How to take advantage of the PI WEB API in your organization

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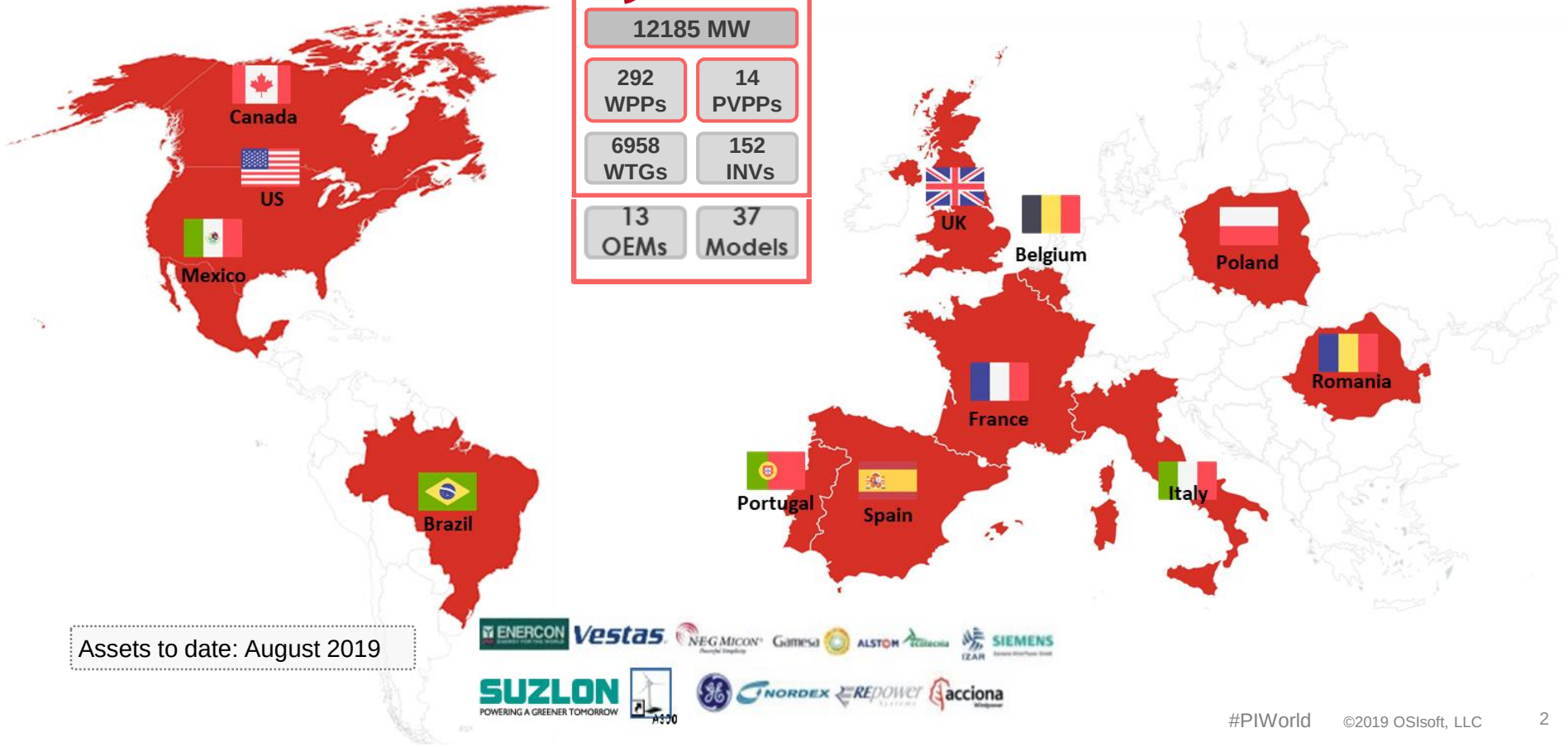
EDPR

