaution?
- Are Microsoft Entra ID security groups used to manage who can do what?
- Do central teams have visibility of effective [auditing and monitoring](#) tools?
- Do monitoring solutions depict information about the data assets, user activities, or both?
- Are auditing and monitoring tools actionable? Are there clear thresholds and actions set, or do monitoring reports simply describe what's in the data estate?

- Is [Azure Log Analytics](#) used (or planned to be used) for detailed monitoring of Fabric capacities? Are the potential benefits and cost of Azure Log Analytics clear to decision makers?
- Are sensitivity labels and data loss prevention policies used? Are the potential benefits and cost of these clear to decision makers?
- Do administrators know the current number of licenses and licensing cost? What proportion of the total BI spend goes to Fabric capacity, and to Pro and PPU licenses? If the organization is only using Pro licenses for Power BI content, could the number of users and usage patterns warrant a cost-effective switch to Power BI Premium or Fabric capacity?

Maturity levels



The following maturity levels will help you assess the current state of your Power BI system oversight.

Level	State of system oversight
100: Initial	<ul style="list-style-type: none"> Tenant settings are configured independently by one or more administrators based on their best judgment. Architecture needs, such as gateways and capacities, are satisfied on an as-needed basis. However, there isn't a strategic plan. Fabric activity logs are unused, or selectively used for tactical purposes.
200: Repeatable	<ul style="list-style-type: none"> The tenant settings purposefully align with established governance guidelines and policies. All tenant settings are reviewed regularly. A small number of specific administrators are selected. All administrators have a good understanding of what users are trying to accomplish in Fabric, so they're in a good position to support users. A well-defined process exists for users to request licenses and software. Request forms are easy for users to find. Self-service purchasing settings are specified. Sensitivity labels are configured in Microsoft 365. However, use of labels remains inconsistent. The advantages of data protection aren't well understood by users.
300: Defined	<ul style="list-style-type: none"> The tenant settings are fully documented in the centralized portal for users to reference, including how to request access to the correct groups.

Level	State of system oversight
	<ul style="list-style-type: none"> • Cross-training and documentation exist for administrators to ensure continuity, stability, and consistency. • Sensitivity labels are assigned to content consistently. The advantages of using sensitivity labels for data protection are understood by users. • An automated process is in place to export Fabric activity log and API data to a secure location for reporting and auditing.
400: Capable	<ul style="list-style-type: none"> • Administrators work closely with the COE and governance teams to provide oversight of Fabric. A balance of user empowerment and governance is successfully achieved. • Decentralized management of data architecture (such as gateways or capacity management) is effectively handled to balance agility and control. • Automated policies are set up and actively monitored in Microsoft Defender for Cloud Apps for data loss prevention. • Activity log and API data is actively analyzed to monitor and audit Fabric activities. Proactive action is taken based on the data.
500: Efficient	<ul style="list-style-type: none"> • The Fabric administrators work closely with the COE actively stay current. Blog posts and release plans from the Fabric product team are reviewed frequently to plan for upcoming changes. • Regular cost management analysis is done to ensure user needs are met in a cost-effective way. • The Fabric REST API is used to retrieve tenant setting values on a regular basis. • Activity log and API data is actively used to inform and improve adoption and governance efforts.

Next steps

For more information about system oversight and Fabric administration, see the following resources.

- [Administer Microsoft Fabric](#)
- [Administer Power BI - Part 1](#)
- [Administer Power BI - Part 2](#)
- [Administrator in a Day Training – Day 1 ↗](#)
- [Administrator in a Day Training – Day 2 ↗](#)

- Power BI security whitepaper
- External guest users whitepaper
- Planning a Power BI enterprise deployment whitepaper ↗

In the [next article](#) in the Microsoft Fabric adoption roadmap series, learn about effective change management.

Microsoft Fabric adoption roadmap: Change management

Article • 11/14/2023

ⓘ Note

This article forms part of the *Microsoft Fabric adoption roadmap* series of articles. For an overview of the series, see [Microsoft Fabric adoption roadmap](#).

When working toward improved data and business intelligence (BI) adoption, you should plan for effective *change management*. In the context of data and BI, change management includes procedures that address the impact of change for people in an organization. These procedures safeguard against disruption and productivity loss due to changes in solutions or processes.

ⓘ Note

Effective change management is particularly important when you [migrate to Power BI](#).

Effective change management improves adoption and productivity because it:

- Helps content creators and consumers use analytics more effectively and sooner.
- Limits redundancy in data, analytical tools, and solutions.
- Reduces the likelihood of risk-creating behaviors that affect shared resources (like Fabric capacity) or organizational compliance (like data security and privacy).
- Mitigates resistance to change that obstructs planning and inhibits user adoption.
- Mitigates the impact of change and improving user wellbeing by reducing the potential for disruption, stress, and conflict.

Effective change management is critical for successful adoption at all levels. To successfully manage change, consider the key actions and activities described in the following sections.

ⓘ Important

Change management is a fundamental obstacle to success in many organizations. Effective change management requires that you understand that it's about people—not tools or processes.

Successful change management involves empathy and communication. Ensure that change isn't forced or resistance to change is ignored, because it can widen organizational divides and further inhibit effectiveness.

💡 Tip

Whenever possible, we recommend that you describe and promote change as *improvement*—it's much less threatening. For many people, *change* implies a cost in terms of effort, focus, and time. Alternatively, *improvement* means a benefit because it's about making something better.

Types of change to manage

When implementing data and BI solutions, you should manage different types of change. Also, depending on the scale and scope of your implementation, you should address different aspects of change.

Consider the following types of change to manage when you plan for Fabric adoption.

Process-level changes

Process-level changes are changes that affect a broader user community or the entire organization. These changes typically have a larger impact, and so they require more effort to manage. Specifically, this change management effort includes specific plans and activities.

Here are some examples of process-level changes.

- Change from centralized to decentralized approaches to ownership (change in [content ownership and management](#)).
- Change from enterprise to departmental, or from team to personal content delivery (change in [content delivery scope](#)).
- Change of central team structure (for example, forming a [Center of Excellence](#)).
- Changes in [governance](#) policies.
- [Migration](#) from other analytics products to Fabric, and the changes this migration involves, like:
 - The [separation of semantic models and reports](#), and a model-based approach to analytics.
 - Transitioning from exports or static reports to interactive analytical reports, which can involve filtering and cross-filtering.

- Moving from distributing reports as PowerPoint files or flat files to accessing reports directly from the Fabric portal.
- Shifting from information in tables, paginated reports, and spreadsheets to interactive visualizations and charts.
- Changing from an on-premises or platform as a service (PaaS) platform to a software as a service (SaaS) tool.

 **Note**

Typically, giving up export-based processes or Excel reporting is a significant challenge. That's because these methods are usually deeply engrained in the organization and are tied to the autonomy and data skills of your users.

Solution-level changes

Solution-level changes are changes that affect a single solution or set of solutions. These changes limit their impact to the user community of those solutions and their dependent processes. Although solution-level changes typically have a lower impact, they also tend to occur more frequently.

 **Note**

In the context of this article, a *solution* is built to address specific business needs for users. A solution can take many forms, such as a data pipeline, a lakehouse, a semantic model, or a report. The considerations for change management described in this article are relevant for all types of solutions, and not only reporting projects.

Here are some examples of solution-level changes.

- Changes in calculation logic for KPIs or measures.
- Changes in how master data or hierarchies for business attributes are mapped, grouped, or described.
- Changes in data freshness, detail, format, or complexity.
- Introduction of advanced analytics concepts, like predictive analytics or prescriptive analytics, or general statistics (if the user community isn't familiar with these concepts, already).
- Changes in the presentation of data, like:
 - Styling, colors, and other formatting choices for visuals.
 - The type of visualization.

- How data is grouped or summarized (such as changing from different measures of central tendency, like average, median, or geometric mean).
- Changes in how content consumers interact with data (like connecting to a [shared semantic model](#) instead of exporting information for [personal usage scenarios](#)).

How you prepare change management plans and activities will depend on the types of change. To successfully and sustainably manage change, we recommend that you implement incremental changes.

Address change incrementally

Change management can be a significant undertaking. Taking an incremental approach can help you facilitate change in a way that's sustainable. To adopt an incremental approach, you identify the highest priority changes and break them into manageable parts, implementing each part with iterative phases and action plans.

The following steps outline how you can incrementally address change.

- 1. Define what's changing:** Describe the change by outlining the before and after states. Clarify the specific parts of the process or situation that you'll change, remove, or introduce. Justify why this change is necessary, and when it should occur.
- 2. Describe the impact of the change:** For each of these changes, estimate the business impact. Identify which processes, teams, or individuals the change affects, and how disruptive it will be for them. Also consider any downstream effects the change has on other dependent solutions or processes. Downstream effects might result in other changes. Additionally, consider how long the situation remained the same before it was changed. Changes to longer-standing processes tend to have a higher impact, as preferences and dependencies arise over time.
- 3. Identify priorities:** Focus on the changes with the highest potential impact. For each change, outline a more detailed description of the changes and how it will affect people.
- 4. Plan how to incrementally implement the change:** Identify whether any high-impact changes can be broken into stages or parts. For each part, describe how it might be incrementally implemented in phases to limit its impact. Determine whether there are any constraints or dependencies (such as when changes can be made, or by whom).
- 5. Create an action plan for each phase:** Plan the actions you will take to implement and support each phase of the change. Also, plan for how you can mitigate disruption in high-impact phases. Be sure to include a rollback plan in your action plan, whenever possible.

💡 Tip

Iteratively plan how you'll implement each phase of these incremental changes as part of your quarterly **tactical planning**.

When you plan to mitigate the impact of changes on Power BI adoption, consider the activities described in the following sections.

Effectively communicate change

Ensure that you clearly and concisely describe planned changes for the user community. Important communication should originate from the executive sponsor, or another leader with relevant authority. Be sure to communicate the following details.

- **What's changing:** What the situation is now and what it will be after the change.
- **Why it's changing:** The benefit and value of the change for the audience.
- **When it's changing:** An estimation of when the change will take effect.
- **Further context:** Where people can go for more information.
- **Contact information:** Who people should contact provide feedback, ask questions, or raise concerns.

Consider maintaining a history of communications in your [centralized portal](#). That way, it's easy to find communications, timings, and details of changes after they've occurred.

ⓘ Important

You should communicate change with sufficient advanced notice so that people are prepared. The higher the potential impact of the change, the earlier you should communicate it. If unexpected circumstances prevent advance notice, be sure to explain why in your communication.

Plan training and support

Changes to tools, processes, and solutions typically require training to use them effectively. Additionally, extra support might be required to address questions or respond to support requests.

Here are some actions you can take to plan for training and support.

- Centralize training and support by using a [centralized portal](#). The portal can help organize discussions, collect feedback, and distribute training materials or

documentation by topic.

- Consider [incentives](#) to encourage self-sustaining support within a community.
- Schedule recurring [office hours](#) to answer questions and provide mentorship.
- Create and demonstrate end-to-end scenarios for people to practice a new process.
- For high-impact changes, prepare training and support plans that realistically assess the effort and actions needed to prevent the change from causing disruption.

Note

These training and support actions will differ depending on the scale and scope of the change. For high-impact, large-scale changes (like transitioning from enterprise to managed self-service approaches to data and BI), you'll likely need to plan iterative, multi-phase plans that span multiple planning periods. In this case, carefully consider the effort and resources needed to deliver success.

Involve executive leadership

Executive support is critical to effective change management. When an executive supports a change, it demonstrates its strategic importance or benefit to the rest of the organization. This top-down endorsement and reinforcement is particularly important for high-impact, large-scale changes, which have a higher potential for disruption. For these scenarios, ensure that you actively engage and involve your [executive sponsor](#) to endorse and reinforce the change.

Caution

Resistance to change from the executive leadership is often a warning sign that stronger **business alignment** is needed between the business and BI strategies. In this scenario, consider specific alignment sessions and change management actions with executive leadership.

Involve stakeholders

To effectively manage change, you can also take a bottom-up approach by engaging the stakeholders, who are the people the change affects. When you create an action plan to address the changes, identify and engage key stakeholders in focused, limited sessions. In this way you can understand the impact of the change on the people whose work will

be affected by the change. Take note of their concerns and their ideas for how you might lessen the impact of this change. Ensure that you identify any potentially unexpected effects of the change on other people and processes.

Handle resistance to change

It's important to address resistance to change, as it can have substantial negative impacts on adoption and productivity. When you address resistance to change, consider the following actions and activities.

- **Involve your executive sponsor:** The authority, credibility, and influence of the executive sponsor is essential to support change management and resolve disputes.
- **Identify blocking issues:** When change disrupts the way people work, this change can prevent people from effectively completing tasks in their regular activities. For such blocking issues, identify potential workarounds when you take into account the changes.
- **Focus on data and facts instead of opinions:** Resistance to change is sometimes due to opinions and preferences, because people are familiar with the situation prior to the change. Understand why people have these opinions and preferences. Perhaps it's due to convenience, because people don't want to invest time and effort in learning new tools or processes.
- **Focus on business questions and processes instead of requirements:** Changes often introduce new processes to address problems and complete tasks. New processes can lead to a resistance to change because people focus on what they miss instead of fully understanding what's new and why.

Additionally, you can have a significant impact on change resistance by engaging *promoters* and *detractors*.

Identify and engage promoters

Promoters are vocal, credible individuals in a user community who advocate in favor of a tool, solution, or initiative. Promoters can have a positive impact on adoption because they can influence peers to understand and accept change.

To effectively manage change, you should identify and engage promoters early in the process. You should involve them and inform them about the change to better utilize and amplify their advocacy.

 Tip

The promoters you identify might also be great candidates for your **champions network**.

Identify and engage detractors

Detractors are the opposite of promoters. They are vocal, credible individuals in a user community who advocate against a tool, solution, or initiative. Detractors can have a significant negative influence on adoption because they can convince peers that the change isn't beneficial. Additionally, detractors can advocate for alternative or solutions marked for retirement, making it more difficult to decommission old tools, solutions, or processes.

To effectively manage change, you should identify and engage detractors early in the process. That way, you can mitigate the potential negative impact they have. Furthermore, if you address their concerns, you might convert these detractors into promoters, helping your adoption efforts.

Tip

A common source of detractors is content owners for solutions that are going to be modified or replaced. The change can sometimes threaten these content owners, who are incentivized to resist the change in the hope that their solution will remain in use. In this case, identify these content owners early and involve them in the change. Giving these individuals a sense of ownership of the implementation will help them embrace, and even advocate in favor, of the change.

Questions to ask



Use questions like those found below to assess change management.

- Is there a role or team responsible for change management in the organization? If so, how are they involved in data and BI initiatives?
- Is change seen as an obstacle to achieving strategic success among people in the organization? Is the importance of change management acknowledged in the

organization?

- Are there any significant promoters for data and BI solutions and processes in the user community? Conversely, are there any significant detractors?
- What communication and training efforts are performed to launch new data tools and solutions? How long do they last?
- How is change in the user community handled (for example, with new hires or promoted individuals)? What onboarding activities introduce these new individuals to existing solutions, processes, and policies?
- Do people who create Excel reports feel threatened or frustrated by initiatives to automate reporting with BI tools?
- To what extent do people associate their identities with the tools they use and the solutions they have created and own?
- How are changes to existing solutions planned and managed? Are changes planned, with a visible roadmap, or are they reactive? Do people get sufficient notification about upcoming changes?
- How frequently do changes disrupt existing processes and tools?
- How long does it take to decommission legacy systems or solutions when new ones become available? How long does it take to implement changes to existing solutions?
- To what extent do people agree with the statement *I am overwhelmed with the amount of information I am required to process*? To what extent do people agree with the sentiment *things are changing too much, too quickly*?

Maturity levels



An assessment of change management evaluates how effectively the organization can enact and respond to change.

The following maturity levels will help you assess your current state of change management, as it relates to data and BI initiatives.

Level	State of change management
100: Initial	<ul style="list-style-type: none">• Change is usually reactive, and it's also poorly communicated and communicated.• The purpose or benefits of change aren't well understood, and resistance to change causes conflict and disruption.

Level	State of change management
	<ul style="list-style-type: none"> No clear teams or roles are responsible for managing change for data initiatives.
200: Repeatable	<ul style="list-style-type: none"> Executive leadership and decision makers recognize the need for change management in data and BI projects and initiatives. Some efforts are taken to plan or communicate change, but they're inconsistent and often reactive. Resistance to change is still common. Change often disrupts existing processes and tools.
300: Defined	<ul style="list-style-type: none"> Formal change management plans or roles are in place. These plans include communication tactics and training, but they're not consistently or reliably followed. Change occasionally disrupts existing processes and tools. Successful change management is championed by key individuals that bridge organizational boundaries.
400: Capable	<ul style="list-style-type: none"> Empathy and effective communication are integral to change management strategies. Change management efforts are owned by particular roles or teams, and effective communication results in a clear understanding of the purpose and benefits of change. Change rarely interrupts existing processes and tools.
500: Efficient	<ul style="list-style-type: none"> Change is an integral part of the organization. People in the organization understand the inevitability of change, and see it as a source for momentum instead of disruption. Change almost never unnecessarily interrupts existing processes or tools. Systematic processes address change as a challenge of people and not processes.

Next steps

In the [next article](#) in the Microsoft Fabric adoption roadmap series, in conclusion, learn about adoption-related resources that you might find valuable.

Microsoft Fabric adoption roadmap conclusion

Article • 01/16/2024

ⓘ Note

This article forms part of the *Microsoft Fabric adoption roadmap* series of articles. For an overview of the series, see [Microsoft Fabric adoption roadmap](#).

This article concludes the series on Microsoft Fabric adoption. The strategic and tactical considerations and action items presented in this series will assist you in your analytics adoption efforts, and with creating a productive data culture in your organization.

This series covered the following aspects of Fabric adoption.

- Adoption introduction
- Adoption maturity levels
- Data culture
- Executive sponsorship
- Business alignment
- Content ownership and management
- Content delivery scope
- Center of Excellence
- Governance
- Mentoring and enablement
- Community of practice
- User support
- System oversight
- Change management

The rest of this article includes suggested next actions to take. It also includes other adoption-related resources that you might find valuable.

Next actions to take

It can be overwhelming to decide where to start. The following series of steps provides a process to help you approach your next actions.

1. **Learn:** First, read this series of articles end-to-end. Become familiar with the strategic and tactical considerations and action items that directly lead to successful analytics adoption. They'll help you to build a data culture in your organization. Discuss the concepts with your colleagues.
2. **Assess current state:** For each area of the adoption roadmap, assess your current state. Document your findings. Your goal is to have full clarity on where you're now so that you can make informed decisions about what to do next.
3. **Clarify your strategic goals:** Ensure that you're clear on what your organization's goals are for adopting Fabric. Confirm that your adoption and data culture goals align with your organization's broader strategic goals for the use of data, analytics, and business intelligence (BI) in general. Focus on what your immediate strategy is for the next 3-12 months. For more information about defining your goals, see the [strategic planning](#) article.
4. **Prioritize:** Clarify what's most important to achieve in the next 12-18 months. For instance, you might identify specific user enablement or risk reduction areas that are a higher priority than other areas. Determine which advancements in maturity levels you should prioritize first. For more information about defining your priorities, see the [strategic planning](#) article.
5. **Identify future state:** For each area of the roadmap, identify the gaps between what you want to happen (your future state) and what's happening (your current state). Focus on the next 12-18 months for identifying your desired future state.
6. **Customize maturity levels:** Using the information you have on your strategy and future state, customize the maturity levels for each area of the roadmap. Update or delete the description for each maturity level so that they're realistic, based on your goals and strategy. Your current state, priorities, staffing, and funding will influence the time and effort it will take to advance to higher maturity levels.
7. **Define measurable objectives:** Create KPIs (key performance indicators) or OKRs (objectives and key results) to define specific goals for the next quarter. Ensure that the objectives have clear owners, are measurable, time-bound, and achievable. Confirm that each objective aligns with your strategic BI goals and priorities.
8. **Create tactical plans:** Add specific action items to your project plan. Action items will identify who will do what, and when. Include short, medium, and longer-term (backlog) items in your project plan to make it easy to track and reprioritize.
9. **Track action items:** Use your preferred project planning software to track continual, incremental progress of your action items. Summarize progress and status every quarter for your executive sponsor.
10. **Adjust:** As new information becomes available—and as priorities change—reevaluate and adjust your focus. Reexamine your strategic goals, objectives, and action items once a quarter so you're certain that you're focusing on the right actions.

11. **Celebrate:** Pause regularly to appreciate your progress. Celebrate your wins.
Reward and recognize people who take the initiative and help achieve your goals.
Encourage healthy partnerships between IT and the different areas of the business.
12. **Repeat:** Continue learning, experimenting, and adjusting as you progress with your implementation. Use feedback loops to continually learn from everyone in the organization. Ensure that continual, gradual, improvement is a priority.

A few important key points are implied within the previous suggestions.

- **Focus on the near term:** Although it's important to have an eye on the big picture, we recommend that you focus primarily on the next quarter, next semester, and next year. It's easier to assess, plan, and act when you focus on the near term.
- **Progress will be incremental:** Changes that happen every day, every week, and every month add up over time. It's easy to become discouraged and sense a lack of progress when you're working on a large adoption initiative that takes time. If you keep track of your incremental progress, you'll be surprised at how much you can accomplish over the course of a year.
- **Changes will continually happen:** Be prepared to reconsider decisions that you make, perhaps every quarter. It's easier to cope with continual change when you expect the plan to change.
- **Everything correlates together:** As you progress through each of the steps listed above, it's important that everything's correlated from the high-level strategic organizational objectives, all the way down to more detailed action items. That way, you'll know that you're working on the right things.

Power BI implementation planning

Successfully implementing analytics throughout the organization requires deliberate thought and planning. The [Power BI implementation planning](#) series of articles, which is a work in progress, is intended to complement the Microsoft Fabric adoption roadmap. It includes key considerations, actions, decision-making criteria, recommendations, and it describes implementation patterns for important common usage scenarios.

Power BI adoption framework

The [Power BI adoption framework](#) describes additional aspects of *how* to adopt Power BI in more detail. The original intent of the framework was to support Microsoft partners with a lightweight set of resources for use when helping their customers deploy and adopt Power BI.

The framework can augment this Microsoft Fabric adoption roadmap series. The roadmap series focuses on the *why* and *what* of adopting Fabric, more so than the *how*.

ⓘ Note

When completed, the Power BI implementation planning series (described in the previous section) will replace the Power BI adoption framework.

Microsoft's BI transformation

Consider reading about [Microsoft's journey and experience with driving a data culture](#). This article describes the importance of two terms: *discipline at the core* and *flexibility at the edge*. It also shares Microsoft's views and experience about the importance of establishing a COE.

Power Platform adoption

The Power Platform team has an excellent set of adoption-related content. Its primary focus is on Power Apps, Power Automate, and Power Virtual Agents. Many of the ideas presented in this content can be applied to Power BI also.

The [Power CAT Adoption Maturity Model](#), published by the Power CAT team, describes repeatable patterns for successful Power Platform adoption.

The [Power Platform Center of Excellence Starter Kit](#) is a collection of components and tools to help you develop a strategy for adopting and supporting Microsoft Power Platform.

The [Power Platform adoption best practices](#) includes a helpful set of documentation and best practices to help you align business and technical strategies.

The [Power Platform adoption framework](#) is a community-driven project with excellent resources on adoption of Power Platform services at scale.

Microsoft 365 and Azure adoption

You might also find useful adoption-related guidance published by other Microsoft technology teams.

- The [Maturity Model for Microsoft 365](#) provides information and resources to use capabilities more fully and efficiently.

- Microsoft Learn has a learning path for [using the Microsoft service adoption framework to drive adoption in your enterprise](#).
- The [Microsoft Cloud Adoption Framework for Azure](#) is a collection of documentation, implementation guidance, best practices, and tools to accelerate your cloud adoption journey.

A wide variety of other adoption guides for individual technologies can be found online. A few examples include:

- [Microsoft Teams adoption guide](#).
- [Microsoft Security and Compliance adoption guide](#).
- [SharePoint Adoption Resources](#).

Industry guidance

The [Data Management Book of Knowledge](#) (DMBOK2) is a book available for purchase from DAMA International. It contains a wealth of information about maturing your data management practices.

 Note

The additional resources provided in this article aren't required to take advantage of the guidance provided in this Fabric adoption series. They're reputable resources should you wish to continue your journey.

Partner community

Experienced partners are available to help your organization succeed with adoption initiatives. To engage a partner, visit the [Power BI partner portal](#).

Fabric known issues

Article • 11/11/2024

This page lists known issues for Fabric and Power BI features. Before submitting a Support request, review this list to see if the issue that you're experiencing is already known and being addressed. Known issues are also available as an [interactive embedded Power BI report](#).

For service level outages or degradation notifications, check <https://support.fabric.microsoft.com/>.

Currently active known issues

Select the **Title** to view more information about that specific known issue.

[+] [Expand table](#)

Issue ID	Product experience	Title	Issues publish date
923	Power BI	Tenant migrations paused through January 2025	November 8, 2024
919	Power BI	Embedded paginated report renders correctly but shows error message	November 7, 2024
918	Power BI	More options menu on a visual doesn't open in unsaved reports	November 7, 2024
916	Power BI	Visual doesn't load due to an unexpected error	November 7, 2024
910	Data Warehouse	SQL analytics endpoint tables lose statistics	October 31, 2024
909	Data Warehouse	SQL analytics endpoint tables lose permissions	October 31, 2024
902	Power BI	INFO.VIEW.MEASURES() in calculated table might cause errors	October 31, 2024
903	Data Warehouse	Data warehouse data preview might fail if multiple data warehouse items	October 28, 2024
898	OneLake	External data sharing OneLake shortcuts don't show in SQL analytics endpoint	October 25, 2024

Issue ID	Product experience	Title	Issues publish date
897	OneLake	OneLake Shared Access Signature (SAS) can't read cross-region shortcuts	October 25, 2024
894	Data Engineering	Pipeline fails when getting a token to connect to Kusto	October 25, 2024
895	OneLake	Dataverse shortcut creation and read fails when organization is moved	October 23, 2024
893	Power BI	Can't connect to semantic model from Excel or use Analyze in Excel	October 23, 2024
891	Data Warehouse	Data warehouse tables aren't accessible or updatable	October 17, 2024
883	Data Engineering	Spark jobs might fail due to Runtime 1.3 updates for GA	October 17, 2024
878	Power BI	Premium capacity doesn't add excess usage into carry forward	October 10, 2024
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872	Data Warehouse	Data warehouses don't show button friendly names	October 3, 2024
865	Power BI	Configure workspace storage to use ADLS Gen2 storage account doesn't work	October 3, 2024
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844	Power BI	Intermittent refresh failure through on-premises data gateway	September 25, 2024
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Issue ID	Product experience	Title	Issues publish date
837	Data Engineering	Monitoring hub displays incorrect queued duration	September 17, 2024
835	Data Engineering	Managed private endpoint connection could fail	September 13, 2024
823	Data Warehouse	Concurrent stored procedures block each other in data warehouse	September 4, 2024
821	Data Warehouse	Schema refresh for a data warehouse's semantic model fails	August 28, 2024
817	Data Factory	Pipelines don't support Role property for Snowflake connector	August 23, 2024
816	Data Factory	Pipeline deployment fails when parent contains deactivated activity	August 23, 2024
810	Data Warehouse	Inserting nulls into Data Warehouse tables fail with incorrect error message	August 16, 2024
809	Data Factory	Dataflow Gen2 refresh fails due to missing SQL analytics endpoint	August 14, 2024
808	Power BI	Custom visuals are blurry in zoomed in or out Microsoft Edge (Chromium) browser	August 14, 2024
800	Data Engineering	Teaching bubble blocks Lakehouse explorer context menu from opening	July 31, 2024
797	Data Engineering	Localization blocks operations in a lakehouse	July 31, 2024
795	Data Factory	Multiple installations of on-premises data gateway causes pipelines to fail	July 31, 2024
789	Data Engineering	SQL analytics endpoint table queries fail due to RLE	July 24, 2024
774	Data Factory	Data warehouse deployment using deployment pipelines fails	July 5, 2024
769	Data Factory	Dataflows Gen2 staging lakehouse doesn't work in deployment pipelines	July 2, 2024
767	Data Warehouse	SQL analytics endpoint table sync fails when table contains linked functions	July 2, 2024

Issue ID	Product experience	Title	Issues publish date
765	Data Factory	Dataflows Gen2 staging warehouse doesn't work in deployment pipelines	July 2, 2024
757	Data Factory	Copy activity from Oracle to lakehouse fails for Number data type	June 20, 2024
732	Data Engineering	Shortcut creation on a lakehouse preview table takes long time	May 31, 2024
726	Data Factory	Pipeline using XML format copy gets stuck	May 24, 2024
723	Data Warehouse	Azure SQL Database change data doesn't propagate to mirror	May 24, 2024
728	Data Engineering	Environment doesn't work when runtime version is changed to Runtime 1.1	May 23, 2024
717	Data Factory	West India region doesn't support on-premises data gateway for data pipelines	May 16, 2024
718	OneLake	OneLake under-reports transactions in the Other category	May 13, 2024
716	Data Warehouse	Response times when composing SQL queries slower than expected	May 13, 2024
702	Data Factory	SQL database mirror doesn't start when you create connection during mirror creation	May 1, 2024
647	Data Engineering	Library management updates with public python libraries time-out	March 14, 2024
641	Power BI	Visuals using the Denodo connector might show connection errors	March 5, 2024
640	Power BI	Microsoft Defender detects OpenSSL vulnerabilities in Power BI Desktop	March 5, 2024
643	Data Engineering	Tables not available to add in Power BI semantic model	February 27, 2024
591	Data Factory	Type mismatch when writing decimals and dates to lakehouse using a dataflow	February 16, 2024
618	Data Warehouse	Using an inactive SQL analytics endpoint can show old data	February 14, 2024
563	Data Engineering	Lakehouse doesn't recognize table names with special characters	November 22, 2023

Issue ID	Product experience	Title	Issues publish date
508	Data Warehouse	User column incorrectly shows as System in Fabric capacity metrics app	October 5, 2023
506	Data Warehouse	InProgress status shows in Fabric capacity metrics app for completed queries	October 5, 2023
454	Data Warehouse	Warehouse's object explorer doesn't support case-sensitive object names	July 10, 2023
447	Data Warehouse	Temp tables in Data Warehouse and SQL analytics endpoint	July 5, 2023

Recently closed known issues

Select the **Title** to view more information about that specific known issue. Known issues are organized in descending order by fixed date. Fixed issues are retained for at least 46 days.

[\[+\] Expand table](#)

Issue ID	Product experience	Title	Issues publish date	Issue fixed date
822	Data Warehouse	SQL queries fail intermittently	August 28, 2024	Fixed: November 11, 2024
818	Data Warehouse	Edit tables for a data warehouse's semantic model doesn't work	August 23, 2024	Fixed: November 11, 2024
770	Data Warehouse	Data warehouse connection or query execution fails	July 3, 2024	Fixed: November 11, 2024
592	Data Warehouse	Relationships in the default semantic model get dropped	January 8, 2024	Fixed: November 11, 2024
529	Data Warehouse	Data warehouse with more than 20,000 tables fails to load	October 23, 2023	Fixed: November 11, 2024
866	Power BI	Can't add My workspace org app items to the org app	September 30, 2024	Fixed: November 8, 2024

Issue ID	Product experience	Title	Issues publish date	Issue fixed date
				2024
836	Power BI	Copilot in DAX query view returns DAX query with syntax error	September 13, 2024	Fixed: November 8, 2024
715	Power BI	TMDL semantic models won't open in Desktop after web edited	May 2, 2024	Fixed: November 8, 2024
667	Power BI	Upload reports from OneDrive or SharePoint fails	April 1, 2024	Fixed: November 8, 2024
811	Data Engineering	Fabric Runtime 1.3 causes invalid libraries	August 16, 2024	Fixed: November 7, 2024
658	Data Engineering	PySpark import statements fail for jar files installed through environment	March 28, 2024	Fixed: November 7, 2024
911	Power BI	Can't edit paginated reports in Report Builder when opened from service	October 30, 2024	Fixed: November 5, 2024
892	OneLake	Data warehouse not accessible when using OneLake URLs with friendly names	October 18, 2024	Fixed: November 5, 2024
828	Power BI	Edit tables dialog doesn't load when reloading a Direct Lake semantic model	September 4, 2024	Fixed: November 5, 2024
597	Data Factory	Dataflow Gen1 admin switch affects Dataflow Gen2	November 6, 2023	Fixed: November 5, 2024
873	OneLake	Write to shortcut destination using workspace identity fails	September 30, 2024	Fixed: October 31, 2024
887	Power BI	Semantic model refresh fails due to circular dependency in calendar table	October 17, 2024	Fixed: October 25, 2024
862	Power BI	Unexpected changes in fonts or themes in reports	September 30, 2024	Fixed: October 17, 2024

Issue ID	Product experience	Title	Issues publish date	Issue fixed date
867	Power BI	Report pages don't show in Fabric org app items	September 30, 2024	Fixed: October 15, 2024
859	Power BI	Dynamic subscriptions don't send emails to recipients	September 27, 2024	Fixed: October 15, 2024
858	Power BI	Live connection to semantic models created by template apps fails	September 27, 2024	Fixed: October 15, 2024
807	Data Warehouse	Mirroring for Azure Cosmos DB fails when you create a new container	August 14, 2024	Fixed: October 15, 2024
796	Data Warehouse	Mirroring for Azure Cosmos DB fails	August 6, 2024	Fixed: October 15, 2024
850	Power BI	PostgreSQL data source connections additions or updates fail	September 23, 2024	Fixed: October 9, 2024
839	Power BI	Dynamics 365 Business Central connector causes refresh failures	September 17, 2024	Fixed: October 9, 2024
825	Power BI	Paginated report cascading parameters with default values aren't set as expected	September 4, 2024	Fixed: October 9, 2024
778	Power BI	Direct Lake semantic model table changes don't work	July 16, 2024	Fixed: October 9, 2024
708	Data Warehouse	SQL analytics endpoint and semantic model are orphaned when a lakehouse is deleted	May 1, 2024	Fixed: October 3, 2024
840	Power BI	Excel enterprise data types feature experiences issues	September 17, 2024	Fixed: September 26, 2024

Related content

- Go to the embedded interactive report version of this page ↗
- Service level outages ↗
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Known issue - Tenant migrations paused through January 2025

Article • 11/08/2024

Cross-region tenant migrations are paused through January 15, 2025. New and existing requests aren't processed during this time period.

