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Azure DevOps Release Pipelines

for SQL Databases, Azure Data Factories, and Analysis Models

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What is your pain?

Development Chaos

Tracking changes

Multiple developers

Ad hoc, manual deployments

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Can you answer these questions?

Who/what/where/when/why

“Where is the code for the Production environment?”

“Where is the latest code deployed?”

“Why does this view/sproc reference a column (or table) that doesn’t exist? (and how long has it been this way?)”

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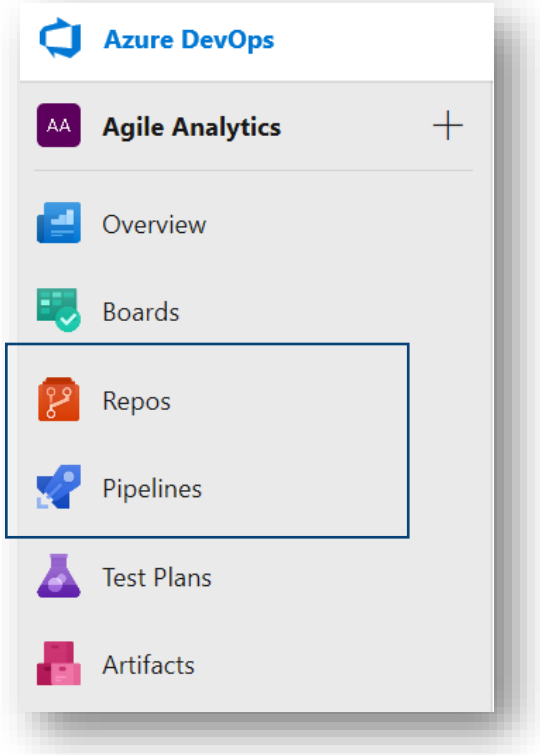
Azure DevOps

https://dev.azure.com

DevOps

Bringing together
Development and Operations

First five users free!



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Why we need Azure Pipelines

Azure Pipelines

Compile source code to discover issues early

Deploy assets consistently from source control repository

Maintain clearly defined environments

Auditing

Allow for change, reduce brittleness, *increase velocity*

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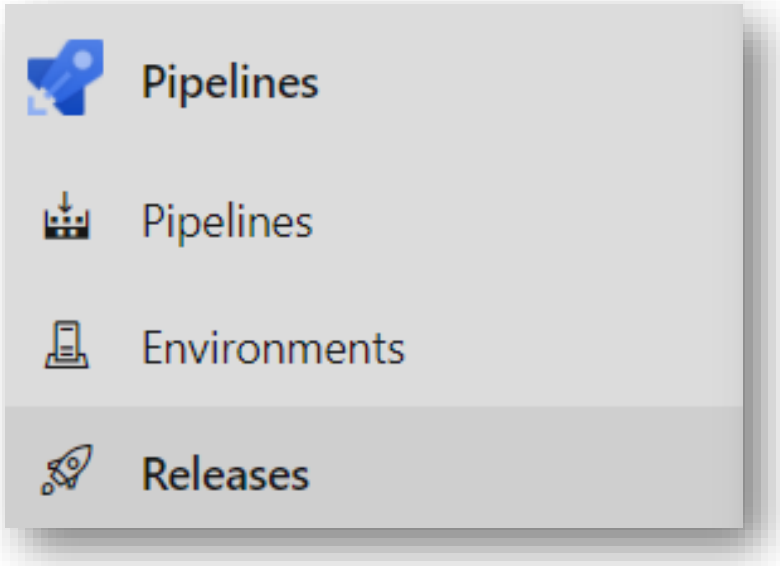
Pipeline Types

Azure DevOps

- **Pipelines**
  - Compile source code to create artifacts
- **Releases**
  - Use build artifacts to deploy to environments



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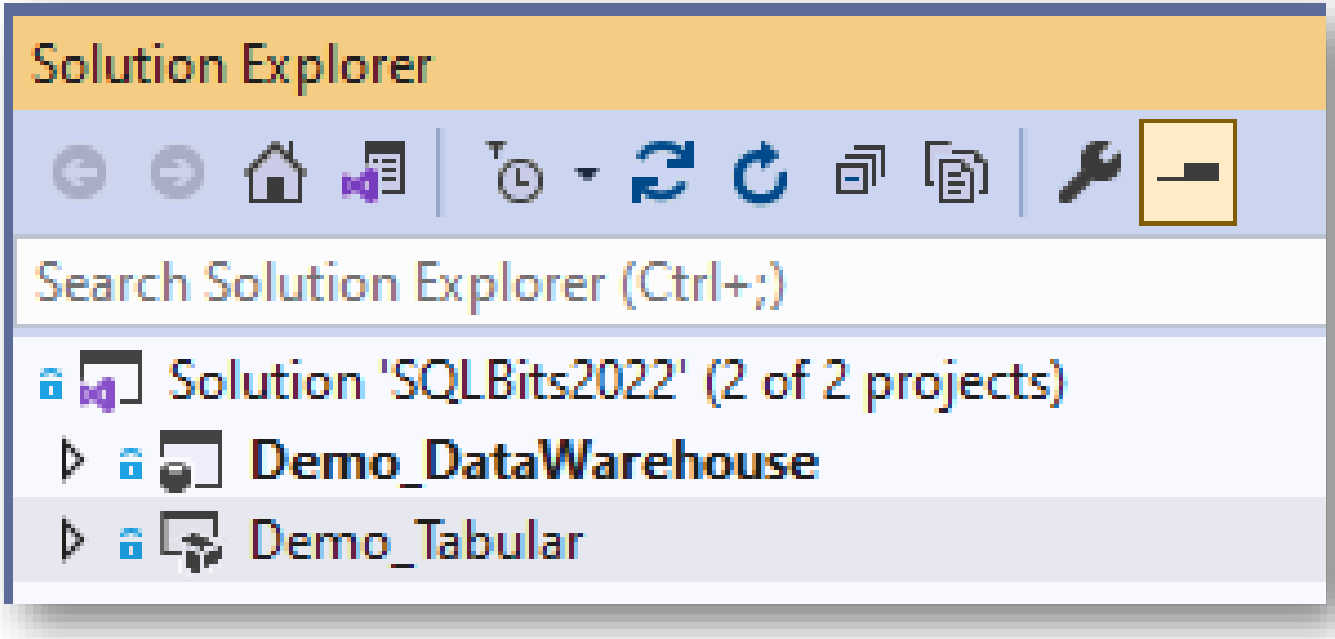
Demo Visual Studio Solution