edp renováveis

12185 MW	
292 WPPs	14 PVPPs
6958 WTGs	152 INVs
13 OEMs	37 Models



Assets to date: August 2019

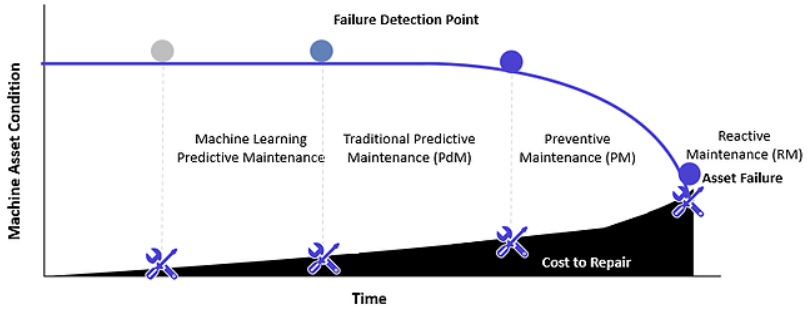
ENERCON Vestas NEG Micon Gamesa ALSTOM IZAR SIEMENS

SUZLON POWERING A GREENER TOMORROW A1500

GE NORDEX REpower acciona

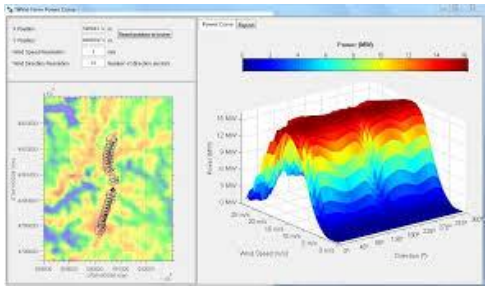
Business Needs

Machine Learning Predictive Maintenance

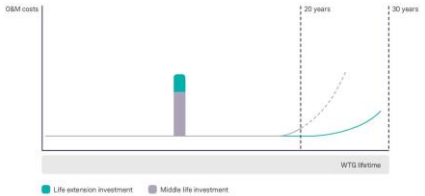


Advanced Historical Calculations & KPIs

Performance of Wind Turbines



Wind Turbine Life Extension



Challenge

Requirements of EDPR's External Data use in Relational Databases and Real Time Applications

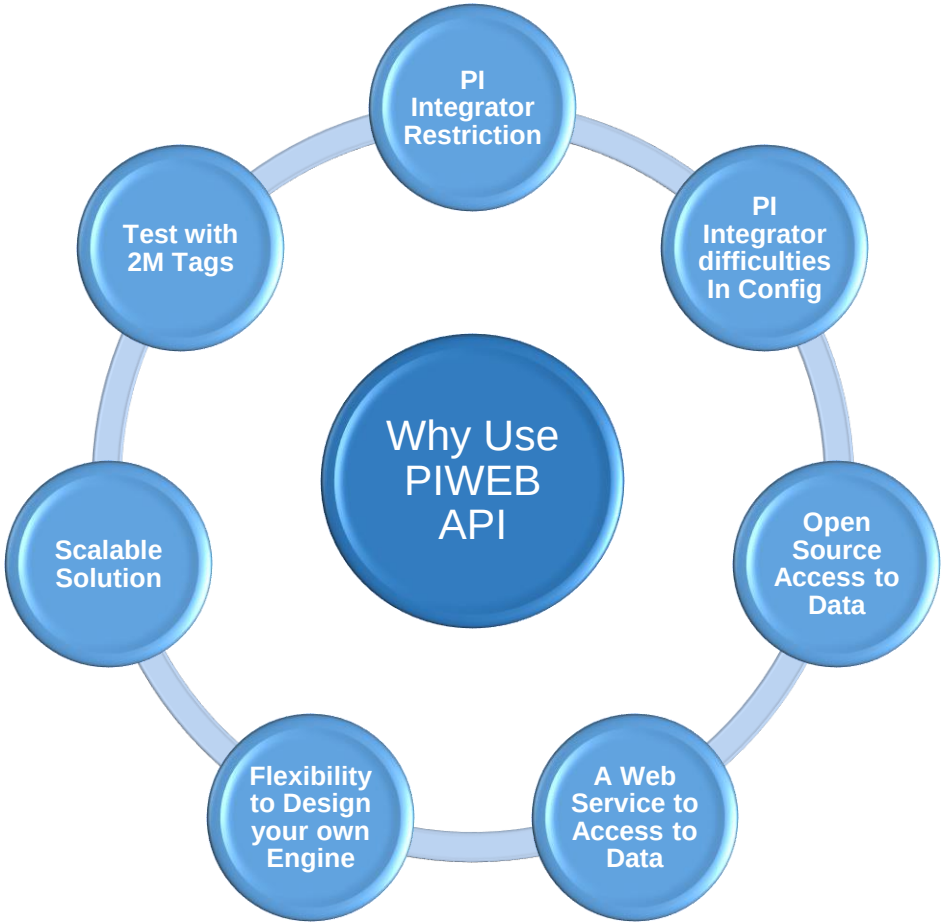
Architecture design and PI Calculations Capabilities

