Next Generation PI SQL

From the OSIsoft Team (Bodo Bachmann, Engineering Manager)

A little bit of history

- PI OLEDB Provider
  - Read/write
  - PI SDK based (multi-threading issues, no major enhancements)

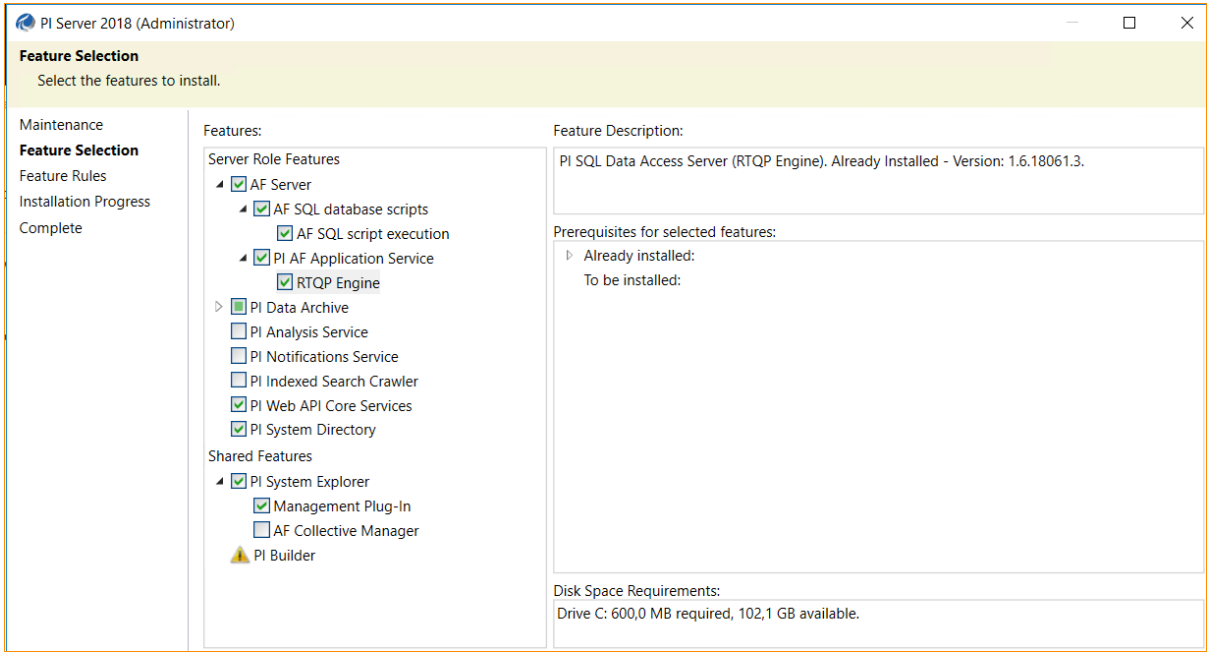
- PI OLEDB Enterprise
  - Read
  - No integration of Data Archive
  - Scalability and performance issues
  - Complex queries (compared to PI OLEDB Provider)

