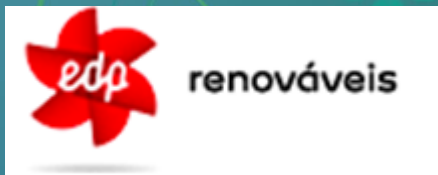




How to take advantage of the PI WEB API in your organization

Sergio Valencia



EDPR

 renováveis

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

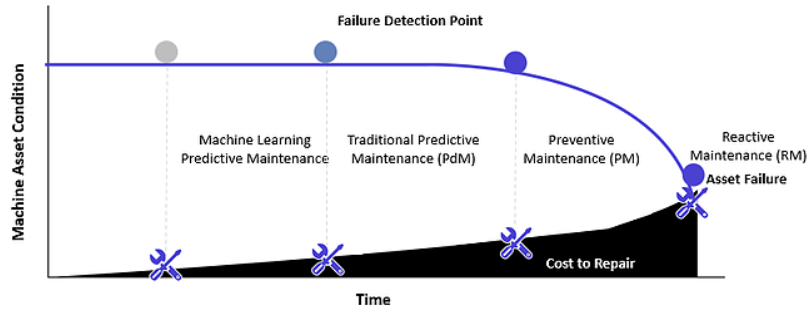


Assets to date: August 2019

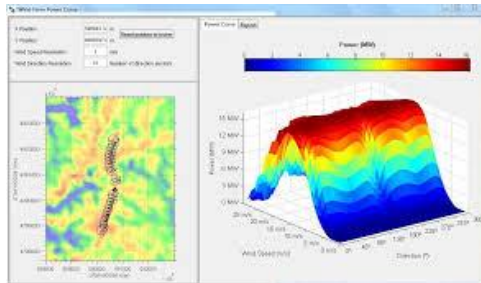


Business Needs

Machine Learning Predictive Maintenance



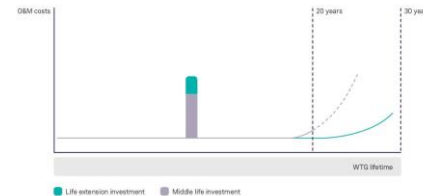
Performance of Wind Turbines



Advanced Historical Calculations & KPIs



Wind Turbine Life Extension



Challenge

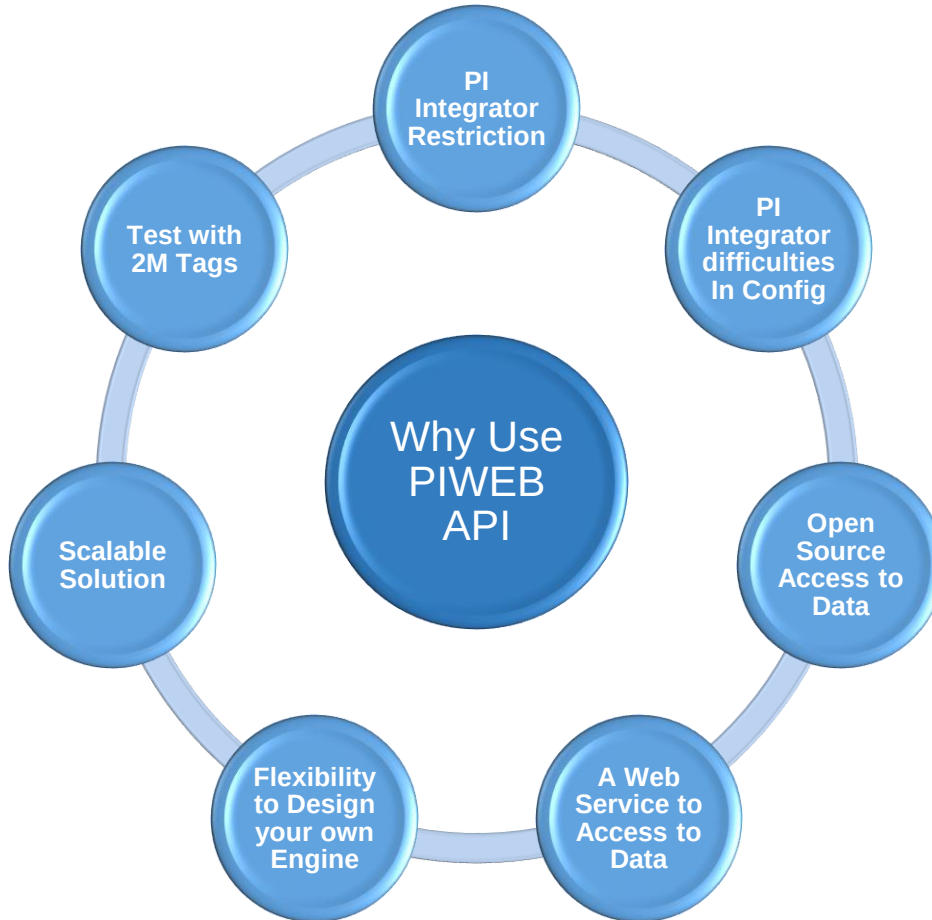


Scope: How to extract amount of historical Data and Streaming data using PIWEB API