Status: Open

Product Experience: Power BI

Symptoms

New and existing cross-region tenant migration requests aren't processed through January 15, 2025.

Solutions and workarounds

This article will be updated once tenant migrations are resumed.

Next steps

- [About known issues ↗](#)
-

Feedback

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Yes



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Known issue - Embedded paginated report renders correctly but shows error message

Article • 11/07/2024

You can embed a paginated report into an application. When you access the report, you might see an error message pop-up; however, the report renders correctly.

Status: Open

Product Experience: Power BI

Symptoms

You see an error message pop-up when trying to view an embedded paginated report. The error message is similar to: Something went wrong. Unable to render paginated report. Please try rendering your report again.

Solutions and workarounds

You can close the pop-up and continue your regular experience.

Next steps

- [About known issues ↗](#)

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Known issue - More options menu on a visual doesn't open in unsaved reports

Article • 11/07/2024

When you're focused on a Power BI visual, you can select the **More options (...)** button to open the menu. When you select **More options**, the menu doesn't open if the report is unsaved.

Status: Open

Product Experience: Power BI

Symptoms

The **More options** menu doesn't open when you select the button.

Solutions and workarounds

To get access to the **More options** menu on your visuals, save the report and try again.

Next steps

- [About known issues ↗](#)
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Known issue - Visual doesn't load due to an unexpected error

Article • 11/07/2024

You might see errors if you have certain combinations of Data Analysis Expressions (DAX) patterns in your semantic model. Your visuals fail to load and you receive an error.

Status: Open

Product Experience: Power BI

Symptoms

When you try to use certain combinations of DAX patterns, visuals fail to load with an error. The error message is similar to: `Unexpected error occurred`.

Solutions and workarounds

No workarounds at this time. This article will be updated when the fix is released.

Next steps

- [About known issues](#)
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Known issue - SQL analytics endpoint tables lose statistics

Article • 10/31/2024

After you successfully sync your tables in your SQL analytics endpoint, the statistics get dropped.

Status: Open

Product Experience: Data Warehouse

Symptoms

Statistics created on the SQL analytics endpoint tables aren't available after a successful sync between the lakehouse and the SQL analytics endpoint.

Solutions and workarounds

The behavior is currently expected for the tables after a schema change. You need to recreate the statistics or allow the auto statistics to run when necessary.

Next steps

- [About known issues ↗](#)
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Known issue - SQL analytics endpoint tables lose permissions

Article • 10/31/2024

After you successfully sync your tables in your SQL analytics endpoint, the permissions get dropped.

Status: Open

Product Experience: Data Warehouse

Symptoms

Permissions applied to the SQL analytics endpoint tables aren't available after a successful sync between the lakehouse and the SQL analytics endpoint.

Solutions and workarounds

The behavior is currently expected for the tables after a schema change. You need to reapply the permissions after a successful sync to the SQL analytics endpoint.

Next steps

- [About known issues ↗](#)

Feedback

Was this page helpful?



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Known issue - INFO.VIEW.MEASURES() in calculated table might cause errors

Article • 10/31/2024

You can add the Data Analysis Expressions (DAX) function INFO.VIEW.MEASURES() to a calculated table in a semantic model. In some cases, an error happens when you create the calculated table. Other times, after the table is in the model, you might receive an error when you remove other tables. The issue is more likely to happen on semantic models that have a calculation group that includes a dynamic format string in one or more calculation items.

Status: Open

Product Experience: Power BI

Symptoms

You either try to create a calculated table that contains INFO.VIEW.MEASURES() or you try to delete a table where another calculated table in the semantic model contains INFO.VIEW.MEASURES(). You receive an error message similar to: An unexpected exception occurred.

Solutions and workarounds

To delete the table, remove the calculated table that contains INFO.VIEW.MEASURES().

Next steps

- [About known issues ↗](#)

Feedback

Was this page helpful?

 Yes

 No

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Known issue - Can't edit paginated reports in Report Builder when opened from service

Article • 11/05/2024

When you try to edit a paginated report in a workspace by selecting **Edit in Power BI Report Builder** from the item menu, the browser offers the choice of opening the link in Power BI Report Builder (or download it, if it's not installed). The change is due to a [recent change in Chromium ↗](#).

Status: Fixed: November 5, 2024

Product Experience: Power BI

Symptoms

When you let the browser open the link, an error dialog is displayed. The error message is similar to: `Unable to connect to the server that is specified in the URL.`
`'https://app.powerbi.com/....`

Solutions and workarounds

Instead of opening the report from the Power BI portal, open it directly from Power BI Report Builder. You can open it directly by using **File > Open > Power BI Service**.

Next steps

- [About known issues ↗](#)

Feedback

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Yes



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Known issue - Data warehouse data preview might fail if multiple data warehouse items

Article • 10/29/2024

The data warehouse data preview in the user experience might fail if there's more than one data warehouse item in the Object Explorer.

Status: Open

Product Experience: Data Warehouse

Symptoms

The data preview fails with error: `Unable to execute the SQL request.`

Solutions and workarounds

As a workaround, use T-SQL queries instead of the data preview in the data warehouse user experience.

Next steps

- [About known issues ↗](#)
-

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Known issue - External data sharing OneLake shortcuts don't support blob specific APIs

Article • 10/25/2024

External data sharing OneLake shortcuts don't support blob specific APIs

You can set up external data sharing using OneLake shortcuts. The shortcut tables show in the shared tenant in the lakehouse, but don't show in the SQL analytics endpoint. Additionally, if you try to use a blob-specific API to access the OneLake shortcut involved in the external data share, the API call fails.

Status: Open

Product Experience: OneLake

Symptoms

If you're using external data sharing, table discovery in the SQL analytics endpoint doesn't work due to an underlying dependency on blob APIs. Additionally, blob APIs on a path containing the shared OneLake shortcut returns a partial response or error.

Solutions and workarounds

There's no workaround for the SQL analytics endpoint table discovery not working. As a workaround for the blob API failures, use a [DFS alternative for the same activity](#).

Next steps

- [About known issues ↗](#)

Feedback

Was this page helpful?

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Known issue - OneLake Shared Access Signature (SAS) can't read cross-region shortcuts

Article • 10/25/2024

You can't read a cross-region shortcut with a OneLake shared access signature (SAS).

Status: Open

Product Experience: OneLake

Symptoms

You receive a 401 Unauthorized error, even if the delegated SAS has the correct permissions to access the shortcut.

Solutions and workarounds

As a workaround, you can read the shortcut from its home region, or authenticate using a Microsoft Entra ID instead of a OneLake SAS.

Next steps

- [About known issues ↗](#)

Feedback

Was this page helpful?

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Known issue - Pipeline fails when getting a token to connect to Kusto

Article • 10/25/2024

You might experience issues while trying to get a token using `mssparkutils.credentials.getToken()` with your cluster URL as the audience when connecting to Kusto using a pipeline.

Status: Open

Product Experience: Data Engineering

Symptoms

You receive a pipeline failure when you try to get the token for Azure Data Explorer.

Solutions and workarounds

Use `mssparkutils.credentials.getToken("kusto")` instead of `mssparkutils.credentials.getToken(cluster_url)`. The code `kusto` is the supported short code for the Kusto audience in `getToken()`.

Next steps

- [About known issues ↗](#)

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Known issue - Dataverse shortcut creation and read fails when organization is moved

Article • 10/24/2024

You can use a shortcut to see data from your Dataverse in a lakehouse. However, when the Dataverse organization is moved to a new storage location, the shortcut stops working.

Status: Open

Product Experience: OneLake

Symptoms

Dataverse shortcut creation/read fails if the underlying Dataverse organization is moved.

Solutions and workarounds

You can work around the issue by deleting and recreating the shortcuts.

Next steps

- [About known issues ↗](#)

Feedback

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 Yes

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Known issue - Can't connect to semantic model from Excel or use Analyze in Excel

Article • 10/24/2024

You can consume Power BI semantic models in Excel by connecting to the semantic model in Excel or choosing the **Analyze in Excel** option from the Power BI service. Either way, when you try to make the connection, you receive an error message and can't properly connect.

Status: Open

Product Experience: Power BI

Symptoms

When you try to connect to a Power BI dataset from Excel or use Analyze in Excel, you receive an error. The error message is similar to [Forbidden Activity](#) or [AAD error](#). It most likely happens if you have [Excel versions 2409 or 2410](#).

Solutions and workarounds

To fix this issue, sign out from all accounts in Excel, then sign in to Excel and try again. Alternatively, you can download a version of Excel earlier 2409 and try again.

Next steps

- [About known issues ↗](#)

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Known issue - Data Warehouse not accessible when using OneLake URLs with friendly names

Article • 11/05/2024

You can try to access files and folders within a data warehouse through an API, Azure Storage Explorer, or another client tool. Due to this issue, the access fails if you try to connect using a friendly name in the OneLake URL. A friendly name contains the name of the data warehouse rather than the data warehouse globally unique identifier (GUID). Examples of URLs that contain friendly names are

`https://onelake.dfs.fabric.microsoft.com//.datawarehouse//` and

`abfs[s]://@onelake.dfs.fabric.microsoft.com/.datawarehouse//`.

Status: Fixed: November 5, 2024

Product Experience: OneLake

Symptoms

When trying to access the content of a data warehouse, you receive an error message similar to: `operation has failed`. For example, in Azure Storage Explorer, you see `No data available` when you try to open a warehouse item.

Solutions and workarounds

Accessing data continues to work with globally unique identifiers (GUIDs) as expected. Use the [GUID process](#) to access data warehouses.

Next steps

- [About known issues ↗](#)

Feedback

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Known issue - Data warehouse tables aren't accessible or updatable

Article • 10/18/2024

You can access data warehouse tables through the SQL analytics endpoint. Due to this known issue, you can't apply changes to the tables. You also see an error marker next to the table and receive an error if you try to access the table. The table sync also doesn't complete as expected.

Status: Open

Product Experience: Data Warehouse

Symptoms

You see a red circle with white 'X' next to the unavailable tables. When you try to access table, you receive an error. The error message is similar to: An internal error has occurred while applying table changes to SQL.

Solutions and workarounds

Update the on-premises data gateway to the October or latest version.

Next steps

- [About known issues ↗](#)

Feedback

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Yes



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Known issue - Semantic model refresh fails due to circular dependency in calendar table

Article • 10/25/2024

You can have a calendar table in your semantic model. Even if you made no changes, the semantic model refresh now fails with a circular dependency error.

Status: Fixed: October 25, 2024

Product Experience: Power BI

Symptoms

Your semantic model refresh fails with an error message. The error message is similar to:
A circular dependency was detected.

Solutions and workarounds

You can mitigate the issue by changing the `CALENDARAUTO` function to the `CALENDAR` function.

Next steps

- [About known issues ↗](#)

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Known issue - Spark jobs might fail due to Runtime 1.3 updates for GA

Article • 10/18/2024

The Microsoft Fabric Runtime 1.3 based on Apache Spark 3.5 went into general availability (GA) on September 23, 2024. Fabric Runtime 1.3 can now be used for production workloads. As part of transitioning from public preview to the general availability stage, we released major built-in library updates to improve functionality, security, reliability, and performance. These updates can affect your Microsoft Fabric environments if you installed libraries or overridden the built-in library version with Runtime 1.3.

Status: Open

Product Experience: Data Engineering

Symptoms

If you installed the environments with libraries with Runtime 1.3, the Spark job starts to fail with an error similar to `Post Personalization failed`. Importing installed custom libraries might fail due to the underlying built-in libraries being updated.

Solutions and workarounds

Reinstall the libraries for Fabric Runtime 1.3 in your Microsoft Fabric environments. The reinstallation builds the new dependency based on the latest updates. If your custom libraries have incompatible dependencies on Python built-in packages, the installation fails and a self debug log is generated with the list of required versions. You can update the dependencies to make your custom libraries compatible. There might be incompatibilities or breaking changes on the existing notebook or pipeline as the underlying Python packages were changed. You need to revisit the code to mitigate.

Next steps

- [About known issues ↗](#)

Feedback

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 Yes

 No

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Known issue - Premium capacity doesn't add excess usage into carry forward

Article • 10/11/2024

In most scenarios, carry forward logic avoids the need to trigger Autoscale for small bursts of usage. Autoscale is only triggered for longer overages as a way to avoid throttling. If you have Power BI Premium, you can set the maximum number of v-cores to use for Autoscale. You don't get any throttling behavior even if your usage is above 100% for a long time.

Status: Open

Product Experience: Power BI

Symptoms

In some cases when you set the maximum number of v-cores to use for Autoscale, you don't see the Autoscale cores triggered as expected. If you face this known issue, you observe the following patterns using the Capacity Metrics App:

- Current usage is clearly higher than the 100% capacity units (CU) line in the Capacity Metrics App
- Little or no overages are added and accumulated during these spikes
- Throttling levels are low and not growing with the overages seen
- Maximum number of v-cores to use for Autoscale is set and active Autoscale isn't reaching it even after long periods higher than average

Solutions and workarounds

No workarounds at this time. This article will be updated when the fix is released.

Next steps

- [About known issues ↗](#)

Feedback

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Known issue - Data pipeline connection fails after connection creator role is removed

Article • 10/09/2024

You might face issues with a connection in a data pipeline in a certain scenario. The scenario is that you add yourself to the connection creator role in an on-premises data gateway. You then create a connection in a data pipeline successfully. Someone removes you from the content creator role. When you try to add and test the same connection, the connection fails, and you receive an error.

Status: Open

Product Experience: Data Factory

Symptoms

When trying to add and test a connection in a data pipeline that uses an on-premises data gateway, you receive an error. The error message is similar to: An exception error occurred: You do not have sufficient permission for this data gateway. Please request permissions from the owner of the gateway.

Solutions and workarounds

To avoid this issue, don't revoke the connection creator role.

Next steps

- [About known issues ↗](#)

Feedback

Was this page helpful?

 Yes

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Known issue - Data warehouses don't show button friendly names

Article • 10/03/2024

The data warehouse user interface might not show the correct button names. You can still use button functionality as expected.

Status: Open

Product Experience: Data Warehouse

Symptoms

If you face this issue, your language might be set to something other than English. When working in the data warehouse experience, you don't see the button friendly names. For example, when you try to create a data warehouse, you see `common.create` instead of `Create` and `common.cancel` instead of `Cancel`.

Solutions and workarounds

The incorrect names don't affect the button functionality. However, if you want to see the button friendly names, you can append `&language=en` to the end of your browser URL.

Next steps

- [About known issues ↗](#)
-

Feedback

Was this page helpful?



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Known issue - Configure workspace storage to use ADLS Gen2 storage account doesn't work

Article • 10/03/2024

You might experience issues when trying to configure your workspace storage to use an Azure Data Lake Storage (ADLS) Gen2 storage account. You can't connect successfully and receive errors.

Status: Open

Product Experience: Power BI

Symptoms

When trying to configure the Azure storage, the connection doesn't work, and you might receive an error. The error message is similar to `UnknownError` or `We couldn't connect to Azure, but it's likely temporary. Try again later or see details.`

Solutions and workarounds

No workarounds at this time. This article will be updated when the fix is released.

Next steps

- [About known issues ↗](#)

Feedback

Was this page helpful?



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Known issue - Write to shortcut destination using workspace identity fails

Article • 10/31/2024

You can create a OneLake Azure Data Lake Storage (ADLS) Gen2 shortcut inside a Fabric lakehouse. You can set the authentication method to use a workspace identity. In the scenario where you use a workspace identity, writing to the shortcut destination fails. Reading successfully works.

Status: Fixed: October 31, 2024

Product Experience: OneLake

Symptoms

You can't write to ADLS Gen2 using a shortcut that uses a workspace identity to authenticate. For example, when you write to the destination using a Spark notebook, you receive an error. The error message is similar to: "SparkException: [TASK_WRITE_FAILED] Task failed while writing rows to ..."

Solutions and workarounds

No workarounds at this time. This article will be updated when the fix is released.

Next steps

- [About known issues ↗](#)

Feedback

Was this page helpful?

 Yes

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Known issue - Report pages not showing in org app items

Article • 10/15/2024

Org apps have a report pages navigation setting. If the setting is enabled and you have a report with pages, you might run into any issues. The navigation doesn't appear to work and you don't see the report pages pane in the consumer experience for org apps.

Status: Fixed: October 15, 2024

Product Experience: Power BI

Symptoms

When working in Fabric org apps, you don't see the Pages pane. Additionally, you can't navigate from page to page for a report in an org app. The report navigation in the org app appears to be broken. However, you can clearly see the report pages when you directly view a report.

Solutions and workarounds

No workarounds at this time. Until the issue is fixed, don't use Fabric org app items in preview. You can continue to use Power BI apps.

Next steps

- [About known issues ↗](#)
-

Feedback

Was this page helpful?



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Known issue - Can't add My workspace org app items to the org app

Article • 11/08/2024

You can create org app items in **My workspace**, but can't add them to the org app.

Status: Fixed: November 8, 2024

Product Experience: Power BI

Symptoms

You experience issues when working with Fabric org apps in **My workspace**. When trying to add items to the org app, you either can't see them or the item picker doesn't load.

Solutions and workarounds

To work around the issue, don't create org apps in **My workspace**. Instead, create org apps in shared workspaces only. If you do create an org app in **My workspace**, use links only.

Next steps

- [About known issues ↗](#)

Feedback

Was this page helpful?



Yes



No

[Provide product feedback ↗](#) | [Ask the community ↗](#)

Known issue - Unexpected changes in fonts or themes in reports

Article • 10/18/2024

You see that fonts or themes look different in Power BI service reports. You didn't modify the report's fonts or themes. Although the theme has an error, the report still applies the theme to the report. In a later release, the report might not apply the errored theme.

Status: Fixed: October 17, 2024

Product Experience: Power BI

Symptoms

In the Power BI service, you see that reports look different than before. You didn't make any changes to the reports.

Solutions and workarounds

As a workaround, you can manually change the report theme using the [report theme JSON file format](#).

Next steps

- [About known issues ↗](#)
-

Feedback

Was this page helpful?

 Yes

 No

[Provide product feedback ↗](#) | [Ask the community ↗](#)

Known issue - Dynamic subscriptions don't send emails to recipients

Article • 10/15/2024

You can set up a dynamic subscription on a PBIX report to send emails to a list of recipients. Due to a recent regression, the subscription doesn't send an email to the recipients.

Status: Fixed: October 15, 2024

Product Experience: Power BI

Symptoms

You don't receive an email with the results of the dynamic subscription.

Solutions and workarounds

No workarounds at this time. This article will be updated when the fix is released.

Next steps

- [About known issues ↗](#)
-

Feedback

Was this page helpful?



Yes



No

[Provide product feedback ↗](#) | [Ask the community ↗](#)

Known issue - Live connection to semantic models created by template apps fails

Article • 10/15/2024

You can create a semantic model using a template app. When you try to connect to the semantic model using live connection mode, the connection fails and you see an error.

Status: Fixed: October 15, 2024

Product Experience: Power BI

Symptoms

When you use live connection mode to connect to the semantic model, the connection fails and you receive an error. The error message is similar to: We couldn't connect to your model in the Power BI Service. The dataset may have been deleted, renamed, moved, or it is possible you don't have permission to access it. The error message is generic, so the known issue only applies when the target of the live connection is a semantic model created by a template app. The error occurs because the template app was published without the appropriate connection configuration.

Solutions and workarounds

To work around this issue, you can inform the publisher of the template app to enable the setting **Connect to datasets using external model authoring tools** and republish the app. The [setting](#) allows users to use the Public XML/A Endpoint.

Next steps

- [About known issues ↗](#)

Feedback

Was this page helpful?



Yes



No

[Provide product feedback](#) | [Ask the community](#)

Known issue - Unable to close organizational app items in left navigation pane

Article • 09/27/2024

The "close" or "x" button doesn't work as expected on organizational app items in the left navigation pane. When you hover over an organizational app item in the left navigation pane, the close button doesn't appear.

Status: Open

Product Experience: Power BI

Symptoms

When you open an organizational app, an icon appears as an item in the left navigation pane. If you hover over the organizational app item, the close button doesn't appear. If you visit another item in the left navigation pane, the organizational app item doesn't close on its own and remains in the left navigation pane.

Solutions and workarounds

There are two ways to close and remove the organizational app item from the left navigation pane:

- If you're willing to closing all items in left nav, close the browser window or tab and open a new window or tab. All items in the left nav are no longer present.
- If you want to close just one item in the left nav, visit any other navigational item other than an organizational app item, such as **Home**. Then, refresh the browser. Finally, hover over the organizational app item you'd like to close, and the close button appears. You can then select the close button, and the organizational app item is removed from the left nav.

Next steps

- [About known issues ↗](#)

Feedback

Was this page helpful?

 Yes

 No

[Provide product feedback ↗](#) | [Ask the community ↗](#)

Known issue - Pipeline fails when copying data to data warehouse with staging

Article • 09/26/2024

The data pipeline copy activity fails when copying data from Azure Blob Storage to a Data Warehouse with staging enabled. Since staging is enabled, the copy activity uses parquet as the staging format; however, the parquet string type can't be copied into a decimal type in the data warehouse.

Status: Open

Product Experience: Data Factory

Symptoms

The pipeline copy activity fails with and error similar to:

```
ErrorCode=DWCopyCommandOperationFailed,'Type=Microsoft.DataTransfer.Common.Shared.H  
ybridDeliveryException,Message='DataWarehouse' Copy Command operation failed with  
error ''Column '' of type 'DECIMAL(32, 6)' is not compatible with external data  
type 'Parquet physical type: BYTE_ARRAY, logical type: UTF8', please try with  
'VARCHAR(8000)'.
```

Solutions and workarounds

To work around this issue: First, copy the data into the lakehouse table with `decimal` type. Then, copy the data from the lakehouse table into to the data warehouse.

Next steps

- [About known issues ↗](#)

Feedback

Was this page helpful?

 Yes

 No

[Provide product feedback ↗](#) | [Ask the community ↗](#)

Known issue - Intermittent refresh failure through on-premises data gateway

Article • 09/26/2024

You might experience intermittent refresh failures for semantic models and dataflows through the on-premises data gateway. Failures happen regardless of how the refresh was triggered, whether scheduled, manually, or over the REST API.

Status: Open

Product Experience: Power BI

Symptoms

You see a gateway-bound refresh fail intermittently with the error `AdoNetProviderOpenConnectionTimeoutError`. Impacted hosts include Power BI semantic models and dataflows. The error occurs when the refresh is scheduled, manual, and via the API.

Solutions and workarounds

As a workaround, you can try to reboot your on-premises data gateway server or upgrade the server to the latest version.

Next steps

- [About known issues ↗](#)

Feedback

Was this page helpful?



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Known issue - PostgreSQL data source connections additions or updates fail

Article • 10/09/2024

You can use PostgreSQL as a connection. When you add or update the data source using the PostgreSQL connection, you might receive an error.

Status: Fixed: October 9, 2024

Product Experience: Power BI

Symptoms

You receive an error when adding or updating the PostgreSQL data source connection.

Solutions and workarounds

To work around this issue, use one of the following options to connect:

- Reuse an existing shared cloud connection
- Create a new connection in a dataflow and use this new connection
- Create a connection using a Data Gateway

Next steps

- [About known issues ↗](#)
-

Feedback

Was this page helpful?

 Yes

 No

[Provide product feedback ↗](#) | [Ask the community ↗](#)

Known issue - Data warehouse exports using deployment pipelines or git fail

Article • 09/24/2024

You might have a data warehouse that you use in a deployment pipeline or store in a Git repository. When you run the deployment pipelines or update the Git repository, you might receive an error.

Status: Open

Product Experience: Data Warehouse

Symptoms

During the pipeline run or Git update, you might see an error. The error message is similar to: `Index was outside the bounds of the array.`

Solutions and workarounds

Try running the pipeline again, as the issue appears intermittently.

Next steps

- [About known issues ↗](#)

Feedback

Was this page helpful?



[Provide product feedback ↗](#) | [Ask the community ↗](#)

Known issue - OneLake BCDR write transactions aren't categorized correctly for billing

Article • 10/30/2024

You can enable Business Continuity and Disaster Recovery (BCDR) for a specific capacity in Fabric. The write transactions that OneLake reports that go through our client are categorized and billed as non-BCDR.

Status: Open

Product Experience: OneLake

Symptoms

You see under-billing of write transactions since you're billed at the non-BCDR rate.

Solutions and workarounds

We fixed the issue, and all BCDR operations via Redirect are now correctly labeled as BCDR. Because BCDR Write operations consume more compute units (CUs) compared to non-BCDR Writes, you see BCDR Write operations marked as nonbillable in the Microsoft Fabric Capacity Metrics app until December 5, 2024. On December 5, 2024, OneLake BCDR Write operations via Redirect become billable and start consuming the CUs.

Next steps

- [About known issues ↗](#)

Feedback

Was this page helpful?



Yes



No

[Provide product feedback ↗](#) | [Ask the community ↗](#)

Known issue - Excel enterprise data types feature experiences issues

Article • 09/27/2024

If you use the enterprise data types feature in Excel, you might experience issues. The issue occurs when inserting data or when using an existing Excel report depending on the level of integration with data types.

Status: Fixed: September 26, 2024

Product Experience: Power BI

Symptoms

If you use the enterprise data types feature in Excel, you might experience issues. The issue occurs when inserting data or when using an existing Excel report depending on the level of integration with data types. The issues could include slow performance or unexpected errors.

Solutions and workarounds

No workarounds at this time. This article will be updated when the fix is released.

Next steps

- [About known issues ↗](#)

Feedback

Was this page helpful?

 Yes

 No

[Provide product feedback ↗](#) | [Ask the community ↗](#)

Known issue - Dynamics 365 Business Central connector causes refresh failures

Article • 10/09/2024

You can use a Dynamics 365 Business Central connector in your semantic model or dataflow. You might experience a failure when refreshing the semantic model or dataflow.

Status: Fixed: October 9, 2024

Product Experience: Power BI

Symptoms

When refreshing a semantic model or dataflow that uses a Dynamics 365 Business Central connector, you receive an error. The error is similar to: `error: The OData connector failed with the following error: We cannot convert the value null to type Record... . The exception was raised by the IDbCommand interface.`

Solutions and workarounds

As a workaround, you can manually change the query from the advanced editor. In the query, add a record as the last parameter to the query, from:

```
Dynamics365BusinessCentral.ApiContentsWithOptions(null, null, null, null) to:  
Dynamics365BusinessCentral.ApiContentsWithOptions(null, null, null,  
[UseReadOnlyReplica = true]).
```

Next steps

- [About known issues ↗](#)

Feedback

Was this page helpful?

 Yes

 No

[Provide product feedback ↗](#) | [Ask the community ↗](#)

Known issue - Monitoring hub displays incorrect queued duration

Article • 09/18/2024

Spark Jobs get queued when the capacity usage reaches its [maximum compute limit on Spark](#). Once the limit is reached, jobs are added to the queue. The jobs are then processed when the cores become available in the capacity. This queueing capability is enabled for all background jobs on Spark, including Spark notebooks triggered from the job scheduler, pipelines, and spark job definitions. The time duration that the job is waiting in the queue isn't correctly represented in the Monitoring hub as queued duration.

Status: Open

Product Experience: Data Engineering

Symptoms

The total duration of the job shown in the Monitoring hub currently includes only the job execution time. The total duration doesn't correctly reflect the duration in which the job waited in the queue.

Solutions and workarounds

When the job is in queue, the status is shown as **Not Started** in the monitoring view. Once the job starts execution, the status updates to **In Progress** in the monitoring view. Use the job status indicator to know when the job is queued and when its execution is in progress.

Next steps

- [About known issues ↗](#)

Feedback

Was this page helpful?

 Yes

 No

[Provide product feedback ↗](#) | [Ask the community ↗](#)

Known issue - Copilot in DAX query view returns DAX query with syntax error

Article • 11/08/2024

You can live connect to a semantic model in Power BI Desktop. When you use Copilot in DAX query view to write a DAX query, the returned DAX query might have a syntax error.

Status: Fixed: November 8, 2024

Product Experience: Power BI

Symptoms

In DAX query view, Copilot returns a DAX query with a syntax error shown by a red underline. When you run the DAX query returned, the query fails.

Solutions and workarounds

If the query has an error, select the Retry option to have Copilot try again. Alternatively, before keeping the query, copy and paste the error into the user prompt and try Copilot again.

Next steps

- [About known issues ↗](#)

Feedback

Was this page helpful?

 Yes

 No

[Provide product feedback ↗](#) | [Ask the community ↗](#)

Known issue - Managed private endpoint connection could fail

Article • 09/13/2024

A managed private endpoint connection for a private link service could fail. The failure occurs due to the inability to allow a list of Fully Qualified Domain Names (FQDNs) as part of the managed private endpoint creation.

Status: Open

Product Experience: Data Engineering

Symptoms

You see a managed private endpoint creation error when trying to create a managed private endpoint from the network security menu in the workspace settings.

Solutions and workarounds

You can use an alternate method to securely connect using the existing data sources supported currently in Fabric.

Next steps

- [About known issues ↗](#)
-

Feedback

Was this page helpful?

 Yes

 No

[Provide product feedback ↗](#) | [Ask the community ↗](#)

Known issue - Edit tables dialog doesn't load when reloading a Direct Lake semantic model

Article • 11/05/2024

You can edit a semantic model in Direct Lake mode built on a data warehouse. If you select **Edit tables** to add or remove tables and then select **Confirm** with or without making selection changes, the semantic model performs a schema refresh. You can also select the **Reload** button to the right of the search box to refresh the schema. You might experience an issue where the **Edit tables** screen hangs and the tables don't load again after selecting the **Reload** button.

Status: Fixed: November 5, 2024

Product Experience: Power BI

Symptoms

You see a `Fetching schema` spin indefinitely after opening or selecting the reload button in **Edit tables** dialog.

Solutions and workarounds

You can go to the data warehouse or SQL analytics endpoint to refresh the table schema. Alternatively, you can wait a minute for the automatic refresh to happen before opening the **Edit tables** dialog.

Next steps

- [About known issues ↗](#)

Feedback

Was this page helpful?



[Provide product feedback ↗](#) | [Ask the community ↗](#)

Known issue - Paginated report cascading parameters with default values aren't set as expected

Article • 10/09/2024

You can configure paginated report parameters as cascading parameters with default values. The default values of the cascading parameter's children aren't getting set as expected when the parent parameter changes.

Status: Fixed: October 9, 2024

Product Experience: Power BI

Symptoms

On a paginated report with cascading parameters, changing the value of the parent parameter doesn't set the value of the children parameters with default values as expected. The child parameters show a blank value instead.

Solutions and workarounds

You can manually set the values of the parameters and render the report normally. Alternatively, you can go to **File > Disable preview features** to disable the react renderer to fix the issue temporarily.

ⓘ Note

The old react renderer is no longer supported and other issues with parameters or rendering might occur with preview features disabled.

Next steps

- [About known issues ↗](#)

Feedback

Was this page helpful?

 Yes

 No

[Provide product feedback ↗](#) | [Ask the community ↗](#)

Known issue - Concurrent stored procedures block each other in data warehouse

Article • 09/04/2024

You can execute the same stored procedure in parallel in a data warehouse. When the stored procedure is run concurrently, it causes blocking because each stored procedure takes an exclusive lock during plan generation.

Status: Open

Product Experience: Data Warehouse

Symptoms

You might experience slowness when the same procedure is executed in parallel as opposed to by itself.

Solutions and workarounds

To relieve the slowdown, you can execute the stored procedures serially. Alternatively, you can let the procedures block each other and execute your new query once the block is released.

Next steps

- [About known issues ↗](#)
-

Feedback

Was this page helpful?

 Yes

 No

[Provide product feedback ↗](#) | [Ask the community ↗](#)

Known issue - SQL queries fail intermittently

Article • 11/11/2024

You can run SQL queries against a data warehouse. If you have a long running session (typically more than one hour), the query intermittently fails.

Status: Fixed: November 11, 2024

Product Experience: Data Warehouse

Symptoms

Your SQL query intermittently fails with an error message similar to: `The query failed because the access is denied on table`. When you retry the same query, it succeeds.

Solutions and workarounds

As a workaround, retry the query.

Next steps

- [About known issues ↗](#)
-

Feedback

Was this page helpful?



Yes



No

[Provide product feedback ↗](#) | [Ask the community ↗](#)

Known issue - Schema refresh for a data warehouse's semantic model fails

Article • 08/28/2024

You can have a semantic model built on a data warehouse. When you try to refresh the schema for the semantic model, you receive an error message, and the schema isn't refreshed.

Status: Open

Product Experience: Data Warehouse

Symptoms

When refreshing the schema for a semantic model built on a data warehouse, you receive an error message similar to: `The datamart data is invalid.`

Solutions and workarounds

No workarounds at this time. This article will be updated when the fix is released.