Visual Studio

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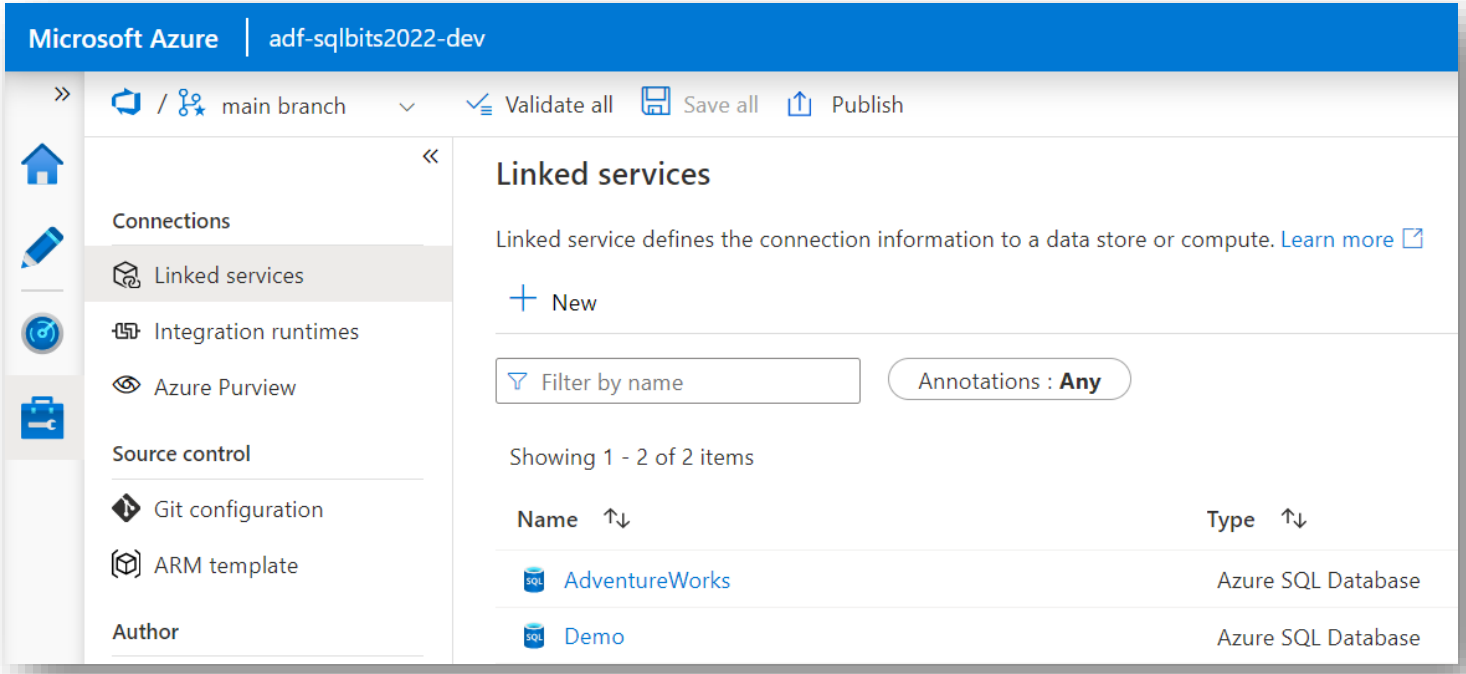
Demo Azure Data Factory



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Compiler Output → Build Artifacts

Project type	Compiler type	Output file
Database .sqlproj	MSBuild	.DACPAC
Analysis .asproj	MSBuild	.ASDatabase
Azure Data Factory	npm script	ARMTemplate.json

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Build Pipeline

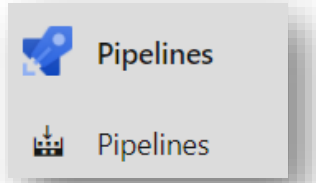
VS Solution Build Tasks:

