Contents

SQL Server Documentation

THIS TOPIC APPLIES TO: ✅ SQL Server ⊗ Azure SQL Database ⊗ Azure SQL Data Warehouse ⊗ Parallel Data Warehouse

SQL Server is a central part of the Microsoft data platform. SQL Server is an industry leader in operational database management systems (ODBMS). This documentation helps you install, configure, and use SQL Server on both Windows and Linux. The content includes end-to-end examples, code samples, and videos. For SQL Server language topics, see Language Reference.

SQL Server is a central part of the Microsoft data platform. SQL Server is an industry leader in operational database management systems (ODBMS). This documentation helps you install, configure, and use SQL Server on Windows. The content includes end-to-end examples, code samples, and videos. For SQL Server language topics, see Language Reference.

WHAT'S NEW	RELEASE NOTES
What's New in SQL Server 2017	SQL Server 2017 Release Notes
What's New in SQL Server 2016	SQL Server 2016 Release Notes

ⓘ The SQL Server 2014 content will soon be merged into the .docs site. For now, see:

- Books Online for SQL Server 2014
- What's New in SQL Server 2014
- SQL Server 2014 Release Notes
- Previous Versions

WHAT'S NEW	RELEASE NOTES
What's New in SQL Server 2017	SQL Server 2017 Release Notes

WHAT'S NEW	RELEASE NOTES
What's New in SQL Server 2016	SQL Server 2016 Release Notes

Try SQL Server!
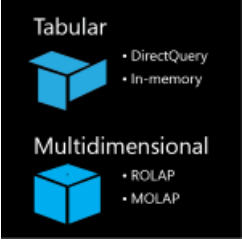
- ⬇ Download SQL Server for Windows
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- 🖥 Get a Virtual Machine with SQL Server
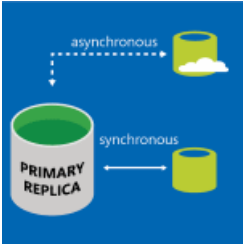
Try SQL Server!

- ⬇ Download SQL Server for Windows
- ⬇ Install SQL Server on Linux
- ⬇ Download SQL Server Management Studio (SSMS)
- ⬇ Download SQL Server Data Tools (SSDT)

- Get a Virtual Machine with SQL Server

SQL Server Technologies

	Database Engine The Database Engine is the core service for storing, processing, and securing data. The Database Engine provides controlled access and rapid transaction processing to meet the requirements of the most demanding data consuming applications within your enterprise. The Database Engine also provides rich support for sustaining high availability.
	Machine Learning Services Microsoft Machine Learning Services supports integration of machine learning, using the popular R and Python languages, into enterprise workflows. Machine Learning Services (In-Database) integrates R and Python with SQL Server, making it easy to build, retrain, and score models by calling stored procedures. Microsoft Machine Learning Server provides enterprise-scale support for R and Python, without requiring SQL Server.
	Integration Services Integration Services is a platform for building high performance data integration solutions, including packages that provide extract, transform, and load (ETL) processing for data warehousing.
	Analysis Services Analysis Services is an analytical data platform and toolset for personal, team, and corporate business intelligence. Servers and client designers support traditional OLAP solutions, new tabular modeling solutions, as well as self-service analytics and collaboration using Power Pivot, Excel, and a SharePoint Server environment. Analysis Services also includes Data Mining so that you can uncover the patterns and relationships hidden inside large volumes of data.
	Reporting Services Reporting Services delivers enterprise, Web-enabled reporting functionality. You can create reports that draw content from a variety of data sources, publish reports in various formats, and centrally manage security and subscriptions.

	Replication

Replication is a set of technologies for copying and distributing data and database objects from one database to another, and then synchronizing between databases to maintain consistency. By using replication, you can distribute data to different locations and to remote or mobile users by means of local and wide area networks, dial-up connections, wireless connections, and the Internet. |
| | **Data Quality Services**

SQL Server Data Quality Services (DQS) provides you with a knowledge-driven data cleansing solution. DQS enables you to build a knowledge base, and then use that knowledge base to perform data correction and deduplication on your data, using both computer-assisted and interactive means. You can use cloud-based reference data services, and you can build a data management solution that integrates DQS with SQL Server Integration Services and Master Data Services. |
| | **Master Data Services**

Master Data Services is the SQL Server solution for master data management. A solution built on Master Data Services helps ensure that reporting and analysis is based on the right information. Using Master Data Services, you create a central repository for your master data and maintain an auditable, securable record of that data as it changes over time. |

Migrate and move data

- Import and Export Data with the SQL Server Import and Export Wizard
- Migrate your SQL Server database to Azure SQL Database
- Microsoft Data Migration Assistant
- Azure migration journey - asses, migrate, optimize]

Migrate and move data

- Import and Export Data with the SQL Server Import and Export Wizard
- Migrate data to SQL Server on Linux
- Migrate your SQL Server database to Azure SQL Database
- Microsoft Data Migration Assistant
- Import data from Excel to SQL Server or SQL Database

Update your version of SQL Server

- SQL Server Update Center links and information for all supported versions

Samples

- Wide World Importers sample database
- AdventureWorks sample databases and scripts for SQL Server 2016
- SQL Server samples on GitHub

ⓘ Get Help

- UserVoice - Suggestion to improve SQL Server?
- Setup and Upgrade - MSDN Forum
- SQL Server Data Tools - MSDN forum
- Transact-SQL - MSDN forum
- DBA Stack Exchange (tag sql-server) - ask SQL Server questions
- Stack Overflow (tag sql-server) - also has some answers about SQL development
- Reddit - general discussion about SQL Server
- Microsoft SQL Server License Terms and Information
- Support options for business users
- Contact Microsoft

✎ Contribute SQL documentation

- How to contribute to SQL Server Documentation

What's new in SQL Server 2016

5/3/2018 • 4 minutes to read • Edit Online

THIS TOPIC APPLIES TO: ✅SQL Server (starting with 2016) ❌Azure SQL Database ❌Azure SQL Data Warehouse ❌Parallel Data Warehouse

With SQL Server 2016, you can build intelligent, mission-critical applications using a scalable, hybrid database platform that has everything built in, from in-memory performance and advanced security to in-database analytics. The SQL Server 2016 release adds new security features, querying capabilities, Hadoop and cloud integration, R analytics and more, along with numerous improvements and enhancements.

This page provides summary information and links to more detailed SQL Server 2016 what's new information for each SQL Server component.
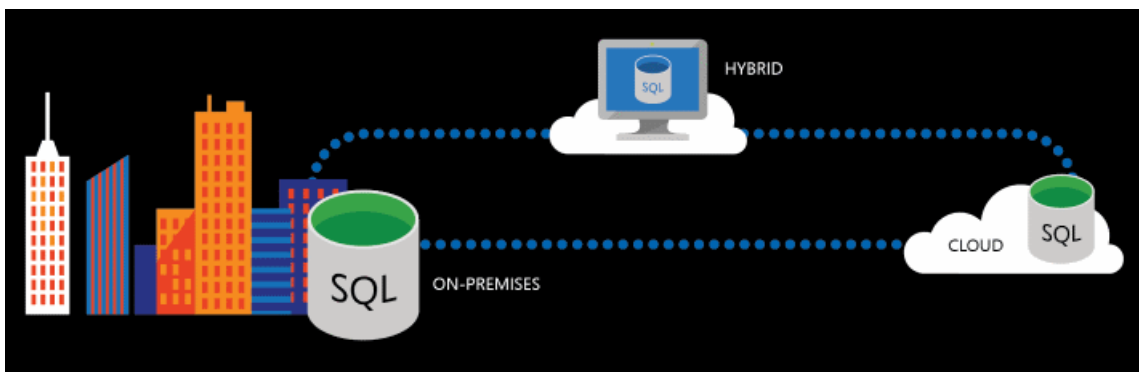
Try SQL Server today!

- Download the **free SQL Server 2016 Developer edition!**.
- Download the latest version of SQL Server Management Studio (SSMS).
- Have an Azure account? Spin up a Virtual Machine with SQL Server 2016 already installed.

SQL Server 2016 Database Engine

- You can now configure **multiple tempDB** database files during SQL Server installation and setup.
- New **Query Store** stores query texts, execution plans, and performance metrics within the database, allowing easy monitoring and troubleshooting of performance issues. A dashboard shows which queries consumed the most time, memory or CPU resources.
- **Temporal tables** are history tables which record all data changes, complete with the date and time they occurred.
- New built-in **JSON support** in SQL Server supports JSON imports, exports, parsing and storing.
- New **PolyBase** query engine integrates SQL Server with external data in Hadoop or Azure Blob storage. You can import and export data as well as executing queries.
- The new **Stretch Database** feature lets you dynamically, securely archive data from a local SQL Server database to an Azure SQL database in the cloud. SQL Server automatically queries both local and remote data in the linked databases.
- **In-memory OLTP:**
  - Now supports FOREIGN KEY, UNIQUE and CHECK constraints, and native compiled stored procedures OR, NOT, SELECT DISTINCT, OUTER JOIN, and subqueries in SELECT.
  - Supports tables up to 2TB (up from 256GB).
  - Has column store index enhancements for sorting and Always On Availability Group support.

- New security features:
  - **Always Encrypted:** When enabled, only the application that has the encryption key can access the encrypted sensitive data in the SQL Server 2016 database. The key is never passed to SQL Server.
  - **Dynamic Data Masking:** If specified in the table definition, masked data is hidden from most users, and only users with UNMASK permission can see the complete data.
  - **Row Level Security:** Data access can be restricted at the database engine level, so users see only what is relevant to them.

See Database Engine.

SQL Server 2016 Analysis Services (SSAS)

SQL Server 2016 Analysis Services provides improved performance, authoring, database management, filtering, processing, and much more for tabular model databases based on the **1200 compatibility level**.

- **SQL Server R Services** integrate the R programming language, used for statistical analysis, into SQL Server.
- New **Database Consistency Checker (DBCC)** runs internally to detect potential data corruption issues.
- **Direct Query**, which queries live external data rather than importing it first, now supports more data sources, including Azure SQL, Oracle and Teradata.
- There are numerous new **DAX (Data Access Expressions) functions**.
- New **Microsoft.AnalysisServices.Tabular** namespace manages tabular mode instances and models.
- Analysis Services Management Objects (AMO) is re-factored to include a second assembly, **Microsoft.AnalysisServices.Core.dll**.

See Analysis Services Engine (SSAS).

SQL Server 2016 Integration Services (SSIS)

- Support for **Always On Availability Groups**
- **Incremental package deployment**
- **Always Encrypted** support
- New **ssis_logreader** database-level role
- New **custom logging level**
- **Column names for errors** in the data flow
- New **connectors**
- Support for the **Hadoop file system (HDFS)**

See Integration Services (SSIS).

SQL Server 2016 Master Data Services (MDS)

- **Derived hierarchy improvements**, including support for recursive and many-to-many hierarchies
- **Domain-based attribute** filtering
- **Entity syncing** for sharing entity data between models
- Approval workflows via **changesets**
- **Custom indexes** to improve query performance
- New **permission levels** for improved security
- Redesigned **business rules management** experience

See Master Data Services (MDS).

SQL Server 2016 Reporting Services (SSRS)

Microsoft has thoroughly revamped Reporting Services in this release.

- New **web Report Portal** with KPI feature
- New **Mobile Report Publisher**
- **Redesigned report rendering engine** that supports HTML5
- New treemap and sunburst **chart types**

See Reporting Services (SSRS).

Next steps

- SQL Server setup
- SQL Server 2016 Release Notes
- SQL Server 2016 datasheet
- Features supported by Editions of SQL Server
- Hardware and Software Requirements for Installing SQL Server 2016
- Install SQL Server 2016 from the Installation Wizard
- Setup and Servicing Installation
- New SQL PowerShell module

ⓘ Get Help

- UserVoice - Suggestion to improve SQL Server?
- Setup and Upgrade - MSDN Forum
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What's new in SQL Server 2017

5/3/2018 • 9 minutes to read • Edit Online

THIS TOPIC APPLIES TO: ✅ SQL Server (starting with 2017) ⊗ Azure SQL Database ⊗ Azure SQL Data Warehouse ⊗ Parallel Data Warehouse

SQL Server 2017 represents a major step towards making SQL Server a platform that gives you choices of development languages, data types, on-premises or cloud, and operating systems by bringing the power of SQL Server to Linux, Linux-based Docker containers, and Windows. This topic summarizes what is new for specific feature areas and includes links to additional details. For more information related to SQL Server on Linux, see SQL Server on Linux Documentation

⬇ **Try it out:** Download SQL Server 2017 Release - October 2017:.

> **NOTE**
>
> In addition to the changes below, cumulative updates are released at regular intervals after the GA release. These cumulative updates provide many improvements and fixes. For information about the latest CU release, see SQL Server 2017 Cumulative updates.

SQL Server 2017 Database Engine

SQL Server 2017 includes many new Database Engine features, enhancements, and performance improvements.

- **CLR assemblies** can now be added to a whitelist, as a workaround for the `clr strict security` feature described in CTP 2.0. sp_add_trusted_assembly, sp_drop_trusted_assembly, and sys.trusted_asssemblies are added to support the white list of trusted assemblies (RC1).

- **Resumable online index rebuild** resumes an online index rebuild operation from where it stopped after a failure (such as a failover to a replica or insufficient disk space), or pauses and later resumes an online index rebuild operation. See ALTER INDEX and Guidelines for online index operations. (CTP 2.0)

- The **IDENTITY_CACHE** option for ALTER DATABASE SCOPED CONFIGURATION allows you to avoid gaps in the values of identity columns if a server restarts unexpectedly or fails over to a secondary server. See ALTER DATABASE SCOPED CONFIGURATION. (CTP 2.0)

- A new generation of query processing improvements that will adapt optimization strategies to your application workload's runtime conditions. For this first version of the **adaptive query processing** feature family, we have three new improvements: **batch mode adaptive joins**, **batch mode memory grant feedback**, and **interleaved execution** for multi-statement table valued functions. See Adaptive query processing in SQL databases.

- **Automatic database tuning** provides insight into potential query performance problems, recommends solutions, and can automatically fix identified problems. See Automatic tuning. (CTP 2.0)

- New **graph database capabilities** for modeling many-to-many relationships include new CREATE TABLE syntax for creating node and edge tables, and the keyword MATCH for queries. See Graph Processing with SQL Server 2017. (CTP 2.0)

- An sp_configure option called `clr strict security` is enabled by default to enhance the security of CLR assemblies. See CLR strict security. (CTP 2.0)

- Setup now allows specifying initial tempdb file size up to **256 GB** (262,144 MB) per file, with a warning if the file size is set greater than 1GB with IFI not enabled. (CTP 2.0)

- The **modified_extent_page_count** column in sys.dm_db_file_space_usage tracks differential changes in each database file, enabling smart backup solutions that perform differential backup or full backup based on

percentage of changed pages in the database. (CTP 2.0)

- SELECT INTO T-SQL syntax now supports loading a table into a FileGroup other than the user's default by using the **ON** keyword. (CTP 2.0)

- Cross database transactions are now supported among all databases that are part of an **Always On Availability Group**, including databases that are part of same instance. See Transactions - Always On Availability Groups and Database Mirroring (CTP 2.0)

- New **Availability Groups** functionality includes clusterless support, Minimum Replica Commit Availability Groups setting, and Windows-Linux cross-OS migrations and testing. (CTP 1.3)

- New dynamic management views:
  - sys.dm_db_log_stats exposes summary level attributes and information on transaction log files, helpful for monitoring transaction log health. (CTP 2.1)
  - sys.dm_tran_version_store_space_usage tracks version store usage per database, useful for proactively planning tempdb sizing based on the version store usage per database. (CTP 2.0)
  - sys.dm_db_log_info exposes VLF information to monitor, alert, and avert potential transaction log issues. (CTP 2.0)
  - sys.dm_db_stats_histogram is a new dynamic management view for examining statistics. (CTP 1.3)
  - **sys.dm_os_host_info** provides operating system information for both Windows and Linux. (CTP 1.0)

- The **Database Tuning Advisor (DTA)** has additional options and improved performance. (CTP 1.2)

- **In-memory enhancements** include support for computed columns in memory-optimized tables, full support for JSON functions in natively compiled modules, and the CROSS APPLY operator in natively compiled modules. (CTP 1.1)

- New **string functions** are CONCAT_WS, TRANSLATE, and TRIM, and WITHIN GROUP is now supported for the STRING_AGG function. (CTP 1.1)

- There are new **bulk access options** (BULK INSERT and OPENROWSET(BULK...)) for CSV and Azure Blob files. (CTP 1.1)

- **Memory-optimized object enhancements** include sp_spaceused and elimination of the 8 index limitation for memory-optimized tables, sp_rename for memory-optimized tables and natively compiled T-SQL modules, and CASE and TOP (N) WITH TIES for natively compiled T-SQL modules. Memory-optimized filegroup files can now be stored, backed up and restored on Azure Storage. (CTP 1.0)

- **DATABASE SCOPED CREDENTIAL** is a new class of securable, supporting CONTROL, ALTER, REFERENCES, TAKE OWNERSHIP, and VIEW DEFINITION permissions. ADMINISTER DATABASE BULK OPERATIONS is now visible in sys.fn_builtin_permissions. (CTP 1.0)

- Database **COMPATIBILITY_LEVEL 140** is added. (CTP 1.0).

For more information, see What's new in SQL Server 2017 Database Engine.

SQL Server 2017 Integration Services (SSIS)

- The new **Scale Out** feature in SSIS has the following new and changed features. For more info, see What's New in Integration Services in SQL Server 2017. (RC1)
  - Scale Out Master now supports high availability.
  - The failover handling of the execution logs from Scale Out Workers is improved.
  - The parameter *runincluster* of the stored procedure **[catalog].[create_execution]** is renamed to *runinscaleout* for consistency and readability.
  - The SSIS Catalog has a new global property to specify the default mode for executing SSIS packages.

- In the new **Scale Out for SSIS** feature, you can now use the **Use32BitRuntime** parameter when you trigger execution. (CTP 2.1)

- SQL Server 2017 Integration Services (SSIS) now supports **SQL Server on Linux**, and a new package lets you run SSIS packages on Linux from the command line. For more information, see the blog post announcing SSIS support for Linux. (CTP 2.1)

- The new **Scale Out for SSIS** feature makes it much easier to run SSIS on multiple machines. See Integration Services Scale Out. (CTP 1.0)
- OData Source and OData Connection Manager now support connecting to the OData feeds of Microsoft Dynamics AX Online and Microsoft Dynamics CRM Online. (CTP 1.0)

For more info, see What's New in Integration Services in SQL Server 2017.

SQL Server 2017 Master Data Services (MDS)

- Experience and performance are improved when upgrading from SQL Server 2012, SQL Server 2014, and SQL Server 2016 to SQL Server 2017 Master Data Services.
- You can now view the sorted lists of entities, collections and hierarchies in the **Explorer** page of the Web application.
- Performance is improved for staging millions of records using the staging stored procedure.
- Performance is improved when expanding the **Entities** folder on the **Manage Groups** page to assign model permissions. The **Manage Groups** page is located in the **Security** section of the Web application. For more information about the performance improvement, see https://support.microsoft.com/help/4023865?preview. For more information about assigning permissions, see Assign Model Object Permissions (Master Data Services).

SQL Server 2017 Analysis Services (SSAS)

SQL Server Analysis Services 2017 introduces many enhancements for tabular models. These include:

- Tabular mode as the default installation option for Analysis Services. (CTP 2.0)
- Object-level security to secure the metadata of tabular models. (CTP 2.0)
- Date relationships to easily create relationships based on date fields. (CTP 2.0)
- New **Get Data** (Power Query) data sources, and existing DirectQuery data sources support for M queries. (CTP 2.0)
- DAX Editor for SSDT. (CTP 2.0)
- Encoding hints, an advanced feature for optimizing data refresh of large in-memory tabular models. (CTP 1.3)
- Support for the **1400 Compatibility level** for tabular models. To create new or upgrade existing tabular model projects to the 1400 compatibility level, download and install SQL Server Data Tools (SSDT) 17.0 RC2. (CTP 1.1)
- A modern **Get Data** experience for tabular models at the 1400 compatibility level. See the Analysis Services Team Blog. (CTP 1.1)
- **Hide Members** property to hide blank members in ragged hierarchies. (CTP 1.1)
- New **Detail Rows** end-user action to **Show Details** for aggregated information. SELECTCOLUMNS and **DETAILROWS** functions for creating Detail Rows expressions. (CTP 1.1)
- DAX **IN** operator for specifying multiple values. (CTP 1.1)

For more information, see What's new in SQL Server Analysis Services 2017.

SQL Server 2017 Reporting Services (SSRS)

SQL Server Reporting Services is no longer available to install through SQL Server setup. Go to the Microsoft Download Center to download Microsoft SQL Server 2017 Reporting Services.

- Comments are now available for reports, to add perspective and collaborate with others. You can also include attachments with comments.
- In the latest releases of Report Builder and SQL Server Data Tools, you can create native DAX queries against supported SQL Server Analysis Services tabular data models by dragging and dropping desired fields in the

query designers. See the Reporting Services blog.

- To enable development of modern applications and customization, SSRS now supports a fully OpenAPI compliant RESTful API. The full API specification and documentation can now be found on swaggerhub.

For more information, see What's new in SQL Server Reporting Services (SSRS).

Machine Learning in SQL Server 2017

SQL Server R Services has been renamed **SQL Server Machine Learning Services**, to reflect support for Python in addition to the R language. You can use Machine Learning Services (In-Database) to run R or Python scripts in SQL Server, or install **Microsoft Machine Learning Server (Standalone)** to deploy and consume R and Python models that don't require SQL Server.

SQL Server developers now have access to the extensive Python ML and AI libraries available in the open-source ecosystem, along with the latest innovations from Microsoft:

- **revoscalepy** - This Python equivalent of RevoScaleR includes parallel algorithms for linear and logistic regressions, decision tree, boosted trees and random forests, as well as a rich set of APIs for data transformation and data movement, remote compute contexts, and data sources.
- **microsoftml** - This state-of-the-art package of machine learning algorithms and transforms with Python bindings includes deep neural networks, fast decision trees and decision forests, and optimized algorithms for linear and logistic regressions. You also get pre-trained models based on ResNet models that you can use for image extraction or sentiment analysis.
- **Python operationalization with T-SQL** - Deploy Python code easily by using the stored procedure `sp_execute_external_script`. Get great performance by streaming data from SQL to Python processes and using MPI ring parallelization.
- **Python in SQL Server compute contexts** - Data scientists and developers can execute Python code remotely from their development environments to explore data and develop models without moving data around.
- **Native scoring** - The PREDICT function in Transact-SQL can be used to perform scoring in any instance of SQL Server 2017, even if R isn't installed. All that's required is that you train the model using one of the supported RevoScaleR and revoscalepy algorithms and save the model in a new, compact binary format.
- **Package management** - T-SQL now supports the CREATE EXTERNAL LIBRARY statement, to give DBAs greater management over R packages. Use roles to control prviate or shared package access, store R packages in the database and share them among users.
- **Performance improvements** - The stored procedure `sp_execute_external_script` has been optimized to support batch mode execution for columnstore data.

For more information, see What's new in SQL Server Machine Learning Services.

Next steps

- See the SQL Server 2017 Release Notes.
- Find out What's new for SQL Server 2017 on Linux.
- Find out What's new in SQL Server 2016.

ⓘ Get Help

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Microsoft

Editions and supported features of SQL Server 2016

5/3/2018 • 16 minutes to read • Edit Online

THIS TOPIC APPLIES TO: ✅ SQL Server (starting with 2016) ⊗ Azure SQL Database ⊗ Azure SQL Data Warehouse ⊗ Parallel Data Warehouse

This topic provides details of features supported by the SQL Server editions. At this time there are no changes to features supported by editions for SQL Server 2017.

Installation requirements vary based on your application needs. The different editions of SQL Server accommodate the unique performance, runtime, and price requirements of organizations and individuals. The SQL Server components that you install also depend on your specific requirements. The following sections help you understand how to make the best choice among the editions and components available in SQL Server.

The SQL Server Evaluation edition is available for a 180-day trial period.

For the latest release notes and what's new information, see the following:

- SQL Server 2017 release notes
- SQL Server 2016 release notes
- What's new in SQL Server 2017
- What's new in SQL Server 2016

Try SQL Server!

⊕ **Download SQL Server 2016 from the Evaluation Center**

⊞ **Spin up a Virtual Machine with SQL Server 2016 already installed**

SQL Server Editions

The following table describes the editions of SQL Server.

SQL SERVER EDITION	DEFINITION
Enterprise	The premium offering, SQL Server Enterprise edition delivers comprehensive high-end datacenter capabilities with blazing-fast performance, unlimited virtualization, and end-to-end business intelligence — enabling high service levels for mission-critical workloads and end user access to data insights.
Standard	SQL Server Standard edition delivers basic data management and business intelligence database for departments and small organizations to run their applications and supports common development tools for on-premise and cloud — enabling effective database management with minimal IT resources.
Web	SQL Server Web edition is a low total-cost-of-ownership option for Web hosters and Web VAPs to provide scalability, affordability, and manageability capabilities for small to large scale Web properties.

SQL SERVER EDITION	DEFINITION
Developer	SQL Server Developer edition lets developers build any kind of application on top of SQL Server. It includes all the functionality of Enterprise edition, but is licensed for use as a development and test system, not as a production server. SQL Server Developer is an ideal choice for people who build SQL Server and test applications.
Express editions	Express edition is the entry-level, free database and is ideal for learning and building desktop and small server data-driven applications. It is the best choice for independent software vendors, developers, and hobbyists building client applications. If you need more advanced database features, SQL Server Express can be seamlessly upgraded to other higher end versions of SQL Server. SQL Server Express LocalDB, a lightweight version of Express that has all of its programmability features, yet runs in user mode and has a fast, zero-configuration installation and a short list of prerequisites.

Using SQL Server with an Internet Server

On an Internet server, such as a server that is running Internet Information Services (IIS), you will typically install the SQL Server client tools. Client tools include the client connectivity components used by an application connecting to an instance of SQL Server.

> **NOTE:** Although you can install an instance of SQL Server on a computer that is running IIS, this is typically done only for small Web sites that have a single server computer. Most Web sites have their middle-tier IIS systems on one server or a cluster of servers, and their databases on a separate server or federation of servers.

Using SQL Server with Client/Server Applications

You can install just the SQL Server client components on a computer that is running client/server applications that connect directly to an instance of SQL Server. A client components installation is also a good option if you administer an instance of SQL Server on a database server, or if you plan to develop SQL Server applications.

The client tools option installs the following SQL Server features: backward compatibility components, SQL Server Data Tools, connectivity components, management tools, software development kit, and SQL Server Books Online components. For more information, see Install SQL Server.

Deciding Among SQL Server Components

Use the Feature Selection page of the SQL Server Installation Wizard to select the components to include in an installation of SQL Server. By default, none of the features in the tree are selected.

Use the information in the following tables to determine the set of features that best fits your needs.

SERVER COMPONENTS	DESCRIPTION
SQL Server Database Engine	SQL Server Database Engine includes the Database Engine, the core service for storing, processing, and securing data, replication, full-text search, tools for managing relational and XML data, in database analytics integration, and Polybase integration for access to Hadoop and other heterogeneous data sources, and the Data Quality Services (DQS) server.

SERVER COMPONENTS	DESCRIPTION
Analysis Services	Analysis Services includes the tools for creating and managing online analytical processing (OLAP) and data mining applications.
Reporting Services	Reporting Services includes server and client components for creating, managing, and deploying tabular, matrix, graphical, and free-form reports. Reporting Services is also an extensible platform that you can use to develop report applications.
Integration Services	Integration Services is a set of graphical tools and programmable objects for moving, copying, and transforming data. It also includes the Data Quality Services (DQS) component for Integration Services.
Master Data Services	Master Data Services (MDS) is the SQL Server solution for master data management. MDS can be configured to manage any domain (products, customers, accounts) and includes hierarchies, granular security, transactions, data versioning, and business rules, as well as an Add-in for Excel that can be used to manage data.
R Services (In-Database)	R Services (In-Database) supports distributed, scalable R solutions on multiple platforms and using multiple enterprise data sources, including Linux, Hadoop, and Teradata.

MANAGEMENT TOOLS	DESCRIPTION
SQL Server Management Studio	SQL Server Management Studio is an integrated environment to access, configure, manage, administer, and develop components of SQL Server. Management Studio lets developers and administrators of all skill levels use SQL Server. Download and install Management Studio from Download SQL Server Management Studio
SQL Server Configuration Manager	SQL Server Configuration Manager provides basic configuration management for SQL Server services, server protocols, client protocols, and client aliases.
SQL Server Profiler	SQL Server Profiler provides a graphical user interface to monitor an instance of the Database Engine or Analysis Services.
Database Engine Tuning Advisor	Database Engine Tuning Advisor helps create optimal sets of indexes, indexed views, and partitions.
Data Quality Client	Provides a highly simple and intuitive graphical user interface to connect to the DQS server, and perform data cleansing operations. It also allows you to centrally monitor various activities performed during the data cleansing operation.

MANAGEMENT TOOLS	DESCRIPTION
SQL Server Data Tools	SQL Server Data Tools provides an IDE for building solutions for the Business Intelligence components: Analysis Services, Reporting Services, and Integration Services. (Formerly called Business Intelligence Development Studio). SQL Server Data Tools also includes "Database Projects", which provides an integrated environment for database developers to carry out all their database design work for any SQL Server platform (both on and off premise) within Visual Studio. Database developers can use the enhanced Server Explorer in Visual Studio to easily create or edit database objects and data, or execute queries.
Connectivity Components	Installs components for communication between clients and servers, and network libraries for DB-Library, ODBC, and OLE DB.

DOCUMENTATION	DESCRIPTION
SQL Server Books Online	Core documentation for SQL Server.

Developer and Evaluation Editions

For features supported by Developer and Evaluation editions, see features listed for the SQL Server Enterprise Edition in the tables below. For a list of features that were added to the Developer edition for SQL Server 2016 (13.x) SP1, see SQL Server 2016 SP1 editions.

The Developer edition continues to support only 1 client for SQL Server Distributed Replay.

Scale Limits

FEATURE	ENTERPRISE	STANDARD	WEB	EXPRESS WITH ADVANCED SERVICES	EXPRESS
Maximum compute capacity used by a single instance - SQL Server Database Engine[1]	Operating system maximum	Limited to lesser of 4 sockets or 24 cores	Limited to lesser of 4 sockets or 16 cores	Limited to lesser of 1 socket or 4 cores	Limited to lesser of 1 socket or 4 cores
Maximum compute capacity used by a single instance - Analysis Services or Reporting Services	Operating system maximum	Limited to lesser of 4 sockets or 24 cores	Limited to lesser of 4 sockets or 16 cores	Limited to lesser of 1 socket or 4 cores	Limited to lesser of 1 socket or 4 cores
Maximum memory for buffer pool per instance of SQL Server Database Engine	Operating System Maximum	128 GB	64 GB	1410 MB	1410 MB

FEATURE	ENTERPRISE	STANDARD	WEB	EXPRESS WITH ADVANCED SERVICES	EXPRESS
Maximum memory for Columnstore segment cache per instance of SQL Server Database Engine	Unlimited memory	32 GB[2]	16 GB[2]	352 MB[2]	352 MB[2]
Maximum memory-optimized data size per database in SQL Server Database Engine	Unlimited memory	32 GB[2]	16 GB[2]	352 MB[2]	352 MB[2]
Maximum memory utilized per instance of Analysis Services	Operating System Maximum	Tabular: 16 GB MOLAP: 64 GB	N/A	N/A	N/A
Maximum memory utilized per instance of Reporting Services	Operating System Maximum	64 GB	64 GB	4 GB	N/A
Maximum relational database size	524 PB	524 PB	524 PB	10 GB	10 GB

[1] Enterprise Edition with Server + Client Access License (CAL) based licensing (not available for new agreements) is limited to a maximum of 20 cores per SQL Server instance. There are no limits under the Core-based Server Licensing model. For more information, see Compute Capacity Limits by Edition of SQL Server.

[2] Applies to SQL Server 2016 (13.x) SP1.

RDBMS High Availability

FEATURE	ENTERPRISE	STANDARD	WEB	EXPRESS WITH ADVANCED SERVICES	EXPRESS
Server core support [1]	Yes	Yes	Yes	Yes	Yes
Log shipping	Yes	Yes	Yes	No	No
Database mirroring	Yes	Yes Full safety only	Witness only	Witness only	Witness only
Backup compression	Yes	Yes	No	No	No

FEATURE	ENTERPRISE	STANDARD	WEB	EXPRESS WITH ADVANCED SERVICES	EXPRESS
Database snapshot	Yes	Yes [3]	Yes [3]	Yes [3]	Yes [3]
Always On failover cluster instances	Yes Number of nodes is the operating system maximum	Yes Support for 2 nodes	No	No	No
Always On availability groups	Yes Up to 8 secondary replicas, including 2 synchronous secondary replicas	No	No	No	No
Basic availability groups [2]	No	Yes Support for 2 nodes	No	No	No
Online page and file restore	Yes	No	No	No	No
Online indexing	Yes	No	No	No	No
Online schema change	Yes	No	No	No	No
Fast recovery	Yes	No	No	No	No
Mirrored backups	Yes	No	No	No	No
Hot add memory and CPU	Yes	No	No	No	No
Database recovery advisor	Yes	Yes	Yes	Yes	Yes
Encrypted backup	Yes	Yes	No	No	No
Hybrid backup to Windows Azure (backup to URL)	Yes	Yes	No	No	No

[1] For more information on installing SQL Server on Server Core, see Install SQL Server on Server Core.

[2] For more information about Basic availability groups, see Basic Availability Groups.

[3] Applies to SQL Server 2016 SP1.

RDBMS Scalability and Performance

FEATURE	ENTERPRISE	STANDARD	WEB	EXPRESS WITH ADVANCED SERVICES	EXPRESS
Columnstore [1]	Yes	Yes [2]	Yes [2]	Yes[2]	Yes[2]
In-Memory OLTP [1]	Yes	Yes [2]	Yes [2]	Yes [2, 3]	Yes [2]
Stretch Database	Yes	Yes	Yes	Yes	Yes
Persistent Main Memory	Yes	Yes	Yes	Yes	Yes
Multi-instance support	50	50	50	50	50
Table and index partitioning	Yes	Yes [2]	Yes [2]	Yes [2]	Yes [2]
Data compression	Yes	Yes [2]	Yes [2]	Yes [2]	Yes [2]
Resource Governor	Yes	No	No	No	No
Partitioned Table Parallelism	Yes	No	No	No	No
Multiple Filestream containers	Yes	Yes [2]	Yes [2]	Yes [2]	Yes [2]
NUMA Aware and Large Page Memory and Buffer Array Allocation	Yes	No	No	No	No
Buffer Pool Extension	Yes	Yes	No	No	No
IO Resource Governance	Yes	No	No	No	No
Delayed Durability	Yes	Yes	Yes	Yes	Yes

[1] In-Memory OLTP data size and Columnstore segment cache are limited to the amount of memory specified by edition in the Scale Limits section. The max degrees of parallelism is limited. The degrees of process parallelism (DOP) for an index build is limited to 2 DOP for the Standard Edition and 1 DOP for the Web and Express Editions. This refers to columnstore indexes created over disk-based tables and memory-optimized tables.

[2] Applies to SQL Server 2016 (13.x) SP1.

[3] This feature is not included in the LocalDB installation option.

RDBMS Security

FEATURE	ENTERPRISE	STANDARD	WEB	EXPRESS	EXPRESS WITH ADVANCED SERVICES
Row-level security	Yes	Yes	Yes [1]	Yes [1]	Yes [1]
Always Encrypted	Yes	Yes [1]	Yes [1]	Yes [1]	Yes [1]
Dynamic data masking	Yes	Yes	Yes [1]	Yes [1]	Yes [1]
Basic auditing	Yes	Yes	Yes	Yes	Yes
Fine grained auditing	Yes	Yes [1]	Yes [1]	Yes [1]	Yes [1]
Transparent database encryption	Yes	No	No	No	No
Extensible key management	Yes	No	No	No	No
User-defined roles	Yes	Yes	Yes	Yes	Yes
Contained databases	Yes	Yes	Yes	Yes	Yes
Encryption for backups	Yes	Yes	No	No	No

[1] Applies to SQL Server 2016 SP1.

Replication

FEATURE	ENTERPRISE	STANDARD	WEB	EXPRESS WITH ADVANCED SERVICES	EXPRESS
Heterogeneous subscribers	Yes	Yes	No	No	No
Merge replication	Yes	Yes	Yes (Subscriber only)	Yes (Subscriber only)	Yes (Subscriber only)
Oracle publishing	Yes	No	No	No	No
Peer to peer transactional replication	Yes	No	No	No	No

FEATURE	ENTERPRISE	STANDARD	WEB	EXPRESS WITH ADVANCED SERVICES	EXPRESS
Snapshot replication	Yes	Yes	Yes (Subscriber only)	Yes (Subscriber only)	Yes (Subscriber only)
SQL Server change tracking	Yes	Yes	Yes	Yes	Yes
Transactional replication	Yes	Yes	Yes (Subscriber only)	Yes (Subscriber only)	Yes (Subscriber only)
Transactional replication to Azure	Yes	Yes	No	No	No
Transactional replication updateable subscription	Yes	No	No	No	No

Management Tools

FEATURE	ENTERPRISE	STANDARD	WEB	EXPRESS WITH ADVANCED SERVICES	EXPRESS
SQL Management Objects (SMO)	Yes	Yes	Yes	Yes	Yes
SQL Configuration Manager	Yes	Yes	Yes	Yes	Yes
SQL CMD (Command Prompt tool)	Yes	Yes	Yes	Yes	Yes
Distributed Replay - Admin Tool	Yes	Yes	Yes	Yes	No
Distribute Replay - Client	Yes	Yes	Yes	No	No
Distributed Replay - Controller	Yes (Up to 16 clients)	Yes (1 client)	Yes (1 client)	No	No
SQL Profiler	Yes	Yes	No [1]	No [1]	No [1]
SQL Server Agent	Yes	Yes	Yes	No	No

FEATURE	ENTERPRISE	STANDARD	WEB	EXPRESS WITH ADVANCED SERVICES	EXPRESS
Microsoft System Center Operations Manager Management Pack	Yes	Yes	Yes	No	No
Database Tuning Advisor (DTA)	Yes	Yes [2]	Yes [2]	No	No

[1] SQL Server Web, SQL Server Express, SQL Server Express with Tools, and SQL Server Express with Advanced Services can be profiled using SQL Server Standard and SQL Server Enterprise editions.

[2] Tuning enabled only on Standard edition features

RDBMS Manageability

FEATURE	ENTERPRISE	STANDARD	WEB	EXPRESS WITH ADVANCED SERVICES	EXPRESS
User instances	No	No	No	Yes	Yes
LocalDB	No	No	No	Yes	No
Dedicated admin connection	Yes	Yes	Yes	Yes with trace flag	Yes with trace flag
PowerShell scripting support	Yes	Yes	Yes	Yes	Yes
SysPrep support [1]	Yes	Yes	Yes	Yes	Yes
Support for data-tier application component operations - extract, deploy, upgrade, delete	Yes	Yes	Yes	Yes	Yes
Policy automation (check on schedule and change)	Yes	Yes	Yes	No	No
Performance data collector	Yes	Yes	Yes	No	No

FEATURE	ENTERPRISE	STANDARD	WEB	EXPRESS WITH ADVANCED SERVICES	EXPRESS
Able to enroll as a managed instance in multi-instance management	Yes	Yes	Yes	No	No
Standard performance reports	Yes	Yes	Yes	No	No
Plan guides and plan freezing for plan guides	Yes	Yes	Yes	No	No
Direct query of indexed views (using NOEXPAND hint)	Yes	Yes	Yes	Yes	Yes
Automatic indexed views maintenance	Yes	Yes	Yes	No	No
Distributed partitioned views	Yes	No	No	No	No
Parallel indexed operations	Yes	No	No	No	No
Automatic use of indexed view by query optimizer	Yes	No	No	No	No
Parallel consistency check	Yes	No	No	No	No
SQL Server Utility Control Point	Yes	No	No	No	No
Buffer pool extension	Yes	Yes	No	No	No

[1] For more information, see Considerations for Installing SQL Server Using SysPrep.

[2] Applies to SQL Server 2016 SP1.

Development Tools

FEATURE	ENTERPRISE	STANDARD	WEB	EXPRESS WITH ADVANCED SERVICES	EXPRESS
Microsoft Visual Studio integration	Yes	Yes	Yes	Yes	Yes
Intellisense (Transact-SQL and MDX)	Yes	Yes	Yes	Yes	Yes
SQL Server Data Tools (SSDT)	Yes	Yes	Yes	Yes	No
MDX edit, debug, and design tools	Yes	Yes	No	No	No

Programmability

FEATURE	ENTERPRISE	STANDARD	WEB	EXPRESS WITH ADVANCED SERVICES	EXPRESS
Basic R integration	Yes	Yes	Yes	Yes	No
Advanced R integration	Yes	No	No	No	No
R Server (Standalone)	Yes	No	No	No	No
Polybase compute node	Yes	Yes [1]	Yes [1], [2]	Yes [1], [2]	Yes [1], [2]
Polybase head node	Yes	No	No	No	No
JSON	Yes	Yes	Yes	Yes	Yes
Query Store	Yes	Yes	Yes	Yes	Yes
Temporal	Yes	Yes	Yes	Yes	Yes
Common Language Runtime (CLR) Integration	Yes	Yes	Yes	Yes	Yes
Native XML support	Yes	Yes	Yes	Yes	Yes
XML indexing	Yes	Yes	Yes	Yes	Yes

FEATURE	ENTERPRISE	STANDARD	WEB	EXPRESS WITH ADVANCED SERVICES	EXPRESS
MERGE & UPSERT capabilities	Yes	Yes	Yes	Yes	Yes
FILESTREAM support	Yes	Yes	Yes	Yes	Yes
FileTable	Yes	Yes	Yes	Yes	Yes
Date and Time datatypes	Yes	Yes	Yes	Yes	Yes
Internationalization support	Yes	Yes	Yes	Yes	Yes
Full-text and semantic search	Yes	Yes	Yes	Yes	No
Specification of language in query	Yes	Yes	Yes	Yes	No
Service Broker (messaging)	Yes	Yes	No (Client only)	No (Client only)	No (Client only)
Transact-SQL endpoints	Yes	Yes	Yes	No	No

[1] Scale out with multiple compute nodes requires a head node.