Next Generation Development Goals

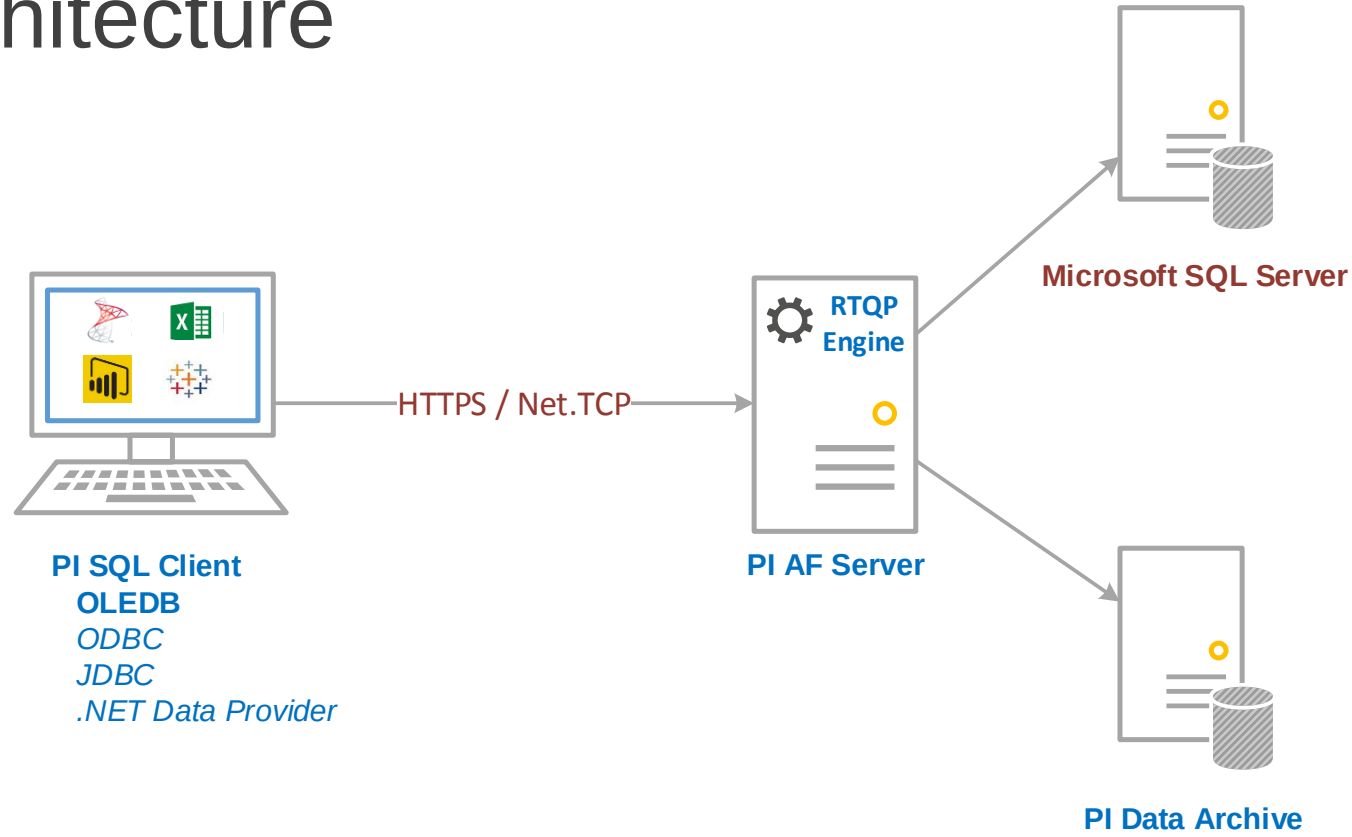
- Performance and scalability
- Review data model
  - Reduce query complexity
  - What are top use cases (use customer feedback)
  - Address known issues (e.g. timestep data type, PI time literals)
- Infrastructure to support multiple standards and thin clients
- Works across WAN and different time zones
- Review security and authentication