Next steps

- [About known issues ↗](#)

Feedback

Was this page helpful?



[Provide product feedback ↗](#) | [Ask the community ↗](#)

Known issue - Subscriptions and exports with maps might produce wrong results

Article • 10/11/2024

You can set up a subscription or export on a report or dashboard. If the item contains an Azure or Bing map visual, the map data might show incorrect results.

Status: Reopened: October 10, 2024

Product Experience: Power BI

Symptoms

There are two main symptoms:

1. Azure maps don't have the bubble layer
2. Maps are zoomed out to the whole globe instead of showing the designed areas

Solutions and workarounds

No workarounds at this time. This article will be updated when the fix is released.

Next steps

- [About known issues ↗](#)

Feedback

Was this page helpful?



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Known issue - Edit tables for a data warehouse's semantic model doesn't work

Article • 11/11/2024

You can edit tables in your semantic model that is built on a data warehouse. When trying to access the screen to edit tables, you might see odd behaviors.

Status: Fixed: November 11, 2024

Product Experience: Data Warehouse

Symptoms

You might face this issue if you run into one of these symptoms:

- The **Edit tables** screen appears for a second and then disappears
- The **Edit tables** screen hangs with a message similar to: `Fetching schema`

Solutions and workarounds

No workarounds at this time. This article will be updated when the fix is released.

Next steps

- [About known issues ↗](#)

Feedback

Was this page helpful?

 Yes

 No

[Provide product feedback ↗](#) | [Ask the community ↗](#)

Known issue - Pipelines don't support Role property for Snowflake connector

Article • 08/23/2024

Pipelines don't support **Role** property for Snowflake connector.

Status: Open

Product Experience: Data Factory

Symptoms

When trying to test the Snowflake connection, you receive an error message similar to:

Test connection operation failed. Failed to open the database connection.

[Snowflake] 390201 (08004): The requested warehouse does not exist or not authorized

Solutions and workarounds

As a solution, you need to allocate the role to the specific warehouse for the connector to use by default.

Next steps

- [About known issues ↗](#)
-

Feedback

Was this page helpful?

 Yes

 No

[Provide product feedback ↗](#) | [Ask the community ↗](#)

Known issue - Pipeline deployment fails when parent contains deactivated activity

Article • 08/23/2024

When creating pipelines, you can have a parent pipeline that contains an **Invoke pipeline** activity that was deactivated. When you try to deploy the pipeline to a new workspace, the deployment fails.

Status: Open

Product Experience: Data Factory

Symptoms

When you try to deploy a pipeline that has a deactivated **Invoke pipeline** activity, you get an error similar to: `Something went wrong. Deployment couldn't be completed.` or `Git_InvalidResponseFromWorkload.`

Solutions and workarounds

To work around the issue, mark the **Invoke pipeline** activity as **Activated**. You can then redeploy the pipeline.

Next steps

- [About known issues ↗](#)

Feedback

Was this page helpful?

 Yes

 No

[Provide product feedback ↗](#) | [Ask the community ↗](#)

Known issue - Dataflows automatically create tables from queries on Fabric destinations

Article • 09/04/2024

In a Dataflow Gen 2 dataflow, you can create queries using functions or combine files steps. You can also have a data destination that is a lakehouse, warehouse, or other experience in Fabric. If both of the previous criteria are true, the query is created as a table in the destination.

Status: Fixed: September 4, 2024

Product Experience: Data Factory

Symptoms

If you face this issue, you might see one of the following symptoms:

- Your refresh fails with the exception: `MashupException.Error: Expression.Error: We cannot convert a value of type Table to type Function. Details: Reason = Expression.Error;Value = #table({}, {});Microsoft.Data.Mashup.Error.Context = User`
- You have undesired tables in your destination loaded by your dataflow.

Solutions and workarounds

Follow the below steps:

1. Before publishing your dataflow, make sure that only table queries have a destination set
2. If your dataflow failed to refresh, edit your query. Revise any queries with steps added by the Dataflow Gen2 engine such as **Converted to table** and remove any steps to bring your query to the desired state before publishing again

Next steps

- [About known issues ↗](#)

Feedback

Was this page helpful?

 Yes

 No

[Provide product feedback ↗](#) | [Ask the community ↗](#)

Known issue - Scorecard dropdown slicers aren't visible when filtering

Article • 08/28/2024

When using reports with dropdown slicers in your scorecards, you might encounter issues when filtering data during the creation or editing of the scorecard.

Status: Fixed: August 28, 2024

Product Experience: Power BI

Symptoms

When creating or editing a scorecard, you can't see the dropdown slicers when filtering data.

Solutions and workarounds

No workarounds at this time. This article will be updated when the fix is released.

Next steps

- [About known issues ↗](#)
-

Feedback

Was this page helpful?



Yes



No

[Provide product feedback ↗](#) | [Ask the community ↗](#)

Known issue - Fabric Runtime 1.3 causes invalid libraries

Article • 11/07/2024

Fabric Runtime 1.3 incorporates Apache Spark 3.5. Spark 3.5 released a major update on August 15, 2024, which causes custom libraries installed in your Fabric environments to become invalid. Starting notebook and Spark job definition sessions fail when using an invalid environment.

Status: Fixed: November 7, 2024

Product Experience: Data Engineering

Symptoms

When a new notebook or Spark job definition session with Fabric Runtime 1.3 environment is executed, the start-up of the Spark session fails with `Spark_Ambiguous_SparkSubmit_PersonalizationFailed` error.

Solutions and workarounds

To fix the issue, follow the below steps:

- Navigate to the environment instance with Runtime 1.3 in your workspace
- Make changes to the libraries section as needed based on library dependencies
- Save and the publish the environment again. The environment is rebuilt with the latest update of the Spark 3.5 runtime.

Next steps

- [About known issues ↗](#)

Feedback

Was this page helpful?



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Known issue - Inserting nulls into Data Warehouse tables fail with incorrect error message

Article • 08/18/2024

When you insert **NULL** values into **NOT NULL** columns in SQL tables, the SQL query fails as expected. However, the error message returned references the incorrect column.

Status: Open

Product Experience: Data Warehouse

Symptoms

You might see a failure when executing a SQL query to insert into a Data Warehouse table. The error message is similar to: `Cannot insert the value NULL into column <columnname>, table <tablename>`. When the query fails, the column referenced isn't the column that caused the error.

Solutions and workarounds

No workarounds at this time. This article will be updated when the fix is released.

Next steps

- [About known issues ↗](#)

Feedback

Was this page helpful?



Yes



No

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Known issue - Dataflow Gen2 refresh fails due to missing staging SQL analytics endpoint

Article • 08/14/2024

When a Dataflow Gen2 creates its staging lakehouse, sometimes the associated SQL analytics endpoint isn't created. When there's no SQL analytics endpoint, the dataflow fails to refresh with an error.

Status: Open

Product Experience: Data Factory

Symptoms

If you face this known issue, you see the dataflow refresh fail with an error. The error message is similar to: Refresh failed. The staging lakehouse is not configured correctly. Please create a support ticket with this error report.

Solutions and workarounds

As a workaround, you can create a support ticket and include the specific error message. Since the staging lakehouse is an internal artifact, we can recreate the lakehouse internally. The issue only affects existing staging lakehouses. If you create a new dataflow, it won't have this issue.

Next steps

- [About known issues ↗](#)

Feedback

Was this page helpful?

 Yes

 No

[Provide product feedback ↗](#) | [Ask the community ↗](#)

Known issue - Custom visuals are blurry in zoomed in or out Microsoft Edge (Chromium) browser

Article • 08/14/2024

When using the Microsoft Edge (Chromium) browser, you can zoom the screen in or out. When you change the zoom percentage, custom visuals appear blurry on the screen.

Status: Open

Product Experience: Power BI

Symptoms

You updated the Microsoft Edge (Chromium) browser to the latest version. You now see blurry custom visuals after zooming the browser in or out.

Solutions and workarounds

No workarounds at this time. This article will be updated when the fix is released.

Next steps

- [About known issues ↗](#)

Feedback

Was this page helpful?



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Known issue - Mirroring for Azure Cosmos DB fails when you create a new container

Article • 10/15/2024

You might experience issues with mirroring for existing or newly created mirrored Azure Cosmos DB. Mirroring fails if you create a new container.

Status: Fixed: October 15, 2024

Product Experience: Data Warehouse

Symptoms

After you create a new Azure Cosmos DB container, mirroring fails for your mirrored Azure Cosmos DB.

Solutions and workarounds

No workarounds at this time. This article will be updated when the fix is released.

Next steps

- [About known issues ↗](#)

Feedback

Was this page helpful?



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Known issue - Mirroring for Azure Cosmos DB fails

Article • 10/15/2024

You might experience issues with mirroring on a mirrored Azure Cosmos DB. The mirroring fails, and the **Monitor replication page** shows an exception.

Status: Fixed: October 15, 2024

Product Experience: Data Warehouse

Symptoms

In the **Monitor replication page**, you see an exception for your mirrored Azure Cosmos DB. The exception message is similar to: `Continuous backup not enabled for account: {AccountEndpoint}`.

Solutions and workarounds

To work around the issue, follow these steps:

1. Go to the source Cosmos DB account in Azure
2. Go to the **Backup and Restore** left navigation tab and enable **7 Days Continuous Backup**
3. Wait until the continuous backup migration succeeds in the Azure portal
4. Go back to Fabric and start mirroring again

Next steps

- [About known issues ↗](#)

Feedback

Was this page helpful?

 Yes

 No

[Provide product feedback ↗](#) | [Ask the community ↗](#)

Known issue - Pipeline copy to Oracle using on-premises data gateway errors

Article • 09/04/2024

You can use the copy activity in a data pipeline to load data into an Oracle database. If you use the on-premises data gateway and an Oracle database as the sink, you might receive an error. Although you receive an error, the pipeline does insert the first batch of rows into the Oracle table.

Status: Fixed: September 4, 2024

Product Experience: Data Factory

Symptoms

When running a data pipeline copy activity to an Oracle database, you receive an error.

The error message is similar to: `The specified table <schema_name>.<table_name> doesn't exist.`

Solutions and workarounds

No workarounds at this time. This article will be updated when the fix is released.

Next steps

- [About known issues ↗](#)

Feedback

Was this page helpful?



Yes



No

[Provide product feedback ↗](#) | [Ask the community ↗](#)

Known issue - Custom visuals don't render in Desktop

Article • 09/24/2024

In Power BI Desktop, when you add or view a custom visual, the visual doesn't render properly. Instead of the visual appearing, you see a blank box.

Status: Fixed: September 23, 2024

Product Experience: Power BI

Symptoms

You see a blank white box, when previously you saw the correct custom visual.

Solutions and workarounds

No workarounds at this time. This article will be updated when the fix is released.

Next steps

- [About known issues ↗](#)

Feedback

Was this page helpful?



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Known issue - Teaching bubble blocks Lakehouse explorer context menu from opening

Article • 08/01/2024

When you open a lakehouse for the first time, a teaching bubble appears to guide you through the feature. Before you close the teaching bubble, you can't open the context menu in the Lakehouse explorer.

Status: Open

Product Experience: Data Engineering

Symptoms

When the teaching bubble appears, you can't open the context menu in the Lakehouse explorer.

Solutions and workarounds

Dismiss the teaching bubble, and then you can open the context menu in the Lakehouse explorer.

Next steps

- [About known issues ↗](#)

Feedback

Was this page helpful?

 Yes

 No

[Provide product feedback ↗](#) | [Ask the community ↗](#)

Known issue - Localization blocks operations in a lakehouse

Article • 08/01/2024

When you select languages other than English in Power BI, you see error when you perform operations in a lakehouse. Operations include table creation, updating, deletion, and folder and schema operations.

Status: Open

Product Experience: Data Engineering

Symptoms

If your Power BI language isn't set to English, you receive an error when working in a lakehouse. The entire lakehouse page becomes blank and you see an error message similar to: `An exception occurred. Please refresh the page and try again.`

Solutions and workarounds

To work around the issue, you can switch the Power BI system language to **English**. Select the gear icon on the top navigation bar, select **General**, and change the display language to **English**.

Next steps

- [About known issues ↗](#)

Feedback

Was this page helpful?



Yes



No

[Provide product feedback ↗](#) | [Ask the community ↗](#)

Known issue - Multiple installations of on-premises data gateway causes pipelines to fail

Article • 08/01/2024

You might face an issue with Data Factory pipelines when performing multiple installations on the on-premises data gateway. The issue occurs when you install the on-premises data gateway that supports pipelines, and then downgrade the on-premises data gateway version to a version that doesn't support pipelines. Finally, you upgrade the on-premises data gateway version to support pipelines. You then receive an error when you run a Data Factory pipeline using the on-premises data gateway.

Status: Open

Product Experience: Data Factory

Symptoms

You receive an error during a pipeline run. The error message is similar to: Please check your network connectivity to ensure your on-premises data gateway can access xx.frontend.clouddatahub.net.

Solutions and workarounds

To solve the issue, uninstall and reinstall the on-premises data gateway.

Next steps

- [About known issues ↗](#)

Feedback

Was this page helpful?

 Yes

 No

[Provide product feedback ↗](#) | [Ask the community ↗](#)

Known issue - SQL analytics endpoint table queries fail due to RLE

Article • 07/24/2024

When creating a delta table, you can use [run length encoding \(RLE\)](#). If the delta writer uses RLE on the table you try to query in the SQL analytics endpoint, you receive an error.

Status: Open

Product Experience: Data Engineering

Symptoms

When you query a table in the SQL analytics endpoint, you receive an error. The error message is similar to: `Error handing external file: 'Unknown encoding type.'`

Solutions and workarounds

To resolve the issue, you can disable RLE in the delta writer and recreate the delta table. You can then query the table in the SQL analytics endpoint.

Next steps

- [About known issues](#)
-

Feedback

Was this page helpful?

 Yes

 No

[Provide product feedback](#) | [Ask the community](#)

Known issue - Add data to a report when scrollbar is present doesn't work

Article • 08/14/2024

When you edit reports in the Power BI service, the data pane sometimes shows a scrollbar. If you attempt to add data to a new or existing visual, the data doesn't get added to the visual. When you select the check box next to the desired data, you see the view scrolled back to the top of the pane, without any data being added. Typically, the issue occurs when you scroll the pane to any position besides at the top.

Status: Fixed: August 14, 2024

Product Experience: Power BI

Symptoms

The issue occurs in the following conditions:

- You're editing a report while using the service online
- You opened the data pane on the right side of the screen, and it has a scrollbar
- You scroll part way or fully down the data pane

When you attempt to select the checkbox next to the data intended to be added to the report, the pane scrolls back to the top. The data isn't added to the report.

Solutions and workarounds

To work around the issue, scroll down to the desired data selection and attempt to add the data a second time, performing the same steps as before. On a second attempt, the data should be reflected.

Next steps

- [About known issues ↗](#)

Feedback

Was this page helpful?

 Yes

 No

[Provide product feedback ↗](#) | [Ask the community ↗](#)

Known issue - Spark operations fail

Article • 07/24/2024

You might experience intermittent errors with notebook execution and Spark operations. The errors prevent you from starting notebooks or Spark sessions. In addition, you might notice other degradations in service availability.

Status: Fixed: July 24, 2024

Product Experience: Data Engineering

Symptoms

You can't start Notebook or Spark sessions and receive an error. The error messages are similar to: Failed to create Livy session for executing notebook or Livy session has failed. You also might notice other degradations in service availability.

Solutions and workarounds

No workarounds at this time. This article will be updated when the fix is released.

Next steps

- [About known issues ↗](#)
-

Feedback

Was this page helpful?



Yes



No

[Provide product feedback ↗](#) | [Ask the community ↗](#)

Known issue - Data Activator alert created from visual with no dimensions doesn't work

Article • 08/28/2024

You can create an alert by selecting the **Set alert** button on a Power BI report visual. If you create the alert on a visual with no dimensions, such as a card, the alert creation doesn't work.

Status: Fixed: August 28, 2024

Product Experience: Data Activator

Symptoms

When trying to set the alert on a visual with no dimensions, you receive an error in the trigger chart. The error message is similar to: **Data Activator is preparing your data.**

In most cases, you should see your data in a few minutes. Otherwise, please contact support..

Solutions and workarounds

No workarounds at this time. This article will be updated when the fix is released.

Next steps

- [About known issues ↗](#)

Feedback

Was this page helpful?



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Known issue - Tables aren't visible in the SQL analytics endpoint in schema enabled lakehouse

Article • 09/24/2024

When creating a lakehouse, you can enable the [Lakehouse schemas \(Public Preview\) option](#). If you create a schema enabled lakehouse, you can't see delta tables in the SQL analytics endpoint. We know the root cause of this problem and are actively working on resolving this issue.

Status: Fixed: September 23, 2024

Product Experience: Data Engineering

Symptoms

You don't see any tables in the SQL analytics endpoint when using a schema enabled lakehouse.

Solutions and workarounds

No workarounds at this time. This article will be updated when the fix is released.

Next steps

- [About known issues ↗](#)

Feedback

Was this page helpful?



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Known issue - Cognitive Services ScoreSentiment function doesn't work in dataflows

Article • 08/14/2024

When using AI insights in a dataflow, you can choose the **ScoreSentiment** function to run text analytics based on a key phrase. If you use this function when creating a dataflow or refresh an existing dataflow with this function, you might receive an error.

Status: Fixed: August 14, 2024

Product Experience: Power BI

Symptoms

When creating a dataflow, you might receive an error in the Power Query editor if using the **ScoreSentiment** function. The error message is similar to: **An internal error occurred**. When refreshing a dataflow that uses the **ScoreSentiment** function, you might see an error similar to: .

Solutions and workarounds

To work around this issue, you can use the [sentiment analysis feature](#) by following the [tutorial](#).

Next steps

- [About known issues](#)

Feedback

Was this page helpful?



[Provide product feedback](#) | [Ask the community](#)

Known issue - Direct Lake semantic model table changes don't work

Article • 10/09/2024

When editing a semantic model in Direct Lake mode, you can add or remove tables by going to **Edit tables** button in the ribbon. In the **Edit tables** screen, when you select **Confirm**, your changes aren't saved. You need to open the **Edit tables** screen and select **Confirm** again for the changes to get applied.

Status: Fixed: October 9, 2024

Product Experience: Power BI

Symptoms

Adding and removing tables in a semantic model in Direct Lake mode doesn't work from the **Edit tables** screen.

Solutions and workarounds

To work around this issue, open the **Edit tables** screen and select **Confirm** again for the changes to get applied.

Next steps

- [About known issues ↗](#)

Feedback

Was this page helpful?

 Yes

 No

[Provide product feedback ↗](#) | [Ask the community ↗](#)

Known issue - Data warehouse deployment using deployment pipelines fails

Article • 07/07/2024

You can use Fabric Data Factory deployment pipelines to deploy data warehouses. When you deploy data warehouse related items from one workspace to another, the data warehouse connection breaks.

Status: Open

Product Experience: Data Factory

Symptoms

Once the deployment pipeline completes in the destination workspace, you see the data warehouse connection is broken. You see an error message similar to: Failed to load connection, please make sure it exists, and you have the permission to access it.

Solutions and workarounds

As a workaround, you can manually update the destination workspace data warehouse connection to point to the destination workspace data warehouse.

Next steps

- [About known issues ↗](#)

Feedback

Was this page helpful?



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Known issue - Dataflow Gen2 ownership takeover fails

Article • 08/06/2024

In the **Settings** of a Dataflow Gen2 dataflow, you can select the **Take over** button to assign ownership of the dataflow to yourself. When trying to perform the takeover, you might receive an error message, and the takeover fails.

Status: Fixed: August 6, 2024

Product Experience: Data Factory

Symptoms

When trying to takeover the ownership of a Dataflow Gen2 dataflow, you receive an error similar to: `Taking ownership failed`.

Solutions and workarounds

To work around the issue, you have two options:

- If the owner can access the dataflow, export the dataflow as a Power Query template and import a new one
- If the owner can't access the dataflow:
 - Export the .json of the dataflow
 - Extract the mashup script from within the dataflow
 - Recreate a new dataflow from it

Next steps

- [About known issues ↗](#)

Feedback

Was this page helpful?



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Known issue - Data warehouse connection or query execution fails

Article • 11/11/2024

You might receive an error when working with your data warehouse. The failure occurs when trying to connect to your data warehouse or trying to execute a query in the data warehouse.

Status: Fixed: November 11, 2024

Product Experience: Data Warehouse

Symptoms

When trying to connect to a data warehouse or when trying to execute a query in the data warehouse, you receive an error message. The error message is similar to:

```
Execution failed against SQL server, please contact SQL Server team if you need further support. SQL error number 18456.
```

Solutions and workarounds

Retry the connection or query execution after a few minutes. If the retry attempt doesn't work, open a support ticket for further assistance.

Next steps

- [About known issues ↗](#)

Feedback

Was this page helpful?



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Known issue - Dataflows Gen2 staging lakehouse doesn't work in deployment pipelines

Article • 07/03/2024

You can use Git integration for your Dataflow Gen2 dataflows. When you begin to commit the workspace to the Git repo, you see the dataflow's staging lakehouse, named **DataflowsStagingLakehouse**, available to commit. While you can select the staging lakehouse to be exported, the integration doesn't work properly. If using a deployment pipeline, you can't deploy **DataflowsStagingLakehouse** to the next stage.

Status: Open

Product Experience: Data Factory

Symptoms

You see the **DataflowsStagingLakehouse** visible in Git integration and can't deploy **DataflowsStagingLakehouse** to the next stage using a deployment pipeline.

Solutions and workarounds

To deploy your files to the next stage in a deployment pipeline, manually ignore **DataflowsStagingLakehouse** from the Git integration.

Next steps

- [About known issues ↗](#)

Feedback

Was this page helpful?



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Known issue - SQL analytics endpoint table sync fails when table contains linked functions

Article • 07/03/2024

The Fabric SQL analytics endpoint uses a backend service to sync delta tables created in a lakehouse. The backend service recreates the tables in the SQL analytics endpoint based on the changes in lakehouse delta tables. When there are functions linked to the SQL table, such as Row Level Security (RLS) functions, the creation operation fails and the table sync fails.

Status: Open

Product Experience: Data Warehouse

Symptoms

In the scenario where there are functions linked to the SQL table, some or all of the tables on the SQL analytics endpoint aren't synced.

Solutions and workarounds

To mitigate the issue, perform the following steps:

1. Run the SQL statement `ALTER SECURITY POLICY DROP FILTER PREDICATE ON <Table>` on the table where the sync failed
2. Update the table on OneLake
3. Force the sync using the lakehouse or wait for the sync to complete automatically
4. Run the SQL statement `ALTER SECURITY POLICY ADD FILTER PREDICATE ON <Table>` on the table where the sync failed
5. Confirm the table is successfully synced by checking the data

Next steps

- [About known issues ↗](#)

Feedback

Was this page helpful?

 Yes

 No

[Provide product feedback ↗](#) | [Ask the community ↗](#)

Known issue - Dataflows Gen2 staging warehouse doesn't work in deployment pipelines

Article • 07/03/2024

You can use Git integration for your Dataflow Gen2 dataflows. When you begin to commit the workspace to the Git repo, you see the dataflow's staging warehouse, named **DataflowsStagingWarehouse**, available to commit. While you can select the staging warehouse to be exported, the integration doesn't work properly. If using a deployment pipeline, you can't deploy **DataflowsStagingWarehouse** to the next stage.

Status: Open

Product Experience: Data Factory

Symptoms

You see the **DataflowsStagingWarehouse** visible in Git integration and can't deploy **DataflowsStagingWarehouse** to the next stage using a deployment pipeline.

Solutions and workarounds

To deploy your files to the next stage in a deployment pipeline, manually ignore **DataflowsStagingWarehouse** from the Git integration.

Next steps

- [About known issues ↗](#)

Feedback

Was this page helpful?

 Yes

 No

[Provide product feedback ↗](#) | [Ask the community ↗](#)

Known issue - Issues with New Card and Reference Label Tabular Layout

Article • 08/18/2024

There are two issues in the new card with reference labels using tabular layout. Firstly, if you reduce the font size, you might see content disappearing. Second, you might see space reserved for the **Detail** label. The space reserved is shown even when the **Detail** label is turned off, which causes content to move left and possibly truncate the **Title** label.

Status: Open

Product Experience: Fixed: August 16, 2024

Symptoms

In a new card, the reference label **Title** or **Value** might disappear if the font size is smaller than 12 in the tabular layout style. The reference label **Title** might truncate early and show an ellipsis. The reference **Value** might shift left, even if **Detail** label is turned off in the tabular layout style.

Solutions and workarounds

For the first issue, turn on the **Detail** label and reduce the font size. For the second issue, there's no workaround at this time. This article will be updated when the fix is released.

Next steps

- [About known issues ↗](#)

Feedback

Was this page helpful?



Yes



No

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Known issue - Python and R visuals don't work in Fabric capacity

Article • 07/18/2024

Free users in an F64 or larger SKU should be able to use Python visuals. However, if you assign your workspace to a Fabric capacity, you can't view Python and R visuals anymore.

Status: Fixed: July 18, 2024

Product Experience: Power BI

Symptoms

In reports that worked before the assignment, you see a message similar to `Python visuals are a Power BI Pro feature. Only users with a Power BI Pro license can create, view or interact with Python visuals.`

Solutions and workarounds

No workarounds at this time. This article will be updated when the fix is released.

Next steps

- [About known issues ↗](#)
-

Feedback

Was this page helpful?



Yes



No

[Provide product feedback ↗](#) | [Ask the community ↗](#)

Known issue - Report Builder can't sign in to the service for some clouds

Article • 07/16/2024

You can normally sign in to the Power BI service through Power BI Report Builder. If your Power BI service is in the Azure Government or Azure China 21Vianet clouds, you now can't sign in to the service using Report Builder.

Status: Fixed: July 16, 2024

Product Experience: Power BI

Symptoms

You're using the latest version of Power BI Report Builder (15.7.1809.28) and trying to sign in to the Azure Government or Azure China cloud. Your sign in fails with an unexpected error.

Solutions and workarounds

As a workaround, you can install an older version of Power BI Report Builder.

Next steps

- [About known issues ↗](#)
-

Feedback

Was this page helpful?

 Yes

 No

[Provide product feedback ↗](#) | [Ask the community ↗](#)

Known issue - Copy activity from Oracle to lakehouse fails for Number data type

Article • 09/04/2024

The copy activity from Oracle to a lakehouse fails when one of the columns from Oracle has a **Number** data type. In Oracle, scale can be greater than precision for decimal/numeric types. Parquet files in Lakehouse require the scale be less than or equal to precision, so the copy activity fails.

Status: Open

Product Experience: Data Factory

Symptoms

When trying to copy data from Oracle to a lakehouse, you receive an error similar to:

```
ParquetInvalidDecimalPrecisionScale. Invalid Decimal Precision or Scale. Precision:  
38 Scale:127.
```

Solutions and workarounds

You can work around this issue by using a query to explicitly cast the column to `NUMBER(p,s)` or other types like `BINARY_DOUBLE`. When using `NUMBER(p,s)`, ensure `p >= s` and `s >= 0`. Meanwhile, the range defined by `NUMBER(p,s)` should cover the range of the values stored in the column. If not, you receive an error similar to `ORA-01438: value larger than specified precision allowed for this column`. Here's a sample query:

```
SELECT CAST(ColA AS BINARY_DOUBLE) AS ColB FROM TableA
```

Next steps

- [About known issues ↗](#)

Feedback

Was this page helpful?

 Yes

 No

[Provide product feedback ↗](#) | [Ask the community ↗](#)

Known issue - Real-Time hub Set Alert fails on prior version of an eventstream

Article • 08/23/2024

In the Real-Time hub, you can use the **Set Alert** functionality to target an eventstream. If the target eventstream is the prior version of Microsoft Fabric Eventstream (version 1), the **Set Alert** functionality doesn't work. Using the current version of Microsoft Fabric Eventstream (version 2) does work.

Status: Fixed: August 23, 2024

Product Experience: Real-Time Intelligence

Symptoms

When trying to use the **Set Alert** functionality to target an eventstream that is v1, you receive a `InternalServerError` error code and the alert doesn't apply.

Solutions and workarounds

No workarounds at this time. This article will be updated when the fix is released.

Next steps

- [About known issues ↗](#)
-

Feedback

Was this page helpful?

 Yes

 No

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Known issue - Pipeline Web activity through on-premises data gateway doesn't support SPN authentication

Article • 09/24/2024

You can use **Web** activity in a pipeline. If you use an on-premises data gateway, you can't use service principal name (SPN) authentication for the **Web** activity.

Status: Fixed: September 23, 2024

Product Experience: Data Factory

Symptoms

When trying to connect using SPN authentication, you receive an error message similar to: `Error calling the Endpoint`

Solutions and workarounds

Until we release a fix, the only way to connect to web activity using SPN authentication is through a cloud gateway.

Next steps

- [About known issues ↗](#)

Feedback

Was this page helpful?



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Known issue - Cross region shortcuts don't show data

Article • 09/24/2024

You can create a OneLake shortcut A in one region that points to a shortcut B in another region, which is considered a cross region shortcut. In this scenario, creating a new or accessing an existing cross region shortcut doesn't work.

Status: Fixed: September 23, 2024

Product Experience: OneLake

Symptoms

If you try to create a new or access an existing cross region shortcut, you can't retrieve, list, or upload data.

Solutions and workarounds

No workarounds at this time. This article will be updated when the fix is released.

Next steps

- [About known issues ↗](#)

Feedback

Was this page helpful?



Yes



No

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Known issue - Eventstream paused for more than two hours don't show data

Article • 08/23/2024

You can create an eventstream item and then pause the item. If the eventstream is paused for more than two hours, you might not be able to process the data.

Status: Fixed: August 23, 2024

Product Experience: Real-Time Intelligence

Symptoms

If you pause your eventstream for more than two hours, you can't preview or see the data for your items, including output data destinations.

Solutions and workarounds

No workarounds at this time. This article will be updated when the fix is released.

Next steps

- [About known issues ↗](#)
-

Feedback

Was this page helpful?



Yes



No

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Known issue - Previous Eventstream UX loads instead of new UX

Article • 08/23/2024

The previous GA Eventstream UX might load immediately after creating a new eventstream with the enhanced capability preview toggle enabled. To access the new Eventstream UX homepage with the enhanced capabilities, refresh the page two to three times before starting an eventstream configuration. This issue occurs intermittently.

Status: Fixed: August 23, 2024

Product Experience: Real-Time Intelligence

Symptoms

When you open an eventstream, you see the previous GA UX instead of the new preview version UX.

Solutions and workarounds

Refresh the page two to three times after the newly created eventstream is open.

Next steps

- [About known issues ↗](#)

Feedback

Was this page helpful?

 Yes

 No

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Known issue - Custom endpoint or Reflex destination on derived stream keeps loading

Article • 08/23/2024

After publishing an eventstream that has a custom endpoint or Reflex destination appended to an already established derived stream, the custom endpoint or Reflex will be in **Loading** status in live view.

Status: Fixed: August 23, 2024

Product Experience: Real-Time Intelligence

Symptoms

You created a derived stream and then appended a custom endpoint or Reflex destination. Once configuring and publishing the eventstream, you see the new destination stuck in **Loading** status.

Solutions and workarounds

No workarounds at this time. This article will be updated when the fix is released.

Next steps

- [About known issues ↗](#)

Feedback

Was this page helpful?



Yes



No

[Provide product feedback ↗](#) | [Ask the community ↗](#)

Known issue - Sample data doesn't flow after destination later added into eventstream

Article • 08/23/2024

When you select the **Sample data** data source from the Real-Time hub, the **Get Events** wizard guides you through the configuration process. Once completed, an eventstream is created with the sample source added. However, if you open this eventstream and add operators and destinations, the sample data stops emitting. No data flows to the destinations you added.

Status: Fixed: August 23, 2024

Product Experience: Real-Time Intelligence

Symptoms

Once the eventstream is published, the sample data source stops emitting and no data flows into the added destinations.

Solutions and workarounds

To work around this issue, don't select the **Sample data** data source from the **Get Events** wizard. Instead, create an eventstream and add the sample data source directly from within the eventstream.

Next steps

- [About known issues ↗](#)

Feedback

Was this page helpful?

 Yes

 No

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Known issue - Tenant migrations paused through August 2024

Article • 09/04/2024

Cross-region tenant migrations are paused from June 1, 2024 through August 20, 2024. New or existing requests aren't processed during the months of June, July, and August.

Status: Fixed: September 4, 2024

Product Experience: Power BI

Solutions and workarounds

Tenant migrations are resumed.

Next steps

- [About known issues ↗](#)
-

Feedback

Was this page helpful?



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Known issue - Shortcut creation on a lakehouse preview table takes long time

Article • 06/02/2024

You can create a shortcut on a lakehouse, and the data shows in a preview table. You might experience the preview table takes a long time to load.

Status: Open

Product Experience: Data Engineering

Symptoms

You see the preview table of a lakehouse shortcut take a long time to load. The issue often happens with lakehouse tables of large data.

Solutions and workarounds

As a workaround, add the parameter `&lhLakehouseV2=0` at the end of the browser URL while trying to access the shortcuts. Alternatively, after waiting for two minutes, select **Create Shortcut**.

Next steps

- [About known issues ↗](#)
-

Feedback

Was this page helpful?

 Yes

 No

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Known issue - Semantic models in Desktop sometimes fail in March 2024 and later versions

Article • 07/18/2024

In Power BI Desktop March 2024 and later versions, connecting to a semantic model sometimes fails with a `Cannot load model` error message. The failure happens when you connect to a semantic model in a different user's My workspace.