[2] Applies to SQL Server 2016 SP1.

Integration Services

For info about the Integration Services (SSIS) features supported by the editions of SQL Server, see Integration Services Features Supported by the Editions of SQL Server.

Master Data Services

For information about the Master Data Services and Data Quality Services features supported by the editions of SQL Server, see Master Data Services and Data Quality Services Features Supported by the Editions of SQL Server.

Data Warehouse

FEATURE	ENTERPRISE	STANDARD	WEB	EXPRESS WITH ADVANCED SERVICES	EXPRESS
Create cubes without a database	Yes	Yes	No	No	No

FEATURE	ENTERPRISE	STANDARD	WEB	EXPRESS WITH ADVANCED SERVICES	EXPRESS
Auto-generate staging and data warehouse schema	Yes	Yes	No	No	No
Change data capture	Yes	Yes [1]	No	No	No
Star join query optimizations	Yes	No	No	No	No
Scalable read-only Analysis Services configuration	Yes	No	No	No	No
Parallel query processing on partitioned tables and indexes	Yes	No	No	No	No
Global batch aggregation	Yes	No	No	No	No

[1] Applies to SQL Server 2016 (13.x) SP1.

Analysis Services

For information about the Analysis Services features supported by the editions of SQL Server, see Analysis Services Features Supported by the Editions of SQL Server.

BI Semantic Model (Multi Dimensional)

For information about the Analysis Services features supported by the editions of SQL Server, see Analysis Services Features Supported by the Editions of SQL Server.

BI Semantic Model (Tabular)

For information about the Analysis Services features supported by the editions of SQL Server, see Analysis Services Features Supported by the Editions of SQL Server.

Power Pivot for SharePoint

For information about the Power Pivot for SharePoint features supported by the editions of SQL Server, see Analysis Services Features Supported by the Editions of SQL Server.

Data Mining

For information about the Data Mining features supported by the editions of SQL Server, see Analysis Services Features Supported by the Editions of SQL Server.

Reporting Services

For information about the Reporting Services features supported by the editions of SQL Server, see Reporting Services Features Supported by the Editions of SQL Server.

Business Intelligence Clients

For information about the Business Intelligence Client features supported by the editions of SQL Server, see Analysis Services Features Supported by the Editions of SQL Server or Reporting Services Features Supported by the Editions of SQL Server.

Spatial and Location Services

FEATURE NAME	ENTERPRISE	STANDARD	WEB	EXPRESS WITH ADVANCED SERVICES	EXPRESS
Spatial indexes	Yes	Yes	Yes	Yes	Yes
Planar and geodetic datatypes	Yes	Yes	Yes	Yes	Yes
Advanced spatial libraries	Yes	Yes	Yes	Yes	Yes
Import/export of industry-standard spatial data formats	Yes	Yes	Yes	Yes	Yes

Additional Database Services

FEATURE NAME	ENTERPRISE	STANDARD	WEB	EXPRESS WITH ADVANCED SERVICES	EXPRESS
SQL Server Migration Assistant	Yes	Yes	Yes	Yes	Yes
Database mail	Yes	Yes	Yes	No	No

Other Components

FEATURE NAME	ENTERPRISE	STANDARD	WEB	EXPRESS WITH ADVANCED SERVICES	EXPRESS
StreamInsight	StreamInsight Premium Edition	StreamInsight Standard Edition	StreamInsight Standard Edition	No	No
StreamInsight HA	StreamInsight Premium Edition	No	No	No	No

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See Also

Product Specifications for SQL Server
Installation for SQL Server

Editions and supported features of SQL Server 2017

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THIS TOPIC APPLIES TO: ✅ SQL Server (starting with 2017) ❌ Azure SQL Database ❌ Azure SQL Data Warehouse ❌ Parallel Data Warehouse

This topic provides details of features supported by the various editions of SQL Server 2017.

For information about older versions, see:

- SQL Server 2016.
- SQL Server 2014.

Installation requirements vary based on your application needs. The different editions of SQL Server accommodate the unique performance, runtime, and price requirements of organizations and individuals. The SQL Server components that you install also depend on your specific requirements. The following sections help you understand how to make the best choice among the editions and components available in SQL Server.

The SQL Server Evaluation edition is available for a 180-day trial period.

For the latest release notes and what's new information, see the following:

- SQL Server 2017 release notes
- What's new in SQL Server 2017

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SQL Server editions

The following table describes the editions of SQL Server.

SQL SERVER EDITION	DEFINITION
Enterprise	The premium offering, SQL Server Enterprise edition delivers comprehensive high-end datacenter capabilities with blazing-fast performance, unlimited virtualization, and end-to-end business intelligence — enabling high service levels for mission-critical workloads and end user access to data insights.
Standard	SQL Server Standard edition delivers basic data management and business intelligence database for departments and small organizations to run their applications and supports common development tools for on-premise and cloud — enabling effective database management with minimal IT resources.
Web	SQL Server Web edition is a low total-cost-of-ownership option for Web hosters and Web VAPs to provide scalability, affordability, and manageability capabilities for small to large scale Web properties.

SQL SERVER EDITION	DEFINITION
Developer	SQL Server Developer edition lets developers build any kind of application on top of SQL Server. It includes all the functionality of Enterprise edition, but is licensed for use as a development and test system, not as a production server. SQL Server Developer is an ideal choice for people who build and test applications.
Express editions	Express edition is the entry-level, free database and is ideal for learning and building desktop and small server data-driven applications. It is the best choice for independent software vendors, developers, and hobbyists building client applications. If you need more advanced database features, SQL Server Express can be seamlessly upgraded to other higher end versions of SQL Server. SQL Server Express LocalDB, a lightweight version of Express that has all of its programmability features, runs in user mode and has a fast, zero-configuration installation and a short list of prerequisites.

Using SQL Server with an Internet Server

On an Internet server, such as a server that is running Internet Information Services (IIS), you will typically install the SQL Server client tools. Client tools include the client connectivity components used by an application connecting to an instance of SQL Server.

> **NOTE**
>
> Although you can install an instance of SQL Server on a computer that is running IIS, this is typically done only for small Web sites that have a single server computer. Most Web sites have their middle-tier IIS systems on one server or a cluster of servers, and their databases on a separate server or federation of servers.

Using SQL Server with client/server applications

You can install just the SQL Server client components on a computer that is running client/server applications that connect directly to an instance of SQL Server. A client components installation is also a good option if you administer an instance of SQL Server on a database server, or if you plan to develop SQL Server applications.

The client tools option installs the following SQL Server features: backward compatibility components, SQL Server Data Tools, connectivity components, management tools, software development kit, and SQL Server Books Online components. For more information, see Install SQL Server.

Deciding among SQL Server components

Use the Feature Selection page of the SQL Server Installation Wizard to select the components to include in an installation of SQL Server. By default, none of the features in the tree are selected.

Use the information in the following tables to determine the set of features that best fits your needs.

SERVER COMPONENTS	DESCRIPTION

SERVER COMPONENTS	DESCRIPTION
SQL Server Database Engine	SQL Server Database Engine includes the Database Engine, the core service for storing, processing, and securing data, replication, full-text search, tools for managing relational and XML data, in database analytics integration, and Polybase integration for access to Hadoop and other heterogeneous data sources, and the Data Quality Services (DQS) server.
Analysis Services	Analysis Services includes the tools for creating and managing online analytical processing (OLAP) and data mining applications.
Reporting Services	Reporting Services includes server and client components for creating, managing, and deploying tabular, matrix, graphical, and free-form reports. Reporting Services is also an extensible platform that you can use to develop report applications.
Integration Services	Integration Services is a set of graphical tools and programmable objects for moving, copying, and transforming data. It also includes the Data Quality Services (DQS) component for Integration Services.
Master Data Services	Master Data Services (MDS) is the SQL Server solution for master data management. MDS can be configured to manage any domain (products, customers, accounts) and includes hierarchies, granular security, transactions, data versioning, and business rules, as well as an Add-in for Excel that can be used to manage data.
Machine Learning Services (In-Database)	Machine Learning Services (In-Database) supports distributed, scalable machine learning solutions using enterprise data sources. In SQL Server 2016, the R language was supported. SQL Server 2017 supports R and Python.
Machine Learning Server (Standalone)	Machine Learning Server (Standalone) supports deployment of distributed, scalable machine learning solutions on multiple platforms and using multiple enterprise data sources, including Linux, Hadoop, and Teradata. In SQL Server 2016, the R language was supported. SQL Server 2017 supports R and Python.

MANAGEMENT TOOLS	DESCRIPTION
SQL Server Management Studio	SQL Server Management Studio is an integrated environment to access, configure, manage, administer, and develop components of SQL Server. Management Studio lets developers and administrators of all skill levels use SQL Server. Download and install Management Studio from Download SQL Server Management Studio
SQL Server Configuration Manager	SQL Server Configuration Manager provides basic configuration management for SQL Server services, server protocols, client protocols, and client aliases.

MANAGEMENT TOOLS	DESCRIPTION
SQL Server Profiler	SQL Server Profiler provides a graphical user interface to monitor an instance of the Database Engine or Analysis Services.
Database Engine Tuning Advisor	Database Engine Tuning Advisor helps create optimal sets of indexes, indexed views, and partitions.
Data Quality Client	Provides a highly simple and intuitive graphical user interface to connect to the DQS server, and perform data cleansing operations. It also allows you to centrally monitor various activities performed during the data cleansing operation.
SQL Server Data Tools	SQL Server Data Tools provides an IDE for building solutions for the Business Intelligence components: Analysis Services, Reporting Services, and Integration Services. (Formerly called Business Intelligence Development Studio). SQL Server Data Tools also includes "Database Projects", which provides an integrated environment for database developers to carry out all their database design work for any SQL Server platform (both on and off premise) within Visual Studio. Database developers can use the enhanced Server Explorer in Visual Studio to easily create or edit database objects and data, or execute queries.
Connectivity Components	Installs components for communication between clients and servers, and network libraries for DB-Library, ODBC, and OLE DB.

DOCUMENTATION	DESCRIPTION
SQL Server Books Online	Core documentation for SQL Server.

Developer and Evaluation Editions

For features supported by Developer and Evaluation editions, see features listed for the SQL Server Enterprise Edition in the tables below.

The Developer edition continues to support only 1 client for SQL Server Distributed Replay.

Scale limits

FEATURE	ENTERPRISE	STANDARD	WEB	EXPRESS WITH ADVANCED SERVICES	EXPRESS
Maximum compute capacity used by a single instance - SQL Server Database Engine[1]	Operating system maximum	Limited to lesser of 4 sockets or 24 cores	Limited to lesser of 4 sockets or 16 cores	Limited to lesser of 1 socket or 4 cores	Limited to lesser of 1 socket or 4 cores

FEATURE	ENTERPRISE	STANDARD	WEB	EXPRESS WITH ADVANCED SERVICES	EXPRESS
Maximum compute capacity used by a single instance - Analysis Services or Reporting Services	Operating system maximum	Limited to lesser of 4 sockets or 24 cores	Limited to lesser of 4 sockets or 16 cores	Limited to lesser of 1 socket or 4 cores	Limited to lesser of 1 socket or 4 cores
Maximum memory for buffer pool per instance of SQL Server Database Engine	Operating System Maximum	128 GB	64 GB	1410 MB	1410 MB
Maximum memory for Columnstore segment cache per instance of SQL Server Database Engine	Unlimited memory	32 GB	16 GB	352 MB	352 MB
Maximum memory-optimized data size per database in SQL Server Database Engine	Unlimited memory	32 GB	16 GB	352 MB	352 MB
Maximum memory utilized per instance of Analysis Services	Operating System Maximum	Tabular: 16 GB MOLAP: 64 GB	N/A	N/A	N/A
Maximum memory utilized per instance of Reporting Services	Operating System Maximum	64 GB	64 GB	4 GB	N/A
Maximum relational database size	524 PB	524 PB	524 PB	10 GB	10 GB

[1] Enterprise Edition with Server + Client Access License (CAL) based licensing (not available for new agreements) is limited to a maximum of 20 cores per SQL Server instance. There are no limits under the Core-based Server Licensing model. For more information, see Compute Capacity Limits by Edition of SQL Server.

RDBMS high availability

FEATURE	ENTERPRISE	STANDARD	WEB	EXPRESS WITH ADVANCED SERVICES	EXPRESS
Server core support [1]	Yes	Yes	Yes	Yes	Yes
Log shipping	Yes	Yes	Yes	No	No
Database mirroring	Yes	Yes Full safety only	Witness only	Witness only	Witness only
Backup compression	Yes	Yes	No	No	No
Database snapshot	Yes	Yes	Yes	Yes	Yes
Always On failover cluster instances[2]	Yes	Yes	No	No	No
Always On availability groups[3]	Yes	No	No	No	No
Basic availability groups [4]	No	Yes	No	No	No
Online page and file restore	Yes	No	No	No	No
Online indexing	Yes	No	No	No	No
Resumable online index rebuilds	Yes	No	No	No	No
Online schema change	Yes	No	No	No	No
Fast recovery	Yes	No	No	No	No
Mirrored backups	Yes	No	No	No	No
Hot add memory and CPU	Yes	No	No	No	No
Database recovery advisor	Yes	Yes	Yes	Yes	Yes
Encrypted backup	Yes	Yes	No	No	No

FEATURE	ENTERPRISE	STANDARD	WEB	EXPRESS WITH ADVANCED SERVICES	EXPRESS
Hybrid backup to Windows Azure (backup to URL)	Yes	Yes	No	No	No
Clusterless availability group	Yes	Yes	No	No	No
Minimum replica commit availability group	Yes	Yes	Yes	No	No

[1] For more information on installing SQL Server on Server Core, see Install SQL Server on Server Core.

[2] On Enterprise Edition, the number of nodes is the operating system maximum. On Standard edition there is support for two nodes.

[3] On Enterprise Edition, provides support for up to 8 secondary replicas - including 2 synchronous secondary replicas.

[4] Standard Edition supports basic availability groups. A basic availability group supports two replicas, with one database. For more information about basic availability groups, see Basic Availability Groups.

RDBMS scalability and performance

FEATURE	ENTERPRISE	STANDARD	WEB	EXPRESS WITH ADVANCED SERVICES	EXPRESS
Columnstore [1]	Yes	Yes	Yes	Yes	Yes
Large object binaries in clustered columnstore indexes	Yes	Yes	Yes	Yes	Yes
Online non-clustered columnstore index rebuild	Yes	No	No	No	No
In-Memory OLTP [1]	Yes	Yes	Yes	Yes, [2]	Yes
Stretch Database	Yes	Yes	Yes	Yes	Yes
Persistent Main Memory	Yes	Yes	Yes	Yes	Yes
Multi-instance support	50	50	50	50	50

FEATURE	ENTERPRISE	STANDARD	WEB	EXPRESS WITH ADVANCED SERVICES	EXPRESS
Table and index partitioning	Yes	Yes	Yes	Yes	Yes
Data compression	Yes	Yes	Yes	Yes	Yes
Resource Governor	Yes	No	No	No	No
Partitioned Table Parallelism	Yes	No	No	No	No
Multiple Filestream containers	Yes	Yes	Yes	Yes	Yes
NUMA Aware and Large Page Memory and Buffer Array Allocation	Yes	No	No	No	No
Buffer Pool Extension	Yes	Yes	No	No	No
IO Resource Governance	Yes	No	No	No	No
Delayed Durability	Yes	Yes	Yes	Yes	Yes
Automatic Tuning	Yes	No	No	No	No
Batch Mode Adaptive Joins	Yes	No	No	No	No
Batch Mode Memory Grant Feedback	Yes	No	No	No	No
Interleaved Execution for Multi-Statement Table Valued Functions	Yes	Yes	Yes	Yes	Yes
Bulk insert improvements	Yes	Yes	Yes	Yes	Yes

[1] In-Memory OLTP data size and Columnstore segment cache are limited to the amount of memory specified by edition in the Scale Limits section. The max degrees of parallelism is limited. The degrees of process parallelism (DOP) for an index build is limited to 2 DOP for the Standard Edition and 1 DOP for the Web and Express Editions. This refers to columnstore indexes created over disk-based tables and memory-optimized tables.

RDBMS security

FEATURE	ENTERPRISE	STANDARD	WEB	EXPRESS	EXPRESS WITH ADVANCED SERVICES
Row-level security	Yes	Yes	Yes	Yes	Yes
Always Encrypted	Yes	Yes	Yes	Yes	Yes
Dynamic data masking	Yes	Yes	Yes	Yes	Yes
Basic auditing	Yes	Yes	Yes	Yes	Yes
Fine grained auditing	Yes	Yes	Yes	Yes	Yes
Transparent database encryption	Yes	No	No	No	No
Extensible key management	Yes	No	No	No	No
User-defined roles	Yes	Yes	Yes	Yes	Yes
Contained databases	Yes	Yes	Yes	Yes	Yes
Encryption for backups	Yes	Yes	No	No	No

Replication

FEATURE	ENTERPRISE	STANDARD	WEB	EXPRESS WITH ADVANCED SERVICES	EXPRESS
Heterogeneous subscribers	Yes	Yes	No	No	No
Merge replication	Yes	Yes	Yes (Subscriber only)	Yes (Subscriber only)	Yes (Subscriber only)
Oracle publishing	Yes	No	No	No	No
Peer to peer transactional replication	Yes	No	No	No	No

FEATURE	ENTERPRISE	STANDARD	WEB	EXPRESS WITH ADVANCED SERVICES	EXPRESS
Snapshot replication	Yes	Yes	Yes (Subscriber only)	Yes (Subscriber only)	Yes (Subscriber only)
SQL Server change tracking	Yes	Yes	Yes	Yes	Yes
Transactional replication	Yes	Yes	Yes (Subscriber only)	Yes (Subscriber only)	Yes (Subscriber only)
Transactional replication to Azure	Yes	Yes	No	No	No
Transactional replication updateable subscription	Yes	No	No	No	No

Management tools

FEATURE	ENTERPRISE	STANDARD	WEB	EXPRESS WITH ADVANCED SERVICES	EXPRESS
SQL Management Objects (SMO)	Yes	Yes	Yes	Yes	Yes
SQL Configuration Manager	Yes	Yes	Yes	Yes	Yes
SQL CMD (Command Prompt tool)	Yes	Yes	Yes	Yes	Yes
Distributed Replay - Admin Tool	Yes	Yes	Yes	Yes	No
Distribute Replay - Client	Yes	Yes	Yes	No	No
Distributed Replay - Controller	Yes (Up to 16 clients)	Yes (1 client)	Yes (1 client)	No	No
SQL Profiler	Yes	Yes	No [1]	No [1]	No [1]
SQL Server Agent	Yes	Yes	Yes	No	No

FEATURE	ENTERPRISE	STANDARD	WEB	EXPRESS WITH ADVANCED SERVICES	EXPRESS
Microsoft System Center Operations Manager Management Pack	Yes	Yes	Yes	No	No
Database Tuning Advisor (DTA)	Yes	Yes [2]	Yes [2]	No	No

[1] SQL Server Web, SQL Server Express, SQL Server Express with Tools, and SQL Server Express with Advanced Services can be profiled using SQL Server Standard and SQL Server Enterprise editions.

[2] Tuning enabled only on Standard edition features

RDBMS manageability

FEATURE	ENTERPRISE	STANDARD	WEB	EXPRESS WITH ADVANCED SERVICES	EXPRESS
User instances	No	No	No	Yes	Yes
LocalDB	No	No	No	Yes	No
Dedicated admin connection	Yes	Yes	Yes	Yes with trace flag	Yes with trace flag
SysPrep support [1]	Yes	Yes	Yes	Yes	Yes
PowerShell scripting support[2]	Yes	Yes	Yes	Yes	Yes
Support for data-tier application component operations - extract, deploy, upgrade, delete	Yes	Yes	Yes	Yes	Yes
Policy automation (check on schedule and change)	Yes	Yes	Yes	No	No
Performance data collector	Yes	Yes	Yes	No	No

FEATURE	ENTERPRISE	STANDARD	WEB	EXPRESS WITH ADVANCED SERVICES	EXPRESS
Able to enroll as a managed instance in multi-instance management	Yes	Yes	Yes	No	No
Standard performance reports	Yes	Yes	Yes	No	No
Plan guides and plan freezing for plan guides	Yes	Yes	Yes	No	No
Direct query of indexed views (using NOEXPAND hint)	Yes	Yes	Yes	Yes	Yes
Automatic indexed views maintenance	Yes	Yes	Yes	No	No
Distributed partitioned views	Yes	No	No	No	No
Parallel indexed operations	Yes	No	No	No	No
Automatic use of indexed view by query optimizer	Yes	No	No	No	No
Parallel consistency check	Yes	No	No	No	No
SQL Server Utility Control Point	Yes	No	No	No	No
Buffer pool extension	Yes	Yes	No	No	No

[1] For more information, see Considerations for Installing SQL Server Using SysPrep.

[2] On Linux, PowerShell scripts are supported, from Windows computers targeting SQL Servers on Linux.

Development tools

FEATURE	ENTERPRISE	STANDARD	WEB	EXPRESS WITH ADVANCED SERVICES	EXPRESS
Microsoft Visual Studio integration	Yes	Yes	Yes	Yes	Yes

FEATURE	ENTERPRISE	STANDARD	WEB	EXPRESS WITH ADVANCED SERVICES	EXPRESS
Intellisense (Transact-SQL and MDX)	Yes	Yes	Yes	Yes	Yes
SQL Server Data Tools (SSDT)	Yes	Yes	Yes	Yes	No
MDX edit, debug, and design tools	Yes	Yes	No	No	No

Programmability

FEATURE	ENTERPRISE	STANDARD	WEB	EXPRESS WITH ADVANCED SERVICES	EXPRESS
Basic R integration	Yes	Yes	Yes	Yes	No
Advanced R integration	Yes	No	No	No	No
Basic Python integration	Yes	Yes	Yes	Yes	No
Advanced Python integration	Yes	No	No	No	No
Machine Learning Server (Standalone)	Yes	No	No	No	No
Polybase compute node	Yes	Yes [1]	Yes [1]	Yes [1]	Yes [1]
Polybase head node	Yes	No	No	No	No
JSON	Yes	Yes	Yes	Yes	Yes
Query Store	Yes	Yes	Yes	Yes	Yes
Temporal	Yes	Yes	Yes	Yes	Yes
Common Language Runtime (CLR) Integration	Yes	Yes	Yes	Yes	Yes
Native XML support	Yes	Yes	Yes	Yes	Yes

FEATURE	ENTERPRISE	STANDARD	WEB	EXPRESS WITH ADVANCED SERVICES	EXPRESS
XML indexing	Yes	Yes	Yes	Yes	Yes
MERGE & UPSERT capabilities	Yes	Yes	Yes	Yes	Yes
FILESTREAM support	Yes	Yes	Yes	Yes	Yes
FileTable	Yes	Yes	Yes	Yes	Yes
Date and Time datatypes	Yes	Yes	Yes	Yes	Yes
Internationalization support	Yes	Yes	Yes	Yes	Yes
Full-text and semantic search	Yes	Yes	Yes	Yes	No
Specification of language in query	Yes	Yes	Yes	Yes	No
Service Broker (messaging)	Yes	Yes	No (Client only)	No (Client only)	No (Client only)
Transact-SQL endpoints	Yes	Yes	Yes	No	No
Graph	Yes	Yes	Yes	Yes	Yes

[1] Scale out with multiple compute nodes requires a head node.

Integration Services

For info about SQL Server Integration Services (SSIS) features supported by the editions of SQL Server, see Integration Services Features Supported by the Editions of SQL Server.

Master Data Services

For information about the Master Data Services and Data Quality Services features supported by the editions of SQL Server, see Master Data Services and Data Quality Services Features Supported by the Editions of SQL Server.

Data warehouse

FEATURE	ENTERPRISE	STANDARD	WEB	EXPRESS WITH ADVANCED SERVICES	EXPRESS
Create cubes without a database	Yes	Yes	No	No	No
Auto-generate staging and data warehouse schema	Yes	Yes	No	No	No
Change data capture	Yes	Yes	No	No	No
Star join query optimizations	Yes	No	No	No	No
Scalable read-only Analysis Services configuration	Yes	No	No	No	No
Parallel query processing on partitioned tables and indexes	Yes	No	No	No	No
Global batch aggregation	Yes	No	No	No	No

Analysis Services

For information about the Analysis Services features supported by the editions of SQL Server, see Analysis Services Features Supported by the Editions of SQL Server.

BI semantic model (Multi Dimensional)

For information about the Analysis Services features supported by the editions of SQL Server, see Analysis Services Features Supported by the Editions of SQL Server.

BI semantic model (Tabular)

For information about the Analysis Services features supported by the editions of SQL Server, see Analysis Services Features Supported by the Editions of SQL Server.

Power Pivot for SharePoint

For information about the Power Pivot for SharePoint features supported by the editions of SQL Server, see Analysis Services Features Supported by the Editions of SQL Server.

Data mining

For information about the Data Mining features supported by the editions of SQL Server, see Analysis Services Features Supported by the Editions of SQL Server.

Reporting Services

For information about the Reporting Services features supported by the editions of SQL Server, see Reporting Services Features Supported by the Editions of SQL Server.

Business intelligence clients

For information about the Business Intelligence Client features supported by the editions of SQL Server, see Analysis Services Features Supported by the Editions of SQL Server or Reporting Services Features Supported by the Editions of SQL Server.

Spatial and location services

FEATURE NAME	ENTERPRISE	STANDARD	WEB	EXPRESS WITH ADVANCED SERVICES	EXPRESS
Spatial indexes	Yes	Yes	Yes	Yes	Yes
Planar and geodetic datatypes	Yes	Yes	Yes	Yes	Yes
Advanced spatial libraries	Yes	Yes	Yes	Yes	Yes
Import/export of industry-standard spatial data formats	Yes	Yes	Yes	Yes	Yes

Additional database services

FEATURE NAME	ENTERPRISE	STANDARD	WEB	EXPRESS WITH ADVANCED SERVICES	EXPRESS
SQL Server Migration Assistant	Yes	Yes	Yes	Yes	Yes
Database mail	Yes	Yes	Yes	No	No

Other components

FEATURE NAME	ENTERPRISE	STANDARD	WEB	EXPRESS WITH ADVANCED SERVICES	EXPRESS
StreamInsight	StreamInsight Premium Edition	StreamInsight Standard Edition	StreamInsight Standard Edition	No	No
StreamInsight HA	StreamInsight Premium Edition	No	No	No	No

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Next steps

Product Specifications for SQL Server
Installation for SQL Server

ⓘ Get Help - UserVoice - Suggestion to improve SQL Server? - Setup and Upgrade - MSDN Forum - SQL Server Data Tools - MSDN forum - Transact-SQL - MSDN forum - DBA Stack Exchange (tag sql-server) - ask SQL Server questions - Stack Overflow (tag sql-server) - also has some answers about SQL development - Reddit - general discussion about SQL Server - Microsoft SQL Server License Terms and Information - Support options for business users - Contact Microsoft

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Maximum Capacity Specifications for SQL Server

5/3/2018 • 8 minutes to read • Edit Online

THIS TOPIC APPLIES TO: ✅ SQL Server ❌ Azure SQL Database ❌ Azure SQL Data Warehouse ❌ Parallel Data Warehouse

> For content related to previous versions of SQL Server, see Maximum Capacity Specifications for SQL Server.

The following tables specify maximum sizes and numbers of various objects defined in SQL Server components. To navigate to the table for a SQL Server technology, click on its link:

SQL Server Database Engine Objects

SQL Server Utility Objects

SQL Server Data-tier Application Objects

SQL Server Replication Objects

Database Engine Objects

Maximum sizes and numbers of various objects defined in SQL Server databases or referenced in Transact-SQL statements.

SQL SERVER DATABASE ENGINE OBJECT		MAXIMUM SIZES/NUMBERS SQL SERVER (64-BIT)	ADDITIONAL INFORMATION
Batch size		65,536 * Network Packet Size	Network Packet Size is the size of the tabular data stream (TDS) packets used to communicate between applications and the relational Database Engine. The default packet size is 4 KB, and is controlled by the network packet size configuration option.
Bytes per short string column		8,000	
Bytes per GROUP BY, ORDER BY		8,060	

SQL SERVER DATABASE ENGINE OBJECT		MAXIMUM SIZES/NUMBERS SQL SERVER (64-BIT)	ADDITIONAL INFORMATION
Bytes per index key		900 bytes for a clustered index. 1,700 for a nonclustered index.	The maximum number of bytes in a clustered index key cannot exceed 900 in SQL Server. For a nonclustered index key, the maximum is 1700 bytes. You can define a key using variable-length columns whose maximum sizes add up to more than the limit. However, the combined sizes of the data in those columns can never exceed the limit. In a nonclustered index, you can include extra non-key columns, and they do not count against the size limit of the key. The non-key columns might help some queries perform better.
Bytes per index key for memory-optimized tables		2500 bytes for a nonclustered index. No limit for a hash index, as long as all index keys fit in-row.	On a memory-optimized table, a nonclustered index cannot have key columns whose maximum declared sizes exceed 2500 bytes. It is irrelevant whether the actual data in the key columns would be shorter than the maximum declared sizes. For a hash index key there is no hard limit on size. For indexes on memory-optimized tables, there is no concept of included columns, since all indexes inherently cover of all columns. For a memory-optimized table, even though the row size is 8060 bytes, some variable-length columns can be physically stored outside those 8060 bytes. However, the maximum declared sizes of all key columns for all indexes on a table, plus any additional fixed-length columns in the table, must fit in the 8060 bytes.
Bytes per foreign key		900	
Bytes per primary key		900	

SQL SERVER DATABASE ENGINE OBJECT		MAXIMUM SIZES/NUMBERS SQL SERVER (64-BIT)	ADDITIONAL INFORMATION
Bytes per row		8,060	SQL Server supports row-overflow storage which enables variable length columns to be pushed off-row. Only a 24-byte root is stored in the main record for variable length columns pushed out of row; because of this, the effective row limit is higher than in previous releases of SQL Server. For more information, see the "Row-Overflow Data Exceeding 8 KB" topic in SQL Server Books Online.
Bytes per row in memory-optimized tables		8,060	Starting SQL Server 2016 (13.x) memory-optimized tables support off-row storage. Variable length columns are pushed off-row if the maximum sizes for all the columns in the table exceeds 8060 bytes; this is a compile-time decision. Only an 8-byte reference is stored in-row for columns stored off-row. For more information, see Table and Row Size in Memory-Optimized Tables.
Bytes in source text of a stored procedure		Lesser of batch size or 250 MB	
Bytes per **varchar(max)**, **varbinary(max)**, **xml**, **text**, or **image** column		2^31-1	
Characters per **ntext** or **nvarchar(max)** column		2^30-1	
Clustered indexes per table		1	
Columns in GROUP BY, ORDER BY		Limited only by number of bytes	
Columns or expressions in a GROUP BY WITH CUBE or WITH ROLLUP statement		10	

SQL SERVER DATABASE ENGINE OBJECT		MAXIMUM SIZES/NUMBERS SQL SERVER (64-BIT)	ADDITIONAL INFORMATION
Columns per index key		32	If the table contains one or more XML indexes, the clustering key of the user table is limited to 31 columns because the XML column is added to the clustering key of the primary XML index. In SQL Server, you can include nonkey columns in a nonclustered index to avoid the limitation of a maximum of 32 key columns. For more information, see Create Indexes with Included Columns.
Columns per foreign key		32	
Columns per primary key		32	
Columns per nonwide table		1,024	
Columns per wide table		30,000	
Columns per SELECT statement		4,096	
Columns per INSERT statement		4,096	
Connections per client		Maximum value of configured connections	
Database size		524,272 terabytes	
Databases per instance of SQL Server		32,767	
Filegroups per database		32,767	
Filegroups per database for memory-optimized data		1	
Files per database		32,767	
File size (data)		16 terabytes	
File size (log)		2 terabytes	
Data files for memory-optimized data per database		4,096 in SQL Server 2014 (12.x). Later versions of SQL Server do not impose such a strict limit.	

SQL SERVER DATABASE ENGINE OBJECT		MAXIMUM SIZES/NUMBERS SQL SERVER (64-BIT)	ADDITIONAL INFORMATION
Delta file per data file for memory-optimized data		1	
Foreign key table references per table		Outgoing = 253. Incoming = 10,000.	For restrictions, see Create Foreign Key Relationships.
Identifier length (in characters)		128	
Instances per computer		50 instances on a stand-alone server. 25 instances on a failover cluster when using a shared cluster disk as the stored option for you cluster installation SQL Server supports 50 instances on a failover cluster if you choose SMB file shares as the storage option for your cluster installation.	
Indexes per memory-optimized table		999 starting SQL Server 2017 (14.x) and in Azure SQL Database 8 in SQL Server 2014 (12.x) and SQL Server 2016 (13.x)	
Length of a string containing SQL statements (batch size)		65,536 * Network packet size	Network Packet Size is the size of the tabular data stream (TDS) packets used to communicate between applications and the relational Database Engine. The default packet size is 4 KB, and is controlled by the network packet size configuration option.
Locks per connection		Maximum locks per server	
Locks per instance of SQL Server		Limited only by memory	This value is for static lock allocation. Dynamic locks are limited only by memory.
Nested stored procedure levels		32	If a stored procedure accesses more than 64 databases, or more than 2 databases in interleaving, you will receive an error.
Nested subqueries		32	
Nested trigger levels		32	

SQL SERVER DATABASE ENGINE OBJECT		MAXIMUM SIZES/NUMBERS SQL SERVER (64-BIT)	ADDITIONAL INFORMATION
Nonclustered indexes per table		999	
Number of distinct expressions in the GROUP BY clause when any of the following are present: CUBE, ROLLUP, GROUPING SETS, WITH CUBE, WITH ROLLUP		32	
Number of grouping sets generated by operators in the GROUP BY clause		4,096	
Parameters per stored procedure		2,100	
Parameters per user-defined function		2,100	
REFERENCES per table		253	
Rows per table		Limited by available storage	
Tables per database		Limited by number of objects in a database	Database objects include objects such as tables, views, stored procedures, user-defined functions, triggers, rules, defaults, and constraints. The sum of the number of all objects in a database cannot exceed 2,147,483,647.
Partitions per partitioned table or index		15,000	
Statistics on non-indexed columns		30,000	
Tables per SELECT statement		Limited only by available resources	
Triggers per table		Limited by number of objects in a database	Database objects include objects such as tables, views, stored procedures, user-defined functions, triggers, rules, defaults, and constraints. The sum of the number of all objects in a database cannot exceed 2,147,483,647.
Columns per UPDATE statement (Wide Tables)		4096	

SQL SERVER DATABASE ENGINE OBJECT		MAXIMUM SIZES/NUMBERS SQL SERVER (64-BIT)	ADDITIONAL INFORMATION
User connections		32,767	
XML indexes		249	

SQL Server Utility Objects

Maximum sizes and numbers of various objects that were tested in the SQL Server Utility.

SQL SERVER UTILITY OBJECT		MAXIMUM SIZES/NUMBERS SQL SERVER (64-BIT)
Computers (physical computers or virtual machines) per SQL Server Utility		100
Instances of SQL Server per computer		5
Total number of instances of SQL Server per SQL Server Utility		200*
User databases per instance of SQL Server, including data-tier applications		50
Total number of user databases per SQL Server Utility		1,000
File groups per database		1
Data files per file group		1
Log files per database		1
Volumes per computer		3

*The maximum number of managed instances of SQL Server supported by SQL Server Utility may vary based on the hardware configuration of the server. For getting started information, see SQL Server Utility Features and Tasks. SQL Server Utility control point is not available in every edition of SQL Server 2017. For a list of features that are supported by the editions of SQL Server, see Features Supported by the Editions of SQL Server 2016.

SQL Server Data-tier Application Objects

Maximum sizes and numbers of various objects that were tested in the SQL Server data-tier applications (DAC).

SQL SERVER DAC OBJECT		MAXIMUM SIZES/NUMBERS SQL SERVER (64-BIT)
Databases per DAC		1
Objects per DAC*		Limited by the number of objects in a database, or available memory.

*The types of objects included in the limit are users, tables, views, stored procedures, user-defined functions, user-defined data type, database roles, schemas, and user-defined table types.

Replication Objects

Maximum sizes and numbers of various objects defined in SQL Server Replication.

SQL SERVER REPLICATION OBJECT		MAXIMUM SIZES/NUMBERS SQL SERVER (64-BIT)
Articles (merge publication)		2048
Articles (snapshot or transactional publication)		32,767
Columns in a table* (merge publication)		246
Columns in a table** (SQL Server snapshot or transactional publication)		1,000
Columns in a table** (Oracle snapshot or transactional publication)		995
Bytes for a column used in a row filter (merge publication)		1,024
Bytes for a column used in a row filter (snapshot or transactional publication)		8,000

*If row tracking is used for conflict detection (the default), the base table can include a maximum of 1,024 columns, but columns must be filtered from the article so that a maximum of 246 columns is published. If column tracking is used, the base table can include a maximum of 246 columns.

**The base table can include the maximum number of columns allowable in the publication database (1,024 for SQL Server), but columns must be filtered from the article if they exceed the maximum specified for the publication type.

See Also

Hardware and Software Requirements for Installing SQL Server 2016
Check Parameters for the System Configuration Checker
SQL Server Utility Features and Tasks

Compute capacity limits by edition of SQL Server

THIS TOPIC APPLIES TO: ✅SQL Server ⊗Azure SQL Database ⊗Azure SQL Data Warehouse ⊗Parallel Data Warehouse

This article discusses compute capacity limits for editions of SQL Server 2017 and how they differ in physical and virtualized environments with hyperthreaded processors.
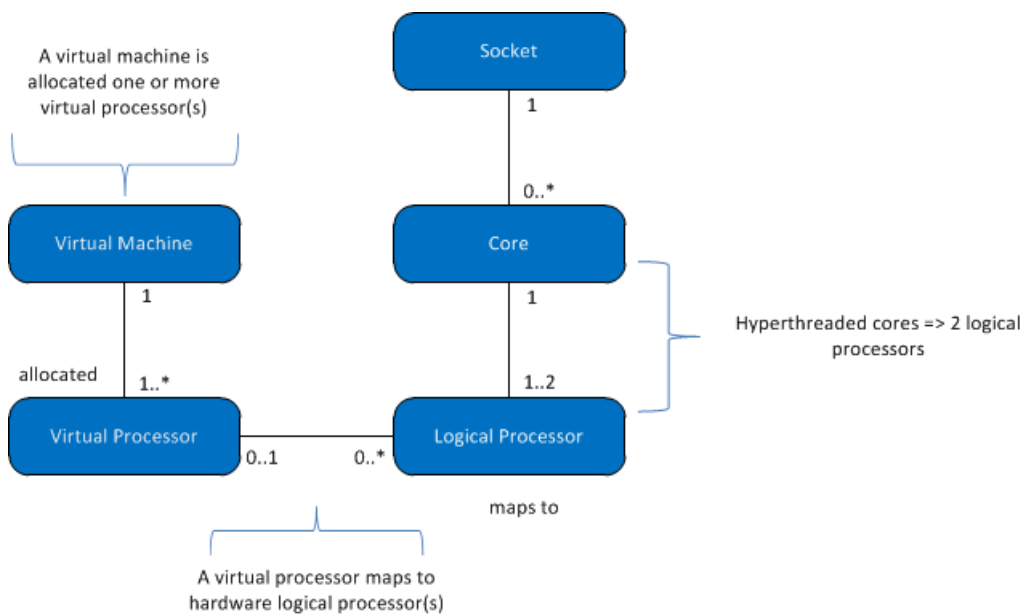
This table describes the notations in the preceding diagram:

VALUE	DESCRIPTION
0..1	Zero or one
1	Exactly one
1..*	One or more
0..*	Zero or more
1..2	One or two

The following definitions apply to the terms used in this article:

- A thread or logical processor is one logical computing engine from the perspective of SQL Server, the operating system, an application, or a driver.

- A core is a processor unit. It can consist of one or more logical processors.

- A physical processor can consist of one or more cores. A physical processor is the same as a processor package or a socket.

Systems with more than one physical processor or systems with physical processors that have multiple cores and/or hyperthreads enable the operating system to execute multiple tasks simultaneously. Each thread of execution appears as a logical processor. For example, if your computer has two quad-core processors with hyperthreading enabled and two threads per core, you have 16 logical processors: 2 processors x 4 cores per processor x 2 threads per core. It's worth noting that:

- The compute capacity of a logical processor from a single thread of a hyperthreaded core is less than the compute capacity of a logical processor from that same core with hyperthreading disabled.

- The compute capacity of the two logical processors in the hyperthreaded core is greater than the compute capacity of the same core with hyperthreading disabled.

Each edition of SQL Server has two compute capacity limits:

- A maximum number of sockets (or physical processors or processor packages)

- A maximum number of cores as reported by the operating system

These limits apply to a single instance of SQL Server. They represent the maximum compute capacity that a single instance will use. They do not constrain the server where the instance may be deployed. In fact, deploying multiple instances of SQL Server on the same physical server is an efficient way to use the compute capacity of a physical server with more sockets and/or cores than the capacity limits allow.

