

AVEVA PI WORLD

OCS Data Science Enablement

Presented By: Kelsey Duffy and Derek Endres

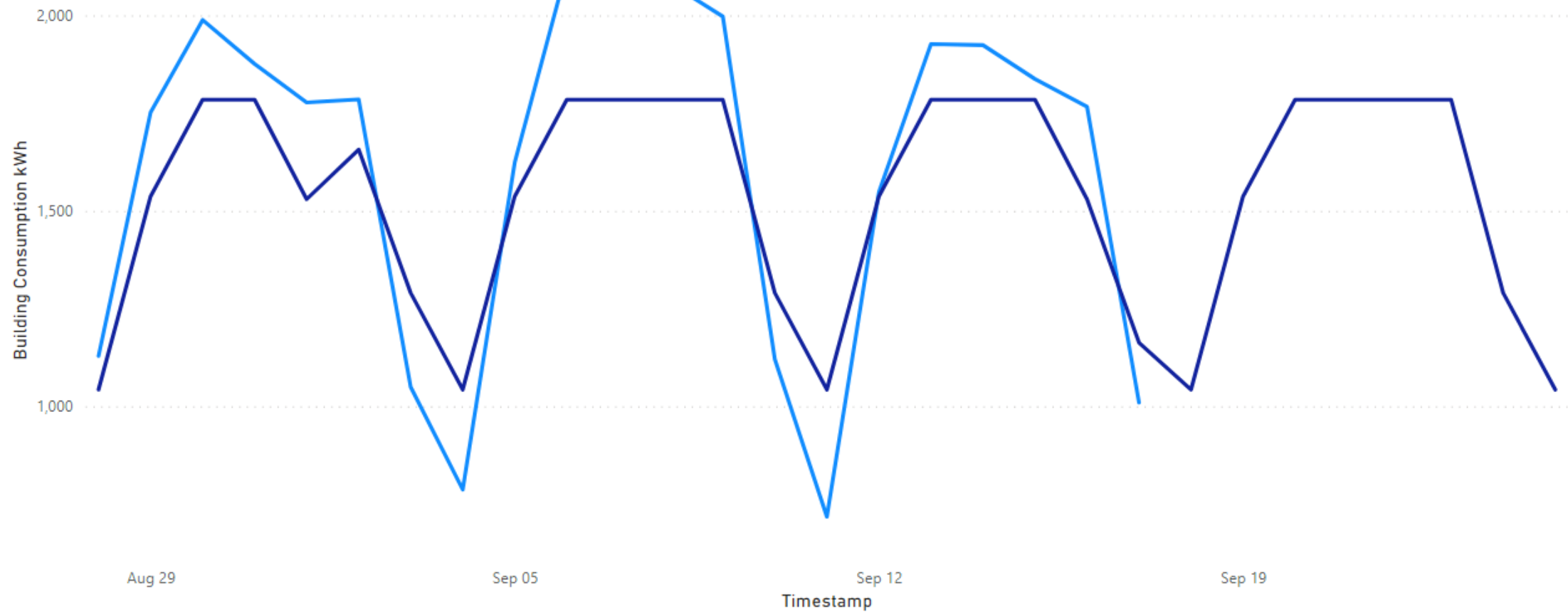
AVEVA



2,156.07

Building Energy Consumption Total kWh

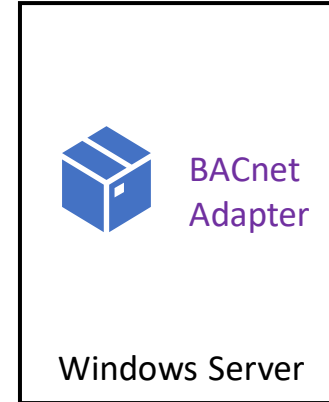
