SQL Server 2019
Big Data Clusters

Ben Weissman
@bweissman

What we need

- All Materials on: https://github.com/bweissman/code/tree/master/SQLSatRheinlandPrecon

- Azure Subscription with Access to AKS
- Ideally: Virtual machine in Azure with 16 GB+ RAM and 4+ Cores
- SQL Server 2019 CTP 2.5 installer including ISO (Download Media)
  - https://www.microsoft.com/en-us/sql-server/sql-server-2019
- Kaggle.com Account
  - Flight Delay Dataset
    - https://www.kaggle.com/usdot/flight-delays

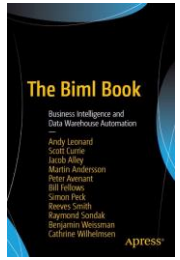
Who am I?

Ben Weissman
@bweissman
b.weissman@solisyon.de
http://biml-blog.de/

I ♥ DATA

Please Talk Data To Me

SOLISYON



BimlHero CERTIFIED EXPERT

MVP Microsoft Most Valuable Professional

Microsoft CERTIFIED Solutions Associate Machine Learning

Microsoft CERTIFIED Solutions Expert Data Management and Analytics

MICROSOFT PROFESSIONAL PROGRAM

Data Science
Big Data
Artificial Intelligence
Data Analysis

FRIEND OF redgate 2019

GENESEE ACADEMY World-Class Training
Certified Data Vault Modeler

Der Data Platform Podcast mit Biml Ben, Mr. T und Angry Frank

Please Talk Data To Me

Adaptive Query Processing ADF Azure Azure Data Studio **Azure Notebooks** Azure Stack Big Data Clusters **Biml** Black Panther Business Application Summit 2018 Data Platform **Data Platform Summit** dbatools **Docker** Flensburger Radler Alkoholfrei GDPR **Git Hub** Ignite Jupyter Notebooks Kubernetes **Las Vegas** Lissabon Microsoft Professional Program MPP **PASS Camp** PASS Deutschland e.V. PASS Essentials PASS Summit **Power BI** PowerShell Query Folding Regionalgruppen Solo SQL Management Studio 18 - Preview SQL Operations Studio **SQL Saturday** SQL Server 2019 Tabular Tomb Raider **tSQLt** TugaIT Visual Studio Code **WDC**

Ben Weissman
Biml Ben

Tillmann Eitelberg
Mr. T

Frank Geisler
Angry Frank

11	2396	1147	12
Episoden	Downloads	Sendeminuten	Gäste

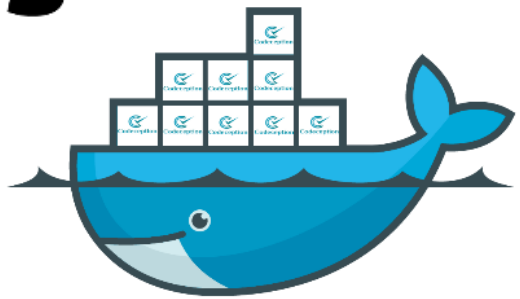
https://www.pleasetalkdatatome.de

Fun Facts on Big Data Clusters

- Some parts only run on Linux
- It's a „box product first" feature set
- It's actually not ONE feature but a huge feature set
- It's name is a bit misleading – not all of it is a cluster
- Some parts are currently in semi-private preview

What to look at before getting started…

kubernetes

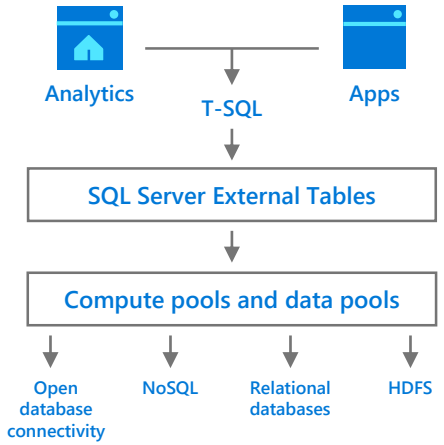


docker

python™

So what is a Big Data Cluster in SQL 2019?!

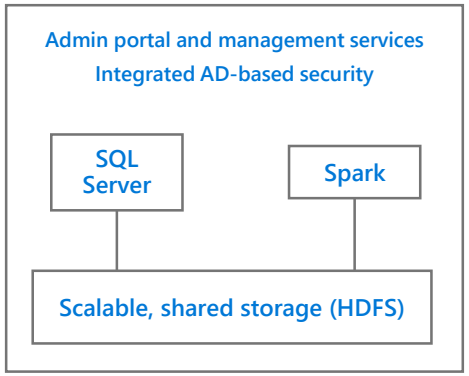
Data virtualization



Combine data from many sources without moving or replicating it

Scale out compute and caching to boost performance

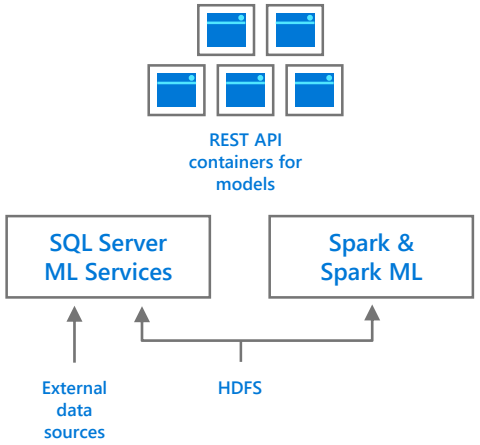
Managed SQL Server, Spark, and data lake



Store high volume data in a data lake and access it easily using either SQL or Spark

Management services, admin portal, and integrated security make it all easy to manage

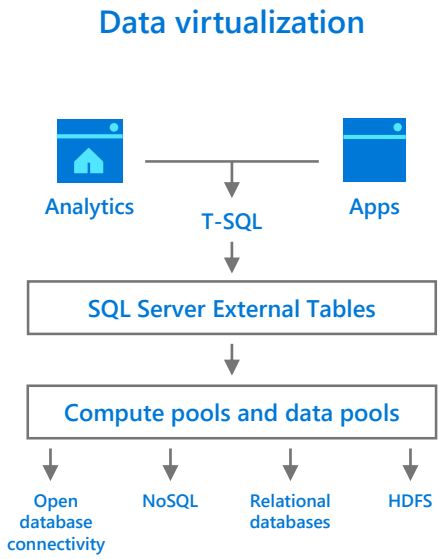
Complete AI platform



Easily feed integrated data from many sources to your model training

Ingest and prep data and then train, store, and operationalize your models all in one system