The following table specifies the compute capacity limits for a single instance of each edition of SQL Server 2017:

SQL SERVER EDITION	MAXIMUM COMPUTE CAPACITY FOR A SINGLE INSTANCE (SQL SERVER DATABASE ENGINE)	MAXIMUM COMPUTE CAPACITY FOR A SINGLE INSTANCE (AS, RS)
Enterprise Edition: Core-based Licensing*	Operating system maximum	Operating system maximum
Developer	Operating system maximum	Operating system maximum
Standard	Limited to lesser of 4 sockets or 24 cores	Limited to lesser of 4 sockets or 24 cores
Express	Limited to lesser of 1 socket or 4 cores	Limited to lesser of 1 socket or 4 cores

*Enterprise Edition with Server + Client Access License (CAL) licensing is limited to 20 cores per SQL Server instance. (This licensing is not available for new agreements.) There are no limits under the Core-based Server Licensing model.

In a virtualized environment, the compute capacity limit is based on the number of logical processors, not cores. The reason is that the processor architecture is not visible to the guest applications.

For example, a server that has four sockets populated with quad-core processors and the ability to enable two hyperthreads per core contains 32 logical processors with hyperthreading enabled. But it contains only 16 logical processors with hyperthreading disabled. These logical processors can be mapped to virtual machines on the server. The virtual machines' compute load on that logical processor is mapped to a thread of execution on the physical processor in the host server.

You might want to disable hyperthreading when the performance for each virtual processor is important. You can enable or disable hyperthreading by using a BIOS setting for the processor during the BIOS setup. But it's typically a server-scoped operation that will affect all workloads running on the server. This might suggest separating workloads that will run in virtualized environments from workloads that would benefit from the hyperthreading performance boost in a physical operating system environment.

See also

Editions and components of SQL Server 2016
Features supported by the editions of SQL Server 2016
Maximum capacity specifications for SQL Server
Quickstart installation of SQL Server 2016

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- UserVoice - Suggestion to improve SQL Server?
- Setup and Upgrade - MSDN Forum
- SQL Server Data Tools - MSDN forum
- Transact-SQL - MSDN forum
- DBA Stack Exchange (tag sql-server) - ask SQL Server questions
- Stack Overflow (tag sql-server) - also has some answers about SQL development
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Customer Experience Improvement Program for SQL Server Data Tools

5/29/2018 • 5 minutes to read • Edit Online

THIS TOPIC APPLIES TO: ✅ SQL Server ✅ Azure SQL Database ✅ Azure SQL Data Warehouse ✅ Parallel Data Warehouse

Learn how the Customer Experience Improvement Program (CEIP) helps Microsoft identify ways to make our software better. You can configure tools to opt in or out at any time.

> **NOTE**
>
> For an explanation of the user data collection and use practices for Microsoft SQL Server 2016 releases and any other products and services, please refer to this privacy statement from Microsoft.

Opting in and out of CEIP for SQL Server Data Tools

The Customer Experience Improvement Program is a program designed to help Microsoft improve its products over time. This program collects information about computer hardware and how people use our product, without interrupting the users in their tasks at the computer. The information that is collected helps Microsoft identify which features to improve. In this document we will cover how to opt-in or out of CEIP for SQL Server Data Tools (SSDT) for Visual Studio 2017, Visual Studio 2015, and Visual Studio 2013.

Choice and Control over CEIP and SQL Server Data Tools for Visual Studio 2017

SSDT for Visual Studio 2017 is the data modeling tool that ships with SQL Server 2017. It uses the CEIP options that are built into Visual Studio 2017. You can learn more about how to submit feedback through CEIP in Visual Studio 2017 from this help document from Visual Studio.

For preview versions of SQL Server 2017, CEIP is turned on by default. You can turn it off, or back on again, by following the instructions below.

In Visual Studio (applies to full language installations of Visual Studio 2017)

If you run SSDT Setup on a computer that already has Visual Studio, only the SQL Server and Business Intelligence project templates are added. For this scenario, customer feedback options that Visual Studio provides can be used to opt in or out of CEIP.

1. Start Visual Studio.

2. From the Help menu, select **Send Feedback** > **Settings**.

3. To turn CEIP off, click **No, I would not like to participate**, and then click **OK**.

   To turn CEIP on, click **Yes, I am willing to participate**, and then click **OK**.

Use a registry-based policy or Group Policy

If you run SSDT Setup on a computer that does not have Visual Studio 2017, only the Visual Studio Shell is installed. The shell doesn't provide customer feedback options. In this case, a registry update is the only option for configuring CEIP

Enterprise customers may construct Group Policy to opt in or out by setting a registry-based policy for SQL Server 2017.

The relevant registry key and settings are as follows:

- 64-bit OS, Key = HKEY_LOCAL_MACHINE\SOFTWARE\Wow6432Node\Microsoft\VSCommon\15.0\SQM
- 32-bit OS, Key = HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\VSCommon\15.0\SQM

When Group Policy is enabled, Key = HKEY_LOCAL_MACHINE\Software\Policies\Microsoft\VisualStudio\SQM

Entry = OptIn

Value = (DWORD)

- 0 is opted out (turn off the VSCEIP)
- 1 is opted in (turn on the VSCEIP)

Caution

Incorrectly editing the registry may severely damage your system. Before making changes to the registry, you should back up any valued data on the computer. You can also use the Last Known Good Configuration startup option if you encounter problems after manual changes have been applied.

For more information about the information collected, processed, or transmitted by CEIP, see the Privacy Statement for the Microsoft Customer Experience Improvement Program.

Choice and Control over CEIP and SQL Server Data Tools for Visual Studio 2015

SSDT for Visual Studio 2015 is the data modeling tool that ships with SQL Server 2016. It uses the CEIP options that are built into Visual Studio 2015. You can learn more about how to submit feedback through CEIP in Visual Studio 2015 from this help document from Visual Studio.

For preview versions of SQL Server 2016, CEIP is turned on by default. You can turn it off, or back on again, by following the instructions below.

In Visual Studio (applies to full language installations of Visual Studio 2015)

If you run SSDT Setup on a computer that already has Visual Studio, only the SQL Server and Business Intelligence project templates are added. For this scenario, customer feedback options that Visual Studio provides can be used to opt in or out of CEIP.

1. Start Visual Studio.

2. From the Help menu, select **Send Feedback** > **Settings**.

3. To turn CEIP off, click **No, I would not like to participate**, and then click **OK**.

   To turn CEIP on, click **Yes, I am willing to participate**, and then click **OK**.

Use a registry-based policy or Group Policy

If you run SSDT Setup on a computer that does not have Visual Studio 2015, only the Visual Studio Shell is installed. The shell doesn't provide customer feedback options. In this case, a registry update is the only option for configuring CEIP

Enterprise customers may construct Group Policy to opt in or out by setting a registry-based policy for SQL Server 2016.

The relevant registry key and settings are as follows:

Key = HKEY_CURRENT_USER\Software\Microsoft\VSCommon\14.0\SQM

RegEntry name = OptIn

Entry type DWORD:

- 0 is opt out

- 1 is opt in

For more information about the information collected, processed, or transmitted by CEIP, see the Privacy Statement for the Microsoft Customer Experience Improvement Program.

Choice and Control for CEIP and SQL Server Data Tools - BI (SSDT-BI)

If you are using SSDT-BI, you will be given an opportunity to participate in CEIP during installation. Later, CEIP configuration changes for SSDT-BI can be made through client tools or by editing registry settings.

In SSDT and SSDT-BI for Visual studio 2013

1. Start the tool and open a new or existing project for either Analysis Services or Integration Services.

2. From the Help menu, select **Microsoft SQL Server Customer Feedback Options**.

3. To turn CEIP off, click **No, I don't wish to participate**.

   To turn CEIP on, click **Yes, I am willing to participate**.

4. Click **OK**.

   Use a registry-based policy or Group Policy

   Enterprise customers may construct Group Policy to opt in or out by setting a registry-based policy for SQL Server 2014.

   The relevant registry key and settings are as follows:

   Key = HKEY_CURRENT_USER\Software\Microsoft\Microsoft SQL Server\120

   RegEntry name = CustomerFeedback

   Entry type DWORD:

- 0 is opt out

- 1 is opt in

Configure SQL Server to send feedback to Microsoft

5/16/2018 • 6 minutes to read • Edit Online

THIS TOPIC APPLIES TO: ✅ SQL Server ⊗ Azure SQL Database ⊗ Azure SQL Data Warehouse ⊗ Parallel Data Warehouse

Summary

By default, Microsoft SQL Server collects information about how its customers are using the application. Specifically, SQL Server collects information about the installation experience, usage, and performance. This information helps Microsoft improve the product to better meet customer needs. For example, Microsoft collects information about what kinds of error codes customers encounter so that we can fix related bugs, improve our documentation about how to use SQL Server, and determine whether features should be added to the product to better serve customers.

Specifically, Microsoft does not send any of the following types of information through this mechanism:

- Any values from inside user tables
- Any logon credentials or other authentication information
- Personally Identifiable Information (PII)

The following sample scenario includes feature usage information that helps improve the product.

SQL Server 2017 supports ColumnStore indexes to enable fast analytics scenarios. ColumnStore indexes combine a traditional "B-tree" index structure for newly inserted data with a special column-oriented compressed structure to compress data and speed query execution. The product contains heuristics to migrate data from the B-tree structure to the compressed structure in the background, thereby speeding up future query results.

If the background operation does not keep pace with the rate at which data is inserted, query performance may be slower than expected. To improve the product, Microsoft collects information about how well SQL Server is keeping up with the automatic data compression process. The product team uses this information to fine-tune the frequency and parallelism of the code that performs compression. This query is run occasionally to collect this information so that we (Microsoft) can evaluate the data movement rate. This helps us optimize the product heuristics.

```
SELECT object_id, type_desc, data_space_id, db_id() AS database_id FROM sys.indexes WITH(nolock) WHERE type = 5
or type = 6
```

```
SELECT cntr_value as merge_policy_evaluation
FROM sys.dm_os_performance_counters WITH(nolock)
WHERE object_name LIKE '%columnstore%'
AND counter_name ='Total Merge Policy Evaluations'
AND instance_name = '_Total'
```

Be aware that this process focuses on the necessary mechanisms for delivering value to customers. The product team does not look at the data in the index or send that data to Microsoft. SQL Server 2017 always collects and sends information about the installation experience from the setup process so that we can quickly find and fix any installation problems that the customer is experiencing. SQL Server 2017 can be configured not to send information (on a per-server instance basis) to Microsoft through the following mechanisms:

- By using the Error and Usage Reporting application

- By setting registry subkeys on the server

For SQL Server on Linux refer to Customer Feedback for SQL Server on Linux

> **NOTE**
>
> You can disable the sending of information to Microsoft only in paid versions of SQL Server.

Error and Usage Reporting application

After setup, the usage data collection setting for SQL Server components and instances can be changed through the Error and Usage Reporting application. This application is available as part of SQL Server installation. This tool lets each SQL Server instance configure its own Usage Data setting.

> **NOTE**
>
> The Error and Usage Reporting application is listed under the Configuration Tools of SQL Server. You can use this tool to manage your preference for Error Reporting and Usage Feedback collection in the same manner as in SQL Server 2017. Error Reporting is separate from Usage Feedback collection, therefore can be turned on or off independently from Usage Feedback collection. Error Reporting collects crash dumps that are sent to Microsoft and that may contain sensitive information as outlined in the Privacy Statement.

To start SQL Server Error and Usage Reporting, click or tap **Start**, and then search on "Error" in the search box. The SQL Server Error and Usage Reporting item will be displayed. After you start the tool, you can manage usage feedback and serious errors that are collected for instances and components that are installed on that computer.

For paid versions, use the "Usage Reports" check boxes to manage sending usage feedback to Microsoft.

For paid or free versions, use the "Error Reports" check boxes to manage sending feedback on serious errors and crash dumps to Microsoft.

Set registry subkeys on the server

Enterprise customers can configure Group Policy settings to opt in or out of usage data collection. This is done by configuring a registry-based policy. The relevant registry subkey and settings are as follows:

- For SQL Server instance features:

  Subkey = HKEY_LOCAL_MACHINE\Software\Microsoft\Microsoft SQL Server{InstanceID}\CPE

  RegEntry name = CustomerFeedback

  Entry type DWORD: 0 is opt out; 1 is opt in

  {InstanceID} refers to the instance type and instance, as in the following examples:

  - MSSQL14.CANBERRA for SQL Server 2017 Database engine and Instance name of "CANBERRA"
  - MSAS14.CANBERRA for SQL Server 2017 Analysis Services and Instance name of "CANBERRA"
  - MSRS14.CANBERRA for SQL Server 2017 Reporting Services and Instance name of "CANBERRA"
- For all shared features:

  Subkey = HKEY_LOCAL_MACHINE\Software\Microsoft\Microsoft SQL Server{Major Version}

  RegEntry name = CustomerFeedback

  Entry type DWORD: 0 is opt out; 1 is opt in

- For SQL Server Management Studio:

  Subkey = HKEY_CURRENT_USER\Software\Microsoft\Microsoft SQL Server\140

  RegEntry name = CustomerFeedback

  Entry type DWORD: 0 is opt out; 1 is opt in

  Additionally, SSMS 17.x is based on the Visual Studio 2015 shell, and the Visual Studio installation enables customer feedback by default.

  To configure Visual Studio to disable customer feedback on individual computers, change the value of the following registry subkey to string "0":
  HKEY_LOCAL_MACHINE\Software\Policies\Microsoft\VisualStudio\SQM OptIn

  For example, change the subkey to the following:
  HKEY_LOCAL_MACHINE\Software\Policies\Microsoft\VisualStudio\SQM OptIn="0")

  Registry-based Group Policy on these registry subkeys is honored by SQL Server 2017 usage data collection.

Set registry subkeys for crash dump collection

Similar to the behavior in an earlier version of SQL Server, SQL Server 2017 Enterprise customers can configure Group Policy settings on the server to opt in or out of crash dump collection. This is done by configuring a registry-based policy. The relevant registry subkeys and settings are as follows:

- For SQL Server instance features:

  Subkey = HKEY_LOCAL_MACHINE\Software\Microsoft\Microsoft SQL Server{InstanceID}\CPE

  RegEntry name = EnableErrorReporting

  Entry type DWORD: 0 is opt out; 1 is opt-in

  {InstanceID} refers to the instance type and instance, as in the following examples:

  - MSSQL14.CANBERRA for SQL Server 2017 Database engine and Instance name of "CANBERRA"
  - MSAS14.CANBERRA for SQL Server 2017 Analysis Services and Instance name of "CANBERRA"
  - MSRS14.CANBERRA for SQL Server 2017 Reporting Services and Instance name of "CANBERRA"
- For all shared features:

  Subkey = HKEY_LOCAL_MACHINE\Software\Microsoft\Microsoft SQL Server{Major Version}

  RegEntry name = EnableErrorReporting

  Entry type DWORD: 0 is opt out; 1 is opt-in

Registry-based Group Policy on these registry subkeys is honored by SQL Server 2017 crash dump collection.

Crash dump collection for SSMS

SSMS doesn't collect its own crash dump. Any crash dump that's related to SSMS is collected as part of Windows Error Reporting.

The procedure to turn this feature on or off is dependent on the OS version. To turn the feature on or off, follow the steps in the appropriate article for your Windows version.

- Windows Server 2016 and Windows 10

  Configure Windows telemetry in your organization

- Windows Server 2008 R2 and Windows 7

  WER Settings

Feedback for Analysis Services

During installation, SQL Server 2016 Analysis Services adds a special account to your Analysis Services instance. This account is a member of the Analysis Services Server Admin role. The account is used to collect information for feedback from the Analysis Services instance.

You can configure your service not to send usage data, as described in the "Set registry subkeys on the server" section. However, doing this does not remove the service account.

ⓘ Get Help

- UserVoice - Suggestion to improve SQL Server?
- Setup and Upgrade - MSDN Forum
- SQL Server Data Tools - MSDN forum
- Transact-SQL - MSDN forum
- DBA Stack Exchange (tag sql-server) - ask SQL Server questions
- Stack Overflow (tag sql-server) - also has some answers about SQL development
- Reddit - general discussion about SQL Server
- Microsoft SQL Server License Terms and Information
- Support options for business users
- Contact Microsoft

SQL Server monitoring partners

5/3/2018 • 2 minutes to read • Edit Online

THIS TOPIC APPLIES TO: ✅ SQL Server ⊗ Azure SQL Database ⊗ Azure SQL Data Warehouse ⊗ Parallel Data Warehouse

To monitor your SQL Server services, choose from a wide variety of industry-leading tools. This article highlights Microsoft partner companies with monitoring solutions supporting Microsoft SQL Server.

Microsoft monitoring partners

PARTNER	DESCRIPTION	LINKS
IDERA	**IDERA** SQL Diagnostic Manager is a powerful performance monitoring and diagnostics solution that proactively alerts administrators to health, performance, and availability problems within SQL Server environments all from a central console. System requirements	Website Twitter Video
Quest	**Quest** Spotlight on SQL Server Enterprise - Ensure peak performance around the clock with unmatched monitoring, diagnosis and optimization of SQL Server environments. Spotlight provides access to the details you need for optimal fitness of your SQL Server databases. Get intuitive overviews of health and performance, automated alerts and actions, and mobile device support.	Marketplace Website Video
redgate	**Redgate** SQL Monitor from Redgate is a SQL Server monitoring tool that helps teams looking after SQL Server be more proactive. Not only does SQL Monitor alert you to current issues, it gives you the information you need to stop them happening in the future. Ideally suited to large SQL Server estates, SQL Monitor makes sure you always have the answer to questions about performance.	Website Twitter LinkedIn Video

PARTNER	DESCRIPTION	LINKS
SentryOne	**SentryOne** SentryOne solutions empower Microsoft data professionals to achieve breakthrough performance across physical, virtual, and cloud environments. With SentryOne, data professionals can consolidate their tool sets, reduce infrastructure costs, and increase database speed and efficiency for peak performance across their Microsoft data platform environments, regardless of size or complexity.	Website Datasheet Twitter LinkedIn
solarwinds	**Solarwinds** Database Performance Analyzer provides visibility across application requests, SQL statements, database resources, host/OS, network, virtualization, and storage performance. DPA incorporates wait-time analysis so the focus is not only on health, but on the speed at which the database responds to application requests. DPA provides full coverage of your databases, no matter how it is deployed. Physical, virtual, cloud, or DBaaS, we've got you covered in a single pane of glass.	Marketplace Website Datasheet LinkedIn Video

Next steps

To learn more about some of our other partners, see High availability and disaster recovery partners, management partners, and development partners.

SQL Server high availability and disaster recovery partners

THIS TOPIC APPLIES TO: ✓ SQL Server ⊗ Azure SQL Database ⊗ Azure SQL Data Warehouse ⊗ Parallel Data Warehouse

To provide high availability and disaster recovery for your SQL Server services, choose from a wide variety of industry-leading tools. This article highlights Microsoft partner companies with high availability and disaster recovery solutions supporting Microsoft SQL Server.

High availability and disaster recovery partners

PARTNER	DESCRIPTION	LINKS
	Azure Site Recovery Site Recovery replicates workloads running on virtual machines or physical servers so that they remain available in a secondary location if the primary site isn't available. You can replicate and fail over SQL Server virtual machines from on-premises data center to Azure or to another on-premises data center or from one Azure data centers to another Azure data center. Enterprise and Standard editions of SQL Server 2008 R2- SQL Server 2016	Website Marketplace Datasheet Twitter Video
	DH2i DxEnterprise is Smart Availability software for Windows, Linux & Docker that helps you achieve the nearest-to-zero planned and unplanned downtime, unlocks huge cost savings, drastically simplifies management, and gets you both physical and logical consolidation. SQL Server 2005+, Windows Server 2008R2+, Ubuntu 16+, RHEL 7+, CentOS 7+	Website Datasheet Twitter Video

PARTNER	DESCRIPTION	LINKS
Hewlett Packard Enterprise	**HPE Serviceguard** Protect your critical SQL Server 2017 workloads on Linux ® from unplanned and planned downtime through a multitude of infrastructure and applications faults across physical and virtual environments over any distance with HPE Serviceguard for Linux (SGLX). HPE SGLX A.12.20.00 and later offers context-sensitive monitoring and recovery options for Failover Cluster Instance and Always On Availability Groups SQL Server workloads. Maximize uptime with HPE SGLX without compromising data integrity and performance. SQL Server 2017 on Linux - RedHat 7.3, 7.4, SUSE 12 SP2, SP3	Website Datasheet Download Evaluation Blog Twitter
IDERA	**IDERA** SQL Safe Backup is a high-performance backup and recovery solution for SQL Server that saves money by reducing database backup time and backup file size, and by providing instant read and write access to databases within backup files. Microsoft SQL Server: 2005 SP1 or later, 2008, 2008 R2, 2012, 2014, 2016; all editions	Website
NEC	**NEC** ExpressCluster is a comprehensive and fully automated high-availability and disaster recovery solution against all major failures including hardware, software, network, and site failures for SQL Server and associated applications running on physical or virtual machines in on-premises or cloud environments. Microsoft SQL Server: 2005 or later; all editions	Website Datasheet Video Download

PARTNER	DESCRIPTION	LINKS
	Portworx Portworx is the solution for stateful containers running in production. With Portworx, users can manage any database or stateful service on any infrastructure using any container scheduler, including Kubernetes, Mesosphere DC/OS, and Docker Swarm. Portworx solves the five most common problems DevOps teams encounter when running containerized databases and other stateful services in production: persistence, high availability, data automation, support for multiple data stores and infrastructure, and security. SQL Server 2017 on Docker	Website Documentation Video
	SIOS SIOS Technology delivers cost-efficient high availability and disaster recovery solutions for SQL Server on Windows or Linux. SIOS SANless clustering eliminates the need for a shared storage SAN, giving you complete flexibility to protect your most important applications in physical, virtual, cloud, and hybrid cloud configurations in single and multi-site environments. Add SIOS DataKeeper to your Windows Server Failover Clustering environment to create a SANless volume resource that replaces traditional shared storage making it easy to run WSFC in Azure. SIOS Protection Suite is a fully flexible clustering solution that protects critical Linux applications such as SQL Server, SAP, HANA, Oracle, and many others.	Website Datasheet Twitter Marketplace Video
	Veeam Veeam Backup & Replication is a powerful, easy-to-use, and affordable backup and availability solution. It provides fast, flexible, and reliable recovery of virtualized applications and data, bringing VM (virtual machine) backup and replication together in a single software solution. Veeam Backup & Replication delivers award-winning support for VMware vSphere and Microsoft Hyper-V virtual environments. SQL Server 2005 SP4 – SQL Server 2016 on Windows	Website Datasheet Twitter Video

Next steps

To learn more about additional partners, see monitoring, management partners, and development partners.

SQL Server managing partners

5/3/2018 • 2 minutes to read • Edit Online

THIS TOPIC APPLIES TO: ✓ SQL Server ⊗ Azure SQL Database ⊗ Azure SQL Data Warehouse ⊗ Parallel Data Warehouse

To manage your SQL Server services, choose from a wide variety of industry-leading tools. This article highlights Microsoft partner companies with management solutions supporting Microsoft SQL Server.

Our management partners

PARTNER	DESCRIPTION	LINKS
IDERA	**IDERA** SQL Compliance Manager is a comprehensive auditing solution that displays who did what, when and how on SQL Servers to help ensure compliance with regulatory and data security requirements. System requirements	Website Twitter Video

Next steps

To learn more about some of our other partners, see High availability, and disaster recovery partners, management partners, and development partners.

SQL Server development partners

THIS TOPIC APPLIES TO: ✅ SQL Server ⊗ Azure SQL Database ⊗ Azure SQL Data Warehouse ⊗ Parallel Data Warehouse

For support developing SQL Server database solutions, choose from a wide variety of industry-leading tools. This article highlights Microsoft partner companies with development solutions for Microsoft SQL Server.

Our development partners

PARTNER	DESCRIPTION	LINKS
IDERA	**IDERA** Rapid SQL is an intelligent SQL integrated development environment empowering database developers and database administrators to create high-performing SQL code on all major database platforms including SQL Server from a single interface. System requirements	Website Twitter Video
Click2Cloud™	**Click2Cloud Inc.** Click2Cloud Inc. enables developer community with the flexibility in choosing programming languages, frameworks and services with use of proper toolset. Using Click2Cloud's toolkit, developers can create 'SQL on Linux' containers and attach it to an application, while still enabling the secure, multi-tenant architecture. The containers can be independently deployed on any cloud based container platform.	Marketplace Website Twitter Video

Next steps

To learn more about some of our other partners, see High availability, and disaster recovery partners, management partners, and monitoring partners.

New and Recently Updated: SQL Server docs

5/1/2018 • 5 minutes to read • Edit Online

Nearly every day Microsoft updates some of its existing articles on its Docs.Microsoft.com documentation website. This article displays excerpts from recently updated articles. Links to new articles might also be listed.

This article is generated by a program that is rerun periodically. Occasionally an excerpt can appear with imperfect formatting, or as markdown from the source article. Images are never displayed here.

Recent updates are reported for the following date range and subject:

- *Date range of updates:* **2018-02-03** -to- **2018-04-28**
- *Subject area:* **SQL Server**.

New Articles Created Recently

The following links jump to new articles that have been added recently.

1. How to contribute to SQL Server Documentation
2. SQL Server privacy supplement

Updated Articles with Excerpts

This section displays the excerpts of updates gathered from articles that have recently experienced a large update.

The excerpts displayed here appear separated from their proper semantic context. Also, sometimes an excerpt is separated from important markdown syntax that surrounds it in the actual article. Therefore these excerpts are for general guidance only. The excerpts only enable you to know whether your interests warrant taking the time to click and visit the actual article.

For these and other reasons, do not copy code from these excerpts, and do not take as exact truth any text excerpt. Instead, visit the actual article.

Compact List of Articles Updated Recently

This compact list provides links to all the updated articles that are listed in the Excerpts section.

1. SQL Server 2012 Service Pack release notes
2. SQL Server 2016 Release Notes
3. SQL Server Documentation

1. SQL Server 2012 Service Pack release notes

Updated: 2018-04-25   (Next)

- **Automatic Soft-NUMA partitioning** – With SQL 2014 SP2, Automatic Soft-NUMA partitioning is introduced when Trace Flag 8079 is enabled at the server level. When Trace Flag 8079 is enabled during startup, SQL Server 2014 SP2 interrogates the hardware layout and automatically configures Soft NUMA on systems reporting 8 or more CPUs per NUMA node. The automatic soft NUMA behavior is Hyperthread (HT/logical processor) aware. The partitioning and creation of additional nodes scales background processing by increasing the number of listeners, scaling, and network and encryption capabilities. It is recommended to first test the performance of the workload with Auto-Soft NUMA before it is turned ON in production.

Service Pack 3 release notes

Download pages

- SQL Server 2012 SP3 Feature Pack
- SQL Server 2012 SP3 Express

For more detailed information to identify the location and name of the file to download based on your currently installed version, see the "Select the correct file to download" section in SQL Server 2012 Service Pack 3 release information.

Service Pack 2 release notes

Download pages

- SQL Server 2012 SP2 Feature Pack
- SQL Server 2012 SP2 Express

Use the table below to identify the location and name of the file to download based on your currently installed version. Download pages have system requirements and basic installation instructions.

|If your current installed version is...|And you want to...|Download and install...|

---

2. **SQL Server 2016 Release Notes**

Updated: 2018-04-27   (Previous | Next)

This article describes limitations and issues with SQL Server 2016 releases, including service packs. For information on what's new, see What's New in SQL Server 2016.

- Download SQL Server 2016 from the **Evaluation Center**
- Azure Virtual Machine small: Have an Azure account? Then go **Here** to spin up a Virtual Machine with SQL Server 2016 SP1 already installed.
- Download SSMS: To get the latest version of SQL Server Management Studio, see **[Download SQL Server Management Studio (SSMS)]**.

SQL Server 2016 Service Pack 2 (SP2)

SQL Server 2016 SP2 includes all cumulative updates released after 2016 SP1, up to and including CU8.

- Microsoft Download SQL Server 2016 Service Pack 2 (SP2)
- For a complete list of updates, see SQL Server 2016 Service Pack 2 release information

3. SQL Server Documentation

Updated: 2018-04-27   (Previous)

Try SQL Server!

- Download from Evaluation Center: Download SQL Server for Windows
- Download from Evaluation Center: Download SQL Server Management Studio (SSMS)
- Download from Evaluation Center: Download SQL Server Data Tools (SSDT)
- Create Virtual Machine: Get a Virtual Machine with SQL Server

Similar articles about new or updated articles

This section lists very similar articles for recently updated articles in other subject areas, within our public GitHub.com repository: MicrosoftDocs/sql-docs.

Subject areas that *do* have new or recently updated articles

- New + Updated (11+6):   **Advanced Analytics for SQL** docs
- New + Updated (18+0):   **Analysis Services for SQL** docs
- New + Updated (218+14): **Connect to SQL** docs
- New + Updated (14+0):   **Database Engine for SQL** docs
- New + Updated (3+2):   **Integration Services for SQL** docs
- New + Updated (3+3):   **Linux for SQL** docs
- New + Updated (7+10):   **Relational Databases for SQL** docs
- New + Updated (0+2):   **Reporting Services for SQL** docs
- New + Updated (1+3):   **SQL Operations Studio** docs
- New + Updated (2+3):   **Microsoft SQL Server** docs
- New + Updated (1+1):   **SQL Server Data Tools (SSDT)** docs
- New + Updated (5+2):   **SQL Server Management Studio (SSMS)** docs
- New + Updated (0+2):   **Transact-SQL** docs
- New + Updated (1+1):   **Tools for SQL** docs

Subject areas that do *not* have any new or recently updated articles

- New + Updated (0+0): **Analytics Platform System for SQL** docs
- New + Updated (0+0): **Data Quality Services for SQL** docs
- New + Updated (0+0): **Data Mining Extensions (DMX) for SQL** docs
- New + Updated (0+0): **Master Data Services (MDS) for SQL** docs
- New + Updated (0+0): **Multidimensional Expressions (MDX) for SQL** docs
- New + Updated (0+0): **ODBC (Open Database Connectivity) for SQL** docs
- New + Updated (0+0): **PowerShell for SQL** docs
- New + Updated (0+0): **Samples for SQL** docs
- New + Updated (0+0): **SQL Server Migration Assistant (SSMA)** docs
- New + Updated (0+0): **XQuery for SQL** docs

SQL Server 2017 Release Notes

5/3/2018 • 6 minutes to read • Edit Online

THIS TOPIC APPLIES TO: ✅ SQL Server (starting with 2017) ❌ Azure SQL Database ❌ Azure SQL Data Warehouse ❌ Parallel Data Warehouse

This article describes limitations and issues with SQL Server 2017. For related information, see:

- What's New in SQL Server 2017
- SQL Server on Linux release notes
- SQL Server 2017 Cumulative updates for information about the latest cumulative update (CU) release

Try SQL Server!

- ⬇ Download SQL Server 2017
- 🖥 Spin up a Virtual Machine with SQL Server 2017

SQL Server 2017 - general availability release (October 2017)

Database Engine

- **Issue and customer impact:** After upgrade, the existing FILESTREAM network share may be no longer available.

- **Workaround:** First, reboot the computer and check if the FILESTREAM network share is available. If the share is still not available, complete the following steps:

  1. In SQL Server Configuration Manager, right-click the SQL Server instance, and click **Properties**.
  2. In the **FILESTREAM** tab clear **Enable FILESTREAM for file I/O streaming access**, then click **Apply**.
  3. Check **Enable FILESTREAM for file I/O streaming access** again with the original share name and click **Apply**.

Master Data Services (MDS)

- **Issue and customer impact:** On the user permissions page, when granting permission to the root level in the entity tree view, you see the following error:

  ```
  "The model permission cannot be saved. The object guid is not valid"
  ```

- **Workarounds:**

  - Grant permission on the sub nodes in the tree view instead of the root level.
  - or
  - Run the script described in this MDS team blog error applying permission on entity level

Analysis Services

- **Issue and customer impact:** Data connectors for the following sources are not yet avaialble for tabular models at the 1400 compatibility level.
  - Amazon Redshift
  - IBM Netezza
  - Impala
- **Workaround:** None.

- **Issue and customer impact:** Direct Query models at the 1400 compatibility level with perspectives can fail on querying or discovering metadata.

- **Workaround:** Remove perspectives and redeploy.

Tools

- **Issue and customer impact:** Running *DReplay* fails with the following message: "Error DReplay Unexpected error occurred!".
- **Workaround:** None.

SQL Server 2017 Release Candidate (RC2 - August 2017)

There are no release notes for SQL Server on Windows related to this release. See SQL Server on Linux Release notes.

SQL Server 2017 Release Candidate (RC1 - July 2017)

SQL Server Integration Services (SSIS) (RC1 - July 2017)

- **Issue and customer impact:** The parameter *runincluster* of the stored procedure **[catalog]. [create_execution]** is renamed to *runinscaleout* for consistency and readability.
- **Work around:** If you have existing scripts to run packages in Scale Out, you have to change the parameter name from *runincluster* to *runinscaleout* to make the scripts work in RC1.

- **Issue and customer impact:** SQL Server Management Studio (SSMS) 17.1 and earlier versions can't trigger package execution in Scale Out in RC1. The error message is: "*@runincluster* is not a parameter for procedure **create_execution**." This issue is fixed in the next release of SSMS, version 17.2. Versions 17.2 and later of SSMS support the new parameter name and package execution in Scale Out.

- **Work around:** Until SSMS version 17.2 is available:
  1. Use your existing version of SSMS to generate the package execution script.
  2. Change the name of the *runincluster* parameter to *runinscaleout* in the script.
  3. Run the script.

SQL Server 2017 CTP 2.1 (May 2017)

Documentation (CTP 2.1)

- **Issue and customer impact:** Documentation for SQL Server 2017 (14.x) is limited and content is included with the SQL Server 2016 (13.x) documentation set. Content in articles that is specific to SQL Server 2017 (14.x) is noted with **Applies To**.
- **Issue and customer impact:** No offline content is available for SQL Server 2017 (14.x).

SQL Server Reporting Services (CTP 2.1)

- **Issue and customer impact:** If you have both SQL Server Reporting Services and Power BI Report Server on the same machine and uninstall one of them, you cannot connect to the remaining report server with Report Server Configuration Manager.
- **Work around** To work around this issue, you must perform the following operations after uninstalling one of the servers.

  1. Launch a command prompt in Administrator mode.

2. Go to the directory where the remaining report server is installed.

   Default location for Power BI Report Server: C:\Program Files\Microsoft Power BI Report Server

   Default location for SQL Server Reporting Services: C:\Program Files\Microsoft SQL Server Reporting Services

3. Then go to the next folder, which is either *SSRS* or *PBIRS* depending on what is remaining.

4. Go to the WMI folder.

5. Run the following command:

```
regsvr32 /i ReportingServicesWMIProvider.dll
```

If you see the following error, ignore it.

```
The module "ReportingServicesWMIProvider.dll" was loaded but the entry-point DLLInstall was not
found. Make sure that "ReportingServicesWMIProvider.dll" is a valid DLL or OCX file and then try
again.
```

TSqlLanguageService.msi (CTP 2.1)

- **Issue and customer impact:** After installing on a computer that has a 2016 version of *TSqlLanguageService.msi* installed (either through SQL Setup or as a standalone redistributable) the v13.* (SQL 2016) versions of *Microsoft.SqlServer.Management.SqlParser.dll* and *Microsoft.SqlServer.Management.SystemMetadataProvider.dll* are removed. Any application that has a dependency on the 2016 versions of those assemblies stops working and generate an error similar to: *error : Could not load file or assembly 'Microsoft.SqlServer.Management.SqlParser, Version=13.0.0.0, Culture=neutral, PublicKeyToken=89845dcd8080cc91' or one of its dependencies. The system cannot find the file specified.*

  In addition, attempts to reinstall a 2016 version of TSqlLanguageService.msi fail with the message: *Installation of Microsoft SQL Server 2016 T-SQL Language Service failed because a higher version already exists on the machine.*

- **Workaround** To work around this issue and fix an application that depends on the v13 version of the assemblies follow these steps:

  1. Go to **Add/Remove Programs**
  2. Find *Microsoft SQL Server vNext T-SQL Language Service CTP2.1*, right-click it, and select **Uninstall**.
  3. After the component is removed, repair the application that is broken or reinstall the appropriate version of *TSqlLanguageService.MSI*.

     This workaround removes the v14 version of those assemblies, so any applications that depend on the v14 versions will no longer function. If those assemblies are needed, then a separate installation without any side-by-side 2016 installs is required.

SQL Server 2017 CTP 2.0 (April 2017)

Documentation (CTP 2.0)

- **Issue and customer impact:** Documentation for SQL Server 2017 (14.x) is limited and content is included with the SQL Server 2016 (13.x) documentation set. Content in articles that is specific to SQL Server 2017 (14.x) is noted with **Applies To**.

- **Issue and customer impact:** No offline content is available for SQL Server 2017 (14.x).

Always On availability groups

- **Issue and customer impact:** A SQL Server instance hosting an availability group secondary replica crashes if the SQL Server major version is lower than the instance that hosts the primary replica. Affects upgrades from all supported versions of SQL Server that host availability groups to SQL Server SQL Server 2017 (14.x) CTP 2.0. The issue occurs under the following conditions.

1. User upgrades SQL Server instance hosting secondary replica in accordance with best practices.
2. After upgrade, a failover occurs and a newly upgraded secondary becomes primary before completing upgrade for all secondary replicas in the availability group. The old primary is now a secondary, which is lower version than primary.
3. The availability group is in an unsupported configuration and any remaining secondary replicas might be vulnerable to crash.

- **Workaround** Connect to the SQL Server instance hosting the new primary replica and remove the faulty secondary replica from the configuration.

```
ALTER AVAILABILITY GROUP agName REMOVE REPLICA ON NODE instanceName
```

The instance of SQL Server that hosted the secondary replica recovers.

More information

- SQL Server Reporting Services release notes.
- Known Issues for Machine Learning Services
- SQL Server Update Center - links and information for all supported versions

ⓘ Get Help

- UserVoice - Suggestion to improve SQL Server?
- Setup and Upgrade - MSDN Forum
- SQL Server Data Tools - MSDN forum
- Transact-SQL - MSDN forum
- DBA Stack Exchange (tag sql-server) - ask SQL Server questions
- Stack Overflow (tag sql-server) - also has some answers about SQL development
- Reddit - general discussion about SQL Server
- Microsoft SQL Server License Terms and Information
- Support options for business users
- Contact Microsoft

✎ Contribute SQL documentation

- How to contribute to SQL Server Documentation

Microsoft

SQL Server 2016 Release Notes

5/8/2018 • 16 minutes to read • Edit Online

THIS TOPIC APPLIES TO: ✅ SQL Server (starting with 2016) ❌ Azure SQL Database ❌ Azure SQL Data Warehouse ❌ Parallel Data Warehouse

This article describes limitations and issues with SQL Server 2016 releases, including service packs. For information on what's new, see What's New in SQL Server 2016.

- ⬇ Download SQL Server 2016 from the **Evaluation Center**
- 🖥 Have an Azure account? Then go **Here** to spin up a Virtual Machine with SQL Server 2016 SP1 already installed.
- ⬇ To get the latest version of SQL Server Management Studio, see **Download SQL Server Management Studio (SSMS)**.

SQL Server 2016 Service Pack 2 (SP2)

ⓘ SQL Server 2016 SP2 includes all cumulative updates released after 2016 SP1, up to and including CU8.

- ⬇ Download SQL Server 2016 Service Pack 2 (SP2)
- For a complete list of updates, see SQL Server 2016 Service Pack 2 release information

The SQL Server 2016 SP2 installation may require reboot after installation. As a best practice, we recommend to plan and perform a reboot following the installation of SQL Server 2016 SP2.

Performance and Scale related improvements included in SQL Server 2016 SP2.

FEATURE	DESCRIPTION	MORE INFORMATION
Improved Distribution DB cleanup procedure	An oversized distribution database tables caused blocking and deadlock situation. An improved cleanup procedure aims to eliminate some of these blocking or deadlock scenarios.	KB4040276
Change Tracking Cleanup	Improved change tracking cleanup performance and efficiency for Change Tracking side tables.	KB4052129
Use CPU time out to cancel Resource Governor request	Improves the handling of query requests by actually cancelling the request, if CPU thresholds for a request is reached. This behavior is enabled under trace flag 2422.	KB4038419
SELECT INTO to create target table in filegroup	Starting with SQL Server 2016 SP2, SELECT INTO T-SQL syntax supports loading a table into a filegroup other than a default filegroup of the user using the ON keyword in T-SQL syntax.	

FEATURE	DESCRIPTION	MORE INFORMATION
Improved Indirect Checkpoint for TempDB	Indirect checkpointing for TempDB is improved to minimize the spinlock contention on DPLists. This improvement allows TempDB workload on SQL Server 2016 to scale out of the box if indirect checkpointing is ON for TempDB.	KB4040276
Improved database backup performance on large memory machines	SQL Server 2016 SP2 optimizes the way we drain the on-going I/O during backup resulting in dramatic gains in backup performance for small to medium databases. We have seen more than 100x improvement when taking system database backups on a 2TB machine. The performance gain reduces as the database size increases as the pages to backup and backup I/O takes more time compared to iterating buffer pool. This change will help improve the backup performance for customers hosting multiple small databases on a large high end servers with large memory.	
VDI backup compression support for TDE enabled databases	SQL Server 2016 SP2, adds VDI support to allow VDI backup solutions to leverage compression for TDE enabled databases. With this improvement, a new backup format has been introduced to support backup compression for TDE enabled databases. The SQL Server engine will transparently handle new and old backup formats to restore the backups.	
Dynamic loading of replication agent profile parameters	This new enhancements allows replication agents parameters to be loaded dynamically without having to restart the agent. This change is applicable only to the most commonly used agent profile parameters.	
Support MAXDOP option for statistics create/update	This enhancement allows to specify the MAXDOP option for a CREATE/UPDATE statistics statement, as well as make sure the right MAXDOP setting is used when statistics are updated as part of create or rebuild for all types of indexes (if the MAXDOP option is present)	KB4041809

FEATURE	DESCRIPTION	MORE INFORMATION
Improved Auto Statistics Update for Incremental Statistics	In certain scenarios, when a number of data changes happened across multiple partitions in a table in a way that the total modification counter for incremented statistics exceeds the auto update threshold, but none of the individual partitions exceed the auto update threshold, statistics update may be delayed until much more modifications happen in the table. This behavior is corrected under trace flag 11024.	