Real-Time Query Processing Engine

- Part of the PI Server integrated install kit
- Optional

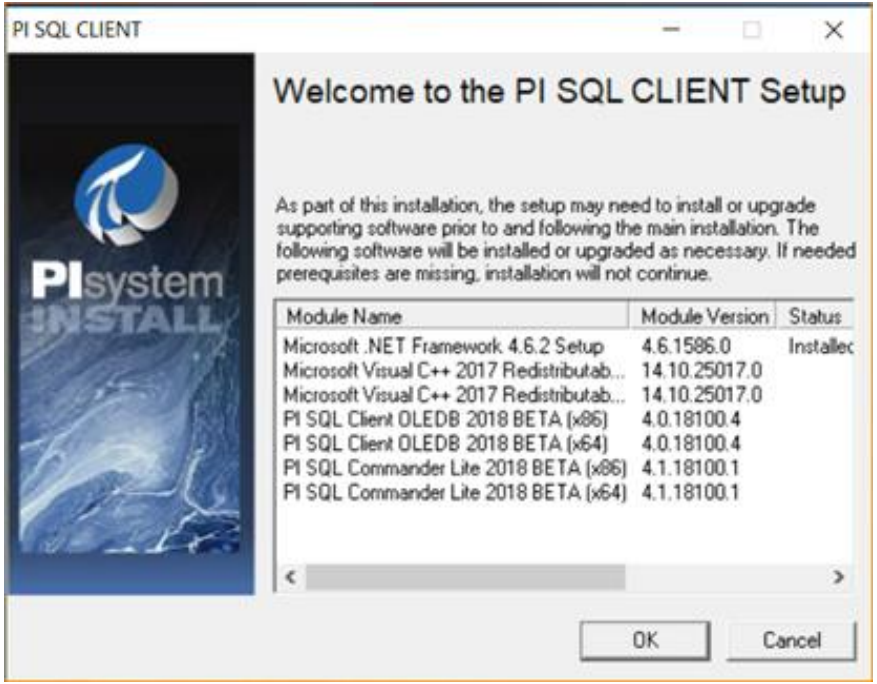


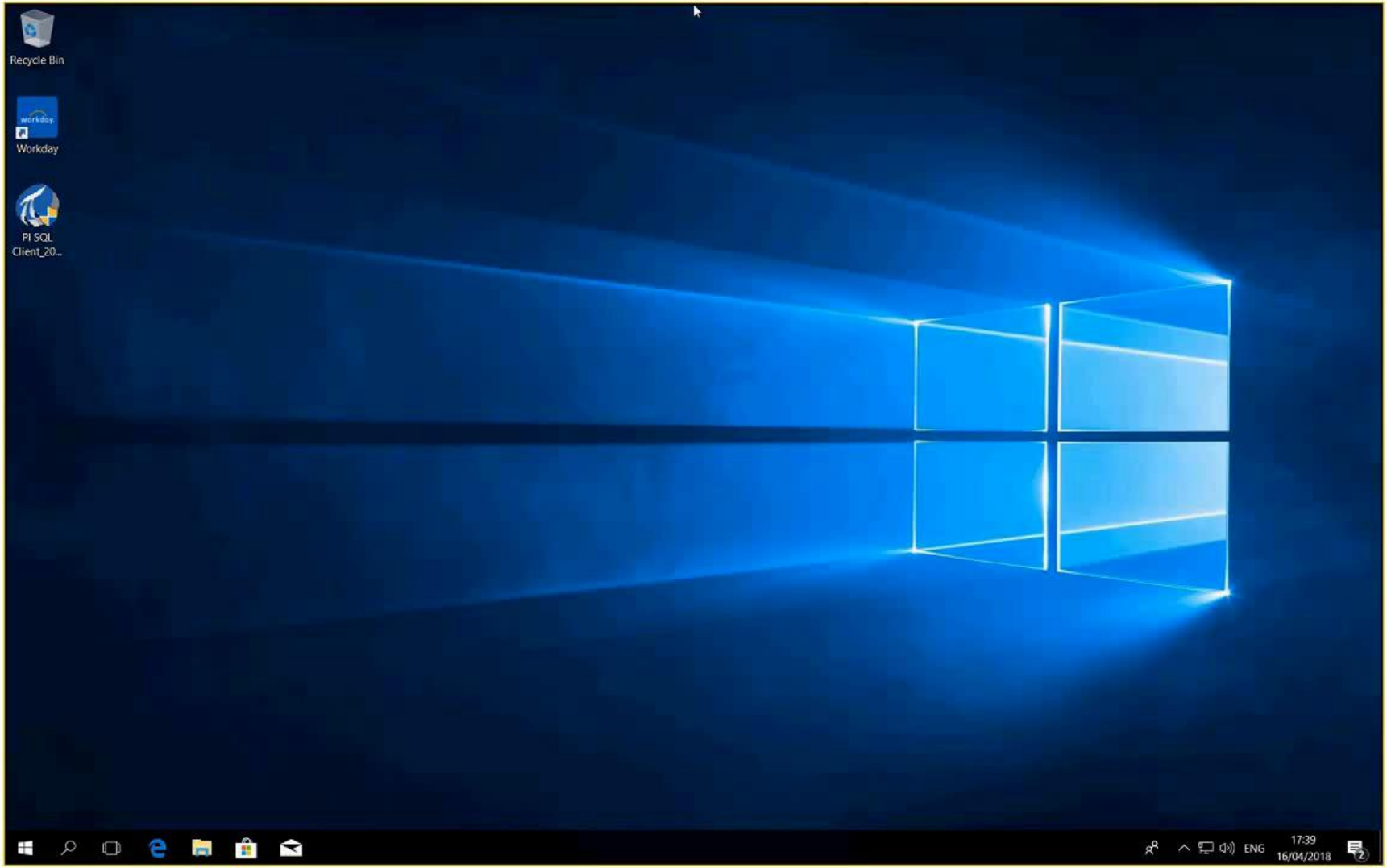
Architecture



Client Installation

- No AF SDK dependency
- PI SQL Commander Lite incl. Query Compendium