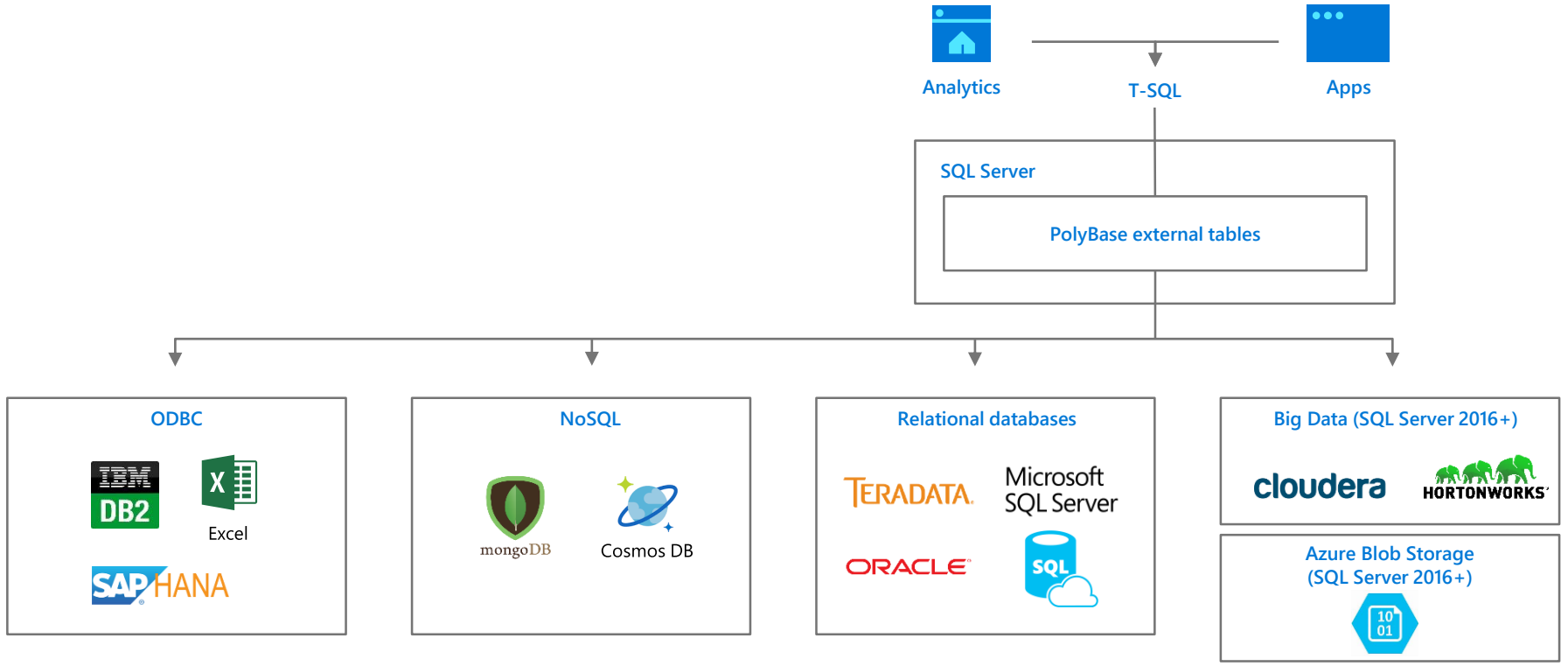
Data Virtualization – Is this the END of SSIS?!



Combine data from many sources without moving or replicating it

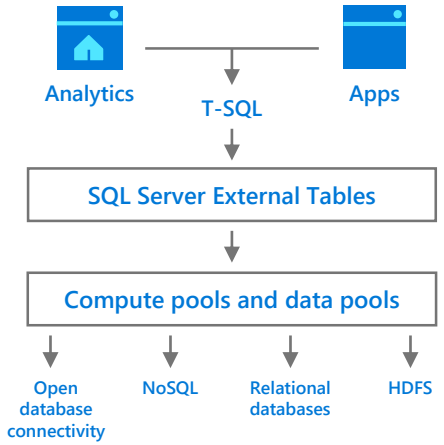
Scale out compute and caching to boost performance

Easily combine across relational and non-relational data stores



Data Virtualization – So it‘s a linked server?