Create an Interface Between PI and External Consumers

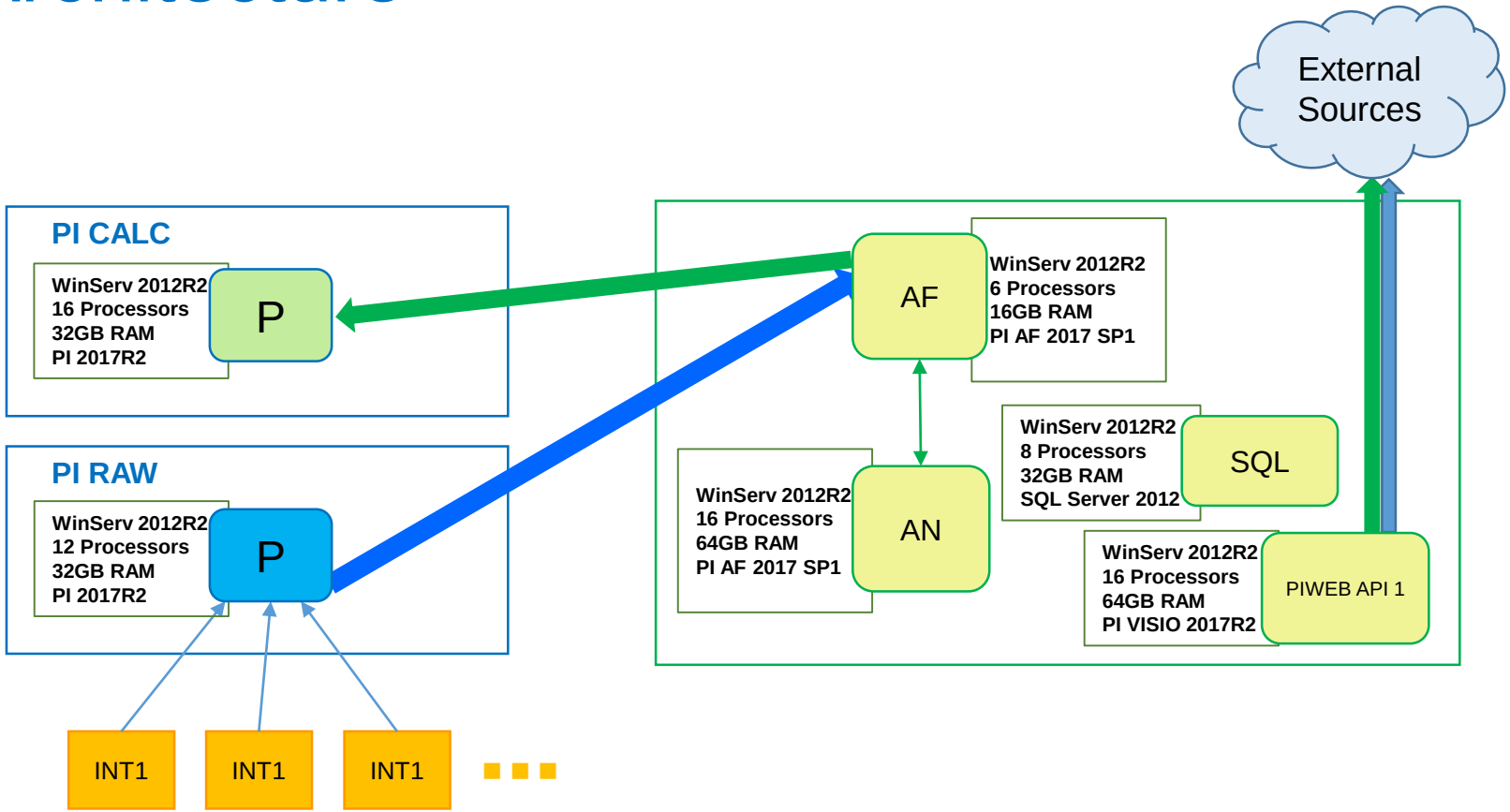
Scope: How to extract amount of historical Data and Streaming data using PIWEB API