● Actual ● Predicted



8/28/2021

9/25/2021



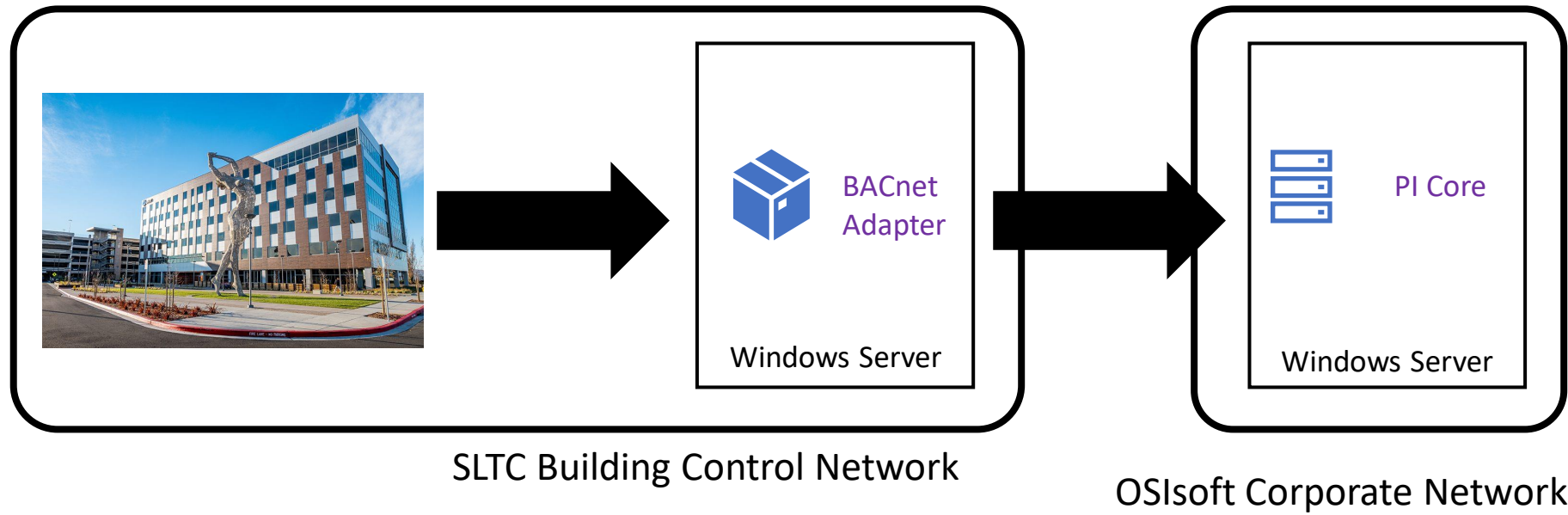


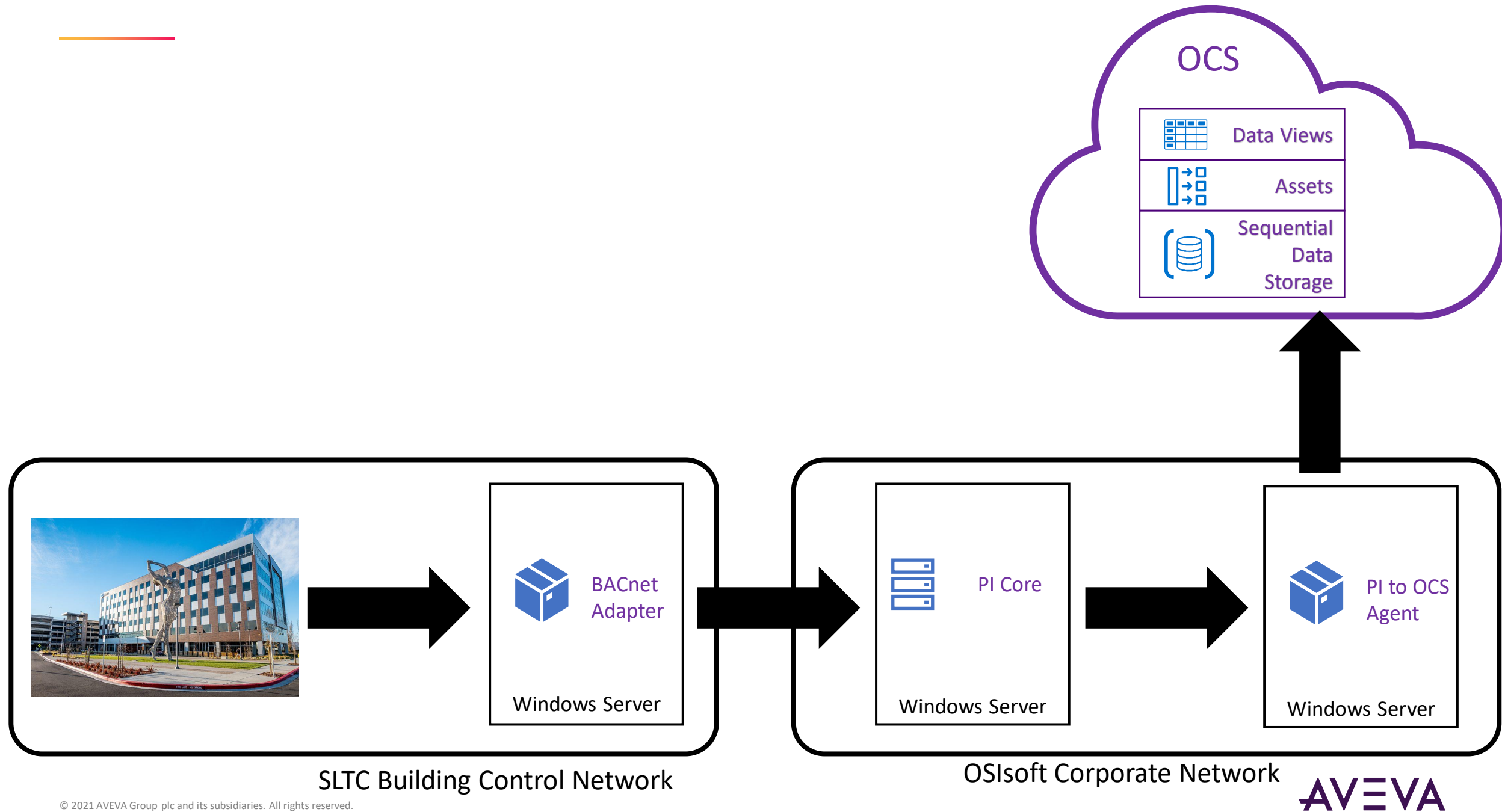


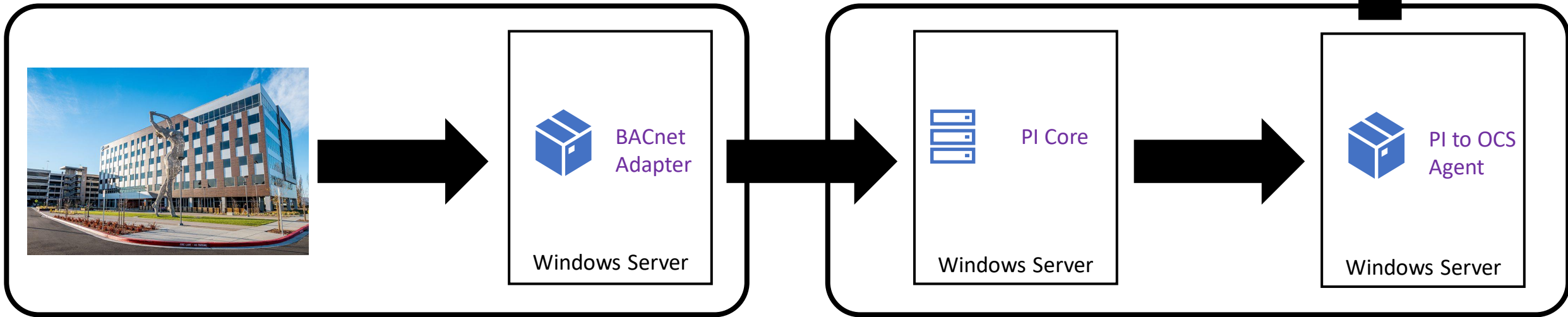
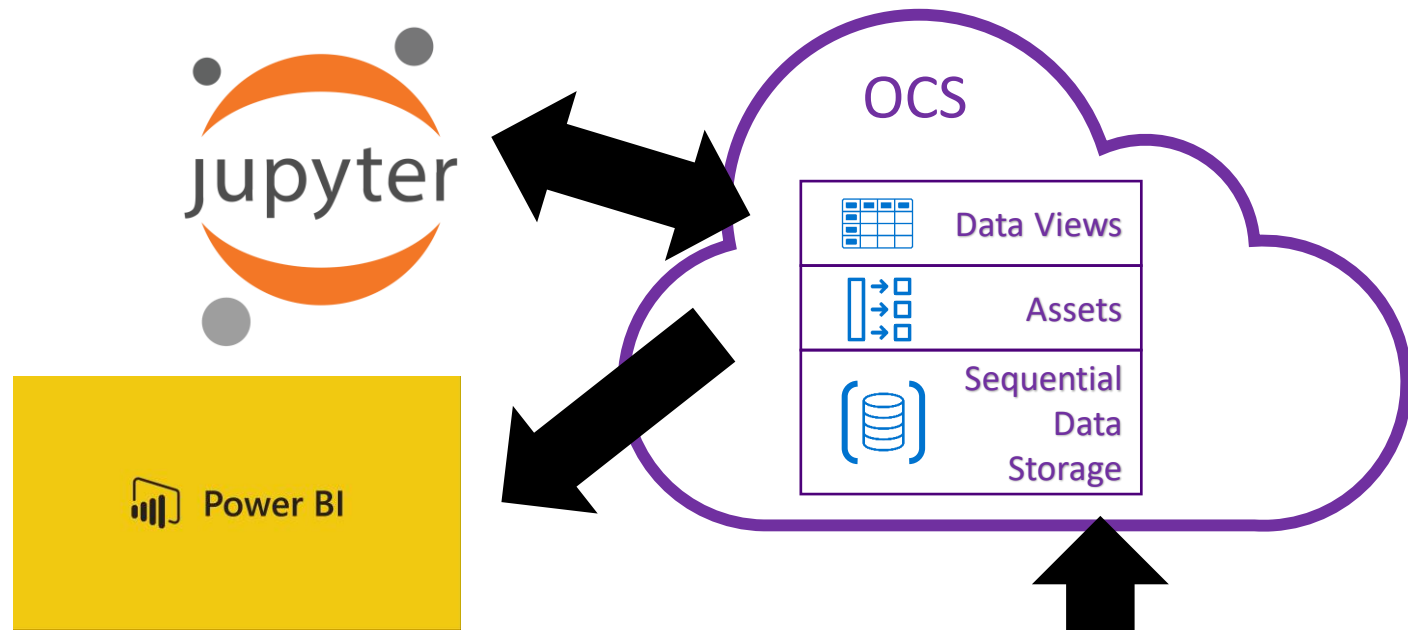
BACnet
Adapter