Data virtualization



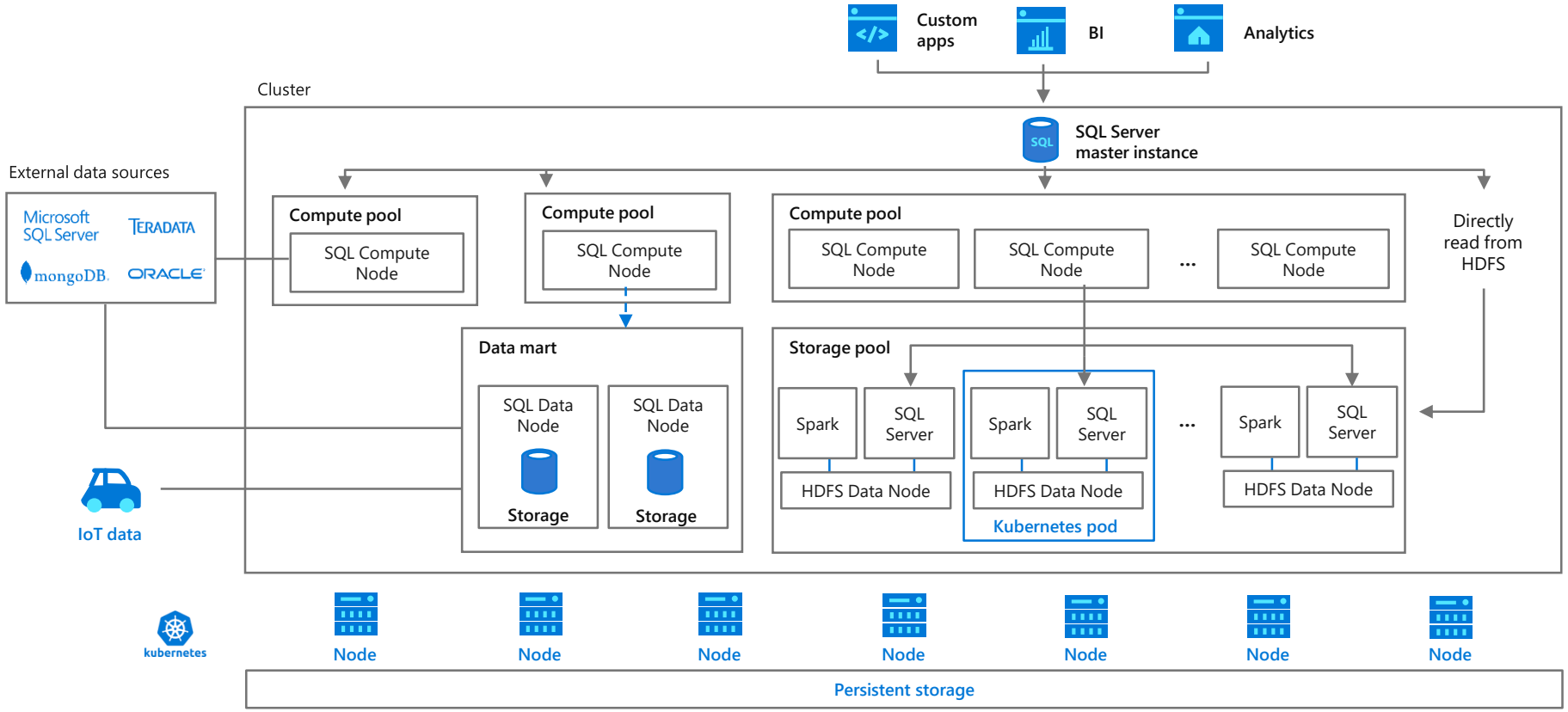
Combine data from many sources without moving or replicating it

Scale out compute and caching to boost performance

Linked Servers

PolyBase External tables

So why do they call it a cluster?!



This slide: © by Microsoft

Scale by Purpose

kubernetes

How can I get it installed? – Polybase only

- Install Java JRE
- Get the latest CTP from http://microsoft.com/sql
- Install SQL Server on Windows or Linux including Polybase
- Use EVALUTATION edition!
- Enable Polybase after installation:

```
exec sp_configure @configname = 'polybase enabled', @configvalue = 1;
RECONFIGURE
```

- Restart SQL Server
- Install Azure Data Studio
- Install the vNext Extension for Azure Data Studio

How can I get it installed? – The full package

- Sign up for the preview program: https://aka.ms/eapsignup
- Install Kubernetes-CLI, MSSQLCTL, Python, azure-cli, curl*
- Install Azure Data Studio
  - Add vNext Extension
- Decide on a Kubernetes environment
  - Docker or Minikube
  - AKS
  - Something completely different ☺
  - (many but not all are supported)
- Set environment variables**
- Deploy the cluster using

  mssqlctl create cluster <your-cluster-name>
- When using AKS, consider this script:

  https://github.com/Microsoft/sql-server-samples/tree/master/samples/features/sql-big-data-cluster/deployment