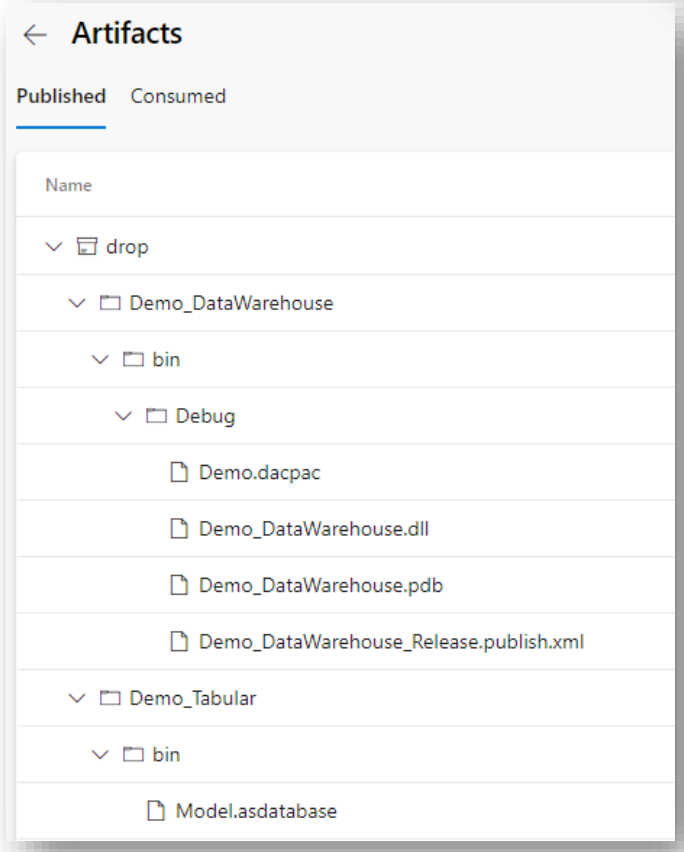
Visual Studio Build (SqlBits2022.sln)
- Demo_Datawarehouse.sqlproj → Demo_Datawarehouse.dacpac, Demo_Datawarehouse_Release.publish.xml, etc
- Demo_Tabular.asproj → Model.asdatabase

Copy Artifacts to Staging
- Copies compiled output to artifact staging folder on agent

Publish Artifacts
- Packages artifact staging files and uploads to Azure DevOps build pipeline