Status: Fixed: July 18, 2024

Product Experience: Power BI

Symptoms

You face this issue when you connect to a semantic model that is in a different user's My Workspace. While trying to connect to a semantic model through Power BI Desktop, you see an error similar to: `Cannot load model. We couldn't connect to your model in the Power BI Service. The dataset may have been deleted, renamed, moved, or it is possible that you don't have permission to access it. Either the database does not exist, or you do not have permissions to access it.`

Solutions and workarounds

To work around the issue, you can use an older version of Power BI Desktop, such as February 2024 or earlier.

Next steps

- [About known issues ↗](#)

Feedback

Was this page helpful?



Yes



No

[Provide product feedback ↗](#) | [Ask the community ↗](#)

Known issue - Real-Time hub Set alert doesn't work for derived streams

Article • 08/23/2024

On the **Details** page of Real-Time hub, you can open a derived stream of an eventstream. If you select the **Set alert** button, it doesn't function correctly. You're redirected to the Data Activator instance on the default stream instead of the derived stream. Data Activator then receives data with the wrong schema and you can't set the right conditions for the trigger. While we work to resolve this issue, you might see that the **Set alert** button is greyed out to prevent you from going down a path that leads to an error situation.

Status: Fixed: August 23, 2024

Product Experience: Real-Time Intelligence

Symptoms

The following are the symptoms when using the Real-Time hub **Details** page for a derived stream:

- The **Set alert** button doesn't work properly for a derived stream of an eventstream.
- The Data Activator instance is added to the default stream instead of the derived stream, and you can't set the desired conditions on the trigger.
- The **Set alert** button might be greyed out for a derived stream of an eventstream.

Solutions and workarounds

No workarounds at this time. This article will be updated when the fix is released.

Next steps

- [About known issues](#)

Feedback

Was this page helpful?



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Known issue - Opening a reflex for a stream in Real-Time hub doesn't work

Article • 08/23/2024

In Real-Time hub, if you have a stream in the first tab, you can select the stream to view more details of that stream. If you chose the option to **Set alert** or **Add destination > Reflex** on a parent eventstream, then that Reflex item shows up in stream details page. If you try to open that Reflex item, it doesn't work.

Status: Fixed: August 23, 2024

Product Experience: Real-Time Intelligence

Symptoms

When you try to open the Reflex item, you receive an error similar to: We could not read the contents of this item.

Solutions and workarounds

To work around the issue, follow these steps:

1. Open parent eventstream of the stream.
2. Select the reflex output node of that eventstream.
3. Select **Open item** in bottom pane.

Next steps

- [About known issues ↗](#)

Feedback

Was this page helpful?

 Yes

 No

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Known issue - Virtual network data gateway service interruption

Article • 06/06/2024

We're performing a data migration for the service backing virtual network (Vnet) data gateways to improve the security. The migration is tentatively scheduled to occur between May 28, 2024 and May 31, 2024.

Status: Fixed: June 6, 2024

Product Experience: Power BI

Symptoms

You can't create, update, or delete virtual network data gateways during your region's migration, which takes between two and three hours. The queries fail if your gateway isn't running before the migration starts.

Solutions and workarounds

During the migration period, you can use an on-premises data gateway instead.

Next steps

- [About known issues ↗](#)
-

Feedback

Was this page helpful?

 Yes

 No

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Known issue - Pipeline using XML format copy gets stuck

Article • 05/28/2024

When using a pipeline to copy XML formatted data to a tabular data source, the pipeline gets stuck. The issue most often appears when XML single records contain many different array type properties.

Status: Open

Product Experience: Data Factory

Symptoms

The copy activity doesn't fail; it runs endlessly until it hits a timeout or is canceled. Some XML files copy without any issue while some files are causing the issue.

Solutions and workarounds

No workarounds at this time. This article will be updated when the fix is released.

Related content

- [About known issues ↗](#)

Feedback

Was this page helpful?



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Known issue - Azure SQL Database change data doesn't propagate to mirror

Article • 05/28/2024

If you set up Fabric mirrored databases from Azure SQL Database, you might see that some of the change data might not propagate to the mirror. The issue occurs when the SQL database mirror is actively replicating source operational data and the service level objective (SLO) is changed. Specifically, if you change the SLO by either:

- Azure SQL database SLO is upgraded in the following sequence: Update SLO to Standard/Business Critical/General Purpose and then upgrade to Hyperscale
- Azure SQL database SLO is reverse migrated from Hyperscale to Standard/General Purpose/Business Critical SLO

Status: Open

Product Experience: Data Warehouse

Symptoms

Change data from Azure SQL Database isn't propagated to the Fabric mirrored database. If you [query the logs](#), you see errors similar to `dwError 32 SQLServerError`.

Solutions and workarounds

You can try to restart the data propagation by starting and stopping the mirror. If restarting doesn't fix the issue, contact Microsoft support.

Related content

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Known issue - Environment doesn't work when runtime version is changed to Runtime 1.1

Article • 05/28/2024

When you change the Fabric Runtime version of an environment item to Runtime 1.1 using Microsoft Fabric Git REST APIs through Deployment pipelines, the environment lands in an inconsistent state.

Status: Open

Product Experience: Data Engineering

Symptoms

If you update the Fabric Runtime of an environment item to Runtime 1.1 and update other changes at the same time, the publish of the environment is problematic. Either the environment publish operation fails or hangs for a long time.

Solutions and workarounds

No workarounds at this time. This article will be updated when the fix is released.

Related content

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Known issue - Shortcuts to a firewall-enabled ADLS stop working if lakehouse is shared

Article • 07/24/2024

You have a lakehouse that contains an Azure Data Lake Storage (ADLS) Gen2 shortcut, where the ADLS Gen2 storage account is protected by a firewall. You share the lakehouse with a viewer or user outside of the workspace, and user can't access the shortcut. Also, no other users can access the shortcut.

Status: Fixed: July 24, 2024

Product Experience: OneLake

Symptoms

You have a lakehouse that contains an ADLS Gen2 shortcut, where the ADLS Gen2 storage account is protected by a firewall. You share the lakehouse with a user outside of the workspace. Then, the shortcut that worked previously now fails.

Solutions and workarounds

Don't share the lakehouse with viewers or users outside of the workspace.

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Known issue - West India region doesn't support on-premises data gateway for pipelines

Article • 05/28/2024

West India region currently doesn't support on-premises Data gateway for Data Factory pipelines.

Status: Open

Product Experience: Data Factory

Symptoms

If you are in the West India region, you don't see the option to select the on-premises data gateway during the creation of a Data Factory pipeline connection.

Solutions and workarounds

Use a tenant in a region other than West India.

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Known issue - Delta tables don't appear in SQL Analytics Endpoint Object Explorer

Article • 08/28/2024

Delta tables in the Lakehouse don't appear in SQL Analytics Endpoint Object Explorer. Instead of loading the tables in SQL Analytics Endpoint, the loading icon appears but doesn't complete as expected.

Status: Fixed: August 28, 2024

Product Experience: Data Warehouse

Symptoms

Delta tables aren't loaded into the SQL Analytics Endpoint Object Explorer and loading icon appears in the Object Explorer.

Solutions and workarounds

No workarounds at this time. This article will be updated when the fix is released.

Related content

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Feedback

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Known issue - Spark session doesn't start when managed virtual network's capacity moved

Article • 06/20/2024

You might receive an error when trying to start a Spark session or run a Spark job about the Livy session failing. This issue happens when the workspace for the managed virtual network moved across capacities.

Status: Fixed: June 20, 2024

Product Experience: Data Engineering

Symptoms

When you try to run a Spark job, the Spark job fails and you receive an error. The error is similar to:

```
Microsoft.Analytics.SynapseNotebookService.Infrastructure.Exceptions.ClientExceptions.LivySessionException: Livy session has failed. Error code: SparkCoreError/Other.  
SessionInfo.State from SparkCore is Error: Error while trying to establish a  
connection through the managed network..
```

Solutions and workarounds

We're fixing the issue in batches. This article will be updated when the fix is released to all regions.

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Known issue - OneLake under-reports transactions in the Other category

Article • 05/31/2024

OneLake is currently under-reporting **OneLake Other Operations Via Redirect** transactions. HTTP 400 errors other than 401 and 403 errors aren't billed. When we fix the issue, your usage for the **OneLake Other Operations Via Redirect** transactions might go up. If your usage exceeds your capacity limits, your capacity might be throttled.

Status: Open

Product Experience: OneLake

Symptoms

You currently don't see all OneLake transactions in the **Other** category being reported.

Solutions and workarounds

No workarounds at this time. This article will be updated when the fix is released.

Related content

- [About known issues ↗](#)

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Known issue - Response times when composing SQL queries slower than expected

Article • 05/28/2024

You can write and execute queries on a data warehouse's SQL analytics endpoint by using the SQL query editor. The response time from the user experience (UX) is slower than expected. The delay can range from seconds to minutes.

Status: Open

Product Experience: Data Warehouse

Symptoms

The response from the SQL query editor is slower than expected.

Solutions and workarounds

The current workaround is to utilize client tools such as SQL Server Management Studio or Azure Data Studio.

Related content

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Known issue - TMDL semantic models won't open in Desktop after web edited

Article • 11/08/2024

If you create a semantic model with Tabular Model Definition Language (TMDL), you can edit it on the web. If you try to open that semantic model in Power BI Desktop, the semantic model doesn't open. Power BI Desktop can't open the semantic model for editing because it doesn't recognize the keyword **cultureInfo** due to a TMDL language update.

Status: Fixed: November 8, 2024

Product Experience: Power BI

Symptoms

When you try to open the semantic model in Power BI Desktop or export using Fabric Git integration, the opening or export fails. You receive an error message similar to: "Unsupported object type - cultureInfo isn't a supported property in the current context."

Solutions and workarounds

To manually fix the issue, open each of the TMDL files. Rename the culture TMDL object type name from **cultureInfo** to **culture**.

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Known issue - Sign-in required when you browse to a secure embed URL

Article • 06/11/2024

You can sign into the Power BI service in one browser tab and also go to a secure embed URL directly in a new browser tab. In this scenario, the sign-in page shows on the second browser tab.

Status: Fixed: June 11, 2024

Product Experience: Power BI

Symptoms

You see a sign-in page when you browse to a secure embed url directly, even though you already signed-in to the browser session.

Solutions and workarounds

No workarounds at this time. This article will be updated when the fix is released.

Related content

- [About known issues ↗](#)

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Known issue - Azure Analysis Services Pricing Tier scaling table doesn't show data

Article • 05/28/2024

You can normally view Azure Analysis Services available capacity SKU and pricing data in the Azure portal. During creation of a new Azure Analysis Services resource, you can see the data by selecting the **View full pricing details** link from the **Pricing Tier** selection header. When attempting to modify the SKU of an existing Azure Analysis Services resource, you can see the data by selecting the **Pricing Tier (Scale QPUs)** option under the **Scale** menu. Normally, you see a table of SKU and pricing data; however, you now see a blank table.

Status: Fixed: May 16, 2024

Product Experience: Power BI

Symptoms

The normal pricing tier table displays the message **No results** under the **SKU** column, with no further data. No data appears regardless of selecting **Recommended** or **View all** table options.

Solutions and workarounds

You can use this [alternate URL for the Azure portal](#) to view the SKU and pricing data.

Related content

- [About known issues](#)

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Known issue - OneLake audit events don't show up in Microsoft 365 admin center

Article • 05/28/2024

The audit events for OneLake aren't showing up in the Microsoft 365 admin center from April 21, 2024 through May 5, 2024.

Status: Fixed: May 13, 2024

Product Experience: OneLake

Symptoms

The Microsoft 365 admin center shows no rows for OneLake events between April 21, 2024 and May 5, 2024.

Solutions and workarounds

Starting May 5, 2024, you can see audit events for OneLake.

Related content

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Known issue - Query folding indicators are incorrect for certain Power Query SDK based connectors

Article • 08/01/2024

You can use a connector created with the Power Query SDK that relies on an ODBC driver. In this case and if the connector supports query folding, the Power Query editor might not yield the correct query folding indicator for certain steps.

Status: Fixed: July 31, 2024

Product Experience: Data Factory

Symptoms

On the editing experience of Power Query Online, the correct query folding indicator for certain steps might not be accurate.

Solutions and workarounds

There are no workarounds available as of now. This issue doesn't affect the user queries as it is only an issue with the query folding indicator, but not the execution of the query itself.

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Known issue - SQL database mirror doesn't start when you create connection during mirror creation

Article • 05/02/2024

When you create an SQL database mirror artifact, you can create a SQL connection with service principal authentication to perform the mirroring. If you created the SQL connection during the creation of the mirror item, the mirror doesn't start.

Status: Open

Product Experience: Data Factory

Symptoms

You face this issue if you see replication is stopped and can't start the replication.

Solutions and workarounds

There are two workarounds:

1. If the mirror artifact isn't yet created, create the SQL connection using the **Manage connections and gateways** page, instead of creating the SQL connection during the creation of the mirror artifact.
2. If the mirror artifact is already created and you face this issue, go to the **Manage connections and gateways** page and edit the SQL connection.

Next steps

- [About known issues ↗](#)

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Known issue - SQL endpoint and semantic model are orphaned when a lakehouse is deleted

Article • 10/03/2024

A lakehouse has an associated SQL analytics endpoint and default semantic model. When the lakehouse is deleted, the two associated items should also be deleted. The two associated items currently remain and can't be deleted.

Status: Fixed: October 3, 2024

Product Experience: Data Warehouse

Symptoms

When a lakehouse is deleted, the associated SQL analytics endpoint and the default semantic model remain in the workspace.

Solutions and workarounds

Once the fix for this issue is released, the orphaned items are deleted automatically.

Related content

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Known issue - Apps and reports not available when editing scorecard metrics

Article • 06/11/2024

When you create or edit a scorecard metric, you can change the **Current** or **Target** field. When you select **Connect to data**, you don't see any apps or reports. You can't select an app or report for the fields.

Status: Fixed: June 11, 2024

Product Experience: Power BI

Symptoms

Even if you have apps connected to the scorecard, the user apps tab is empty.

Solutions and workarounds

You can work around this issue by using one of these two options.

If you have direct access or permission to the reports or apps:

1. Go to the report you would like to connect.
2. Let your computer fully load this report without refreshing the page.
3. Go back to your scorecard where you see the apps in the dialog.

Otherwise:

1. Disable the subfolder in workspace feature by turning off the feature switch.
2. Paste the feature flag at the end of your browser URL: `&subfolderInWorkspace=0`.
3. Select **Enter** key to reload your Power BI.
4. Go back to your scorecard where you see the apps in the dialog.

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Known issue - Semantic model export to OneLake fails for calculated columns in error state

Article • 06/11/2024

When using OneLake integration for semantic models, you can export the data in a semantic model to OneLake. If the semantic model contains a calculated column or a calculated table column in an error state (for example, due to a bad DAX expression), the table might fail to export data to OneLake.

Status: Fixed: June 11, 2024

Product Experience: Power BI

Symptoms

Data in the Semantic Model artifact in OneLake might be out of date, in comparison to the Semantic Model data. If you didn't previously export the semantic model, you don't see the data in OneLake. If you previously exported the semantic model and then added a calculated column or a calculated table column in an error state, you see an older version of the semantic model data in OneLake. The export doesn't happen and the updated data doesn't get exported to OneLake.

Solutions and workarounds

To work around this issue, fix the DAX expression that left the columns in an error state.

Related content

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Known issue - Shortcut data inaccessible if data is in a paused capacity

Article • 07/18/2024

You can create a shortcut in an item in a workspace associated with one capacity. The shortcut points to data in an item in another workspace in second capacity. If the second capacity hosting the data is paused, the data is inaccessible when you access the shortcut in the first capacity.

Status: Fixed: July 18, 2024

Product Experience: OneLake

Symptoms

You can't access the data using a shortcut if the workspace that contains the data is associated with a paused capacity.

Solutions and workarounds

The only workaround is to resume the capacity that is hosting the data.

Related content

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Known issue - Report Copilot button shows even though Copilot admin setting is off

Article • 05/28/2024

Even if the tenant admin setting **Users can use a preview of Copilot and other features powered by Azure OpenAI** is turned off, the Copilot button still appears on reports. You can select the button to open the pane, but the pane shows an error and Copilot can't be used.

Status: Fixed: May 16, 2024

Product Experience: Power BI

Symptoms

Even when the tenant switch is off, the Copilot button still shows in the following situations:

- In apps, the button shows on reports shared with viewers without workspace access
- On reports, the button shows on reports that are in a workspace whose capacity doesn't support Copilot

Solutions and workarounds

To work around the issue, ignore the Copilot button. This article will be updated when the fix is released.

Related content

- [About known issues](#)

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Known issue - Copilot and Azure OpenAI service capacity setting delegation postponed

Article • 06/11/2024

Since April 19, you see the ability to delegate the enablement of Copilot and the Azure OpenAI service at capacity levels from the tenant setting admin portal. However, the delegation doesn't work until late May.

Status: Fixed: June 11, 2024

Product Experience: Administration & Management

Symptoms

Customers can't delegate the enablement of Copilot and the Azure OpenAI service to their capacity admins.

Solutions and workarounds

No workarounds at this time. This article will be updated when the fix is released.

Related content

- [Copilot in MS Fabric: Soon available to more users in your organization ↗](#)
- [About known issues ↗](#)

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Known issue - Copy visual as image for report and dashboard visuals is broken

Article • 05/28/2024

The **Copy visual as image** functionality is broken for both report and dashboard visuals. As a result, you can't copy visuals as images or images with captions in Power BI.

Status: Fixed: May 1, 2024

Product Experience: Power BI

Symptoms

You can try to copy a visual in a report or dashboard by selecting the **Copy visual as image** option by either right-clicking or selecting the ellipses on an image. When you select the option, you receive an error message that the image couldn't be copied since the server is busy. The image isn't successfully copied.

Solutions and workarounds

Rather than use the **Copy visual as image** option, you can use your operating system screenshot tools to capture screenshots of report and dashboard visuals.

Related content

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Known issue - Git integrated workspaces incorrectly show status of Uncommitted

Article • 05/28/2024

You have a Git integrated workspace that was synced. However, in the workspace view, the Git status is 'Uncommitted.'

Status: Fixed: May 1, 2024

Product Experience: Administration & Management

Symptoms

The Git integrated workspaces show 'Uncommitted' Git status in workspace view though they're already synced.

Solutions and workarounds

To correct the status, follow these steps:

1. Commit all changes from workspaces into Git. If conflicts are created, you can resolve manually.
2. Undo all changes in the workspace. Open all reports in the March version of Power BI Desktop, commit changes, and then sync Git into all workspaces.

Related content

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Feedback

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Known issue - Filled or bubble layers on Azure Maps visual doesn't render

Article • 08/18/2024

The Azure Maps APIs used by Azure maps visual had a bug where place geocoding results, such as geocoding for a place **Washington, Seattle, King County**, as opposed to an address, returned empty results. You see filled or bubble layers in the Azure maps visual not rendering. The geocoding bug was mitigated, but Power BI cached some of the empty result sets, which could cause you to continue to see blank geocoding results. The cached results last up to three months, so if affected, you can clear your geocoding cache using the workarounds provided.

Status: Fixed: August 16, 2024

Product Experience: Power BI

Symptoms

Blank geocoding results for Azure Maps causing filled or bubble layers of Azure Maps visual to not render. You don't see points in the Azure map visual rendering, especially when geocoding is used (latitude and longitude aren't provided). Filled or bubble layers in the Azure maps visual also don't render.

Solutions and workarounds

To fix the issue in the Power BI service:

1. Go to powerbi.com
2. Open your browser's dev tools (in Microsoft Edge or Chrome, using the F12 key)
3. Go to the **Application** tab
4. Look for **IndexedDB** on the left hand side
5. Select the arrow to expand
6. Look for **GeocoderCache**
7. Select the arrow to expand
8. Look for **objects**
9. Right-click and press **Clear**
10. Refresh the page

To fix the issue in Power BI Desktop:

1. Open Power BI Desktop
2. Go to Options and Settings
3. Select **Options**
4. Find the **Diagnostics** Tab
5. Select **Bypass Geocoding Cache**
6. Select **Ok** to close the dialog

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Known issue - Upload reports from OneDrive or SharePoint fails

Article • 11/08/2024

Uploading a report from OneDrive or SharePoint fails when you use the file picker in the workspace view. The error happens when your language locale is set to something other than English. The file picker opens, but then shows an error message.

Status: Fixed: November 8, 2024

Product Experience: Power BI

Symptoms

When opening the file picker, you see an error message similar to "Connection was refused" or "Something went wrong." The error happens when your language locale is set to something other than English.

Solutions and workarounds

To work around this issue, you can add or replace the language URL parameter with `language=en-us` in the browser URL.

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Known issue - Currency format is unavailable in web modeling

Article • 04/30/2024

When working in the Power BI service, you can edit your semantic models. Within the **Edit tables** screen, you can change the **Format** property for a columns and measure. If you change the column's or measure's **Format** value to **Currency**, the value doesn't show in the currency format. You also might not be able to interact with the column or measure anymore. The change was applied on the model even though you can't see it reflected in the **Edit tables** screen.

Status: Fixed: April 25, 2024

Product Experience: Power BI

Symptoms

You can't change your column's or measure's **Format** value to **Currency**. The **Currency** option might not show up under the **Format** property pane or the top ribbon.

Solutions and workarounds

If you're working within Power BI, you can work around this issue by making the change in Power BI Desktop. You can download the .pbix file, make the change in Power BI Desktop, and then upload the .pbix file back to the service. If you're working in a data warehouse, lakehouse, or datamart, you can work around this issue by using the XMLA endpoint to make the change.

Next steps

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Known issue - Creating or opening a Dataflow Gen2 dataflow shows endless spinner

Article • 06/11/2024

You aren't able to create a new or open an existing Dataflow Gen2 dataflow. Instead, you see a spinner for a long time and then see an error message.

Status: Fixed: June 11, 2024

Product Experience: Data Factory

Symptoms

You see a spinner for a long time (more than a minute) when trying to create or open a Dataflow Gen2 dataflow. After the spinner completed, you see the error message: "Timeout while waiting for the Power Query Editor to be ready."

Solutions and workarounds

You can refresh the page and retry to open or edit the dataflow.

Related content

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Known issue - Creating or opening a Dataflow Gen2 dataflow fails if capacity is inactive

Article • 06/06/2024

When creating a new or opening an existing Dataflow Gen2 dataflow, you might see the error message: "Something went wrong. Please try again." If the dataflow is in a workspace associated with an inactive capacity, the error message applies to this known issue.

Status: Fixed: June 6, 2024

Product Experience: Data Factory

Symptoms

When you create a new Dataflow Gen2 dataflow or open an existing Dataflow Gen2 dataflow, you see the error message: "Something went wrong. Please try again." The dataflow is in a workspace associated with an inactive capacity.

Solutions and workarounds

To prevent the error message, have a capacity administration unpause the capacity. Wait for a few minutes before trying to create or edit the dataflow again.

Related content

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Known issue - Exporting semantic model data to OneLake fails due to unicode characters

Article • 05/28/2024

When using OneLake integration for semantic models, you can export the data in a semantic model to OneLake. If the semantic model contains table names or column names with unicode characters, the export doesn't work.

Status: Fixed: May 1, 2024

Product Experience: OneLake

Symptoms

If you didn't previously export the semantic model, you don't see the data in OneLake. If you previously exported the semantic model and then a table or column with a unicode character in the name was added, you see an older version of the semantic model data in OneLake. The export doesn't happen and the updated data doesn't get exported to OneLake.

Solutions and workarounds

To work around this issue, you can deactivate the export or change the table and column names to not contain any unicode characters.

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Known issue - PySpark import statements fail for .jar files installed through environment

Article • 11/07/2024

You can upload a custom library file with a .jar format into a Fabric environment. Although uploading and publishing of the environment succeeds, the import command fails in the PySpark session.

Status: Fixed: November 7, 2024

Product Experience: Data Engineering

Symptoms

In a PySpark session, the import library statement fails with a **Class not found** error. The custom library with a .jar format was installed through an environment.

Solutions and workarounds

To work around this issue, you can use the following command to install the library in Notebook session: `%configure -f { "conf": { "spark.jars": "<>", } }` Alternatively, you can switch from a PySpark to a Scala session if applicable.

Related content

- [About known issues ↗](#)

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Known issue - Cross-region internal shortcuts don't work with SQL analytics endpoints

Article • 09/26/2024

You can create OneLake internal shortcuts that reference OneLake locations across Fabric capacities in different regions. If you create one of these internal shortcuts, you can't access it through the SQL analytics endpoint or a semantic model. You see an error when trying to access the data using these shortcuts through the SQL analytics endpoint or semantic model. Shortcuts that reference OneLake locations in the same region as the shortcut location work as expected.

Status: Fixed: September 25, 2024

Product Experience: OneLake

Symptoms

The shortcut is visible through the Lakehouse user interface and accessible through Spark notebooks. However, the shortcut doesn't appear in the SQL analytics endpoint, and you can't add it to a semantic model.

Solutions and workarounds

No workarounds at this time. This article will be updated when the fix is released.

Related content

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Known issue - ParquetSharpNative error in dataflow refresh using a gateway

Article • 03/21/2024

After you upgrade to the December 2023 (or newer) version of the on-premises data gateway, Dataflow Gen2 refreshes using that gateway might start failing with the error "Unable to load DLL 'ParquetSharpNative'."

Status: Fixed: March 20, 2024

Product Experience: Data Factory

Symptoms

You have a Dataflow Gen2 dataflow that uses the December 2023 (or newer) version of the on-premises data gateway. When you try to refresh the dataflow, the refresh fails with the following error message: "Couldn't refresh the entity because of an issue with the mashup document. MashupException.Error: Unable to load DLL 'ParquetSharpNative': A dynamic link library (DLL) initialization routine failed. (Exception from HRESULT: 0x8007045A)."

Solutions and workarounds

The issue is fixed. Upgrade to the March 2024 version of the on-premises data gateway to stop receiving the error. If you run the on-premises data gateway on a Hyper-V virtual machine with processor compatibility mode turned on, try disabling processor compatibility mode.

Next steps

- [About known issues ↗](#)

Feedback

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Known issue - Library management updates with public python libraries time-out

Article • 05/28/2024

If you update your environment with python libraries from the conda channel or provide an env.yml file with libraries from conda channel, the environment publish hangs and eventually times out.

Status: Open

Product Experience: Data Engineering

Symptoms

You see the environment publish hang and time out if you have one of the following scenarios:

- public python libraries specified with feed/source selected as conda
- libraries specified under 'dependencies' in an env.yml file

Solutions and workarounds

You have a few options to work around this issue:

- Use [Fabric Runtime 1.3](#).
- Install the same library using the PyPI feed or move the library under the pip section in the env.yml file.
- Install the same library from conda using and [in-line session install](#), example `%conda install`, if you're using a Notebook.

Related content

- [About known issues ↗](#)

Feedback

Was this page helpful?

 Yes

 No

[Provide product feedback ↗](#) | [Ask the community ↗](#)

Known issue - Load Table public API response returns error

Article • 05/28/2024

If you use the [Lakehouse Load Table public API](#) to retrieve the operation status URL, the response sends a '404-NotFound' error.

Status: Fixed: April 1, 2024

Product Experience: Data Engineering

Symptoms

If you have this issue, you could see one of two symptoms:

- The response from the Load Table public API is a '404-NotFound' error.
- The Load Table API is also used when [loading the data to delta lake tables](#). When you try loading a file, you see an error message with an error code "LakehouseOperationFailed." The table is created successfully though.

Solutions and workarounds

If you receive the '404-NotFound' error, wait until the fix is released. If you receive the LakehouseOperationFailed error message, you can safely ignore the error.

Related content

- [About known issues ↗](#)

Feedback

Was this page helpful?

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Known issue - Visuals using the Denodo connector might show errors

Article • 05/28/2024

If your Denodo Server restarts or is briefly offline, your connection to the server isn't available. Any visuals in the Power BI reports that use the Denodo connector in DirectQuery mode show a connection error. However, these errors might show for more than ~20 min after the server comes back online.

Status: Open

Product Experience: Power BI

Symptoms

Visuals in a Power BI report using the Denodo connector in DirectQuery mode might show up errors for more than 20 minutes after a Denodo Server restart or a small offline occurrence of the Denodo Server.

Solutions and workarounds

To work around this issue, you can restart Power BI Desktop or restart the on-premises data gateway. Once you restart either application, the visuals render successfully. If you choose not to restart either application, you can wait for at least 20 minutes, and the report reverts back to normal.

Related content

- [About known issues](#)

Feedback

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Known issue - Microsoft Defender detects OpenSSL vulnerability in Power BI Desktop

Article • 05/28/2024

Microsoft Defender detects OpenSSL 3.0.11.0 vulnerabilities in the December 2023 and above versions of Power BI Desktop. When you check the scan results in Microsoft Defender, you see OpenSSL 3.0.11.0 listed with one weakness against it. The vulnerabilities reported are CVE-2023-5363 and CVE-2023-5678 and are marked as High and Medium. The vulnerability reference Power BI Desktop DLLs from the Simba Spark ODBC drivers. However, the vulnerabilities are due to areas that we don't use in the driver and the message can be ignored.

Status: Open

Product Experience: Power BI

Symptoms

Microsoft Defender reports OpenSSL 3.0.11.0 vulnerabilities in Power BI Desktop for versions December 2023 and above. The vulnerabilities detected are CVE-2023-5363 and CVE-2023-5678 and are marked as High and Medium. The scan results show OpenSSL 3.0.11.0 listed with one weakness against it.

The associated DLLs are from the Simba Spark ODBC drivers:

- C:\Program Files\Microsoft Power BI Desktop\bin\ODBC Drivers\Simba Spark ODBC Driver\libcurl64.dll\openssl64.dll\libcrypto-3-x64.dll
- C:\Program Files\Microsoft Power BI Desktop\bin\ODBC Drivers\Simba Spark ODBC Driver\libcurl64.dll\openssl64.dll\libssl-3-x64.dll
- C:\Program Files\Microsoft Power BI Desktop\bin\ODBC Drivers\Simba Spark ODBC Driver\openssl64.dll\libcrypto-3-x64.dll
- C:\Program Files\Microsoft Power BI Desktop\bin\ODBC Drivers\Simba Spark ODBC Driver\openssl64.dll\libssl-3-x64.dll

Solutions and workarounds

You can set Microsoft Defender to exclude these vulnerabilities. The CVE-2023-5363 vulnerability is related to ciphers that we don't use in the driver. The CVE-2023-5678

vulnerability is related to X9.42 DH keys that we don't use in the driver. Both CVEs specifically state that the vulnerability doesn't affect the SSL/TLS implementation. These CVEs don't affect the Simba driver that shipped with the December version of Power BI.

Future Power BI Desktop releases will contain OpenSSL 3.0.13 to fix these issues.

Related content

- [About known issues](#)
-

Feedback

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Known issue - Tables not available to add in Power BI semantic model

Article • 05/28/2024

When you're working in a lakehouse, you can create and add tables to a new Power BI semantic model. You also can adjust the tables shown in the default semantic model associated with a lakehouse. In either case, you might run into a scenario where you don't see all available tables and can't add them to your semantic model.

Status: Open

Product Experience: Data Engineering

Symptoms

When trying to select the tables to include in a semantic model, you don't see all expected tables.

Solutions and workarounds

No workarounds at this time. This article will be updated when the fix is released.

Related content

- [About known issues ↗](#)

Feedback

Was this page helpful?

 Yes	 No
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Known issue - Dataflow Gen1 refresh fails in premium workspaces connecting to Azure Cosmos DB

Article • 06/06/2024

In this scenario, you have a Dataflow Gen1 dataflow that resides in a workspace assigned to a Premium or Fabric capacity or are moving the residing workspace from a Pro capacity to a Premium or Fabric capacity. The dataflow uses an Azure Cosmos DB connection and you receive refresh or connection failures.

Status: Fixed: June 6, 2024

Product Experience: Power BI

Symptoms

On your Dataflow Gen1 dataflow connected to Azure Cosmos DB in Premium workspaces, you receive a refresh or connection failure.

Solutions and workarounds

There are two possible workarounds:

- Move your dataflow from Dataflow Gen1 to Dataflow Gen2
- Move your dataflow to a workspace assigned to a Pro capacity

Related content

- [About known issues](#)

Feedback

Was this page helpful?

 Yes

 No

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Known issue - Type mismatch when writing decimals and dates to lakehouse using a dataflow

Article • 05/28/2024

You can create a Dataflow Gen2 dataflow that writes data to a lakehouse as an output destination. If the source data has a **Decimal** or **Date** data type, you might see a different data type appear in the lakehouse after running the dataflow. For example, when the data type is **Date**, the resulting data type is sometimes converted to **Datetime**, and when the data type is **Decimal**, the resulting data type is sometime converted to **Float**.

Status: Open

Product Experience: Data Factory

Symptoms

You see an unexpected data type in the lakehouse after running a dataflow.

Solutions and workarounds

No workarounds at this time. This article will be updated when the fix is released.

Related content

- [About known issues ↗](#)

Feedback

Was this page helpful?



Yes



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Known issue - Tighter throttling limit for GetDatasourcesAsAdmin Admin API

Article • 05/28/2024

In our ongoing efforts to enhance the performance and reliability of admin APIs, we recently implemented new throttling limits based on historical usage data. However, it's now apparent that the introduction of a new throttling limit, set at 50 calls per hour for the GetDatasourcesAsAdmin API, is overly restrictive for quite a few customers. We're actively addressing this issue by reverting to our previous throttling mechanism, where calls are queued rather than rejected. This interim solution ensures smoother operation while we determine a new throttling limit that accommodates all intended use cases for this API.