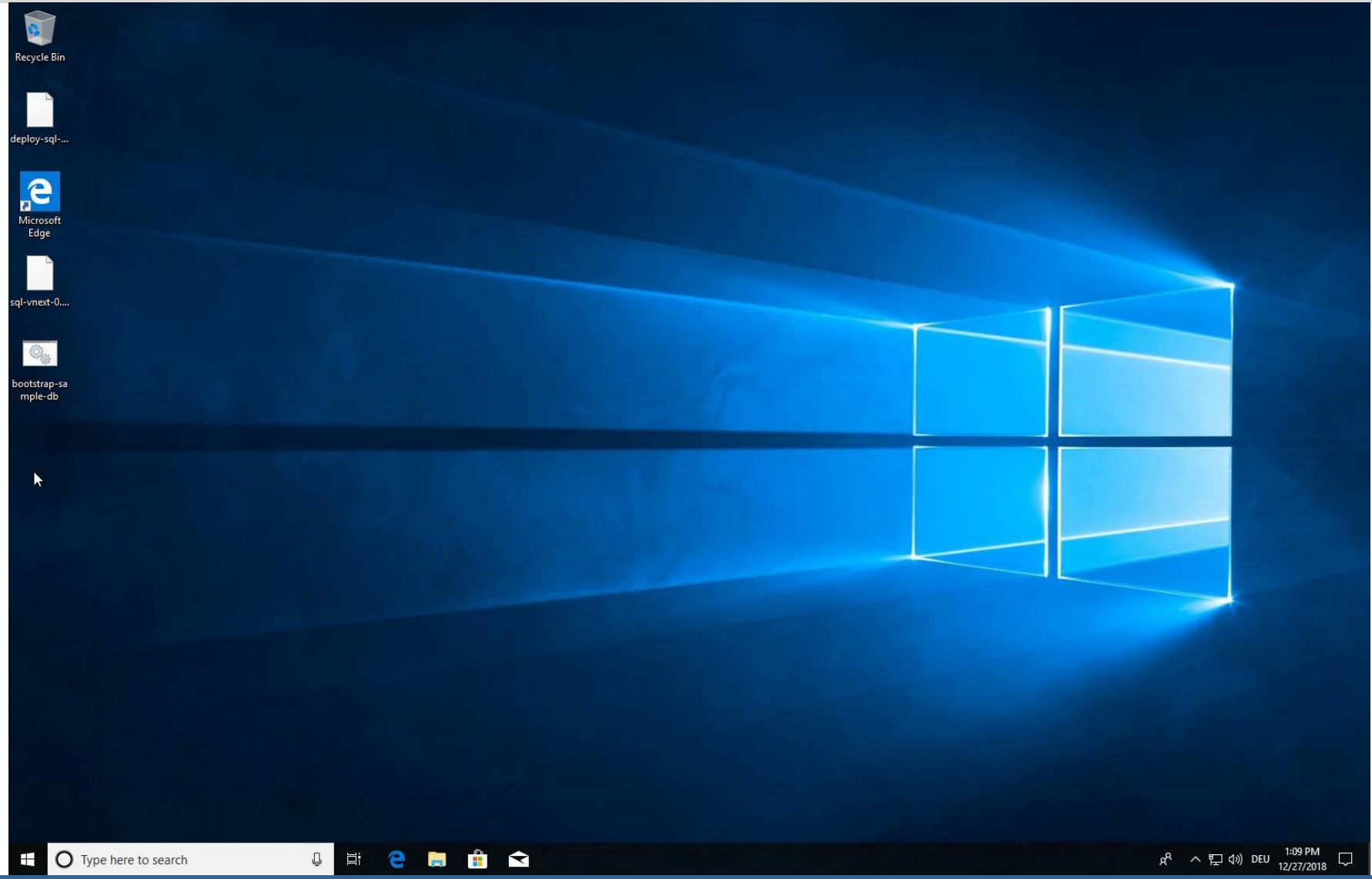
Picture: © Klaus Aschenbrenner

It's Demo Time: Kubernetes Cluster

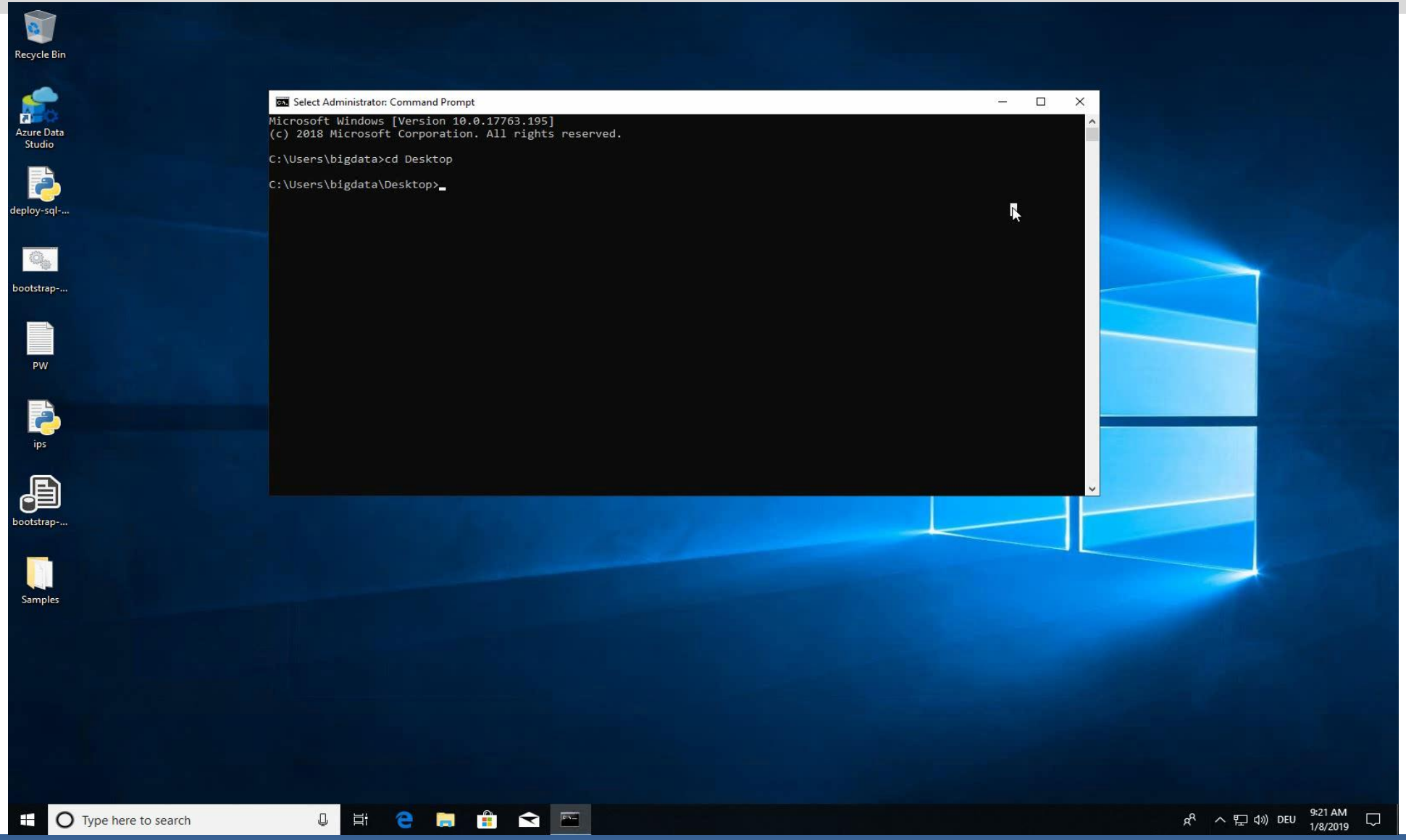
- Deploying a cluster with some sample data* (yay! videos ☺)
- The Cluster Portal
- Play with it using T-SQL
  - Query HDFS Data
  - Write/Read Data from Data Pool
- Play with it using Notebooks
  - Read/Analyze Date with Spark
  - Train and query a ML Model

*https://github.com/Microsoft/sql-server-samples/tree/master/samples/features/sql-big-data-cluster/

Kubernetes Cluster – Install Prerequisits



Kubernetes Cluster – Install Cluster (incl. AKS)