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ENG
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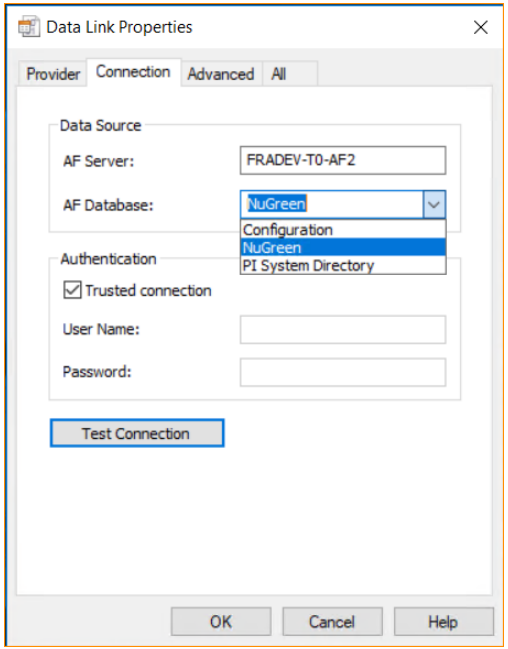
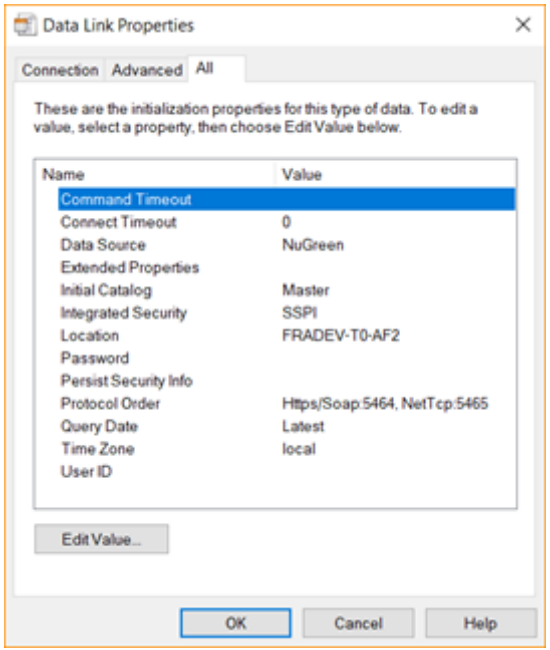
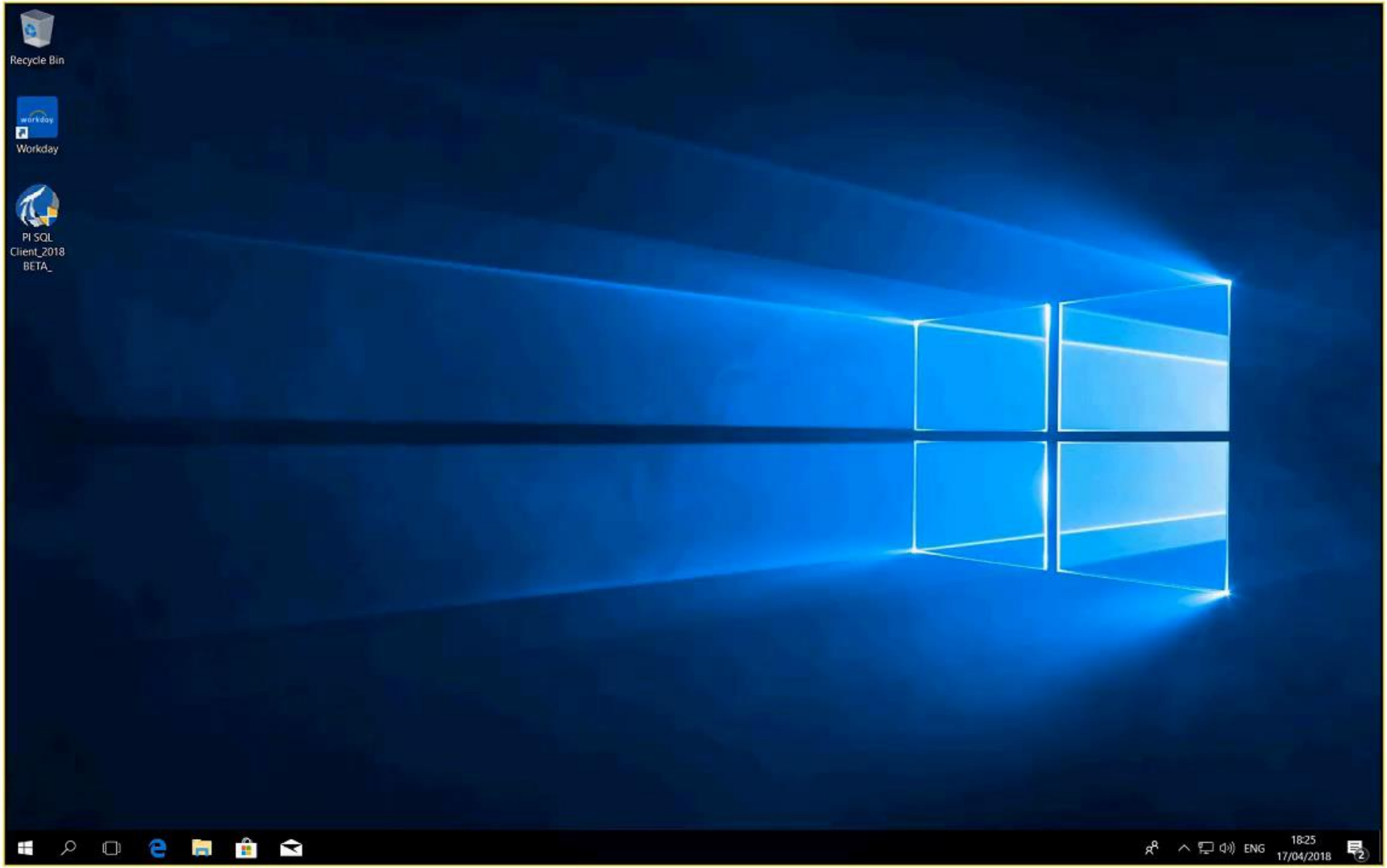
16/04/2018