Supportability and Diagnostics related improvements included in SQL Server 2016 SP2.

FEATURE	DESCRIPTION	MORE INFORMATION
Full DTC support for databases in an Availability Group	Cross-databases transactions for databases which are part of an Availability Group are currently not supported for SQL Server 2016. With SQL Server 2016 SP2, we are introducing full support for distributed transactions with Availability Group Databases.	
Update to sys.databases is_encrypted column to accurately reflect encryption status for TempDB	The value of is_encryptedcolumn column in sys.databases is 1 for TempDB, even after you turn off encryption for all user databases and restart SQL Server. The expected behavior would be that the value for this is 0, since TempDB is no longer encrypted in this situation. Starting with SQL Server 2016 SP2, sys.databases.is_encrypted now accurately reflects encryption status for TempDB.	
New DBCC CLONEDATABASE options to generate verified clone and backup	With SQL Server 2016 SP2, DBCC CLONEDATABASE allows two new options: produce a verified clone, or produce a backup clone. When a clone database is created using WITH VERIFY_CLONEDB option, a consistent database clone is created and verified which will be supported by Microsoft for production use. A new property is introduced to validate if the clone is verified SELECT DATABASEPROPERTYEX('clone_database _name', 'IsVerifiedClone'). When a clone is created with BACKUP_CLONEDB option, a backup is generated in the same folder as the data file to make it easy for customers to move the clone to different server or to send it to Microsoft Customer Support (CSS) for troubleshooting.	

FEATURE	DESCRIPTION	MORE INFORMATION
Service Broker (SSB) support for DBCC CLONEDATABASE	Enhanced DBCC CLONEDATABASE command to allow scripting of SSB objects.	KB4092075
New DMV to monitor TempDB version store space usage	A new sys.dm_tran_version_store_space_usage DMV is introduced in SQL Server 2016 SP2 to allow monitoring TempDB for version store usage. DBAs can now proactively plan TempDB sizing based on the version store usage requirement per database, without any performance overhead when running it on production servers.	
Full Dumps support for Replication Agents	Today if replication agents encounter a unhandled exception, the default is to create a mini dump of the exception symptoms. This makes troubleshooting unhandled exception issues very difficult. Through this change we are introducing a new Registry key, which would allow to create a full dump for Replication Agents.	
Extended Events enhancement for read routing failure for an Availability Group	Before, the read_only_rout_fail xEvent fired if there was a routing list present, but none of the servers in the routing list were available for connections. SQL Server 2016 SP2 includes additional information to assist with troubleshooting, and also expand on the code points where this xEvent gets fired.	
New DMV to monitor the transaction log	Added a new DMV sys.dm_db_log_stats that returns summary level attributes and information about transaction log files of databases.	
New DMV to monitor VLF information	A new DMV sys.dm_db_log_info is introduced in SQL Server 2016 SP2 to expose the VLF information similar to DBCC LOGINFO to monitor, alert and avert potential T-Log issues experienced by customers.	
Processor Information in sys.dm_os_sys_info	New columns added to the sys.dm_os_sys_info DMV to expose the processor related information, such as socket_count, and cores_per_numa.	
Extent modified information in sys.dm_db_file_space_usage	New column added to sys.dm_db_file_space_usage to track the number of modified extents since the last full backup.	

FEATURE	DESCRIPTION	MORE INFORMATION
Segment information in sys.dm_exec_query_stats	New columns were added to sys.dm_exec_query_stats to track number of columnstore segments skipped and read, such as total_columnstore_segment_reads, and total_columnstore_segment_skips.	KB4051358
Setting correct compatibility level for distribution database	After Service Pack installation, the Distribution database compatibility level changes to 90. This was because of an code path in sp_vupgrade_replication stored procedure. The SP has now been changed to set the correct compatibility level for the distribution database.	
Expose last known good DBCC CHECKDB information	A new database option has been added to programmatically return the date of the last successful DBCC CHECKDB run. Users can now query DATABASEPROPERTYEX([database], 'lastgoodcheckdbtime') to obtain a single value representing the date/time of the last successful DBCC CHECKDB run on the specified database.	
Showplan XML enhancements	Information on which statistics were used to compile the query plan, including statistics name, modification counter, sampling percent, and when the statistics was updated last time. Note this is added for CE models 120 and later only. For example it is not supported for CE 70.	
	A new attribute EstimateRowsWithoutRowgoal is added to showplan XML if Query Optimizer uses "row goal" logic.	
	New runtime attributes UdfCpuTime and UdfElapsedTime in actual showplan XML, to track time spent in scalar User-Defined Functions (UDF).	
	Add CXPACKET wait type to list of possible top 10 waits in actual showplan XML – Parallel query execution frequently involves CXPACKET waits, but this type of wait was not reporting in actual showplan XML.	
	Extended the runtime spill warning to report number of pages written to TempDB during a parallelism operator spill.	

FEATURE	DESCRIPTION	MORE INFORMATION
Replication Support for databases with Supplemental characters collations	Replication is now supportable on databases which use the Supplemental Character Collation.	
Proper handling of Service Broker with Availability group failover	In the current implementation when Service Broker is enabled on an Availability Group Databases, during an AG failover all Service broker connections which originated on the Primary Replica are left open. This improvement targets to close all such open connections during an AG failover.	
Improved parallelism waits troubleshooting	by adding a new CXCONSUMER wait.	
Improved consistency between DMVs for same information	The sys.dm_exec_session_wait_stats DMV now tracks CXPACKET and CXCONSUMER waits consistently with the sys.dm_os_wait_stats DMV.	
Improved troubleshooting of intra-query parallelism deadlocks	A new exchange_spill Extended Event to report the number of pages written to TempDB during a parallelism operator spill, in the xEvent field name worktable_physical_writes.	
	The spills columns in the sys.dm_exec_query_stats, sys.dm_exec_procedure_stats, and sys.dm_exec_trigger_stats DMVs (such as total_spills) now also include the data spilled by parallelism operators.	
	The XML deadlock graph is improved for parallelism deadlock scenarios, with more attributes added to the exchangeEvent resource.	
	The XML deadlock graph is improved for deadlocks involving batch-mode operators, with more attributes added to the SyncPoint resource.	
Dynamic reloading of some replication agent profile parameters	In the current implementation of replication agents any change in the agent profile parameter requires the agent to be stopped and restarted. This improvements allows for the parameters to be dynamically reloaded without having to restart the replication agent.	

SQL Server 2016 Service Pack 1 (SP1)

ⓘ SQL Server 2016 SP1 includes all cumulative updates up to SQL Server 2016 RTM CU3 including Security Update MS16-136. It contains a roll-up of solutions provided in SQL Server 2016 cumulative updates up to and includes the latest Cumulative Update - CU3 and Security Update MS16-136 released on November 8th, 2016.

The following features are available in the Standard, Web, Express, and Local DB editions of SQL Server SP1 (except as noted):

- Always encrypted
- Changed data capture (not available in Express)
- Columnstore
- Compression
- Dynamic data masking
- Fine grain auditing
- In Memory OLTP (not availabe in Local DB)
- Multiple filestream containers (not available in Local DB)
- Partitioning
- Polybase
- Row level security

The following table summarizes key improvements provided in SQL Server 2016 SP1.

FEATURE	DESCRIPTION	FOR MORE INFORMATION
Bulk insert into heaps with auto TABLOCK under TF 715	Trace Flag 715 enables table lock for bulk load operations into heap with no non-clustered indexes.	Migrating SAP workloads to SQL Server just got 2.5x faster
CREATE OR ALTER	Deploy objects such as Stored Procedures, Triggers, User-Defined Functions, and Views.	SQL Server Database Engine Blog
DROP TABLE support for replication	DROP TABLE DDL support for replication to allow replication articles to be dropped.	KB 3170123
Filestream RsFx Driver signing	The Filestream RsFx driver is signed and certified using Windows Hardware Developer Center Dashboard portal (Dev Portal) allowing SQL Server 2016 SP1 Filestream RsFx driver to be installed on Windows Server 2016/Windows 10 without any issue.	Migrating SAP workloads to SQL Server just got 2.5x faster
LPIM to SQL service account - programmatic identification	Allow DBAs to programmatically identify if Lock Pages in Memory (LPIM) privilege is in effect at the service startup time.	Developers Choice: Programmatically identify LPIM and IFI privileges in SQL Server
Manual Change Tracking Cleanup	New stored procedure cleans the change tracking internal table on demand.	KB 3173157
Parallel INSERT..SELECT Changes for Local temp tables	New Parallel INSERT in INSERT..SELECT operations.	SQL Server Customer Advisory Team

FEATURE	DESCRIPTION	FOR MORE INFORMATION
Showplan XML	Extended diagnostics including grant warning and maximum memory enabled for a query, enabled trace flags, and also surfaces other diagnostic information.	KB 3190761
Storage class memory	Boost the transaction processing using Storage Class Memory in Windows Server 2016, resulting in the ability to accelerate transaction commit times by orders of magnitude.	SQL Server Database Engine Blog
USE HINT	Use the query option, `OPTION(USE HINT('<option>'))` to alter query optimizer behavior using supported query level hints. Unlike QUERYTRACEON, the USE HINT option does not require sysadmin privileges.	Developers Choice: USE HINT query hints
XEvent additions	New XEvents and Perfmon diagnostics capabilities improve latency troubleshooting.	Extended Events

In addition, note the following fixes:

- Based on feedback from DBAs and SQL community, starting SQL 2016 SP1, the Hekaton logging messages are reduced to minimal.
- Review new Trace flags.
- The full versions of the WideWorldImporters sample databases now work with Standard Edition and Express Edition, starting SQL Server 2016 SP1 and are available on Github. No changes are needed in the sample. The database backups created at RTM for Enterprise edition work with Standard and Express in SP1.

The SQL Server 2016 SP1 installation may require reboot post installation. As a best practice, we recommend to plan and perform a reboot following the installation of SQL Server 2016 SP1.

Download pages and more information

- Download Service Pack 1 for Microsoft SQL Server 2016
- SQL Server 2016 Service Pack 1 (SP1) Released
- SQL Server 2016 Service Pack 1 release information
- ⓘ SQL Server Update Center for links and information for all supported versions, including service packs of SQL Server

SQL Server 2016 Release - General Availability (GA)

- Database Engine (GA)
- Stretch Database (GA)
- Query Store (GA)
- Product Documentation (GA)

⚠ **Install Patch Requirement (GA)**

Issue and customer impact: Microsoft has identified a problem that affects the Microsoft VC++ 2013 Runtime

binaries that are installed as a prerequisite by SQL Server 2016. An update is available to fix this problem. If this update to the VC runtime binaries is not installed, SQL Server 2016 may experience stability issues in certain scenarios. Before you in stall SQL Server 2016, check to see if the computer needs the patch described in KB 3164398. The patch is also included in Cumulative Update Package 1 (CU1) for SQL Server 2016 RTM.

Resolution: Use one of the following solutions:

- Install KB 3138367 - Update for Visual C++ 2013 and Visual C++ Redistributable Package. The KB is the preferred resolution. You can install this before or after you install SQL Server 2016.

  If SQL Server 2016 is already installed, do the following steps in order:

  1. Download the appropriate *vcredist_*exe*.
  2. Stop the SQL Server service for all instances of the database engine.
  3. Install **KB 3138367**.
  4. Reboot the computer.
  - Install KB 3164398 - Critical Update for SQL Server 2016 MSVCRT prerequisites.

    If you use **KB 3164398**, you can install during SQL Server installation, through Microsoft Update, or from Microsoft Download Center.

    - **During SQL Server 2016 Installation:** If the computer running SQL Server setup has internet access, SQL Server setup checks for the update as part of the overall SQL Server installation. If you accept the update, setup downloads and update the binaries during installation.

    - **Microsoft Update:** The update is available from Microsoft Update as a critical non-security SQL Server 2016 update. Installing through Microsoft update, after SQL Server 2016 requires the server to be restarted following the update.

    - **Download Center:** Finally, the update is available from the Microsoft Download Center. You can download the software for the update and install it on servers after they have SQL Server 2016.

Stretch Database

Problem with a specific character in a database or table name

Issue and customer impact: Attempting to enable Stretch Database on a database or a table fails with an error. The issue occurs when the name of the object includes a character that's treated as a different character when converted from lower case to upper case. An example of a character that causes this issue is the character "ƒ" (created by typing ALT+159).

Workaround: If you want to enable Stretch Database on the database or the table, the only option is to rename the object and remove the problem character.

Problem with an index that uses the INCLUDE keyword

Issue and customer impact: Attempting to enable Stretch Database on a table that has an index that uses the INCLUDE keyword to include additional columns in the index fails with an error.

Workaround: Drop the index that uses the INCLUDE keyword, enable Stretch Database on the table, then recreate the index. If you do this, be sure to follow your organization's maintenance practices and policies to ensure minimal or no impact to users of the affected table.

Query Store

Problem with automatic data cleanup on editions other than Enterprise and Developer

Issue and customer impact: Automatic data cleanup fails on editions other than Enterprise and Developer. Consequently, if data is not purged manually, space used by the Query Store will grow over time until configured limit is reached. If not mitigated, this issue will also fill up disk space allocated for the error logs, as every attempt

to execute cleanup produces a dump file. Cleanup activation period depends on the workload frequency, but it is no longer than 15 min.

Workaround: If you plan to use Query Store on editions other than Enterprise and Developer, you need to explicitly turn off cleanup policies. It can be done either from SQL Server Management Studio (Database Properties page) or via Transact-SQL script:

```
ALTER DATABASE <database name> SET QUERY_STORE (OPERATION_MODE = READ_WRITE, CLEANUP_POLICY =
(STALE_QUERY_THRESHOLD_DAYS = 0), SIZE_BASED_CLEANUP_MODE = OFF)
```

Additionally, consider manual cleanup options to prevent Query Store from transitioning to read-only mode. For example, run the following query to periodically clean entire data space:

```
ALTER DATABASE <database name> SET QUERY_STORE CLEAR
```

Also, execute the following Query Store stored procedures periodically to clean runtime statistics, specific queries or plans:

- `sp_query_store_reset_exec_stats`

- `sp_query_store_remove_plan`

- `sp_query_store_remove_query`

Product Documentation (GA)

Issue and customer impact: A downloadable version of the SQL Server 2016 documentation is not yet available. When you use Help Library Manager to attempt to **Install content from online**, you see the SQL Server 2012 and SQL Server 2014 documentation but there are no options for SQL Server 2016 documentation.

Workaround: Use one of the following work-arounds:

Manage Help Settings
Desktop app
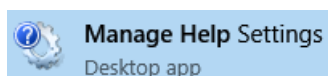
- Use the option **Choose online or local help** and configure help for "I want to use online help".

- Use the option **Install content from online** and download the SQL Server 2014 Content.

  F1 Help: By design when you press F1 in SQL Server Management Studio, the online version of the F1 Help article is displayed in the browser. The issues is browser-based help even when you have configured and installed local Help.

Updating content: In SQL Server Management Studio and Visual Studio, the Help Viewer application may freeze (hang) during the process of adding the documentation. To resolve this issue, complete the following steps. For more information about this issue, see Visual Studio Help Viewer freezes.

- Open the %LOCALAPPDATA%\Microsoft\HelpViewer2.2\HlpViewer_SSMS16_en-US.settings | HlpViewer_VisualStudio14_en-US.settings file in Notepad and change the date in the following code to some date in the future.

```
    Cache LastRefreshed="12/31/2017 00:00:00"
```

Additional Information

- SQL Server 2016 installation
- SQL Server Update Center - links and information for all supported versions

ⓘ Get Help

- UserVoice - Suggestion to improve SQL Server?

- Setup and Upgrade - MSDN Forum

- SQL Server Data Tools - MSDN forum

- Transact-SQL - MSDN forum

- DBA Stack Exchange (tag sql-server) - ask SQL Server questions

- Stack Overflow (tag sql-server) - also has some answers about SQL development

- Reddit - general discussion about SQL Server

- Microsoft SQL Server License Terms and Information

- Support options for business users

- Contact Microsoft

🖉 Contribute SQL documentation

- How to contribute to SQL Server Documentation

SQL Server 2014 Release Notes

5/3/2018 • 19 minutes to read • Edit Online

THIS TOPIC APPLIES TO: ✅ SQL Server (starting with 2014) ⊗ Azure SQL Database ⊗ Azure SQL Data Warehouse ⊗ Parallel Data Warehouse

This article describes known issues with SQL Server 2014 (12.x) releases, including related service packs.

SQL Server 2014 Service Pack 2 (SP2)

SQL Server 2014 SP2 contains rollups of released hotfixes for SQL Server 2014 SP1 CU7. It contains improvements centered around performance, scalability, and diagnostics based on the feedback from customers and the SQL community.

Performance and scalability improvements in SP2

FEATURE	DESCRIPTION	FOR MORE INFORMATION
Automatic Soft NUMA partitioning	You can automatically configure Soft NUMA on systems reporting 8 or more CPUs per NUMA node.	Soft-NUMA (SQL Server)
Buffer Pool Extension	Enables SQL Server Buffer Pool to scale beyond 8 TB.	Buffer Pool Extension
Dynamic Memory Object Scaling	Dynamically partition memory object based on number of nodes and cores. This enhancement eliminates the need of Trace Flag 8048 post SQL 2014 SP2.	Dynamic Memory Object Scaling
MAXDOP hint for DBCC CHECK* commands	This improvement is useful to run DBCC CHECKDB with a MAXDOP setting other than the sp_configure value.	Hints (Transact-SQL) - Query
SOS_RWLock spinlock improvement	Removes the need for spinlock for SOS_RWLock and instead uses lock-free techniques similar to in-memory OLTP.	SOS_RWLock Redesign
Spatial Native Implementation	Significant improvement in spatial query performance.	Spatial performance improvements in SQL Server 2012 and 2014

Supportability and diagnostics improvements in SP2

FEATURE	DESCRIPTION	FOR MORE INFORMATION
AlwaysON timeout logging	Added new logging capability for Lease Timeout messages so that the current time and the expected renewal times are logged.	Improved AlwaysOn Availability Group Lease Timeout Diagnostics
AlwaysON XEvents and performance counters	New AlwaysON XEvents and performance counters to improve diagnostics when troubleshooting latency issues with AlwaysON.	KB 3107172 and KB 3107400

FEATURE	DESCRIPTION	FOR MORE INFORMATION
Change tracking cleanup	A new stored procedure sp_flush_CT_internal_table_on_demand cleans up change tracking internal tables on demand.	KB 3173157
Database cloning	Use the new DBCC command to troubleshoot existing production databases by cloning the schema, metadata, and statistics but without the data. Cloned databases are not meant to be used in production environments.	KB 3177838
DMF additions	New DMF sys.dm_db_incremental_stats_properties expose information per-partition for incremental statistics.	KB 3170114
DMF for retrieving input buffer in SQL Server	A new DMF for retrieving the input buffer for a session/request (sys.dm_exec_input_buffer) is now available. This is functionally equivalent to DBCC INPUTBUFFER.	sys.dm_exec_input_buffer
DROP DDL Support for Replication	Allows a table that's included as an article in transactional replication publication to be dropped from the database and the publication.	KB 3170123
IFI privilege to SQL service account	Determine whether Instant File initialization (IFI) is in effect at the SQL Server service startup.	Database File Initialization
Memory Grants - Handling issues	You can leverage diagnostic hints while running queries by capping their memory grants to prevent memory contention.	KB 3107401
Query execution lightweight per-operator profiling	Optimizes collecting per-operator query execution statistics such as actual number of rows.	Developers Choice: Query progress - anytime, anywhere
Query execution diagnostics	Actual rows read are now reported in the query execution plans to help improve query performance troubleshooting.	KB 3107397
Query execution diagnostics for tempdb spill	Hash Warning and Sort Warnings now have additional columns to track physical I/O statistics, memory used, and rows affected.	Improve temptdb spill diagnostics
Tempdb supportability	Use a new Errorlog message for the number of tempdb files, and tempdb data file changes, at server startup.	KB 2963384

In addition, note the following fixes:

- The Xevent call stack now include modules names and offset instead of absolute addresses.
- Better correlation between diagnostics XE and DMVs – Query_hash and query_plan_hash are used for identifying a query uniquely. DMV defines them as varbinary(8), while XEvent defines them as UINT64. Since SQL server does not have "unsigned bigint", casting does not always work. This improvement introduces new XEvent action/filter columns equivalent to query_hash and query_plan_hash except when they are defined as INT64. This fix helps correlating queries between XE and DMVs.
- Support for UTF-8 in BULK INSERT and BCP – Support for export and import of data encoded in UTF-8 character set is now enabled in BULK INSERT and BCP.

Download pages and more information for SP2

- Download Service Pack 2 for Microsoft SQL Server 2014
- SQL Server 2014 Service Pack 2 is now available
- SQL Server 2012 SP2 Express
- SQL Server 2014 SP2 Feature Pack
- SQL Server 2014 SP2 Report Builder
- SQL Server 2014 SP2 Reporting Services Add-in for Microsoft Sharepoint
- SQL Server 2014 SP2 Semantic Language Statistics
- SQL Server 2014 Service Pack 2 Release Information

SQL Server 2014 Service Pack 1 (SP1)

SQL Server 2014 SP1 contains fixes provided in SQL Server 2014 CU 1 up to and including CU 5, as well as a rollup of fixes previously shipped in SQL Server 2012 SP2.

> **NOTE**
>
> If your SQL Server instance has SSISDB catalog enabled, and if you get an installation error when you upgrade to SP1, follow the instructions described for this issue on Error 912 or 3417 when you install SQL Server 2014 SP1.

Download pages and more information for SP1

- Download Service Pack 1 for Microsoft SQL Server 2014
- SQL Server 2014 Service Pack 1 has released – Updated
- Microsoft SQL Server 2014 SP1 Express
- Microsoft SQL Server 2014 SP1 Feature Pack

Before You Install SQL Server 2014 RTM

Limitations and Restrictions in SQL Server 2014 RTM

1. Upgrading from SQL Server 2014 CTP 1 to SQL Server 2014 RTM is NOT supported.
2. Installing SQL Server 2014 CTP 1 side-by-side with SQL Server 2014 RTM is NOT supported.
3. Attaching or restoring a SQL Server 2014 CTP 1 database to SQL Server 2014 RTM is NOT supported.

Workaround: None.

Upgrading from SQL Server 2014 CTP 2 to SQL Server RTM

Upgrade is fully supported. Specifically, you can:

1. Attach a SQL Server 2014 CTP 2 database to an instance of SQL Server 2014 RTM.
2. Restore a database backup taken on SQL Server 2014 CTP 2 to an instance of SQL Server 2014 RTM.
3. In-place upgrade to SQL Server 2014 RTM.
4. Rolling upgrade to SQL Server 2014 RTM. You are required to switch to manual failover mode before initiating

the rolling upgrade. Refer to Upgrade and Update of Availability Group Servers with Minimal Downtime and Data Loss for details.

5. Data collected by Transaction Performance Collection Sets installed in SQL Server 2014 CTP 2 cannot be viewed through SQL Server Management Studio in SQL Server 2014 RTM, and vice versa.

Downgrading from SQL Server 2014 RTM to SQL Server 2014 CTP 2

This action is not supported.

Workaround: There is no workaround for downgrade. We recommend that you back up the database before upgrading to SQL Server 2014 RTM.

Incorrect version of StreamInsight Client on SQL Server 2014 media/ISO/CAB

The wrong version of StreamInsight.msi and StreamInsightClient.msi is located in the following path on the SQL Server media/ISO/CAB (StreamInsight\<Architecture>\<Language ID>).

Workaround: Download and install the correct version from the SQL Server 2014 Feature Pack download page.

Product Documentation RTM

Report Builder and PowerPivit content are not available in some languages.

Issue: Report Builder content is not available in the following languages:

- Greek (el-GR)
- Norwegian (Bokmal) (nb-NO)
- Finnish (fi-FI)
- Danish (da-DK)

In SQL Server 2012 (11.x), this content was available in a CHM file that shipped with the product and was available in these languages. The CHM files no longer ship with the product and the Report Builder content is only available on MSDN. MSDN does not support these languages. Report Builder was also removed from TechNet and is no longer available in those supported languages.

Workaround: None.

Issue: Power Pivot content is not available in the following languages:

- Greek (el-GR)
- Norwegian (Bokmal) (nb-NO)
- Finnish (fi-FI)
- Danish (da-DK)
- Czech (cs-CZ)
- Hungarian (hu-HU)
- Dutch (Netherlands) (nl-NL)
- Polish (pl-PL)
- Swedish (sv-SE)
- Turkish (tr-TR)
- Portuguese (Portugal) (pt-PT)

In SQL Server 2012 (11.x), this content was available on TechNet and was available in these languages. This content was removed from TechNet and is no longer available in these supported languages.

Workaround: None.

Database Engine (RTM)

Changes made for Standard Edition in SQL Server 2014 RTM

SQL Server 2014 Standard has the following changes:

- The Buffer Pool Extension feature allows using the maximum size of up to 4x times of configured memory.
- The maximum memory has been raised from 64 GB to 128 GB.

Memory Optimization Advisor flags default constraints as incompatible

Issue: The Memory Optimized Advisor in SQL Server Management Studio flags all default constraints as incompatible. Not all default constraints are supported in a memory-optimized table; the Advisor does not distinguish between supported and unsupported types of default constraints. Supported default constraints include all constants, expressions, and built-in functions supported within natively compiled stored procedures. To see the list of functions supported in natively compiled stored procedures, refer to Supported Constructs in Natively Compiled Stored Procedures.

Workaround: If you want to use the advisor to identify blockers, ignore the compatible default constraints. To use the Memory Optimization Advisor to migrate tables that have compatible default constraints, but no other blockers, follow these steps:

1. Remove the default constraints from the table definition.
2. Use the Advisor to produce a migration script on the table.
3. Add back the default constraints in the migration script.
4. Execute the migration script.

Informational message "file access denied" incorrectly reported as an error in the SQL Server 2014 error log

Issue: When restarting a server that has databases that contain memory-optimized tables, you may see the following type of error messages in the SQL Server 2014 error log:

```
[ERROR]Unable to delete file C:\Program Files\Microsoft SQL
Server\....old.dll. This error may be due to a previous failure to unload
memory-optimized table DLLs.
```

This message is actually informational and no user action is required.

Workaround: None. This is an informational message.

Missing index details incorrectly report included columns for memory-optimized table

Issue: If SQL Server 2014 detects a missing index for a query on a memory-optimized table, it will report a missing index in the SHOWPLAN_XML, as well as in the missing index DMVs such as sys.dm_db_missing_index_details. In some cases, the missing index details will contain included columns. As all columns are implicitly included with all indexes on memory-optimized tables, it is not allowed to explicitly specify included columns with memory-optimized indexes.

Workaround: Do not specify the INCLUDE clause with indexes on memory-optimized tables.

Missing index details omit missing indexes when a hash index exists but is not suitable for the query

Issue: If you have a HASH index on columns of a memory-optimized table referenced in a query, but the index cannot be used for the query, SQL Server 2014 will not always report a missing index in SHOWPLAN_XML and in the DMV sys.dm_db_missing_index_details.

In particular, if a query contains equality predicates that involve a subset of the index key columns or if it contains inequality predicates that involve the index key columns, the HASH index cannot be used as is, and a different index would be required to execute the query efficiently.

Workaround: In case you are using hash indexes, inspect the queries and query plans to determine if the queries could benefit from Index Seek operations on a subset of the index key, or Index Seek operations on inequality predicates. If you need to seek on a subset of the index key, either use a NONCLUSTERED index, or use a HASH index on exactly the columns you need to seek on. If you need to seek on an inequality predicate, use a NONCLUSTERED index instead of HASH.

Failure when using a memory-optimized table and memory-optimized table variable in the same query, if the database option

READ_COMMITTED_SNAPSHOT is set to ON

Issue: If the database option READ_COMMITTED_SNAPSHOT is set to ON, and you access both a memory-optimized table and a memory-optimized table variable in the same statement outside the context of a user transaction, you may encounter this error message:

```
Msg 41359
A query that accesses memory optimized tables using the READ COMMITTED
isolation level, cannot access disk based tables when the database option
READ_COMMITTED_SNAPSHOT is set to ON. Provide a supported isolation level
for the memory optimized table using a table hint, such as WITH (SNAPSHOT).
```

Workaround: Either use the table hint WITH (SNAPSHOT) with the table variable, or set the database option MEMORY_OPTIMIZED_ELEVATE_TO_SNAPSHOT to ON, using the following statement:

```
ALTER DATABASE CURRENT
SET MEMORY_OPTIMIZED_ELEVATE_TO_SNAPSHOT=ON
```

Procedure and query execution statistics for natively compiled stored procedures record worker time in multiples of 1000

Issue: After enabling the collection of procedure or query execution statistics collection for natively compiled stored procedures using sp_xtp_control_proc_exec_stats or sp_xtp_control_query_exec_stats, you will see the *_worker_time reported in multiples of 1000, in the DMVs sys.dm_exec_procedure_stats and sys.dm_exec_query_stats. Query executions that have a worker time of less than 500 microseconds will be reported as having a worker_time of 0.

Workaround: None. Do not rely on worker_time reported in the execution stats DMVs for short-running queries in natively compiled stored procedures.

Error with SHOWPLAN_XML for natively compiled stored procedures that contain long expressions

Issue: If a natively compiled stored procedure contains a long expression, obtaining the SHOWPLAN_XML for the procedure, either using the T-SQL option SET SHOWPLAN_XML ON or using the option 'Display Estimated Execution Plan' in Management Studio, may result in the following error:

```
Msg 41322. MAT/PIT export/import encountered a failure for memory
optimized table or natively compiled stored procedure with object ID
278292051 in database ID 6. The error code was
0xc00cee81.
```

Workaround: Two suggested workarounds:

1. Add parentheses to the expression, similar to the following example:

   Instead of:

   ```
   SELECT @v0 + @v1 + @v2 + ... + @v199
   ```

   Write:

   ```
   SELECT((@v0 + ... + @v49) + (@v50 + ... + @v99)) + ((@v100 + ... + @v149) + (@v150 + ... + @v199))
   ```

2. Create a second procedure with a slightly simplified expression, for showplan purposes - the general shape of the plan should be the same. For example, instead of:

   ```
   SELECT @v0 +@v1 +@v2 +...+@v199
   ```

Write:

```
SELECT @v0 +@v1
```

Using a string parameter or variable with DATEPART and related functions in a natively compiled stored procedure results in an error

Issue: When using a natively compiled stored procedure that uses string parameter or variable with the built-in functions DATEPART, DAY, MONTH, and YEAR, an error message shows that datetimeoffset is not supported with natively compiled stored procedures.

Workaround: Assign the string parameter or variable to a new variable of type datetime2, and use that variable in the function DATEPART, DAY, MONTH, or YEAR. For example:

```
DECLARE @d datetime2 = @string
DATEPART(weekday, @d)
```

Native Compilation Advisor flags DELETE FROM clauses incorrectly

Issue: Native Compilation Advisor flags DELETE FROM clauses inside a stored procedure incorrectly as incompatible.

Workaround: None.

Register through SSMS adds DAC meta-data with mismatched instance IDs

Issue: When registering or deleting a Data-Tier Application package (.dacpac) through SQL Server Management Studio, the sysdac* tables are not updated correctly to allow a user to query dacpac history for the database. The instance_id for sysdac_history_internal and sysdac_instances_internal do not match to allow for a join.

Workaround: This issue is fixed with the feature pack redistribution of the Data-Tier Application Framework. After the update is applied, all new history entries will use the value listed for the instance_id in the sysdac_instances_internal table.

If you already have the issue with mismatched instance_id values, the only way to correct the mismatched values is to connect to the server as a user with privileges to write to MSDB database and update the instance_id values to match. If you get several register and unregister events from the same database, you may need to look at the time/date to see which records match with the current instance_id value.

1. Connect to the server in SQL Server Management Studio using a login that has update permissions to MSDB.
2. Open a new query using the MSDB database.
3. Run this query to see all of your active dac instances. Find the instance that you want to correct and note the instance_id:

   `select * from` sysdac_instances_internal

4. Run this query to see all of the history entries:

   `select * from` sysdac_history_internal

5. Identify the rows that should correspond to the instance you are fixing.

6. Update the sysdac_history_internal.instance_id value to the value you noted in step 3 (from the sysdac_instances_internal table):

   `update` sysdac_history_internal `set` instance_id = '<value from step 3>' `where` <expression that matches the rows you want to update>

Reporting Services (RTM)

The SQL Server 2012 Reporting Services Native Mode report server cannot run side-by-side with SQL Server 2014 Reporting Services SharePoint Components

Issue: The Reporting Services Native mode Windows service 'SQL Server Reporting Services' (ReportingServicesService.exe) fails to start when there are SQL Server 2014 (12.x) Reporting Services SharePoint components installed on the same server.

Workaround: Uninstall SQL Server 2014 (12.x) Reporting Services SharePoint components and restart Microsoft SQL Server 2012 Reporting Services Windows service.

More Information:

SQL Server 2012 (11.x) Reporting Services Native Mode cannot run side-by-side in either of the following conditions:

- SQL Server 2014 (12.x) Reporting Services Add-in for SharePoint Products
- SQL Server 2014 (12.x) Reporting Services SharePoint Shared Service

The side-by-side installation prevents the SQL Server 2012 (11.x) Reporting Services Native Mode Windows Service from starting. Error messages, similar to the those depicted here, will be seen in the Windows Event log:

```
Log Name:    Application
Source:          Report Server (<SQL instance ID>)
Event ID:        117
Task Category:   Startup/Shutdown
Level:           Error
Keywords:        Classic
Description:     The report server database is an invalid version.


Log Name:        Application
Source:          Report Server (<SQL instance ID>)
Event ID:        107
Task Category: Management
Level:           Error
Keywords:        Classic
Description:     Report Server (DENALI) cannot connect to the report server database.
```

For more information, see SQL Server 2014 Reporting Services Tips, Tricks, and Troubleshooting.

Required Upgrade Order for Multi-node SharePoint Farm to SQL Server 2014 Reporting Services

Issue: Report rendering in a multi-node farm fails if instances of the Reporting Services SharePoint Shared Service are upgraded before all instances of the Reporting Services Add-in for SharePoint Products.

Workaround: In a multi-node SharePoint farm:

1. First upgrade all instances of the Reporting Services Add-in for SharePoint Products.
2. Then upgrade all instances of the Reporting Services SharePoint Shared Service.

For more information, see SQL Server 2014 Reporting Services Tips, Tricks, and Troubleshooting

SQL Server 2014 RTM on Windows Azure Virtual Machines

The Add Azure Replica Wizard returns an error when configuring an Availability Group Listener in Windows Azure

Issue: If an Availability Group has a Listener, the Add Azure Replica Wizard will return an error when trying to configure the Listener in Windows Azure.

This issue is because Availability Group Listeners require assigning one IP address in every subnet hosting Availability Group replicas, including the Azure subnet.

Workaround:

1. In the Listener page, assign a free static IP address in the Azure subnet that will host the Availability Group replica to the Availability Group Listener.

   This workaround will allow the Wizard to complete adding the replica in Windows Azure.

2. After the Wizard completes, you will need to finish the configuration of the Listener in Windows Azure as described in Listener Configuration for AlwaysOn Availability Groups in Windows Azure

Analysis Services (RTM)

MSOLAP.5 must be downloaded, installed, and registered for a SharePoint 2010 new farm configured with SQL Server 2014

Issue:

- For a SharePoint 2010 MSOLAP.5 must be downloaded, installed and registered for a SharePoint 2013 new farm configured with SQL Server 2014farm configured with a SQL Server 2014 RTM deployment, PowerPivot workbooks cannot connect to data models because the provider referenced in the connection string is not installed.

Workaround:

1. Download the MSOLAP.5 provider from the SQL Server 2012 SP1 (11.0.3x) Feature Pack. Install the provider on the application servers running Excel Services. For more information, see the section "Microsoft Analysis Services OLE DB Provider for Microsoft SQL Server 2012 SP1" Microsoft SQL Server 2012 SP1 Feature Pack.

2. Register MSOLAP.5 as a trusted provider with SharePoint Excel Services. For more information, see Add MSOLAP.5 as a Trusted Data Provider in Excel Services.

More Information:

- SQL Server 2014 (12.x) includes MSOLAP.6. SQL Server 2012 (11.x) and SQL Server 2014 (12.x) Power Pivot workbooks use MSOLAP.5. If MSOLAP.5 is not installed on the computer running Excel Services, Excel Services cannot load the data models.

MSOLAP.5 must be downloaded, installed and registered for a SharePoint 2013 new farm configured with SQL Server 2014

Issue:

- For a SharePoint 2013 farm configured with a SQL Server 2014 (12.x) deployment, Excel workbooks referencing the MSOLAP.5 provider cannot connect to tabula data models because the provider referenced in the connection string is not installed.

Workaround:

1. Download the MSOLAP.5 provider from the SQL Server 2012 SP1 (11.0.3x) Feature Pack. Install the provider on the application servers running Excel Services. For more information, see the section "Microsoft Analysis Services OLE DB Provider for Microsoft SQL Server 2012 SP1" Microsoft SQL Server 2012 SP1 Feature Pack.

2. Register MSOLAP.5 as a trusted provider with SharePoint Excel Services. For more information, see Add MSOLAP.5 as a Trusted Data Provider in Excel Services.

More Information:

- SQL Server 2014 (12.x) includes MSOLAP.6. but SQL Server 2014 PowerPivot workbooks use MSOLAP.5. If MSOLAP.5 is not installed on the computer running Excel Services, Excel Services cannot load the data models.

Corrupt Data Refresh Schedules (RTM)

Issue:

- You update a refresh schedule and the schedule becomes corrupt and unusable.

Workaround:

1. In Microsoft Excel, clear the custom advanced properties. See the "Workaround" section of the following knowledge base article KB 2927748.

More Information:

- If the serialized length of the refresh schedule is smaller than the original schedule, when you update a data refresh schedule for a workbook the buffer size is not correctly updated and the new schedule information is merged with the old schedule information resulting in a corrupt schedule.

Data Quality Services (RTM)

No cross-version support for Data Quality Services in Master Data Services

Issue: The following scenarios are not supported:

- Master Data Services 2014 hosted in a SQL Server Database Engine database in SQL Server 2012 with Data Quality Services 2012 installed.

- Master Data Services 2012 hosted in a SQL Server Database Engine database in SQL Server 2014 with Data Quality Services 2014 installed.

Workaround: Use the same version of Master Data Services as the Database Engine database and Data Quality Services.

Upgrade Advisor Issues (RTM)

SQL Server 2014 Upgrade Advisor reports irrelevant upgrade issues for SQL Server Reporting Services

Issue: SQL Server Upgrade Advisor (SSUA) shipped with the SQL Server 2014 media incorrectly reports multiple errors when analyzing SQL Server Reporting Services server.

Workaround: This issue is fixed in the SQL Server Upgrade Advisor provided in the SQL Server 2014 Feature Pack for SSUA.

SQL Server 2014 Upgrade Advisor reports an error when analyzing SQL Server Integration Services server

Issue: SQL Server Upgrade Advisor (SSUA) shipped with the SQL Server 2014 media reports an error when analyzing SQL Server Integration Services server. The error that is displayed to the user is:

```
The installed version of Integration Services does not support Upgrade Advisor.
The assembly information is "Microsoft.SqlServer.ManagedDTS, Version=11.0.0.0,
Culture=neutral, PublicKeyToken=89845dcd8080cc91
```

Workaround: This issue is fixed in the SQL Server Upgrade Advisor provided in the SQL Server 2014 Feature Pack for SSUA.

ⓘ Get Help

- UserVoice - Suggestion to improve SQL Server?
- Setup and Upgrade - MSDN Forum
- SQL Server Data Tools - MSDN forum
- Transact-SQL - MSDN forum
- DBA Stack Exchange (tag sql-server) - ask SQL Server questions
- Stack Overflow (tag sql-server) - also has some answers about SQL development
- Reddit - general discussion about SQL Server
- Microsoft SQL Server License Terms and Information
- Support options for business users
- Contact Microsoft

SQL Server 2012 Service Pack release notes

5/3/2018 • 18 minutes to read • Edit Online

THIS TOPIC APPLIES TO: ✅SQL Server (starting with 2012) ❌Azure SQL Database ❌Azure SQL Data Warehouse ❌Parallel Data Warehouse

This topic contains the aggregated release notes of the four service packs for SQL Server 2012. Each service pack is cumulative of prior service packs.

The Service Packs are available online only, not on the installation media, and can be downloaded as follows:

- SQL Server 2012 SP4
- SQL Server 2012 SP3
- SQL Server 2012 SP2
- SQL Server 2012 SP1

Service Pack 4 release notes

Download pages
- SQL Server 2012 SP4 Feature Pack
- SQL Server 2012 SP4 Patch installation
- SQL Server 2012 SP4 Express

Performance and scale improvements

- **Improved distribution agent cleanup procedure** - An oversized distribution database caused blocking and deadlock situation. An improved cleanup procedure aims to eliminate some of these blocking or deadlock scenarios.

- **Dynamic Memory Object Scaling** - Dynamically partition memory objects based on number of nodes and cores to scale on modern hardware. The goal of dynamic promotion is to prevent potential bottlenecks and automatically partition a thread safe memory object. Unpartitioned memory objects can be dynamically promoted to be partitioned by node. The number of partitions equals the number of NUMA nodes. Memory objects partitioned by node can by further promoted to be partitioned by CPU, where the number of partitions equals number of CPUs.