Windows Server

SLTC Building Control Network







SLTC Building Control Network

OSIsoft Corporate Network



Cloud native platform designed for real-time operations

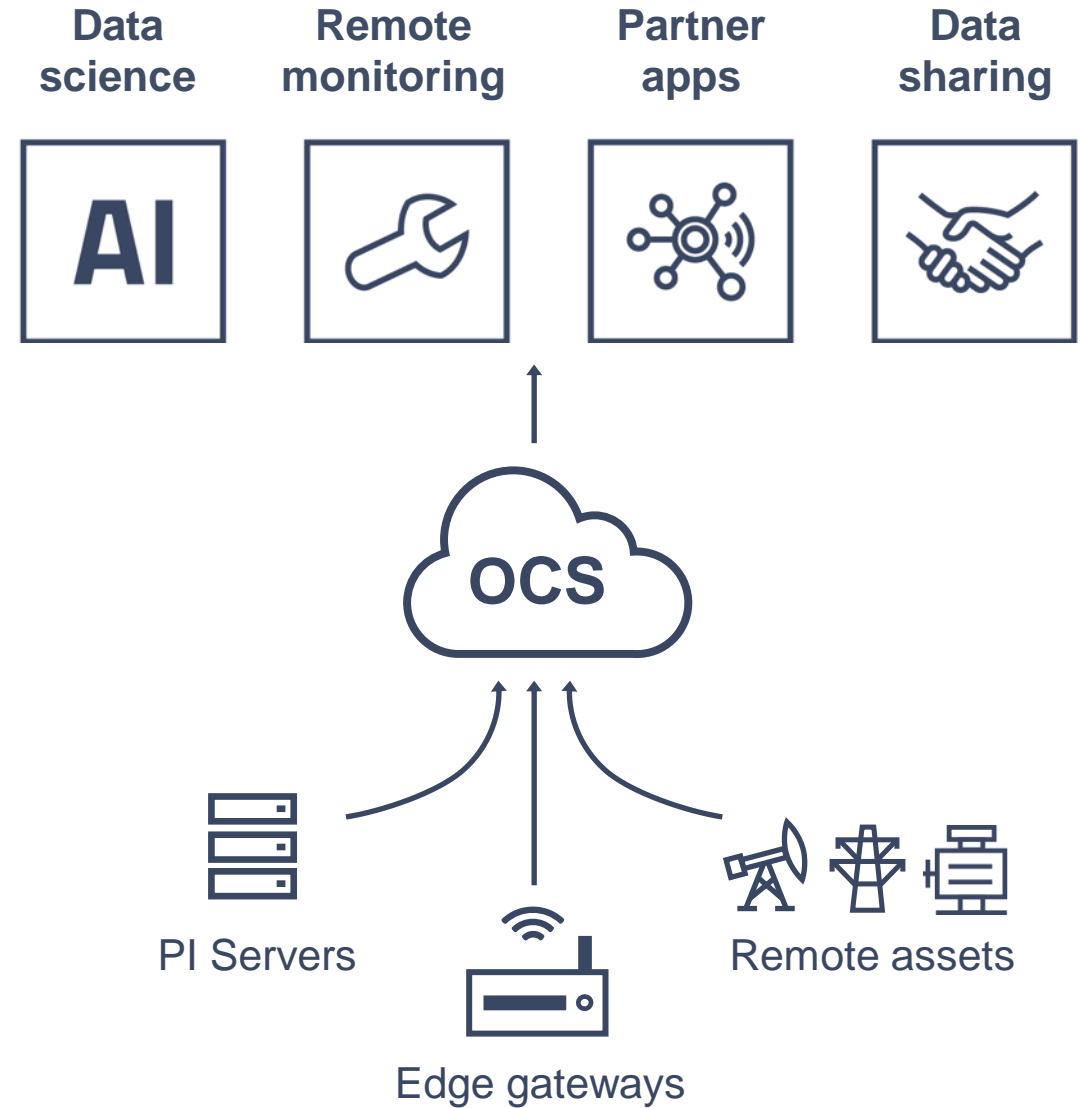
Managed, secure, multi-tenant platform

Operated & maintained by AVEVA

High speed, scalable, elastic, & resilient

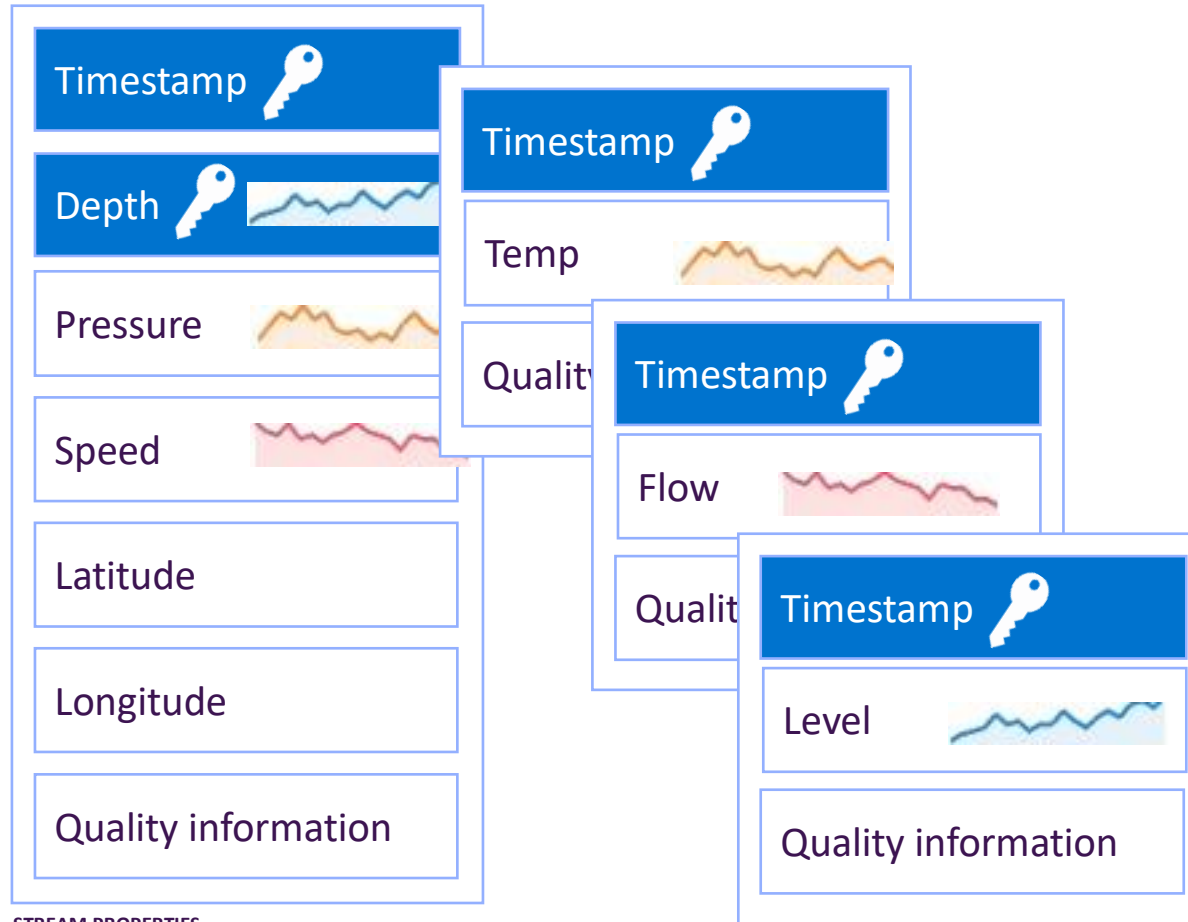
Modern, secure REST APIs

Built & deployed on Microsoft Azure



SEQUENTIAL DATA STORE (SDS)

Stream types & streams



STREAM PROPERTIES

PI to OCS Streams



```
{
  "TypeId": "PI-Float64",
  "Id": "PI_oakpi-slrc01_19276",
  "Name": "UFL.15MDeliveredKw",
  "Description": "",
  "InterpolationMode": null,
  "ExtrapolationMode": null,
  "PropertyOverrides": [
    {
      "SdsTypePropertyId": "Value",
      "Uom": "kilowatt hour",
      "InterpolationMode": null
    }
  ]
}
```