Connection and Connection Options

- AF Database names can be browsed when PI Directory Service and PI Web API Core Services are configured
- Time Zone support



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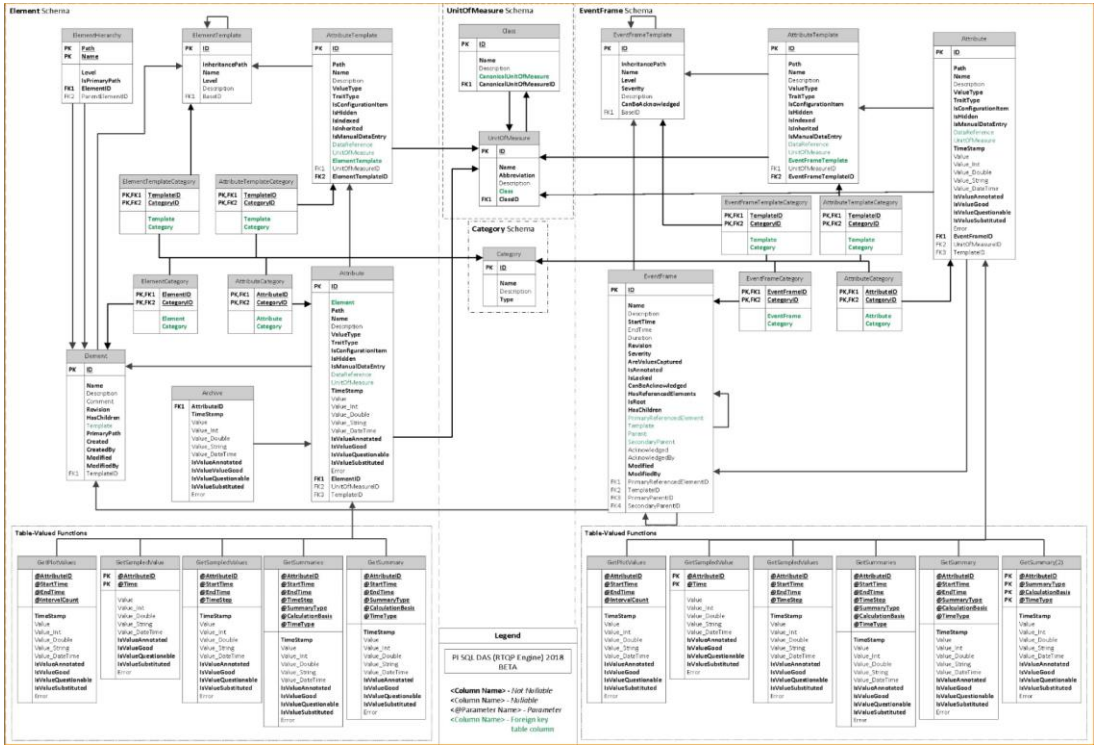
ENG
18:25
17/04/2018

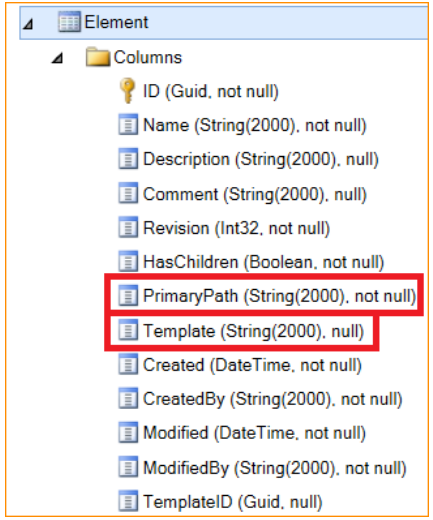
Catalogs and Schemas

- Connection = AF Database
- Elements and Event Frames
- Attributes and Data
- Categories and Templates
- Template based TVFs
- Multiple Value columns
- Navigation columns