Azure Pipelines





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Azure Data Factory

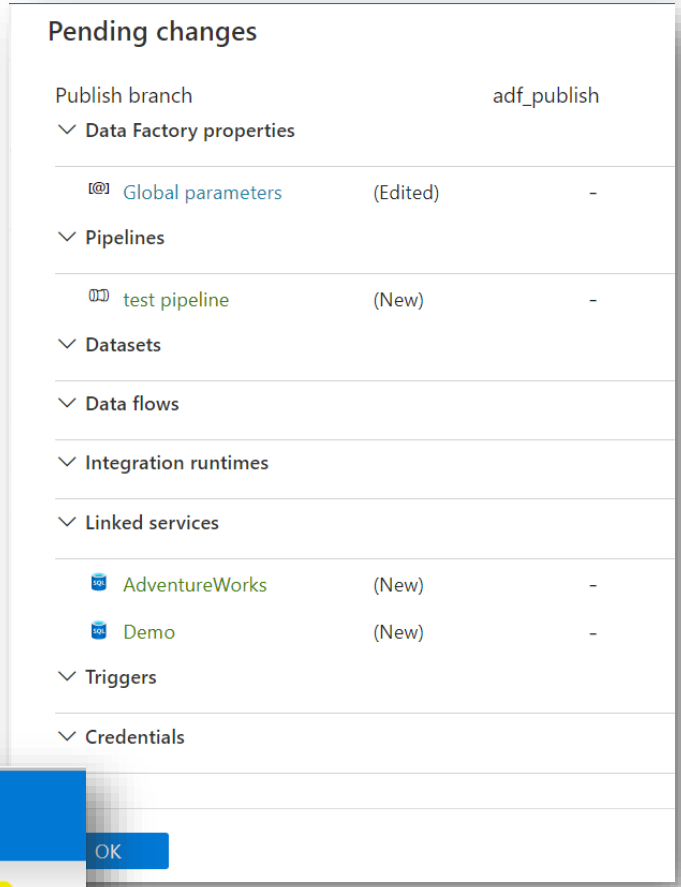
Manual ARM Template Publishing

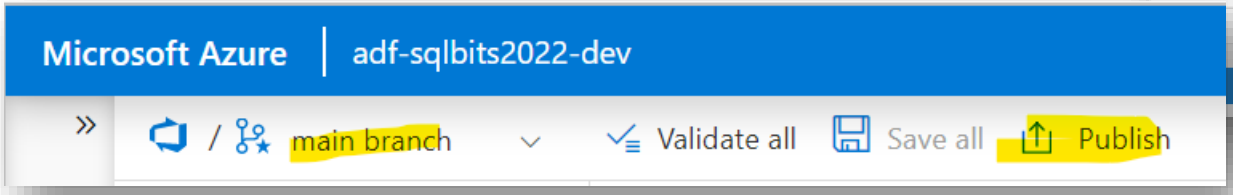
Complete Pull Request

Switch to main branch in ADF portal

Click Publish

Creates template in adf-publish branch





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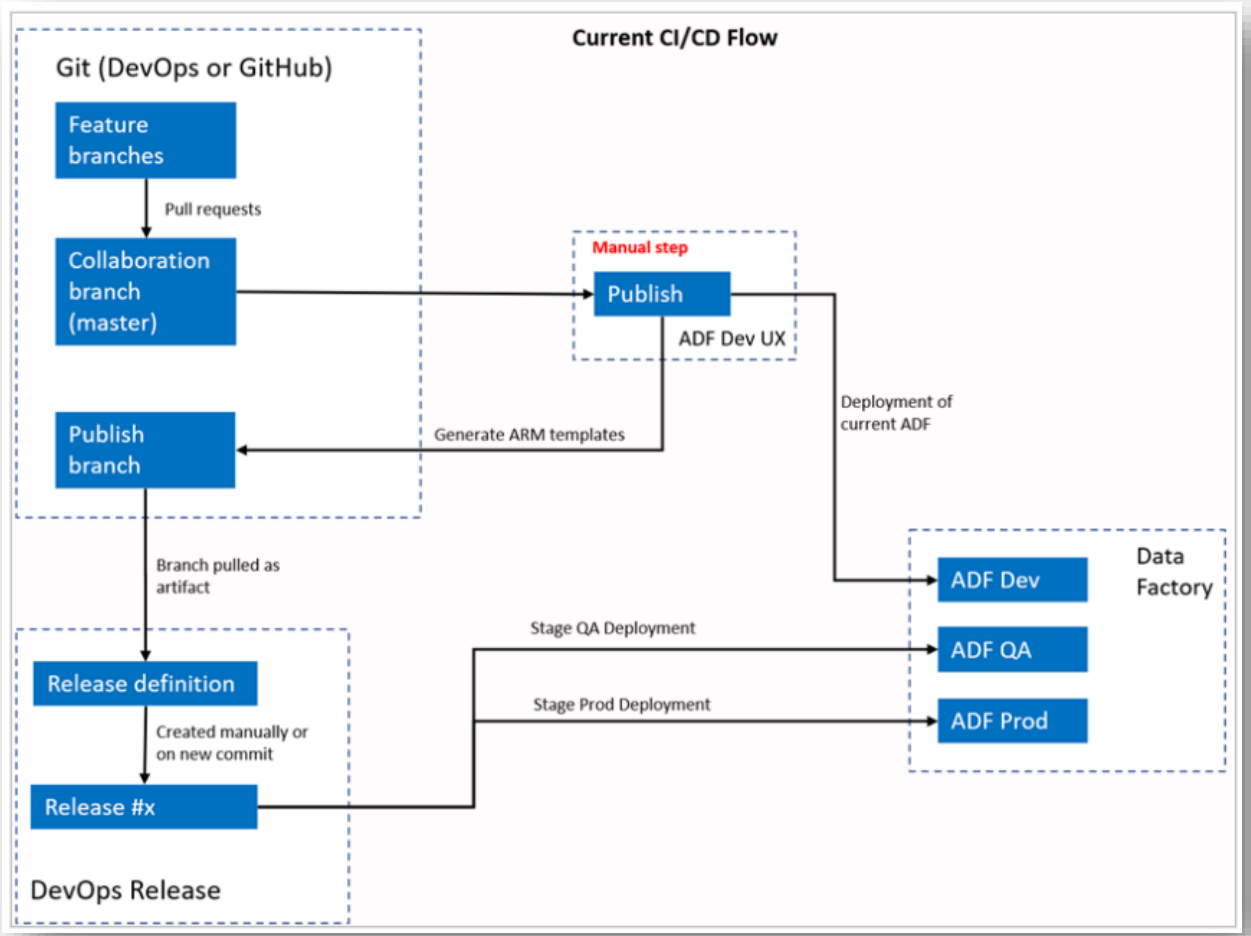
Azure Data Factory

Manual ARM Template Publishing



https://docs.microsoft.com/en-us/azure/data-factory/continuous-integration-delivery-improvements

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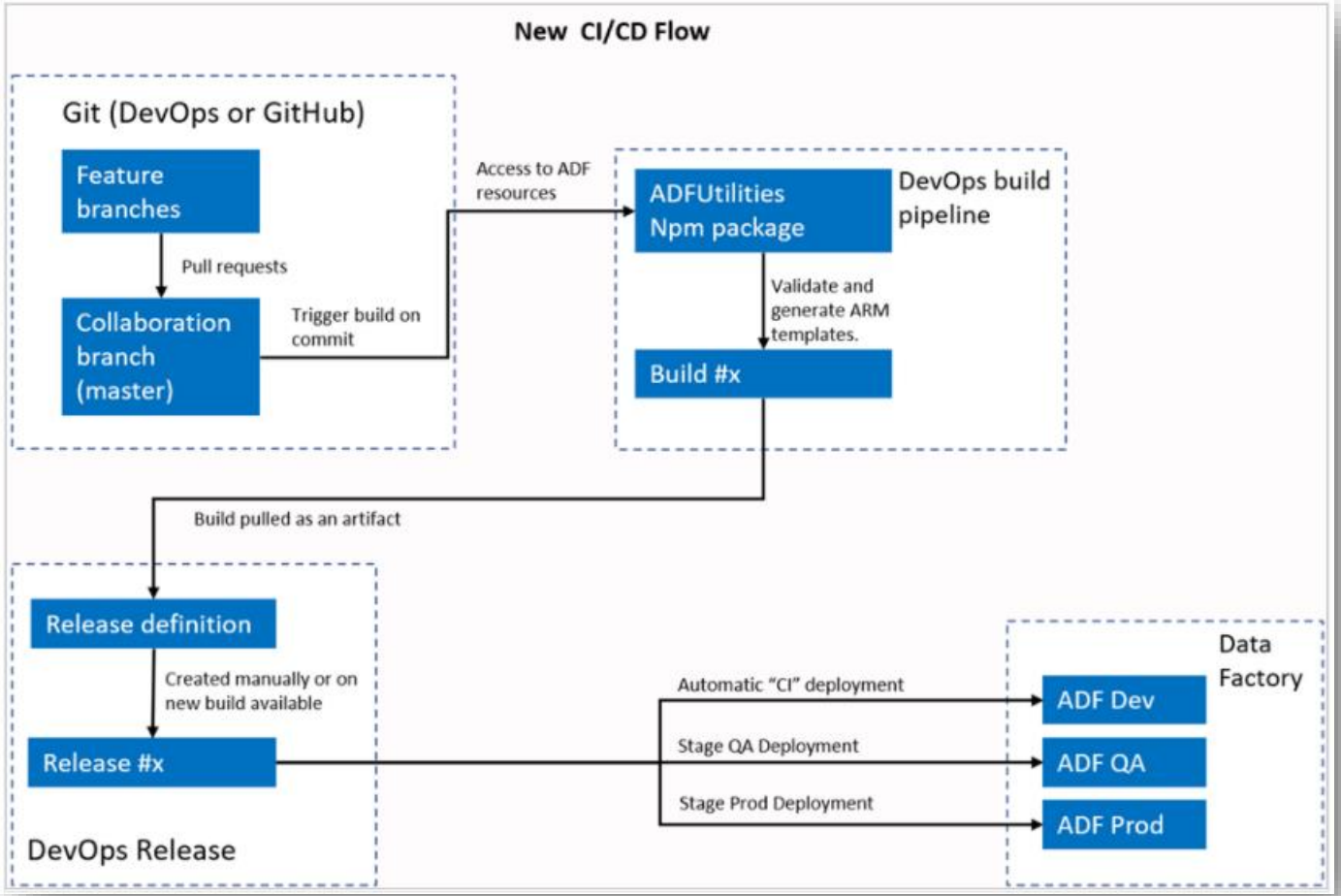
Azure Data Factory