PI to OCS Stream Metadata



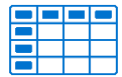
```
{  
  "exdesc": "ef3143c7-c4b4-  
419e-8a3b-8e9be1729f30",  
  "instrumenttag": "",  
  "sourcetag": "",  
  "tag": "UFL.15MDeliveredKw",  
  "step": "0",  
  "engunits": "kilowatt",  
  "description": "SLTC Energy  
Consumption",  
  "pointid": "19276",  
  "pointsource": "PIC",  
  "pointtype": "Float64"  
}
```

PI to OCS Stream Data

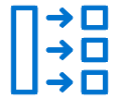


```
{  
  "Timestamp": "2021-08-  
22T06:30:00Z",  
  "Value": 13.6,  
  "IsQuestionable": false,  
  "IsSubstituted": false,  
  "IsAnnotated": false,  
  "SystemStateCode": null,  
  "DigitalStateName": null  
}
```

OCS



Data Views

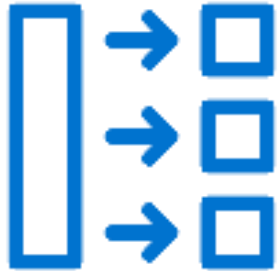


Assets



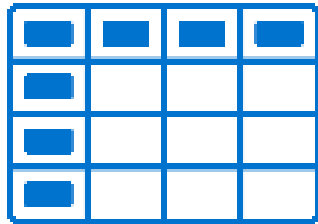
Sequential
Data
Storage

Assets



```
{
  "Id": "a8fe038f-c79a-48ad-b82f-355c03f6ca15",
  "AssetTypeId": null,
  "Name": "SLTC Building 1600",
  "Description": "San Leandro Tech Campus Building 1600",
  "Metadata": [
    {
      "Id": "a3zp6",
      "Name": "Building",
      "Description": null,
      "SdsTypeCode": "String",
      "Value": "Building 1600",
      "Uom": null
    },
    ...
  ],
  "StreamReferences": [
    {
      "Id": "am4yq",
      "Name": "Building kW Baseload",
      "Description": null,
      "StreamId": "PI_oakpi-slrc01_19436"
    },
    ...
  ],
  "Status": null
}
```


Data view



| | | | |
|--|--|--|--|
| | | | |
| | | | |
| | | | |
| | | | |

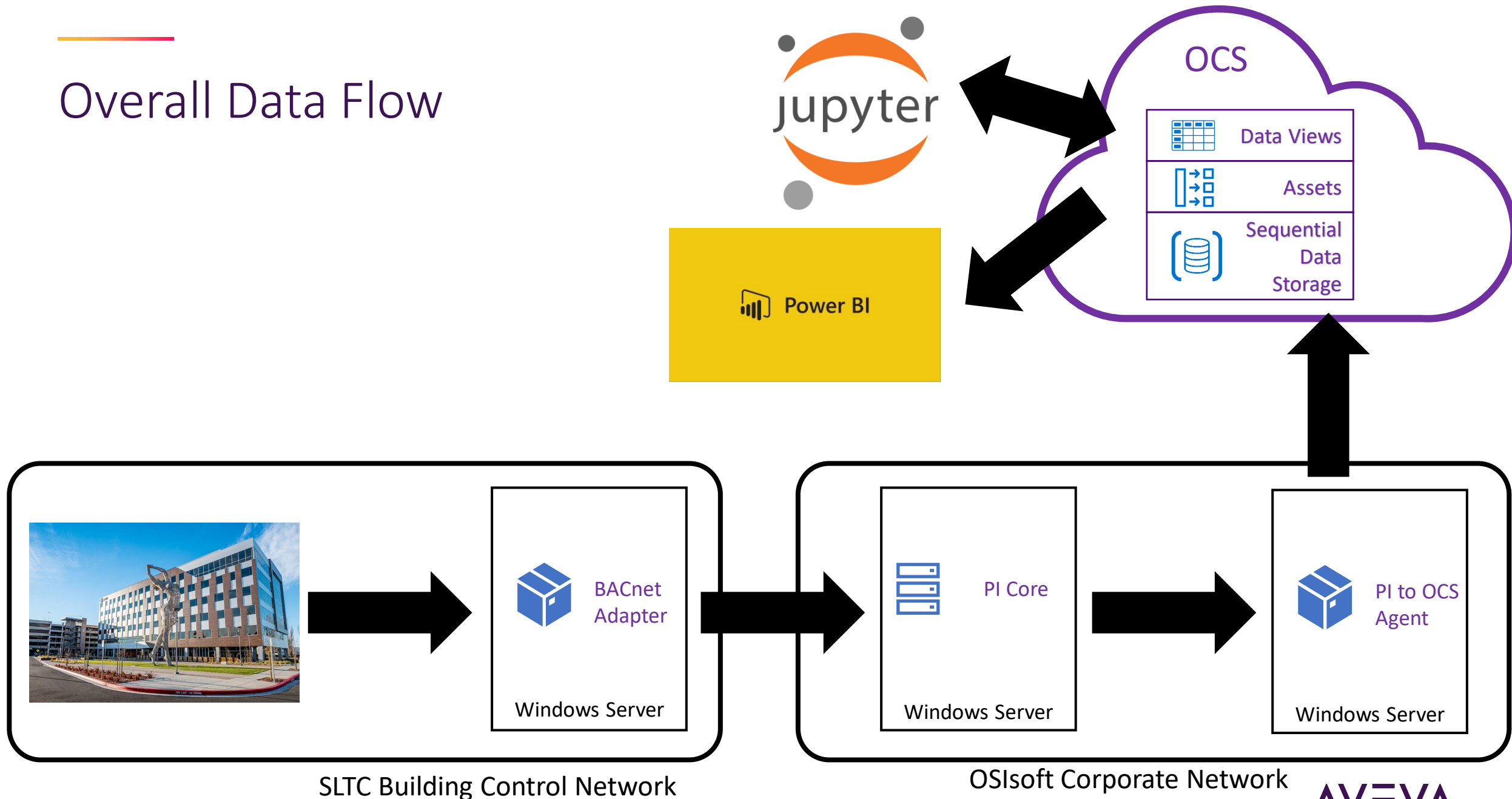
```
{  
  "Id": "SLTC_Building_Energy_Predictions_Asset",  
  "Name": "SLTC_Building_Energy_Predictions_Asset",  
  "Description": "",  
  "IndexField": {  
    ...  
  },  
  "Queries": [  
    ...  
  ],  
  "DataFieldSets": [  
    ...  
  ],  
  "GroupingFields": [],  
  "DefaultStartIndex": "2021-06-01T04:00:00.000Z",  
  "DefaultEndIndex": "2021-06-15T04:00:00.000Z",  
  "DefaultInterval": "01.00:00:00",  
  "IndexTypeCode": "DateTime",  
  "Shape": "Standard"  
}
```