Requirements in Numbers

Reasons to use PI WEB API



Pilot Architecture



AF Configuration v1

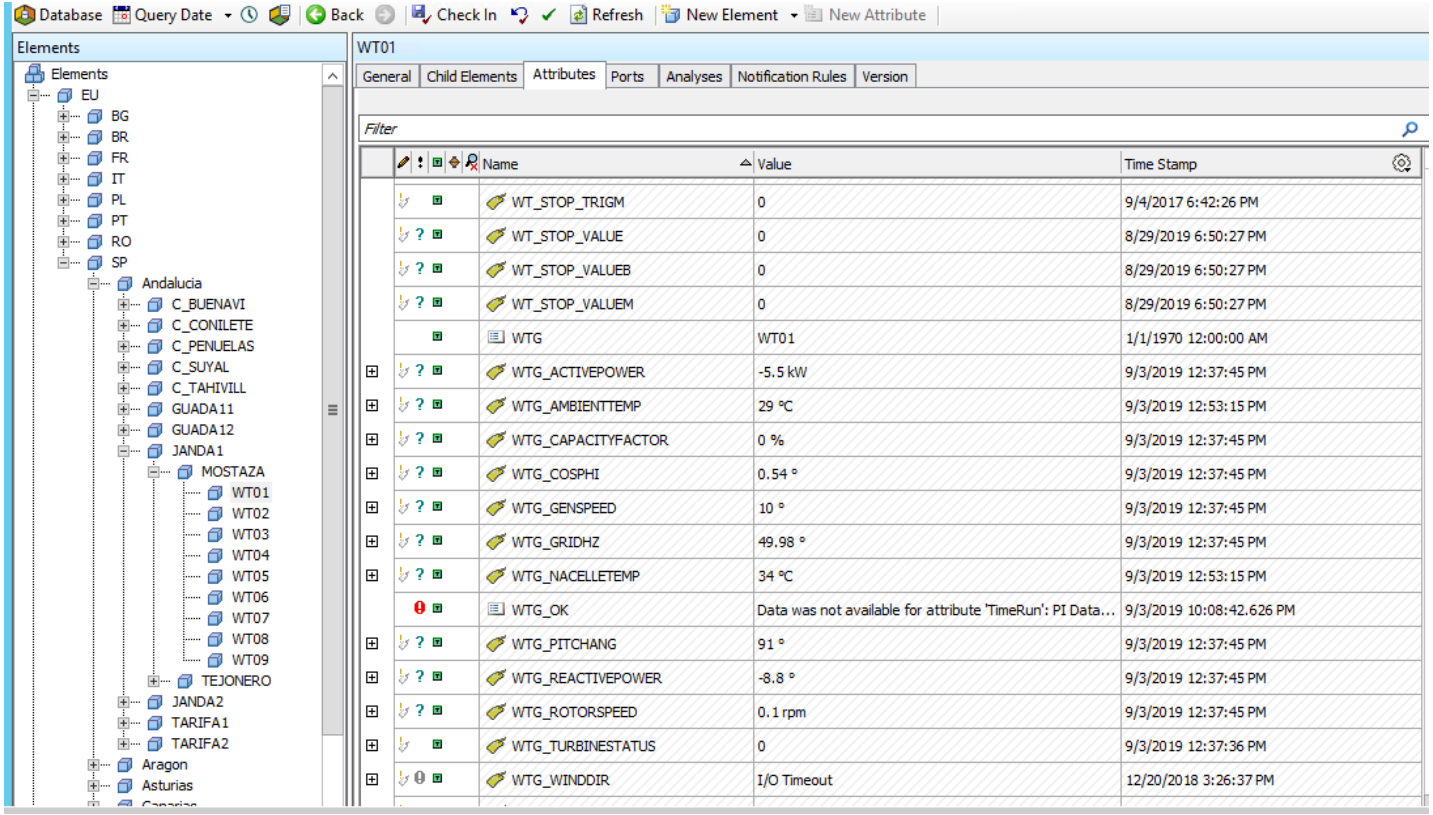
Organization by:

- Platform
- Country
- Zone
- Node
- WPP
- WTG

~7000 Assets
(WTGs & INVs)

~300 Tags per Asset

Total: ~2.000.000 Tags



Types of Reading used with PIWEB API

Get Point by path
https://localhost/piwebapi/points?path={path} → Webid of Tag

Get Element by path
https://localhost/piwebapi/elements?path={path} → Webid of Element

Current Value for a Tag or Attribute
https://localhost/piwebapi/streams/{webId}/value → Return One Value

Current Value for All Attributes of Element
https://localhost/piwebapi/streamsets/{webid}/value → Return One Value per each Attr of Element

Get all the Archive Values for All attributes of an element for 30 minute
https://localhost/piwebapi/streamsets/{webid}/recorded?starttime=*-1h&endtime=*-30m → Return Multiples Values per each Attr of Element

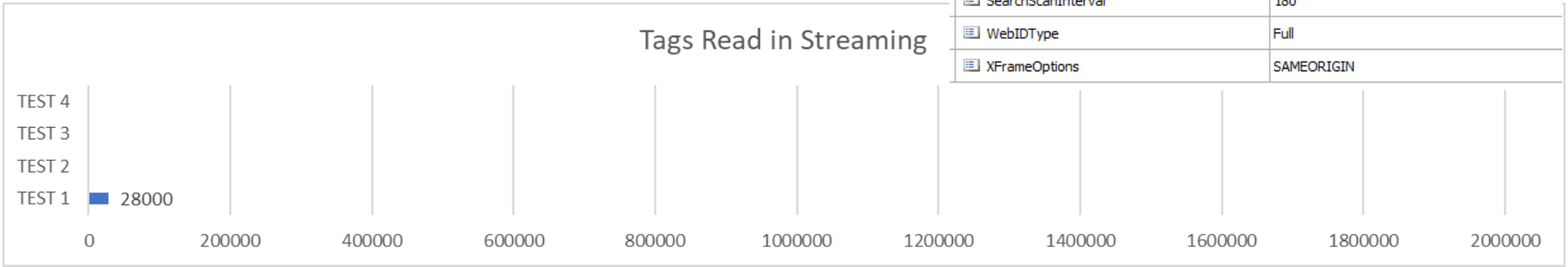
Get Streaming Data for All atributes of an element continously
https:// localhost/piwebapi/streamsets/{webid}/channel → Return Continuously incoming data of each Attr of Element

First Test

Default Configuration & AF, Using 1 PIWEB API

- Default Configuration PIWEB API
- Access to AF Default Configuration Element by WTG
- Run with 100 Elements without constrictions
- Total Tags Streaming: ~30.000

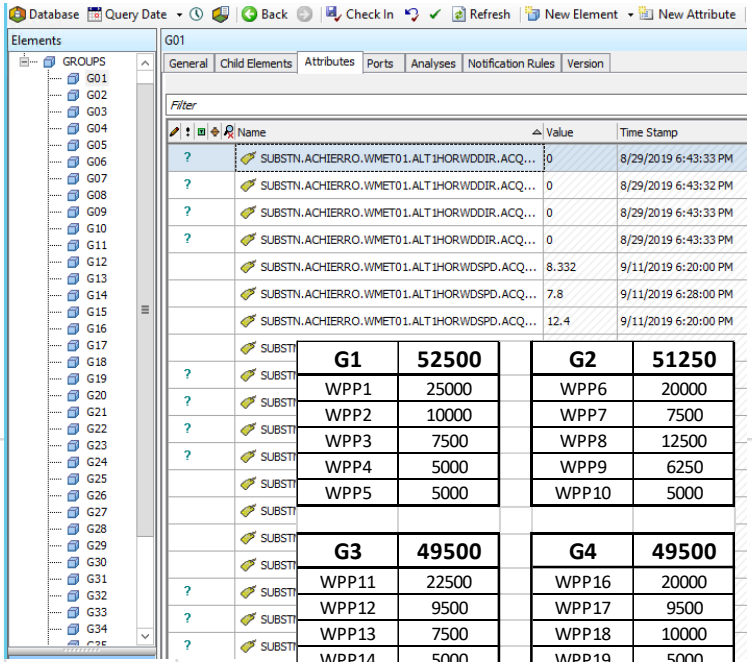
Name	Value
AuthenticationMethods	String Array
CorsExposedHeaders	Allow,Content-Encoding,Content-Length,Date,I
CorsHeaders	
CorsMethods	GET,OPTIONS
CorsOrigins	
CorsSupportsCredentials	False
DisableWrites	False
EnableCSRFDefense	True
SearchBoosts	Single Array
SearchPointAttributes	String Array
SearchScanInterval	180
WebIDType	Full
XFrameOptions	SAMEORIGIN



