

Felix Möller

Avanade



CI/CD for your Cloud Data Platform from Data Lake to Power BI

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Agenda

- 1 About me
- 2 Cloud Data Platform
- 3 Continuous Integration & Azure DevOps
- 4 Build
- 5 Deploy
- 6 Q&A



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About Me

Felix Möller

Senior Azure Analytics Architect at Avanade – joint venture of Microsoft and Accenture.

Currently Building an Azure data platform with use cases thyssenkrupp.

Building data warehouses with a focus on financial data and SAP for more than 7 years. Focus shifted to Azure Architectures.

Contact Info

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<https://news.microsoft.com/transform/thyssenkrupp-materials-services-keeps-calm-and-carries-on/>

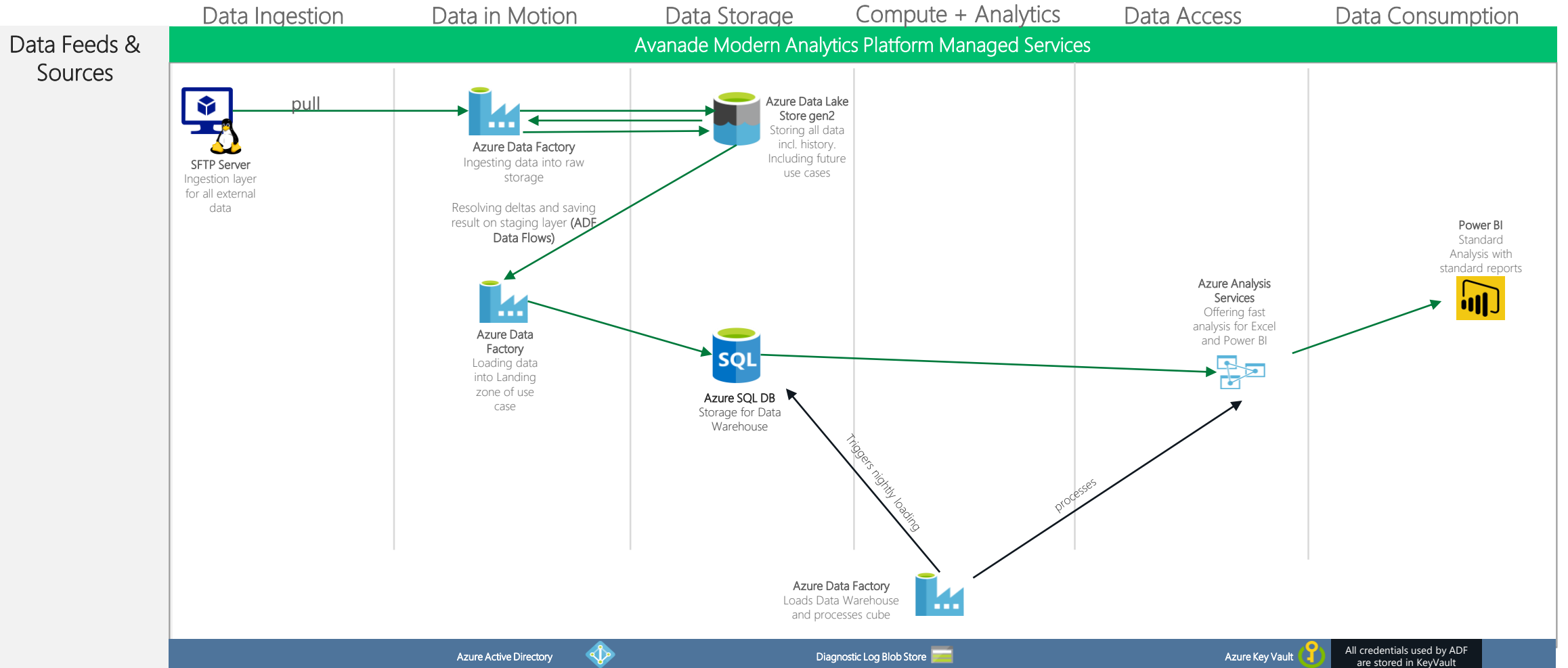


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alfred.SimOne: Platform Technical Data Flow (original)