Automated ARM Template Generation



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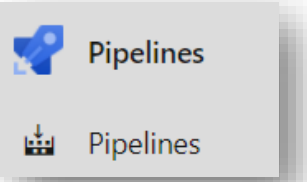
Build Pipeline

Data Factory

Azure Pipelines

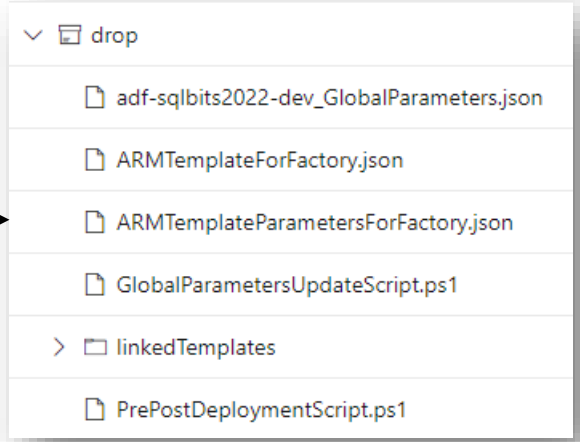


Build Tasks:

npm install
- Loads @microsoft/azure-data-factory-utilities package
- (References package.json file in repo)

npm custom
run build validate <<sourcefolder>> <<AzureResourceString>>
- Validates json files (like "Validate All" button in ADF)

npm custom
run build export <<sourcefolder>> <<AzureResourceString>> "ARMTemplate"
- Validates files and generates template files and PowerShell scripts



Copy Artifacts to Staging
- Copies files generated in ARMTemplate folder to artifact staging folder on agent

Publish Artifacts
- Packages artifact staging files and uploads to Azure DevOps build pipeline

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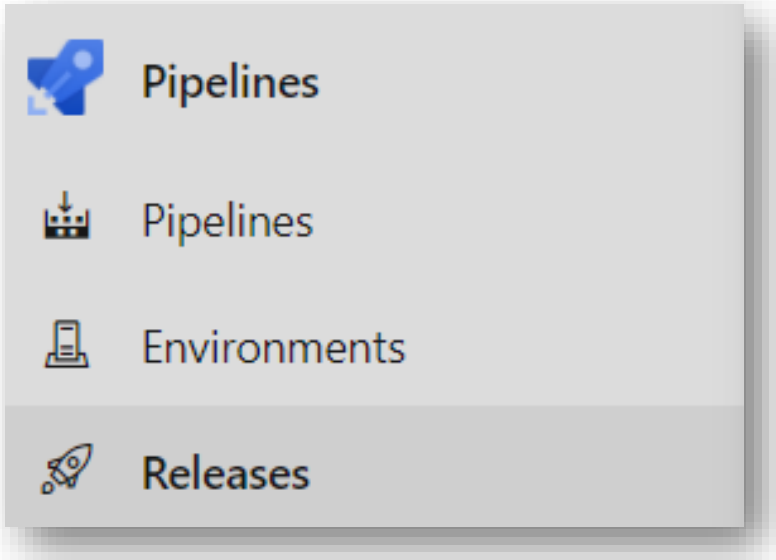
Demo: Build Pipelines

Azure DevOps



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Release Tasks → Base Tools

Project type	Output file	Tool
Database .sqlproj	.DACPAC	SQLPACKAGE.EXE
Analysis .asproj	.ASDatabase	PowerShell (custom script)
Azure Data Factory	ARM Template	ARM Template Task