Simplified Queries

Denormalization

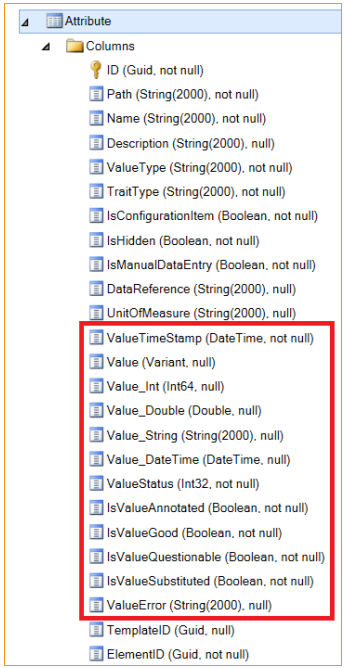



```
SELECT eh.Path + eh.Name Element, et.Name Template
FROM NuGreen.Asset.Element e
LEFT OUTER JOIN NuGreen.Asset.ElementTemplate et
    ON et.ID = e.ElementTemplateID
INNER JOIN NuGreen.Asset.ElementHierarchy eh
    ON eh.ElementID = e.ID
WHERE et.Name IN ('Boiler', 'Heater')
```

```
SELECT e.PrimaryPath + e.Name Element, e.Template
FROM Master.Element.Element e
WHERE e.Template IN ('Boiler', 'Heater')
```

Simplified Queries

Extension




```
SELECT eh.Path + eh.Name Element, et.Name Template, ea.Name Attribute, s.Time, s.Value
FROM NuGreen.Asset.Element e
LEFT OUTER JOIN NuGreen.Asset.ElementTemplate et    ON et.ID = e.ElementTemplateID
INNER JOIN NuGreen.Asset.ElementHierarchy eh    ON e.ID = eh.ElementID
INNER JOIN NuGreen.Asset.ElementAttribute ea    ON eh.ElementID = ea.ElementID
INNER JOIN NuGreen.Data.Snapshot s              ON ea.ID = s.ElementAttributeID
WHERE et.Name IN ('Boiler', 'Heater')
      AND eh.Path = N'\NuGreen\Houston\Cracking Process\Equipment\'
ORDER BY 1
```

```
SELECT e.PrimaryPath + e.Name Element, e.Template, ea.Name Attribute,
       ea.ValueTimeStamp, ea.Value
FROM Master.Element.Element e
INNER JOIN Master.Element.Attribute ea     ON e.ID = ea.ElementID
WHERE e.Template IN ('Boiler', 'Heater')
      AND e.PrimaryPath = N'\NuGreen\Houston\Cracking Process\Equipment\'
ORDER BY 1
```