Status: Fixed: March 14, 2024

Product Experience: Administration & Management

Symptoms

You receive a return code 429 (too many requests) after hitting the limit of 50 calls within the time window of an hour.

Solutions and workarounds

While we work on refining the throttling limits for the GetDatasourcesAsAdmin API, we understand the importance of providing viable alternatives for our users. As a temporary workaround, we recommend using our scanner APIs to access all datasource information for your tenant. The scanner APIs offer a robust solution for retrieving datasets and related datasource information. For more information, please refer to [Admin - WorkspacelInfo GetScanResult REST API](#). We acknowledge that this workaround might not fully replicate the functionality of the affected API. However, we believe it serves as a practical solution until we finalize a new throttling limit that effectively caters to all use cases. Thank you for your patience and understanding as we navigate through this process.

Related content

- [About Admin - WorkspacelInfo GetScanResult REST API](#)
- [About known issues ↗](#)

Feedback

Was this page helpful?

 Yes

 No

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Known issue - Using an inactive SQL analytics endpoint can show old data

Article • 05/28/2024

If you use a SQL analytics endpoint that hasn't been active for a while, the SQL analytics endpoint scans the underlying delta tables. It's possible for you to query one of the tables before the refresh is completed with the latest data. If so, you might see old data being returned or even errors being raised if the parquet files were vacuumed.

Status: Open

Product Experience: Data Warehouse

Symptoms

When querying a table through the SQL analytics endpoint, you see old data or get an error, similar to: "Failed to complete the command because the underlying location does not exist. Underlying data description: %1."

Solutions and workarounds

You can retry after allowing the SQL analytics endpoint to complete its refresh process.

Related content

- [About known issues ↗](#)

Feedback

Was this page helpful?

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Known issue - Under-billing of OneLake storage for January 26 2024

Article • 05/28/2024

From January 26, 2024 4:00 AM through 8:00 PM UTC, there was an outage where OneLake storage was under billed. During the time window, due to Event Hubs outage, OneLake storage wasn't reported. Thus, storage wasn't billed for this period. The under billing only occurred in the East US region.

Status: Open

Product Experience: Fixed: May 23, 2024

Symptoms

You won't see billing of OneLake Storage for From January 26, 2024 4:00 AM through 8:00 PM.

Solutions and workarounds

There are no solutions or workarounds to this issue.

Related content

- [About known issues ↗](#)

Feedback

Was this page helpful?

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Known issue - OneLake storage isn't billed for paused capacities

Article • 05/28/2024

Data stored in OneLake gets billed even when the capacity is paused. However, the storage billing isn't currently happening, and you're inadvertently not charged for storage while the capacity is paused.

Status: Fixed: April 25, 2024

Product Experience: OneLake

Symptoms

You don't see billing for OneLake storage when the capacity is paused.

Solutions and workarounds

No workarounds at this time. This article will be updated when the fix is released.

Related content

- [About known issues ↗](#)

Feedback

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Known issue - Relationships in the default semantic model get dropped

Article • 11/11/2024

You see that some relationships no longer exist in the default semantic model. Earlier, the structure of the underlying table changed, such as adding or removing a column. The change leads to the table being recreated in the SQL analytics endpoint, which could potentially disrupt and drop the existing relationships in the default semantic model.

Status: Fixed: November 11, 2024

Product Experience: Data Warehouse

Symptoms

When viewing the default semantic model, you no longer see relationships that previously existed.

Solutions and workarounds

To mitigate the issue, you can recreate the missing relationships in the default semantic model.

Related content

- [About known issues ↗](#)

Feedback

Was this page helpful?



Yes



No

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Known issue - Reflex item creation fails due to a token creation failure

Article • 02/28/2024

You can create a reflex trigger from a Power BI report. The creation can fail because of a token creation failure.

Status: Fixed: February 27, 2024

Product Experience: Data Activator

Symptoms

When you try to create a reflex trigger, you see an error message similar to: An internal error occurred while creating your trigger. If this error persists, please contact support, quoting the following information: "There is an error in creating AAD token"

Solutions and workarounds

Follow these steps to work around the issue:

1. Remove `&clientSideAuth=0` from the URL in address bar of your browser, and reload your Power BI report.
2. Proceed as normal to create your reflex trigger.

Related content

- [About known issues ↗](#)

Feedback

Was this page helpful?

 Yes	 No
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Known issue - Product switcher and creation process inadvertently show Fabric experiences

Article • 05/02/2024

When tenant settings controlling Fabric items are turned off, you don't expect to observe the product switcher at the bottom left of the Fabric interface. Furthermore, you don't anticipate seeing new Fabric items during the creation process. Due to this issue, you can see Data Engineering and Data Science options within the product switcher, allowing you to unintentionally create Fabric environments.

Status: Fixed: May 1, 2024

Product Experience: Administration & Management

Symptoms

You see the Data Engineering or Data Science experience in the product switcher and can create Fabric environment items even when Fabric is turned off.

Solutions and workarounds

Environments, a specialized type for storing Spark settings such as Spark runtime, differ from Spark notebooks or other Data Engineering items that involve customer data. Environments don't consume capacity, even if created by users. Don't take any further action until Microsoft implements a gating mechanism through a tenant setting.

Related content

- [About known issues ↗](#)

Feedback

Was this page helpful?



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Known issue - Lakehouse doesn't recognize table names with special characters

Article • 11/24/2023

The Lakehouse explorer doesn't correctly identify Data Warehouse tables names containing spaces and special characters, such as non-Latin characters.

Status: Open

Product Experience: Data Engineering

Symptoms

In the Lakehouse Explorer user interface, you see tables whose names contains spaces and special characters in the "Unidentified tables" section.

Solutions and workarounds

To correctly see the table, you can use the SQL Analytics Endpoint on the Lakehouse. You can also query the tables using Spark notebooks. When using a Spark notebook, you must use the backtick notation and directly reference the table in disk in Spark commands.

Next steps

- [About known issues ↗](#)
-

Feedback

Was this page helpful?

 Yes

 No

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Known issue - Dataflow Gen1 admin switch affects Dataflow Gen2

Article • 11/05/2024

Users aren't able to use Dataflow Gen2 when Dataflow Gen1 admin switch is disabled.

APPLIES TO: ✓ Dataflow Gen2 in Microsoft Fabric.

Status: Fixed: November 5, 2024

Product experience: Data Factory

Symptoms

When the Dataflow Gen1 admin switch is disabled, users aren't able to use Dataflow Gen2. When the user tries to create a Dataflow Gen2, the user gets the following error message: Request failed with 401(Unauthorized): Unauthorized.

Solutions and workarounds

Enable the Dataflow Gen1 admin switch to use Dataflow Gen2. For more information, see [Dataflow Gen1 admin switch](#)

Related content

- [About known issues ↗](#)

Feedback

Was this page helpful?

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Known issue - Creating or updating Fabric items is blocked

Article • 06/06/2024

You can't create or update a Fabric or Power BI item because your organization's compute capacity has exceeded its limits. You don't receive an error message when the creation or update is blocked. However, when the compute capacity exceeded its limits, a notification was sent to your company's Fabric admin.

Status: Fixed: June 6, 2024

Product Experience: Administration & Management

Symptoms

You can't load a page, create an item, or update anything in Fabric.

Solutions and workarounds

In the future, we'll improve the notifications for the known issue to improve your experience. In the meantime, wait a while and retry your request to see if capacity is available. For further information on capacity usage, reach out to your capacity admin.

Related content

- [About known issues ↗](#)

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Was this page helpful?

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Known issue - Data warehouse with more than 20,000 tables fails to load

Article • 11/11/2024

A data warehouse or SQL analytics endpoint that has more than 20,000 tables fails to load in the portal. If connecting through any other client tools, you can load the tables. The issue is only observed while accessing the data warehouse through the portal.

Status: Fixed: November 11, 2024

Product Experience: Data Warehouse

Symptoms

Your data warehouse or SQL analytics endpoint fails to load in the portal with the error message "Batch was canceled," but the same connection strings are reachable using other client tools.

Solutions and workarounds

If you're impacted, use a client tool such as SQL Server Management Studio or Azure Data studio to query the data warehouse.

Related content

- [About known issues ↗](#)

Feedback

Was this page helpful?

 Yes

 No

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Known issue - User column incorrectly shows as System in Fabric capacity metrics app

Article • 01/22/2024

In a limited number of cases, when you make a user-initiated request to the data warehouse, the user identity isn't correctly reported to the Fabric capacity metrics app. In the capacity metrics app, the **User** column shows as **System**.

Status: Open

Product Experience: Data Warehouse

Symptoms

In the interactive operations table on the timepoint page, you incorrectly see the value **System** under the **User** column.

Solutions and workarounds

No workarounds at this time. When the fix is released, we'll update this article.

Related content

- [About known issues ↗](#)

Feedback

Was this page helpful?

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Known issue - InProgress status shows in Fabric capacity metrics app for completed queries

Article • 01/22/2024

In the Fabric capacity metrics app, completed queries in the Data Warehouse SQL analytics endpoint appear with the status as "InProgress" in the interactive operations table on the timepoint page.

Status: Open

Product Experience: Data Warehouse

Symptoms

In the interactive operations table on the timepoint page, completed queries in the Data Warehouse SQL analytics endpoint appear with the status **InProgress**

Solutions and workarounds

No workarounds at this time. When the fix is released, we'll update this article.

Related content

- [About known issues ↗](#)

Feedback

Was this page helpful?



Yes



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Known issue - Refresh history reports in progress for some tables that failed

Article • 08/01/2024

Users are experiencing an intermittent issue. Refresh history reports in progress for some tables while the dataflow has failed.

APPLIES TO: ✓ Dataflow Gen2 in Microsoft Fabric.

Status: Fixed: July 31, 2024

Product experience: Data Factory

Symptoms

Failed dataflows show in progress refresh history for some tables, while it's not refreshing anymore.

Solutions and workarounds

Retry to refresh the dataflow again and check the refresh history.

Related content

- [About known issues ↗](#)

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Known issue - The Data Warehouse Object Explorer doesn't support case-sensitive object names

Article • 01/22/2024

The object explorer fails to display the Fabric Data Warehouse objects (ex. tables, views, etc.) when have same noncase sensitive name (ex. table1 and Table1). In case there are two objects with same name, one displays in the object explorer. but, if there's three or more objects, nothing gets display. The objects show and can be used from system views (ex. sys.tables). The objects aren't available in the object explorer.

Status: Open

Product Experience: Data Warehouse

Symptoms

If the customer notice the object shares the same noncase sensitive name as another object listed in a system view and is working as intended, but isn't listed in the object explorer, then the customer has encountered this known issue.

Solutions and workarounds

Recommend naming objects with different names and not relying on case-sensitivity as it helps avoid any inconsistency from not being listed in the object explorer, but listed in system views

Related content

- [About known issues ↗](#)

Feedback

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Known issue - Temp table usage in Data Warehouse and SQL analytics endpoint

Article • 01/22/2024

Users can create Temp tables in the Data Warehouse and in SQL analytics endpoint but data from user tables can't be inserted into Temp tables. Temp tables can't be joined to user tables.

Status: Open

Product Experience: Data Warehouse

Symptoms

Users may notice that data from their user tables can't be inserted into a Temp table. Temp tables can't be joined to user tables.

Solutions and workarounds

Use regular user tables instead of Temp tables.

Related content

- [About known issues ↗](#)

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Known issue - Autoscale not triggered by carry forward accumulated usage

Article • 05/24/2024

This known issue relates to two main concepts on the premium capacity administration: Autoscale and carry forward usage.

Autoscale allows capacity administrators to automatically trigger individual Power BI v-cores whenever the capacity usage reaches the purchased capacity limits. With the latest updates on the capacity usage rules, we now allow capacity usage to consume future CPU. We also carry forward the excess usage to be burned down in the future windows. Capacity throttling is only applied when we [can't clear the carry forward usage after an extended period](#).

In this known issue, if you set a maximum of Autoscale v-cores to be used, Autoscale v-cores are only activated based on the current usage. Autoscale doesn't get activated by the excess carry forward usage. If Autoscale v-cores are active due to current usage, they're used to burn down any carried forward usage.

Autoscale is a valuable mechanism to prevent capacity usage exceeding 100% and to add usage into the carry forward to be paid off in a future window.

APPLIES TO:  Power BI

Status: Fixed: May 2, 2024

Problem area: Capacity Management

Symptoms

If you set up a maximum value of Autoscale v-cores, you might see the Autoscale v-cores activated don't appear to reach the maximum number. Autoscale v-cores are only activated for the current usage, so even if you accumulate carry forward, the carry forward usage doesn't count towards activating Autoscale. If Autoscale is activated through normal usage, the extra v-cores do still help pay off any accumulated carry forward.

Solutions and workarounds

The known issue is fixed, and the Autoscale logic is different. Learn more at [Using Autoscale in Power BI Premium](#).

Related content

- [Using Autoscale with Power BI Premium](#)
 - [Fabric capacity throttling logic](#)
 - [About known issues](#)
-

Feedback

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Fabric known issues

Article • 11/11/2024

This page lists known issues for Fabric and Power BI features. Before submitting a Support request, review this list to see if the issue that you're experiencing is already known and being addressed. Known issues are also available as an [interactive embedded Power BI report](#).

For service level outages or degradation notifications, check <https://support.fabric.microsoft.com/>.

Currently active known issues

Select the **Title** to view more information about that specific known issue.

[+] [Expand table](#)

Issue ID	Product experience	Title	Issues publish date
923	Power BI	Tenant migrations paused through January 2025	November 8, 2024
919	Power BI	Embedded paginated report renders correctly but shows error message	November 7, 2024
918	Power BI	More options menu on a visual doesn't open in unsaved reports	November 7, 2024
916	Power BI	Visual doesn't load due to an unexpected error	November 7, 2024
910	Data Warehouse	SQL analytics endpoint tables lose statistics	October 31, 2024
909	Data Warehouse	SQL analytics endpoint tables lose permissions	October 31, 2024
902	Power BI	INFO.VIEW.MEASURES() in calculated table might cause errors	October 31, 2024
903	Data Warehouse	Data warehouse data preview might fail if multiple data warehouse items	October 28, 2024
898	OneLake	External data sharing OneLake shortcuts don't show in SQL analytics endpoint	October 25, 2024

Issue ID	Product experience	Title	Issues publish date
897	OneLake	OneLake Shared Access Signature (SAS) can't read cross-region shortcuts	October 25, 2024
894	Data Engineering	Pipeline fails when getting a token to connect to Kusto	October 25, 2024
895	OneLake	Dataverse shortcut creation and read fails when organization is moved	October 23, 2024
893	Power BI	Can't connect to semantic model from Excel or use Analyze in Excel	October 23, 2024
891	Data Warehouse	Data warehouse tables aren't accessible or updatable	October 17, 2024
883	Data Engineering	Spark jobs might fail due to Runtime 1.3 updates for GA	October 17, 2024
878	Power BI	Premium capacity doesn't add excess usage into carry forward	October 10, 2024
819	Power BI	Subscriptions and exports with maps might produce wrong results	October 10, 2024
877	Data Factory	Data pipeline connection fails after connection creator role is removed	October 9, 2024
872	Data Warehouse	Data warehouses don't show button friendly names	October 3, 2024
865	Power BI	Configure workspace storage to use ADLS Gen2 storage account doesn't work	October 3, 2024
861	Power BI	Unable to close organizational app items in left navigation pane	September 26, 2024
856	Data Factory	Pipeline fails when copying data to data warehouse with staging	September 25, 2024
844	Power BI	Intermittent refresh failure through on-premises data gateway	September 25, 2024
842	Data Warehouse	Data warehouse exports using deployment pipelines or git fail	September 23, 2024
846	OneLake	OneLake BCDR write transactions aren't categorized correctly for billing	September 17, 2024

Issue ID	Product experience	Title	Issues publish date
837	Data Engineering	Monitoring hub displays incorrect queued duration	September 17, 2024
835	Data Engineering	Managed private endpoint connection could fail	September 13, 2024
823	Data Warehouse	Concurrent stored procedures block each other in data warehouse	September 4, 2024
821	Data Warehouse	Schema refresh for a data warehouse's semantic model fails	August 28, 2024
817	Data Factory	Pipelines don't support Role property for Snowflake connector	August 23, 2024
816	Data Factory	Pipeline deployment fails when parent contains deactivated activity	August 23, 2024
810	Data Warehouse	Inserting nulls into Data Warehouse tables fail with incorrect error message	August 16, 2024
809	Data Factory	Dataflow Gen2 refresh fails due to missing SQL analytics endpoint	August 14, 2024
808	Power BI	Custom visuals are blurry in zoomed in or out Microsoft Edge (Chromium) browser	August 14, 2024
800	Data Engineering	Teaching bubble blocks Lakehouse explorer context menu from opening	July 31, 2024
797	Data Engineering	Localization blocks operations in a lakehouse	July 31, 2024
795	Data Factory	Multiple installations of on-premises data gateway causes pipelines to fail	July 31, 2024
789	Data Engineering	SQL analytics endpoint table queries fail due to RLE	July 24, 2024
774	Data Factory	Data warehouse deployment using deployment pipelines fails	July 5, 2024
769	Data Factory	Dataflows Gen2 staging lakehouse doesn't work in deployment pipelines	July 2, 2024
767	Data Warehouse	SQL analytics endpoint table sync fails when table contains linked functions	July 2, 2024

Issue ID	Product experience	Title	Issues publish date
765	Data Factory	Dataflows Gen2 staging warehouse doesn't work in deployment pipelines	July 2, 2024
757	Data Factory	Copy activity from Oracle to lakehouse fails for Number data type	June 20, 2024
732	Data Engineering	Shortcut creation on a lakehouse preview table takes long time	May 31, 2024
726	Data Factory	Pipeline using XML format copy gets stuck	May 24, 2024
723	Data Warehouse	Azure SQL Database change data doesn't propagate to mirror	May 24, 2024
728	Data Engineering	Environment doesn't work when runtime version is changed to Runtime 1.1	May 23, 2024
717	Data Factory	West India region doesn't support on-premises data gateway for data pipelines	May 16, 2024
718	OneLake	OneLake under-reports transactions in the Other category	May 13, 2024
716	Data Warehouse	Response times when composing SQL queries slower than expected	May 13, 2024
702	Data Factory	SQL database mirror doesn't start when you create connection during mirror creation	May 1, 2024
647	Data Engineering	Library management updates with public python libraries time-out	March 14, 2024
641	Power BI	Visuals using the Denodo connector might show connection errors	March 5, 2024
640	Power BI	Microsoft Defender detects OpenSSL vulnerabilities in Power BI Desktop	March 5, 2024
643	Data Engineering	Tables not available to add in Power BI semantic model	February 27, 2024
591	Data Factory	Type mismatch when writing decimals and dates to lakehouse using a dataflow	February 16, 2024
618	Data Warehouse	Using an inactive SQL analytics endpoint can show old data	February 14, 2024
563	Data Engineering	Lakehouse doesn't recognize table names with special characters	November 22, 2023

Issue ID	Product experience	Title	Issues publish date
508	Data Warehouse	User column incorrectly shows as System in Fabric capacity metrics app	October 5, 2023
506	Data Warehouse	InProgress status shows in Fabric capacity metrics app for completed queries	October 5, 2023
454	Data Warehouse	Warehouse's object explorer doesn't support case-sensitive object names	July 10, 2023
447	Data Warehouse	Temp tables in Data Warehouse and SQL analytics endpoint	July 5, 2023

Recently closed known issues

Select the **Title** to view more information about that specific known issue. Known issues are organized in descending order by fixed date. Fixed issues are retained for at least 46 days.

[\[+\] Expand table](#)

Issue ID	Product experience	Title	Issues publish date	Issue fixed date
822	Data Warehouse	SQL queries fail intermittently	August 28, 2024	Fixed: November 11, 2024
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Fabric known issues

Article • 11/11/2024

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Known issue - Dataflow REST API returns more data sources and gateways than expected

Article • 06/06/2024

When you call the Dataflow REST API, [Dataflows - Get Dataflow Data Sources](#), the response presents more data sources and gateways than the ones bound to the dataflow being queried.

APPLIES TO:  Power BI

Status: Fixed: June 6, 2024

Problem area: Embedded REST API or PowerShell

Symptoms

In the API response, you see other data sources and gateways available, not only the ones expected for the queried dataflow.

Solutions and workarounds

No workarounds at this time. This article is updated when the fix is released.

Related content

- [About known issues](#)

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Known issue - A scheduled refresh of a dataset intermittently hangs when connected to a dataflow

Article • 06/06/2024

Scheduled refreshes of datasets connected to dataflows may hang intermittently and the following scheduled refreshes may be skipped.

APPLIES TO:  Power BI

Status: Fixed: June 6, 2024

Problem area: Create and Author Data

Symptoms

You may experience a skipped scheduled refresh on datasets connected to a dataflow. The schedule time under the **Scheduled Refresh** option on the dataset settings page displays correctly, however if you refer to the "Refresh history" you find that the refresh didn't take place.

Solutions and workarounds

To work around this issue, republish the dataset under a different name to the same workspace.

Related content

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Known issue #222 - Search strings that include Japanese symbols don't return matches

Article • 08/18/2024

In the Power BI service, you may see unexpected results when the search string contains Japanese symbols. Search strings that include Japanese symbols don't return matching content in the search results.

APPLIES TO: Power BI

Status: Removed: August 16, 2024

Problem area: Consume and View

Symptoms

When using the global search box in the header of the Power BI service, you may see no results returned if you use Japanese symbols in the search string.

Solutions and workarounds

As [documented](#), search currently supports only English characters.

Related content

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Microsoft Fabric product, workload, and item icons

Article • 10/15/2024

This article provides information about the official collection of icons for Microsoft Fabric that you can use in architectural diagrams, training materials, slide decks or documentation.

Do's

- Use the icons to illustrate how products can work together.
- In diagrams, we recommend including a label that contains the product, experience, or item name somewhere close to the icon.
- Use the icons as they appear within the product.

Don'ts

- Don't crop, flip, or rotate icons.
- Don't distort or change icon shape in any way.
- Don't use Microsoft product icons to represent your product or service.

Terms

Microsoft permits the use of these icons in architectural diagrams, training materials, or documentation. You can copy, distribute, and display the icons only for the permitted use unless granted explicit permission by Microsoft. Microsoft reserves all other rights. Fabric icons are also available as a [npm package](#) for use in Microsoft Fabric platform extension development. To use these icons, import the package into your project, then use individual SVG files as an image source or as an SVG. You can also directly download the icons from the following GitHub repository. Select the following button to open the repo, select ... from the right hand corner and select **Download**:

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- [Azure icons](#)

- Dynamics 365 icons
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What's new in Microsoft Fabric? archive

Article • 09/26/2024

This archive page is periodically updated with an archival of content from [What's new in Microsoft Fabric?](#)

To follow the latest in Fabric news and features, see the [Microsoft Fabric Blog](#). Also follow the latest in Power BI at [What's new in Power BI?](#)

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This section includes past articles and announcements that are useful to users new to Microsoft Fabric.

- [Learning Paths for Fabric](#)
- [Get started with Microsoft Fabric](#)
- [End-to-end tutorials in Microsoft Fabric](#)
- [Definitions of terms used in Microsoft Fabric](#)

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Month	Feature	Learn more
March 2024	Microsoft Fabric is now HIPAA compliant	We're excited to announce that Microsoft Fabric, our all-in-one analytics solution for enterprises, has achieved new certifications for HIPAA and ISO 27017, ISO 27018, ISO 27001, ISO 27701 .
March 2024	Exam DP-600 is now available	Exam DP-600 is now available, leading to the Microsoft Certified: Fabric Analytics Engineer Associate certification . The Fabric Career Hub can help you learn quickly and get certified.
March 2024	Fabric Copilot Pricing: An End-to-End example	Copilot in Fabric begins billing on March 1, 2024 as part of your existing Power BI Premium or Fabric Capacity. Learn how Fabric Copilot usage is calculated .
January 2024	Microsoft Fabric Copilot for Data Science and Data Engineering	Copilot for Data Science and Data Engineering is now available worldwide. What can Copilot for Data Science and Data Engineering do for you?
December 2023	Fabric platform Security Fundamentals	Learn more about the big-picture perspective of the Microsoft Fabric security architecture by describing how the main security flows in the system work.

Month	Feature	Learn more
November 2023	Microsoft Fabric, explained for existing Synapse users	A focus on what customers using the current Platform-as-a-Service (PaaS) version of Synapse can expect . We explain what the general availability of Fabric means for your current investments (spoiler: we fully support them), but also how to think about the future.
November 2023	Microsoft Fabric is now generally available	Microsoft Fabric is now generally available for purchase . Microsoft Fabric can reshape how your teams work with data by bringing everyone together on a single, AI-powered platform built for the era of AI. This includes: Power BI, Data Factory, Data Engineering, Data Science, Real-Time Analytics, Data Warehouse, and the overall Fabric platform.
November 2023	Fabric workloads are now generally available!	Microsoft Fabric is now generally available! Microsoft Fabric Synapse Data Warehouse, Data Engineering & Data Science, Real-Time Analytics, Data Factory, OneLake, and the overall Fabric platform are now generally available.
November 2023	Implement medallion lakehouse architecture in Microsoft Fabric	An introduction to medallion lake architecture and how you can implement a lakehouse in Microsoft Fabric.
October 2023	Announcing the Fabric roadmap	Announcing the Fabric Roadmap . One place you can see what we are working on and when you can expect it to be available.
October 2023	Get started with semantic link	Explore how semantic link seamlessly connects Power BI semantic models with Synapse Data Science within Microsoft Fabric. Learn more at Semantic link in Microsoft Fabric: Bridging BI and Data Science .
		You can also check out the semantic link sample notebooks that are now available in the fabric-samples GitHub repository. These notebooks showcase the use of semantic link's Python library, SemPy , in Microsoft Fabric.
September 2023	Fabric Capacities – Everything you need to know about what's new and what's coming	Read more about the improvements we're making to the Fabric capacity management platform for Fabric and Power BI users .
August 2023	Accessing Microsoft Fabric for developers, startups and enterprises!	Learn how to enable Microsoft Fabric as a developer, as a startup or as an enterprise has different steps. Learn more at Enabling Microsoft Fabric for developers, startups, and enterprises .

Month	Feature	Learn more
August 2023	Strong, useful, beautiful: Designing a new way of getting data	From the Data Integration Design Team, learn about the strong, creative, and function design of Microsoft Fabric, as Microsoft designs for the future of data integration.
August 2023	Learn Live: Get started with Microsoft Fabric	Calling all professionals, enthusiasts, and learners! On August 29, we'll be kicking off the "Learn Live: Get started with Microsoft Fabric" series in partnership with Microsoft's Data Advocacy teams and Microsoft WorldWide Learning teams to deliver 9x live-streamed lessons covering topics related to Microsoft Fabric!
July 2023	Step-by-Step Tutorial: Building ETLs with Microsoft Fabric	In this comprehensive guide, we walk you through the process of creating Extract, Transform, Load (ETL) pipelines using Microsoft Fabric.
June 2023	Get skilled on Microsoft Fabric - the AI-powered analytics platform	Who is Fabric for? How can I get skilled? This blog post answers these questions about Microsoft Fabric, a comprehensive data analytics solution by unifying many experiences on a single platform.
June 2023	Introducing the end-to-end scenarios in Microsoft Fabric	In this blog, we explore four end-to-end scenarios that are typical paths our customers take to extract value and insights from their data using Microsoft Fabric .
May 2023	Get Started with Microsoft Fabric - All in-one place for all your Analytical needs	A technical overview and introduction to everything from data movement to data science, real-time analytics, and business intelligence in Microsoft Fabric .
May 2023	Microsoft OneLake in Fabric, the OneDrive for data	Microsoft OneLake brings the first multicloud SaaS data lake for the entire organization .

Generally available features

The following table lists the features of Microsoft Fabric that have transitioned from preview to general availability (GA).

[+] [Expand table](#)

Month	Feature	Learn more
May 2024	Microsoft Fabric Private Links	Azure Private Link for Microsoft Fabric secures access to your sensitive data in Microsoft Fabric by providing network isolation and applying required controls on your inbound network traffic.

Month	Feature	Learn more
		For more information, see Announcing General Availability of Fabric Private Links .
May 2024	Trusted workspace access	Trusted workspace access in OneLake shortcuts is now generally available. You can now create data pipelines to access your firewall-enabled Azure Data Lake Storage Gen2 (ADLS Gen2) accounts using Trusted workspace access (preview) in your Fabric Data Pipelines. Use the workspace identity to establish a secure and seamless connection between Fabric and your storage accounts. Trusted workspace access also enables secure and seamless access to ADLS Gen2 storage accounts from OneLake shortcuts in Fabric.
May 2024	Managed private endpoints	Managed private endpoints for Microsoft Fabric allow secure connections over managed virtual networks to data sources that are behind a firewall or not accessible from the public internet. For more information, see Announcing General Availability of Fabric Private Links, Trusted Workspace Access, and Managed Private Endpoints .
May 2024	Eventhouse	Eventhouse is a new, dynamic workspace hosting multiple KQL databases, generally available as part of Fabric Real-Time Intelligence. An Eventhouse offers a robust solution for managing and analyzing substantial volumes of real-time data. Get started with a guide to Create and manage an Eventhouse .
May 2024	Data Engineering: Environment	The Environment in Fabric is now generally available. The Environment is a centralized item that allows you to configure all the required settings for running a Spark job in one place. At GA, we added support for Git, deployment pipelines, REST APIs, resource folders, and sharing.
May 2024	Microsoft Fabric Core REST APIs	Microsoft Fabric Core APIs are now generally available. The Fabric user APIs are a major enabler for both enterprises and partners to use Microsoft Fabric as they enable end-to-end fully automated interaction with the service, enable integration of Microsoft Fabric into external web applications, and generally enable customers and partners to scale their solutions more easily.
May 2024	Power Query Dataflow Gen2 SDK for VS Code	The Power Query SDK is now generally available in Visual Studio Code! To get started with the Power Query SDK in Visual Studio Code, install it from the Visual Studio Code Marketplace .
April 2024	Semantic Link	Semantic links are now generally available! The package comes with our default VHD, and you can now use Semantic link in Fabric right away without any pip installation.

Month	Feature	Learn more
March 2024	VNet Gateways in Dataflow Gen2	VNet Data Gateway support for Dataflows Gen2 in Fabric is now generally available. The VNet data gateway helps to connect from Fabric Dataflows Gen2 to Azure data services within a VNet, without the need of an on-premises data gateway.
November 2023	Microsoft Fabric is now generally available	Microsoft Fabric is now generally available for purchase . Microsoft Fabric can reshape how your teams work with data by bringing everyone together on a single, AI-powered platform built for the era of AI. This includes: Power BI , Data Factory , Data Engineering , Data Science , Real-Time Analytics , Data Warehouse , and the overall Fabric platform .

Community

This section summarizes previous Microsoft Fabric community opportunities for prospective and current influencers and MVPs. To learn about the Microsoft MVP Award and to find MVPs, see [mvp.microsoft.com](#).

[+] [Expand table](#)

Month	Feature	Learn more
May 2024	Announcing Microsoft Fabric Community Conference Europe	Announcing the Microsoft Fabric Community Conference Europe on September 24, 2024. Register today !
May 2024	Register for the Microsoft Build: Microsoft Fabric Cloud Skills Challenge	Starting May 21, 2024, sign up for the Microsoft Build: Microsoft Fabric Cloud Skills Challenge and prepare for Exam DP-600 and upskill to the Fabric Analytics Engineer Associate certification.
March 2024	Exam DP-600 is now available	Exam DP-600 is now available, leading to the Microsoft Certified: Fabric Analytics Engineer Associate certification . The Fabric Career Hub can help you learn quickly and get certified.
March 2024	Microsoft Fabric Community Conference	Join us in Las Vegas March 26-28, 2024 for the first annual Microsoft Fabric Community Conference. See firsthand how Microsoft Fabric and the rest of the data and AI products at Microsoft can help your organization prepare for the era of AI. Register today using code <code>MSCUST</code> for an exclusive discount!
March 2024	Announcing the winners of "HackTogether: The	We received 50 Hackathon project submissions from over 100 registrants, participating from every corner of the world. Our judges were blown away by the breadth,

Month	Feature	Learn more
	Microsoft Fabric Global AI Hack"	depth, and overall quality of submissions. Meet the winners of the Fabric Global AI Hack!
January 2024	Announcing Fabric Career Hub	The new Fabric Career Hub is your one-stop-shop for professional growth! We've created a comprehensive learning journey with the best free on-demand and live training, plus exam discounts.
January 2024	Hack Together: The Microsoft Fabric Global AI Hack	Hack Together is a global online hackathon that runs from February 15 to March 4, 2024. Join us for Hack Together: The Microsoft Fabric Global AI Hack, a virtual event where you can learn, experiment, and hack together with the new Copilot and AI features in Microsoft Fabric! For more information, see Microsoft Fabric Global AI Hack .
December 2023	Microsoft Fabric Community Conference	Join us in Las Vegas March 26-28, 2024 for the first annual Microsoft Fabric Community Conference. See firsthand how Microsoft Fabric and the rest of the data and AI products at Microsoft can help your organization prepare for the era of AI. Register today to immerse yourself in the future of data and AI and connect with thousands of data innovators like yourself eager to share their insights.
November 2023	Microsoft Fabric MVP Corner – Special Edition (Ignite)	A special edition of the "Microsoft Fabric MVP Corner" blog series highlights selected content related to Fabric and created by MVPs around the Microsoft Ignite 2023 conference , when we announced Microsoft Fabric generally available.
October 2023	Microsoft Fabric MVP Corner – October 2023	Highlights of selected content related to Fabric and created by MVPs from October 2023 .
September 2023	Microsoft Fabric MVP Corner – September 2023	Highlights of selected content related to Fabric and created by MVPs from September 2023 .
August 2023	Microsoft Fabric MVP Corner – August 2023	Highlights of selected content related to Fabric and created by MVPs from August 2023 .
July 2023	Microsoft Fabric MVP Corner – July 2023	Highlights of selected content related to Fabric and created by MVPs in July 2023 .
June 2023	Microsoft Fabric MVP Corner – June 2023	The Fabric MVP Corner blog series to highlight selected content related to Fabric and created by MVPs in June 2023 .
May 2023	Fabric User Groups	Power BI User Groups are now Fabric User Groups !