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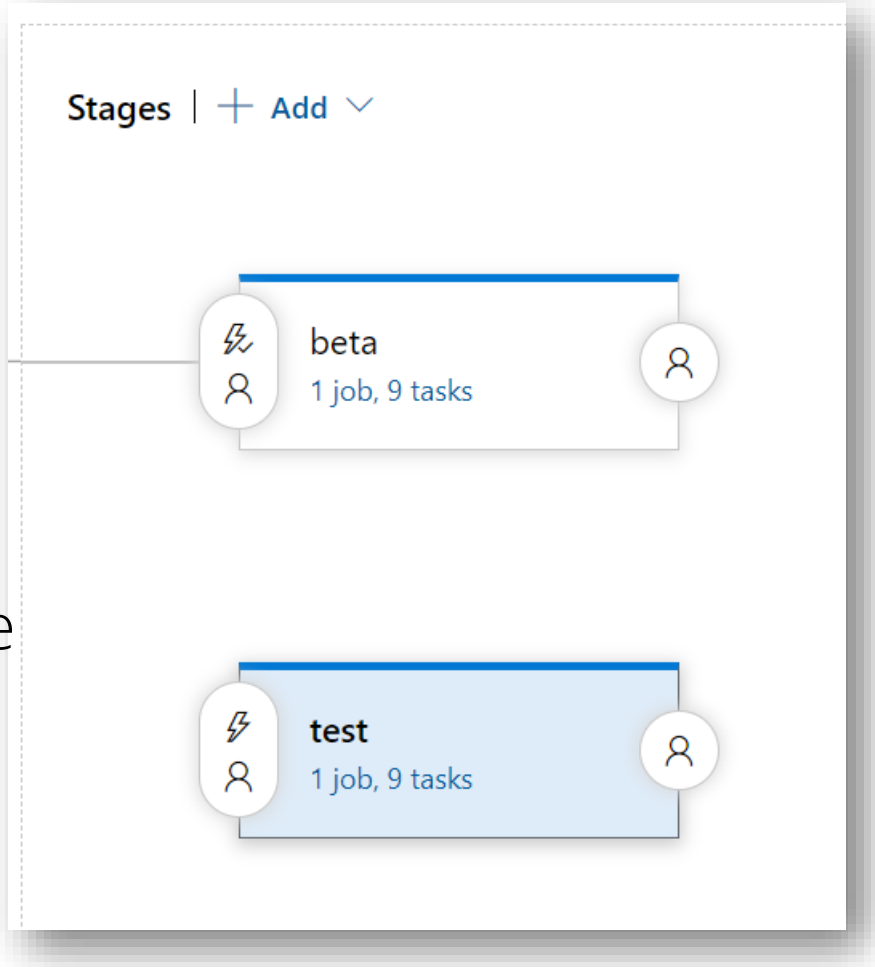
Release Stages

Environments

Usually the same tasks in each

Variables can be scoped to stage



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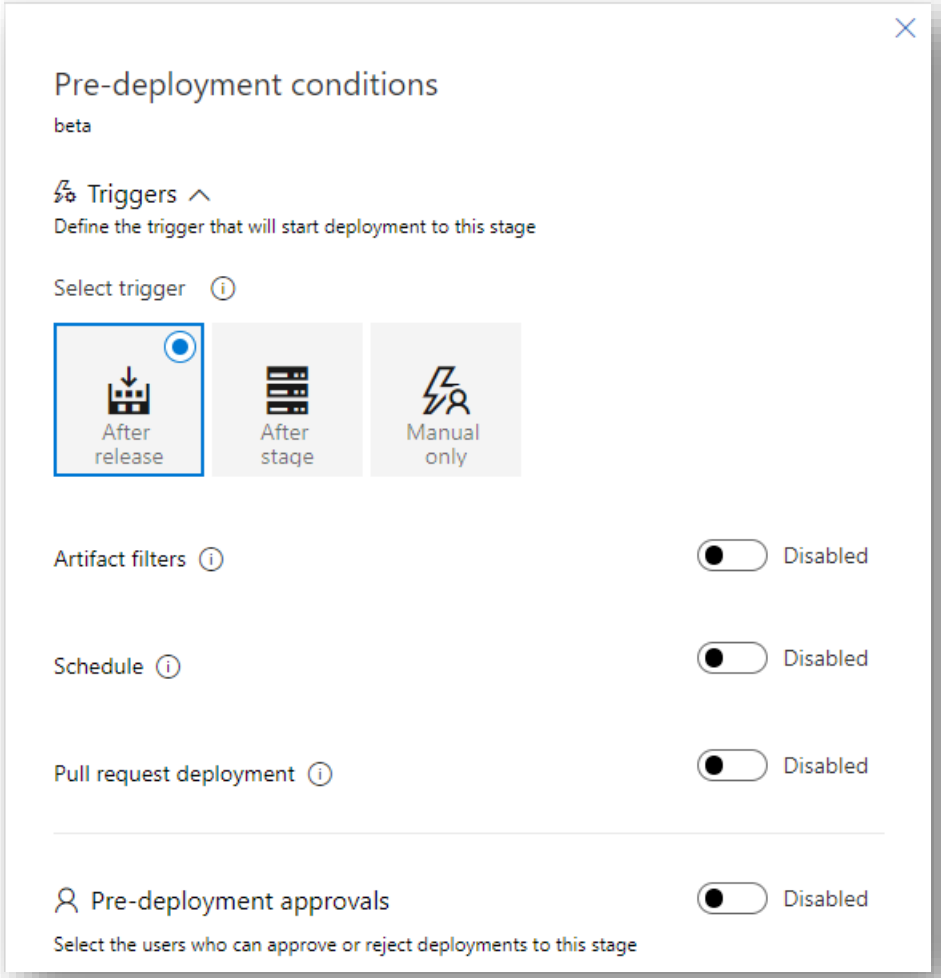
Release Stages