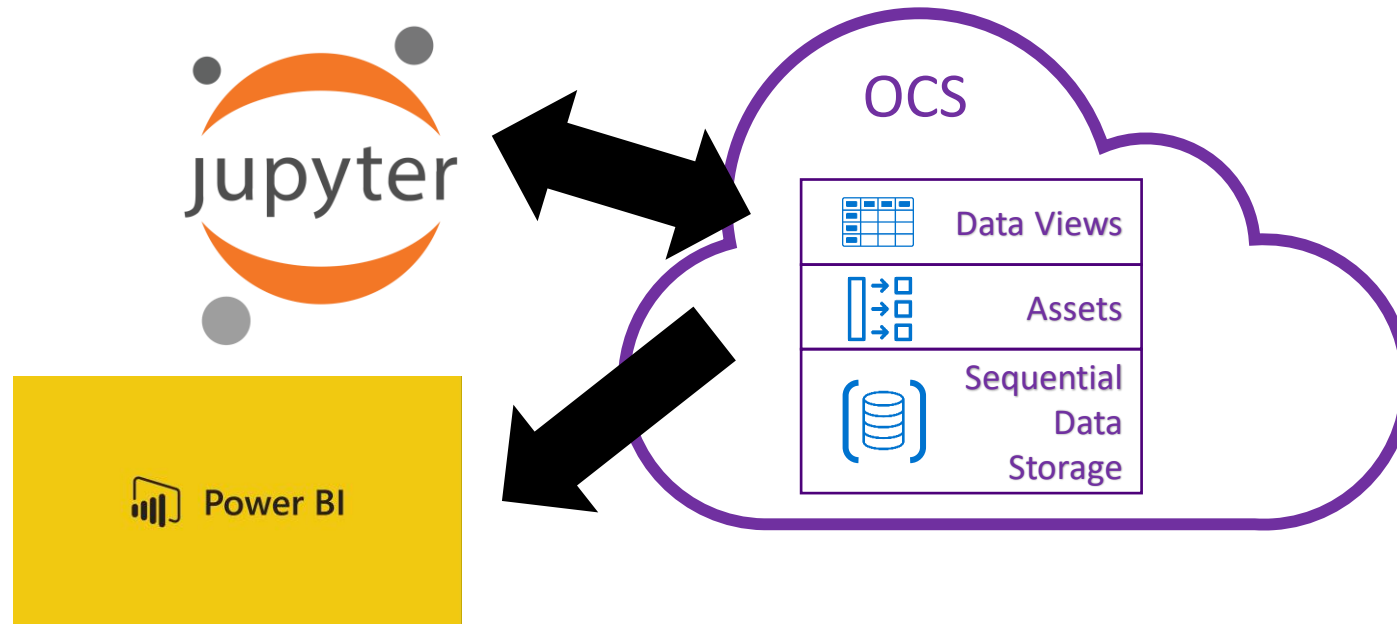
Demo

- Agents page
- SDS Explorer
- Asset Explorer
- Trend
- API console
- Data views

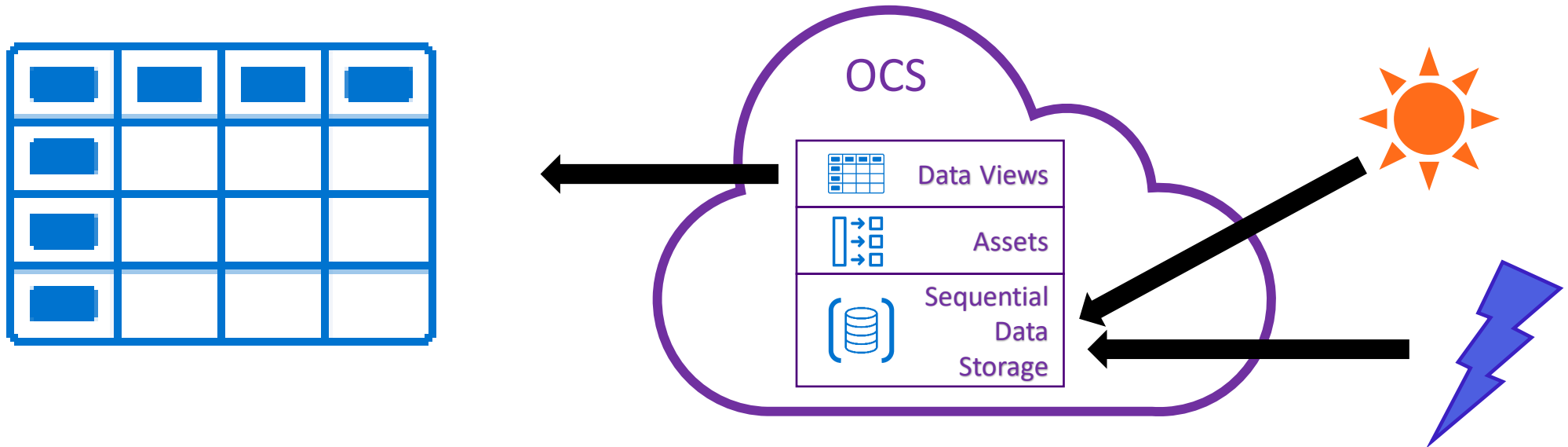
Overall Data Flow



Final Portion – Data Science



Create a Data View to Shape the Data



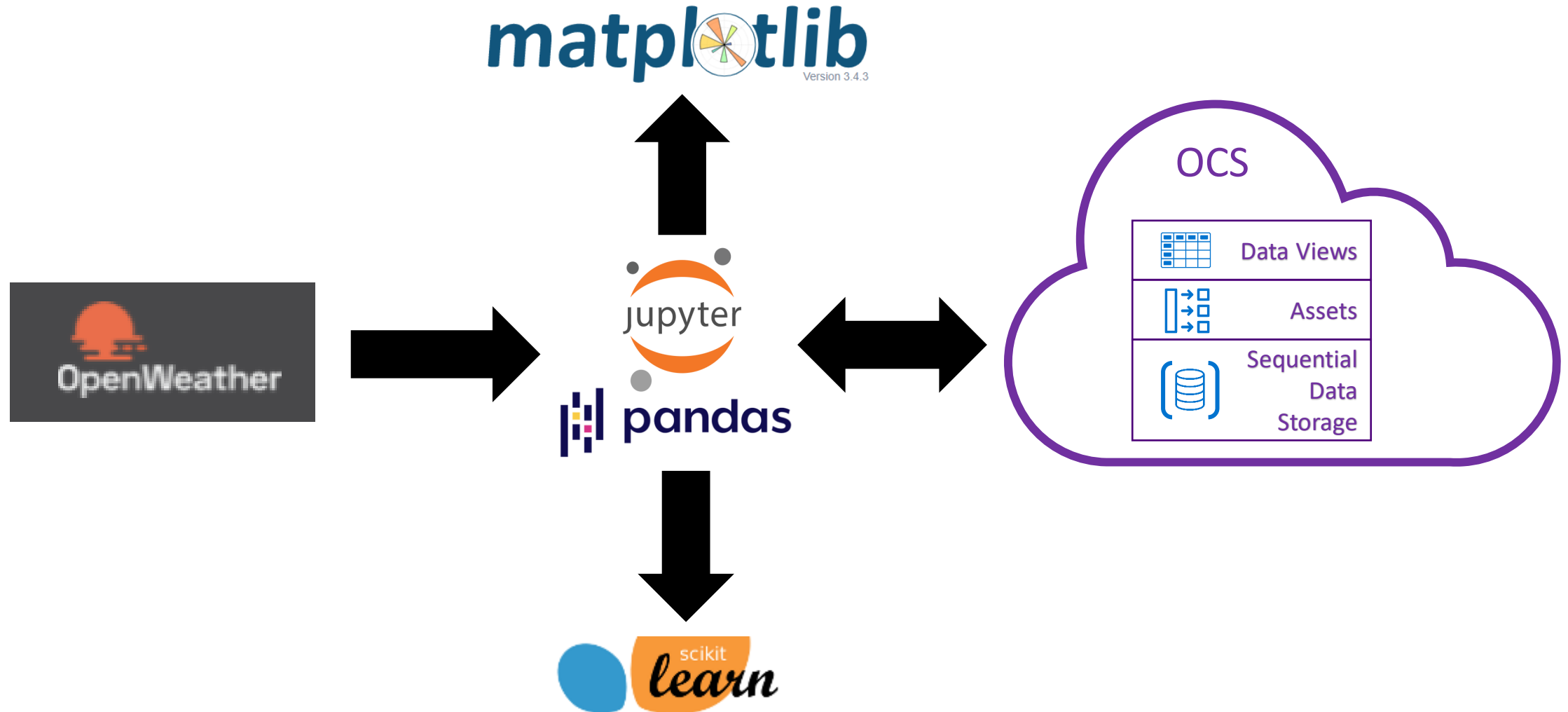


Demo

Data Science Prep in OCS