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Definitions

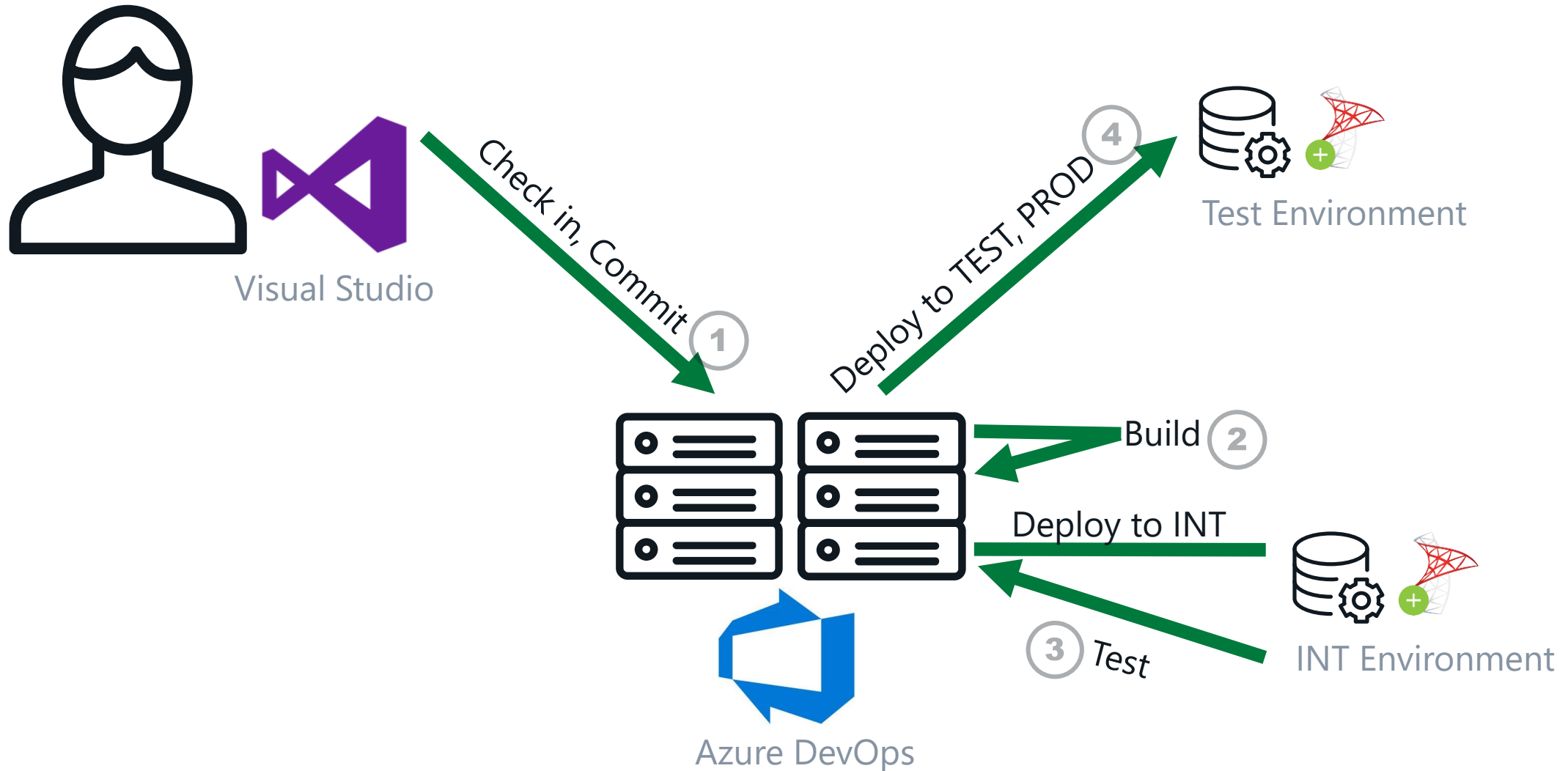
Continuous Integration: is a **development practice** that requires developers to **integrate** code into a shared repository **several times a day**. Each check-in is then **verified** by an **automated build**, allowing teams to detect problems early.

Continuous Delivery: on top of having CI, you also have automated your release process and you can **deploy** your application at any point of time by **clicking on a button**.

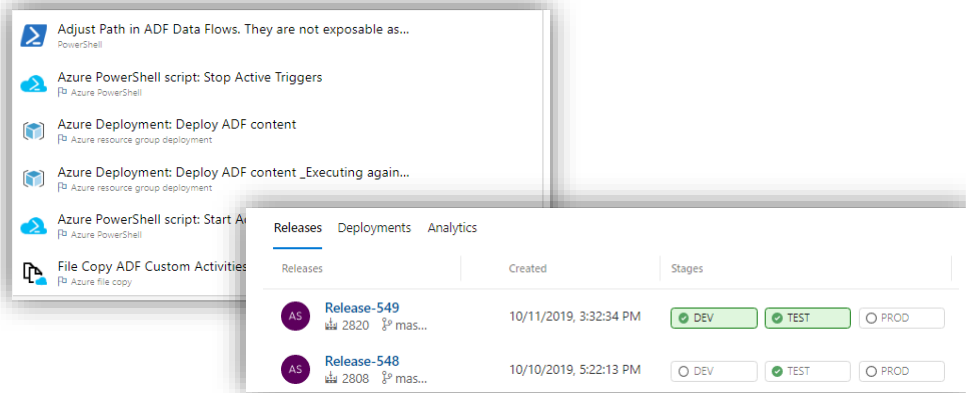
Continuous deployment: There's **no human intervention**, and only a **failed test** will prevent a new change to be deployed to **production**.