Month	Feature	Learn more
May 2023	Learn about Microsoft Fabric from MVPs	Prior to our official announcement of Microsoft Fabric at Build 2023, MVPs had the opportunity to familiarize themselves with the product. For several months, they have been actively testing Fabric and gaining valuable insights. Now, their enthusiasm for the product is evident as they eagerly share their knowledge and thoughts about Microsoft Fabric with the community .

Fabric samples and guidance

This section summarizes archived guidance and sample project resources for Microsoft Fabric.

[Expand table](#)

Month	Feature	Learn more
March 2024	Protect PII information in your Microsoft Fabric Lakehouse with Responsible AI	One possible way to use Azure AI to identify and extract personally identifiable information (PII) in Microsoft Fabric is to use Azure AI Language to detect and categorize PII entities in text data, such as names, addresses, emails, phone numbers, social security numbers, etc.
February 2024	Building Common Data Architectures with OneLake in Microsoft Fabric	Read more about common data architecture patterns and how they can be secured with Microsoft Fabric , and the basic building blocks of security for OneLake.
January 2024	New Fabric certification and Fabric Career Hub	Beta availability of Microsoft Certification Exam DP-600: Implementing Analytics Solutions with Microsoft Fabric is available for a limited time. Passing this exam earns the Microsoft Certified: Fabric Analytics Engineer Associate certification.
December 2023	Working with OneLake using Azure Storage Explorer	If you want to use an application that directly integrates with Windows File Explorer, check out OneLake file explorer . However, if you're accustomed to using Azure Storage Explorer for your data management tasks , you can continue to harness its functionalities with OneLake and some of its key benefits.
November 2023	Semantic Link: OneLake integrated Semantic Models	Semantic Link adds support for the recently released OneLake integrated semantic models . You can now directly access data using your semantic model's name via

Month	Feature	Learn more
		OneLake using the <code>read_table</code> function and the new <code>mode</code> parameter set to <code>onelake</code> .
November 2023	Integrate your SAP data into Microsoft Fabric	Using the built-in connectivity of Microsoft Fabric is the easiest and least-effort way of adding SAP data to your Fabric data estate .
November 2023	Fabric Changing the game: Validate dependencies with Semantic Link – Data Quality	Follow this step-by-step example of how to explore the functional dependencies between columns in a table using the semantic link . The semantic link is a feature that allows you to establish a connection between Power BI datasets and Synapse Data Science in Microsoft Fabric.
November 2023	Implement medallion lakehouse architecture in Microsoft Fabric	An introduction to medallion lake architecture and how you can implement a lakehouse in Microsoft Fabric.
October 2023	Fabric Change the Game: Exploring the data	Follow this realistic example of reading data from Azure Data Lake Storage using shortcuts, organizing raw data into structured tables, and basic data exploration. Our data exploration uses as a source the diverse and captivating city of London with information extracted from data.london.gov.uk/ .
September 2023	Announcing an end-to-end workshop: Analyzing Wildlife Data with Microsoft Fabric	A new workshop guides you in building a hands-on, end-to-end data analytics solution for the Snapshot Serengeti dataset using Microsoft Fabric. The dataset consists of approximately 1.68M wildlife images and image annotations provided in .json files.
September 2023	New learning path: Implement a Lakehouse with Microsoft Fabric	The new Implement a Lakehouse with Microsoft Fabric learning path introduces the foundational components of implementing a data lakehouse with Microsoft Fabric with seven in-depth modules.
September 2023	Fabric Readiness repository	The Fabric Readiness repository is a treasure trove of resources for anyone interested in exploring the exciting world of Microsoft Fabric.
July 2023	Connecting to OneLake	How do I connect to OneLake? This blog covers how to connect and interact with OneLake, including how OneLake achieves its compatibility with any tool used over ADLS Gen2!
June 2023	Using Azure Databricks with Microsoft Fabric and OneLake	How does Azure Databricks work with Microsoft Fabric? This blog post answers that question and more details on how the two systems can work together.

Month	Feature	Learn more
July 2023	Free preview usage of Microsoft Fabric experiences extended to October 1, 2023	We're extending the free preview usage of Fabric experiences (other than Power BI). These experiences won't count against purchased capacity until October 1, 2023 .

Microsoft Copilot in Microsoft Fabric

This section summarizes archived announcements about [Copilot in Fabric](#).

[\[+\] Expand table](#)

Month	Feature	Learn more
May 2024	The AI and Copilot setting automatically delegated to capacity admins	In the tenant admin portal, you can delegate the enablement of AI and Copilot features to Capacity administrators . This AI and Copilot setting is automatically delegated to capacity administrators and tenant administrators won't be able to turn off the delegation.
February 2024	Fabric Change the Game: How easy is it to use Copilot in Microsoft Fabric	This blog post shows how simple is to enable Copilot, a generative AI that brings new ways to transform and analyze data, generate insights, and create visualizations and reports in Microsoft Fabric.
February 2024	Copilot for Data Factory in Microsoft Fabric	Copilot for Data Factory in Microsoft Fabric is now available in preview and included in the Dataflow Gen2 experience. For more information, see Copilot for Data Factory .
January 2024	Microsoft Fabric Copilot for Data Science and Data Engineering	Copilot for Data Science and Data Engineering is now available worldwide. What can Copilot for Data Science and Data Engineering do for you?
January 2024	How to enable Copilot in Fabric for Everyone	Follow this guide to get Copilot in Fabric enabled for everyone in your organization. For more information, see Overview of Copilot for Microsoft Fabric (preview) .
January 2024	Copilot in Fabric is available worldwide	Copilot in Fabric is now available to all customers, including Copilot for Power BI , Data Factory , and Data Science & Data Engineering . Read more in our Overview on Copilot in Fabric .
November 2023	Empower Power BI users with Microsoft	We're thrilled to announce the general availability of Microsoft Fabric and the preview of Copilot in Microsoft

Month	Feature	Learn more
	Fabric and Copilot	Fabric, including the experience for Power BI .
November 2023	Copilot for Power BI in Microsoft Fabric preview	We're thrilled to announce the preview of Copilot in Microsoft Fabric , including the experience for Power BI, which helps users quickly get started by helping them create reports in the Power BI web experience. For more information, see Copilot for Power BI .
October 2023	Chat your data in Microsoft Fabric with Semantic Kernel	Learn how to construct Copilot tools based on business data in Microsoft Fabric .

Data Factory in Microsoft Fabric

This section summarizes archived new features and capabilities of [Data Factory in Microsoft Fabric](#). Follow issues and feedback through the [Data Factory Community Forum](#).

[+] [Expand table](#)

Month	Feature	Learn more
May 2024	Data Factory Announcements at Microsoft Build Recap	Don't miss any of the Data Factory in Fabric announcements, here's a recap of all new features in Data Factory in Fabric from Build 2024 .
May 2024	New certified connectors	The Power Query SDK and Power Query Connector Certification process has introduced several new Power Query connectors , including connectors for Oracle database, MySQL, Oracle Cloud Storage, Azure AI, Azure Files, Dynamics AX, Google Bigquery, Snowflake ADBC, and more coming soon.
May 2024	API for GraphQL in Microsoft Fabric (preview)	The new API for GraphQL is a data access layer that allows us to query multiple data sources quickly and efficiently in Fabric. For more information, see What is Microsoft Fabric API for GraphQL?
May 2024	Power Query Dataflow Gen2 SDK for VS Code GA	The Power Query SDK is now generally available in Visual Studio Code! To get started with the Power Query SDK in Visual Studio Code, install it from the Visual Studio Code Marketplace .
May 2024	Refresh the Refresh History Dialog	The Refresh History details popup window now has a Refresh button .

Month	Feature	Learn more
May 2024	New and updated certified connectors	The Power Query SDK and Power Query Connector Certification process has introduced four new and updated Power Query connectors .
May 2024	Data workflows in Data Factory preview	Data workflows (preview) in Data Factory , powered by Apache Airflow, offer seamless authoring, scheduling, and monitoring experience for Python-based data processes defined as Directed Acyclic Graphs (DAGs). For more information, see Quickstart: Create a Data workflow .
May 2024	Trusted Workspace Access in Fabric Data Pipelines preview	Use the workspace identity to establish a secure and seamless connection between Fabric and your storage accounts. You can now create data pipelines to access your firewall-enabled Azure Data Lake Storage Gen2 (ADLS Gen2) accounts using Trusted workspace access (preview) in your Fabric Data Pipelines.
May 2024	Blob storage Event Triggers for Data Pipelines preview	Azure Blob storage event triggers (preview) in Fabric Data Factory Data Pipelines use Fabric Reflex alerts and event streams to create event subscriptions to your Azure storage accounts.
May 2024	Azure HDInsight activity for data pipelines	The Azure HDInsight activity allows you to execute Hive queries, invoke a MapReduce program, execute Pig queries, execute a Spark program, or a Hadoop Stream program.
May 2024	Copy data assistant	Start using the Modern Get Data experience by selecting Copy data assistant in the Pipeline landing page or Use copy assistant in the Copy data drop down. You can easily connect to recently used Fabric items and provides an intuitive way to read sources from sample data and new connections.
May 2024	Edit the Destination Table Column Type when Copying Data	You can edit destination table column types when copying data for a new or autocreated destination table for many data stores. For more information, see Configure Lakehouse in a copy activity .
April 2024	Spark job definition activity	With the new Spark job definition activity , you'll be able to run a Spark job definition in your pipeline.
April 2024	Fabric Warehouse in ADF copy activity	You can now connect to your Fabric Warehouse from an Azure Data Factory/Synapse pipeline . You can find this new connector when creating a new source or sink destination in your copy activity, in the Lookup

Month	Feature	Learn more
		activity, Stored Procedure activity, Script activity, and Get Metadata activity.
April 2024	Edit column type to destination table support added to Fabric Warehouse and other SQL data stores	When moving data from any supported data sources into Fabric Warehouse or other SQL data stores (SQL Server, Azure SQL Database, Azure SQL Managed Instance, or Azure Synapse Analytics) via data pipelines, users can now specify the data type for each column .
April 2024	Performance improvements when writing data to SFTP	The SFTP connector has been improved to offer better performance when writing to SFTP as destination.
April 2024	Service Principal Name authentication kind support for On-Premises and virtual network data gateways	Azure Service Principals (SPN) are now supported for on-premises data gateways and virtual network data gateways. Learn how to use the service principal authentication kind in Azure Data Lake Storage, Dataverse, Azure SQL Database, Web connector, and more.
April 2024	New and updated Certified connectors	The Power Query SDK and Power Query Connector Certification process has introduced 11 new and updated custom Power Query connectors .
April 2024	New Expression Builder Experience	A new experience in the Script activity in Fabric Data Factory pipelines to make it even easier to build expressions using the pipeline expression language.
April 2024	Data Factory Increases Maximum Activities Per Pipeline to 80	We have doubled the limit on number of activities you can define in a pipeline from 40 to 80.
April 2024	REST APIs for Fabric Data Factory pipelines preview	The REST APIs for Fabric Data Factory Pipelines are now in preview. REST APIs for Data Factory pipelines enable you to extend the built-in capability in Fabric to create, read, update, delete, and list pipelines.
March 2024	Fast copy in Dataflows Gen2	With Fast copy , you can ingest terabytes of data with the easy experience of dataflows, but with the scalable backend of Pipeline's Copy activity.
March 2024	Integrating On-Premises Data into Microsoft Fabric Using Data Pipelines in Data Factory preview	With the on-premises Data Gateway (preview), customers can connect to on-premises data sources using dataflows and data pipelines with Data Factory . For more information, see How to access on-premises data sources in Data Factory for Microsoft Fabric .

Month	Feature	Learn more
March 2024	CI/CD for Fabric Data Pipelines preview	Git Integration and integration with built-in Deployment Pipelines to Data Factory data pipelines is now in preview. For more information, see Data Factory Adds CI/CD to Fabric Data Pipelines .
March 2024	Browse Azure resources with Get Data	Learn how to browse and connect to all your Azure resources with the 'browse Azure' functionality in Get Data. You can browse Azure resources then connect to Synapse, blob storage, or ADLS Gen2 resources easily.
March 2024	Dataflow Gen2 Support for VNet Gateways now generally available	VNet Data Gateway support for Dataflows Gen2 in Fabric is now generally available. The VNet data gateway helps to connect from Fabric Dataflows Gen2 to Azure data services within a VNet, without the need of an on-premises data gateway.
March 2024	Privacy levels support in Dataflows	You can now set privacy levels for your connections in your Dataflow Gen2. Privacy levels are critical to configure correctly so that sensitive data is only viewed by authorized users.
March 2024	Copy data to S3 Compatible via Fabric Data Factory Data Pipeline	Copying data to S3 Compatible is now available in Data pipeline of Fabric Data Factory! You can use Copy assistant and Copy activity in your Data pipeline to finish this data movement.
February 2024	Dataflows Gen2 data destinations and managed settings	New features for Dataflows Gen2 include destinations, managed settings, and advanced topics.
February 2024	Copilot for Data Factory in Microsoft Fabric	Copilot for Data Factory in Microsoft Fabric is now available in preview and included in the Dataflow Gen2 experience. For more information, see Copilot for Data Factory .
February 2024	Certified Connector updates	The Power Query SDK enables you to create new connectors for both Power BI and Dataflow. New certified Power Query connectors are available to the list of Certified Connectors in Power Query .
February 2024	Data pipeline connector updates	New connectors are available in your Data Factory data pipelines, including S3 compatible and Google Cloud Storage data sources. For more information, see Data pipeline connectors in Microsoft Fabric .
January 2024	Automate Fabric Data Warehouse Queries and	In Fabric Data Factory, there are many ways to query data, retrieve data, and execute commands from your

Month	Feature	Learn more
	Commands with Data Factory	warehouse using pipeline activities that can then be easily automated ↗ .
January 2024	Use Fabric Data Factory Data Pipelines to Orchestrate Notebook-based Workflows	Guidance and good practices when building Fabric Spark Notebook workflows using Data Factory in Fabric ↗ with data pipelines.
December 2023	Read and Write to the Fabric Lakehouse using Azure Data Factory (ADF)	You can now read and write data in the Microsoft Fabric Lakehouse from ADF (Azure Data Factory). Using either Copy Activity or Mapping Data Flows, you can read, write, transform, and process data using ADF or Synapse Analytics, currently in preview.
December 2023	Set activity state for easy pipeline debugging	In Fabric Data Factory data pipelines, you can now set an activity's state to inactive so that you can save your pipeline even with incomplete, invalid configurations. Think of it as "commenting out" part of your pipeline code.
December 2023	Connection editing in pipeline editor	You can now edit your existing data connections while you're designing your pipeline without leaving the pipeline editor! When setting your connection, select Edit and a pop-up appears.
December 2023	Azure Databricks Notebook executions in Fabric Data Factory	You can now create powerful data pipeline workflows that include Notebook executions from your Azure Databricks clusters using Fabric Data Factory ↗ . Add a Databricks activity to your pipeline, point to your existing cluster, or request a new cluster, and Data Factory will execute your Notebook code for you.
November 2023	Implement medallion lakehouse architecture in Microsoft Fabric	An introduction to medallion lake architecture and how you can implement a lakehouse in Microsoft Fabric.
November 2023	Dataflow Gen2 General availability of Fabric connectors	The connectors for Lakehouse, Warehouse, and KQL Database are now generally available ↗ . We encourage you to use these connectors when trying to connect to data from any of these Fabric workloads.
November 2023	Dataflow Gen2 Automatic refresh cancellation	To prevent unnecessary resources from being consumed, there's a new mechanism that stops the refresh of a Dataflow as soon as the results of the refresh are known to have no impact ↗ . This is to reduce consumption more proactively.

Month	Feature	Learn more
November 2023	Dataflow Gen2 Error message propagation through gateway	We made diagnostics improvement to provide meaningful error messages when Dataflow refresh fails for those Dataflows running through the Enterprise Data Gateway.
November 2023	Dataflow Gen2 Support for column binding for SAP HANA connector	Column binding support is enabled for SAP HANA. This optional parameter results in significantly improved performance. For more information, see Support for column binding for SAP HANA connector .
November 2023	Dataflow Gen2 staging artifacts hidden	When using a Dataflow Gen2 in Fabric, the system will automatically create a set of staging artifacts. Now, these staging artifacts will be abstracted from the Dataflow Gen2 experience and will be hidden from the workspace list. No action is required by the user and this change has no impact on existing Dataflows.
November 2023	Dataflow Gen2 Support for VNet Gateways preview	VNet Data Gateway support for Dataflows Gen2 in Fabric is now in preview. The VNet data gateway helps to connect from Fabric Dataflows Gen2 to Azure data services within a VNet, without the need of an on-premises data gateway.
November 2023	Cross workspace "Save as"	You can now clone your data pipelines across workspaces by using the "Save as" button.
November 2023	Dynamic content flyout integration with Email and Teams activity	In the Email and Teams activities, you can now add dynamic content with ease. With this new pipeline expression integration, you'll now see a flyout menu to help you select and build your message content quickly without needing to learn the pipeline expression language.
November 2023	Copy activity now supports fault tolerance for Fabric Data Warehouse connector	The Copy activity in data pipelines now supports fault tolerance for Fabric Warehouse . Fault tolerance allows you to handle certain errors without interrupting data movement. By enabling fault tolerance, you can continue to copy data while skipping incompatible data like duplicated rows.
November 2023	MongoDB and MongoDB Atlas connectors	MongoDB and MongoDB Atlas connectors are now available to use in your Data Factory data pipelines as sources and destinations.
November 2023	Microsoft 365 connector now supports ingesting	The Microsoft 365 connector now supports ingesting data into Lakehouse tables .

Month	Feature	Learn more
	data into Lakehouse (preview)	
November 2023	Multi-task support for editing pipelines in the designer	You can now open and edit data pipelines from different workspaces and navigate between them using the multi-tasking capabilities in Fabric.
November 2023	String interpolation added to pipeline return value	You can now edit your data connections within your data pipelines . Previously, a new tab would open when connections needed editing. Now, you can remain within your pipeline and seamlessly update your connections.
October 2023	Category redesign of activities	We've redesigned the way activities are categorized to make it easier for you to find the activities you're looking for with new categories like Control flow, Notifications, and more.
October 2023	Copy runtime performance improvement	We've made improvements to the Copy runtime performance. According to our tests results, with the improvements users can expect to see the duration of copying from parquet/csv files into Lakehouse table to improve by ~25%-35%.
October 2023	Integer data type available for variables	We now support variables as integers! When creating a new variable, you can now choose to set the variable type to Integer, making it easier to use arithmetic functions with your variables.
October 2023	Pipeline name now supported in System variables.	We've added a new system variable called Pipeline Name so that you can inspect and pass the name of your pipeline inside of the pipeline expression editor, enabling a more powerful workflow in Fabric Data Factory.
October 2023	Support for Type editing in Copy activity Mappings	You can now edit column types when you land data into your Lakehouse tables. This makes it easier to customize the schema of your data in your destination. Simply navigate to the Mapping tab, import your schemas, if you don't see any mappings, and use the dropdown list to make changes.
October 2023	New certified connector: Emplifi Metrics	Announcing the release of the new Emplifi Metrics connector. The Power BI Connector is a layer between Emplifi Public API and Power BI itself. For more information, see Emplifi Public API documentation .
October 2023	SAP HANA (Connector Update)	The update enhances the SAP HANA connector with the capability to consume HANA Calculation Views

Month	Feature	Learn more
		deployed in SAP Datasphere by taking into account SAP Datasphere's additional security concepts.
October 2023	Set Activity State to "Comment Out" Part of Pipeline	Activity State is now available in Fabric Data Factory data pipelines , giving you the ability to comment out part of your pipeline without deleting the definition.
August 2023	Staging labels	The concept of staging data was introduced in Dataflows Gen2 for Microsoft Fabric and now you have the ability to define what queries within your Dataflow should use the staging mechanisms or not.
August 2023	Secure input/output for logs	We've added advanced settings for the Set Variable activity called Secure input and Secure output. When you enable secure input or output, you can hide sensitive information from being captured in logs.
August 2023	Pipeline run status added to Output panel	We've recently added Pipeline status so that developers can easily see the status of the pipeline run. You can now view your Pipeline run status from the Output panel.
August 2023	Data pipelines FTP connector	The FTP connector is now available to use in your Data Factory data pipelines in Microsoft Fabric. Look for it in the New connection menu.
August 2023	Maximum number of entities in a Dataflow	The new maximum number of entities that can be part of a Dataflow has been raised to 50.
August 2023	Manage connections feature	The Manage Connections option now allows you to view the linked connections to your dataflow, unlink a connection, or edit connection credentials and gateway.
August 2023	Power BI Lakehouses connector	An update to the Lakehouses connector in the August version of the Power BI Desktop and Gateway includes significant performance improvements.
July 2023	New modern data connectivity and discovery experience in Dataflows	An improved experience aims to expedite the process of discovering data in Dataflow, Dataflow Gen2, and Datamart .
May 2023	Introducing Data Factory in Microsoft Fabric	Data Factory enables you to develop enterprise-scale data integration solutions with next-generation dataflows and data pipelines .

Data Factory in Microsoft Fabric samples and guidance

Month	Feature	Learn more
May 2024	Semantic model refresh activity	Learn how to use the much-requested Semantic model refresh activity in Data pipelines and how you can now create a complete end-to-end solution that spans the entire pipeline lifecycle.
February 2024	Fabric Data Pipelines – Advanced Scheduling Techniques	This blog series covers Advanced Scheduling techniques in Microsoft Fabric Data Pipelines .
December 2023	Read data from Delta Lake tables with the DeltaLake.Table M function	The DeltaLake.Table is a new function in Power Query's M language for reading data from Delta Lake tables. This function is now available in Power Query in Power BI Desktop and in Dataflows Gen1 and Gen2 and replaces the need to use community-developed solution.
October 2023	Microsoft Fabric Data Factory Webinar Series – October 2023	You're invited to join our October webinar series , where we'll show you how to use Data Factory to transform and orchestrate your data in various scenarios.
September 2023	Notify Outlook and Teams channel/group from a Microsoft Fabric pipeline	Learn how to send notifications to both Teams channels/groups and Outlook emails .
September 2023	Microsoft Fabric Data Factory Webinar Series – September 2023	Join our Data Factory webinar series where we'll show you how to use Data Factory to transform and orchestrate your data in various scenarios.
August 2023	Metadata Driven Pipelines for Microsoft Fabric – Part 2, Data Warehouse Style	An overview of a metadata-driven pipeline in Microsoft Fabric that follows the medallion architecture with Data Warehouse serving as the Gold layer.
August 2023	Metadata Driven Pipelines for Microsoft Fabric	An overview of a Metadata driven pipeline in Microsoft Fabric that follows the medallion architecture (Bronze, Silver, Gold).
August 2023	Using Data pipelines for copying data to/from KQL Databases and crafting workflows with the Lookup activity	Real-Time Intelligence' KQL DB is supported as both a destination and a source with data pipelines, allowing you to build and manage various extract, transform, and load (ETL) activities, leveraging the power and capabilities of KQL DBs.
August 2023	Incrementally amass data	With Dataflows Gen2 that comes with support for data destinations, you can setup your own pattern to load new data incrementally , replace some old

Month	Feature	Learn more
		data, and keep your reports up to date with your source data.
August 2023	Data Pipeline Performance Improvement Part 3: Gaining more than 50% improvement for Historical Loads	Learn how to account for pagination given the current state of Fabric Data Pipelines in preview. This pipeline is performant when the number of paginated pages isn't too large. Read more at Gaining more than 50% improvement for Historical Loads .
August 2023	Data Pipeline Performance Improvements Part 2: Creating an Array of JSONs	Examples from this blog series include how to merge two arrays into an array of JSON objects, and how to take a date range and create multiple subranges then store these as an array of JSONs. Read more at Creating an Array of JSONs .
July 2023	Data Pipeline Performance Improvements Part 1: How to convert a time interval (dd.hh:mm:ss) into seconds	Part one of a series of blogs on moving data with multiple Copy Activities moving smaller volumes in parallel: How to convert a time interval (dd.hh:mm:ss) into seconds .
July 2023	Construct a data analytics workflow with a Fabric Data Factory data pipeline	A blog covering data pipelines in Data Factory and the advantages you find by using pipelines to orchestrate your Fabric data analytics projects and activities .
July 2023	Data Pipelines Tutorial: Ingest files into a Lakehouse from a REST API with pagination ft. AVEVA Data Hub	In this blog, we will act in the persona of an AVEVA customer who needs to retrieve operations data from AVEVA Data Hub into a Microsoft Fabric Lakehouse .
July 2023	Data Factory Spotlight: Dataflow Gen2	This blog spotlight covers the two primary high-level features Data Factory implements: dataflows and pipelines .

Synapse Data Engineering in Microsoft Fabric

This section summarizes archived new features and capabilities of data engineering, including [Data Factory in Microsoft Fabric](#).

[] [Expand table](#)

Month	Feature	Learn more
May 2024	Runtime 1.3 (Apache Spark 3.5, Delta Lake)	The enhancements in Fabric Runtime 1.3 include the incorporation of Delta Lake 3.1, compatibility with

Month	Feature	Learn more
	3.1, R 4.3.3, Python 3.11 (preview)	Python 3.11, support for Starter Pools, integration with Environment, and library management capabilities. Additionally, Fabric Runtime now enriches the data science experience by supporting the R language and integrating Copilot.
May 2024	Spark Run Series Analysis and Autotune feature preview	The Spark Monitoring Run Series Analysis features allow you to analyze the run duration trend and performance comparison for Pipeline Spark activity recurring run instances and repetitive Spark run activities, from the same Notebook or Spark Job Definition.
May 2024	OneLake shortcuts to on-premises and network-restricted data sources (preview)	Connect to on-premises data sources with a Fabric on-premises data gateway on a machine in your environment, with networking visibility of your S3 compatible, Amazon S3, or Google Cloud Storage data source. Then, you create your shortcut and select that gateway. For more information, see Create shortcuts to on-premises data .
May 2024	Comment @tagging in Notebook	Notebook now supports the ability to tag others in comments , just like the familiar functionality of using Office products.
May 2024	Notebook ribbon upgrades	New features in the Fabric notebook ribbon including the Session connect control and Data Wrangler button on the Home tab, High concurrency sessions , new View session information control including the session timeout.
May 2024	Data Engineering: Environment GA	The Environment in Fabric is now generally available. The Environment is a centralized item that allows you to configure all the required settings for running a Spark job in one place. At GA, we added support for Git, deployment pipelines, REST APIs, resource folders, and sharing.
May 2024	Public API for Workspace Data Engineering/Science	REST API support for Fabric Data Engineering/Science workspace settings allows users to create/manage their Spark compute, select the default runtime/default environment, enable or disable high concurrency mode, or ML autologging.
April 2024	Fabric Spark Optimistic Job Admission	Fabric Spark Optimistic Job Admission reduces the frequency of throttling errors (HTTP 430: Spark Capacity Limit Exceeded Response) and improves the job admission experience for our customers, especially during peak usage hours.

Month	Feature	Learn more
April 2024	Single Node support for starter pools	The Single Node support for starter pools feature lets you set your starter pool to max one node and get super-fast session start times for your Spark sessions.
April 2024	Container Image for Synapse VS Code	To simplify the development process, we have released a container image for Synapse VS Code that contains all the necessary dependencies for the extension.
April 2024	Git integration with Spark Job definition	Git integration with Spark Job definitions allows you to check in the changes of your Spark Job Definitions into a Git repository, which will include the source code of the Spark jobs and other item properties.
April 2024	New Revamped Object Explorer experience in the notebook	The new Object Explorer experience improves flexibility and discoverability of data sources in the explorer and improve the discoverability of Resource folders.
April 2024	%Run your scripts in Notebook	Now you can use %run magic command to run your Python scripts and SQL scripts in Notebook resources folder , just like Jupyter notebook <code>%run</code> command.
April 2024	OneLake shortcuts to S3-compatible data sources preview	OneLake shortcuts to S3-compatible data sources are now in preview. Create an Amazon S3 compatible shortcut to connect to your existing data through a single unified name space without having to copy or move data.
April 2024	OneLake shortcuts to Google Cloud Storage preview	OneLake shortcuts to Google Cloud Storage are now in preview. Create a Google Cloud Storage shortcut to connect to your existing data through a single unified name space without having to copy or move data.
April 2024	OneLake data access roles	OneLake data access roles for lakehouse are in preview. Role permissions and user/group assignments can be easily updated through a new folder security user interface.
March 2024	New validation enhancement for "Load to table"	The new validation enhancement to the "Load to table" feature help mitigate any validation issues and make your data loading experience smoother and faster.
March 2024	Queuing for Notebook Jobs	Now with Job Queueing for Notebook Jobs , jobs that are triggered by pipelines or job scheduler will be added to a queue and will be retried automatically when the capacity frees up. For more information, see Job queueing in Microsoft Fabric Spark .

Month	Feature	Learn more
March 2024	Autotune Query Tuning feature for Apache Spark	The Autotune Query Tuning feature for Apache Spark is now available. Autotune leverages historical data from your Spark SQL queries and machine learning algorithms to automatically fine-tune your configurations, ensuring faster execution times and enhanced efficiency.
March 2024	OneLake File Explorer: Editing via Excel	With our latest release v1.0.11.0 of file explorer , we're excited to announce that you can now update your files directly using Excel , mirroring the user-friendly experience available in OneDrive.
February 2024	Trusted workspace access (preview) for OneLake Shortcuts	Trusted workspace access (preview) enables secure and seamless access to ADLS Gen2 storage accounts from OneLake shortcuts in Fabric . For more information, see Trusted workspace access (preview) .
February 2024	Reduce egress costs with S3 shortcuts in OneLake	Learn how OneLake shortcuts to S3 now support caching , which can greatly reduce egress costs. Use the new Enable Cache for S3 Shortcuts setting with an S3 shortcut .
February 2024	OneLake Shortcuts API	New REST APIs for OneLake Shortcuts allow programmatic creation and management of shortcuts, currently in preview. You can now programmatically create, read, and delete OneLake shortcuts . For example, see Use OneLake shortcuts REST APIs .
February 2024	Browse code snippet	The new Browse code snippet notebook feature allows you to easily access and insert code snippets for commonly used code snippets with multiple supported languages.
February 2024	Configure session timeout	Notebooks now support configuring session timeout for the current live session. It can help you avoid wasting resources or losing context due to timeout. You can specify the maximum duration of your spark sessions, from minutes to hours, and also get alerts before the session expires and extend it.
February 2024	Fabric notebook status bar upgrade	The new Fabric Notebook status bar has three persisted info buttons: session status, save status, and cell selection status. Plus, context features include info on the git connection state, a shortcut to extend session timeout, and a failed cell navigator.
January 2024	Microsoft Fabric Copilot for Data Science and Data Engineering	Copilot for Data Science and Data Engineering is now available worldwide. What can Copilot for Data Science and Data Engineering do for you?