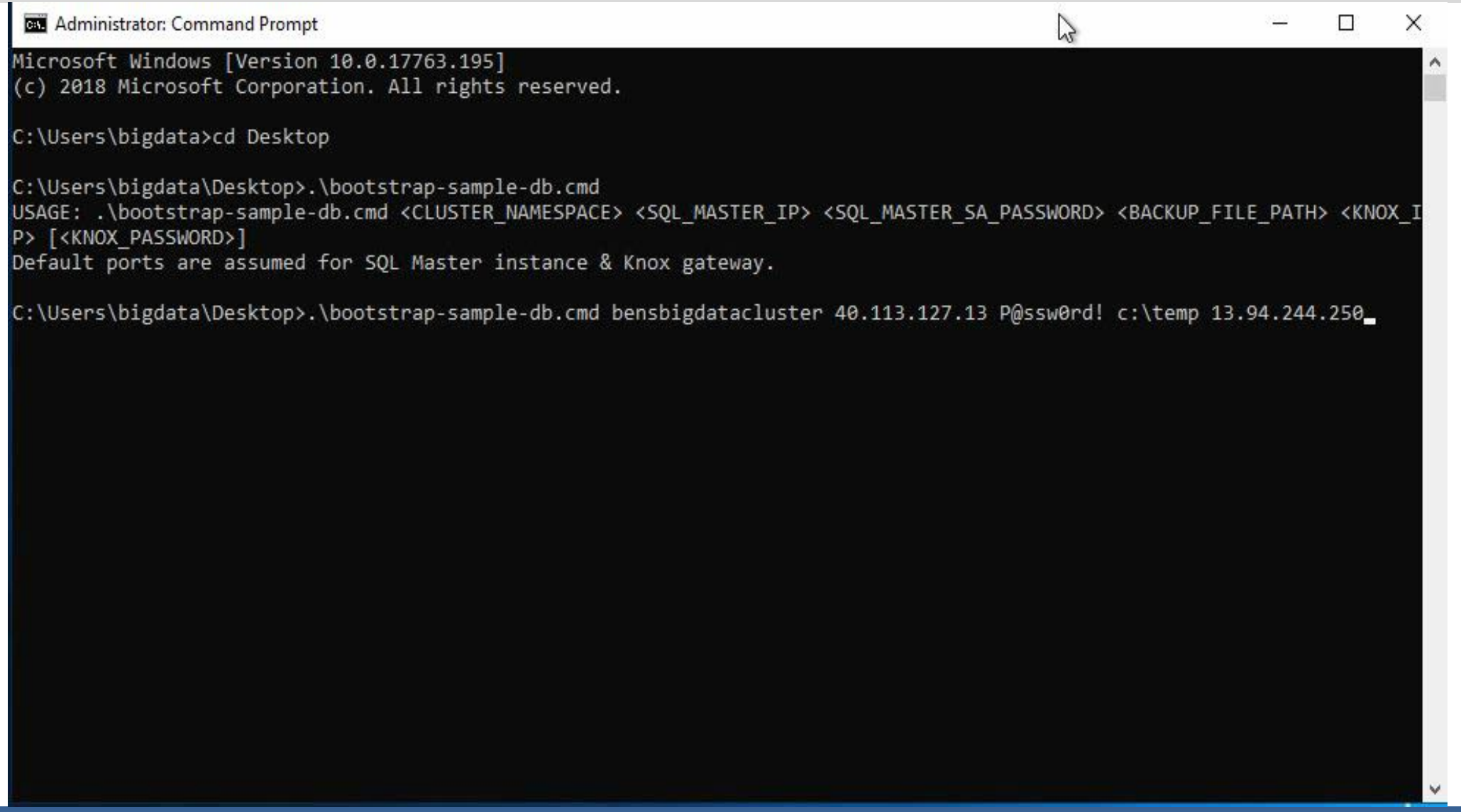


Kubernetes Cluster – Install Cluster (incl. AKS)

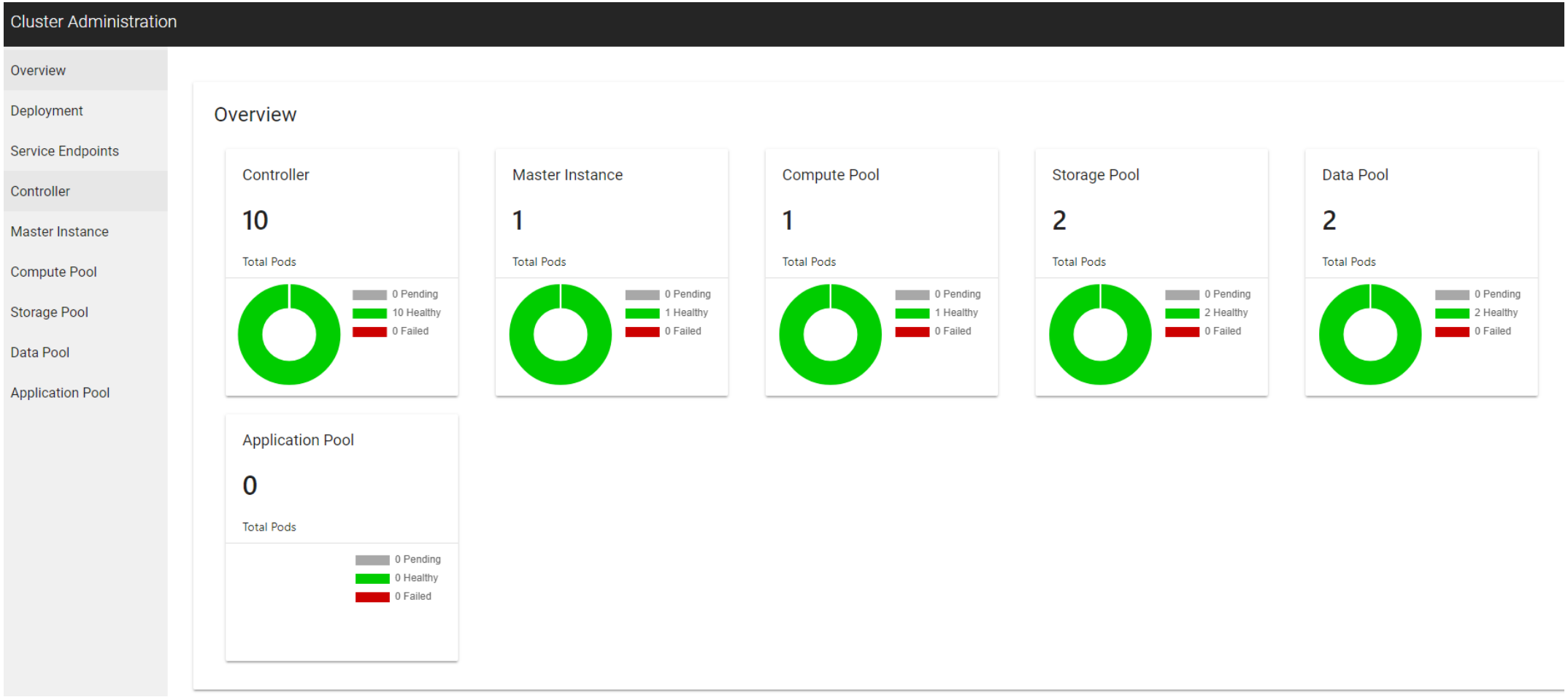
```
SQL Server big data cluster connection endpoints:
SQL Server master instance:
IP              PORT
40.113.127.13   31433

HDFS/KNOX:
IP              PORT
13.94.244.250   30443

Cluster administration portal (https://<ip>:<port>):
IP             PORT
40.68.84.89    30777
```