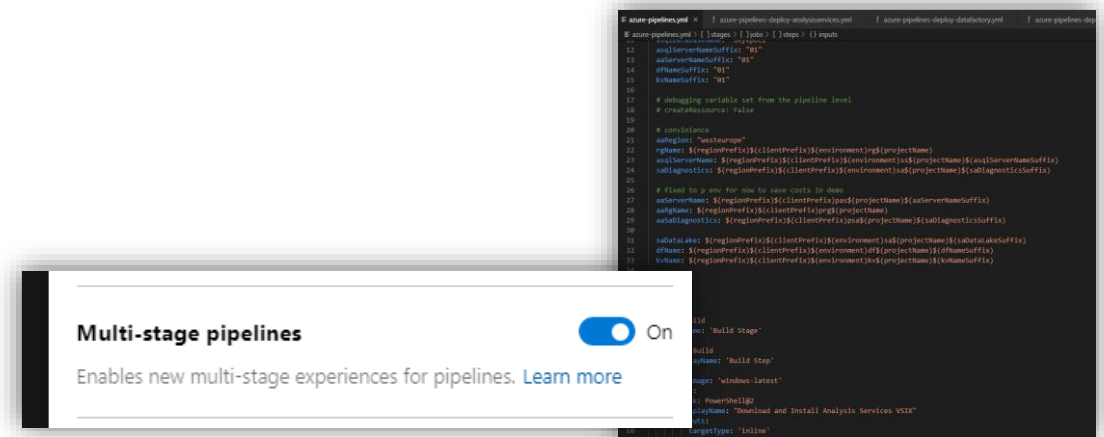
Continuous Deployment Process



Classic vs YAML



- Graphical creation
- Well established
- Not part of source



- Code driven
- Previously only for build not for release. Now preview.
- Documentation still lacking
- Frequent fixes



Self hosted vs Microsoft-Hosted

Self-Hosted CI/CD

- Full flexibility what to install
- SSMS can be installed
- Visual Studio Extensions can be installed easily

Cost

- Cost of VM (ca. 150 EUR per month)

MS Hosted CI/CD

- Pure PaaS philosophy
- Nothing to maintain
- Additional software must be installed on each build

Cost

- 29 EUR /agent per month



Benefits of DevOps

- **Higher productivity:** deployments do not create manual work
- **Higher Quality:** everything source controlled
- **Faster time to market:** features deployed very quickly
- **Less errors:** connection strings and configuration up to date
- **Automatic Testing:** find regressions



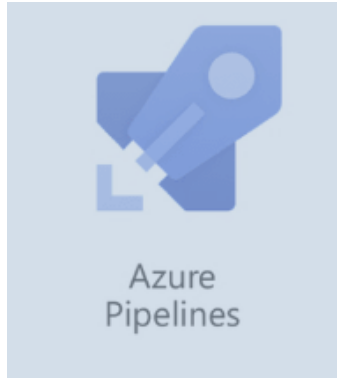
Demo: Azure DevOps Overview



Azure
Boards



Azure
Repos



Azure
Pipelines



Azure
Test Plans



Azure
Artifacts



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Build

- Build is simple!
- Build the solution

```
Settings
66 | ..... - task: VSBUILD@1
67 | ..... displayName: 'Build the entire solution'
68 | ..... inputs:
69 | ..... solution: '**\*.sln'
70 | ..... vsVersion: '16.0'
71 | ..... clean: true
```

- Copy everything to release artifact

Name	Size
▼ beye	7 MB
> arm	37 KB
> as	2 MB
> asql	99 KB
> df	53 KB
> pbi	5 MB



What happens during “build”

Component	Source Code	Deployment artifact
SQL Database	*.sql	*.dacpac
Analysis Services	Model.bim	Model.asdatabase
Azure Data Factory	*.json (available with configured git integration)	ARM template (created during publish)
Power BI	*.pbix	*.pbix
Integration Services	*.dtsx	*.ispac