- **Enable > 8TB for Buffer Pool** - Enable 128-TB Virtual address space for buffer pool usage

- **Change Tracking Cleanup** - Improved change tracking cleanup performance and efficiency for Change Tracking side tables.

Supportability and diagnostics improvements

- **Full dumps support for Replication Agents** - Today if replication agents encounter an unhandled exception, the default behavior is to create a mini dump of the exception symptoms. The default behavior requires complex troubleshooting steep for unhandled exceptions. SP4 introduces a new Registry key, which supports the creation of a full dump for Replication Agents.

- **Enhanced diagnostics in showplan XML** - Showplan XML has been enhanced to expose information about enabled trace flags, memory fractions for optimized nested loop join, CPU time, and elapsed time.

- **Better correlation between diagnostics XE and DMVs** - Query_hash and query_plan_hash fields are used for identifying a query uniquely. DMV defines them as varbinary(8), while XEvent defines them as UINT64. Since SQL server does not have "unsigned bigint", casting does not always work. This improvement introduces new XEvent action/filter columns equivalent to query_hash and query_plan_hash except they are defined as INT64 which can help correlating queries between XE and DMVs.

- **Better memory grant/usage diagnostics** - New query_memory_grant_usage XEvent (backport from Server 2016 SP1)
- **Add protocol tracing to SSL negotiation steps** - Add bit trace information for successful/failed negotiation, including the protocol etc. Can be useful when troubleshooting connectivity scenarios while, for example, deploying TLS 1.2
- **Setting correct compatibility level for distribution database** - After Service Pack Installation the Distribution database compatibility level changes to 90. The level change was due to an issue in sp_vupgrade_replication stored procedure. The SP has now been changed to set the correct compatibility level for the distribution database.
- **New DBCC command for cloning a database** - Clone database is a new DBCC command added that allows power users such as CSS to trouble shoot existing production databases by cloning the schema and metadata, without the data. The call is performed with DBCC clonedatabase ('source_database_name', 'clone_database_name'). Cloned databases should not be used in production environments. To see if a database has been generated from a call to clone database you can use the following command, select DATABASEPROPERTYEX('clonedb', 'isClone').The return value of 1 is true, and 0 is false.
- **TempDB file and file size information in SQL Error Log** - If size and auto growth is different for TempDB data files during startup, print the number of files and trigger a warning.
- **IFI support messages in SQL Server Error Log** - Indicate in the error log that Database Instant File Initialization is enabled/disabled
- **New DMF to replace DBCC INPUTBUFFER** - A new Dynamic Management Function sys.dm_input_buffer that takes the session_id as parameter is introduced to replace DBCC INPUTBUFFER
- **XEvents enhancement for read routing failure for an Availability Group** - Currently the read_only_rout_fail XEvent only gets fired if there is a routing list present, but none of the servers in the routing list is available for connections. This improvement includes additional information to assist with troubleshooting and it also expands on the code points where the XEvent gets fired.
- **Improved handling of Service Broker with Availability group failover** - Currently when Service Broker is enabled on an Availability Group Databases, during an AG failover all Service broker connections that originated on the Primary Replica are left open. The improvement closes all such open connections during an AG failover.
- **Automatic Soft-NUMA partitioning** – With SQL 2014 SP2, Automatic Soft-NUMA partitioning is introduced when Trace Flag 8079 is enabled at the server level. When Trace Flag 8079 is enabled during startup, SQL Server 2014 SP2 interrogates the hardware layout and automatically configures Soft NUMA on systems reporting 8 or more CPUs per NUMA node. The automatic soft NUMA behavior is Hyperthread (HT/logical processor) aware. The partitioning and creation of additional nodes scales background processing by increasing the number of listeners, scaling, and network and encryption capabilities. It is recommended to first test the performance of the workload with Auto-Soft NUMA before it is turned ON in production.

Service Pack 3 release notes

Download pages

- SQL Server 2012 SP3 Feature Pack
- SQL Server 2012 SP3 Express

For more detailed information to identify the location and name of the file to download based on your currently installed version, see the "Select the correct file to download" section in SQL Server 2012 Service Pack 3 release information.

Service Pack 2 release notes

Download pages

- SQL Server 2012 SP2 Feature Pack

- SQL Server 2012 SP2 Express

Use the table below to identify the location and name of the file to download based on your currently installed version. Download pages have system requirements and basic installation instructions.

IF YOUR CURRENT INSTALLED VERSION IS...	AND YOU WANT TO...	DOWNLOAD AND INSTALL...
32-bit Installations:		
A 32-bit version of any edition of SQL Server 2012	Upgrade to the 32-bit version of SQL Server 2012 SP2	**SQLServer2012SP2-KB2958429--.exe** from SQL Server 2012 SP2 download page
A 32-bit version of SQL Server 2012 RTM Express	Upgrade to the 32-bit version of SQL Server 2012 Express SP2	**SQLEXPR__.msi** from SQL Server 2012 SP2 Express download page
A 32-bit version of only the client and manageability tools for SQL Server 2012 (including SQL Server 2012 Management Studio)	Upgrade the client and manageability tools to the 32-bit version of SQL Server 2012 SP2	**SQLEXPRWT__.msi** from SQL Server 2012 SP2 Express download page
A 32-bit version of SQL Server 2012 Management Studio Express	Upgrade to the 32-bit version of SQL Server 2012 SP2 Management Studio Express	**SQLManagementStudio__.msi** from SQL Server 2012 SP2 Express download page
A 32-bit version of any edition of SQL Server 2012 and a 32-bit version of the client and manageability tools (including SQL Server 2012 RTM Management Studio)	Upgrade all products to the 32-bit version of SQL Server 2012 SP2	**SQLEXPRADV__.msi** from SQL Server 2012 SP2 Express download page.
A 32-bit version of one or more tools from the Microsoft SQL Server 2012 RTM Feature Pack or the Microsoft SQL Server 2012 SP1 Feature Pack	Upgrade the tools to the 32-bit version of Microsoft SQL Server 2012 SP2 Feature Pack	One or more tools from Microsoft SQL Server 2012 SP2 Feature Pack download page
64-bit Installations:		
A 64-bit version of any edition of SQL Server 2012	Upgrade to the 64-bit version of SQL Server 2012 SP2	SQLServer2012SP2-KB2958429--.exe from SQL Server 2012 SP2 download page
A 64-bit version of SQL Server 2012 RTM Express	Upgrade to the 64-bit version of SQL Server 2012 SP2	**SQLEXPR__.msi** from SQL Server 2012 SP2 Express download page
A 64-bit version of only the client and manageability tools for SQL Server 2012 (including SQL Server 2012 Management Studio)	Upgrade the client and manageability tools to the 64-bit version of SQL Server 2012 SP2	**SQLEXPRWT__.msi** from SQL Server 2012 SP2 Express download page
A 64-bit version of SQL Server 2012 Management Studio Express	Upgrade to the 64-bit version of SQL Server 2012 SP2 Management Studio Express	**SQLManagementStudio__.msi** from SQL Server 2012 SP2 Express download page
A 64-bit version of one or more tools from the Microsoft SQL Server 2012 RTM Feature Pack or the Microsoft SQL Server 2012 SP1 Feature Pack	Upgrade the tools to the 64-bit version of Microsoft SQL Server 2012 SP2 Feature Pack	One or more tools from Microsoft SQL Server 2012 SP2 Feature Pack download page

Service Pack 1 release notes

Download pages

- SQL Server 2012 SP1 Feature Pack
- SQL Server 2012 SP1 Express

Use the following table to determine which file to download and install. Verify that you have the correct system requirements before installing the service pack. The system requirements are provided on the download pages that are linked to in the table.

IF YOUR CURRENT INSTALLED VERSION IS...	AND YOU WANT TO...	DOWNLOAD AND INSTALL...
32-bit Installations:		
A 32-bit version of any edition of SQL Server 2012	Upgrade to the 32-bit version of SQL Server 2012 SP1	SQLServer2012SP1-KB2674319-x86-ENU.exe from here
A 32-bit version of SQL Server 2012 RTM Express	Upgrade to the 32-bit version of SQL Server 2012 Express SP1	SQLServer2012SP1-KB2674319-x86-ENU.exe from here
A 32-bit version of only the client and manageability tools for SQL Server 2012 (including SQL Server 2012 Management Studio)	Upgrade the client and manageability tools to the 32-bit version of SQL Server 2012 SP1	SQLManagementStudio_x86_ENU.exe from here
A 32-bit version of SQL Server 2012 Management Studio Express	Upgrade to the 32-bit version of SQL Server 2012 SP1 Management Studio Express	SQLManagementStudio_x86_ENU.exe from here
A 32-bit version of any edition of SQL Server 2012 **and** a 32-bit version of the client and manageability tools (including SQL Server 2012 RTM Management Studio)	Upgrade all products to the 32-bit version of SQL Server 2012 SP1	SQLServer2012SP1-KB2674319-x86-ENU.exe from here
A 32-bit version of one or more tools from the Microsoft SQL Server 2012 RTM Feature Pack	Upgrade the tools to the 32-bit version of Microsoft SQL Server 2012 SP1 Feature Pack	One or more files from Microsoft SQL Server 2012 SP1 Feature Pack
No 32-bit installation of SQL Server 2012	Install 32-bit Server 2012 including SP1 (New instance with SP1 pre-installed)	SQLServer2012SP1-FullSlipstream-x86-ENU.exe **and** SQLServer2012SP1-FullSlipstream-x86-ENU.box from here
No 32-bit installation of SQL Server 2012 Management Studio	Install 32-bit SQL Server 2012 Management Studio including SP1	SQLManagementStudio_x86_ENU.exe from here
No 32-bit version of SQL Server 2012 RTM Express	Install 32-bit SQL Server 2012 Express including SP1	SQLEXPR32_x86_ENU.exe from here
A 32-bit installation of **SQL Server 2008** or **SQL Server 2008 R2**	**In place upgrade** to 32-bit SQL Server 2012 including SP1	SQLServer2012SP1-FullSlipstream-x86-ENU.exe **and** SQLServer2012SP1-FullSlipstream-x86-ENU.box from here
64-bit Installations:		

IF YOUR CURRENT INSTALLED VERSION IS…	AND YOU WANT TO…	DOWNLOAD AND INSTALL…
A 64-bit version of any edition of SQL Server 2012	Upgrade to the 64-bit version of SQL Server 2012 SP1	SQLServer2012SP1-KB2674319-x64-ENU.exe from here
A 64-bit version of SQL Server 2012 RTM Express	Upgrade to the 64-bit version of SQL Server 2012 SP1	SQLServer2012SP1-KB2674319-x64-ENU.exe from here
A 64-bit version of only the client and manageability tools for SQL Server 2012 (including SQL Server 2012 Management Studio)	Upgrade the client and manageability tools to the 64-bit version of SQL Server 2012 SP1	SQLManagementStudio_x64_ENU.exe from here
A 64-bit version of SQL Server 2012 Management Studio Express	Upgrade to the 64-bit version of SQL Server 2012 SP1 Management Studio Express	SQLManagementStudio_x64_ENU.exe from here
A 64-bit version of any edition of SQL Server 2012 **and** a 64-bit version of the client and manageability tools (including SQL Server 2012 RTM Management Studio)	Upgrade all products to the 64-bit version of SQL Server 2012 SP1	SQLServer2012SP1-KB2674319-x64-ENU.exe from here
A 64-bit version of one or more tools from the Microsoft SQL Server 2012 RTM Feature Pack	Upgrade the tools to the 64-bit version of Microsoft SQL Server 2012 SP1 Feature Pack	One or more files from Microsoft SQL Server 2012 SP1 Feature Pack
No 64-bit installation of SQL Server 2012	Install 64-bit Server 2012 including SP1 (New instance with SP1 pre-installed)	SQLServer2012SP1-FullSlipstream-x64-ENU.exe **and** SQLServer2012SP1-FullSlipstream-x64-ENU.box from here
No 64-bit installation of SQL Server 2012 Management Studio	Install 64-bit SQL Server 2012 Management Studio including SP1	SQLManagementStudio_x64_ENU.exe from here
No 64-bit version of SQL Server 2012 RTM Express	Install 64-bit SQL Server 2012 Express including SP1	SQLEXPR_x64_ENU.exe from here
A 64-bit installation of **SQL Server 2008** or **SQL Server 2008 R2**	**In place upgrade** to 64-bit SQL Server 2012 including SP1	SQLServer2012SP1-FullSlipstream-x64-ENU.exe **and** SQLServer2012SP1-FullSlipstream-x64-ENU.box from here

Known Issues Fixed in this Service Pack

For a complete list of bugs and known issues fixed in this service pack, see this KB article.

Reinstalling instances of SQL Server Failover Cluster fails if you use the same IP address

Issue: If you specify an incorrect IP address during an installation of a SQL Server Failover Cluster instance, the installation fails. After you uninstall the failed instance, and if you try to reinstall the SQL Server failover cluster instance with the same instance name, and correct IP address, the installation fails. The failure is because of the duplicate resource group left behind by the previous installation.

Workaround: To resolve this issue, use a different instance name during the reinstallation, or manually delete the resource group before reinstalling. For more information, see Add or Remove Nodes in a SQL Server Failover Cluster.

Analysis Services and PowerPivot

PowerPivot configuration tool does not create the PowerPivot Gallery

Issue: The PowerPivot Configuration Tool provisions a Team Site, and therefore the PowerPivot Gallery is not

created.

Workaround: Create a new app (library).

1. Verify the site collection feature **PowerPivot Feature Integration for Site Collections** is active.

2. From the **Site Contents** page of an existing site, click **add app**.

3. Click **PowerPivot Gallery**.

To use PowerPivot for Excel with Excel 2013, you must use the add-in that is installed with Excel
Issue: With Office 2010, PowerPivot for Excel is a stand-alone add-in that is downloadable from
http://www.microsoft.com/bi/powerpivot.aspx. Alternatively it can also be downloaded from the Microsoft
Download Center. Note that there are two versions of the PowerPivot add-in available as a download: One that
shipped with SQL Server 2008 R2 and another that shipped with SQL Server 2012. However, for Office 2013,
PowerPivot for Excel ships with Office and is installed when you install Excel. While the SQL Server 2008 R2 and
SQL Server 2012 versions of PowerPivot for Excel 2010 are not compatible with Excel 2013, you still can install
PowerPivot for Excel 2010 on your client computer if you want to run Excel 2010 side-by-side with Excel 2013. In
other words, the two versions of Excel can coexist and so can the corresponding PowerPivot add-ins.

Workaround: To use PowerPivot for Excel 2013 you must enable the COM add-in. From Excel 2013, select **File** |
Options | **Add-Ins**. From the **Manage** drop-down box, select **COM Add-ins** and click **Go**. From **COM Add-ins**,
select **Microsoft Office PowerPivot for Excel 2013** and click **Okay**.

Reporting Services
Install and Configure SharePoint Server 2013 prior to installing Reporting Services
Issue: Complete the following requirements **before** you install SQL Server Reporting Services (SSRS).

1. Run the SharePoint 2013 Products Preparation Tool.

2. Install SharePoint Server 2013.

3. Run the SharePoint 2013 Product Configuration Wizard, or complete an equivalent set of configuration
   steps to configure the SharePoint farm.

Workaround: If you installed Reporting Services SharePoint mode before the SharePoint farm was configured,
the required work around depends on what other components are installed.

Power View in SharePoint Server 2013 Requires Microsoft.AnalysisServices.SPClient.dll
Issue: Reporting Services does not install a required component, **Microsoft.AnalysisServices.SPClient.dll**. If
you install SharePoint Server 2013 Preview and SQL Server 2012 SP1 (11.0.3x) Reporting Services in SharePoint
mode, but do not download and install the PowerPivot for SharePoint 2013 installer package, **spPowerPivot.msi**
then Power View will not work and Power View will exhibit the following symptoms.

Symptoms: When you attempt to create a Power View report, you see an error message similar to the following:

- "Cannot create a connection to data source..."

The inner error details will contain a message similar to the following:

- "The value 'SharePoint Principal' is not supported for the connection string property 'User Identity'."

Workaround: Install the PowerPivot for SharePoint 2013 installer package (**spPowerPivot.msi**) on the
SharePoint Server 2013. The installer package is available as part of the SQL Server 2012 SP1 (11.0.3x) feature
pack. The feature pack can be downloaded from the Microsoft download center at SQL Server 2012 SP1 Feature
Pack

Power View sheets in a PowerPivot workbook are deleted after a scheduled data refresh
Issue: In the PowerPivot add-in for SharePoint, using **Scheduled Data Refresh** on a workbook with Power View
will delete any Power View sheets.

Workaround: To use **Scheduled Data Refresh** with Power View workbooks, create a PowerPivot workbook that is just the data model. Create a separate workbook with your Excel sheets and Power View sheets that links to the PowerPivot workbook with the data model. Only the PowerPivot workbook with the data model should be scheduled for data refresh.

Data Quality Services

DQS available in the incorrect edition of SQL Server 2012

Issue: In the SQL Server 2012 (11.x) RTM release, the Data Quality Services (DQS) feature is available in SQL Server editions other than the Enterprise, Business Intelligence, and Developer editions. After installing SQL Server 2012 SP1, DQS will be unavailable in all editions except the Enterprise, Business Intelligence, and Developer editions.

Workaround: If you are using DQS in a unsupported edition, either upgrade to a supported edition or remove the dependency on this feature from your applications.

SQL Server Express

Full Version of SQL Server Management Studio Available in SQL Server 2012 Express SP1

The SQL Server 2012 Express Service Pack 1 (SP1) release includes the full version of SQL Server 2012 Management Studio (which was previously available only on the SQL Server 2012 DVD) instead of SQL Server 2012 Management Studio Express. To download and install SQL Server 2012 Express SP1, see SQL Server 2012 Express Service Pack 1.

Change Data Capture Service and Designer for Oracle by Attunity

Upgrading the CDC Service and Designer

Issue: If the Change Data Capture Designer for Oracle and the Change Data Capture Service for Oracle by Attunity are installed on your machine at the time that you install SQL Server 2012 SP1, these components are not upgraded by installing SP1.

Workaround: To upgrade the CDC components to the latest version:

1. Download the .msi files for Change Data Capture Service for Oracle by Attunity from the SQL Server 2012 SP1 Feature Pack download page.

2. Run the .msi file.

SQL Server Data-Tier Application Framework (DACFx)

In-place Upgrade Support

This version of the Data-Tier Application Framework (DACFx) supports in-place upgrade from previous versions, so it is not required to remove previous DACFx installations before upgrading to this release. You can find future releases of DACFx here.

Support for Selective XML Index

SQL Server 2012 SP1 includes support for Selective XML Index (SXI), a new SQL Server feature that provides a new way of indexing XML column data with increased performance and efficiency.

DACFx now supports SXI indexes across all DAC scenarios and client tools. SXI is only supported in the latest version of SSDT. SSDT RTM and September 2012 versions do not support SXI.

Support for Native BCP data format

Previously, the data format used to store table data inside DACPAC and BACPAC packages was JSON. With this update, Native BCP is now the data persistence format. This change brings improved SQL Server data type fidelity to DACFx including support for SQL_Variant types as well as enhanced data deployment performance for large scale databases.

Preservation of Check Constraint state across package creation/deployment

Previously, DACFx did not preserve the state (WITH CHECK/NOCHECK) of check constraints defined on tables in the database schema or store this information inside DACPACs. This behavior could lead to potential issues on package deployment when there is existing table data that violates check constraints. With this update, DACFx now stores the current state of check constraints within the DACPAC when extracted from a database and appropriately restores this state upon package deployment.

Updates to SqlPackage.exe (DACFx command-line tool)

- Extract DACPAC with data – Creates a database snapshot file (.dacpac) from a live SQL Server or Windows Azure SQL Database that contains data from user tables in addition to the database schema. These packages can be published to a new or existing SQL Server or Windows Azure SQL Database using the SqlPackage.exe Publish action. Data contained in package replaces the existing data in the target database.

- Export BACPAC - Creates a logical backup file (.bacpac) of a live SQL Server or Windows Azure SQL Database containing the database schema and user data which can be used to migrate a database from on-premise SQL Server to Windows Azure SQL Database. Databases compatible with Azure can be exported and then later imported between supported versions of SQL Server.

- Import BACPAC – Import a .bacpac file to create a new or populate an empty SQL Server or Windows Azure SQL Database.

Full SqlPackage.exe documentation on MSDN can be found here.

Package compatibility

This release introduces several forward compatibility scenarios for DAC packages.

- DAC packages created by this release that do not contain SXI elements or table data may be consumed by previous releases of DACFx (SQL Server 2012 RTM, SQL Server 2012 CU1, and DACFx September, 2012).

- All DAC packages created by previous versions of DACFx can be consumed by this release.

See Also

- Install SQL Server 2012 Servicing Updates
- How to identify your SQL Server version and edition
- Install SQL Server 2012 Servicing Updates
- How to identify your SQL Server version and edition
- How to determine the version and edition of SQL Server
- Features Supported by the Editions of SQL Server 2014

ⓘ Get Help

- UserVoice - Suggestion to improve SQL Server?
- Setup and Upgrade - MSDN Forum
- SQL Server Data Tools - MSDN forum
- Transact-SQL - MSDN forum
- DBA Stack Exchange (tag sql-server) - ask SQL Server questions
- Stack Overflow (tag sql-server) - also has some answers about SQL development
- Reddit - general discussion about SQL Server
- Microsoft SQL Server License Terms and Information
- Support options for business users
- Contact Microsoft

SQL Server 2012 Release Notes

5/3/2018 • 36 minutes to read • Edit Online

THIS TOPIC APPLIES TO: ✅ SQL Server (starting with 2012) ❌ Azure SQL Database ❌ Azure SQL Data Warehouse ❌ Parallel Data Warehouse

This Release Notes document describes known issues that you should read about before you install or troubleshoot Microsoft SQL Server 2012 (click here to download it). This Release Notes document is available online only, not on the installation media, and it is updated periodically.

For information about how to get started and install SQL Server 2012, see the SQL Server 2012 Readme. The Readme document is available on the installation media and from the Readme download page. You can also find more information in SQL Server Books Online and on the SQL Server Forums.

1.0 Before You Install

Before installing SQL Server 2017, consider the following information.

1.1 Rules Documentation for SQL Server 2012 Setup

Issue: SQL Server Setup validates your computer configuration before the Setup operation completes. The various rules that are run during the SQL Server Setup operation are captured using the System Configuration Checker (SCC) report. The documentation about these setup rules is no longer available on the MSDN library.

Workaround : You can refer to the system configuration check report to learn more about these setup rules. The system configuration check generates a report that contains a short description for each executed rule, and the execution status. The system configuration check report is located at %programfiles%\Microsoft SQL Server\110\Setup Bootstrap\Log\<YYYYMMDD_HHMM>\.

1.2 Adding a Local User Account for the Distributed Replay Controller Service Might Terminate Setup Unexpectedly

Issue: In the **Distributed Replay Controller** page of SQL Server setup, when attempting to add a local user account for the Distributed Replay Controller service, setup will be terminated unexpectedly with a "SQL Server Setup failure" error message.

Workaround: During SQL setup, do not add local user accounts via either "Add Current User" or "Add...". After setup, add a local user account manually by using the following steps:

1. Stop the SQL Server Distributed Replay controller service

2. On the controller computer on which the controller service is installed, from the command prompt, type dcomcnfg.

3. In the Component Services window, navigate to **Console Root** -> **Component Services** -> **Computers** -> **My Computer** -> **Dconfig** ->**DReplayController**.

4. Right-click **DReplayController**, and then click **Properties**.

5. In the **DReplayController Properties** window, on the **Security** tab, click **Edit** in the **Launch and Activation Permissions** section.

6. Grant the local user account **Local and Remote activation** permissions, and then click **OK**.

7. In the Access Permissions section, click **Edit** and grant the local user account **Local and Remote access** permissions, and then click **OK**.

8. Click **OK** to close the **DReplayController Properties** window.

9. On the controller computer, add the local user account to the **Distributed COM Users** group.

10. Start the SQL Server Distributed Replay controller service.

1.3 SQL Server Setup might fail while trying to start the SQL Server Browser service

Issue: SQL Server Setup might fail while trying to start the SQL Server Browser service, with errors similar to the following:

```
The following error has occurred:
Service 'SQLBrowser' start request failed. Click 'Retry' to retry the failed action, or click
'Cancel' to cancel this action and continue setup.
```

or

```
The following error has occurred:
SQL Server Browser configuration for feature 'SQL_Browser_Redist_SqlBrowser_Cpu32' was cancelled by
user after a previous installation failure. The last attempted step: Starting the SQL Server
Browser service 'SQLBrowser', and waiting for up to '900' seconds for the process to complete.
```

Workaround: This can happen when SQL Server Engine or Analysis Services fails to install. To fix this issue, refer the SQL Server Setup logs, and troubleshoot the SQL Server Engine and Analysis Services failures. For more information, see View and Read SQL Server Setup Log Files. For more information, see View and Read SQL Server Setup Log Files.

1.4 SQL Server 2008, 2008 R2 Analysis Services Failover Cluster upgrade to SQL Server 2012 might fail after renaming the network name

Issue: After you change the network name of a Microsoft SQL Server 2008, or 2008 R2 Analysis Services failover cluster instance using the Windows Cluster Administrator tool, the upgrade operation might fail.

Workaround: To resolve this issue update the ClusterName registry entry following the instructions in the resolution section of this KB article.

1.5 Installing SQL Server 2012 on Windows Server 2008 R2 Server Core Service Pack 1

You can install SQL Server on Windows Server 2008 R2 Server Core SP1, with the following limitations:

- Microsoft SQL Server 2012 does not support Setup using the installation wizard on the Server Core operating system. When installing on Server Core, SQL Server Setup supports full quiet mode by using the /Q parameter, or Quiet Simple mode by using the /QS parameter.

- Upgrade of an earlier version of SQL Server to Microsoft SQL Server 2012 is not supported on a computer that is running Windows Server 2008 R2 Server Core SP1.

- Installing a 32-bit version of Microsoft SQL Server 2012 edition is not supported on a computer running Windows Server 2008 R2 Server Core SP1.

- Microsoft SQL Server 2012 cannot be installed side-by-side with earlier versions of SQL Server on a computer that is running Windows Server 2008 R2 Server Core SP1.

- Not all features of SQL Server 2012 are supported on the Server Core operating system. For more information on features supported, and on installing SQL Server 2012 on Server Core, see Install SQL Server 2012 on Server Core.

1.6 Semantic Search Requires You to Install an Additional Dependency

Issue: Statistical Semantic Search has an additional prerequisite, the semantic language statistics database, which is not installed by the SQL Server Setup program.

Workaround: To set up the semantic language statistics database as a prerequisite for semantic indexing, perform the following tasks:

1. Locate and run the Windows Installer package named SemanticLanguageDatabase.msi on the SQL Server installation media to extract the database. For SQL Server 2012 Express, download the semantic language statistics database from Microsoft Download Center (http://go.microsoft.com/fwlink/?LinkId=221787), and then run the Windows Installer package.

2. Move the database to an appropriate data folder. If you leave the database in the default location, you must change permissions before you can attach it successfully.

3. Attach the extracted database.

4. Register the database by calling the stored procedure **sp_fulltext_semantic_register_language_statistics_db** and providing the name that you gave to the database when you attached it.

If these tasks are not completed, you will see the following error message when you try to create a semantic index.

```
Msg 41209, Level 16, State 3, Line 1
A semantic language statistics database is not registered. Full-text indexes using
'STATISTICAL_SEMANTICS' cannot be created or populated.
```

1.7 Installation Prerequisite Handling During SQL Server 2012 Setup

The following items describe the prerequisite installation behavior during SQL Server 2012 Setup:

- Installing SQL Server 2012 is supported only on Windows 7 SP1 or Windows Server 2008 R2 SP1. However, Setup does not block installing SQL Server 2012 on Windows 7 or Windows Server 2008 R2.

- The .NET Framework 3.5 SP1 is a requirement for SQL Server 2012 when you select Database Engine, Replication, Master Data Services, Reporting Services, Data Quality Services (DQS), or SQL Server Management Studio, and the framework is no longer installed by SQL Server Setup.

  - If you run Setup on a computer with either the Windows Vista SP2 or Windows Server 2008 SP2 operating system and you do not have the .NET Framework 3.5 SP1 installed, SQL Server Setup requires you to download and install the .NET Framework 3.5 SP1 before you can continue with the SQL Server installation. You can download the .NET Framework 3.5 SP1 from Windows Update or directly from here. To avoid interruption during SQL Server Setup, download and install the .NET Framework 3.5 SP1 before you run SQL Server Setup.

  - If you run Setup on a computer with either the Windows 7 SP1 or Windows Server 2008 R2 SP1 operating system, you must enable the .NET Framework 3.5 SP1 before you install SQL Server 2012.

    Use one of the following methods to enable .NET Framework 3.5 SP1 on Windows Server 2008 R2 SP1:

    Method 1: Use Server Manager

    1. In Server Manager, click **Add Features** to display a list of possible features.

    2. In the **Select Features** interface, expand the **.NET Framework 3.5.1 Features** entry.

    3. After you expand **.NET Framework 3.5.1 Features**, you see two check boxes. One check box is for .NET Framework 3.5.1 and other check box is for WCF Activation. Select **.NET Framework 3.5.1**, and then click **Next**. You cannot install .NET Framework 3.5.1 features unless the required role services and features are also installed.

    4. In the **Confirm Installation Selections**, review the selections, and then click Install.

5. Let the installation process complete, and then click **Close**.

Method 2: Use Windows PowerShell

1. Click **Start** | **All Programs** | **Accessories**.

2. Expand **Windows PowerShell**, right-click **Windows PowerShell**, and click **Run as administrator**. Click **Yes** in the **User Account Control** box.

3. At the PowerShell command prompt, type the following commands and press ENTER after each command:

    ```
    Import-Module ServerManager
    Add-WindowsFeature as-net-framework
    ```

Use the following method to enable .NET Framework 3.5 SP1 on Windows 7 SP1:

1. Click **Start** | **Control Panel** | **Programs**, and then click **Turn Windows features on or off**. If you are prompted for an administrator password or confirmation, type the password or provide confirmation.

2. To enable **Microsoft .NET Framework 3.5.1**, select the check box next to the feature. To turn a Windows feature off, clear the check box.

3. Click **OK**.

Use Deployment Image Servicing and Management (DISM.exe) to enable .NET Framework 3.5 SP1:

You can also enable .NET Framework 3.5 SP1 using Deployment Image Servicing and Management (DISM.exe). For more information about enabling windows features online, see Enable or Disable Windows Features Online. The following are the instructions to enable .NET Framework 3.5 SP1:

1. At the command prompt, type the following command to list all of the features available in the operating system.

    ```
    sm /online /Get-Features
    ```

2. Optional: At the command prompt, type the following command to list information about the specific feature you are interested in.

    ```
    Dism /online /Get-FeatureInfo /FeatureName:NetFx3
    ```

3. Type the following command to enable a Microsoft .NET Framework 3.5.1.

    ```
    Dism /online /Enable-Feature /FeatureName:NetFx3
    ```

-   The .NET Framework 4 is a requirement for SQL Server 2012 . SQL Server Setup installs the .NET Framework 4 during the feature installation step.

SQL Server 2012 Express does not install the .NET Framework 4 when installing on the Windows Server 2008 R2 SP1 Server Core operating system. When installing SQL Server 2012 Express (Database only) .NET Framework 4 is not required if .NET Framework 3.5 SP1 is present. When .NET Framework 3.5 SP1 is not present or when installing SQL Server 2012 Management Studio Express, SQL Server 2012 Express with Tools, or SQL Server 2012 Express with Advanced Services, you must install the .NET Framework 4

before you install SQL Server2012 Express on a Windows Server 2008 R2 SP1 Server Core operating system.

- To make sure that the Visual Studio component can be installed correctly, SQL Server requires you to install an update. SQL Server Setup checks for the presence of this update and then requires you to download and install the update before you can continue with the SQL Server installation. To avoid the interruption during SQL Server Setup, you can download and install the update as described below before running SQL Server Setup (or you can install all the updates for the .NET Framework 3.5 SP1 that are available on Windows Update):

  - If you install SQL Server 2012 on a computer with the Windows Vista SP2 or Windows Server 2008 SP2 operating system, you can get the required update from here.

  - If you install SQL Server 2012 on a computer with the Windows 7 SP1 or Windows Server 2008 R2 SP1 operating system, this update is already installed on the computer.

- Windows PowerShell 2.0 is a prerequisite for installing SQL Server 2012 Database Engine components and SQL Server Management Studio, but Windows PowerShell is no longer installed by SQL Server Setup. If PowerShell 2.0 is not present on your computer, you can enable it by following the instructions on the Windows Management Framework page. How you get Windows PowerShell 2.0 depends on which operating system you are running:

  - Windows Server 2008 – Windows PowerShell 1.0 is a feature and can be added. Windows PowerShell 2.0 versions are downloaded and installed (effectively as an OS Patch).

  - Windows 7/Windows Server 2008 R2 – Windows PowerShell 2.0 are installed by default.

- If you plan to use SQL Server 2012 features in a SharePoint environment, then SharePoint Server 2010 Service Pack 1 (SP1) and the SharePoint August Cumulative Update is required. You must install SP1, the SharePoint August Cumulative Update, and fully patch the server farm before you add SQL Server 2012 features to the farm. This requirement applies to the following SQL Server 2012 features: using an instance of Database Engine as the farm's database server, configuring PowerPivot for SharePoint, or deploying Reporting Services in SharePoint mode.

1.8 Supported Operating Systems for SQL Server 2012

SQL Server 2012 is supported on the Windows Vista SP2, Windows Server 2008 SP2, Windows 2008 R2 SP1, and Windows 7 SP1 operating systems.

1.9 Sync Framework Is Not Included in the Installation Package

Issue: Sync Framework is not included in the SQL Server 2012 installation package.

Workaround: Download the appropriate version of Sync Framework from this Microsoft Download Center page.

1.10 If Visual Studio 2010 Service Pack 1 is uninstalled, the SQL Server 2012 instance must be repaired to restore certain components

Issue: SQL Server 2012 (11.x) installation is dependent on some components of the Visual Studio 2010 Service Pack 1. If you uninstall Service Pack 1, some of the shared components are downgraded to their original versions, and a few other components are completely removed from the machine.

Workaround: Repair the instance of SQL Server 2012 (11.x) from the original source media or network installation location.

1. Launch the SQL Server Setup program (setup.exe) from SQL Server installation media.

2. After prerequisites and system verification, the Setup program will display the **SQL Server Installation Center** page.

3. Click **Maintenance** in the left-hand navigation area, and then click **Repair** to start the repair operation. If

the Installation Center was launched using the **Start** menu, you will need to provide the location of the installation media at this time.

4. Setup support rule and file routines will run to ensure that your system has prerequisites installed and that the computer passes Setup validation rules. Click **OK** or **Install** to continue.

5. On the **Select Instance** page, select the instance to repair, and then click **Next** to continue.

6. The repair rules will run to validate the operation. To continue, click **Next**.

7. The **Ready to Repair** page indicates that the operation is ready to proceed. To continue, click **Repair**.

8. The **Repair Progress** page shows the status of the repair operation. The **Complete** page indicates that the operation is finished.

For more information on how to repair an instance of SQL Server, see Repair a Failed SQL Server 2012 Installation.

1.11 An instance of SQL Server 2012 might fail after an OS upgrade

Issue: An instance of SQL Server 2012 might fail with the following error after you upgrade the operating system to Windows 7 SP1 from Windows Vista.

```
Setup has detected that the .NET Framework version 4 needs to be repaired. Do not restart your computer until
Setup is complete.
```

Workaround: Repair your installation of the .NET Framework 4 after you upgrade your operating system. For more information, see How to repair an existing installation of the.NET Framework.

1.12 SQL Server Edition upgrade requires a restart

Issue: When you edition upgrade an instance of SQL Server 2012, some of the functionalities associated with the new edition might not be activated immediately.

Workaround: Restart the machine after the edition upgrade of an instance of SQL Server 2012. For more information about supported upgrades in SQL Server 2012, see Supported Version and Edition Upgrades.

1.13 Database with read-only filegroup or files cannot be upgraded

Issue: You cannot upgrade a database by either attaching the database or restoring the database from backup if the database or its files/filegroups are set to read-only. Error 3415 is returned. This issue also applies when performing an in-place upgrade of an instance of SQL Server. That is, you attempt to replace an existing instance of SQL Server by installing SQL Server 2012 and one or more of the existing databases is set to read-only.

Workaround: Before upgrading, ensure that the database and its files/filegroups are set to read-write.

1.14 Reinstalling an instance of SQL Server Failover Custer fails if you use the same IP address

Issue: If you specify an incorrect IP address during an installation of a SQL Server Failover Cluster instance, the installation fails. After you uninstall the failed instance, and if you try to reinstall the SQL Server failover cluster instance with the same instance name, and correct IP address, the installation fails. The failure is because of the duplicate resource group left behind by the previous installation.

Workaround: To resolve this issue, use a different instance name during the reinstallation, or manually delete the resource group before reinstalling. For more information, see Add or Remove Nodes in a SQL Server Failover Cluster.

2.0 Analysis Services

2.1 SQL editor and AS editor cannot connect to their respective server instances in the same SSMS instance

Issue: Cannot connect to an Analysis Services server using the MDX/DMX editor when the SQL editor is already connected.

When using SQL Server Management Studio 2012 (SSMS), if a .sql file is open in the editor and is connected to a SQL Server instance, an MDX or DMX file when opened in the same instance of SSMS cannot connect to an instance of AS server. Likewise, if an MDX or DMX file is already open in the editor in SSMS and connected to an AS server instance, a .sql file when opened in the same instance of SSMS cannot connect to an instance of SQL Server.

Workaround: Use one of the following options to resolve this issue.

- Start another instance of SSMS to open the MDX / DMX file.

- Disconnect the SQL editor and then connect the MDX / DMX editor to an AS server.

2.2 Cannot Create or Open Tabular Projects When BUILTIN\Administrators Group Name Cannot Be Resolved

Issue: You must be an administrator on a workspace database server before you can create or open tabular projects. A user can be added to the server administrators group by adding the user name or group name. If you are a member of the BUILTIN\Administrator group, you cannot create or edit BIM files unless the workspace database server is joined to the domain from which it was originally provisioned. If you open or create the BIM file, it will fail with the following error message:

```
"The BIM file cannot be opened. The server connected to is not valid. Reason: You are not an administrator of
server [server name]."
```

Workarounds:

- Re-join the workspace database server and SQL Server Data Tools (SSDT) computer to the domain.

- If the workspace database server and/or SSDT computers are not going to be domain joined at all times, add individual user names instead of the BUILTIN\Administrators group as administrators on the workspace database server.

2.3 SSIS Components for AS Tabular Models Do Not Work as Expected

SQL Server Integration Services (SSIS) components for Analysis Services (AS) do not work as expected for tabular models. The following are known issues that may occur when you try to write an SSIS package for working with tabular models.

Issue: The AS Connection Manager cannot use a tabular model in the same solution as a data source.

Workaround: You must explicitly connect to the AS server before configuring the AS Processing Task or the AS Execute DDL Task.

There are problems with the AS Processing Task when you work with tabular models:

Issue: Instead of databases, tables, and partitions, you see cubes, measure groups, and dimensions. This is a limitation of the task.

Workaround: You can still process your tabular model using the cube/measure group/dimension structure.

Issue: Some processing options supported by AS running in tabular mode are not exposed in the AS Processing Task, such as Process Defrag.

Workaround: Use the Analysis Services Execute DDL task instead to execute an XMLA script that contains the ProcessDefrag command.

Issue: Some configuration options in the tool are not applicable. For example, "Process related objects" should not be used when processing partitions, and the "Parallel Processing" configuration option contains an invalid error message stating that parallel processing is not supported on the Standard SKU.

Workaround: None

3.0 Books Online

3.1 Help Viewer for SQL Server Crashes in Environments Configured to Run Only IPv6

Issue: If your environment is configured to run only IPv6, the Help Viewer for SQL Server 2012 will crash, and you will be presented with the following error message:

```
HelpLibAgent.exe has stopped working.
```

> **IMPORTANT**
>
> This applies to all environments running with only IPv6 enabled. IPv4 (and IPv4 with IPv6) enabled environments are not impacted.

Workaround: To avoid this issue, enable IPv4, or use the following steps to add a registry entry and create an ACL to enable the Help viewer for IPv6:

1. Create a registry key with the name "IPv6" and a value of "1 (DWORD(32 bit))" under HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Help\v1.0.

2. Set the security ACL's for the port for IPv6, executing the following from an admin CMD window:

   ```
   netsh http add urlacl url=http://[::1]:47873/help/ sddl=D:(A;;GX;;;WD)
   ```

4.0 Data Quality Services

4.1 DQS Not Supported in a Cluster

Issue: DQS is not supported in a SQL Server cluster installation. If you are installing a cluster instance of SQL Server, you must not select the **Data Quality Services** and **Data Quality Client** check boxes on the **Feature Selection** page. If these check boxes are selected during cluster instance installation (and you complete the Data Quality Server installation by running the DQSInstaller.exe file), DQS will be installed on this node, but will not be available on additional nodes when you add more nodes to the cluster, and hence will not work on additional nodes.

Workaround: Install SQL Server 2012 Cumulative Update 1 to resolve this issue. For instructions, see http://support.microsoft.com/kb/2674817.

4.2 To Reinstall Data Quality Server, Delete the DQS Objects After Uninstalling Data Quality Server

Issue: If you uninstall the Data Quality Server, the DQS objects (DQS databases, DQS logins, and a DQS stored procedure) are not deleted from the SQL Server instance.

Workaround: To reinstall Data Quality Server on the same computer and in the same SQL Server instance, you must manually delete the DQS objects from the SQL Server instance. Additionally, you must also delete the DQS databases (DQS_MAIN, DQS_PROJECTS, and DQS_STAGING_DATA) files from the C:\Program Files\Microsoft SQL Server\MSSQL11.<SQL_Server_Instance>\MSSQL\DATA folder on your computer before you reinstall Data Quality Server. Otherwise, the Data Quality Server installation fails. Move the database files instead of deleting them if you want to preserve data, such as knowledge bases or data quality projects. For more information about removing DQS objects after the uninstall process is complete, see Remove Data Quality Server Objects.