Second Test

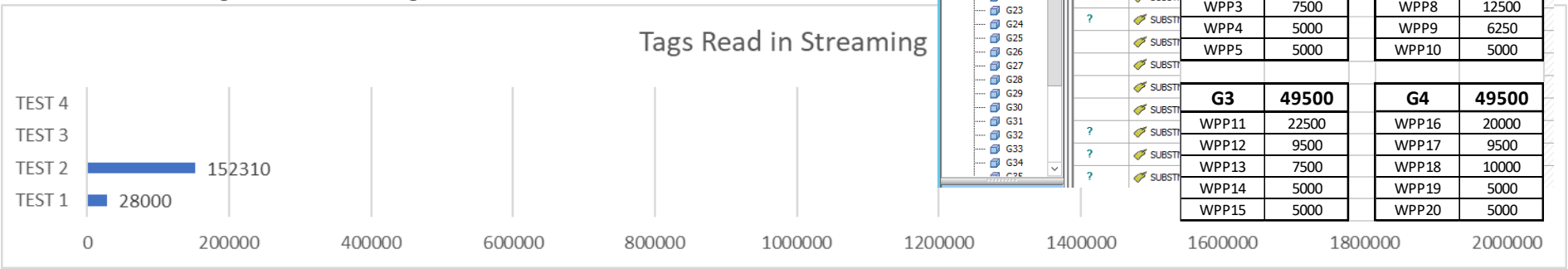
Default Configuration, New AF Model, Using 1 PIWEB API

- Default Configuration PIWEB API
- New Model by Groups of ~50.000 Tags each one (39) in Heterogeneous distribution
- Run with 3 Elements without constrictions
- Total Tags Streaming: ~150.000



G1	52500	G2	51250
WPP1	25000	WPP6	20000
WPP2	10000	WPP7	7500
WPP3	7500	WPP8	12500
WPP4	5000	WPP9	6250
WPP5	5000	WPP10	5000

G3	49500	G4	49500
WPP11	22500	WPP16	20000
WPP12	9500	WPP17	9500
WPP13	7500	WPP18	10000
WPP14	5000	WPP19	5000
WPP15	5000	WPP20	5000



Third Test

Only With OSIsoft Recomendations!

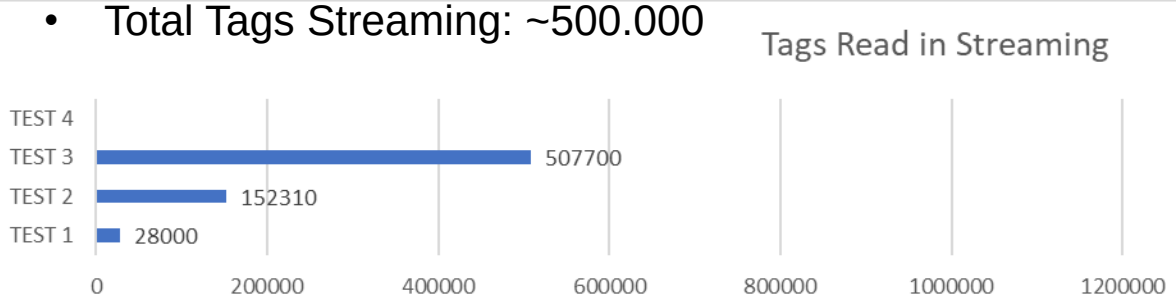
New Configuration, New AF Model, Using 1 PIWEB API

- New Configuration PIWEB API
- (Probably requires New Conf in PI Archive)

- New Model by Groups of ~50.000 Tags each one (39) in Heterogeneous distribution