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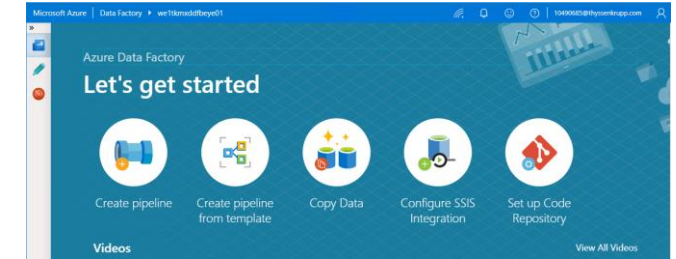
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Data Factory



- Resource
 - Can be created with a few lines of PowerShell upfront (Set-AzDataFactoryV2)
- Content
 - One Data Factory should be linked to git repository
 - Parameters can be explicitly exposed via arm-template-parameters-definition.json
 - All needed secrets should be part of key Vault

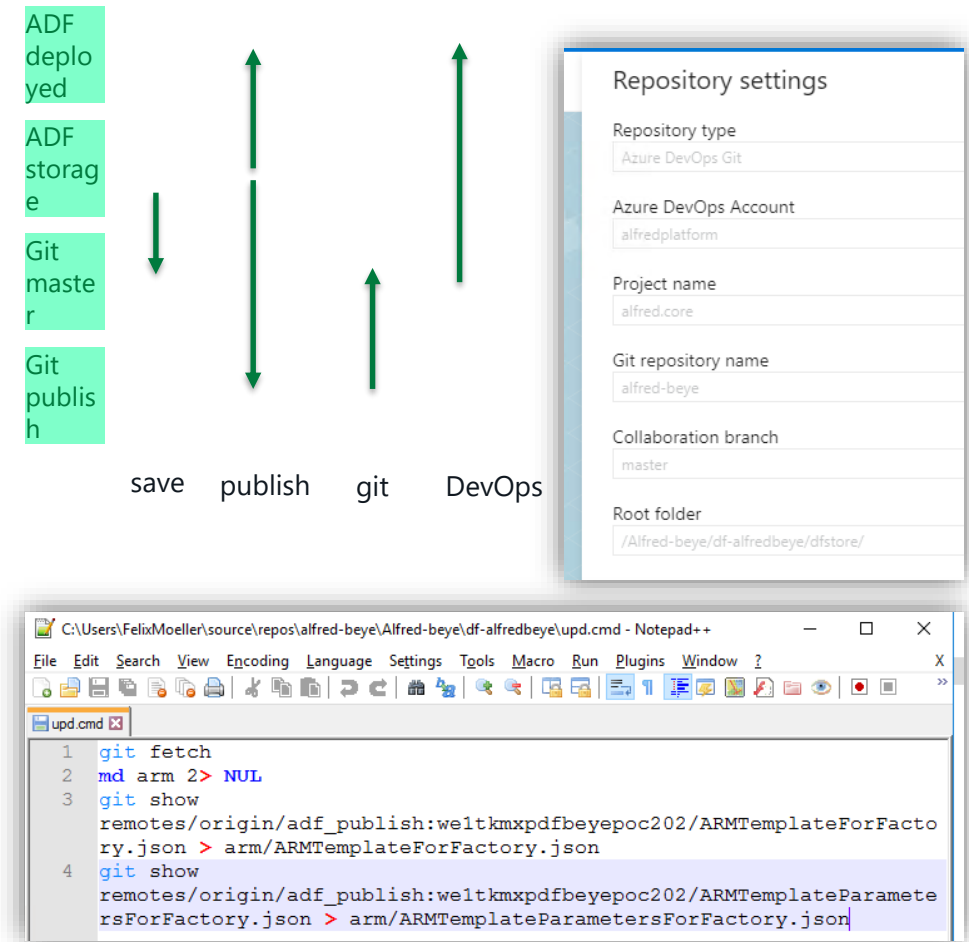


```
1  {
2    "Microsoft.DataFactory/factories/pipelines": {
3      "properties": {
4        "activities": [
5          {
6            "typeProperties": {
7              "parameters": {
8                "Region": "=-AnalysisServicesRegion",
9                "Server": "=-AnalysisServicesServer",
10               "DatabaseName": "=-AnalysisServicesDatabase"
11             }
12           }
13         ]
14       }
15     },
16   },
17   "Microsoft.DataFactory/factories/datasets": {},
18   "Microsoft.DataFactory/factories/linkedServices": {
19     "AzureBlobFS": {
20       "properties": {
21         "typeProperties": {
22           "url": "=-datalakeUrl:string"
23         }
24       }
25     },
26     "AzureKeyVault": {
27       "properties": {
28         "typeProperties": {
29           "baseUrl": "=-keyVaultBaseUrl:string"
30         }
31       }
32     },
33     "AzureSqlDatabase": {
34       "properties": {
35         "typeProperties": {
36           "connectionString": "=-sqlConnectionString:string"
37         }
38       }
39     }
40   }
41 }
```



git integrated data factory

- Git integration is essential
-  Save All saves one json file per object into the repository
- Pressing  Publish commits ARM templates to the adf_publish branch
- Short script allows to integrate in master branch (see right)