Month	Feature	Learn more
January 2024	Newest version of OneLake File Explorer includes Excel Integration	With the newest version of OneLake file explorer (v1.0.11.0) we bring a few updates to enhance your experience with OneLake, including Excel Integration .
December 2023	%%configure – personalize your Spark session in Notebook	Now you can personalize your Spark session with the magic command %%configure , in both interactive notebook and pipeline notebook activities.
December 2023	Rich dataframe preview in Notebook	The display() function has been updated on Fabric Notebook , now named the <i>Rich dataframe preview</i> . Now when you use <code>display()</code> to preview your dataframe, you can easily specify the range, view the dataframe summary and column statistics, check invalid values or missing values, and preview the long cell.
December 2023	Working with OneLake using Azure Storage Explorer	If you want to use an application that directly integrates with Windows File Explorer, check out OneLake file explorer . However, if you're accustomed to using Azure Storage Explorer for your data management tasks , you can continue to harness its functionalities with OneLake and some of its key benefits.
November 2023	Accessibility support for Lakehouse	To provide a more inclusive and user-friendly interaction, we have implemented improvements so far to support accessibility in the Lakehouse , including screen reader compatibility, responsive design text reflow, keyboard navigation, alternative text for images, and form fields and labels.
November 2023	Enhanced multitasking experience in Lakehouse	We've introduced new capabilities to enhance the multitasking experience in Lakehouse , including multitasking during running operations, nonblocking reloading, and clearer notifications.
November 2023	Upgraded DataGridView capabilities in Lakehouse	An upgraded DataGridView for the Lakehouse table preview now features sorting, filtering, and resizing of columns.
November 2023	SQL analytics endpoint re-provisioning	You can now retry the SQL analytics endpoint provisioning directly within the Lakehouse . This means that if your initial provisioning attempt fails, you have the option to try again without the need to create an entirely new Lakehouse.
November 2023	Microsoft Fabric Runtime 1.2	The Microsoft Fabric Runtime 1.2 is a significant advancement in our data processing capabilities. Microsoft Fabric Runtime 1.2 includes Apache Spark 3.4.1, Mariner 2.0 as the operating system, Java 11, Scala

Month	Feature	Learn more
		2.12.17, Python 3.10, Delta Lake 2.4, and R 4.2.2, ensuring you have the most cutting-edge tools at your disposal. In addition, this release comes bundled with default packages, encompassing a complete Anaconda installation and essential libraries for Java/Scala, Python, and R, simplifying your workflow.
November 2023	Multiple Runtimes Support	With the introduction of Runtime 1.2, Fabric supports multiple runtimes , offering users the flexibility to seamlessly switch between them, minimizing the risk of incompatibilities or disruptions. When changing runtimes, all system-created items within the workspace, including Lakehouses, SJDs, and Notebooks, will operate using the newly selected workspace-level runtime version starting from the next Spark Session.
November 2023	Delta as the default table format in the new Runtime 1.2	The default Spark session parameter <code>spark.sql.sources.default</code> is now <code>delta</code> . All tables created using Spark SQL, PySpark, Scala Spark, and Spark R, whenever the table type is omitted, will create the table as Delta by default .
November 2023	Intelligent Cache	By default, the newly revamped and optimized Intelligent Cache feature is enabled in Fabric Spark. The intelligent cache works seamlessly behind the scenes and caches data to help speed-up the execution of Spark jobs in Microsoft Fabric as it reads from your OneLake or ADLS Gen2 storage via shortcuts.
November 2023	Monitoring Hub for Spark enhancements	The latest enhancements in the monitoring hub are designed to provide a comprehensive and detailed view of Spark and Lakehouse activities , including executor allocations, runtime version for a Spark application, a related items link in the detail page.
November 2023	Monitoring for Lakehouse operations	Users can now view the progress and status of Lakehouse maintenance jobs and table load activities.
November 2023	Spark application resource Usage Analysis	Responding to customers' requests for monitoring Spark resource usage metrics for performance tuning and optimization, we're excited to introduce the Spark resource usage analysis feature , now available in preview. This newly released feature enables users to monitor allocated executors, running executors, and idle executors, alongside Spark executions.
November 2023	REST API support for Spark Job Definition preview	REST Public APIs for Spark Job Definition are now available, making it easy for users to manage and manipulate SJD items .

Month	Feature	Learn more
November 2023	REST API support for Lakehouse, Load to tables and table maintenance	As a key requirement for workload integration, REST Public APIs for Lakehouse are now available. The Lakehouse REST Public APIs makes it easy for users to manage and manipulate Lakehouse items programmatically.
November 2023	Lakehouse support for git integration and deployment pipelines (preview)	The Lakehouse now integrates with the lifecycle management capabilities in Microsoft Fabric , providing a standardized collaboration between all development team members throughout the product's life. Lifecycle management facilitates an effective product versioning and release process by continuously delivering features and bug fixes into multiple environments.
November 2023	Embed a Power BI report in Notebook	We're thrilled to announce that the powerbiclient Python package is now natively supported in Fabric notebooks. This means you can easily embed and interact with Power BI reports in your notebooks with just a few lines of code. To learn more about how to use the powerbiclient package to embed a Power BI component .
November 2023	Mssparkutils new API – reference run multiple notebooks in parallel	A new runMultiple API in mssparkutils called <code>mssparkutils.notebook.runMultiple()</code> allows you to run multiple notebooks in parallel, or with a predefined topological structure. For more information, see Notebook utilities .
November 2023	Notebook resources .JAR file support	We now support uploading the .jar files in the Notebook Resources explorer . You can add your own compiled libs, use drag & drop to generate a code snippet to install them in the session, and load the libraries in code conveniently.
November 2023	Notebook Git integration preview	Fabric notebooks now offer Git integration for source control using Azure DevOps . It allows users to easily control the notebook code versions and manage the git branches by leveraging the Fabric Git functions and Azure DevOps.
November 2023	Notebook in Deployment Pipeline Preview	Now you can also use notebooks to deploy your code across different environments , such as development, test, and production. You can also use deployment rules to customize the behavior of your notebooks when they're deployed, such as changing the default Lakehouse of a Notebook. Get started with deployment

Month	Feature	Learn more
		pipelines , and Notebook shows up in the deployment content automatically.
November 2023	Notebook REST APIs Preview	With REST Public APIs for the Notebook items, data engineers/data scientists can automate their pipelines and establish CI/CD conveniently and efficiently. The notebook Restful Public API ↗ can make it easy for users to manage and manipulate Fabric notebook items and integrate notebook with other tools and systems.
November 2023	Environment preview	We're thrilled to announce preview of the Environment in Fabric . The Environment is a centralized item ↗ that allows you to configure all the required settings for running a Spark job in one place.
November 2023	Synapse VS Code extension in vscode.dev preview	With support for the Synapse VS Code extension on vscode.dev , users can now seamlessly edit and execute Fabric Notebooks without ever leaving their browser window↗ . Additionally, all the native pro-developer features of VS Code are now accessible to end-users in this environment.
October 2023	Create multiple OneLake shortcuts at once	Creating multiple OneLake shortcuts just got easier. Rather than creating shortcuts one at a time, you can now browse to your desired location and select multiple targets at once. All your selected targets then get created as new shortcuts in a single operation ↗ .
October 2023	Delta-RS introduces native support for OneLake	The OneLake team worked with the Delta-RS community to help introduce support for recognizing OneLake URLs in both Delta-RS and the Rust Object Store ↗ .
September 2023	Import notebook to your Workspace	The new "Import Notebook" entry on the Workspace -> New menu ↗ lets you easily import new Fabric Notebook items in the target workspace. You can upload one or more files, including <code>.ipynb</code> , <code>.py</code> , <code>.sql</code> , <code>.scala</code> , and <code>.r</code> file formats.
September 2023	Notebook file system support in Synapse VS Code extension	The Synapse VS Code extension now supports notebook File System ↗ for Data Engineering and Data Science in Microsoft Fabric. The Synapse VS Code extension empowers users to develop their notebook items directly within the Visual Studio Code environment.
September 2023	Notebook sharing execute-only mode	We now support checking the "Run" operation separately when sharing a notebook, if you just selected the "Run" operation, the recipient would see a "Execution-only" notebook ↗ .

Month	Feature	Learn more
September 2023	Notebook save conflict resolution	We now support viewing and comparing the differences between two versions of the same notebook when there are saving conflicts.
September 2023	Mssparkutils new API for fast data copy	We now support a new method in mssparkutils that can enable large volume of data move/copy much faster , <code>Mssparkutils.fs.fastcp()</code> . You can use <code>mssparkutils.fs.help("fastcp")</code> to check the detailed usage.
September 2023	Notebook resources .whl file support	We now support uploading .whl files in the Notebook Resources explorer .
August 2023	Introducing High Concurrency Mode in Notebooks for Data Engineering and Data Science workloads in Microsoft Fabric	High concurrency mode allows you to run notebooks simultaneously on the same cluster without compromising performance or security when paying for a single session. High concurrency mode offers several benefits for Fabric Spark users.
August 2023	Service principal support to connect to data in Dataflow, Datamart, Dataset and Dataflow Gen 2	Azure service principal has been added as an authentication type for a set of data sources that can be used in Dataset, Dataflow, Dataflow Gen2 and Datamart.
August 2023	Announcing XMLA Write support for Direct Lake datasets	Direct Lake datasets now support XMLA-Write operations . Now you can use your favorite BI Pro tools and scripts to create and manage Direct Lake datasets using XMLA endpoints .
July 2023	Lakehouse Sharing and Access Permission Management	Share a lakehouse and manage permissions so that users can access lakehouse data through the Data Hub, the SQL analytics endpoint, and the default semantic model.
June 2023	Virtualize your existing data into OneLake with shortcuts	Connect data silos without moving or copying data with OneLake, which allows you to create special folders called shortcuts that point to other storage locations .
May 2023	Introducing Data Engineering in Microsoft Fabric	With Synapse Data Engineering, one of the core experiences of Microsoft Fabric, data engineers feel right at home, able to leverage the power of Apache Spark to transform their data at scale and build out a robust lakehouse architecture .

Synapse Data Engineering samples and guidance

[\[+\] Expand table](#)

Month	Feature	Learn more
May 2024	Copy Data from Lakehouse in another Workspace using Data pipeline	Learn how to copy data between Lakehouse that cross different workspaces via Data pipeline .
May 2024	Profiling Microsoft Fabric Spark Notebooks with Sparklens	In this blog, you will learn how to leverage Sparklens, an open-source Spark profiling tool, to profile Microsoft Fabric Spark Notebooks and improve the performance of your spark code.
March 2024	Bridging Fabric Lakehouses: Delta Change Data Feed for Seamless ETL	Learn how to use the Delta Change Data Feed to facilitate seamless data synchronization across different lakehouses in your medallion architecture .
January 2024	Use Fabric Data Factory Data Pipelines to Orchestrate Notebook-based Workflows	Guidance and good practices when building Fabric Spark Notebook workflows using Data Factory in Fabric with data pipelines.
November 2023	Fabric Changing the game: Using your own library with Microsoft Fabric	A step-by-step guide to use your own Python library in the Lakehouse . It's quite simple to create your own library with Python and even simpler to reuse it on Fabric.
August 2023	Fabric changing the game: Logging your workload using Notebooks	Learn more about logging your workload into OneLake using notebooks , using the OneLake API Path inside the notebook.

Synapse Data Science in Microsoft Fabric

This section summarizes archived improvements and features for the [Data Science experience in Microsoft Fabric](#).

[\[+\] Expand table](#)

Month	Feature	Learn more
May 2024	Public API for Workspace Data Engineering/Science	REST API support for Fabric Data Engineering/Science workspace settings allows users to create/manage their Spark compute, select the default runtime/default environment, enable or disable high concurrency mode, or ML autologging.

Month	Feature	Learn more
April 2024	Semantic Link GA	Semantic links are now generally available! The package comes with our default VHD. You can now use Semantic link in Fabric right away without any pip installation.
April 2024	Capacity level delegation for AI and Copilot	Tenant admins can now enable AI and Copilot in Fabric ↗ for the entire organization, certain security groups, or for a specific Capacity.
March 2024	EU customers can use AI and Copilot without cross-geo setting	Since mid-March EU customers can use AI and Copilot without turning on the cross-geo setting ↗ , and their AI and Copilot requests will be processed within EUDB.
March 2024	Code-First Hyperparameter Tuning preview	FLAML is now integrated for hyperparameter tuning, currently a preview feature. Fabric's <code>flaml.tune</code> feature streamlines this process, offering a cost-effective and efficient approach to hyperparameter tuning ↗ .
March 2024	Code-First AutoML preview	With the new AutoML feature ↗ , you can automate your machine learning workflow and get the best results with less effort. AutoML, or Automated Machine Learning , is a set of techniques and tools that can automatically train and optimize machine learning models for any given data and task type.
March 2024	Compare Nested Runs	Parent and child runs in the Run List View for ML Experiments ↗ introduces a hierarchical structure, allowing users to effortlessly view various parent and child runs within a single view and seamlessly interact with them to visually compare results.
March 2024	Support for Mandatory MIP Label Enforcement	ML Model and Experiment items in Fabric now offer enhanced support for Microsoft Information Protection (MIP) labels ↗ .
January 2024	Microsoft Fabric Copilot for Data Science and Data Engineering	Copilot for Data Science and Data Engineering is now available worldwide. What can Copilot for Data Science and Data Engineering do for you? ↗
December 2023	Semantic Link update	We're excited to announce the latest update of Semantic Link ↗ ! Apart from many improvements, we also added many new features for our Power BI engineering community that you can use from Fabric notebooks to satisfy all your automation needs.
December 2023	Prebuilt Azure AI services in Fabric preview	The preview of prebuilt AI services in Fabric ↗ is an integration with Azure AI services ↗ , formerly known as Azure Cognitive Services. Prebuilt Azure AI services allow for easy enhancement of data with prebuilt AI

Month	Feature	Learn more
		models without any prerequisites. Currently, prebuilt AI services are in preview and include support for the Microsoft Azure OpenAI Service , Azure AI Language , and Azure AI Translator .
November 2023	Copilot in notebooks preview	The Copilot in Fabric Data Science and Data Engineering notebooks is designed to accelerate productivity, provide helpful answers and guidance, and generate code for common tasks like data exploration, data preparation, and machine learning. You can interact and engage with the AI from either the chat panel or even from within notebooks cells using magic commands to get insights from data faster. For more information, see Copilot in notebooks .
November 2023	Custom Python Operations in Data Wrangler	Data Wrangler , a notebook-based tool for exploratory data analysis, has always allowed users to browse and apply common data-cleaning operations, generating the corresponding code in real time. Now, in addition to generating code from the UI, users can also write their own code with custom operations in Data Wrangler .
November 2023	Data Wrangler for Spark DataFrames preview	Data Wrangler now supports Spark DataFrames in preview. Until now, users have been able to explore and transform pandas DataFrames using common operations that can be converted to Python code in real time. The new release allows users to edit Spark DataFrames in addition to pandas DataFrames with Data Wrangler .
November 2023	MLflow Notebook Widget	The MLflow inline authoring widget enables users to effortlessly track their experiment runs along with metrics and parameters , all directly from within their notebook.
November 2023	New Model & Experiment Item Usability Improvements	New enhancements to our model and experiment tracking features are based on valuable user feedback. The new tree-control in the run details view makes tracking easier by showing which run is selected. We've enhanced the comparison feature, allowing you to easily adjust the comparison pane for a more user-friendly experience. Now you can select the run name to see the Run Details view.
November 2023	Recent Experiment Runs	It's now simpler for users to check out recent runs for an experiment directly from the workspace list view . This update makes it easier to keep track of recent

Month	Feature	Learn more
		activity, quickly jump to the related Spark application, and apply filters based on the run status.
November 2023	Models renamed to ML Models	Microsoft has renamed "Models" to "ML Models" ↗ to ensure clarity and avoid any confusion with other Fabric elements. For more information, see Machine learning experiments in Microsoft Fabric .
November 2023	SynapseML v1.0	SynapseML v1.0 is now released. SynapseML v1.0 makes it easy to build production ready machine learning systems on Fabric ↗ and has been in use at Microsoft for over six years.
November 2023	Train Interpretable Explainable Boosting Machines with SynapseML	We've introduced a scalable implementation of Explainable Boosting Machines (EBM) powered by Apache Spark in SynapseML ↗ . EBMs are a powerful machine learning technique that combines the accuracy of gradient boosting with a strong focus on model interpretability.
November 2023	Prebuilt AI models in Microsoft Fabric preview	We're excited to announce the preview for prebuilt AI models in Fabric ↗ . Azure OpenAI Service ↗ , Text Analytics ↗ , and Azure AI Translator ↗ are prebuilt models available in Fabric, with support for both RESTful API and SynapseML. You can also use the OpenAI Python Library ↗ to access Azure OpenAI service in Fabric.
November 2023	Reusing existing Spark Session in sparklyr	We have added support for a new connection method called "synapse" in sparklyr ↗ , which enables users to connect to an existing Spark session. Additionally, we have contributed this connection method to the OSS sparklyr project. Users can now use both sparklyr and SparkR in the same session and easily share data between them.
November 2023	REST API Support for ML Experiments and ML Models	REST APIs for ML Experiment and ML Model ↗ are now available. These REST APIs for ML Experiments and ML Models begin to empower users to create and manage machine learning items programmatically, a key requirement for pipeline automation and workload integration.
October 2023	Semantic link (preview)	Semantic Link is an innovative feature that seamlessly connects Power BI semantic models with Synapse Data Science within Microsoft Fabric. As the gold layer in a medallion architecture, Power BI semantic models contain the most refined and valuable data in your organization.

Month	Feature	Learn more
October 2023	Semantic link in Microsoft Fabric: Bridging BI and Data Science	We're pleased to introduce the preview of semantic link , an innovative feature that seamlessly connects Power BI semantic models with Synapse Data Science within Microsoft Fabric.
October 2023	Get started with semantic link (preview)	Explore how semantic link seamlessly connects Power BI semantic models with Synapse Data Science within Microsoft Fabric. Learn more at Semantic link in Microsoft Fabric: Bridging BI and Data Science .
		You can also check out the semantic link sample notebooks that are now available in the fabric-samples GitHub repository. These notebooks showcase the use of semantic link's Python library, SemPy , in Microsoft Fabric.
August 2023	Harness the Power of LangChain in Microsoft Fabric for Advanced Document Summarization	Harness the potential of Microsoft Fabric and SynapseML LLM capabilities to effectively summarize and organize your own documents.
July 2023	Unleashing the Power of SynapseML and Microsoft Fabric: A Guide to Q&A on PDF Documents	In this blog post, we delve into the exciting functionalities and features of Microsoft Fabric and SynapseML to demonstrate how to leverage Generative AI models or Large Language Models (LLMs) to perform question and answer (Q&A) tasks on any PDF document.
May 2023	Introducing Synapse Data Science in Microsoft Fabric	With data science in Microsoft Fabric, you can utilize the power of machine learning features to seamlessly enrich data as part of your data and analytics workflows .

Synapse Data Science samples and guidance

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Month	Feature	Learn more
March 2024	New AI Samples	New AutoML sample, Model Tuning, and Semantic Link samples appear in the Quick Tutorial category of the Data Science samples on Microsoft Fabric.
December 2023	Using Microsoft Fabric's Lakehouse Data and prompt flow in Azure Machine Learning	A step-by-step RAG application through prompt flow in Azure Machine Learning Service combined with Microsoft Fabric's Lakehouse data.

Month	Feature	Learn more
	Service to create RAG applications	
November 2023	New data science happy path tutorial in Microsoft Fabric	We've updated the Data Science Happy Path tutorial for Microsoft Fabric . This new comprehensive tutorial demonstrates the entire data science workflow, using a bank customer churn problem as the context.
November 2023	New data science samples	We've expanded our collection of data science samples to include new end-to-end R samples and new quick tutorial samples for "Explaining Model Outputs" and "Visualizing Model Behavior."
November 2023	New data science forecasting sample	The new Data Science sample on sales forecasting was developed in collaboration with Sonata Software . This new sample encompasses the entire data science workflow, spanning from data cleaning to Power BI visualization. The notebook covers the steps to develop, evaluate, and score a forecasting model for superstore sales, harnessing the power of the SARIMAX algorithm.
August 2023	New Machine failure and Customer churn samples	More samples have been added to the Microsoft Fabric Synapse Data Science Use a sample menu. To check these Data Science samples, select Synapse Data Science , then Use a sample .
August 2023	Use Semantic Kernel with Lakehouse in Microsoft Fabric	Learn how Fabric allows data scientists to use Semantic Kernel with Lakehouse in Microsoft Fabric .

Synapse Data Warehouse

This section summarizes archived improvements and features for [Synapse Data Warehouse in Microsoft Fabric](#).

[Expand table](#)

Month	Feature	Learn more
May 2024	Monitor Warehouse tools	You can Monitor Synapse Data Warehouse activity with a variety of tools, including: Billing and utilization reporting in Synapse Data Warehouse , monitor connections, sessions, and requests using DMVs , Query insights , and now Query activity . For more information, read Query activity: A one-stop view to monitor your running and completed T-SQL queries .

Month	Feature	Learn more
May 2024	Copilot for Data Warehouse	Copilot for Data Warehouse (preview) is now available in limited preview, offering the Copilot chat pane , quick actions , and code completions .
May 2024	Warehouse queries with time travel (preview)	Warehouse in Microsoft Fabric offers the capability to query the historical data as it existed in the past at the statement level, currently in preview. The ability to query data from a specific timestamp is known in the data warehousing industry as <i>time travel</i> .
May 2024	COPY INTO enhancements	<code>COPY INTO</code> now supports Microsoft Entra ID authentication and access to firewall protected storage via the trusted workspace functionality. For more information, see COPY INTO enhancements and COPY INTO (Transact-SQL) .
April 2024	Fabric Warehouse in ADF copy activity	You can now connect to your Fabric Warehouse from an Azure Data Factory/Synapse pipeline . You can find this new connector when creating a new source or sink destination in your copy activity, in the Lookup activity, Stored Procedure activity, Script activity, and Get Metadata activity.
April 2024	Git integration	Git integration for the Warehouse allows you to check in the changes of your Warehouse to an Azure DevOps Git repository as a SQL database project.
April 2024	Partition elimination	Partition elimination is a performance improvement for tables with a large number of files. The SQL analytics endpoint of a Lakehouse uses partition elimination to read data from only those partitions that are relevant to the query. Recent improvements boosted performance even more when queries are aimed at a few partitions in a table that has many files.
March 2024	Mirroring in Microsoft Fabric preview	With Mirroring in Fabric, you can easily bring your databases into OneLake in Microsoft Fabric , enabling seamless zero-ETL, near real-time insights on your data – and unlocking warehousing, BI, AI, and more. For more information, see What is Mirroring in Fabric? .
March 2024	Cold cache performance improvements	Fabric stores data in Delta tables and when the data is not cached , it needs to transcode data from parquet file format structures to in-memory structures for query processing. Recent cold cache performance improvements further optimize transcoding and we observed up to 9% faster queries in our tests when data is not previously cached.

Month	Feature	Learn more
March 2024	Extract and publish a SQL database project directly through the DW editor	The SQL Database Projects extension creates a SQL project (.sqlproj) file, a local representation of SQL objects that comprise the schema for a single database, such as tables, stored procedures, or functions. You can now extract and publish a SQL database project directly through the DW editor .
March 2024	Change owner of Warehouse item	The new Takeover API allows you to change the warehouse owner from the current owner to a new owner, which can be an SPN or an Organizational Account.
March 2024	Clone table RLS and CLS	A cloned table now inherits the row-level security (RLS) and dynamic data masking from the source of the clone table.
February 2024	Experience performance improvements	Recent connectivity and performance enhancements include an improved experience for creating warehouses, T-SQL execution, automatic metadata discovery, and error messaging.
December 2023	Automatic Log Checkpointing for Fabric Warehouse	Automatic Log Checkpointing is one of the ways that we help your Data Warehouse to provide you with great performance and best of all, it involves no additional work from you!
December 2023	Restore points and restore in place	You can now create restore points and perform an in-place restore of a warehouse to a past point in time. The restore points and restore in place features are currently in preview. Restore in-place is an essential part of data warehouse recovery , which allows to restore the data warehouse to a prior known reliable state by replacing or over-writing the existing data warehouse from which the restore point was created.
November 2023	TRIM T-SQL support	You can now use the <code>TRIM</code> command to remove spaces or specific characters from strings by using the keywords LEADING, TRAILING or BOTH in TRIM (Transact-SQL) .
November 2023	GENERATE_SERIES T-SQL support	Generates a series of numbers within a given interval with GENERATE_SERIES (Transact-SQL) . The interval and the step between series values are defined by the user.
November 2023	SSD metadata caching	File and rowgroup metadata are now also cached with in-memory and SSD cache, further improving performance.

Month	Feature	Learn more
November 2023	PARSER 2.0 improvements for CSV ingestion	CSV file parser version 2.0 for COPY INTO ↗ builds an innovation from Microsoft Research's Data Platform and Analytics group to make CSV file ingestion blazing fast on Fabric Warehouse. For more information, see COPY INTO (Transact-SQL) .
November 2023	Fast compute resource assignment enabled	All query executions in Fabric Warehouse are now powered by the new technology recently deployed as part of the Global Resource Governance component that assigns compute resources in milliseconds.
November 2023	REST API support for Warehouse	With the Warehouse public APIs , SQL developers can now automate their pipelines and establish CI/CD conveniently and efficiently. The Warehouse REST Public APIs ↗ makes it easy for users to manage and manipulate Fabric Warehouse items.
November 2023	SQLPackage support for Fabric Warehouse	SQLPackage now supports Fabric Warehouse ↗ . SqlPackage is a command-line utility that automates the following database development tasks by exposing some of the public Data-Tier Application Framework (DacFx) APIs. The SqlPackage command line tool allows you to specify these actions along with action-specific parameters and properties.
November 2023	Power BI semantic models	Microsoft has renamed the Power BI <i>dataset</i> content type to <i>semantic model</i> . This applies to Microsoft Fabric semantic models as well. For more information, see New name for Power BI datasets .
November 2023	SQL analytics endpoint	Microsoft has renamed the SQL endpoint of a Lakehouse to the SQL analytics endpoint of a Lakehouse .
November 2023	Dynamic data masking	Dynamic Data Masking (DDM) ↗ for Fabric Warehouse and the SQL analytics endpoint in the Lakehouse. For more information and samples, see Dynamic data masking in Fabric data warehousing and How to implement dynamic data masking in Synapse Data Warehouse .
November 2023	Clone tables with time travel	You can now use table clones to create a clone of a table based on data up to seven calendar days in the past ↗ .
November 2023	User experience updates	Several user experiences in Warehouse have landed. For more information, see Fabric Warehouse user experience updates ↗ .

Month	Feature	Learn more
November 2023	Automatic data compaction	Automatic data compaction rewrites many smaller parquet files into a few larger parquet files, which will improve the performance of reading the table. Data Compaction is one of the ways that we help your Warehouse to provide you with great performance and no effort on your part.
October 2023	Support for sp_rename	Support for the T-SQL sp_rename syntax is now available for both Warehouse and SQL analytics endpoint. For more information, see Fabric Warehouse support for sp_rename .
October 2023	Query insights	The query insights feature is a scalable, sustainable, and extendable solution to enhance the SQL analytics experience. With historic query data, aggregated insights, and access to actual query text, you can analyze and tune your query performance.
October 2023	Full DML to Delta Lake Logs	Fabric Warehouse now publishes all Inserts, Updates, and Deletes for each table to their Delta Lake Log in OneLake.
October 2023	V-Order write optimization	V-Order optimizes parquet files to enable lightning-fast reads under the Microsoft Fabric compute engines such as Power BI, SQL, Spark, and others. Warehouse queries in general benefit from faster read times with this optimization, still ensuring the parquet files are 100% compliant to its open-source specification. Starting this month, all data ingested into Fabric Warehouses use V-Order optimization.
October 2023	Burstable capacity	Burstable capacity allows workloads to use more resources to achieve better performance. Burstable capacity is finite, with a limit applied to the backend compute resources to greatly reduce the risk of throttling . For more information, see Warehouse SKU Guardrails for Burstable Capacity .
October 2023	Throttling and smoothing in Synapse Data Warehouse	A new article details the throttling and smoothing behavior in Synapse Data Warehouse , where almost all activity is classified as <i>background</i> to take advantage of the 24-hr smoothing window before throttling takes effect. Learn more about how to observe utilization in Synapse Data Warehouse .
September 2023	Default semantic model improvements	The default semantic model no longer automatically adds new objects . This can be enabled in the Warehouse item settings.

Month	Feature	Learn more
September 2023	Deployment pipelines now support warehouses	Deployment pipelines enable creators to develop and test content in the service before it reaches the users. Supported content types include reports, paginated reports, dashboards, semantic models, dataflows, and now warehouses. Learn how to deploy content programmatically using REST APIs and DevOps .
September 2023	SQL Projects support for Warehouse in Microsoft Fabric	Microsoft Fabric Data Warehouse is now supported in the SQL Database Projects extension available inside of Azure Data Studio and Visual Studio Code .
September 2023	Announcing: Column-level & Row-level security for Fabric Warehouse & SQL analytics endpoint	Column-level and row-level security in Fabric Warehouse and SQL analytics endpoint are now in preview, behaving similarly to the same features in SQL Server.
September 2023	Usage reporting	Utilization and billing reporting is available for Fabric data warehousing in the Microsoft Fabric Capacity Metrics app. For more information, read about Utilization and billing reporting Fabric data warehousing .
August 2023	SSD Caching enabled	Local SSD caching stores frequently accessed data on local disks in highly optimized format, significantly reducing I/O latency. This benefits you immediately, with no action required or configuration necessary.
July 2023	Sharing	Any Admin or Member within a workspace can share a Warehouse with another recipient within your organization. You can also grant these permissions using the "Manage permissions" experience.
July 2023	Table clone	A zero-copy clone creates a replica of the table by copying the metadata, while referencing the same data files in OneLake. This avoids the need to store multiple copies of data, thereby saving on storage costs when you clone a table in Microsoft Fabric . For more information, see tutorials to Clone a table with T-SQL or Clone tables in the Fabric portal .
May 2023	Introducing Synapse Data Warehouse in Microsoft Fabric	Synapse Data Warehouse is the next generation of data warehousing in Microsoft Fabric that is the first transactional data warehouse to natively support an open data format, Delta-Parquet.

Synapse Data Warehouse samples and guidance

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Month	Feature	Learn more
April 2024	Fabric Change the Game: Azure SQL Database mirror into Microsoft Fabric	A step-by-step guide to mirror your Azure SQL Database ↗ into Microsoft Fabric.
February 2024	Mapping Azure Synapse dedicated SQL pools to Fabric data warehouse compute	Read for guidance on mapping Data Warehouse Units (DWU) from Azure Synapse Analytics dedicated SQL pool to an approximate equivalent number of Fabric Capacity Units (CU) ↗ .
January 2024	Automate Fabric Data Warehouse Queries and Commands with Data Factory	In Fabric Data Factory, there are many ways to query data, retrieve data, and execute commands from your warehouse using pipeline activities that can then be easily automated ↗ .
November 2023	Migrate from Azure Synapse dedicated SQL pools	A detailed guide with a migration runbook is available for migrations from Azure Synapse Data Warehouse dedicated SQL pools into Microsoft Fabric .
August 2023	Efficient Data Partitioning with Microsoft Fabric: Best Practices and Implementation Guide	A proposed method for data partitioning using Fabric notebooks ↗ . Data partitioning is a data management technique used to divide a large dataset into smaller, more manageable subsets called partitions or shards.
May 2023	Microsoft Fabric - How can a SQL user or DBA connect	This blog reviews how to connect to a SQL analytics endpoint of the Lakehouse or the Warehouse through the Tabular Data Stream, or TDS endpoint ↗ , familiar to all modern web applications that interact with a SQL Server endpoint.

Real-Time Intelligence in Microsoft Fabric

This section summarizes archived improvements and features for [Real-Time Intelligence in Microsoft Fabric](#).