- Run with 10 Elements without constrictions

- Total Tags Streaming: ~500.000

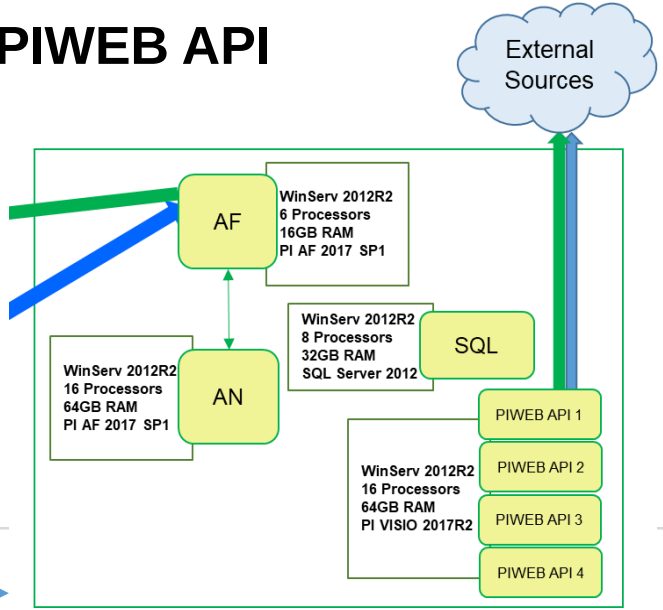


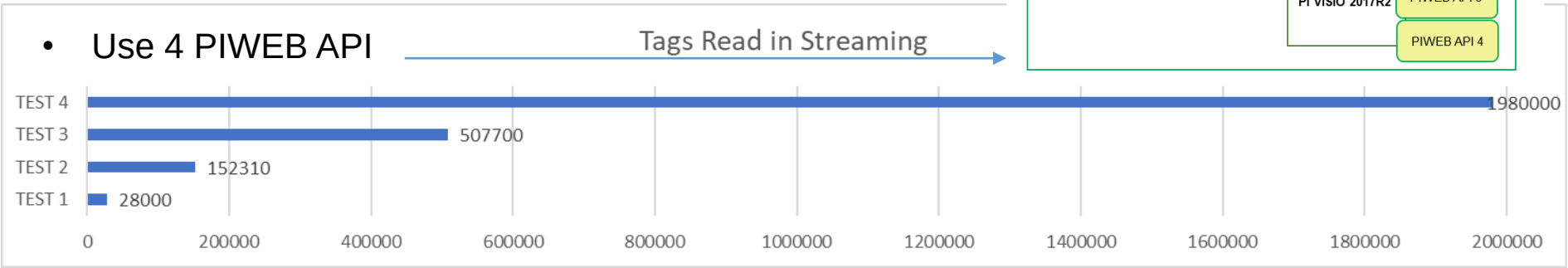
Name	Value
AFCacheMaxObjects	40000
AFCacheTime	600
AuthenticationMethods	String Array
CorsExposedHeaders	Allow,Content-Encoding,Co...
CorsHeaders	content-type,requestverific...
CorsMethods	GET,OPTIONS,POST
CorsOrigins	https://edpropmspocweb1,h...
CorsSupportsCredentials	True
DisableWrites	False
EnableCSRFDefense	True
MaxAccepts	40000
MaxRequestQueueLength	40000
MaxReturnedItemsPerCall	20000000
QueryCountMax	10000
RateLimitMaxRequests	40000
SearchBoosts	Single Array
SearchPointAttributes	String Array
SearchScanInterval	180
WebIDType	Full
XFrameOptions	SAMEORIGIN