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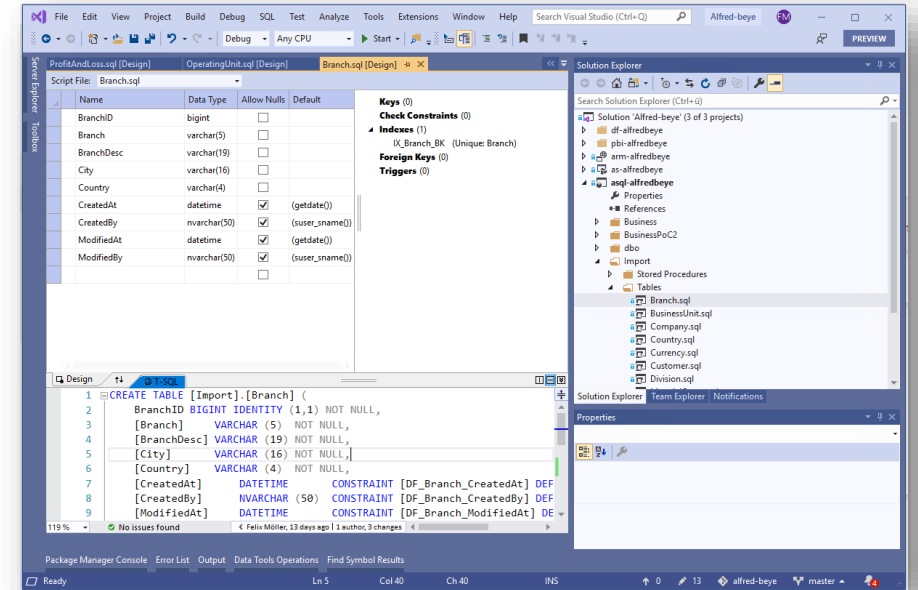
6 Q&A



Azure SQL Server

- Resource
 - A simple ARM template
- Content
 - managed in Visual Studio database project
 - Use Post Deployment Scripts
 - Use Merge Generator

(cf. <https://github.com/readymill/generate-sql-merge>)