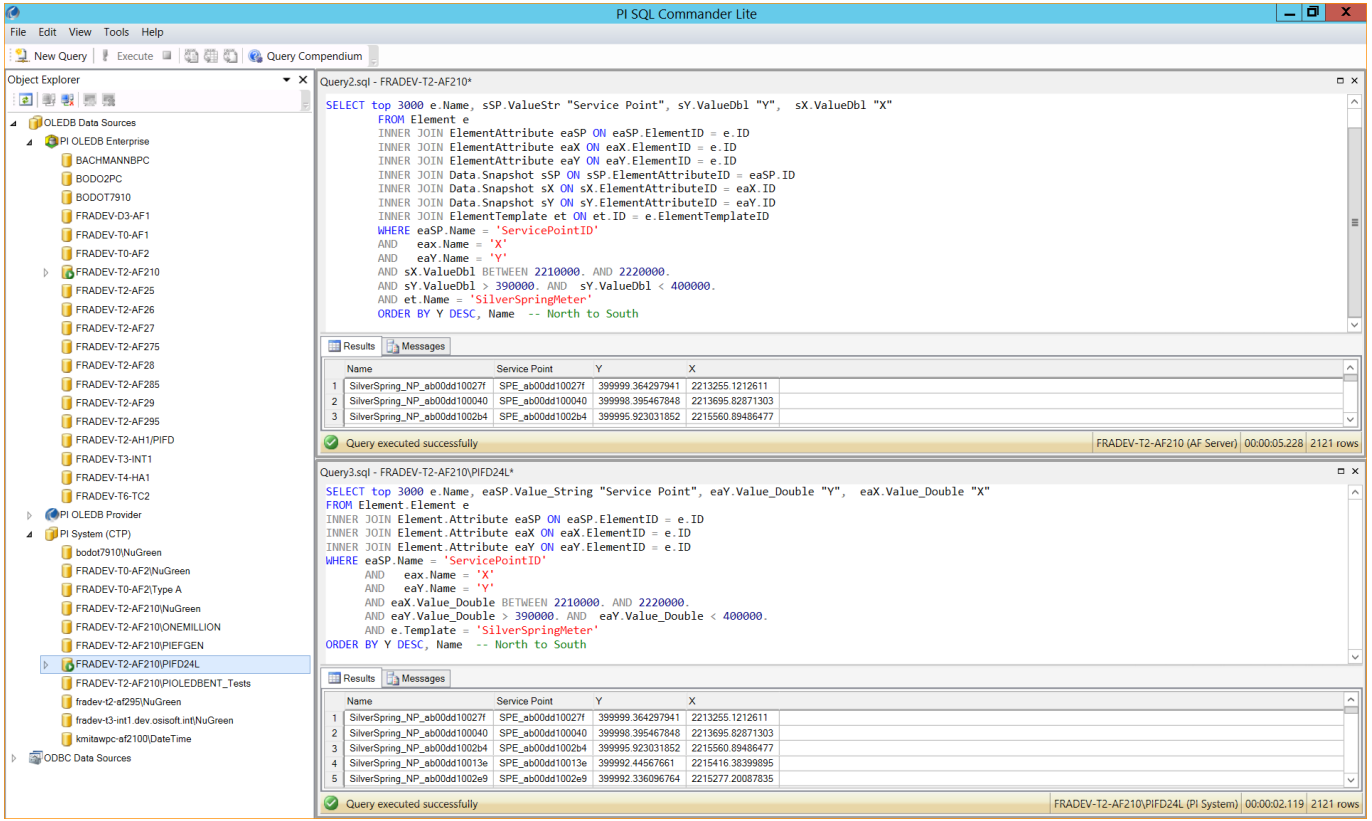
Attribute Values and Data Types

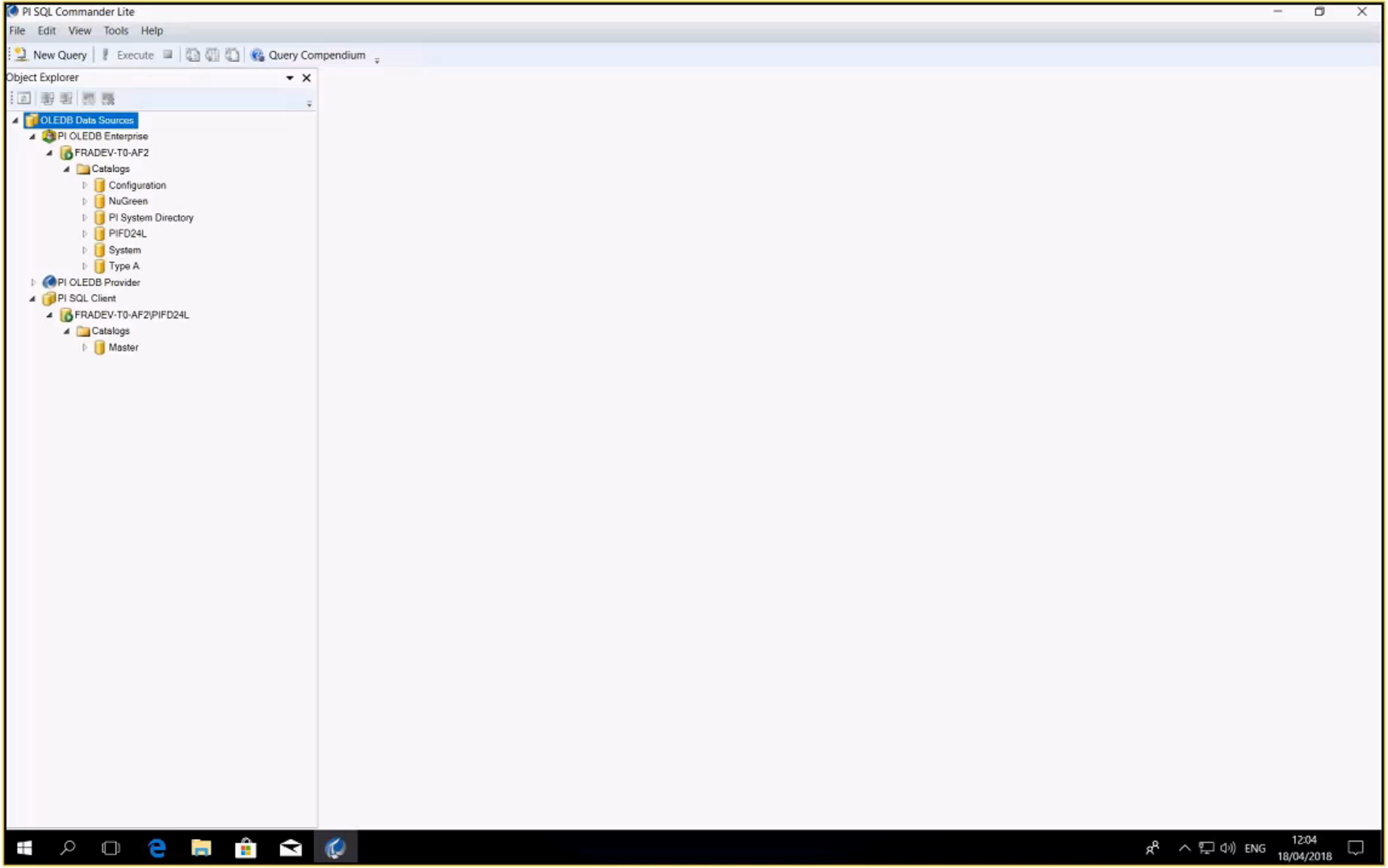
- Only the Value column is always populated
- Unlike in PI OLEDB Enterprise, at max one native type is filled