- Data View Creation
- Testing in API Console

Data Science in Jupyter



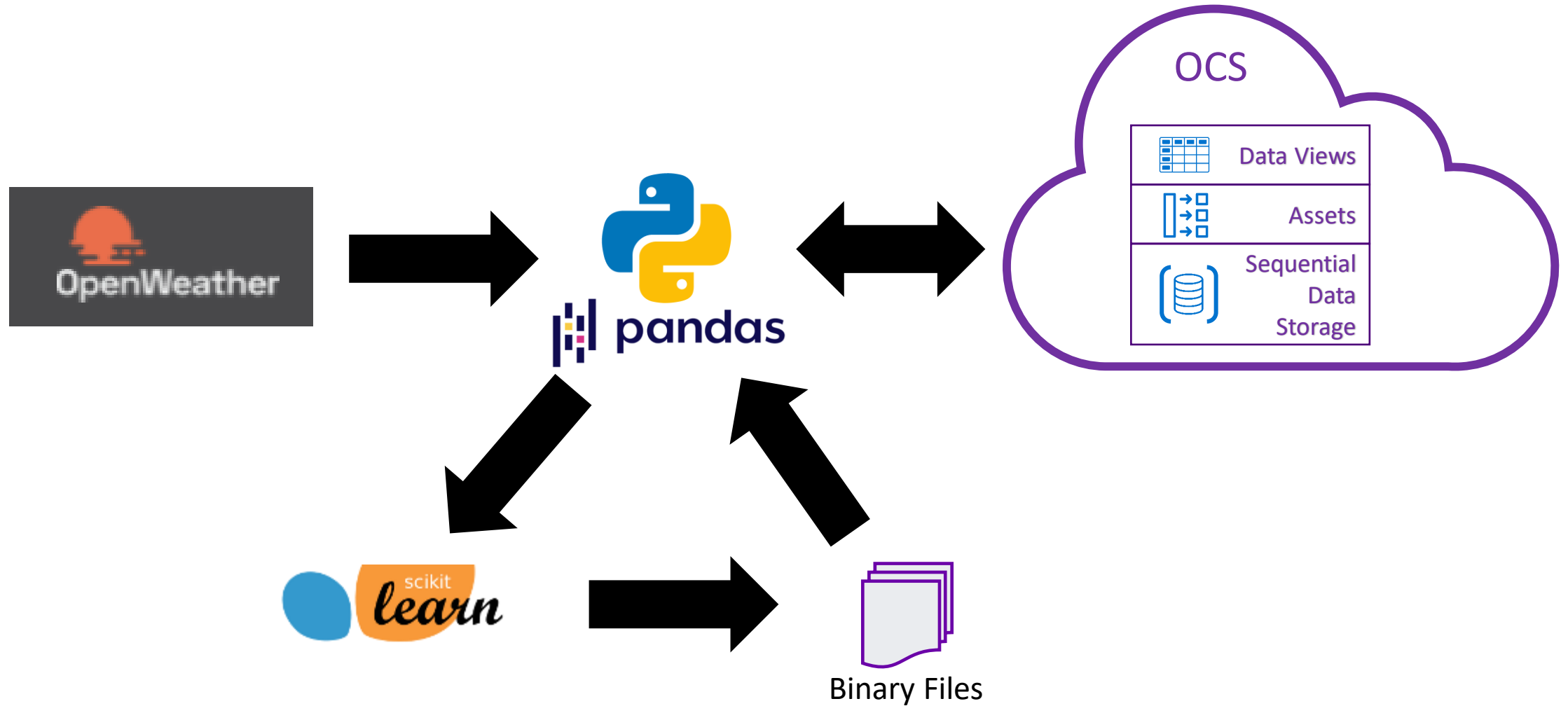


Demo

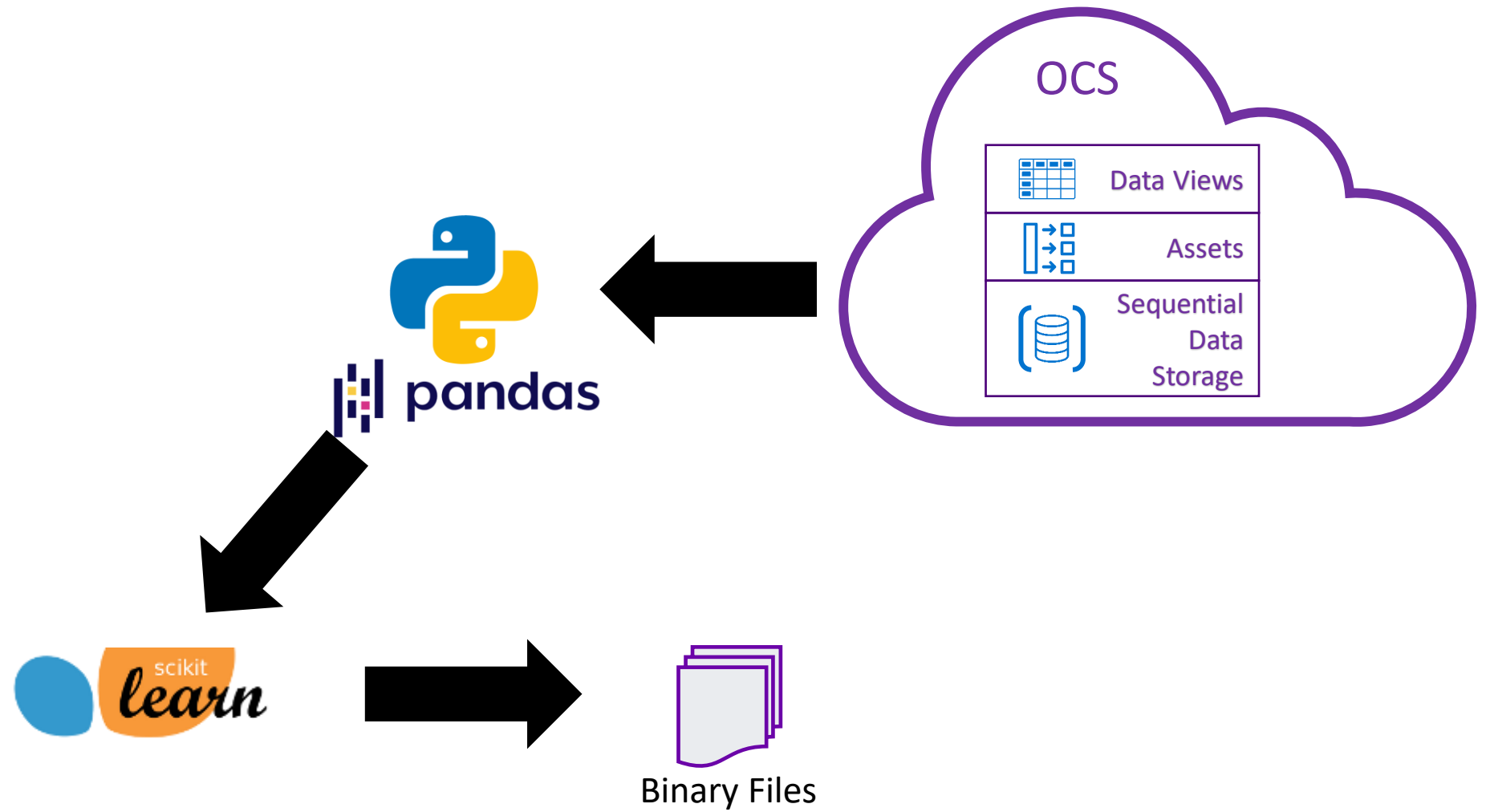
Data Science in Jupyter

- Pull Data View Data into Jupyter
- Show Matplotlib trends
- Fit SciKitLearn Regression Models
- Pull in Weather Forecast
- Write Energy Predictions to OCS