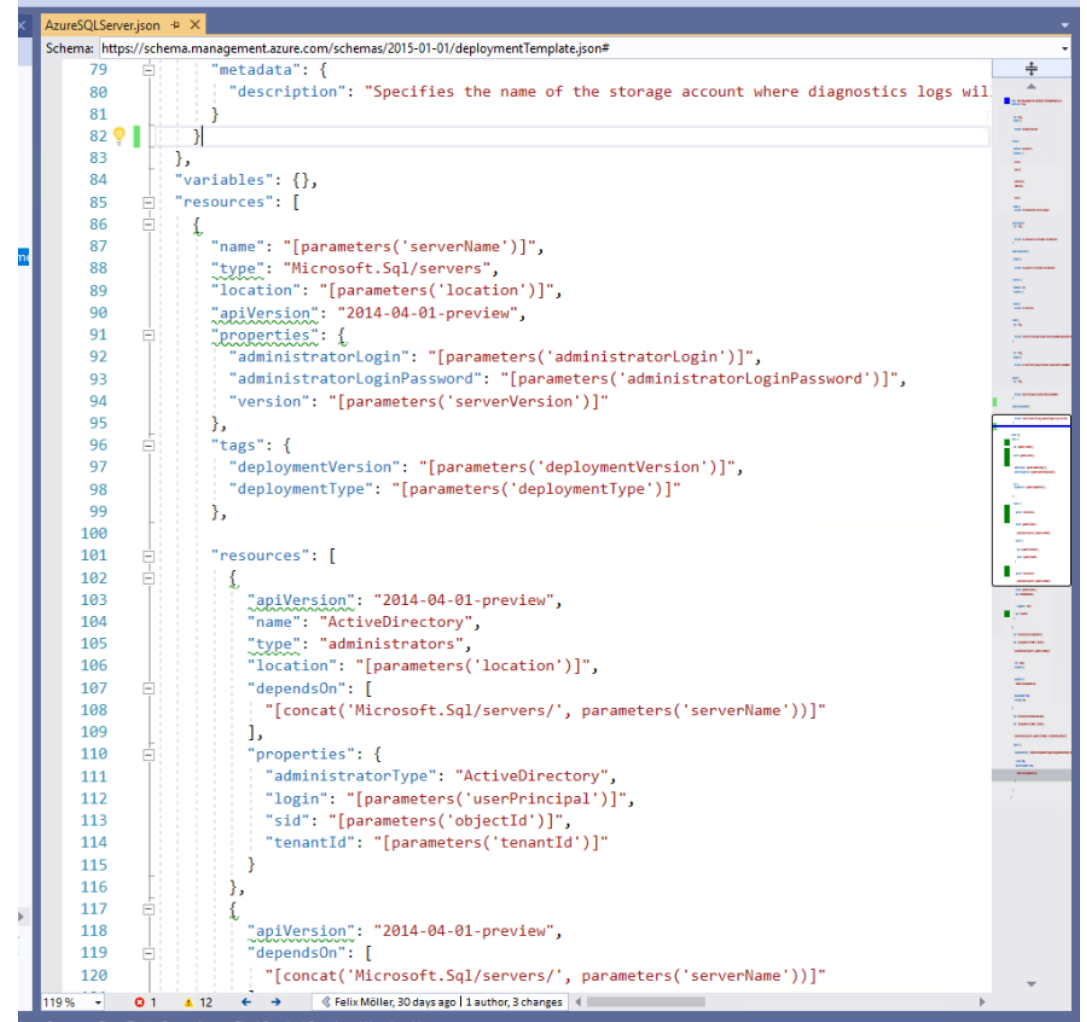


```
1 -- EXEC [dbo].[sp_generate_merge] @table_name = 'Comparison', @cols_to_
2 SET NOCOUNT ON
3
4 MERGE INTO [Comparison] AS [Target]
5 USING (VALUES
6     (N'1', N'vs-BUD')
7     , (N'2', N'vs-PY')
8 ) AS [Source] ([ComparisonID], [Comparisonflag])
9 ON ([Target].[ComparisonID] = [Source].[ComparisonID])
10 WHEN MATCHED AND (
11     NULLIF([Source].[ComparisonID], [Target].[ComparisonID]) IS NOT NULL
12     NULLIF([Source].[Comparisonflag], [Target].[Comparisonflag]) IS NOT
13 UPDATE SET
```



Demo: ARM template

- Azure Resource Manager templates



The screenshot shows a code editor with an ARM template for an Azure SQL Server. The template is named 'AzureSQLServer.json' and is located at 'https://schema.management.azure.com/schemas/2015-01-01/deploymentTemplate.json#'. The code is structured as follows:

```
79  "metadata": {  
80    "description": "Specifies the name of the storage account where diagnostics logs will  
81  }  
82 }  
83 },  
84 "variables": {},  
85 "resources": [  
86   {  
87     "name": "[parameters('serverName')]",  
88     "type": "Microsoft.Sql/servers",  
89     "location": "[parameters('location')]",  
90     "apiVersion": "2014-04-01-preview",  
91     "properties": {  
92       "administratorLogin": "[parameters('administratorLogin')]",  
93       "administratorLoginPassword": "[parameters('administratorLoginPassword')]",  
94       "version": "[parameters('serverVersion')]"  
95     },  
96     "tags": {  
97       "deploymentVersion": "[parameters('deploymentVersion')]",  
98       "deploymentType": "[parameters('deploymentType')]"  
99     },  
100   },  
101   {  
102     "apiVersion": "2014-04-01-preview",  
103     "name": "ActiveDirectory",  
104     "type": "administrators",  
105     "location": "[parameters('location')]",  
106     "dependsOn": [  
107       "[concat('Microsoft.Sql/servers/', parameters('serverName'))]"  
108     ],  
109     "properties": {  
110       "administratorType": "ActiveDirectory",  
111       "login": "[parameters('userPrincipal')]",  
112       "sid": "[parameters('objectId')]",  
113       "tenantId": "[parameters('tenantId')]"  
114     },  
115   },  
116   {  
117     "apiVersion": "2014-04-01-preview",  
118     "dependsOn": [  
119       "[concat('Microsoft.Sql/servers/', parameters('serverName'))]"  
120     ]  
121   }  
122 ],  
123 "outputs": {  
124   "serverName": {  
125     "type": "string",  
126     "value": "[parameters('serverName')]"  
127   },  
128   "serverVersion": {  
129     "type": "string",  
130     "value": "[parameters('serverVersion')]"  
131   },  
132   "location": {  
133     "type": "string",  
134     "value": "[parameters('location')]"  
135   },  
136   "deploymentVersion": {  
137     "type": "string",  
138     "value": "[parameters('deploymentVersion')]"  
139   },  
140   "deploymentType": {  
141     "type": "string",  
142     "value": "[parameters('deploymentType')]"  
143   }  
144 },  
145 }
```