*If you forget about these…
kubectl get service -n <clustername>

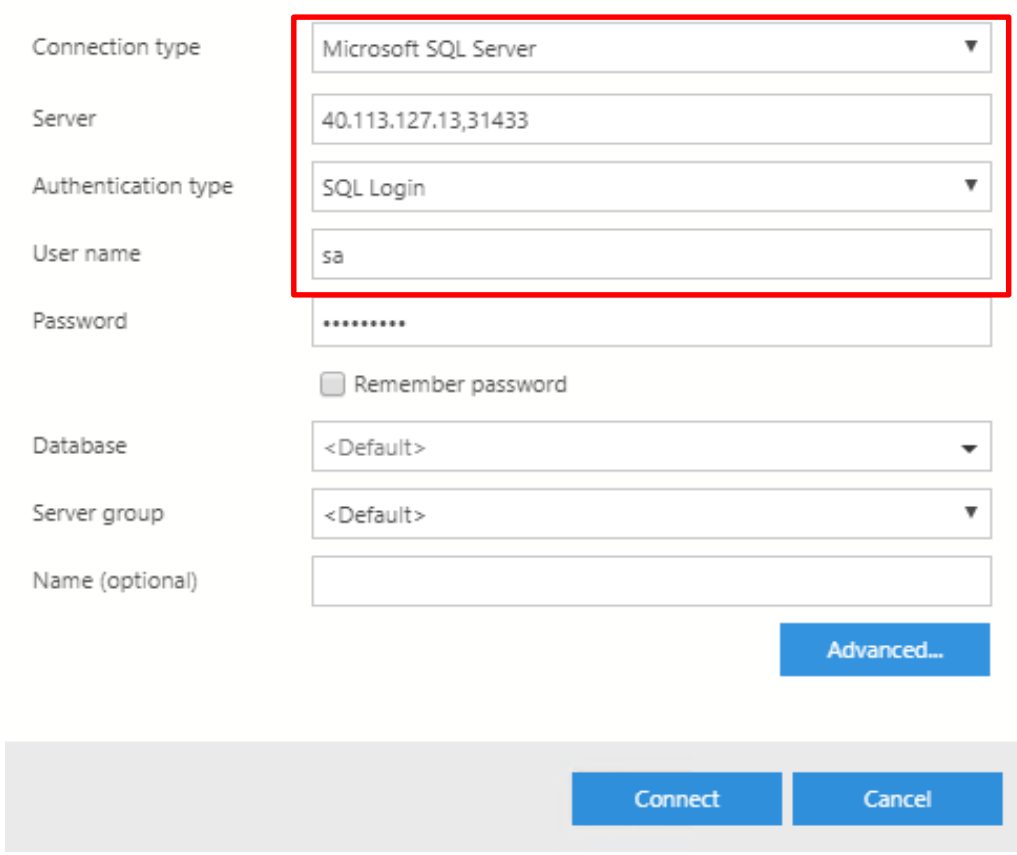
Kubernetes Cluster – Install Sample Data

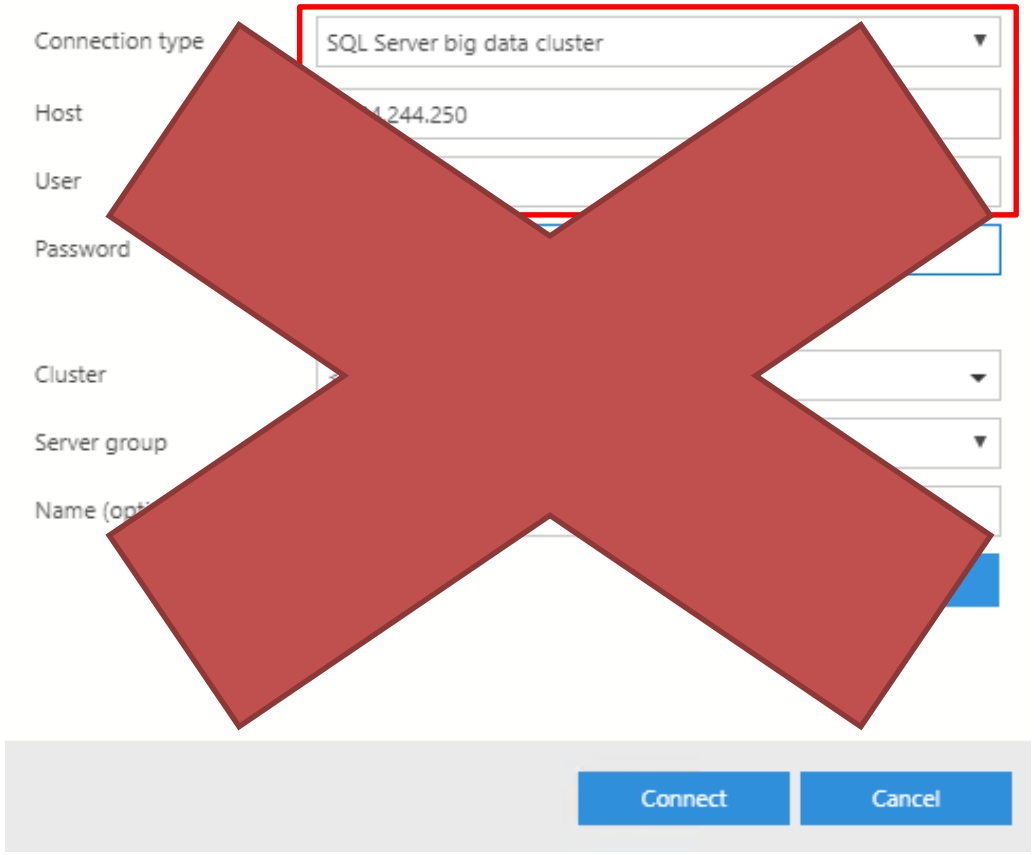


Kubernetes Cluster – Portal



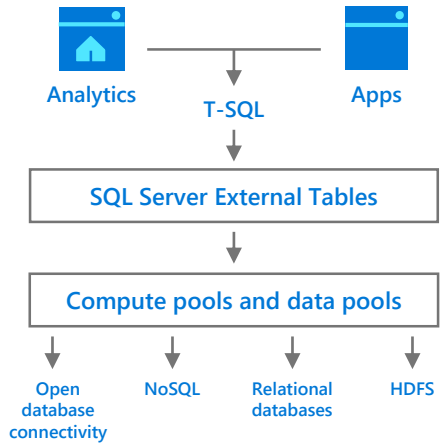
Kubernetes Cluster – Connect in ADS





So what is a Big Data Cluster in SQL 2019?!