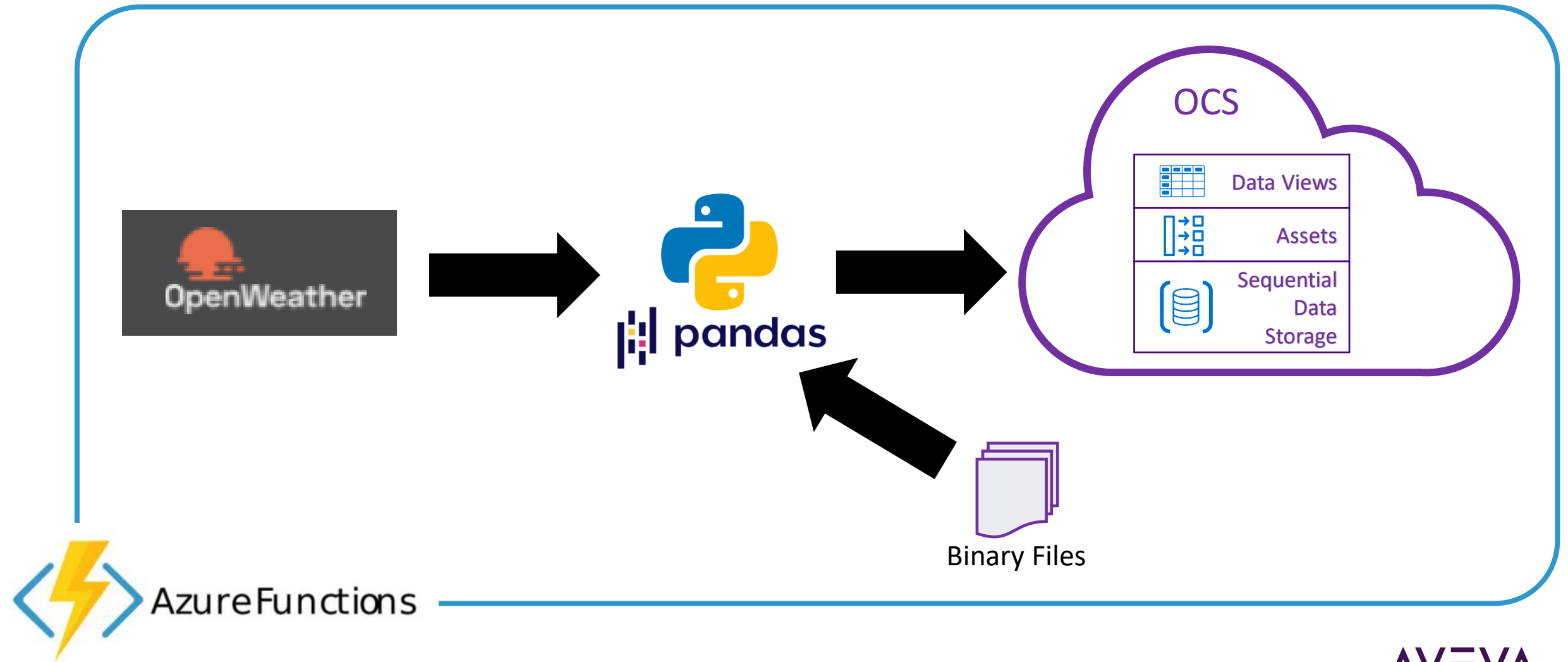
CICD Overview



CICD – Prep

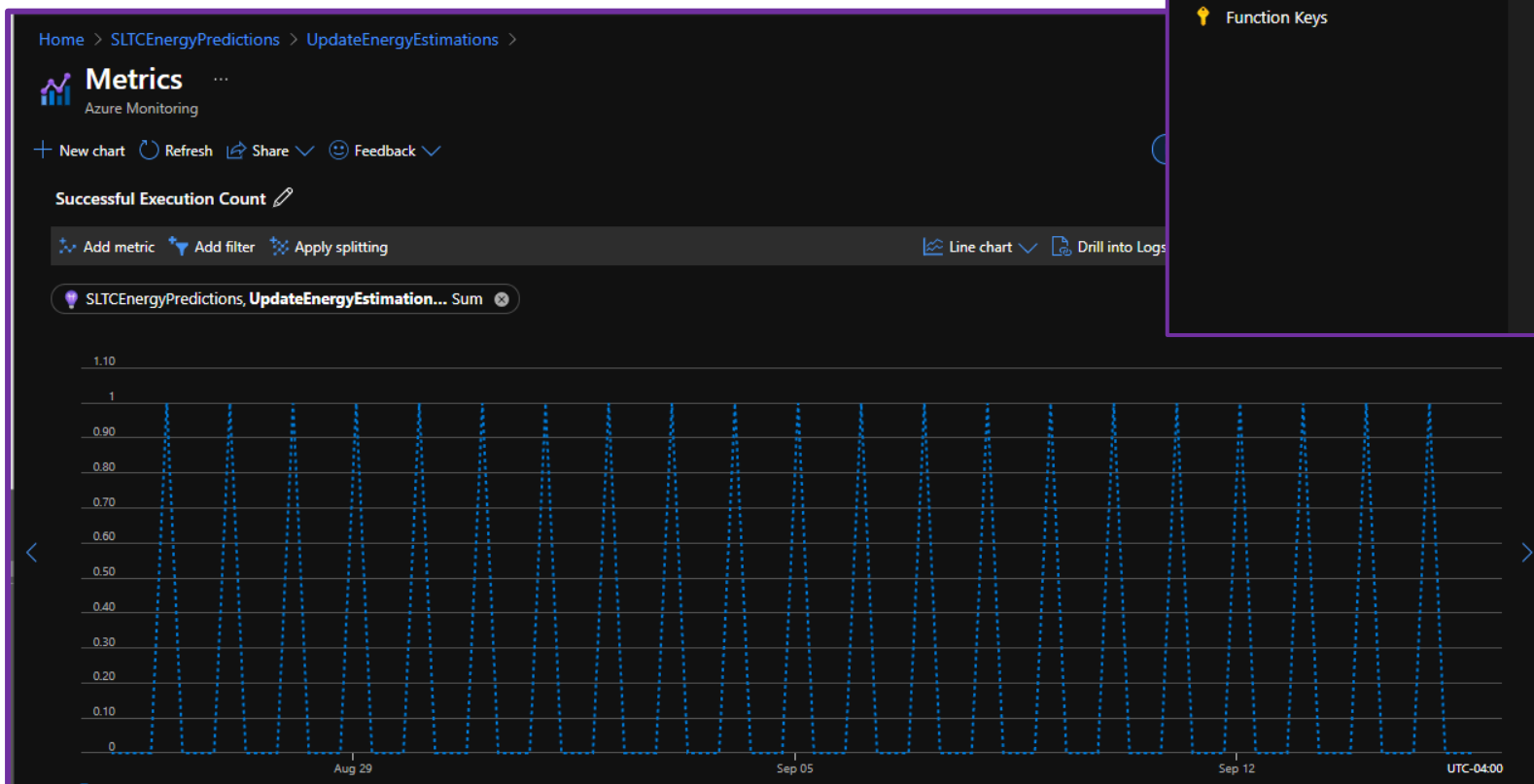


CICD – Execution



Azure Portal

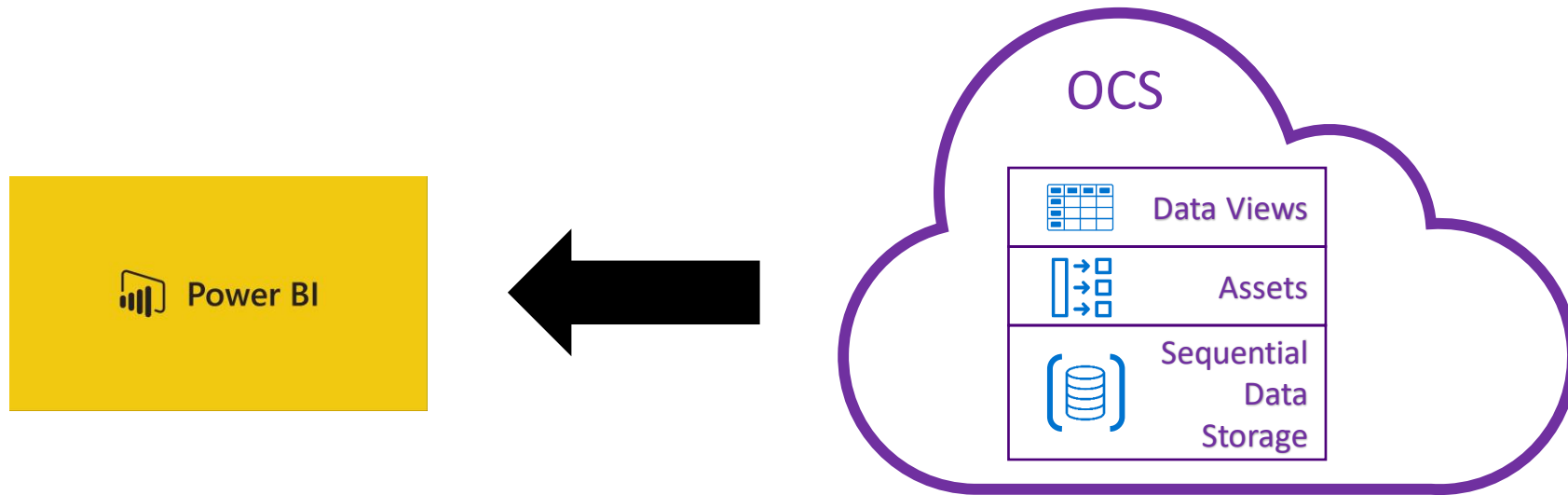
- Daily Execution of the python code handled by Azure



The screenshot shows the 'UpdateEnergyEstimations | Code + Test' page in the Azure Portal. The page displays the Python code for the function, which includes imports for Azure Functions, datetime, logging, configparser, json, numpy, pandas, pathlib, pickle, pytz, and requests. The code also includes imports for matplotlib.pyplot, sklearn.preprocessing, sklearn.tree, and sklearn.linear_model. The function is named 'Lasso'.

```
1 import azure.functions as func
2