Database deployment

- sqlpackage.exe works in the following sequence
 1. compares dacpac to database
 2. generates a deploy script
 3. runs pre-deployment script
 4. runs deploy script (generated in step 2)
 5. runs post-deploy script
- Thus you need a pre-pre-deployment script



Hundreds of Options in Publish Profile

Advanced Publish Settings

General Drop Ignore

Deployment Behavior

- ☒ Deploy database properties
- ☐ Always re-create database
- ☒ Block incremental deployment if data loss might occur
- ☐ Execute deployment script in single-user mode
- ☐ Back up database before deployment
- ☐ Do not use alter assembly statements to update CLR types

Advanced Deployment Options

Enabled	Option
<input type="checkbox"/>	Compare using target collation
<input checked="" type="checkbox"/>	Disable and reenable DDL triggers
<input checked="" type="checkbox"/>	Do not alter Change Data Capture objects
<input checked="" type="checkbox"/>	Do not ALTER replicated objects
<input checked="" type="checkbox"/>	Drop statistics not in source
<input checked="" type="checkbox"/>	Generate smart defaults, when applicable
<input checked="" type="checkbox"/>	Include composite objects
<input type="checkbox"/>	Include transactional scripts
<input checked="" type="checkbox"/>	Populate files on FileGroups
<input type="checkbox"/>	Script database collation
<input type="checkbox"/>	Script database compatibility
<input type="checkbox"/>	Script file size
<input checked="" type="checkbox"/>	Script refresh module
<input type="checkbox"/>	Script state checks

Automatically provides a default value when updating a table that contains data with a column that does not allow null values.

OK Cancel

Advanced Publish Settings

General Drop Ignore

☒ Drop objects in target but not in source

Enabled	Option
<input type="checkbox"/>	Do not drop aggregates
<input type="checkbox"/>	Do not drop application roles
<input type="checkbox"/>	Do not drop assemblies
<input type="checkbox"/>	Do not drop asymmetric keys
<input type="checkbox"/>	Do not drop audits
<input type="checkbox"/>	Do not drop broker priorities
<input type="checkbox"/>	Do not drop certificates
<input type="checkbox"/>	Do not drop clr user defined types
<input type="checkbox"/>	Do not drop column encryption keys
<input type="checkbox"/>	Do not drop column master keys
<input type="checkbox"/>	Do not drop contracts
<input type="checkbox"/>	Do not drop credentials
<input type="checkbox"/>	Do not drop cryptographic providers

- ☐ Drop role members not in source
- ☒ Drop constraints not in source
- ☒ Drop DML triggers not in source
- ☒ Drop extended properties not in source
- ☒ Drop indexes not in source
- ☐ Drop permissions not in source

When false, Aggregates in the target database that are not defined in the source will be dropped during deployment.

OK Cancel



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Azure Analysis Services

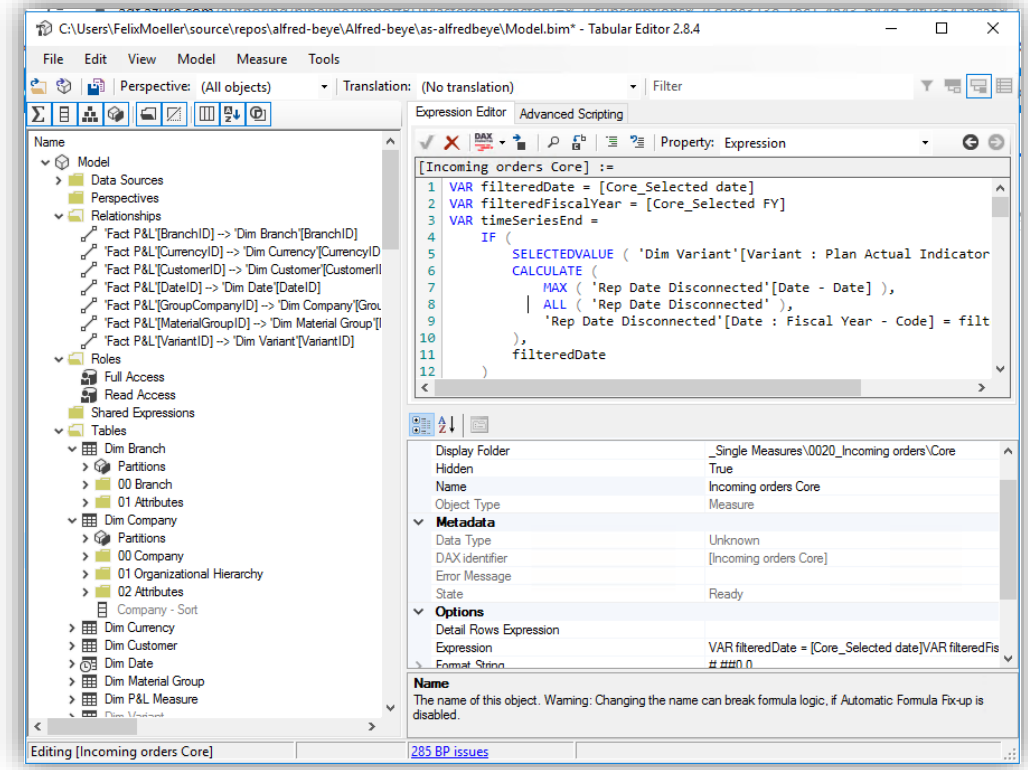
- Resource
 - A simple ARM template
- Content
 - Microsoft.AnalysisServices.Deployment.exe part of SSMS not available on Build Agents
 - Use Tabular Editor
(cf. <https://github.com/otykier/TabularEditor>)
 - Credentials must be configured on every deployment (Invoke-ASCmd)