4.3 Indication of a Terminated Knowledge Discovery or Interactive Cleansing Activity is Delayed

Issue: If an administrator terminates an activity in the Activity Monitoring screen, an interactive user who is running the knowledge discovery, domain management, or interactive cleansing activity will not receive any indication that his or her activity was terminated until he or she performs the next operation.

Workaround: None

4.4 A Cancel Operation Discards Work from Multiple Activities

Issue: If you click **Cancel** for a running knowledge discovery or domain management activity, and other activities have completed previously without a publish operation being performed while the activity is running, the work from all the activities performed since the last publish will be discarded, not just the current one.

Workaround: To avoid this, publish work that you need to persist in the knowledge base before starting a new activity.

4.5 Controls Do Not Scale Properly On Large Font Sizes

Issue: If you change the size of text to "Larger – 150%" (in Windows Server 2008 or Windows 7), or change the Custom DPI setting to 200% (in Windows 7), the **Cancel** and **Create** buttons on the **New Knowledge Base** page are not accessible.

Workaround: To resolve the issue, set the font to a smaller size.

4.6 Screen Resolution of 800x600 Is Not Supported

Issue: The Data Quality Client application does not display correctly if the screen resolution is set to 800x600.

Workaround: To resolve the issue, set the screen resolution to a higher value.

4.7 Map Bigint Column in the Source Data to a Decimal Domain to Prevent Data Loss

Issue: If a column in your source data is of the **bigint** data type, you must map the column to a domain of the **decimal** data type rather than the **integer** data type in DQS. This is because the **decimal** data type represents a larger range of values than the **int** data type and therefore can hold larger values.

4.8 NVARCHAR(MAX) and VARCHAR(MAX) Data Types Are Not Supported in the DQS Cleansing Component in Integration Services

Issue: Data columns of the **nvarchar(max)** and **varchar(max)** data types are not supported in the DQS Cleansing component in Integration Services. As such, these data columns are unavailable for mapping in the Mapping tab of DQS Cleansing Transformation Editor, and hence cannot be cleansed.

Workaround: Before processing these data columns using the DQS Cleansing component, you must convert them to the **DT_STR** or **DT_WSTR** data type using the Data Conversion transform.

4.9 The Item to Run DQSInstaller.exe on the Start Menu Is Overwritten On New SQL Server Instance Installation

Issue: If you choose to install Data Quality Services in a SQL Server instance, an item is created on the **Start** menu under the **Data Quality Services** program group called **Data Quality Server Installer** after you complete the SQL Server setup. However, if you install multiple SQL Server instances on the same computer, there is still a single **Data Quality Server Installer** item on the **Start** menu. Clicking this item runs the DQSInstaller.exe file in the most recent installed SQL Server instance.

4.10 Activity Monitoring Displays Incorrect Status for Failed Integration Services Cleansing Activities

The Activity Monitoring screen incorrectly displays **Succeeded** even for failed Integration Services Cleansing activities in the **Current Status** column.

4.11 Schema Name Is Not Displayed As Part of Table/View Name

When selecting a SQL Server data source in any of the DQS activities during the mapping stage in Data Quality Client, the list of tables and views is displayed without the schema name. Therefore, if there are several

tables/views with the same name but different schema, they can be distinguished only by looking at the data preview, or by selecting them, and then looking at the available fields to map.

4.12 Issue with Cleansing Output and Export If Data Source Is Mapped To a Composite Domain Containing a Child Domain of Date Type

In a cleansing data quality project, if you have mapped a field in your source data with a composite domain that has a child domain of date data type, the child domain output in the cleansing result has incorrect date format, and the export to database operation fails.

4.13 Error When Mapping To An Excel Sheet That Contains a ; (Semicolon) In Its Name

Issue: On the **Map** page of any DQS activity in Data Quality Client, if you map to the source excel sheet that contains a ; (semicolon) in its name, an unhandled exception message is displayed when you click **Next** on the **Map** page.

Workaround: Remove the ; (semicolon) from the sheet name in the Excel file that contains the source data to be mapped, and try again.

4.14 Issue with Date or DateTime Values in Unmapped Source Fields in Excel during Cleansing and Matching

Issue: If your source data is Excel and you have not mapped the source fields containing values of **Date** or **DateTime** data type, the following happens during the cleansing and matching activities:

- The unmapped **Date** values are displayed and exported in the yyyymmdd format.

- The time value is lost for the unmapped **DateTime** values, and they are displayed and exported in the yyyymmdd format.

Workaround: You can view the unmapped field values in the right-lower pane on the **Manage and view results** page in the cleansing activity, and on the **Matching** page in the matching activity.

4.15 Cannot Import Domain Values from an Excel File (.xls) Containing More Than 255 Columns of Data

Issue: If you import values into a domain from an Excel 97-2003 file (.xls) that contains more than 255 columns of data, an exception message appears, and the import fails.

Workaround: To fix this issue, you can do one of the following:

- Save the .xls file as .xlsx file, and then import the values from the .xlsx file into a domain.

- Remove data in all the columns beyond column 255 in the .xls file, save the file, and then import the values from the .xls file into a domain.

4.16 Activity Monitoring Feature is Unavailable for Roles Other Than dqs_administrator

The Activity Monitoring feature is available only for the users having the dqs_administrator role. If your user account has the dqs_kb_editor or dqs_kb_operator role, the Activity Monitoring feature will be unavailable in the Data Quality Client application.

4.17 Error on Opening a Knowledge Base in the Recent Knowledge Base List for Domain Management

Issue: You might receive the following error if you open a knowledge base in the **Recent Knowledge Base** list for the domain management activity in the Data Quality Client home screen:

```
"A configuration with name 'RecentList:KB:<domain>\<username>' already exists in the database."
```

This occurs because of the difference in the way DQS compares strings in the SQL Server database and C#. The string comparison in the SQL Server database is case insensitive whereas it is case sensitive in C#.

Let us illustrate this with an example. Consider a user, Domain\user1. The user logs on to the Data Quality Client computer using the "user1" account, and works on a knowledge base. DQS stores the recent knowledge base for each user as a record in the A_CONFIGURATION table in the DQS_MAIN database. In this case, the record will be stored with the following name: RecentList:KB:Domain\user1. Later, the user logs on the Data Quality Client

computer as "User1" (note the U in upper case), and tries to open the knowledge base in the **Recent Knowledge Base** list for the domain management activity. The underlying code in DQS will compare the two strings, RecentList:KB:DOMAIN\user1 and DOMAIN\User1, and considering the case-sensitive string comparison in C#, the strings won't match and therefore DQS will attempt to insert a new record for the user (User1) in the A_CONFIGURATION table in the DQS_MAIN database. However, owing to the case-insensitive string comparison in SQL database, the string already exists in the A_CONFIGURATION table in the DQS_MAIN database, and the insert operation will fail.

Workaround: To fix this issue, you can do one of the following:

- Verify that duplicate entries exist by running the following statement:

```
SELECT * FROM DQS_MAIN.dbo.A_CONFIGURATION WHERE NAME like 'RecentList%'
```

  Next, you can run the following statement to delete the record just for the affected user by changing the value in the WHERE clause to match the affected domain and user name.

```
DELETE DQS_MAIN.dbo.A_Configuration WHERE NAME LIKE 'RecentList%<domain>\<username>'
```

  Alternatively, you could remove all recent items for all users in DQS:

```
DELETE DQS_MAIN.dbo.A_Configuration WHERE NAME LIKE 'RecentList%'
```

- Use same capitalization as the last time to specify your user account while logging on to the Data Quality Client computer.

> **NOTE**
>
> To avoid this issue, use consistent capitalization rules to specify your user account while logging on the Data Quality Client computer.

5.0 Database Engine

5.1 Use of Distributed Replay Controller and Distributed Replay Client Features

Issue: Distributed Replay Controller and Distributed Replay Client features are made available in the Server Core SKU of Windows Server 2008, Windows Server 2008 R2, and Windows Server 7, even though these two features are not supported in the Server Core SKU.

Workaround: Do not install or use these two features in the Server Core SKU of Windows Server 2008, Windows Server 2008 R2, and Windows Server 7.

5.2 SQL Server Management Studio depends on Visual Studio 2010 SP1

Issue: SQL Server 2012 Management Studio depends on Visual Studio 2010 SP1 to function correctly. Uninstalling Visual Studio 2010 SP1 may cause functionality loss in SQL Server Management Studio and will leave Management Studio in an unsupported state. The following issues may be seen in this case:

- Command-line parameters to ssms.exe will not work correctly.

- Help information displayed when trying to run ssms.exe with the /? switch will be incorrect.

- For every file that is opened by double clicking on it in Windows Explorer, a new instance of SSMS will be

launched to open the file.

- Queries cannot be debugged in the normal user mode.

Workaround: Install Visual Studio 2010 SP1 again and restart Management Studio.

5.3 x64 Operating Systems Require 64-bit PowerShell 2.0

Issue: 32-bit installations of Windows PowerShell Extensions for SQL Server are not supported for instances of SQL Server 2012 on 64-bit operating systems.

Workarounds:

- Install 64-bit SQL Server 2012 with 64-bit Management Tools and 64-bit Windows PowerShell Extensions for SQL Server.

- Or, import the SQLPS Module from a 32-bit Windows PowerShell 2.0 prompt.

5.4 An Error Might Occur When Navigating in the Generate Script Wizard

Issue: After generating a script in the Generate Script Wizard by clicking **Save or Publish Scripts**, then navigating by clicking **Choose Options** or **Set Scripting Options**, clicking **Save or Publish Scripts** again might result in the following error:

```
An exception occurred while executing a Transact-SQL
statement or batch. (Microsoft.SqlServer.ConnectionInfo)
```

ADDITIONAL INFORMATION:
Invalid object name 'sys.federations'. (Microsoft SQL Server, Error: 208)

Workaround: Close and reopen the Generate Scripts Wizard.

5.5 New Maintenance Plan Layout Not Compatible with Earlier SQL Server Tools

Issue: When SQL Server 2012 management tools are used to modify an existing maintenance plan created in a previous version of SQL Server management tools (SQL Server 2008 R2, SQL Server 2008, or SQL Server 2005), the maintenance plan is saved in a new format. Earlier versions of SQL Server management tools do not support this new format.

Workaround: None

5.6 Intellisense Has Limitations When Logged in to a Contained Database

Issue: Intellisense in SQL Server Management Studio (SSMS) and SQL Server Data Tools (SSDT) does not function as expected when contained users are logged in to contained databases. The following behavior is seen in such cases:

1. Underlining for invalid objects does not appear.

2. Auto-complete list does not appear.

3. Tooltip help for built-in functions does not work.

Workaround: None

5.7 AlwaysOn Availability Groups

Before you attempt to create an availability group, see Prerequisites, Restrictions, and Recommendations for AlwaysOn Availability Groups (SQL Server) in Books Online. For an introduction to AlwaysOn Availability Groups, see AlwaysOn Availability Groups (SQL Server)in Books Online.

5.7.1 Client-Connectivity for AlwaysOn Availability Groups

Updated on: August 13, 2012

This section describes driver support for AlwaysOn Availability Groups and workarounds for not supported drivers.

Driver Support

The following table summarizes driver support for AlwaysOn Availability Groups:

DRIVER	MULTI-SUBNET FAILOVER	APPLICATION INTENT	READ-ONLY ROUTING	MULTI-SUBNET FAILOVER: FASTER SINGLE SUBNET ENDPOINT FAILOVER	MULTI-SUBNET FAILOVER: NAMED INSTANCE RESOLUTION FOR SQL CLUSTERED INSTANCES
SQL Native Client 11.0 ODBC	Yes	Yes	Yes	Yes	Yes
SQL Native Client 11.0 OLEDB	No	Yes	Yes	No	No
ADO.NET with .NET Framework 4.0 with connectivity patch*****	Yes	Yes	Yes	Yes	Yes
ADO.NET with .NET Framework 3.5 SP1 with connectivity patch ******	Yes	Yes	Yes	Yes	Yes
Microsoft JDBC driver 4.0 for SQL Server	Yes	Yes	Yes	Yes	Yes

***** Download the connectivity patch for ADO .NET with .NET Framework 4.0: http://support.microsoft.com/kb/2600211.

****** Download the connectivity patch for ADO.NET with .NET Framework 3.5 SP1: http://support.microsoft.com/kb/2654347.

MultiSubnetFailover Keyword and Associated Features

MultiSubnetFailover is a new connection string keyword used to enable faster failover with AlwaysOn Availability Groups and AlwaysOn Failover Cluster Instances in SQL Server 2012. The following three sub-features are enabled when MultiSubnetFailover=True is set in connection string:

- Faster multi-subnet failover to a multi-subnet listener for an AlwaysOn Availability Group or Failover Cluster Instances.
  - Named instance resolution to a multi-subnet AlwaysOn Failover Cluster Instance.
- Faster single subnet failover to a single subnet listener for an AlwaysOn Availability Group or Failover Cluster Instances.
  - This feature is used when connecting to a listener that has a single IP in a single subnet. This performs more aggressive TCP connection retries to speed up single subnet failovers.

- Named instance resolution to a multi-subnet AlwaysOn Failover Cluster Instance.

  - This is to add named instance resolution support for an AlwaysOn Failover Cluster Instances with multiple subnet endpoints.

MultiSubnetFailover=True Not Supported by NET Framework 3.5 or OLEDB

Issue: If your Availability Group or Failover Cluster Instance has a listener name (known as the network name or Client Access Point in the WSFC Cluster Manager) depending on multiple IP addresses from different subnets, and you are using either ADO.NET with .NET Framework 3.5SP1 or SQL Native Client 11.0 OLEDB, potentially, 50% of your client-connection requests to the availability group listener will hit a connection timeout.

Workarounds: We recommend that you do one of the following tasks.

- If do not have the permission to manipulate cluster resources, change your connection timeout to 30 seconds (this value results in a 20-second TCP timeout period plus a 10-second buffer).

  Pros: If a cross-subnet failover occurs, client recovery time is short.

  Cons: Half of the client connections will take more than 20 seconds

- If you have the permission to manipulate cluster resources, the more recommended approach is to set the network name of your availability group listener to **RegisterAllProvidersIP**=0. For more information, see "Sample PowerShell Script to Disable RegisterAllProvidersIP and Reduce TTL", later in this section.

  Pros: You do not need to increase your client-connection timeout value.

  Cons: If a cross-subnet failover occurs, the client recovery time could be 15 minutes or longer, depending on your HostRecordTTL setting and the setting of your cross-site DNS/AD replication schedule.

Sample PowerShell Script to Disable RegisterAllProvidersIP and Reduce TTL

The following sample PowerShell script demonstrates how to disable `RegisterAllProvidersIP` and reduce TTL. Replace `yourListenerName` with the name of the listener you are changing.

```
Import-Module FailoverClusters
Get-ClusterResource yourListenerName|Set-ClusterParameter RegisterAllProvidersIP 0
Get-ClusterResource yourListenerName|Set-ClusterParameter HostRecordTTL 300
```

5.7.2 Upgrading from CTP3 with availability group configured is not supported

Drop the availability group and recreate it before you upgrade. This is due to a limitation in the CTP3 build. Future builds will not have this restriction.

5.7.3 Side by Side Installation of CTP3 with later versions is not supported if you have an availability group configured in your instance

This is due to a limitation in the CTP3 build. Future builds will not have this restriction.

5.7.4 Side by Side Installation of CTP3 with later versions of Failover Cluster Instances is not supported.

This is due to a limitation in the CTP3 build. Future builds will not have this restriction. To upgrade failover cluster instances from CTP3 make sure to upgrade all instances on a node at the same time.

5.7.5 Timeouts may occur when using multi IPs in the same subnet with AlwaysOn

Issue: When using multi IPs in the same subnet with AlwaysOn, customers may sometimes see a timeout. This happens if the top IP in the list is bad.

Workaround: Use 'multisubnetfailover = true' in the connection string.

5.7.6 Failure to Create New Availability Group Listeners Because of Active Directory Quotas

Issue: The creation of a new availability group listener may fail upon creation because you have reached an Active Directory quota for the participating cluster node machine account. For more information, see How to troubleshoot the Cluster service account when it modifies computer objects and Active Directory Quotas.,

5.7.7 NetBIOS Conflicts Because Availability Group Listener Names Use an Identical 15-Character Prefix

If you have two WSFC clusters that are controlled by the same Active Directory and you try to create availability group listeners in both of clusters using names with more than 15 characters and an identical 15 character prefix, you will get an error reporting that the Virtual Network Name resource could not be brought online. For information about prefix naming rules for DNS names, see Assigning Domain Names

6.0 Integration Services

6.1 The Change Data Capture Service for Oracle and the Change Data Capture Designer Console for Oracle

The CDC Service for Oracle is a Windows service that scans Oracle transaction logs and captures changes to Oracle tables of interest into SQL Server change tables. The CDC Designer Console is used to develop and maintain Oracle CDC Instances. The CDC Designer Console is a Microsoft Management Console (MMC) snap-in.

6.1.1 Install the CDC Service for Oracle and the CDC Designer for Oracle

Issue: The CDC Service and CDC Designer are not installed by SQL Server Setup. You must manually install the CDC Service or CDD Designer on a computer that meets the requirements and prerequisites as described in the updated Help files.

Workaround: To install the CDC Service for Oracle, manually run AttunityOracleCdcService.msi from the SQL Server installation media. To install the CDC Designer Console, manually run AttunityOracleCdcDesigner.msi from the SQL Server installation media. Installation packages for x86 and x64 are located in .\Tools\AttunityCDCOracle\ on the SQL Server installation media.

6.1.2 F1 Help Functionality Points to Incorrect Documentation Files

Issue: You cannot access the correct Help documentation by using either the F1 Help drop-down list or by clicking the "?" in the Attunity Consoles. These methods point to incorrect chm files.

Workaround: The correct chm files are installed when the CDC Service for Oracle and CDC Designer for Oracle are installed. To view the correct Help content, launch the chm files directly from this location:

```
%Program Files%\Change Data Capture for Oracle by Attunity\*.chm
```

7.0 Master Data Services

7.1 Fixing an MDS installation in a Cluster

Issue: If you install a clustered instance of the RTM version of SQL Server 2012 with the **Master Data Services** checkbox selected, MDS will be installed on a single node, but it will not be available and will not work on additional nodes that you add to the cluster.

Workaround: To resolve this issue, you must install the SQL Server 2012 Cumulative Release 1 (CU1), performing the following steps:

1. Make sure that there is no existing SQL/MDS installation.

2. Download SQL Server 2012 CU1 into a local directory.

3. Install SQL Server 2012 with the MDS feature on the primary cluster node, and then install SQL Server 2012 with the MDS feature on any additional cluster nodes.

For more information about the issues, and information about how to perform the above steps, see http://support.microsoft.com/kb/2683467.

7.2 Microsoft Silverlight 5 Required

To work in the Master Data Manager web application, Silverlight 5.0 must be installed on the client computer. If you do not have the required version of Silverlight, you will be prompted to install it when you navigate to an area of the web application that requires it. You can install Silverlight 5 from http://go.microsoft.com/fwlink/?LinkId=243096.

8.0 Reporting Services

8.1 Reporting Services Connectivity to SQL Server PDW Requires Updated Drivers

Connectivity from SQL Server 2012 Reporting Services to Microsoft SQL Server PDW Appliance Update 2 and higher requires an update to the PDW connectivity drivers. For more information, SQL Server PDW customers should contact Microsoft support.

9.0 StreamInsight

SQL Server 2012 includes StreamInsight 2.0. StreamInsight 2.0 requires a Microsoft SQL Server 2012 license and .NET Framework 4.0. It includes a number of performance improvements along with few bug fixes. For more information see the Microsoft StreamInsight 2.0 Release Notes. In order to download StreamInsight 2.0 separately, please visit the Microsoft StreamInsight 2.0 download page on the Microsoft Download Center.

10.0 Upgrade Advisor

10.1 Link to Install Upgrade Advisor Is Not Enabled on Chinese (HK) Operating Systems

Issue: When you try to install Upgrade Advisor on any supported Windows version in Chinese (Hong Kong) operating systems (OS), you might find that the link to install Upgrade Advisor is not enabled.

Workaround: Locate the **SQLUA.msi** file on your SQL Server 2012 media at `\1028_CHT_LP\x64\redist\Upgrade Advisor` or at `\1028_CHT_LP\x86\redist\Upgrade Advisor`, depending on your operating system architecture.

SQL Server 2008 R2 SP2 Release Notes

5/3/2018 • 5 minutes to read • Edit Online

THIS TOPIC APPLIES TO: ✅ SQL Server (starting with 2008) ✖ Azure SQL Database ✖ Azure SQL Data Warehouse ✖ Parallel Data Warehouse

This Release Notes document describes known issues that you should read about before you install or troubleshoot Microsoft SQL Server 2008 R2 Service Pack 2. This Release Notes document applies to all editions of SQL Server 2008 R2 SP2 and is available online only. It is updated periodically.

1.0 What's New in Service Pack 2

Added the dynamic management view (DMV) **sys.dm_db_stats_properties**. You can use this DMV to return statistics properties for a specified table or indexed view in the current database. For example, this DMV returns the number of rows that were sampled and the number of steps in the histogram.

2.0 Before You Install

For information about how to install SQL Server 2008 R2 updates, see SQL Server 2008 R2 Servicing Documentation.

For general information about how to get started and install SQL Server 2008 R2, see the SQL Server 2008 R2 Readme. The Readme document is available on the installation media. You can also find more information in SQL Server Books Online and on the SQL Server Forums.

2.1 Choose the Correct File to Download and Install

Use the following table to determine which file to download and install. Verify that you have the correct system requirements before installing the service pack. The system requirements are provided on the download pages that are linked to in the table.

IF YOUR CURRENT INSTALLED VERSION IS...	AND YOU WANT TO...	DOWNLOAD AND INSTALL...
A 32-bit version of any edition of SQL Server 2008 R2 or SQL Server 2008 R2 SP1	Upgrade to the 32-bit version of SQL Server 2008 R2 SP2	SQLServer2008R2SP2-KB2630458-x86-ENU from here
A 32-bit version of SQL Server 2008 R2 RTM Express or SQL Server 2008 R2 SP1 Express	Upgrade to the 32-bit version of SQL Server 2008 R2 SP2	SQLServer2008R2SP2-KB2630458-x86-ENU.exe from here
A 32-bit version of only the client and manageability tools for SQL Server 2008 R2 or SQL Server 2008 R2 SP1 (including SQL Server 2008 R2 Management Studio)	Upgrade the client and manageability tools to the 32-bit version of SQL Server 2008 R2 SP2	SQLServer2008R2SP2-KB2630458-x86-ENU.exe from here
A 32-bit version of SQL Server 2008 R2 Management Studio Express or SQL Server 2008 R2 SP1 Management Studio Express	Upgrade to the 32-bit version of SQL Server 2008 R2 SP2 Management Studio Express	SQLManagementStudio_x86_ENU.exe from here

IF YOUR CURRENT INSTALLED VERSION IS…	AND YOU WANT TO…	DOWNLOAD AND INSTALL…
A 32-bit version of any edition of SQL Server 2008 R2 or SQL Server 2008 R2 SP1 **and** a 32-bit version of the client and manageability tools (including SQL Server 2008 R2 RTM Management Studio)	Upgrade all products to the 32-bit version of SQL Server 2008 R2 SP2	SQLServer2008R2SP2-KB2630458-x86-ENU.exe from here
A 32-bit version of one or more tools from the Microsoft SQL Server 2008 R2 RTM Feature Pack	Upgrade the tools to the 32-bit version of Microsoft SQL Server 2008 R2 SP2 Feature Pack	One or more files from Microsoft SQL Server 2008 R2 SP2 Feature Pack
No 32-bit installation of SQL Server 2008 R2	Install Server 2008 R2 including SP2	Go to SQL Server 2008 R2 SP2 – Express Edition and follow the instructions.
No 32-bit installation of SQL Server 2008 R2 Management Studio	Install SQL Server 2008 R2 Management Studio including SP2	SQLManagementStudio_x86_ENU.exe from here to install the free SQL Server 2008 R2 SP2 Management Studio Express Edition.
A 64-bit version of any edition of SQL Server 2008 R2 or SQL Server 2008 R2 SP1	Upgrade to the 64-bit version of SQL Server 2008 R2 SP2	SQLServer2008R2SP2-KB2630458-x64-ENU or SQLServer2008R2SP2-KB2630455-IA64-ENU.exe from here
A 64-bit version of SQL Server 2008 R2 RTM Express or SQL Server 2008 R2 SP1 Express	Upgrade to the 64-bit version of SQL Server 2008 R2 SP2	SQLServer2008R2SP2-KB2630458-x64-ENU.exe or SQLServer2008R2SP2-KB2630455-IA64-ENU.exe from here
A 64-bit version of only the client and manageability tools for SQL Server 2008 R2 or SQL Server 2008 R2 SP1 (including SQL Server 2008 R2 Management Studio)	Upgrade the client and manageability tools to the 64-bit version of SQL Server 2008 R2 SP2	SQLServer2008R2SP2-KB2630458-x64-ENU.exe or SQLServer2008R2SP2-KB2630455-IA64-ENU.exe from here
A 64-bit version of SQL Server 2008 R2 Management Studio Express or SQL Server 2008 R2 SP1 Management Studio Express	Upgrade to the 64-bit version of SQL Server 2008 R2 SP2 Management Studio Express	SQLManagementStudio_x64_ENU.exe from here
A 64-bit version of any edition of SQL Server 2008 R2 or SQL Server 2008 R2 SP1 **and** a 64-bit version of the client and manageability tools (including SQL Server 2008 R2 RTM Management Studio)	Upgrade all products to the 64-bit version of SQL Server 2008 R2 SP2	SQLServer2008R2SP2-KB2630458-x64-ENU.exe from here
A 64-bit version of one or more tools from the Microsoft SQL Server 2008 R2 RTM Feature Pack	Upgrade the tools to the 64-bit version of Microsoft SQL Server 2008 R2 SP2 Feature Pack	One or more files from Microsoft SQL Server 2008 R2 SP2 Feature Pack
No 64-bit installation of SQL Server 2008 R2	Install Server 2008 R2 including SP2	Go to SQL Server 2008 R2 SP2 – Express Edition and follow the instructions.

IF YOUR CURRENT INSTALLED VERSION IS...	AND YOU WANT TO...	DOWNLOAD AND INSTALL...
No 64-bit installation of SQL Server 2008 R2 Management Studio	Install SQL Server 2008 R2 Management Studio including SP2	SQLManagementStudio_x64_ENU.exe from here to install the free SQL Server 2008 R2 SP2 Management Studio Express Edition.

2.2 Setup Might Fail if SQAGTRES.dll Is Locked by Another Process

Issue: A SQL Server setup operation might fail with this error:

```
Upgrading of cluster resource C:\Program Files\Microsoft SQL Server\MSSQL10_50.<Instance
name>\MSSQL\Binn\SQAGTRES.DLL on machine <Computer name> failed with Win32Exception. Please look at inner
exception for details.
```

The root cause is that C:\Windows\system32\SQAGTRES.DLL is locked by another process and Setup was not able to update it.

Workaround: Rename C:\Windows\system32\SQAGTRES.DLL to a temporary name such as C:\Windows\system32\SQAGTRES_old.DLL, and then select the Retry option on the setup error message. That will allow Setup to continue. After a reboot, you can delete the temporary file C:\Windows\system32\SQAGTRES_old.DLL.

3.0 Known Issues Fixed in this Service Pack

For a complete list of bugs and known issues fixed in this service pack, see this master KB article.

See Also

How to determine the version and edition of SQL Server

SQL Server on Linux

5/24/2018 • 2 minutes to read • Edit Online

THIS TOPIC APPLIES TO: ✔️SQL Server (Linux only) ✖️Azure SQL Database ✖️Azure SQL Data Warehouse ✖️Parallel Data Warehouse

SQL Server 2017 now runs on Linux. It's the same SQL Server database engine, with many similar features and services regardless of your operating system.

Install

To get started, install SQL Server on Linux using one of the following quickstarts:

- Install on Red Hat Enterprise Linux
- Install on SUSE Linux Enterprise Server
- Install on Ubuntu
- Run on Docker
- Provision a SQL VM in Azure

> **NOTE**
>
> Docker itself runs on multiple platforms, which means that you can run the Docker image on Linux, Mac, and Windows.

Connect

After installation, connect to the SQL Server instance on your Linux machine. You can connect locally or remotely and with a variety of tools and drivers. The quickstarts demonstrate how to use the sqlcmd command-line tool. Other tools include the following:

TOOL	TUTORIAL
Visual Studio Code (VS Code)	Use VS Code with SQL Server on Linux
SQL Server Management Studio (SSMS)	Use SSMS on Windows to connect to SQL Server on Linux
SQL Server Data Tools (SSDT)	Use SSDT with SQL Server on Linux

Explore

SQL Server 2017 has the same underlying database engine on all supported platforms, including Linux. So many existing features and capabilities operate the same way on Linux. This area of the documentation exposes some of these features from a Linux perspective. It also calls out areas that have unique requirements on Linux.

If you are already familiar with SQL Server, review the Release notes for general guidelines and known issues for this release. Then look at what's new for SQL Server on Linux as well as what's new for SQL Server 2017 overall.

> **TIP**
>
> For answers to frequently asked questions, see the SQL Server on Linux FAQ.

ⓘ Get Help

- UserVoice - Suggestion to improve SQL Server?
- Setup and Upgrade - MSDN Forum
- SQL Server Data Tools - MSDN forum
- Transact-SQL - MSDN forum
- DBA Stack Exchange (tag sql-server) - ask SQL Server questions
- Stack Overflow (tag sql-server) - also has some answers about SQL development
- Reddit - general discussion about SQL Server
- Microsoft SQL Server License Terms and Information
- Support options for business users
- Contact Microsoft

✎ Contribute SQL documentation

- How to contribute to SQL Server Documentation

About SQL Server Analysis Services

Analysis Services is an analytical data engine used in decision support and business analytics. It provides enterprise-grade semantic data models for business reports and client applications such as Power BI, Excel, Reporting Services reports, and other data visualization tools.

A typical workflow includes creating a tabular or multidimensional data model project in Visual Studio, deploying the model as a database to a server instance, setting up recurring data processing, and assigning permissions to allow data access by end-users. When it's ready to go, your semantic data model can be accessed by client applications supporting Analysis Services as a data source.

Analysis Services is available in two different platforms:

Azure Analysis Services - Supports tabular models at the 1200 and higher compatibility levels. DirectQuery, partitions, row-level security, bi-directional relationships, and translations are all supported. To learn more, see Azure Analysis Services.

SQL Server Analysis Services - Supports tabular models at all compatibility levels, multidimensional models, data mining, and Power Pivot for SharePoint.

Documentation by area

In general, Azure Analysis Services documentation is included with Azure documentation. If you're interested in having your tabular models in the cloud, it's best to start there. This article and documentation in this section is mostly for SQL Server Analysis Services. However, at least for tabular models, how you create and deploy your tabular model projects is much the same, regardless of the platform you're using. Check out these sections to learn more:

- Comparing Tabular and Multidimensional Solutions
- Install SQL Server Analysis Services
- Tabular models
- Multidimensional models
- Data Mining
- Power Pivot for SharePoint
- Tutorials
- Server management
- Developer documentation
- Technical reference

See also

Azure Analysis Services documentation
SQL Server Documentation

SQL Server Database Engine

5/3/2018 • 2 minutes to read • Edit Online

THIS TOPIC APPLIES TO: ✅SQL Server (starting with 2016) ⊗Azure SQL Database ⊗Azure SQL Data Warehouse ⊗Parallel Data Warehouse

The Database Engine is the core service for storing, processing, and securing data. The Database Engine provides controlled access and rapid transaction processing to meet the requirements of the most demanding data consuming applications within your enterprise.

Use the Database Engine to create relational databases for online transaction processing or online analytical processing data. This includes creating tables for storing data, and database objects such as indexes, views, and stored procedures for viewing, managing, and securing data. You can use SQL Server Management Studio to manage the database objects, and SQL Server Profiler to capture server events.

See Also

SQL Server Resource Center

Data Quality Services

THIS TOPIC APPLIES TO: ✅ SQL Server (Windows only) ⊗ Azure SQL Database ⊗ Azure SQL Data Warehouse ⊗ Parallel Data Warehouse

SQL Server Data Quality Services (DQS) is a knowledge-driven data quality product. DQS enables you to build a knowledge base and use it to perform a variety of critical data quality tasks, including correction, enrichment, standardization, and de-duplication of your data. DQS enables you to perform data cleansing by using cloud-based reference data services provided by reference data providers. DQS also provides you with profiling that is integrated into its data-quality tasks, enabling you to analyze the integrity of your data.

DQS consists of Data Quality Server and Data Quality Client, both of which are installed as part of SQL Server 2017. Data Quality Server is a SQL Server instance feature that consists of three SQL Server catalogs with data-quality functionality and storage. Data Quality Client is a SQL Server shared feature that business users, information workers, and IT professionals can use to perform computer-assisted data quality analyses and manage their data quality interactively. You can also perform data quality processes by using the DQS Cleansing component in Integration Services and Master Data Services (MDS) data quality functionality, both of which are based on DQS.

For information about installing DQS, see Install Data Quality Services. If you want to upgrade your existing version of DQS to SQL Server 2017, see Upgrade Data Quality Services.

Browse Content by Area

📁 Data Quality Client Application

📁 DQS Knowledge Bases and Domains

📁 Data Quality Projects

📁 Data Cleansing

📁 Data Matching

📁 Reference Data Services in DQS

📁 Data Profiling and Notifications in DQS

📁 DQS Administration

📁 DQS Security

See Also

Introduction to Data Quality Services

Data Quality Services Concepts

DQS Resources

SQL Server Resource Center

SQL Server Failover Cluster Installation

6/5/2018 • 3 minutes to read • Edit Online

THIS TOPIC APPLIES TO: ✅SQL Server ⊗Azure SQL Database ⊗Azure SQL Data Warehouse ⊗Parallel Data Warehouse

To install a SQL Server failover cluster, you must create and configure a failover cluster instance by running SQL Server Setup.

Installing a Failover Cluster

To install a failover cluster, you must use a domain account with local administrator rights, permission to log on as a service, and to act as part of the operating system on all nodes in the failover cluster. To install a failover cluster by using the SQL Server Setup program, follow these steps:

1. To install, configure, and maintain a SQL Server failover cluster, use SQL Server Setup.

   - Identify the information you need to create your failover cluster instance (for example, cluster disk resource, IP addresses, and network name) and the nodes available for failover. For more information:

     - Before Installing Failover Clustering

     - Security Considerations for a SQL Server Installation

   - The configuration steps must take place before you run the SQL Server Setup program; use the Windows Cluster Administrator to carry them out. You must have one WSFC group for each failover cluster instance you want to configure.

   - You must ensure that your system meets minimum requirements. For more information on specific requirements for a SQL Server failover cluster, see Before Installing Failover Clustering.

2. Add or remove nodes from a failover cluster configuration without affecting the other cluster nodes. For more information, see Add or Remove Nodes in a SQL Server Failover Cluster (Setup).

   - All nodes in a failover cluster must be of the same platform, either 32-bit or 64-bit, and must run the same operating system edition and version. Also, 64-bit SQL Server editions must be installed on 64-bit hardware running the 64-bit versions of Windows operating systems. There is no WOW64 support for failover clustering in this release.

3. Specify multiple IP addresses for each failover cluster instance. You can specify mutiple IP addresses for each subnet. If the mutiple IP addresses are on the same subnet, SQL Server Setup sets the dependency to AND. If you are clustering nodes across multiple subnets, SQL Server Setup sets the dependency to OR.

SQL Server Failover Cluster Installation options

Option 1: Integrated installation with Add Node

SQL Server integrated failover cluster installation consists of two steps:

1. Create and configure a single-node SQL Server failover cluster instance. At the completion of a successful configuration of the node, you have a fully functional failover cluster instance. At this time it does not have high-availability because there is only one node in the failover cluster.

2. On each node to be added to the SQL Server failover cluster, run Setup with Add Node functionality to add that node.

SQL Server Advanced/Enterprise failover cluster installation consists of two steps:

1. On each node that will be part of the SQL Server failover cluster, run Setup with Prepare Failover Cluster functionality. This step prepares the nodes ready to be clustered, but there is no operational SQL Server instance at the end of this step.

2. After the nodes are prepared for clustering, run Setup on the node that owns the shared disk with the Complete Failover Cluster functionality. This step configures and completes the failover cluster instance. At the end of this step, you will have an operational SQL Server failover cluster instance.

> **NOTE**
>
> Either installation option allows for multi-node SQL Server failover cluster installation. Add Node can be used to add additional nodes for either option after a SQL Server failover cluster has been created.

> **IMPORTANT**
>
> The operating system drive letter for SQL Server install locations must match on all the nodes added to the SQL Server failover cluster.

IP Address Configuration During Setup

SQL Server Setup lets you set or change the IP resource dependency settings during the following actions:

- Integrated Install - Create a New SQL Server Failover Cluster (Setup)

- CompleteFailoverCluster (Advanced Install) - Create a New SQL Server Failover Cluster (Setup)

- Add Node - Add or Remove Nodes in a SQL Server Failover Cluster (Setup)

- Remove Node - Add or Remove Nodes in a SQL Server Failover Cluster (Setup)

  Note IPV6 IP addresses are supported. If you configure both IPV4 and IPV6 there are treated like different subnets, and IPV6 is expected to come online first.

SQL Server Multi-Subnet Failover Cluster

You can set OR dependencies when the nodes on the cluster are on different subnets. However, each node in the SQL Server multi-subnet failover cluster must be a possible owner of at least one of IP address specified.

See Also

Before Installing Failover Clustering
Create a New SQL Server Failover Cluster (Setup)
Install SQL Server 2016 from the Command Prompt
Upgrade a SQL Server Failover Cluster Instance

Planning a SQL Server Installation

6/5/2018 • 2 minutes to read • Edit Online

THIS TOPIC APPLIES TO: ✅ SQL Server (Windows only) ⊗ Azure SQL Database ⊗ Azure SQL Data Warehouse ⊗ Parallel Data Warehouse

To install SQL Server, follow these steps:

- Review installation requirements, system configuration checks, and security considerations for a SQL Server installation.

- Run SQL Server Setup to install or upgrade to a later version. Before upgrading, review Upgrade SQL Server.

- Use SQL Server utilities to configure SQL Server.

  Regardless of the installation method, you are required to confirm acceptance of the software license terms as an individual or on behalf of an entity, unless your use of the software is governed by a separate agreement such as a Microsoft volume licensing agreement or a third-party agreement with an ISV or OEM.

  The license terms are displayed for review and acceptance in the Setup user interface. Unattended installations (using the `/Q` or `/QS` parameters) must include the `/IAcceptSQLServerLicenseTerms` parameter. Download and review the license terms separately at Microsoft SQL Server License Terms and Information. For volume licensing terms, see Licensing Termss and Documentation. For older versions of SQL Server, see Microsoft Software License Terms.

> **NOTE**
>
> Depending on how you received the software (for example, through Microsoft volume licensing), your use of the software may be subject to additional terms and conditions.

In This Section

What's New in SQL Server Installation
This article describes the details about the new or improved features of installation in this version of SQL Server.

Hardware and Software Requirements for Installing SQL Server
This article lists the minimum hardware and software requirements to install and run an instance of SQL Server 2017.

Security Considerations for a SQL Server Installation
This article describes some security best practices that you should consider before you install SQL Server and after you install SQL Server.

Configure Windows Service Accounts and Permissions
This article describes the default configuration of services in this release of SQL Server, and configuration options for SQL Server services that you can set during and after SQL Server installation.

Network Protocols and Network Libraries
This article describes the default configuration of network protocols in this release of SQL Server, and the configuration options available.

[Work with Multiple Versions and Instances of SQL Server](#)

This article describes the considerations for installing multiple versions and instances of SQL Server.

[Local Language Versions in SQL Server](#)

This article describes about the localized versions of SQL Server.

Related Sections

[Install SQL Server](#)

This section provides an overview of different installation options we have for installing SQL Server.

[Install SQL Server Business Intelligence Features](#)

This section of the SQL Server Setup documentation explains how to install SQL Server features that are part of the Microsoft BI platform.

[Upgrade SQL Server](#)

The section provides an overview of upgrading instances of previous SQL Server versions to SQL Server 2017.

[Uninstall SQL Server](#)

Refer this section to uninstall an existing instance of SQL Server completely, and prepare the system so that you can reinstall SQL Server.

[SQL Server Failover Cluster Installation](#)

This section of the SQL Server Setup documentation explains how to install, and configure SQL Server failover cluster.

See Also

[Install SQL Server from the Command Prompt](#)
[High Availability Solutions (SQL Server)](#)
[Before Installing Failover Clustering](#)
[Upgrade SQL Server Using the Installation Wizard (Setup)](#)

Installation guidance for SQL Server on Linux

5/18/2018 • 6 minutes to read • Edit Online

THIS TOPIC APPLIES TO: ✅ SQL Server (Linux only) ⊗ Azure SQL Database ⊗ Azure SQL Data Warehouse ⊗ Parallel Data Warehouse

This article provides guidance for installing, updating, and uninstalling SQL Server 2017 on Linux.

> **TIP**
>
> This guide coves several deployment scenarios. If you are only looking for step-by-step installation instructions, jump to one of the quickstarts:
>
> - RHEL quickstart
> - SLES quickstart
> - Ubuntu quickstart
> - Docker quickstart

For answers to frequently asked questions, see the SQL Server on Linux FAQ.

Supported platforms

SQL Server 2017 is supported on Red Hat Enterprise Linux (RHEL), SUSE Linux Enterprise Server (SLES), and Ubuntu. It is also supported as a Docker image, which can run on Docker Engine on Linux or Docker for Windows/Mac.