Fourth Test

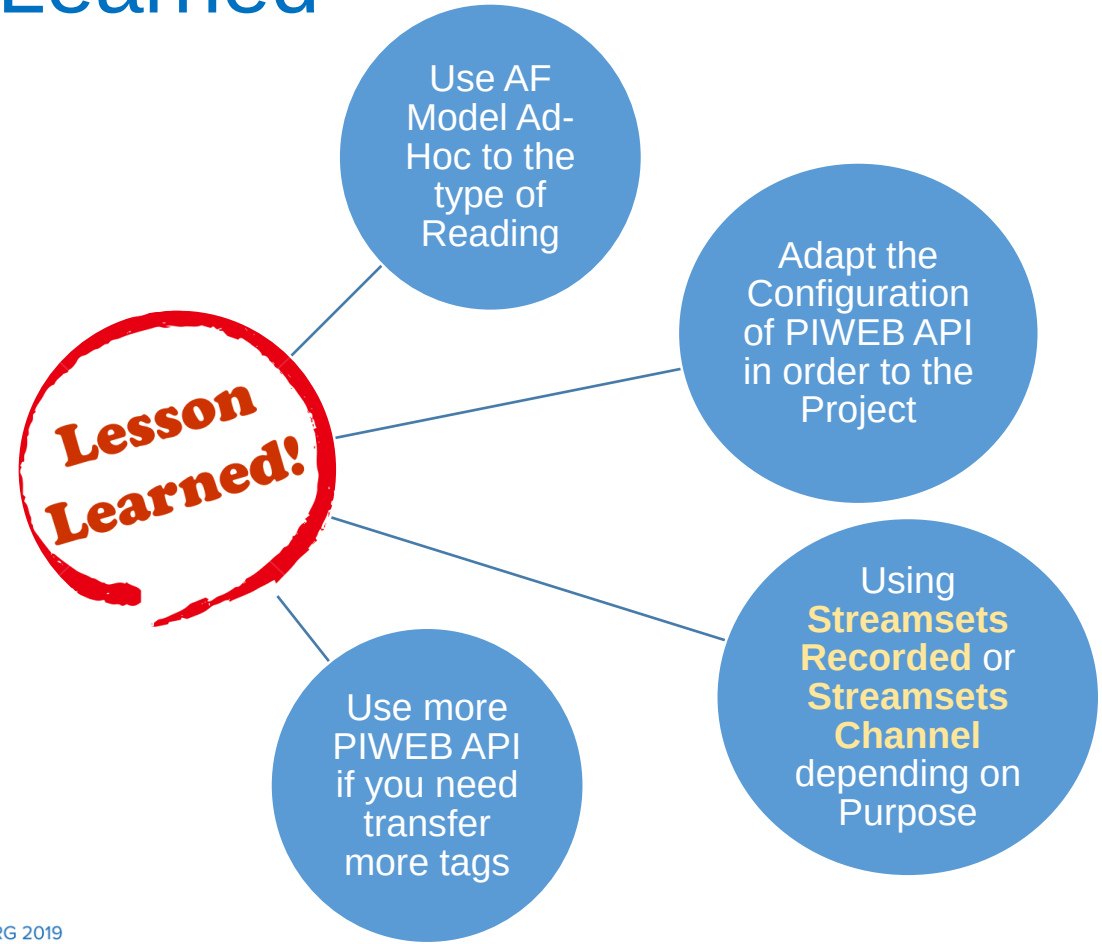
New Configuration, New AF Model, Using 4 PIWEB API

- New Configuration PIWEB API
- New Model by Groups of ~50.000 Tags each one (39) in Heterogeneous distribution
- Run with 39 Elements without constrictions
- Total Tags Streaming: ~2.000.000
- Use 4 PIWEB API





Lesson Learned



DEMO

View Streaming Updating of 39 Channels

Enterprise Agreement = Partnership

- A collaborative path towards customer success with OSIsoft products
- Extends across an entire portfolio of assets as opposed to a “buy as you go” plan
- The focus of the enterprise agreement is returning value to EDP
  - Customer Success Managers (CSMs)
  - Technical Advisors
  - Workshops (AF, Architecture, etc.) and training plan
    - Analysis Configuration Engine
    - AF Analytics Recomendations
  - Field Service Activities
  - Asset Monitoring
  - Audit Plans

How to take advantage of the PI WEB API in your organization

CHALLENGES

Improve Key Processes of the Compay extracting 2M of Tags:

- Machine Learning Predictive Maintenance
- Advanced Historical Calculations & KPIs
- Performance of Wind Turbines
- Wind Turbine Life Extension

SOLUTION

Using PIWEB API with Streamsets – Channel and:

- Adapt AF Structure
- Change Configuration in PIWEB API
- Use Multiples PIWEB API

BENEFITS

- Include 100% of the Assets in our Key Processes
- Reduce between 97.0%-99.9% the excecution time of processes
- Increase the analytic tools to improve our processes

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- **EDP Renewables**

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