3 from datetime import date, timedelta, datetime
4 import logging
5 import configparser
6 import json
7 import numpy as np
8 import pandas as pd
9 import pathlib
10 import pickle
11 import pytz
12 import requests
13
14 from matplotlib import pyplot as plt
15 from sklearn import preprocessing
16 from sklearn import tree
17 from sklearn.tree import DecisionTreeRegressor
18 from sklearn.linear_model import Lasso
```

Power BI Integration





Demo

Power BI Integration

- Create Data View
- Install Power BI Connector for OCS
- Add Data View to Power BI Display

Cloud native platform designed for real-time operations

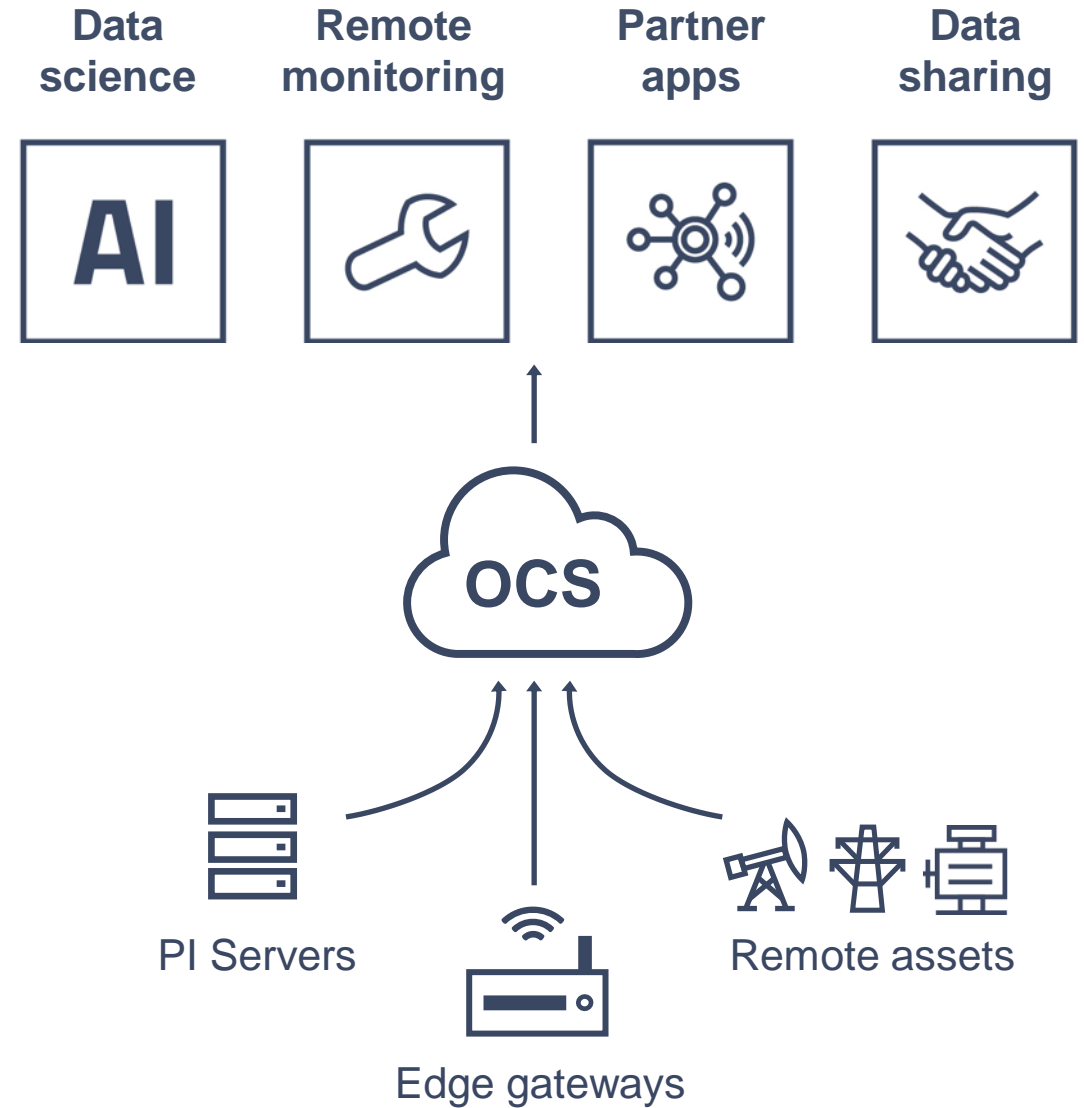
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