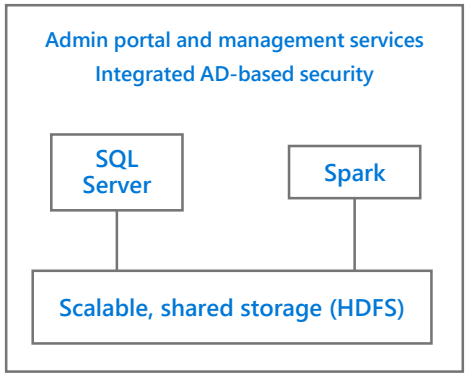
Data virtualization



- No Data redundancy
- Real time data

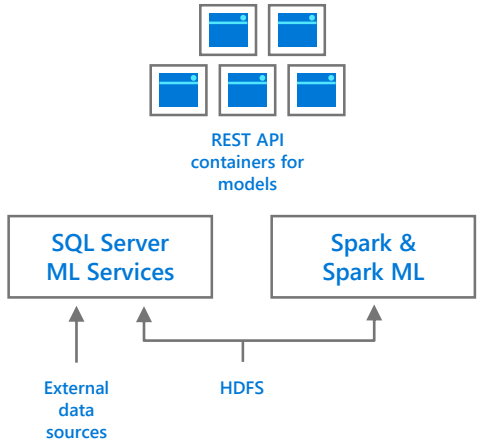
- No extra indexing
- Extra load on source
- Read only

Managed SQL Server, Spark, and data lake



- Store high volume data in a data lake and access it easily using either SQL or Spark
- Management services, admin portal, and integrated security make it all easy to manage

Complete AI platform



- Easily feed integrated data from many sources to your model training
- Ingest and prep data and then train, store, and operationalize your models all in one system

Let‘s go! – Install Chocolatey

Run in Powershell:

```
Set-ExecutionPolicy Bypass -Scope Process -Force; iex ((New-Object System.Net.WebClient).DownloadString('https://chocolatey.org/install.ps1'))
```

Agenda - Standalone PolyBase Installation

- Prerequistes
- Install SQL Server
- Enable Polybase
- Install Azure Data Studio
- Add Extension
- Add external tables from Azure SQL DB
  - Automate with Biml:
    - https://www.solisyon.de/biml-polybase-external-tables/
- Query those tables

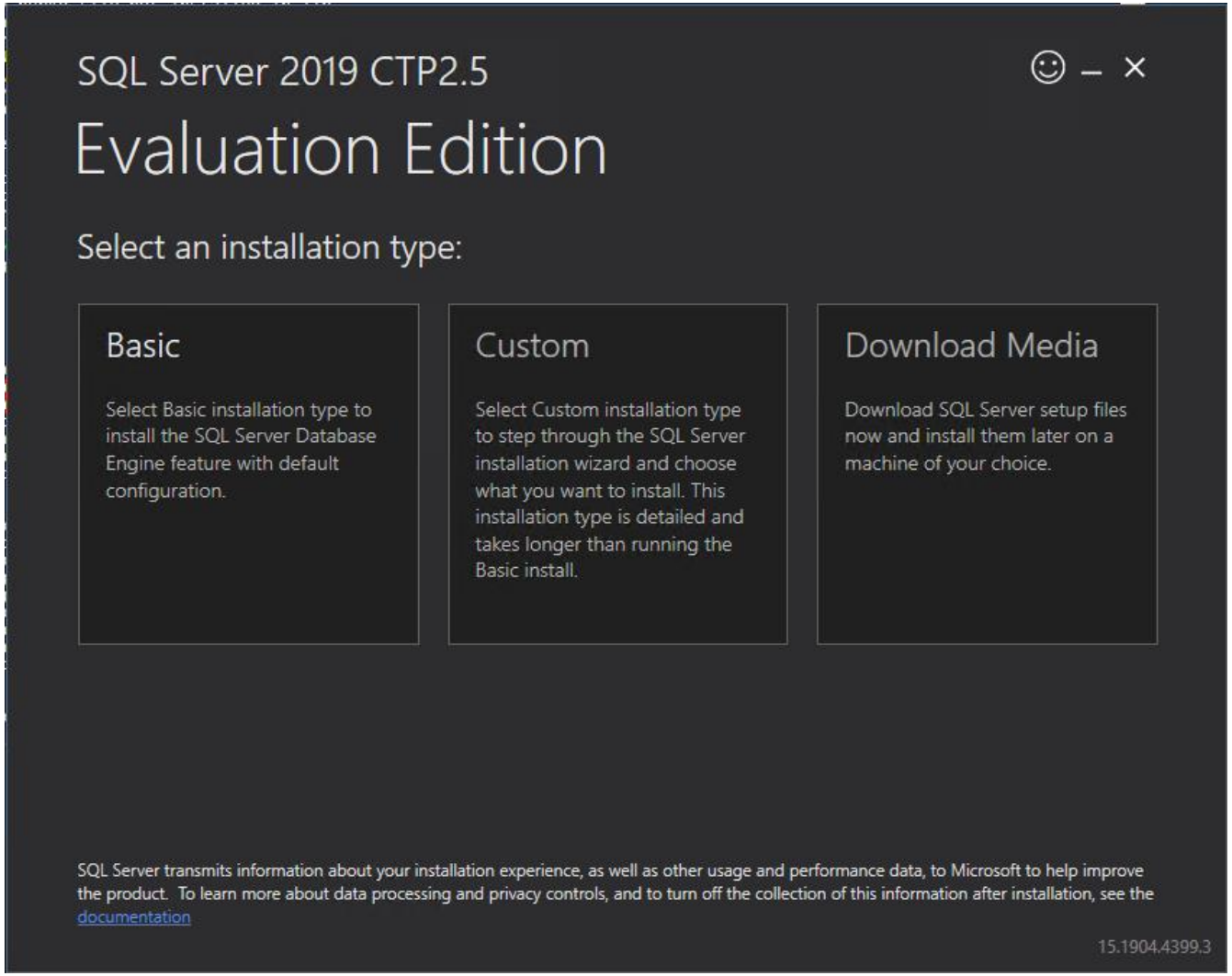
Prerequisites for Polybase and client tools

choco install jre8 -y
choco install vcredist2012 -y
choco install azure-data-studio -y
choco install sql-server-management-studio -y