Pre-deployment conditions

Trigger type and schedule

Approvals



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Pipeline Variables

Azure DevOps

Name	Value	Scope
AASApplicationId	43bfc4a3-19e0-4918-9954-32203b5be234	Release
AASApplicationSecret	********	Release
AASTenantId	0a539319-678b-498f-a887-083148b2abea	Release
AdventureWorksConnectionString	Initial Catalog=source_oltp;Data Source=$(SqlServer).net;Integrated Se...	Release
AzureAnalysisServer	asazure://canadacentral.asazure.windows.net/sqlbits2022md	Release
DatabaseName	Demo	Release
datafactory	adf-sqlbits2022-$(Release.EnvironmentName)	Release
demoConnectionString	Initial Catalog=$(DemoDB);Data Source=$(SqlServer);Integrated Securi...	Release
DemoDB	demo_$(Release.EnvironmentName)	Release

- **Releases**
  - Used for configuration of environment-specific resources, like database names, locations, passwords
  - Variables not often used in **build** pipelines

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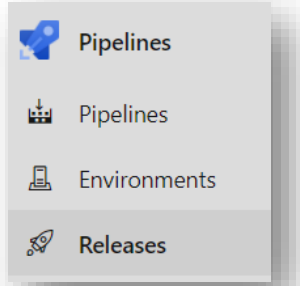
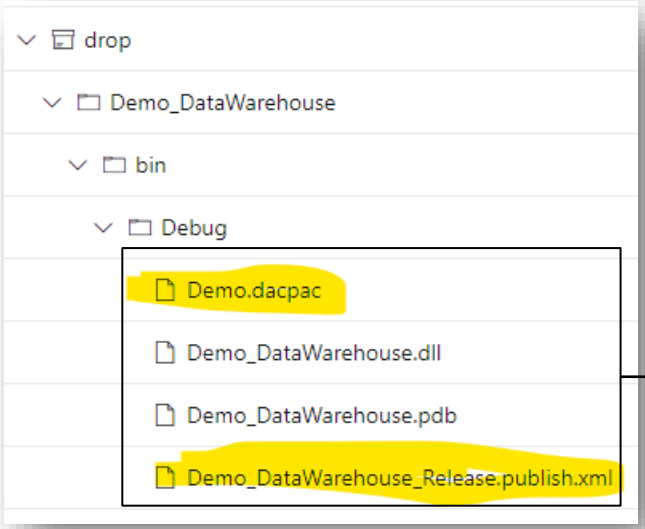
Release Pipeline

Database Deployment Task

Azure Pipelines





Task 1 – Create Change Script

- Connect to $(SqlServer), using Service Principal identity
- Create Script of changes to $(DatabaseName) from artifact Demo.dacpac, using profile Demo_Datawarehouse_release.publish.xml
- Uses SQLPACKAGE.EXE

Task 2 – Publish changes to database

- Connect to $(SqlServer), using Service Principal identity
- Deploy $(DatabaseName) from artifact Demo.dacpac, using profile Demo_Datawarehouse_release.publish.xml
- Uses SQLPACKAGE.EXE

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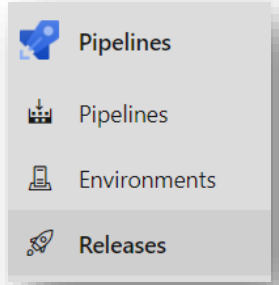
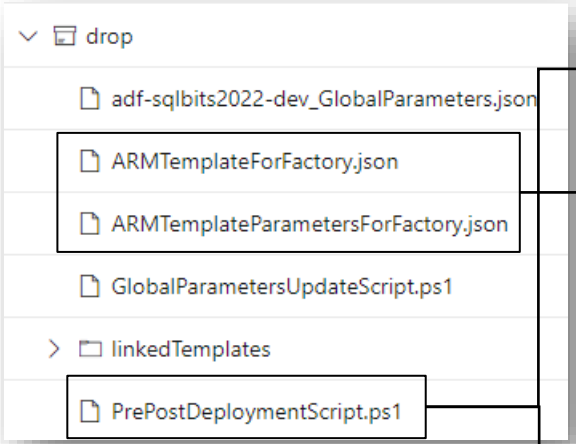
Release Pipeline

Deploy Azure Data Factory Tasks

Azure Pipelines





Task 1 – Disable Triggers (PowerShell)

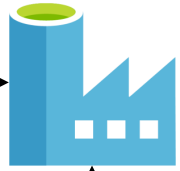
- Execute PrePostDeploymentScript.ps1
- -predeployment $true

Task 2 – Deploy ARM template

- -factoryName $(datafactory) –Demo_connectionString "$(DemoConnectionString) –AdventureWorks_connectionString "$(AdventureWorksConnectionString)"

Task 3 – Cleanup (PowerShell)

- Execute PrePostDeploymentScript.ps1
- -predeployment $false
- Removes objects in ADF not in template



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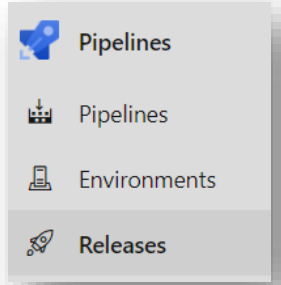
Release Pipeline

Azure Pipelines



Warning: ARM Template Deployment mode

$(System.DefaultWorkingDirectory)/_SqlBits2022-ADF-CI/drop/ARMTemplateForFactory.json

Template parameters

$(System.DefaultWorkingDire

Override template parameters

-factoryName $(datafactory)
"$(DemoConnectionString)"

Deployment mode *

Incremental

Advanced

Deployment name

Deployment outputs

Refer to this for more details.