Results | Messages

	Name	Description	TimeStamp	ValueType	Value	Value_Int	Value_Double	Value_String	Value_DateTime	IsValueSubstituted
1	Feedrate Tag		1970-01-01 00:00:00.000	String	SINUSOID			SINUSOID		False
2	Fuel	Relative Fuel Gas Use per ton of Feed	2018-03-12 15:52:14.302	Double	1000		1000			False
3	Water Savings	Current percent savings in energy use.	2018-03-12 15:52:14.302	Double	-1920.20202020202		-1920.20202020202			False
4	Fuel Savings	Current percent savings in energy use.	2018-03-12 15:52:14.302	Double	48.9535477284329		48.9535477284329			False
5	WaterTarget	Water use target based on 98 % of 2007 use.	1970-01-01 00:00:00.000	Double	48.51		48.51			False
6	FuelTarget	Fuel use target based on 98 % of 2007 use.	1970-01-01 00:00:00.000	Double	1919.82		1919.82			False
7	Process Feedrate		2018-03-12 15:52:14.302	Double	94.894172668457		94.894172668457			False
8	Water(2007)	2007 Water Use	1970-01-01 00:00:00.000	Double	49.5		49.5			False
9	Fuel(2007)	2007 Fuel Gas Use	1970-01-01 00:00:00.000	Double	1959		1959			False
10	Water	Make-Up Water Use per Ton of Feed	2018-03-12 15:52:14.302	Double	1000		1000			False
11	Process	Process Name	1970-01-01 00:00:00.000	String	Cracking Plant			Cracking Plant		False
12	Plant	Plant Name	1970-01-01 00:00:00.000	String	Houston			Houston		False
13	Model	Manufacturer Model	1970-01-01 00:00:00.000	String	BX-414			BX-414		False
14	Manufacturer	Equipment Manufacturer	1970-01-01 00:00:00.000	String	Borne Engineering			Borne Engineering		False
15	Make-Up Water Tag	Make-Up Water PI Tag	1970-01-01 00:00:00.000	String	SINUSOID			SINUSOID		False
16	Water Flow	Make-Up Water Flow	2018-03-12 15:52:14.302	Double	94.894172668457		94.894172668457			False
17	Installation Date	Installation Date	1970-01-01 00:00:00.000	DateTime	5/16/1985 6:00:00 AM				1985-05-16 06:00:00.000	False
18	Fuel Gas Flow Tag	Fuel Gas Flow PI Tag	1970-01-01 00:00:00.000	String	SINUSOID			SINUSOID		False
19	Fuel Gas Flow	Fuel Gas Flow Rate	2018-03-12 15:52:14.302	Double	94.894172668457		94.894172668457			False
20	Burner	Burner Model	1970-01-01 00:00:00.000	String	TZ-14			TZ-14		False
21	Asset Name	Asset Process Name	1970-01-01 00:00:00.000	String	High Pressure			High Pressure		False

Sample Queries and Performance




PI SQL Commander Lite
File Edit View Tools Help
New Query
Execute
Query Compendium
Object Explorer
OLEDB Data Sources
PI OLEDB Enterprise
FRADEV-T0-AF2
Catalogs
Configuration
NuGreen
PI System Directory
PIFD24L
System
Type A
PI OLEDB Provider
PI SQL Client
FRADEV-T0-AF2\PIFD24L
Catalogs
Master
ENG
12:04
18/04/2018

Roadmap

- Q2/2018:
  - PI SQL Client with OLEDB
  - PI SQL Data Access Server (RTQP Engine)
- Q4/2018:
  - PI SQL Client adding ODBC and JDBC support
- Later:
  - Direct Tag based queries
  - INSERT/UPDATE/DELETE for Event Frames and Attribute/Tag data

Questions

Please wait for the **microphone** before asking your questions

State your **name & company**

Please remember to…

Complete the Online Survey for this session

PI SQL Family

- **Bodo Bachmann**
- Bodo@osisoft.com
- Engineering Manager Europe
- OSIsoft

Merci

谢谢

Danke

Спасибо

Gracias

Thank You

감사합니다

ありがとう

Grazie

Obrigado

Optional: Click to add a takeaway you wish the audience to leave with.