Download ADS Extension from:
https://docs.microsoft.com/en-us/sql/azure-data-studio/sql-server-2019-extension?view=sqlallproducts-allversions

Install extension to Azure Data Studio

Install SQL Server



Enable PolyBase

```
exec sp_configure @configname = 'polybase enabled', @configvalue = 1;
RECONFIGURE
```

Create Database (empty) BigDataFun

Restart SQL Server

Create external tables using ADS

Agenda – Full Cluster in AKS

- Prerequistes
- Deploy Cluster
- Add Database to Cluster
- Add CSVs to Cluster
- Add MS Sample Data to Cluster
- Query the Cluster

Additional Prerequisites for AKS

```
choco install python3 -y
choco install sqlserver-cmdlineutils -y
$env:Path = [System.Environment]::GetEnvironmentVariable("Path","Machine") + ";" + [System.Environment]::GetEnvironmentVariable("Path","User")
python -m pip install --upgrade pip
python -m pip install requests
python -m pip install requests --upgrade
choco install curl -y
choco install kubernetes-cli -y
choco install notepadplusplus -y
choco install 7zip -y
pip3 install kubernetes
pip3 install -r https://private-repo.microsoft.com/python/ctp-2.5/mssqlctl/requirements.txt
choco install azure-cli -y
```

Deploy the Cluster

az login

curl -o deploy-sql-big-data-aks.py "https://raw.githubusercontent.com/Microsoft/sql-server-samples/master/samples/features/sql-big-data-cluster/deployment/aks/deploy-sql-big-data-aks.py"
python deploy-sql-big-data-aks.py

Subscription ID: From az login
RG Name: sqlsatprecon
Docker Username/PW: From Credentials
Azure Region: westeurope
VM Size: Default (if available)
Number of nodes: 1
Clustername: sqlsatprecon
PW: Default (MySQLBigData2019)
User: Default (admin)

WAIT ☺

Look at the cluster in the Azure Portal and Management Portal

Add Data – Adventureworks2014

```
curl -L -G "https://github.com/Microsoft/sql-server-samples/releases/download/adventureworks/AdventureWorks2014.bak" -o AdventureWorks2014.bak

kubectl cp AdventureWorks2014.bak sqlsatprecon/master-0:var/opt/mssql/data -c mssql-server
```

Connect to the Cluster Master Instance in Azure Data Studio

```
USE [master]
RESTORE DATABASE [AdventureWorks2014] FROM  DISK = N'/var/opt/mssql/data/AdventureWorks2014.bak' WITH  FILE = 1,  MOVE
N'AdventureWorks2014_Data' TO N'/var/opt/mssql/data/AdventureWorks2014_Data.mdf',  MOVE N'AdventureWorks2014_Log' TO
N'/var/opt/mssql/data/AdventureWorks2014_Log.ldf',  NOUNLOAD,  STATS = 5
```

Add Data – Flight Delays

→ Get it from Kaggle first!

Create Directory:

curl -i -L -k -u root:%KNOX_PASSWORD% -X PUT "https://%KNOX_ENDPOINT%/gateway/default/webhdfs/v1/FlightDelays?op=MKDIRS"

Add files in Azure Data Studio

Add Data – MS Sample Data

```
curl -o bootstrap-sample-db.cmd "https://raw.githubusercontent.com/Microsoft/sql-server-samples/master/samples/features/sql-big-data-cluster/bootstrap-sample-db.cmd"

curl -o bootstrap-sample-db.sql "https://raw.githubusercontent.com/Microsoft/sql-server-samples/master/samples/features/sql-big-data-cluster/bootstrap-sample-db.sql"

.\bootstrap-sample-db.cmd <CLUSTER_NAMESPACE> <SQL_MASTER_IP> <SQL_MASTER_SA_PASSWORD> <KNOX_IP> <KNOX_PASSWORD> --install-extra-samples

.\bootstrap-sample-db.cmd sqlsatprecon <SQL_MASTER_IP> MySQLBigData2019 <KNOX_IP> MySQLBigData2019 --install-extra-samples
```

Query the cluster – Flight Delays

```
SELECT TOP 10 *
FROM flights fl
   INNER JOIN airlines al
    ON fl.AIRLINE = al.IATA_CODE
    INNER JOIN airports ap
    ON fl.DESTINATION_AIRPORT = ap.IATA_CODE;
```

Query the cluster – MS Samples

https://github.com/microsoft/sql-server-samples/blob/master/samples/features/sql-big-data-cluster/spark/data-loading/transform-csv-files.ipynb

Easier:
curl -o transform.ipynb "https://raw.githubusercontent.com/microsoft/sql-server-samples/master/samples/features/sql-big-data-cluster/spark/data-loading/transform-csv-files.ipynb"

https://github.com/microsoft/sql-server-samples/blob/master/samples/features/sql-big-data-cluster/data-virtualization/storage-pool/web-clickstreams-hdfs-csv.sql

https://github.com/microsoft/sql-server-samples/blob/master/samples/features/sql-big-data-cluster/data-virtualization/storage-pool/product-reviews-hdfs-csv.sql

https://github.com/microsoft/sql-server-samples/blob/master/samples/features/sql-big-data-cluster/data-virtualization/storage-pool/web-clickstreams-hdfs-parquet.sql

https://github.com/microsoft/sql-server-samples/blob/master/samples/features/sql-big-data-cluster/data-pool/data-ingestion-sql.sql

SOLISYON

Any questions?

DON'T FORGET TO DELETE YOUR AZURE RESOURCES!

Ben Weissman
@bweissman