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Month	Feature	Learn more
May 2024	Eventhouse GA	Eventhouse is a new, dynamic workspace hosting multiple KQL databases ↗ , generally available as part of Fabric Real-Time Intelligence. An Eventhouse offers a robust solution for managing and analyzing substantial volumes of real-time

Month	Feature	Learn more
		data. Get started with a guide to Create and manage an Eventhouse .
May 2024	Copilot for Real-Time Intelligence	Copilot for Real-Time Intelligence is now in preview ! For those who are already fans of KQL or newcomers exploring its potential, Copilot can help you get started, and navigate data with ease.
May 2024	Automating Fabric items with Real-Time Intelligence	Learn how to interact with data pipelines, notebooks, spark jobs in a more event-driven way .
May 2024	Real-Time Intelligence	This month includes the announcement of Real-Time Intelligence , the next evolution of Real-Time Analytics and Data Activator.
May 2024	Real-Time Intelligence new preview features	At Build 2024, a dozen new features and capabilities were announced for Real-Time Intelligence, organized into categories of Ingest & Process , Analyze & Transform , and Visualize & Act .
May 2024	Real-Time hub preview	Real-Time hub is single, tenant-wide, unified, logical place for streaming data-in-motion. It enables you to easily discover, ingest, manage, and consume data-in-motion from a wide variety of sources. It lists all the streams and Kusto Query Language (KQL) tables that you can directly act on. It also gives you an easy way to ingest streaming data from Microsoft products and Fabric events. For more information, see Real-Time hub overview .
May 2024	Get Events preview	The Get Events experience allows users to connect to a wide range of sources directly from Real-Time hub, Eventstreams, Eventhouse, and Data Activator. Using Get Events, bring streaming data from Microsoft sources directly into Fabric with a first-class experience.
May 2024	Enhanced Eventstream capabilities preview	With enhanced Eventstream capabilities , you can now stream data not only from Microsoft sources but also from other platforms like Google Cloud, Amazon Kinesis, Database change data capture streams, and more, using our new messaging connectors.
May 2024	Event streams - enhanced capabilities preview	The preview of enhanced capabilities supports many new sources - Google Cloud Pub/Sub, Amazon Kinesis Data Streams, Confluent Cloud Kafka, Azure SQL Database Change Data Capture (CDC), PostgreSQL Database CDC, MySQL Database CDC, Azure Cosmos DB CDC, Azure Blob Storage events, and Fabric workspace item events, and a new Stream destination. It supports two distinct modes, Edit

Month	Feature	Learn more
		mode and Live view, in the visual designer. It also supports routing based on content in data streams. For more information, see What is Fabric event streams .
April 2024	Kusto Cache consumption preview	The preview of Kusto Cache consumption means that you will start seeing billable consumption of the OneLake Cache Data Stored meter from the KQL Database and Eventhouse items. For more information, see KQL Database consumption .
April 2024	Pause and Resume in Eventstream preview	The Pause and Resume feature enables you to pause data streaming from various sources and destinations within Eventstream. You can then resume data streaming seamlessly from the paused time or a customized time, ensuring no data loss.
March 2024	New Expressions "Changes by", "Increases by", and "Decreases by"	In Data Activator, when setting conditions on a trigger, we've added syntax to allows you to detect when there's been a change in your data by absolute number or percentage. See New Expressions "Changes by", "Increases by", and "Decreases by" .
March 2024	Fabric Real-Time Intelligence Integrates with Newly Announced Database Watcher for Azure SQL	Users of Azure SQL can use the Database Watcher monitoring solution with Microsoft Fabric . Database Watcher for Azure SQL (preview) provides advanced monitoring capabilities, and can integrate with Eventhouse KQL database .
March 2024	Update records in a KQL Database preview	The .update command is now available, as a preview feature. Learn more about how to Update records in a Kusto database .
March 2024	Query Azure Data Explorer data from Queryset	Connecting to and using data in Azure Data explorer cluster from Fabric's KQL Queryset is now available.
February 2024	Eventhouse Overview: Handling Real-Time Data with Microsoft Fabric	Eventhouse (preview) is a dynamic workspace hosting multiple KQL databases , part of Fabric Real-Time Intelligence. An Eventhouse offers a robust solution for managing and analyzing substantial volumes of real-time data. Get started with a guide to Create and manage an Eventhouse .
February 2024	KQL DB shortcut to Delta Lake tables support name-based column mapping	KQL DB now supports reading Delta tables with column name mappings . The column mapping feature allows Delta table columns and the underlying Parquet file columns to use different names. This enables Delta schema evolution operations such on a Delta table without the need to rewrite

Month	Feature	Learn more
		the underlying Parquet files and allows users to name Delta table columns by using characters that aren't allowed by Parquet.
February 2024	KQL DB shortcut to Delta Lake tables support deletion vectors	KQL DB can now read delta tables with deletion vectors , resolving the current table state by applying the deletions noted by deletion vectors to the most recent table version.
February 2024	Get Data in KQL DB now supports processing events before ingestion via Eventstream	The Process event before ingestion in Eventstream option enables you to process the data before it's ingested into the destination table. By selecting this option, the get data process seamlessly continues in Eventstream , with the destination table and data source details automatically populated.
February 2024	KQL DB now supports data ingestion using Apache Flink	Using the open-source Flink connector, you can send data from Flink to your table. Using Azure Data Explorer and Apache Flink , you can build fast and scalable applications targeting data driven scenarios.
February 2024	Route data from Splunk Universal Forwarder to KQL DB using Kusto Splunk Universal Connector	You can now use the Kusto Splunk Universal Connector to send data from Splunk Universal Forwarder to a table in your KQL DB .
December 2023	Calculating distinct counts in Power BI running reports on KQL Databases	New Fabric KQL database dcount and dcountif functions use a special algorithm to return an estimate of distinct counts , even in extremely large datasets. The new functions count_distinct and count_distinctif calculate exact distinct counts.
December 2023	Create a Notebook with pre-configured connection to your KQL DB	You can now just create a new Notebook from KQL DB editor with a preconfigured connection to your KQL DB and explore the data using PySpark. This option creates a PySpark Notebook with a ready-to execute code cell to read data from the selected KQL DB.
December 2023	KQL Database schema validation	The new Kusto command <code>.show database schema violations</code> was designed to validate the current state of your database schema and find inconsistencies . You can use <code>.show database schema violations</code> for a spot check on your database or in CI/CD automation.
December 2023	Enabling Data Availability of KQL	Data availability of KQL Database in OneLake means you can enjoy the best of both worlds. You can query the data with high performance and low latency in their KQL

Month	Feature	Learn more
	Database in OneLake	database, and you can query the same data in Delta Parquet via Power BI Direct Lake mode, Warehouse, Lakehouse, Notebooks, and more.
December 2023	Fabric Change the Game: Real-time Intelligence	Real-Time Intelligence is a formidable tool , diminishing complexity and streamlining data integration processes. Microsoft Fabric allows you to build Real-Time streaming analytics with eventstream or Spark Stream.
November 2023	Announcing Delta Lake support in Real-Time Analytics KQL Database	You can now enable availability of KQL Database in Delta Lake format . Delta Lake is the unified data lake table format chosen to achieve seamless data access across all compute engines in Microsoft Fabric.
November 2023	Real-Time Analytics in Microsoft Fabric general availability (GA)	Announcing the general availability of Real-Time Analytics in Microsoft Fabric ! Real-Time Analytics offers countless features all aimed at making your data analysis more efficient and effective.
November 2023	Delta Parquet support in KQL Database	As part of the one logical copy promise , we're excited to announce that data in KQL Database can now be made available in OneLake in delta parquet format . You can now access this Delta table by creating a OneLake shortcut from Lakehouse, Warehouse, or directly via Power BI Direct Lake mode .
November 2023	Open Source Connectors for KQL Database	Several open-source connectors for real-time analytics are now supported to enable users to ingest data from various sources and process it using KQL DB.
November 2023	REST API Support for KQL Database	We're excited to announce the launch of REST Public APIs for KQL DB . The Public REST APIs of KQL DB enables users to manage and automate their flows programmatically.
November 2023	Eventstream now Generally Available	Eventstream is now generally available, adding enhancements aimed at taking your data processing experience to the next level.
November 2023	Eventstream Data Transformation for KQL Database	Now, you can transform your data streams into real time within Eventstream before they're sent to your KQL Database . When you create a KQL Database destination in the eventstream, you can set the ingestion mode to "Event processing before ingestion" and add event processing logics such as filtering and aggregation to transform your data streams.
November 2023	Splunk add-on preview	Microsoft Fabric add-on for Splunk allows users to ingest logs from Splunk platform into a Fabric KQL DB using the Kusto python SDK.

Month	Feature	Learn more
November 2023	Get Data from Eventstream anywhere in Fabric	If you're working on other Fabric items and are looking to ingest data from Eventstream, our new "Get Data from Eventstream" feature simplifies the process, you can Get data from Eventstream while you're working with a KQL database and Lakehouse.
November 2023	Two ingestion modes for Lakehouse Destination	We've introduced two distinct ingestion modes for your Lakehouse Destination: Rows per file and Duration .
November 2023	Optimize Tables Before Ingesting Data to Lakehouse	The table optimization shortcut is now available inside Eventstream Lakehouse destination to compact numerous small streaming files generated on a Lakehouse table. Table optimization shortcut works by opening a Notebook with Spark job, which would compact small streaming files in the destination Lakehouse table.
November 2023	Create a Cloud Connection within Eventstream	We've simplified the process of establishing a cloud connection to your Azure services within Eventstream . When adding an Azure resource, such as Azure IoT Hub and Azure Event Hubs, to your Eventstream, you can now create the cloud connection and enter your Azure resource credentials right within Eventstream. This enhancement significantly improves the process of adding new data sources to your Eventstream, saving time and effort.
November 2023	Get Data in Real-Time Analytics: A New and Improved Experience	A new Get Data experience simplifies the data ingestion process in your KQL database.
October 2023	Expanded Custom App Connections	New new custom app connections provide more flexibility when it comes to bringing your data streams into Eventstream.
October 2023	Enhanced UX on Event Processor	New UX improvements on the no-code Event Processor provide an intuitive experience, allowing you to effortlessly add or delete operations on the canvas.
October 2023	Eventstream Kafka Endpoints and Sample Code	The Custom App feature has new endpoints in sources and destinations , including sample Java code for your convenience. Simply add it to your application, and you're all set to stream your real-time event to Eventstream.
October 2023	Event processing editor UX improvements	Recent UX improvements introduce a full-screen mode, providing a more spacious workspace for designing your data processing workflows. The insertion and deletion of data stream operations have been made more intuitive,

Month	Feature	Learn more
		making it easier to drag and drop and connect your data transformations.
October 2023	KQL Database Auto scale algorithm improvements	Users do not need to worry about how many resources are needed to support their workloads in a KQL database. KQL Database has a sophisticated in-built, multi-dimensional, auto scaling algorithm. We recently implemented some optimizations that make some time series analysis more efficient .
October 2023	Understanding Fabric KQL DB Capacity	Read more about how a KQL database is billed in the SaaS world of Microsoft Fabric.
September 2023	OneLake shortcut to delta tables from KQL DB	Now you can create a shortcut from KQL DB to delta tables in OneLake , allowing in-place data queries. Now you query delta tables in your Lakehouse or Warehouse directly from KQL DB.
September 2023	Model and Query data as graphs using KQL	Kusto Query Language (KQL) now allows you to model and query data as graphs. This feature is currently in preview. Learn more at Introduction to graph semantics in KQL and Graph operators and functions .
September 2023	Easily connect to KQL Database from Power BI desktop	Power BI desktop released two new ways to easily connect to a KQL database, in the Get Data dialogue and in the OneLake data hub menus.
September 2023	Eventstream now supports AMQP format connection string for data ingestion	AMQP stands for Advanced Message Queuing Protocol, a protocol that supports a wide range of messaging patterns. In Eventstream, you can now create a Custom App source or destination and select AMQP format connection string for ingesting data into Fabric or consuming data from Fabric.
September 2023	Eventstream supports data ingestion from Azure IoT Hub	Azure IoT Hub is a cloud-hosted solution that provides secure communication channels for sending and receiving data from IoT devices. In Eventstream, you can now stream your Azure IoT Hub data into Fabric and perform real-time processing before storing it in a Kusto Database or Lakehouse.
September 2023	Real-Time Data Sharing in Microsoft Fabric	A database shortcut in Real-Time Intelligence is an embedded reference within a KQL database to a source database in Azure Data Explorer (ADX) allowing in-place data sharing. The behavior exhibited by the database shortcut is similar to that of an Azure Data Explorer follower database .
August 2023	Provisioning optimization	The KQL Database provisioning process has been optimized. Now you can create a KQL Database within a few seconds.

Month	Feature	Learn more
August 2023	KQL Database support for inline Python	Fabric KQL Database supports running Python code embedded in Kusto Query Language (KQL) using the python() plugin. The plugin is disabled by default. Before you start, enable the Python plugin in your KQL database .
July 2023	Microsoft Fabric eventstreams: Generating Real-time Insights with Python, KQL, and Power BI	Microsoft Fabric eventstreams are a high-throughput, low-latency data ingestion and transformation service.
July 2023	Stream Real-time Events to Microsoft Fabric with eventstreams from a custom application	Eventstreams under Real-Time Intelligence are a centralized platform within Fabric, allowing you to capture, transform, and route real-time events to multiple destinations effortlessly, all through a user-friendly, no-code experience.
June 2023	Unveiling the Epic Opportunity: A Fun Game to Explore the Real-Time Intelligence	As part of the Kusto Detective Agency Season 2 , we're excited to introduce an epic opportunity for all investigators and data enthusiasts to learn about the new portfolio in a fun and engaging way. Recruiting now at https://detective.kusto.io/ !
May 2023	What's New in Kusto – Build 2023!	Announcing the Synapse Real Time Analytics in Microsoft Fabric !

Real-Time Intelligence samples and guidance

[Expand table](#)

Month	Feature	Learn more
May 2024	Alerting and acting on data from the Real-Time hub	Microsoft Fabric's new Real-Time hub and Data Activator provide a no-code experience for automatically taking actions when patterns or conditions are detected in changing data and is embedded around the Real-Time hub to make creating alerts always accessible.
May 2024	Using APIs with Fabric Real-Time Intelligence: Eventhouse and KQL DB	Learn how to create/update/delete items in Fabric with the KQL APIs , accessing the data plane of a resource.

Month	Feature	Learn more
May 2024	Connect and stream events with the Get events experience	The Get events experience streamlines the process of browsing and searching for sources and streams [↗] .
May 2024	Acquiring Real-Time Data from New Sources with Enhanced Eventstream	Learn how to connect to new sources in Eventstream. Start by creating an eventstream and choosing "Enhanced Capabilities (preview)" [↗] .
March 2024	Browse Azure resources with Get Data	Learn how to browse and connect to all your Azure resources with the 'browse Azure' functionality in Get Data [↗] . You can browse Azure resources then connect to Synapse, blob storage, or ADLS Gen2 resources easily.
November 2023	Semantic Link: Data validation using Great Expectations	Great Expectations Open Source (GX OSS) is a popular Python library that provides a framework for describing and validating the acceptable state of data. With the recent integration of Microsoft Fabric semantic link, GX can now access semantic models [↗] , further enabling seamless collaboration between data scientists and business analysts.
November 2023	Explore Data Transformation in Eventstream for KQL Database Integration	Dive into a practical scenario using real-world bike-sharing data and learn to compute the number of bikes rented every minute on each street, using Eventstream's powerful event processor, mastering real-time data transformations, and effortlessly directing the processed data to your KQL Database [↗] .
October 2023	From RabbitMQ to PowerBI reports with Microsoft Fabric Real-Time Analytics	A walkthrough of an end-to-end scenario sending data from RabbitMQ to a KQL Database in Microsoft Fabric [↗] .
October 2023	Stream Azure IoT Hub Data into Fabric Eventstream for Email Alerting	A demo of using Fabric Eventstream to seamlessly ingest and transform real-time data streams [↗] before they reach various Fabric destinations such as Lakehouse, KQL Database, and Reflex. Then, configure email alerts in Reflex with Data Activator triggers .
September 2023	Real-Time Intelligence sample gallery	Real-Time Intelligence now offers a comprehensive sample gallery with multiple datasets allowing you to explore, learn, and get started quickly. Access the samples by selecting Use a sample from the Real-Time Intelligence experience home [↗] .

Month	Feature	Learn more
September 2023	Quick start: Sending data to Real-Time Intelligence in Fabric from Apache Kafka Ecosystems using Java	Learn how to send data from Kafka to Real-Time Intelligence in Fabric .
June 2023	From raw data to insights: How to ingest data from Azure Event Hubs into a KQL database	Learn about the integration between Azure Event Hubs and your KQL database .
June 2023	From raw data to insights: How to ingest data from eventstreams into a KQL database	Learn about the integration between eventstreams and a KQL database , both of which are a part of the Real-Time Intelligence experience.
June 2023	Discovering the best ways to get data into a KQL database	This blog covers different options for bringing data into a KQL database .
June 2023	Get started with exploring your data with KQL – a purpose-built tool for petabyte scale data analytics	In this blog, we focus on the different ways of querying data in Real-Time Intelligence .
May 2023	Ingest, transform, and route real-time events with Microsoft Fabric event streams	You can now ingest, capture, transform and route real-time events to various destinations in Microsoft Fabric with a no-code experience using Microsoft Fabric eventstreams.

Microsoft Fabric core features

Archived news and feature announcements core to the Microsoft Fabric experience.

[\[+\] Expand table](#)

Month	Feature	Learn more
May 2024	Microsoft Fabric Private Links GA	Azure Private Link for Microsoft Fabric secures access to your sensitive data in Microsoft Fabric by providing network isolation and applying required controls on your inbound network traffic. For more information, see Announcing General Availability of Fabric Private Links .

Month	Feature	Learn more
May 2024	Trusted workspace access GA	Trusted workspace access in OneLake shortcuts is now generally available ↗ . You can now create data pipelines to access your firewall-enabled Azure Data Lake Storage Gen2 (ADLS Gen2) accounts using Trusted workspace access (preview) in your Fabric Data Pipelines. Use the workspace identity to establish a secure and seamless connection between Fabric and your storage accounts ↗ . Trusted workspace access also enables secure and seamless access to ADLS Gen2 storage accounts from OneLake shortcuts in Fabric ↗ .
May 2024	Fabric APIs walkthrough	Learn about using REST APIs in Fabric ↗ , including creating workspaces, adding permission, dropping, creating, executing data pipelines, and how to pause/resume Fabric activities using the management API.
May 2024	Managed private endpoints GA	Managed private endpoints for Microsoft Fabric allow secure connections over managed virtual networks to data sources that are behind a firewall or not accessible from the public internet. For more information, see Announcing General Availability of Fabric Private Links, Trusted Workspace Access, and Managed Private Endpoints ↗ .
May 2024	Fabric UX System	The Fabric UX System ↗ represents a leap forward in design consistency and extensibility for Microsoft Fabric.
May 2024	Microsoft Fabric Core REST APIs	Microsoft Fabric Core APIs are now generally available. The Fabric user APIs ↗ are a major enabler for both enterprises and partners to use Microsoft Fabric as they enable end-to-end fully automated interaction with the service, enable integration of Microsoft Fabric into external web applications, and generally enable customers and partners to scale their solutions more easily.
May 2024	Microsoft Fabric Admin APIs preview	Fabric Admin APIs ↗ are designed to streamline administrative tasks. Now, you can manage both Power BI and the new Fabric items (previously referred to as artifacts) using the same set of APIs. Before this enhancement, you had to navigate using two different APIs—one for Power BI items and another for new Fabric items.
May 2024	Fabric workload dev kit (preview)	The Microsoft Fabric workload development kit ↗ extends to additional workloads and offers a robust developer toolkit for designing, developing, and

Month	Feature	Learn more
		interoperating with Microsoft Fabric using frontend SDKs and backend REST APIs .
May 2024	Introducing external data sharing (preview)	External Data Sharing (preview) is a new feature that makes it possible for Fabric users to share data from within their Fabric tenant with users in another Fabric tenant.
May 2024	Task flows in Microsoft Fabric (preview)	The preview of task flows in Microsoft Fabric is enabled for all Microsoft Fabric users. With Fabric task flows , when designing a data project, you no longer need to use a whiteboard to sketch out the different parts of the project and their interrelationships. Instead, you can use a task flow to build and bring this key information into the project itself.
May 2024	Power BI: Subscriptions, licenses, and trials	Information on Power BI implementation planning and key considerations for planning subscriptions, licenses, and trials for Power BI and Fabric .
May 2024	Register for the Microsoft Build: Microsoft Fabric Cloud Skills Challenge	Starting May 21, 2024, sign up for the Microsoft Build: Microsoft Fabric Cloud Skills Challenge and prepare for Exam DP-600 and upskill to the Fabric Analytics Engineer Associate certification.
March 2024	Microsoft Fabric is now HIPAA compliant	We are excited to announce that Microsoft Fabric, our all-in-one analytics solution for enterprises, has achieved new certifications for HIPAA and ISO 27017, ISO 27018, ISO 27001, ISO 27701 .
March 2024	Folder in Workspace preview	As an organizational unit in the workspace, folder addresses this pain point by providing a hierarchical structure for organizing and managing your items. For more information, see Create folders in workspaces (preview) .
March 2024	Fabric Copilot Pricing: An End-to-End example	Copilot in Fabric begins billing on March 1, 2024 as part of your existing Power BI Premium or Fabric Capacity. Learn how Fabric Copilot usage is calculated .
March 2024	Capacity Platform Updates for Pause/Resume, Capacity Metrics, virtualized items and workspaces for Copilot, and VNET Gateways	The Fabric Capacity Platform now supports usage reporting for Pause/Resume, virtualized items and workspaces supporting Copilot, Capacity Metrics, and VNET Gateway. For more information, read Capacity Platform Updates for Pause Resume and Capacity Metrics for Copilot and VNET Gateways .

Month	Feature	Learn more
February 2024	Managed private endpoints for Microsoft Fabric (Preview)	Managed private endpoints for Microsoft Fabric (preview) allow secure connections to data sources that are behind a firewall or not accessible from the public internet. Workspaces with managed private endpoints have network isolation through a managed virtual network created by Microsoft Fabric . For more information, see Introducing Managed private endpoints for Microsoft Fabric preview .
February 2024	Azure Private Link Support for Microsoft Fabric (Preview)	Azure Private Link for Microsoft Fabric secures access to your sensitive data in Microsoft Fabric by providing network isolation and applying required controls on your inbound network traffic. For more information, see Announcing Azure Private Link Support for Microsoft Fabric in Preview .
February 2024	Domains in OneLake (preview)	Domains in OneLake help you organize your data into a logical data mesh, allowing federated governance and optimizing for business needs. You can now create sub domains, default domains for users, and move workspaces between domains. For more information, see Fabric domains .
February 2024	Customizable Fabric navigation bar	You can now customize your preferred entry points in the navigation bar , including pinning common entry points and unpinning rarely used options.
February 2024	Persistent filters in workspace	You can now save selected filters in workspace list view , and they'll be automatically applied the next time you open the workspace.
December 2023	Microsoft Fabric Admin APIs preview	Fabric Admin APIs are designed to streamline administrative tasks. The initial set of Fabric Admin APIs is tailored to simplify the discovery of workspaces, Fabric items, and user access details.
December 2023	Workspace retention changes in Fabric and Power BI	The retention period for collaborative workspaces is configurable from 7 to 90 days . The workspace retention setting is enabled by default and the default retention period is seven days.
November 2023	Fabric workloads are now generally available!	Microsoft Fabric is now generally available! Microsoft Fabric Synapse Data Warehouse, Data Engineering & Data Science, Real-Time Analytics, Data Factory, OneLake, and the overall Fabric platform are now generally available.

Month	Feature	Learn more
November 2023	Microsoft Fabric User APIs preview	We're happy to announce the preview of Microsoft Fabric User APIs . The Fabric user APIs are a major enabler for both enterprises and partners to use Microsoft Fabric as they enable end-to-end fully automated interaction with the service, enable integration of Microsoft Fabric into external web applications, and generally enable customers and partners to scale their solutions more easily.
October 2023	Item type icons	Our design team has completed a rework of the item type icons across the platform to improve visual parsing.
October 2023	Keyword-Based Filtering of Tenant Settings	Microsoft Fabric has recently introduced keyword-based filtering for the tenant settings page in the admin portal .
September 2023	Monitoring hub – column options	Column options inside the monitoring hub give users a better customization experience and more room to operate.
September 2023	OneLake File Explorer v1.0.10	The OneLake file explorer automatically syncs all Microsoft OneLake items that you have access to in Windows File Explorer. With the latest version, you can seamlessly transition between using the OneLake file explorer app and the Fabric web portal. You can also right-click on the OneLake icon in the Windows notification area, and select Diagnostic Operations to view client-site logs. Learn more about easy access to open workspaces and items online .
August 2023	Multitasking navigation improvement	Now, all Fabric items are opened in a single browser tab on the navigation pane, even in the event of a page refresh. This ensures you can refresh the page without the concern of losing context.
August 2023	Monitoring Hub support for personalized column options	We have updated Monitoring Hub to allow users to personalize activity-specific columns. You now have the flexibility to display columns that are relevant to the activities you're focused on.
July 2023	New OneLake file explorer update with support for switching organizational accounts	With OneLake file explorer v1.0.9.0, it's simple to choose and switch between different Microsoft Entra ID (formerly Azure Active Directory) accounts .
July 2023	Help pane	The Help pane is feature-aware and displays articles about the actions and features available on the current

Month	Feature	Learn more
		Fabric screen. For more information, see Help pane in the monthly Fabric update.

Continuous Integration/Continuous Delivery (CI/CD) in Microsoft Fabric

This section includes guidance and documentation updates on development process, tools, and versioning in the Microsoft Fabric workspace.

[\[+\] Expand table](#)

Month	Feature	Learn more
May 2024	Deployment pipelines APIs for CI/CD	Fabric deployment pipelines APIs have been introduced, starting with the 'Deploy' API, which will allow you to deploy the entire workspace, or only selected items.
May 2024	New items in Fabric CI/CD	Data pipelines , Warehouse , Spark , and Spark jobs are now available for CI/CD in git integration and deployment pipelines.
April 2024	Introducing Trusted Workspace Access in Fabric Data Pipelines	Create data pipelines in Fabric to access your firewall-enabled ADLS Gen2 storage accounts with ease and security. This feature leverages the workspace identity to establish a secure and seamless connection between Fabric and your storage accounts.
March 2024	CI/CD for Fabric Data Pipelines preview	Git Integration and integration with built-in Deployment Pipelines to Data Factory data pipelines is now in preview. For more information, see Data Factory Adds CI/CD to Fabric Data Pipelines .
March 2024	System file updates for Git integration	The automatically generated system files <code>item.metadata.json</code> and <code>item.config.json</code> have been consolidated into a single system file <code>.platform</code> . For more information, see Automatically generated system files .
February 2024	REST APIs for Fabric Git integration	REST APIs for Fabric Git integration enable seamless incorporation of Fabric Git integration into your team's end-to-end CI/CD pipeline, eliminating the need for manual triggering of actions from Fabric.
February 2024	Delegation for Git integration settings	To enable more control over Git related settings , a tenant admin can now delegate these settings to both capacity

Month	Feature	Learn more
		admins and workspace admins via the What is the admin portal?
November 2023	Microsoft Fabric User APIs	Microsoft Fabric User APIs are now available. The Fabric user APIs are a major enabler for both enterprises and partners to use Microsoft Fabric as they enable end-to-end fully automated interaction with the service, enable integration of Microsoft Fabric into external web applications, and generally enable customers and partners to scale their solutions more easily.
November 2023	Notebook in Deployment Pipeline Preview	Now you can also use notebooks to deploy your code across different environments, such as development, test, and production. You can also use deployment rules to customize the behavior of your notebooks when they're deployed, such as changing the default Lakehouse of a Notebook. Get started with deployment pipelines , and Notebook shows up in the deployment content automatically.
November 2023	Notebook Git integration preview	Fabric notebooks now offer Git integration for source control using Azure DevOps. It allows users to easily control the notebook code versions and manage the Git branches by leveraging the Fabric Git functions and Azure DevOps.
November 2023	Notebook REST APIs Preview	With REST Public APIs for the Notebook items, data engineers/data scientists can automate their pipelines and establish CI/CD conveniently and efficiently. The notebook Restful Public API can make it easy for users to manage and manipulate Fabric notebook items and integrate notebook with other tools and systems.
November 2023	Lakehouse support for git integration and deployment pipelines (preview)	The Lakehouse item now integrates with the lifecycle management capabilities in Microsoft Fabric, providing a standardized collaboration between all development team members throughout the product's life. Lifecycle management facilitates an effective product versioning and release process by continuously delivering features and bug fixes into multiple environments.
November 2023	SQLPackage support for Fabric Warehouse	SQLPackage now supports Fabric Warehouse. SqlPackage is a command-line utility that automates the following database development tasks by exposing some of the public Data-Tier Application Framework (DacFx) APIs. The SqlPackage command line tool allows you to specify these actions along with action-specific parameters and properties.

Month	Feature	Learn more
September 2023	SQL Projects support for Warehouse in Microsoft Fabric	Microsoft Fabric Data Warehouse is now supported in the SQL Database Projects extension available inside of Azure Data Studio and Visual Studio Code .
September 2023	Notebook file system support in Synapse VS Code extension	The Synapse VS Code extension now supports notebook File System for Data Engineering and Data Science in Microsoft Fabric. The Synapse VS Code extension empowers users to develop their notebook items directly within the Visual Studio Code environment.
September 2023	Deployment pipelines now support warehouses	Deployment pipelines enable creators to develop and test content in the service before it reaches the users. Supported content types include reports, paginated reports, dashboards, semantic models, dataflows, and now warehouses. Learn how to deploy content programmatically using REST APIs and DevOps .
September 2023	Git integration with paginated reports in Power BI	You can now publish a Power BI paginated report and keep it in sync with your git workspace . Developers can apply their development processes, tools, and best practices.
August 2023	Introducing the dbt adapter for Synapse Data Warehouse in Microsoft Fabric	The dbt adapter allows you to connect and transform data into Synapse Data Warehouse . The Data Build Tool (dbt) is an open-source framework that simplifies data transformation and analytics engineering.
May 2023	Introducing git integration in Microsoft Fabric for seamless source control management	While developing in Fabric, developers can back up and version their work, roll back as needed, collaborate, or work in isolation using git branches . Read more about connecting the workspace to an Azure repo .

Continuous Integration/Continuous Delivery (CI/CD) samples

[+] [Expand table](#)

Month	Feature	Learn more
March 2024	Microsoft Fabric Lifecycle Management – Getting started with Git Integration and Deployment Pipelines	Learn the essentials of Lifecycle Management through a demo scenario, and explore what Lifecycle Management is, and what it means in Fabric.

Fabric Data Activator

This section summarizes archived new features and capabilities of Data Activator in Microsoft Fabric.

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Month	Feature	Learn more
October 2023	Announcing the Data Activator preview	We're thrilled to announce that Data Activator is now in preview and is enabled for all existing Microsoft Fabric users .
August 2023	Updated preview experience for trigger design	We have been working on a new experience for designing triggers and it's now available in our preview! You now see three cards in every trigger: Select, Detect, and Act.
May 2023	Driving actions from your data with Data Activator	Data Activator is a new no-code Microsoft Fabric experience that empowers the business analyst to drive actions automatically from your data. To learn more, sign up for the Data Activator limited preview .

Fabric and Microsoft 365

This section includes articles and announcements about Microsoft Fabric integration with Microsoft Graph and Microsoft 365.

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Month	Feature	Learn more
March 2024	Analyze Dataverse tables from Microsoft Fabric	When creating a shortcut within Fabric, you will now see an option for Dataverse . When you choose this shortcut type and specify your Dataverse environment details, you can quickly see and work with the tables from that environment.
November 2023	Fabric + Microsoft 365 Data: Better Together	Microsoft Graph is the gateway to data and intelligence in Microsoft 365. Microsoft 365 Data Integration for Microsoft Fabric enables you to manage your Microsoft 365 alongside your other data sources in one place with a suite of analytical experiences.
November 2023	Microsoft 365 connector now supports ingesting data into Lakehouse (preview)	The Microsoft 365 connector now supports ingesting data into Lakehouse tables .

Month	Feature	Learn more
October 2023	Microsoft OneLake adds shortcut support to Power Platform and Dynamics 365	You can now create shortcuts directly to your Dynamics 365 and Power Platform data in Dataverse and analyze it with Microsoft Fabric alongside the rest of your OneLake data. There's no need to export data, build ETL pipelines, or use partner integration tools.
May 2023	Step-by-Step Guide to Enable Microsoft Fabric for Microsoft 365 Developer Account	This blog reviews how to enable Microsoft Fabric with a Microsoft 365 Developer Account and the Fabric Free Trial .
May 2023	Microsoft 365 Data + Microsoft Fabric better together	Microsoft 365 Data Integration for Microsoft Fabric enables you to manage your Microsoft 365 alongside your other data sources in one place with a suite of analytical experiences.

Migration

This section includes guidance and documentation updates on migration to Microsoft Fabric.

[\[+\] Expand table](#)

Month	Feature	Learn more
February 2024	Mapping Azure Synapse dedicated SQL pools to Fabric data warehouse compute	Read for guidance on mapping Data Warehouse Units (DWU) from Azure Synapse Analytics dedicated SQL pool to an approximate equivalent number of Fabric Capacity Units (CU) .
November 2023	Migrate from Azure Synapse dedicated SQL pools	A detailed guide with a migration runbook is available for migrations from Azure Synapse Data Warehouse dedicated SQL pools into Microsoft Fabric .
November 2023	Migrating from Azure Synapse Spark to Fabric	A detailed set of articles on migration of Azure Synapse Spark to Microsoft Fabric , including a migration process that can involve multiple scenarios and phases.
July 2023	Fabric Changing the game – OneLake integration	This blog post covers OneLake integrations and multiple scenarios to ingest the data inside of Fabric OneLake , including ADLS, ADF, OneLake Explorer, Databricks.

Month	Feature	Learn more
June 2023	Microsoft Fabric changing the game: Exporting data and building the Lakehouse	This blog post covers the scenario to export data from Azure SQL Database into OneLake .
June 2023	Copy data to Azure SQL at scale with Microsoft Fabric	Did you know that you can use Microsoft Fabric to copy data at scale from supported data sources to Azure SQL Database or Azure SQL Managed Instance within minutes?
June 2023	Bring your Mainframe DB2 z/OS data to Microsoft Fabric	In this blog, we review the convenience and ease of opening DB2 for z/OS data in Microsoft Fabric .

Monitor

This section includes guidance and documentation updates on monitoring your Microsoft Fabric capacity and utilization, including the [Monitoring hub](#).

[Expand table](#)

Month	Feature	Learn more
March 2024	Capacity Metrics support for Pause and Resume	Fabric Capacity Metrics has been updated with new system events and reconciliation logic to simplify analysis of paused capacities . Fabric Pause and Resume is a capacity management feature that lets you pause F SKU capacities to manage costs. When your capacity isn't operational, you can pause it to enable cost savings and then later, when you want to resume work on your capacity you can reactivate it.
October 2023	Throttling and smoothing in Synapse Data Warehouse	A new article helps you understand Fabric capacity throttling . Throttling occurs when a tenant's capacity consumes more capacity resources than it has purchased over a period of time.
September 2023	Monitoring hub - column options	Users can select and reorder the columns according to their customized needs in the Monitoring hub .
September 2023	Fabric Capacities – Everything you need to know about what's new and what's coming	Read more about the improvements we're making to the Fabric capacity management platform for Fabric and Power BI users .

Month	Feature	Learn more
September 2023	Microsoft Fabric Capacity Metrics	The Microsoft Fabric Capacity Metrics app is available in App Source for a variety of billing and utilization reporting.
August 2023	Monitoring Hub support for personalized column options	The Monitoring Hub to allow users to personalize activity-specific columns. You now have the flexibility to display columns that are relevant to the activities you're focused on.
May 2023	Capacity metrics in Microsoft Fabric	Learn more about the universal compute capacities and Fabric's capacity metrics governance features that admins can use to monitor usage and make data-driven scale-up decisions.

Microsoft Purview

This section summarizes archived announcements about governance and compliance capabilities with [Microsoft Purview in Microsoft Fabric](#). Learn more about [Information protection in Microsoft Fabric](#).

[\[+\] Expand table](#)

Month	Feature	Learn more
May 2023	Administration, Security and Governance in Microsoft Fabric	Microsoft Fabric provides built-in enterprise grade governance and compliance capabilities , powered by Microsoft Purview.

Related content

- [Modernization Best Practices and Reusable Assets Blog](#)
- [Azure Data Explorer Blog](#)
- [Get started with Microsoft Fabric](#)
- [Microsoft Training Learning Paths for Fabric](#)
- [End-to-end tutorials in Microsoft Fabric](#)
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