PLATFORM	SUPPORTED VERSION(S)	GET
Red Hat Enterprise Linux	7.3 or 7.4	Get RHEL 7.4
SUSE Linux Enterprise Server	v12 SP2	Get SLES v12 SP2
Ubuntu	16.04	Get Ubuntu 16.04
Docker Engine	1.8+	Get Docker

Microsoft also supports deploying and managing SQL Server containers by using OpenShift and Kubernetes.

> **NOTE**
>
> SQL Server is tested and supported on Linux for the previously listed distributions. If you choose to install SQL Server on an unsupported operating system, please review the **Support policy** section of the Technical support policy for Microsoft SQL Server to understand the support implications.

System requirements

SQL Server 2017 has the following system requirements for Linux:

Memory	2 GB
File System	**XFS** or **EXT4** (other file systems, such as **BTRFS**, are unsupported)
Disk space	6 GB
Processor speed	2 GHz
Processor cores	2 cores
Processor type	x64-compatible only

If you use **Network File System (NFS)** remote shares in production, note the following support requirements:

- Use NFS version **4.2 or higher**. Older versions of NFS do not support required features, such as fallocate and sparse file creation, common to modern file systems.
- Locate only the **/var/opt/mssql** directories on the NFS mount. Other files, such as the SQL Server system binaries, are not supported.
- Ensure that NFS clients use the 'nolock' option when mounting the remote share.

Configure source repositories

When you install or upgrade SQL Server, you get the latest version of SQL Server 2017 from your configured Microsoft repository. The quickstarts use the **Cumulative Update (CU)** respository. But you can instead configure the **GDR** repository. For more information on repositories and how to configure them, see Configure repositories for SQL Server on Linux.

> **IMPORTANT**
>
> If you previously installed a CTP or RC version of SQL Server 2017, you must remove the preview repository and register a General Availability (GA) one. For more information, see Configure repositories for SQL Server on Linux.

Install SQL Server

You can install SQL Server on Linux from the command line. For instructions, see one of the following quickstarts:

- Install on Red Hat Enterprise Linux
- Install on SUSE Linux Enterprise Server
- Install on Ubuntu
- Run on Docker
- Provision a SQL VM in Azure

Update SQL Server

To update the **mssql-server** package to the latest release, use one of the following commands based on your platform:

PLATFORM	PACKAGE UPDATE COMMAND(S)
RHEL	`sudo yum update mssql-server`

PLATFORM	PACKAGE UPDATE COMMAND(S)
SLES	`sudo zypper update mssql-server`
Ubuntu	`sudo apt-get update` `sudo apt-get install mssql-server`

These commands download the newest package and replace the binaries located under `/opt/mssql/` . The user generated databases and system databases are not affected by this operation.

Rollback SQL Server

To rollback or downgrade SQL Server to a previous release, use the following steps:

1. Identify the version number for the SQL Server package you want to downgrade to. For a list of package numbers, see the Release notes.

2. Downgrade to a previous version of SQL Server. In the following commands, replace `<version_number>` with the SQL Server version number you identified in step one.

PLATFORM	PACKAGE UPDATE COMMAND(S)
RHEL	`sudo yum downgrade mssql-server-` `<version_number>.x86_64`
SLES	`sudo zypper install --oldpackage mssql-server=` `<version_number>`

Ubuntu	`sudo apt-get install mssql-server=`
	`<version_number>`
	`sudo systemctl start mssql-server`

> **NOTE**
>
> It is only supported to downgrade to a release within the same major version, such as SQL Server 2017.

Check installed SQL Server version

To verify your current version and edition of SQL Server on Linux, use the following procedure:

1. If not already installed, install the SQL Server command-line tools.

2. Use **sqlcmd** to run a Transact-SQL command that displays your SQL Server version and edition.

```
sqlcmd -S localhost -U SA -Q 'select @@VERSION'
```

Uninstall SQL Server

To remove the **mssql-server** package on Linux, use one of the following commands based on your platform:

PLATFORM	PACKAGE REMOVAL COMMAND(S)
RHEL	`sudo yum remove mssql-server`

PLATFORM	PACKAGE REMOVAL COMMAND(S)
SLES	`sudo zypper remove mssql-server`
Ubuntu	`sudo apt-get remove mssql-server`

Removing the package does not delete the generated database files. If you want to delete the database files, use the following command:

```
sudo rm -rf /var/opt/mssql/
```

Unattended install

You can perform an unattended installation in the following way:

- Follow the initial steps in the quickstarts to register the repositories and install SQL Server.
- When you run `mssql-conf setup`, set environment variables and use the `-n` (no prompt) option.

The following example configures the Developer edition of SQL Server with the **MSSQL_PID** environment variable. It also accepts the EULA (**ACCEPT_EULA**) and sets the SA user password (**MSSQL_SA_PASSWORD**). The `-n` parameter performs an unprompted installation where the configuration values are pulled from the environment variables.

```
sudo MSSQL_PID=Developer ACCEPT_EULA=Y MSSQL_SA_PASSWORD='<YourStrong!Passw0rd>' /opt/mssql/bin/mssql-conf -n
setup
```

You can also create a script that performs other actions. For example, you could install other SQL Server packages.

For a more detailed sample script, see the following examples:

- Red Hat unattended installation script
- SUSE unattended installation script
- Ubuntu unattended installation script

Offline install

If your Linux machine does not have access to the online repositories used in the quick starts, you can download the package files directly. These packages are located in the Microsoft repository, https://packages.microsoft.com.

> **TIP**
>
> If you successfully installed with the steps in the quick starts, you do not need to download or manually install the SQL Server package(s). This section is only for the offline scenario.

1. **Download the database engine package for your platform**. Find package download links in the package details section of the Release Notes.

2. **Move the downloaded package to your Linux machine**. If you used a different machine to download the packages, one way to move the packages to your Linux machine is with the **scp** command.

3. **Install the database engine package**. Use one of the following commands based on your platform. Replace the package file name in this example with the exact name you downloaded.

PLATFORM	PACKAGE INSTALL COMMAND
RHEL	`sudo yum localinstall mssql-server_versionnumber.x86_64.rpm`
SLES	`sudo zypper install mssql-server_versionnumber.x86_64.rpm`
Ubuntu	`sudo dpkg -i mssql-server_versionnumber_amd64.deb`

> **NOTE**
>
> You can also install the RPM packages (RHEL and SLES) with the `rpm -ivh` command, but the commands in the previous table automatically install dependencies if available from approved repositories.

4. **Resolve missing dependencies**: You might have missing dependencies at this point. If not, you can skip this step. On Ubuntu, if you have access to approved repositories containing those dependencies, the easiest solution is to use the `apt-get -f install` command. This command also completes the installation of SQL Server. To manually inspect dependencies, use the following commands:

PLATFORM	LIST DEPENDENCIES COMMAND
RHEL	`rpm -qpR mssql-server_versionnumber.x86_64.rpm`
SLES	`rpm -qpR mssql-server_versionnumber.x86_64.rpm`
Ubuntu	`dpkg -I mssql-server_versionnumber_amd64.deb`

After resolving the missing dependencies, attempt to install the mssql-server package again.

5. **Complete the SQL Server setup**. Use **mssql-conf** to complete the SQL Server setup:

```
sudo /opt/mssql/bin/mssql-conf setup
```

Optional SQL Server features

After installation, you can also install or enable optional SQL Server features.

- SQL Server command-line tools
- SQL Server Agent
- SQL Server Full Text Search
- SQL Server Integration Services (Ubuntu)

ⓘ Get Help

- UserVoice - Suggestion to improve SQL Server?
- Setup and Upgrade - MSDN Forum
- SQL Server Data Tools - MSDN forum
- Transact-SQL - MSDN forum
- DBA Stack Exchange (tag sql-server) - ask SQL Server questions
- Stack Overflow (tag sql-server) - also has some answers about SQL development

- Reddit - general discussion about SQL Server
- Microsoft SQL Server License Terms and Information
- Support options for business users
- Contact Microsoft

> **TIP**
>
> For answers to frequently asked questions, see the SQL Server on Linux FAQ.

SQL Server Integration Services

For content related to previous versions of SQL Server, see SQL Server Integration Services.

Microsoft Integration Services is a platform for building enterprise-level data integration and data transformations solutions. You use Integration Services to solve complex business problems by copying or downloading files, sending e-mail messages in response to events, updating data warehouses, cleaning and mining data, and managing SQL Server objects and data. The packages can work alone or in concert with other packages to address complex business needs. Integration Services can extract and transform data from a wide variety of sources such as XML data files, flat files, and relational data sources, and then load the data into one or more destinations.

Integration Services includes a rich set of built-in tasks and transformations; tools for constructing packages; and the Integration Services service for running and managing packages. You can use the graphical Integration Services tools to create solutions without writing a single line of code; or you can program the extensive Integration Services object model to create packages programmatically and code custom tasks and other package objects.

Try SQL Server and SQL Server Integration Services

- ⬇ Download SQL Server 2017 or 2016
- ⬇ Download SQL Server Data Tools (SSDT)
- ⬇ Download SQL Server Management Studio (SSMS)

ⓘ Resources

- Get help in the SSIS forum
- Get help on Stack Overflow
- Follow the SSIS team blog
- Report issues & request features
- Get the docs on your PC

Master Data Services Overview (MDS)

6/12/2018 • 6 minutes to read • Edit Online

THIS TOPIC APPLIES TO: ✅ SQL Server (Windows only) ⊗ Azure SQL Database ⊗ Azure SQL Data Warehouse ⊗ Parallel Data Warehouse

This topic describes the key data organization and management features of Master Data Services.
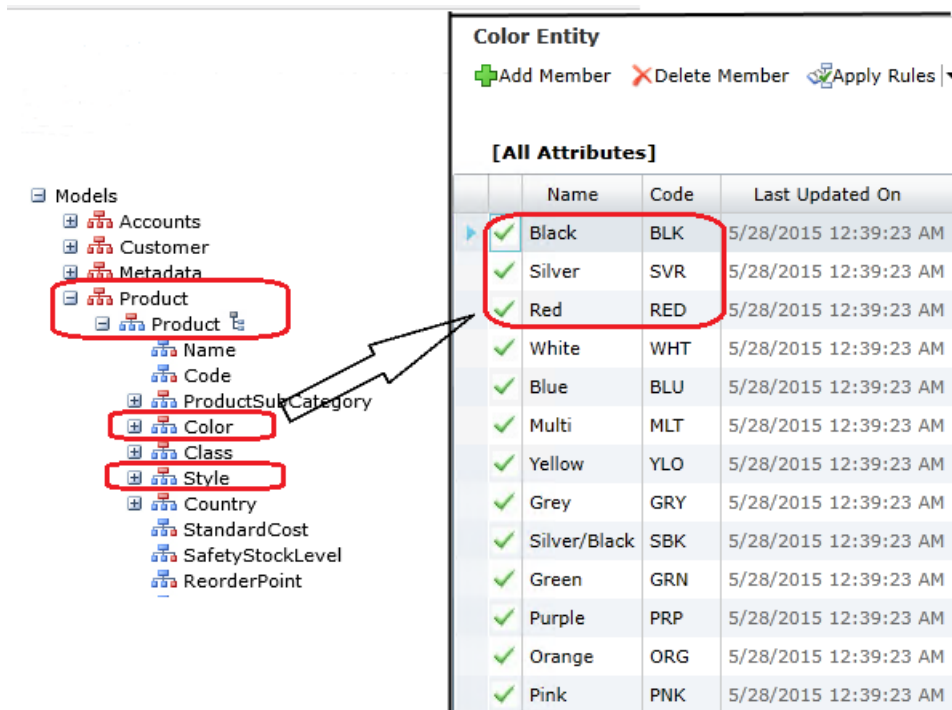
Master Data Services enables you to manage a master set of your organization's data. You can organize the data into models, create rules for updating the data, and control who updates the data. With Excel, you can share the master data set with other people in your organization.

> For a description of the Master Data Services architecture, see the Master Data Services -- The Basics article on simple-talk.com. For information about the new features in SQL Server 2017, see What's New in Master Data Services (MDS)
>
> **For instructions on how to install Master Data Services, set up the database and Website, and deploy the sample models, see** Master Data Services Installation and Configuration.

In Master Data Services, the model is the highest level container in the structure of your master data. You create a model to manage groups of similar data, for example to manage online product data. A model contains one or more entities, and entities contain members that are the data records. An entity is similar to a table.

For example, your online product model may contain entities such as product, color, and style. The color entity may contain members for the colors red, silver, and black.

Models also contain attributes that are defined within entities. An attribute contains values that help describe the entity members. There are free-form attributes and domain-based attributes. A domain-based attribute contains values that are populated by members from an entity and can be used as attribute values for other entities.

For example, the product entity might have free-form attributes for cost and weight. And, there is a domain-based attribute for color ① that contains values that are populated by the color entity members. This master list of colors is used as attribute values for the Product entity ②.

Derived hierarchies come from the relationships between entities in a model. These are domain-based attribute relationships. In the product model for example, you can have a color derived hierarchy ❶ that comes from the relationship between the color ❷ and product ❸ entities.

Once you've defined a basic structure for your data, you can start adding data records (members) by using the import feature. You load data into staging tables, validate the data using business rules, and load the data into MDS tables. You can also use business rules to set attribute values.

The following table outlines the key Master Data Services tasks. Unless otherwise noted, all of the following procedures require you to be a model administrator. For more information, see Administrators (Master Data Services).

ACTION	DETAILS	RELATED TOPICS
Create a model	When you create a model, it is considered VERSION_1.	Models (Master Data Services) Create a Model (Master Data Services)
Create entities	Create as many entities as you need to contain your members.	Entities (Master Data Services) Create an Entity (Master Data Services)
Create entities to use as domain-based attributes	To create a domain-based attribute, first create the entity to populate the attribute value list.	Domain-Based Attributes (Master Data Services) Create a Domain-Based Attribute (Master Data Services)
Create attributes for your entities	Create attributes to describe members. A Name and Code attribute are automatically included in each entity and cannot be removed. You might want to create other free-form attributes to contain text, dates, numbers, or files.	Attributes (Master Data Services) Create a Text Attribute (Master Data Services) Create a Numeric Attribute (Master Data Services) Create a Date Attribute (Master Data Services) Create a Link Attribute (Master Data Services) Create a File Attribute (Master Data Services)
Create attribute groups	If you have more than four or five attributes for an entity, you might want to create attribute groups. These groups are the tabs that are displayed above the grid in **Explorer** and they help ease navigation by grouping attributes together on individual tabs.	Attribute Groups (Master Data Services) Create an Attribute Group (Master Data Services)
Import members for your supporting entities	Import the data for your supporting entities by using the staging process. For the Product model, this might mean importing colors or sizes. You can also create members manually. Note: Users can create members in Master Data Manager if they have a minimum of **Update** permission to an entity's leaf model object and access to the **Explorer** functional area.	Overview: Importing Data from Tables (Master Data Services) Create a Leaf Member (Master Data Services)

ACTION	DETAILS	RELATED TOPICS
Create and apply business rules to ensure data quality	Create and publish business rules to ensure the accuracy of your data. You can use business rules to: Set default attribute values. Change attribute values. Send email notifications when data doesn't pass business rule validation.	Business Rules (Master Data Services) Create and Publish a Business Rule (Master Data Services) Validate Specific Members against Business Rules (Master Data Services) Configure Email Notifications (Master Data Services) Configure Business Rules to Send Notifications (Master Data Services)
Import members for your primary entities and apply business rules	Import the members for your primary entities by using the staging process. When done, validate the version, which applies business rules to all members in the model version. You can then work to correct any business rule validation issues.	Validation (Master Data Services) Validate a Version against Business Rules (Master Data Services) Validation Stored Procedure (Master Data Services)
Create derived hierarchies	Derived hierarchies can be updated as your business needs change and ensure that all members are accounted for at the appropriate level.	Derived Hierarchies (Master Data Services) Create a Derived Hierarchy (Master Data Services)
If needed, create explicit hierarchies	If you want to create hierarchies that are not level-based and that include members from a single entity, you can create explicit hierarchies.	Explicit Hierarchies (Master Data Services) Create an Explicit Hierarchy (Master Data Services)
If needed, create collections	If you want to view different groupings of members for reporting or analysis and do not need a complete hierarchy, create a collection. Note: Users can create collections in Master Data Manager if they have a minimum of **Update** permission to the collection model object and access to the **Explorer** functional area.	Collections (Master Data Services) Create a Collection (Master Data Services)
Create user-defined metadata	To describe your model objects, add user-defined metadata to your model. The metadata might include the owner of an object or the source the data comes from.	

ACTION	DETAILS	RELATED TOPICS
Lock a version of your model and assign a version flag	Lock a version of your model to prevent changes to the members, except by administrators. When the version's data has validated successfully against business rules, you can commit the version, which prevents changes to members by all users. Create and assign a version flag to the model. Flags help users and subscribing systems identify which version of a model to use.	Versions (Master Data Services) Lock a Version (Master Data Services) Create a Version Flag (Master Data Services)
Create subscription views	For your subscribing systems to consume your master data, create subscription views, which create standard views in the Master Data Services database.	Overview: Exporting Data (Master Data Services) Create a Subscription View to Export Data (Master Data Services)
Configure user and group permissions	You cannot copy user and group permissions from a test to a production environment. However, you can use your test environment to determine the security you want to use eventually in production.	Security (Master Data Services) Add a Group (Master Data Services) Add a User (Master Data Services)

When ready, you can deploy your model, with or without its data, to your production environment. For more information, see Deploying Models (Master Data Services).

What is SQL Server Reporting Services (SSRS)?

6/12/2018 • 4 minutes to read • Edit Online

THIS TOPIC APPLIES TO: ✅ SQL Server Reporting Services (2016 and later) ⊗ Power BI Report Server

For content related to previous versions of SQL Server Reporting Services, see SQL Server Reporting Services 2014. Looking for Power BI Report Server? See What is Power BI Report Server?.

Create, deploy, and manage mobile and paginated Reporting Services reports on premises with the range of ready-to-use tools and services that SQL Server Reporting Services (SSRS) provides.

Create, deploy, and manage mobile and paginated reports

SQL Server Reporting Services is a solution that customers deploy on their own premises for creating, publishing, and managing reports, then delivering them to the right users in different ways, whether that's viewing them in web browser, on their mobile device, or as an email in their in-box.

For SQL Server 2016, Reporting Services offers an updated suite of products:

- **"Traditional" paginated reports** brought up to date, so you can create modern-looking reports, with updated tools and new features for creating them.
- **New mobile reports** with a responsive layout that adapts to different devices and the different ways you hold them.
- **A modern web portal** you can view in any modern browser. In the new portal, you can organize and display mobile and paginated Reporting Services reports and KPIs. You can also store Excel workbooks on the portal.
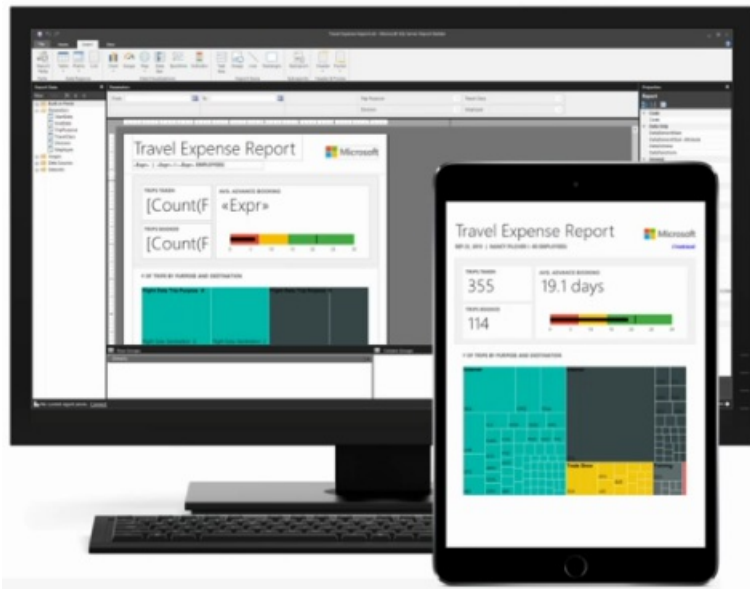
Read on for more about each.

What's new in Reporting Services

These sources will keep you up-to-date on new features in SQL Server 2016 Reporting Services.

- What's New in Reporting Services
- SQL Server Reporting Services Team Blog
- The Guy in a Cube YouTube channel

Paginated reports

Reporting Services is associated with "traditional" paginated document-style reports, in which the more data you have, the more rows in the tables, and the more pages the report would have. That's great for generating fixed-layout, pixel-perfect documents optimized for printing, such as PDF and Word files.

That core BI workload still exists today, so we've modernized it. Now you can create modern-looking reports with updated new features, using Report Builder or Report Designer in SQL Server Data Tools (SSDT).

- We updated all the default styles and color palettes, so by default you create reports with a new minimalist modern style.
- We updated the Parameter pane, so you can arrange parameters however you want.
- You can export to new formats such as PowerPoint. Reporting Services visualizations in PowerPoint are live and editable, not just screen shots.
- You can create a hybrid Power BI/Reporting Services experience: Rather than recreating your on-premises Reporting Services reports in Power BI, you can pin visuals from those reports to your Power BI dashboards. Then you can monitor everything in one place on your Power BI dashboard.

Mobile reports

Mobile computing has shifted the devices we need to work, meaning people today have a different reporting need. The fixed-layout report experience doesn't work well when you introduce tablets and phones. Something designed for a wide PC screen isn't the optimal experience on a small phone screen that's not just smaller but a portrait or

landscape orientation.

What you need with these widely different screen form factors is not a fixed layout, but a responsive layout that adapts to these different devices and the different ways you hold them. For that we've added a new report type: mobile reports, based on the Datazen technology we acquired about a year ago and integrated into the product. You can migrate your existing Datazen reports to Reporting Services with the SQL Server Migration Assistant for Datazen.

You create these mobile reports in the new Mobile Report Publisher app. Then in the native Power BI apps for mobile devices for Windows 10, iOS, Android, and HTML5, you can access the data you have in Power BI the cloud, plus your on-premises SQL Server 2016 Reporting Services data. As you create visualizations, Mobile Report Publisher automatically generates sample data for each, so you see how the visualization will look with your data, and what kind of data works well in each visualization.

Web portal

For end users of native-mode Reporting Services, the front door is a modern web portal you can view in any modern browser. You can access all your Reporting Services mobile and paginated reports and KPIs in the new portal.

You can apply your own custom branding to your web portal. And you can create KPIs right in the web portal. KPIs can surface key business metrics at a glance in the browser, without having to open a report.

The new web portal is a complete rewrite of Report Manager. Now it's a single-page, standards-based HTML5 app, which modern browsers are optimized for: Edge, Internet Explorer 10 and 11, Chrome, Firefox, Safari, and all the major browsers.

The content on the web portal is organized by type: Reporting Services mobile and paginated reports and KPIs, Excel workbooks, shared datasets, and shared data sources to use as building blocks for your reports. You can store and manage them securely here, in the traditional folder hierarchy. You can tag your favorites, and you can manage the content if you have that role.

And you can still schedule report processing, access reports on demand,and subscribe to published reports in the new web portal.

More about the Web portal (SSRS Native Mode).

Reporting Services in SharePoint integrated mode

You publish reports to Reporting Services in SharePoint integrated mode. You can schedule report processing, access reports on demand, subscribe to published reports, and export reports to other applications such as Microsoft Excel. Create data alerts on reports published to a SharePoint site and receive email messages when report data changes.

More about Reporting Services Report Server in SharePoint integrated mode.

Reporting Services programming features

Take advantage of Reporting Services programming features so you can extend and customize your reporting functionality, with APIs to integrate or extend data and report processing in custom applications.

More Reporting Services Developer Documentation.

Next steps

- Install Reporting Services
- Install Report Builder
- Download SQL Server Data Tools (SSDT)

More questions? Try asking the Reporting Services forum

SQL Server Migration Assistant

Microsoft SQL Server Migration Assistant (SSMA) is a tool designed to automate database migration to SQL Server from Microsoft Access, DB2, MySQL, Oracle, and SAP ASE.

Migration Sources

- SQL Server Migration Assistant for Access

- SQL Server Migration Assistant for DB2

- SQL Server Migration Assistant for MySQL

- SQL Server Migration Assistant for Oracle

- SQL Server Migration Assistant for SAP ASE

Supported Sources and Target Versions

For supported sources, review the information on the Download Center for the SSMA download.

The following target versions are supported for SSMA.

- SQL Server 2008
- SQL Server 2008 R2
- SQL Server 2012
- SQL Server 2014
- SQL Server 2016
- Azure SQL Database
- SQL Server 2017 on Windows and Linux (Preview)
- **Azure SQL Data Warehouse

** This target is supported only by SSMA for Oracle.

Downloads

- SSMA for Access
- SSMA for DB2
- SSMA for MySql
- SSMA for Oracle
- SSMA for SAP ASE

Getting SSMA Support

Help and support for Microsoft SQL Server Migration Assistant (SSMA):

- **Product help** - To access product support, launch SSMA, and select the Help menu or press the F1 key.

- **SQL Server community forums** – Ask a question in the SQL Server Community

  - SQL Server Community - Newsgroups and forums that are monitored by the SQL Server

community. This site also lists community information sources, such as blogs and Web sites.

- SQL Server Developer Center Community - Newsgroups, forums, and other community resources that are useful to SQL Server developers

- Assisted support - Go to https://support.microsoft.com/assistedsupportproducts and search for 'SQL Server Migration Assistant'. Select your version, then select "start request." Assisted support is included with the SQL Server Migration Assistant Tool.

- Premier support - If you have a Premier Contract, you can get Premier support on the Premier Online portal.

- Consulting services – For partner assisted migrations, go the Partner Portal.

Legal Notice (SSMA)

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The primary purpose of a sample contained within this documentation is to illustrate a concept, or a reasonable use of a particular statement or clause. Most samples do not include all of the code that may normally be found in a full production system, as some of the usual data validation and error handling is removed to focus the sample on a particular concept or statement. Technical support is not available for these samples or for any included source code.

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Documentation Policy for SQL Server Support and Upgrade

Content that appears in SQL Server documentation is published only after it has been tested sufficiently. Product documentation – SQL Server Books Online, readme files, known issues documents, and Knowledge Base articles –

contains content regarding SQL Server features and functionality that is robust enough to be safe for general use by all customers. This policy applies to all SQL Server documentation, including readme files for releases and services packs; a readme file is considered an extension of Books Online.

In some cases, a particular feature is not something that customers should use directly and, therefore, it is not documented. Unless a feature is also discussed in SQL Server documentation published by Microsoft, content from third-party books or Web sites is not supported by Microsoft customer support, and should not be used in production databases or applications.

Customers must not use undocumented APIs, including but not limited to: stored procedures, extended stored procedures, functions, views, tables, columns, properties, or metadata. Microsoft customer support does not support databases or applications that leverage or use undocumented entry points.

Server and database upgrades to future versions of SQL Server are not guaranteed for applications and databases that leverage and use undocumented entry points. Use of SQL Server features and functionality must be limited to those that are included in Microsoft SQL Server documentation. If a feature is not documented in Microsoft SQL Server documentation, it is not a supported part of SQL Server.

Overview of Data Migration Assistant

6/1/2018 • 2 minutes to read • Edit Online

The Data Migration Assistant (DMA) enables you to upgrade to a modern data platform by detecting compatibility issues that can impact database functionality in your new version of SQL Server and Azure SQL Database. DMA recommends performance and reliability improvements for your target environment and allows you to move your schema, data, and uncontained objects from your source server to your target server.

> **NOTE**
>
> For large (in terms of number and size of databases) migrations, it is recommended to use the Azure Database Migration Service, which can migrate databases at scale.

Capabilities

- Assess on-premises SQL Server instance(s) migrating to Azure SQL database(s). The assessment workflow helps you to detect the following issues that can affect Azure SQL database migration and provides detailed guidance on how to resolve them.

  - Migration blocking issues: Discovers the compatibility issues that block migrating on-premises SQL Server database(s)s to Azure SQL Database(s). DMA provides recommendations to help you address those issues.

  - Partially supported or unsupported features: Detects partially supported or unsupported features that are currently in use on the source SQL Server instance. DMA provides a comprehensive set of recommendations, alternative approaches available in Azure, and mitigating steps so that you can incorporate into your migration projects.

- Discover issues that can affect an upgrade to an on-premises SQL Server. These are described as compatibility issues and are organized in the following categories:

  - Breaking changes
  - Behavior changes
  - Deprecated features

- Discover new features in the target SQL Server platform that the database can benefit from after an upgrade. These are described as feature recommendations and are organized in the following categories:

  - Performance
  - Security
  - Storage

- Migrate an on-premises SQL Server instance to a modern SQL Server instance, hosted on premises or on an Azure virtual machine (VM) that is accessible from your on-premises network. The Azure VM can be accessed using VPN or other technologies. The migration workflow helps you to migrate the following components:

  - Schema of databases
  - Data and users
  - Server roles
  - SQL Server and Windows logins

- After the successful migration, applications can connect to the target SQL server databases seamlessly.

Supported source and target versions

DMA replaces all previous versions of SQL Server Upgrade Advisor and should be used for upgrades for most SQL Server versions. Supported source and target versions follow.

Sources

- SQL Server 2005
- SQL Server 2008
- SQL Server 2008 R2
- SQL Server 2012
- SQL Server 2014
- SQL Server 2016
- SQL Server 2017 on Windows

Targets

- SQL Server 2012
- SQL Server 2014
- SQL Server 2016
- SQL Server 2017 on Windows and Linux
- Azure SQL Database

> **NOTE**
>
> DMA does not currently support Azure SQL Database Managed Instance as a target.

Installation

To install DMA, download the latest version of the tool from the Microsoft Download Center, and then run the **DataMigrationAssistant.msi** file.

See also

Assess your SQL Server Migration

Data Migration Assistant: Configuration settings

Migrate On-Premises SQL Server using Data Migration Assistant

Data Migration Assistant: Best Practices

Stretch Database

THIS TOPIC APPLIES TO: ✅ SQL Server (Windows only starting with 2016) ❌ Azure SQL Database ❌ Azure SQL Data Warehouse ❌ Parallel Data Warehouse

Stretch Database migrates your cold data transparently and securely to the Microsoft Azure cloud.

If you just want to get started with Stretch Database right away, see Get started by running the Enable Database for Stretch Wizard.

What are the benefits of Stretch Database?

Stretch Database provides the following benefits:

Provides cost-effective availability for cold data
Stretch warm and cold transactional data dynamically from SQL Server to Microsoft Azure with SQL Server Stretch Database. Unlike typical cold data storage, your data is always online and available to query. You can provide longer data retention timelines without breaking the bank for large tables like Customer Order History. Benefit from the low cost of Azure rather than scaling expensive, on-premises storage. You choose the pricing tier and configure settings in the Azure Portal to maintain control over price and costs. Scale up or down as needed. Visit SQL Server Stretch Database Pricing for details.

Doesn't require changes to queries or applications
Access your SQL Server data seamlessly regardless of whether it's on-premises or stretched to the cloud. You set the policy that determines where data is stored, and SQL Server handles the data movement in the background. The entire table is always online and queryable. And, Stretch Database doesn't require any changes to existing queries or applications – the location of the data is completely transparent to the application.

Streamlines on-premises data maintenance
Reduce on-premises maintenance and storage for your data. Backups for your on-premises data run faster and finish within the maintenance window. Backups for the cloud portion of your data run automatically. Your on-premises storage needs are greatly reduced. Azure storage can be 80% less expensive than adding to on-premises SSD.

Keeps your data secure even during migration
Enjoy peace of mind as you stretch your most important applications securely to the cloud. SQL Server's Always Encrypted provides encryption for your data in motion. Row Level Security (RLS) and other advanced SQL Server security features also work with Stretch Database to protect your data.

What does Stretch Database do?

After you enable Stretch Database for a SQL Server instance and a database, and select at least one table, Stretch Database silently begins to migrate your cold data to Azure.

- If you store cold data in a separate table, you can migrate the entire table.

- If your table contains both hot and cold data, you can specify a filter function to select the rows to migrate.

You don't have to change existing queries and client apps. You continue to have seamless access to both local and remote data, even during data migration. There is a small amount of latency for remote queries, but you only encounter this latency when you query the cold data.

Stretch Database ensures that no data is lost if a failure occurs during migration. It also has retry logic to handle connection issues that may occur during migration. A dynamic management view provides the status of migration.

You can pause data migration to troubleshoot problems on the local server or to maximize the available network bandwidth.
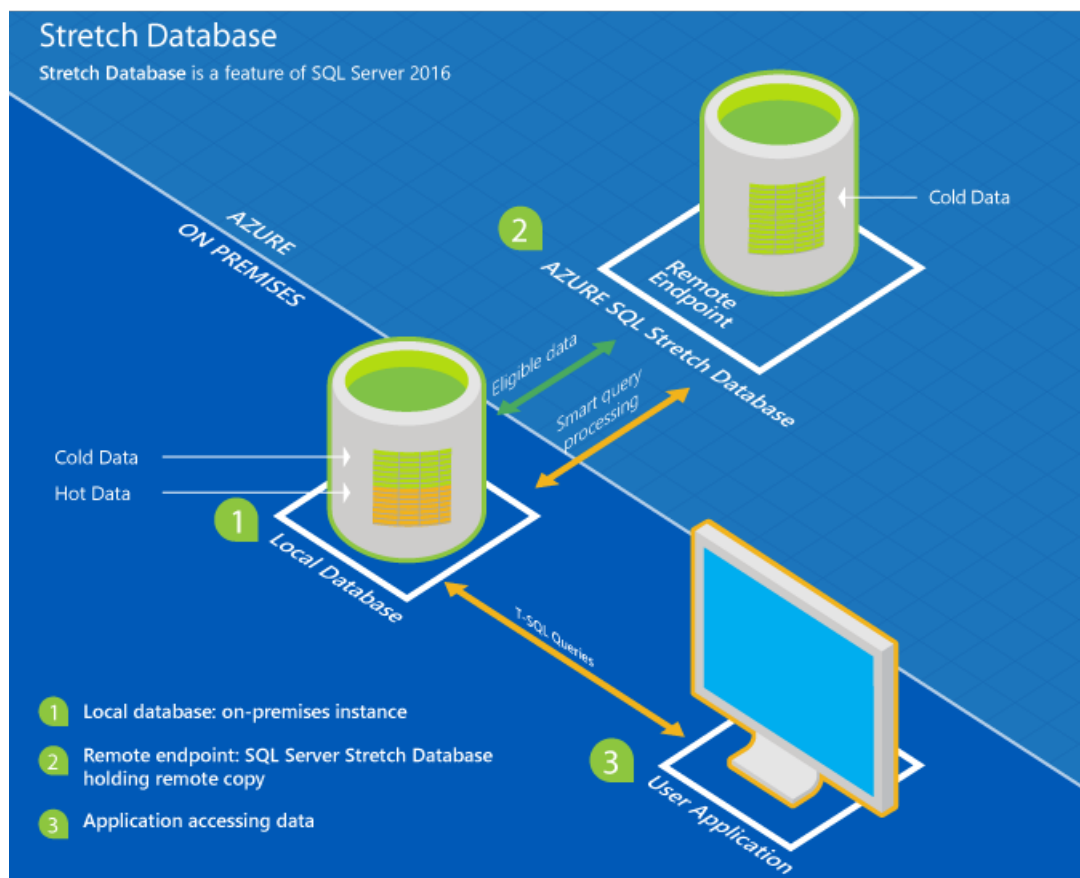
Is Stretch Database for you?

If you can make the following statements, Stretch Database may help to meet your requirements and solve your problems.

IF YOU'RE A DECISION MAKER	IF YOU'RE A DBA
I have to keep transactional data for a long time.	The size of my tables is getting out of control.
Sometimes I have to query the cold data.	My users say that they want access to cold data, but they only rarely use it.
I have apps, including older apps, that I don't want to update.	I have to keep buying and adding more storage.
I want to find a way to save money on storage.	I can't backup or restore such large tables within the SLA.

What kind of databases and tables are candidates for Stretch Database?

Stretch Database targets transactional databases with large amounts of cold data, typically stored in a small number of tables. These tables may contain more than a billion rows.

If you use the temporal table feature of SQL Server, use Stretch Database to migrate all or part of the associated

history table to cost-effective storage in Azure. For more info, see Manage Retention of Historical Data in System-Versioned Temporal Tables.

Use Stretch Database Advisor, a feature of SQL Server 2016 Upgrade Advisor, to identify databases and tables for Stretch Database. For more info, see Identify databases and tables for Stretch Database by running Stretch Database Advisor. To learn more about potential blocking issues, see Limitations for Stretch Database.

Test drive Stretch Database

Test drive Stretch Database with the AdventureWorks sample database. To get the AdventureWorks sample database, download at least the database file and the samples and scripts file from here. After you restore the sample database to an instance of SQL Server 2016, unzip the samples file and open the Stretch DB Samples file from the Stretch DB folder. Run the scripts in this file to check the space used by your data before and after you enable Stretch Database, to track the progress of data migration, and to confirm that you can continue to query existing data and insert new data both during and after data migration.

Next step

Identify databases and tables that are candidates for Stretch Database. Download SQL Server 2016 Upgrade Advisor and run the Stretch Database Advisor to identify databases and tables that are candidates for Stretch Database. Stretch Database Advisor also identifies blocking issues. For more info, see Identify databases and tables for Stretch Database by running Stretch Database Advisor.

Tutorials for SQL Server

5/3/2018 • 2 minutes to read • Edit Online

THIS TOPIC APPLIES TO: ✅SQL Server ⊗Azure SQL Database ⊗Azure SQL Data Warehouse ⊗Parallel Data Warehouse

SQL Server provides tutorials to help you learn new technologies and features. Tutorials for earlier versions can usually be used with more recent versions. When tutorials address a newer feature, they will indicate the minimum version to complete the tutorial.

- If a tutorial uses one of the Adventure Works databases, you should download and use the most recent version from CodePlex. For more information, see AdventureWorks Databases and Scripts for SQL Server 2016 CTP3.
- Download a Power Pivot workbook and Power View reports to use with Power View tutorials, go to Power View Samples for SQL Server 2012.
- Check out the new Wide World Importers sample available on the sql-server-samples GitHub repository.

Current tutorials

TECHNOLOGY	DESCRIPTION
Analysis Services Tutorials (SSAS)	Learn how to develop and deploy Analysis Services tabular or multidimensional models. Also learn how to use tools such as PowerPivot to analyze the data in the models.
Database Engine Tutorials	Learn how to connect to an instance of the database engine and then build and run Transact-SQL statements.
Enterprise Information Management Tutorials	Learn how to manage information in an enterprise using Microsoft EIM technologies.
Integration Services Tutorials	Learn how to create and deploy SSIS packages.
Replication Tutorials	Learn how to set up and run replication topologies using SQL Server Management Studio.
Reporting Services Tutorials (SSRS)	Learn how to create basic reports and subscriptions.
SQL Server Machine Learning Tutorials	Learn how to work with SQL Server data using R or Python. Run R or Python scripts from Transact-SQL.

Previously published tutorials

- Tutorials for SQL Server 2014
- Tutorials for SQL Server 2012
- Tutorials for SQL Server 2008 R2

ⓘ Get Help

- UserVoice - Suggestion to improve SQL Server?

- Setup and Upgrade - MSDN Forum
- SQL Server Data Tools - MSDN forum
- Transact-SQL - MSDN forum
- DBA Stack Exchange (tag sql-server) - ask SQL Server questions
- Stack Overflow (tag sql-server) - also has some answers about SQL development
- Reddit - general discussion about SQL Server
- Microsoft SQL Server License Terms and Information
- Support options for business users
- Contact Microsoft

✎ Contribute SQL documentation

- How to contribute to SQL Server Documentation

SQL Tools and Utilities for SQL Server, Azure SQL Database, and Azure SQL Data Warehouse

6/1/2018 • 5 minutes to read • Edit Online

THIS TOPIC APPLIES TO: ✓ SQL Server ✓ Azure SQL Database ✓ Azure SQL Data Warehouse ✓ Parallel Data Warehouse

To manage (query, monitor, etc.) your database you need a tool. There are several database tools available. While your databases can be running in the cloud, on Windows, or on Linux, your tool doesn't need to run on the same platform as the database.

This article provides information about the available tools for working with your SQL databases.

Tools to run queries and manage databases

TOOL	DESCRIPTION
Microsoft SQL Operations Studio (preview)	SQL Operations Studio (preview) is a free, light-weight tool, for managing databases wherever they're running. This preview release provides database management features, including an extended Transact-SQL editor and customizable insights into the operational state of your databases. **SQL Operations Studio (preview) runs on Windows, macOS, and Linux**.
SQL Server Management Studio (SSMS)	Use SQL Server Management Studio (SSMS) to query, design, and manage your SQL Server, Azure SQL Database, and Azure SQL Data Warehouse. **SSMS runs on Windows**.
SQL Server Data Tools (SSDT)	Turn Visual Studio into a powerful development environment for SQL Server, Azure SQL Database, and Azure SQL Data Warehouse. **SSDT runs on Windows**.
mssql-cli	mssql-cli is an interactive command-line tool for querying SQL Server. **mssql-cli runs on Windows, macOS, and Linux**
Visual Studio Code	After installing Visual Studio Code, install the mssql extension for developing Microsoft SQL Server, Azure SQL Database, and SQL Data Warehouse. **Visual Studio Code runs on Windows, macOS, and Linux**.

Which tool should I choose?