Incremental mode handles deployments as incremental updates to the resource group. It leaves unchanged resources that exist in the resource group but are not specified in the template.

Complete mode deletes resources that are not in your template. Complete mode takes relatively more time than incremental mode. If the task times out, consider increasing the timeout, or changing the mode to 'Incremental'.
[Warning] Complete mode will delete all the existing resources in the resource group that are not specified in the template. Do review if the resource group you're deploying to doesn't contain any necessary resources that are not specified in the template.

Validate mode enables you to find problems with the template before creating actual resources. Validate mode enables you to find problems with the template before creating actual resources. Please note that this mode will anyways create a resource group even if it does not deploy any resource.

By default, Incremental mode is used.

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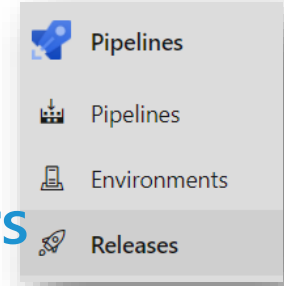
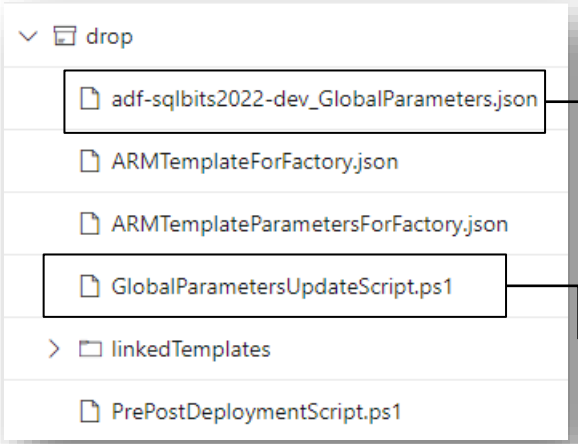
Release Pipeline

Azure Pipelines



Deploy Azure Data Factory Tasks – global parameters



Task 4 – Transform parameters json

- File transform file task
- adf-sqlbits2022-dev_GlobalParameters.json
- Variables: Name.Value matching parameter names

Task 5 – Set global parameters (PowerShell)

- Execute GlobalParametersUpdateScript.ps1
- Script arguments: -globalParametersFilePath <<path>>adf-sqlbits2022-dev_GlobalParameters.json

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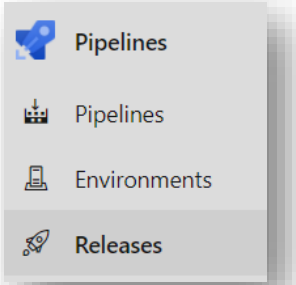
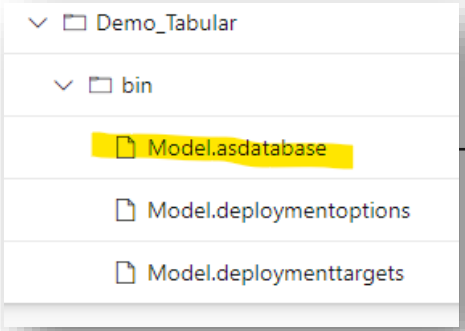
Release Pipeline

Deploy Tabular Model task

Azure Pipelines





Task – Execute PowerShell Script

- Connects to XMLA endpoint (Azure Analysis Server or Power BI Premium workspace)
- Deploys Model.asdatabase
- Updates SQL datasource connection
- Refreshes model (optional)

XMLA endpoints:

“**powerbi://api.powerbi.com/v1.0/myorg/SQLBits 2022 Beta**”

asazure://canadacentral.asazure.windows.net/sqlbits2022md

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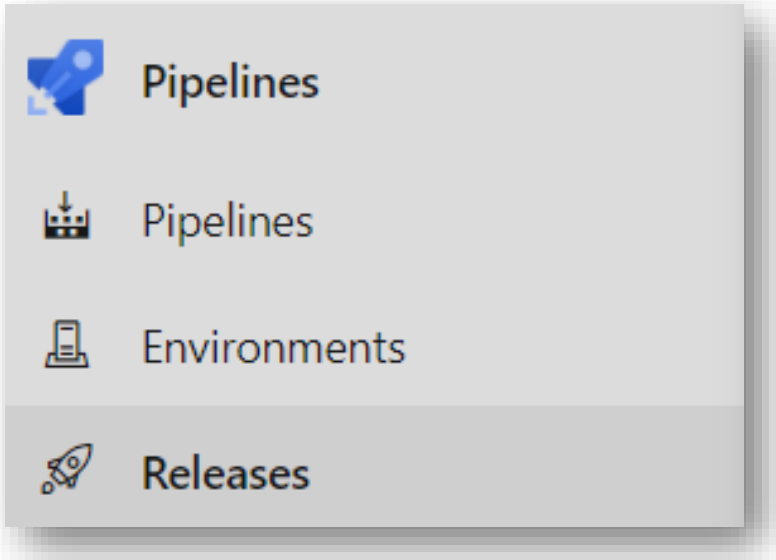
Demo: Release Pipelines

Azure DevOps



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Recommendations

- Start with “Classic Editor” instead of YAML
- Use PowerShell and Command tasks
- Define stages to match your environments (Integration, Test, UAT, Prod)
- Use $(variables) to simplify pipeline development
- Invest time early to develop build and release pipelines

https://github.com/xhead/SqlBits2022

Feedback

https://sqlb.it/?7045

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