✓	Download and Install Tabular Editor	2s
✓	Deploying AS Cube	27s
✓	Adjust Connection String	7s



Tabular Editor

- Way faster
- Keeps file structure stable
- Can validate best practices
- Integration with DaxFormatter.com
- Great author
- Command line ready for automation
- Fully functional when using Provider Datasources



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Power BI

- Resource

- Workspaces can be created via PowerShell

- Content

- Reports can be uploaded via PowerShell (cf. <https://github.com/Microsoft/powerbi-powershell>)
- Each report has an internal GUID if this changes, depending objects (e.g. dashboards) break

✓	Install Power BI module to interface REST API	22s
✓	Deploying Power BI Reports	39s
✓	Grant access to Power BI for users	3s



PowerShell cmdlets lack functionalities

- Only a subset of Power BI REST API has its own PowerShell cmdlets
 - REST API: <https://docs.microsoft.com/en-us/rest/api/power-bi/>
 - Cmdlets: <https://github.com/microsoft/powerbi-powershell>
- These can be called via Invoke-PowerBIRestMethod



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Overview

Component	Resource	Content
Azure Data Factory	PowerShell	ARM
Azure SQL Database	ARM	dacpac
Azure Analysis Services	ARM	PowerShell, Tabular Editor, Invoke-ASCmd
Power BI	(REST API)	PowerShell, REST-API



Demo

```
65 | Invoke-ASCmd -InputFile "$(System.DefaultWor
66 |
67 - task: PowerShell@2
68   displayName: "Download the DLLs to access a tabu
69   inputs:
70     targetType: 'inline'
71     script: |
72       # https://docs.microsoft.com/en-us/azure/analysis-services/analysis-services-data-providers
73       $ProgressPreference = 'SilentlyContinue'
74       $amo = "https://go.microsoft.com/fwlink/?linkid=829578"
75       $amopath = Join-Path $env:TEMP "x64_15.0.2000.20_SQL_AS_AMO.msi"
76       $log = Join-Path $env:TEMP "log.log"
77       Invoke-WebRequest -Uri $amo -OutFile $amopath
78       Write-Output "installing $amopath"
79       Start-Process $amopath -ArgumentList "/q /li $log" -Wait
80       Get-Content $log
81
82 - task: AzurePowerShell@4
83   displayName: Grant access to SSAS for users
84   inputs:
85     azureSubscription: 'Footprint (c1ee313e-1ec1-4a43-b44d-f4f03641bca5)'
86     ScriptType: 'InlineScript'
87     Inline: |
88       $(Agent.BuildDirectory)/beye/arm/Scripts/Sync-AnalysisServicesPermissions.ps1 -USER "$(asAdminUser)" -PWD "$(asAdminPassword)" -SERVER "asazure://
```

Azure DevOps

/ alfred.core / Pipelines / alfred-beye

Search

Runs Branches Analytics

#alfred-beye_master_20191018.9 disabled pinning cards to dashboard ...	✓ - ✗ - > - >	Yesterday	7m 34s
#alfred-beye_master_20191018.8 all minor things cleaned	✓ - ✓ - > - >	Yesterday	8h 27m 54s
#alfred-beye_master_20191018.7 :)	✓ - ✓ - ✓ - ✓	Yesterday	25m 36s



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Questions?

Evaluations

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