- Do you want to manage a SQL Server instance or database, in a light-weight editor on Windows, Linux or Mac? Choose Microsoft SQL Operations Studio (preview)

- Do you want to manage a SQL Server instance or database on Windows with full GUI support? Choose SQL Server Management Studio (SSMS)

- Do you want to create or maintain database code, including compile time validation, refactoring and designer support on Windows? Choose SQL Server Data Tools (SSDT)

- Do you want to query SQL Server with a command-line tool that features IntelliSense, syntax high-lighting, and more? Choose mssql-cli

- Do you want to write T-SQL scripts in a light-weight editor on Windows, Linux or Mac? Choose Visual Studio

Code and the mssql extension

Additional tools

TOOL	DESCRIPTION
Configuration Manager	Use SQL Server Configuration Manager to configure SQL Server services and configure network connectivity. Configuration Manager runs on Windows
mssql-conf	Use mssql-conf to configure SQL Server running on Linux.
SQL Server Migration Assistant	Use SQL Server Migration Assistant to automate database migration to SQL Server from Microsoft Access, DB2, MySQL, Oracle, and Sybase.
Distributed Replay	Use the Distributed Replay feature to help you assess the impact of future SQL Server upgrades. Also use Distributed Replay to help assess the impact of hardware and operating system upgrades, and SQL Server tuning.
ssbdiagnose	The ssbdiagnose utility reports issues in Service Broker conversations or the configuration of Service Broker services.

Command line utilities

Command line utilities enable you to script SQL Server operations. The following table contains a list of command prompt utilities that ship with SQL Server.

UTILITY	DESCRIPTION	INSTALLED IN
bcp Utility	Used to copy data between an instance of Microsoft SQL Server and a data file in a user-specified format.	*drive:*>\Program Files\ Microsoft SQL Server\Client SDK\ODBC\110\Tools\Binn
dta Utility	Used to analyze a workload and recommend physical design structures to optimize server performance for that workload.	*drive*>:\Program Files\Microsoft SQL Server*nnn*\Tools\Binn
dtexec Utility	Used to configure and execute an Integration Services package. A user interface version of this command prompt utility is called **DTExecUI**, which brings up the Execute Package Utility.	*drive*>:\Program Files\Microsoft SQL Server*nnn*\DTS\Binn
dtutil Utility	Used to manage SSIS packages.	*drive*>:\Program Files\Microsoft SQL Server*nnn*\DTS\Binn
Deploy Model Solutions with the Deployment Utility	Used to deploy Analysis Services projects to instances of Analysis Services.	*drive*>:\Program Files\Microsoft SQL Server*nnn*\Tools\Binn\VShell\Common7\IDE

UTILITY	DESCRIPTION	INSTALLED IN
mssql-scripter (Public Preview)	Used to generate CREATE and INSERT T-SQL scripts for database objects in SQL Server, Azure SQL Database, and Azure SQL Data Warehouse.	See our GitHub repo for download and usage information.
osql Utility	Allows you to enter Transact-SQL statements, system procedures, and script files at the command prompt.	*<drive>*:\Program Files\Microsoft SQL Server*nnn*\Tools\Binn
Profiler Utility	Used to start SQL Server Profiler from a command prompt.	*<drive>*:\Program Files\Microsoft SQL Server*nnn*\Tools\Binn
RS.exe Utility (SSRS)	Used to run scripts designed for managing Reporting Services report servers.	*<drive>*:\Program Files\Microsoft SQL Server*nnn*\Tools\Binn
rsconfig Utility (SSRS)	Used to configure a report server connection.	*<drive>*:\Program Files\Microsoft SQL Server*nnn*\Tools\Binn
rskeymgmt Utility (SSRS)	Used to manage encryption keys on a report server.	*<drive>*:\Program Files\Microsoft SQL Server*nnn*\Tools\Binn
sqlagent90 Application	Used to start SQL Server Agent from a command prompt.	<drive>:\Program Files\Microsoft SQL Server*<instance_name>*\MSSQL\Binn
sqlcmd Utility	Allows you to enter Transact-SQL statements, system procedures, and script files at the command prompt.	*<drive*:>\Program Files\ Microsoft SQL Server\Client SDK\ODBC\110\Tools\Binn
SQLdiag Utility	Used to collect diagnostic information for Microsoft Customer Service and Support.	*<drive>*:\Program Files\Microsoft SQL Server*nnn*\Tools\Binn
sqllogship Application	Used by applications to perform backup, copy, and restore operations and associated clean-up tasks for a log shipping configuration without running the backup, copy, and restore jobs.	*<drive>*:\Program Files\Microsoft SQL Server*nnn*\Tools\Binn
SqlLocalDB Utility	An execution mode of SQL Server targeted to program developers.	*<drive>*:\Program Files\Microsoft SQL Server*nnn*\Tools\Binn\
sqlmaint Utility	Used to execute database maintenance plans created in previous versions of SQL Server.	<drive>:\Program Files\Microsoft SQL Server\MSSQL13.MSSQLSERVER\MSSQL\Binn
sqlps Utility	Used to run PowerShell commands and scripts. Loads and registers the SQL Server PowerShell provider and cmdlets.	*<drive>*:\Program Files\Microsoft SQL Server*nnn*\Tools\Binn
sqlservr Application	Used to start and stop an instance of Database Engine from the command prompt for troubleshooting.	<drive>:\Program Files\Microsoft SQL Server\MSSQL13.MSSQLSERVER\MSSQL\Binn

UTILITY	DESCRIPTION	INSTALLED IN
Ssms Utility	Used to start SQL Server Management Studio from a command prompt.	*<drive>*:\Program Files\Microsoft SQL Server*nnn*\Tools\Binn\VSShell\Common 7\IDE
tablediff Utility	Used to compare the data in two tables for non-convergence, which is useful when troubleshooting a replication topology.	*<drive>*:\Program Files\Microsoft SQL Server*nnn*\COM

SQL Command Prompt utilities syntax conventions

CONVENTION	USED FOR
UPPERCASE	Statements and terms used at the operating system level.
`monospace`	Sample commands and program code.
italic	User-supplied parameters.
bold	Commands, parameters, and other syntax that must be typed exactly as shown.

How to contribute to SQL Server Documentation

6/11/2018 • 4 minutes to read • Edit Online

THIS TOPIC APPLIES TO: ✅SQL Server ✅Azure SQL Database ✅Azure SQL Data Warehouse ✅Parallel Data Warehouse

Anyone can contribute to SQL Server documentation. This includes correcting typos, suggesting better explanations, and improving technical accuracy. This article explains how to get started with content contributions and how the process works.

There are two main workflows you can use to contribute:

Edit in your browser	Good for small, quick edits of any article.
Edit locally with tools	Good for more complex edits, edits involving multiple articles, and frequent contributions to docs.microsoft.com.

Edit in your browser

The following steps provide an overview of making simple edits to SQL Server content in your browser. The complete process is documented in the article, GitHub contribution workflow for minor or infrequent changes.

1. Every article, including this one, has an **Edit** button on the right. Find an article you want to change, and click the **Edit** button to get started.
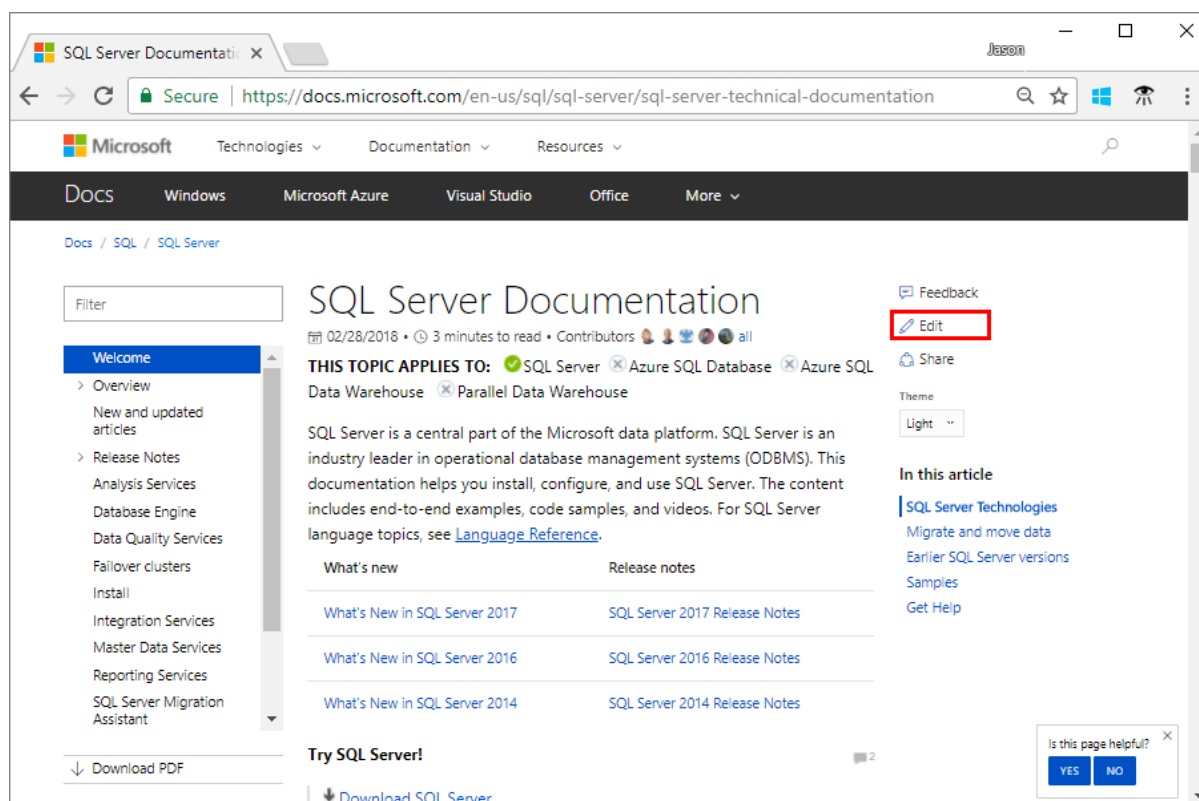
All of the content on docs.microsoft.com is managed in various GitHub Repositories. When you click the edit button, you are taken to the article in the **sql-docs** repository. Or, if you are editing a SQL article in the Azure documentation, you are taken to the **azure-docs** repository.

2. Next, click on the pencil icon at the top-right of the article in GitHub.
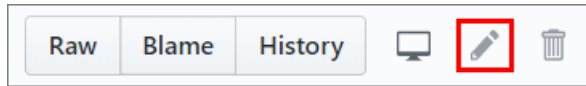
> **NOTE**
>
> You must be signed in to GitHub to edit an article. If you do not have a GitHub account, see GitHub account setup. After creating a new account, you must also verify your email address with GitHub before you can edit.

3. Edit the article in the browser. All of the articles are written in Markdown. If you need help with Markdown, you can review Markdown basics. You can also learn by observing how published articles render existing Markdown.
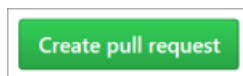
4. Scroll down to the bottom of the edit window, enter a title for your change, and click the **Propose file change** button.
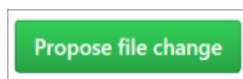
5. On the next page, click **Create pull request**.
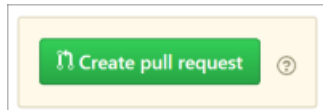
6. Enter a title and description for the pull request. Then click **Create pull request** again.

At this point, you should be guided through the rest of the process in the comments of the pull request. The complete process and additional details can be found in the contributor guide.

Edit locally with tools

Another editing option is to fork the **sql-docs** or **azure-docs** repositories and clone it locally to your machine. You can then use a Markdown editor and a git client to submit the changes. This workflow is good for edits that are more complex or involve multiple files. It is also good for frequent contributors to docs.microsoft.com.

To contribute with this method, see the following articles:

- Create a GitHub account
- Install content authoring tools
- Set up a Git repository locally
- Use tools to contribute

If you submit a pull request with significant changes to documentation, you will get a comment in GitHub asking you to submit an online **Contribution License Agreement (CLA)**. You must complete the online form before your pull request can be accepted.

Recognition

If your changes are accepted, you are recognized as a contributor at the top of the article.

sql-docs overview

This section provides some additional guidance on working in the **sql-docs** repository.

> **IMPORTANT**
>
> The information in this section is specific to **sql-docs**. If you are editing a SQL article in the Azure documentation, see the Readme for the azure-docs repository on GitHub.

The sql-docs repository uses several standard folders to organize the content.

FOLDER	DESCRIPTION
docs	Contains all published SQL Server content. Subfolders logically organize different areas of the content.
docs/includes	Contains include files. These files are blocks of content that can be included in one or more other topics.
./media	Each folder can have one **media** subfolder for article images. The **media** folder in turn has subfolders with the same name as the topics that the image appears in. Images should be .png files with all lower-case letters and no spaces.
TOC.MD	A table-of-contents file. Each subfolder has the option of using one TOC.MD file.

Applies-to includes

Each SQL Server article contains an **applies-to** include file after the title. This indicates what areas or versions of SQL Server the article applies to.

Consider the following Markdown example that pulls in the **appliesto-ss-asdb-asdw-pdw-md.md** include file.

```
[!INCLUDE[appliesto-ss-asdb-asdw-pdw-md](../includes/appliesto-ss-asdb-asdw-pdw-md.md)]
```

This adds the following text at the top of the article:

Guidance for using Microsoft SQL relational databases

📅 07/26/2017 • ⏱ 2 minutes to read • Contributors 👤 🧑 🧑 🧑 👤

THIS TOPIC APPLIES TO: ✅ SQL Server ✅ Azure SQL Database ✅ Azure SQL Data Warehouse ✅ Parallel Data Warehouse

To find the correct applies-to include for your article, use the following tips:

- Look at other articles that cover the same feature or a related task. If you edit that article, you can copy the Markdown for the applies-to include link (you can cancel the edit without submitting it).
- Search the docs/includes directory for files containing the text "applies-to". You can use the **Find** button in github to quickly filter. Click on the file to see how it is rendered.
- Pay attention to the naming convention. If there are x's in the name, they are usually placeholders indicating the lack of support for a service. For example, **appliesto-xx-xxxx-asdw-xxx-md.md** indicates support for only

Azure SQL Data Warehouse, because only **asdw** is spelled out, whereas the other fields have x's.

- Some includes specify a version number, such as **tsql-appliesto-ss2017-xxxx-xxxx-xxx-md.md**. Only use these includes when you know the feature was introduced with a specific version of SQL Server.

Contributor resources

- Contributor guide for docs.microsoft.com
- Microsoft Style Guide
- Markdown basics

TIP

If you have product feedback rather than documentation feedback, provide feedback on the SQL Server product here.

Next steps

Explore the sql-docs repository on GitHub.

Find an article, submit a change, and help the SQL Server community.

Thank you!

SQL Server offline help and Help Viewer

5/3/2018 • 7 minutes to read • Edit Online

THIS TOPIC APPLIES TO: ✅ SQL Server ⊗ Azure SQL Database ⊗ Azure SQL Data Warehouse ⊗ Parallel Data Warehouse

You can use the Help Viewer in SQL Server Management Studio (SSMS) or Visual Studio (VS) to download and install SQL Server help packages from online sources or disk and view them offline. This article describes tools that install the Help Viewer, how to install offline help content, and how to view help for SQL Server 2014 (12.*x*), SQL Server 2016, and SQL Server 2017.

> **NOTE**
>
> SQL Server 2016 and SQL Server 2017 help are combined, although some topics apply to individual versions where noted. Most topics apply to both.

Install the Help Viewer

The Help Viewer has two versions: v2.x supports SQL Server 2016/SQL Server 2017 help, and v1.x supports SQL Server 2014 (12.*x*) help. The Help Viewer does not support proxy settings, and does not support the ISO format.

The following tools install the Help Viewer:

TOOL THAT INSTALLS HELP VIEWER	HELP VIEWER VERSION INSTALLED
SQL Server Management Studio 17.x	v2.2
SQL Server Data Tools for Visual Studio 2015	v2.2
Visual Studio 2017*	v2.3
Visual Studio 2015	v2.2
SQL Server 2014 Management Studio	v1.x
Earlier versions of Visual Studio	v1.x
SQL Server 2016	v1.x

* To install the Help Viewer with Visual Studio 2017, on the Individual Components tab in the Visual Studio Installer, select **Help Viewer** under Code Tools, and then click **Install**.
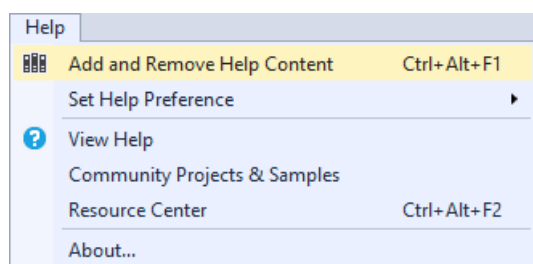
> **NOTE**
>
> - SQL Server 2016 installs Help Viewer 1.1, which does not support SQL Server 2016 help.
> - Installing SQL Server 2017 does not install any Help Viewer.
> - Help Viewer v2.x can also support SQL Server 2014 (12.*x*) help, if you install the content from disk.

Use Help Viewer v2.x

SSMS 17.x and VS 2015 and 2017 use Help Viewer 2.x, which supports SQL Server 2016/2017 Help.

To download and install offline help content with Help Viewer v2.x

1. In SSMS or VS, click **Add and Remove Help Content** on the Help menu.

The Help Viewer opens to the Manage Content tab.

2. To install the latest help content package, choose **Online** under Installation source.
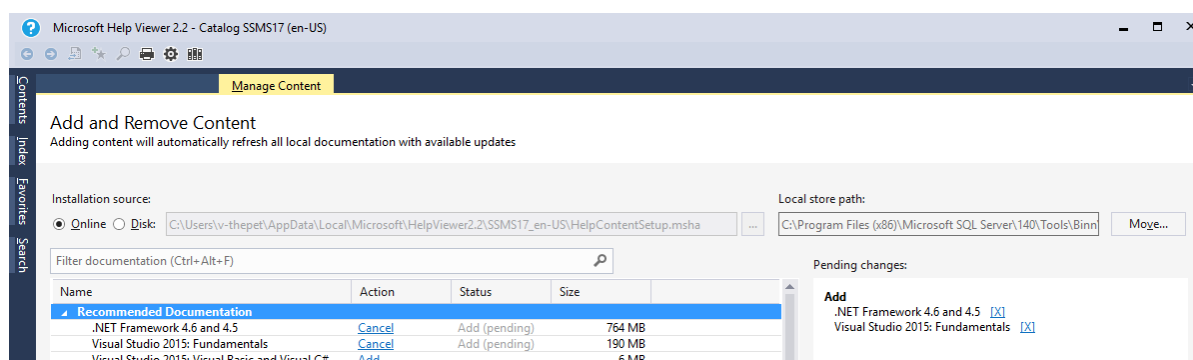
> **NOTE**
>
> To install from disk (SQL Server 2014 help), choose **Disk** under Installation source, and specify the disk location.

The Local store path on the Manage Content tab shows where the content will be installed on the local computer. If you want to change the location, click **Move**, enter a different folder path in the **To** field, and then click **OK**. If the help installation fails after changing the Local store path, close and reopen the Help Viewer, ensure the new location appears in the Local store path, and then try the installation again.

3. Click **Add** next to each content package (book) that you want to install. To install all SQL Server help content, add all 13 books under SQL Server.

4. Click **Update** at lower right. The help table of contents on the left automatically updates with the added books.

Microsoft Help Viewer 2.2 - Catalog SSMS17 (en-US)

Contents | Getting Started with the .NE... | Manage Content

Add and Remove Content
Adding content will automatically refresh all local documentation with available updates

Filter Contents

Help Viewer Home
.NET Framework 4.6 and 4.5
Getting started with Blend for
Visual Studio 2012
Welcome to Visual Studio 201
Creating a UI by using Blend fo
Application Lifecycle Manager
DevOps and Application Lifecy
Microsoft Help Viewer

Installation source:
Online   Disk: C:\Users\v-thepet\AppData\Local\Microsoft\HelpViewer2.2\SSMS17_en-US\HelpCont

Local store path:
C:\Program Files (x86)\Microsoft SQL Server\14(Move...

Filter documentation (Ctrl+Alt+F)

Pending changes:

Name	Action	Status	Size
.NET Framework 3.5	Add		370 MB
▲ **patterns & practices**			
Cloud Design Patterns	Add		12 MB
On-Demand Video Service	Add		12 MB
Big Data Solutions	Add		12 MB
▲ **SQL Server**			
Analysis Services (MDX) Language Reference	Cancel	Add (pending)	1 MB
Data Analysis Expressions (DAX) Reference	Cancel	Add (pending)	1 MB
Data Mining Extensions (DMX) Reference	Cancel	Add (pending)	1 MB
Microsoft Machine Learning Services	Cancel	Add (pending)	2 MB
Power Query M Reference	Cancel	Add (pending)	1 MB
SQL Server Connection Drivers	Cancel	Add (pending)	6 MB
SQL Server Developer Reference	Cancel	Add (pending)	33 MB
SQL Server Management Studio	Cancel	Add (pending)	1 MB
SQL Server on Linux	Cancel	Add (pending)	3 MB
SQL Server Technical Documentation	Cancel	Add (pending)	68 MB
SQL Server Tools	Cancel	Add (pending)	2 MB
Transact-SQL Reference	Add		4 MB
XQuery Language Reference (SQL Server)	Add		1 MB
▲ **Windows**			
Develop with Windows Server Technologies	Add		65 MB
Windows Debugging	Add		2 MB
Windows Desktop App Development	Add		324 MB
Windows Driver Development	Add		439 MB

Remove
.NET Framework 4.6 and 4.5   [X]
Visual Studio 2015: Fundamentals   [X]

Add
Analysis Services (MDX) Language Reference   [X]
Data Analysis Expressions (DAX) Reference   [X]
Data Mining Extensions (DMX) Reference   [X]
Microsoft Machine Learning Services   [X]
Power Query M Reference   [X]
SQL Server Connection Drivers   [X]
SQL Server Developer Reference   [X]
SQL Server Management Studio   [X]
SQL Server on Linux   [X]
SQL Server Technical Documentation   [X]
SQL Server Tools   [X]

Estimated download size: 121 MB
Free disk space: 337216 MB
Required disk space: 605 MB

Update   Cancel

Conte... | Index | Favori... | Search

32 books returned from https://services.mtps.microsoft.com/ServiceAPI/catalogs/Dev14/en-US

NOTE

Not all the top-node titles in the SQL Server table of contents exactly match the names of the corresponding downloadable help books. The TOC titles map to the book names as follows:

| CONTENTS PANE	SQL SERVER BOOK
Analysis services language reference	Analysis Services (MDX) language reference
Data Analysis Expressions (DAX) reference	Data Analysis Expressions (DAX) reference
Data mining extensions (DMX) reference	Data mining extensions (DMX) reference
Developer Guides for SQL Server	SQL Server Developer Reference
Download SQL Server Management Studio	SQL Server Management Studio
Getting started with machine learning in SQL Server	Microsoft Machine Learning Services
Power Query M Reference	Power Query M Reference
SQL Server Drivers	SQL Server Connection Drivers
SQL Server on Linux	SQL Server on Linux
SQL Server Technical Documentation	SQL Server Technical Documentation (SSIS, SSRS, DB engine, setup)
Tools and utilities for Azure SQL Database	SQL Server tools

CONTENTS PANE	SQL SERVER BOOK
Transact-SQL Reference (Database Engine)	Transact-SQL Reference
XQuery Language Reference (SQL Server)	XQuery Language Reference (SQL Server)

> **NOTE**
>
> If the Help Viewer freezes (hangs) while adding content, change the Cache LastRefreshed="<mm/dd/yyyy> 00:00:00" line in the %LOCALAPPDATA%\Microsoft\HelpViewer2.x\HlpViewer_SSMSx_en-US.settings or HlpViewer_VisualStudiox_en-US.settings file to some date in the future. For more information about this issue, see Visual Studio Help Viewer freezes.

To view offline help content in SSMS with Help Viewer v2.x

To view the installed help in SSMS, press CTRL + ALT + F1, or choose **Add or Remove Content** from the Help menu, to launch the Help Viewer.
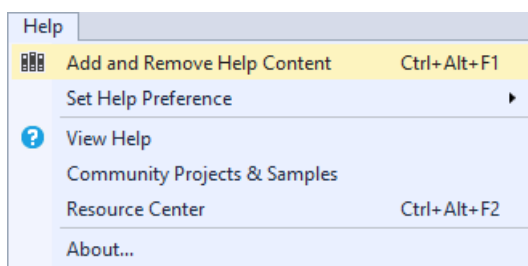
The Help Viewer opens to the Manage Content tab, with the installed help table of contents in the left pane. Click topics in the table of contents to display them in the right pane.

> **TIP**
>
> If the contents pane is not visible, click Contents on the left margin. Click the pushpin icon to keep the contents pane open.
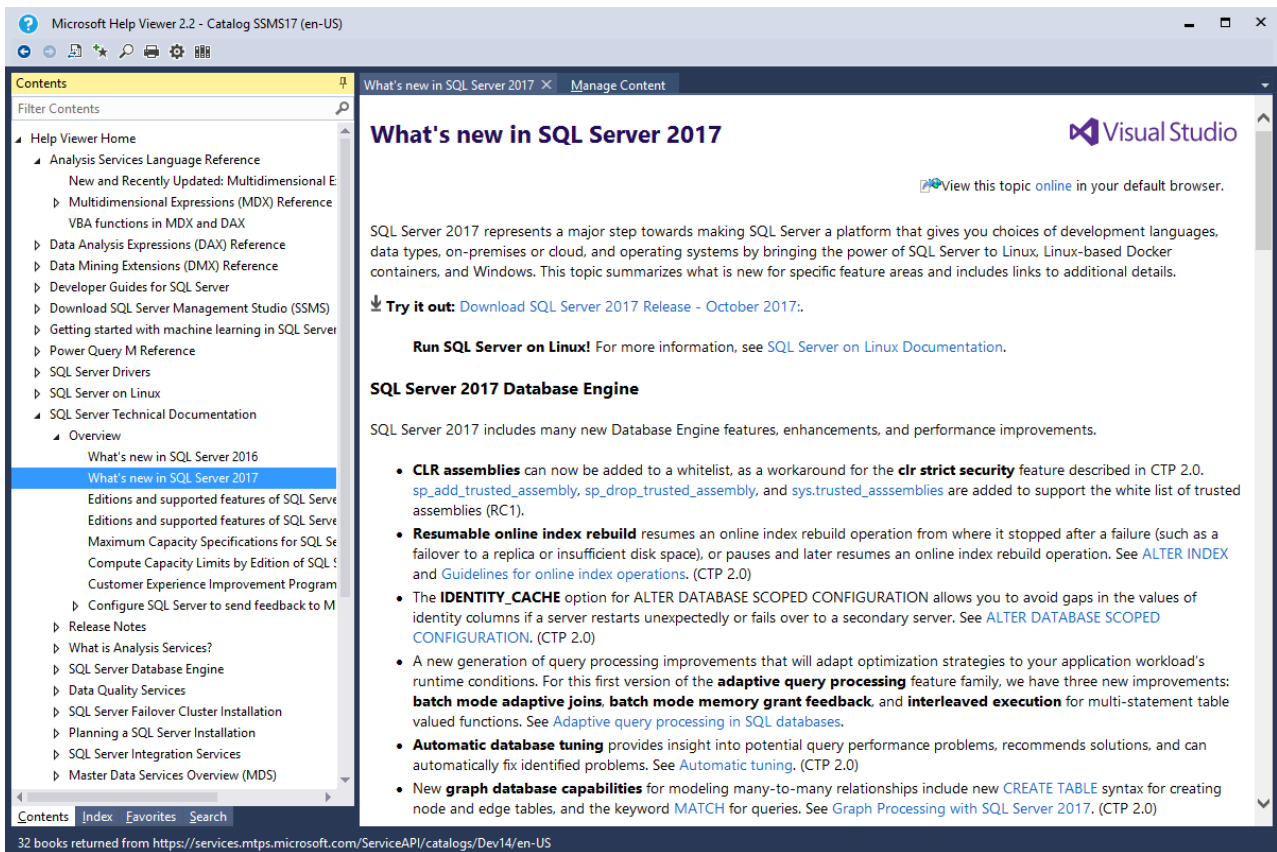
To view offline help content in VS with Help Viewer v2.x

To view the installed help in Visual Studio:

1. Point to **Set Help Preference** on the Help menu and choose **Launch in Help Viewer**.
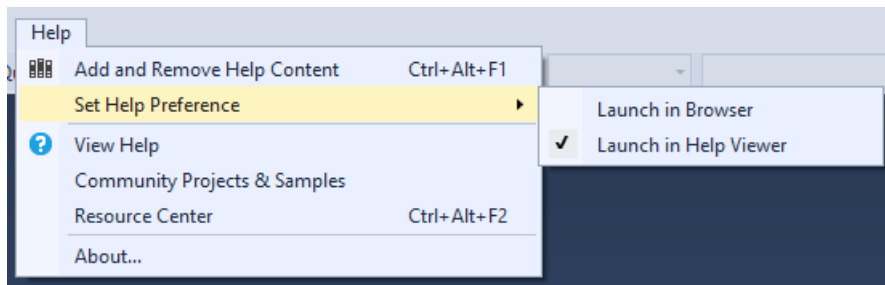
2. Click **View Help** in the Help menu to display the content in the Help Viewer.
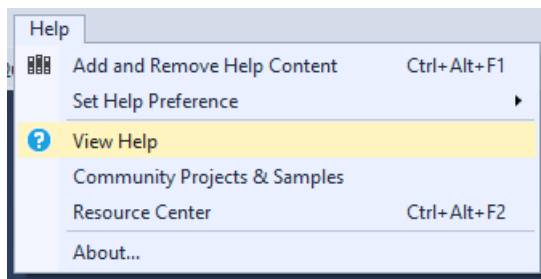
The help table of contents shows on the left, and the selected help topic on the right.

Use Help Viewer v1.x

Earlier versions of SSMS and VS use Help Viewer 1.x, which supports SQL Server 2014 Help.

To download and install offline help content with Help Viewer v1.x

This process uses Help Viewer 1.x to download SQL Server 2014 help from the Microsoft Download Center and

install it on your computer.

1. Navigate to the Product Documentation for Microsoft SQL Server 2014 download site and click **Download**.
2. Click **Save** in the message box to save the *SQLServer2014Documentation_*.exe* file to your computer.

> **NOTE**
>
> For firewall and proxy restricted environments, save the download to a USB drive or other portable media that can be carried into the environment.

3. Double-click the .exe to unpack the help content file, and save the file to a local or shared folder.
4. Open the **Help Library Manager** by launching SSMS or VS and clicking **Manage Help Settings** on the Help menu.
5. Click **Install content from disk**, and browse to the folder where you unpacked the help content file.
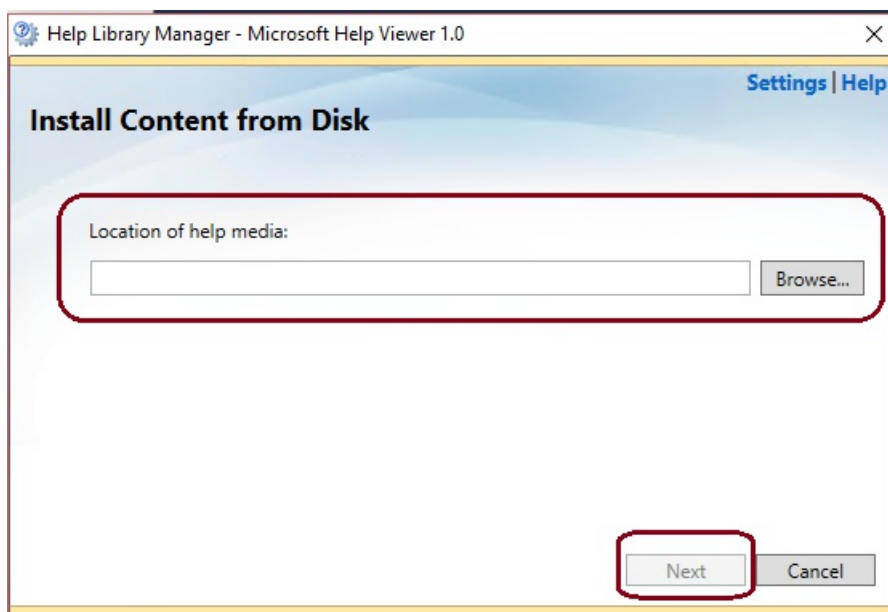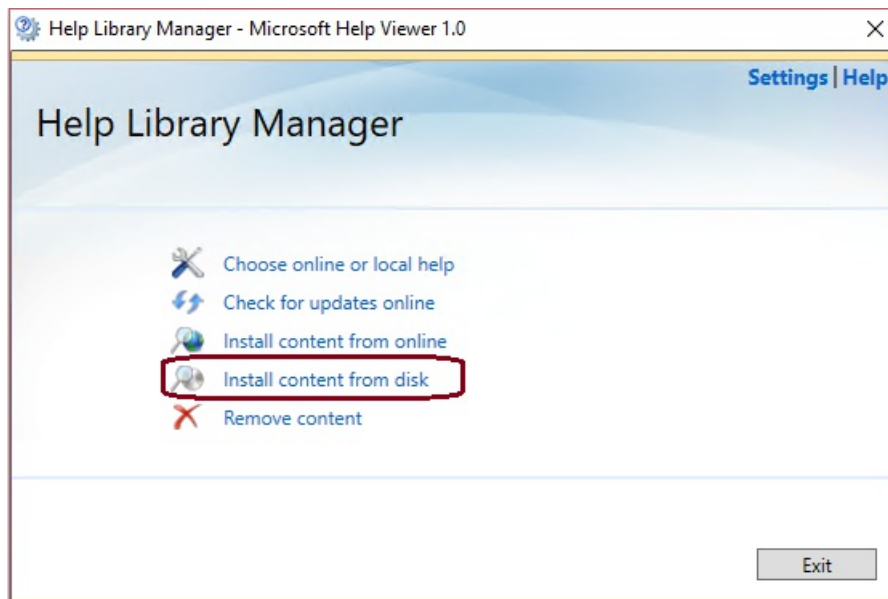
6. Click the HelpContentSetup.msha file, click **Open**, and then click **Next**.

7. Click **Add** next to the documentation you want to install, and then click **Update**.
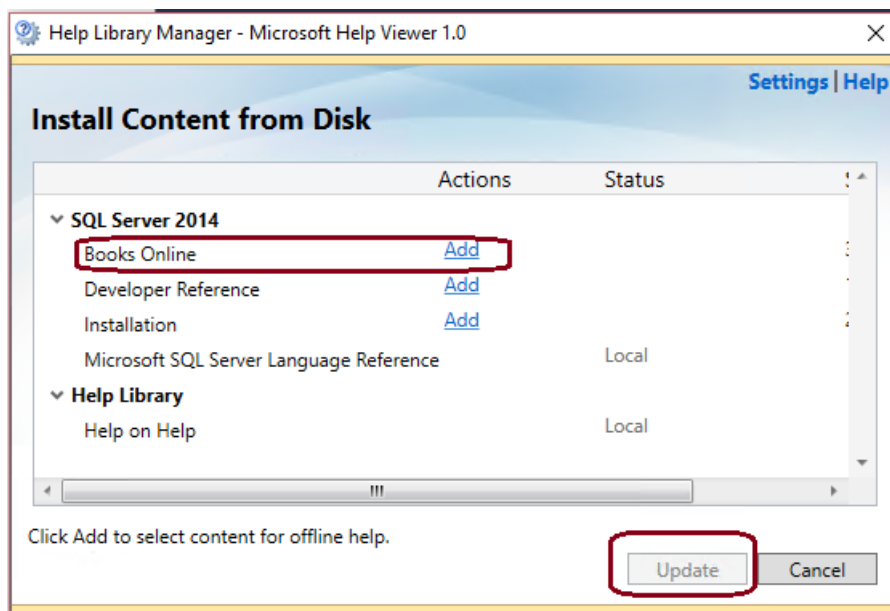
8. Click **Finish**, and then click **Exit**.

To view offline help content with Help Viewer v1.x

1. To view installed help, open **Help Library Manager**, click **Choose online or local help**, and then click **I want to use local help**.

2. Open the Help Viewer to see the content by clicking **View Help** on the **Help** menu. The content you installed is listed in the left pane.
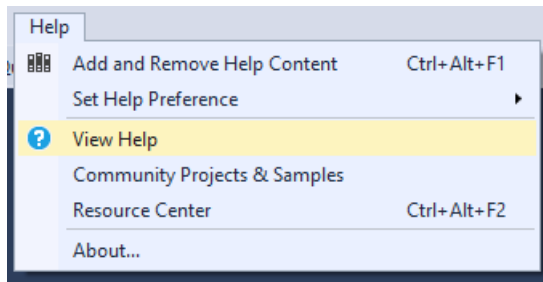

View online help

Online help always shows the most up-to-date content.

To view SQL Server online help in SSMS 17.x

- Click **View Help** in the **Help** menu. The latest SQL Server 2016/2017 documentation from

https://docs.microsoft.com/sql/https://docs.microsoft.com/en-us/sql/sql-server/sql-server-technical-documentation displays in a browser.
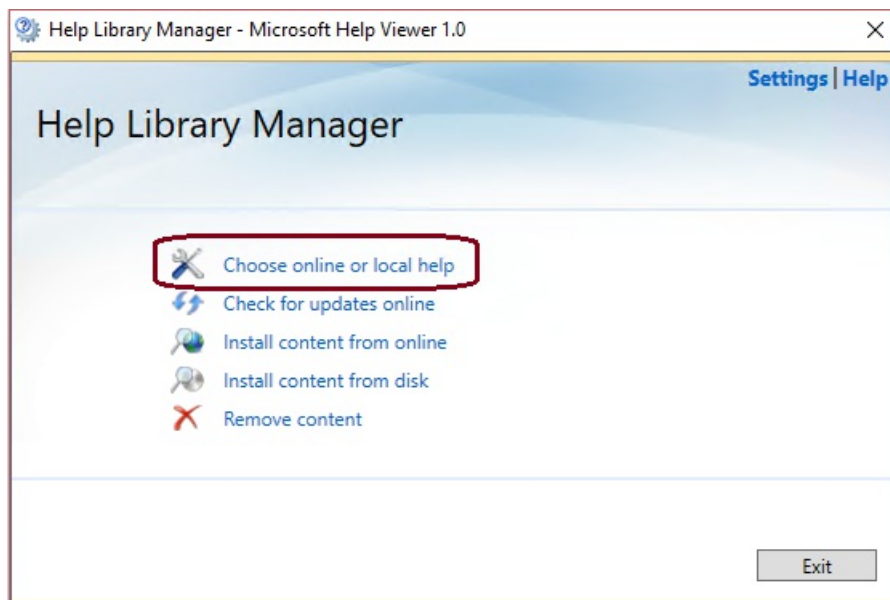

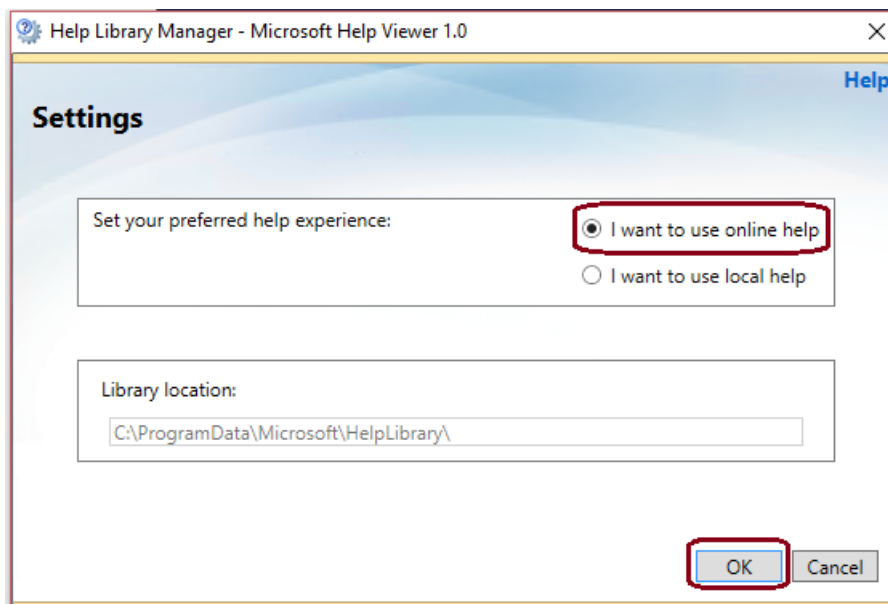**To view Visual Studio online help in Visual Studio**

1. Point to **Set Help Preference** on the Help menu and choose either **Launch in Browser** or **Launch in Help Viewer**.
2. Click **View Help** in the Help menu. The latest Visual Studio help displays in the chosen environment.

To view online help with Help Viewer v1.x

1. Open the **Help Library Manager** by clicking **Manage Help Settings** on the Help menu.
2. In the Help Library Manager dialog box, click **Choose online or local help**.

3. Click **I want to use online help**, click **OK**, and then click **Exit**.

4. Open the Help Viewer to see the content by clicking **View Help** on the **Help** menu.

View F1 help

When you press F1 or click **Help** or the **?** icon in a dialog box in SSMS or VS, a context-sensitive online help topic appears in the browser or Help Viewer.

To view F1 help

1. Point to **Set Help Preference** on the Help menu, and choose either **Launch in Browser** or **Launch in Help Viewer**.

2. Press F1, or click **Help** or **?** in dialog boxes where they are available, to see context-sensitive online topics in the chosen environment.

> **NOTE**
>
> F1 help only works when you are online. There are no offline sources for F1 help.

Next steps

Microsoft Help Viewer - Visual Studio

ⓘ Get Help

- UserVoice - Suggestion to improve SQL Server?
- Setup and Upgrade - MSDN Forum
- SQL Server Data Tools - MSDN forum
- Transact-SQL - MSDN forum
- DBA Stack Exchange (tag sql-server) - ask SQL Server questions
- Stack Overflow (tag sql-server) - also has some answers about SQL development
- Reddit - general discussion about SQL Server
- Microsoft SQL Server License Terms and Information
- Support options for business users
- Contact Microsoft