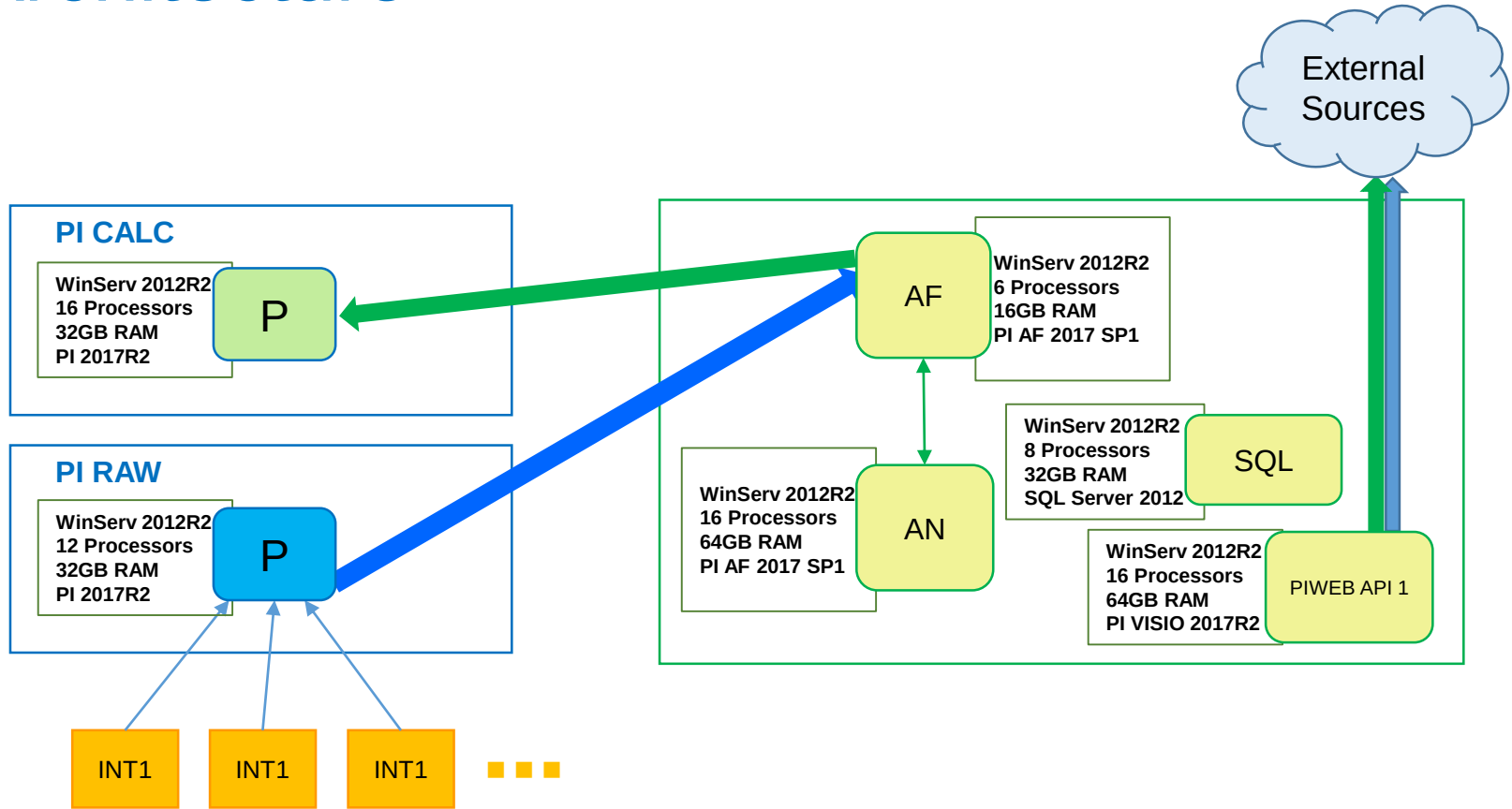
Requirements in Numbers



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

The screenshot displays the AF Configuration v1 software interface. On the left, a hierarchical tree structure shows the organization of elements. The tree is organized by Platform (EU), Country (BG, BR, FR, IT, PL, PT, RO, SP), and Node (Andalucia, MOSTAZA, JANDA1, JANDA2, TARIFA1, TARIFA2, Aragon, Asturias). Under the 'EU' platform, the 'Andalucia' node is expanded, showing a list of assets including WT01, WT02, WT03, WT04, WT05, WT06, WT07, WT08, and WT09. The 'WT01' asset is selected, and its details are shown in the main panel on the right. The main panel has tabs for 'General', 'Child Elements', 'Attributes', 'Ports', 'Analyses', 'Notification Rules', and 'Version'. The 'Attributes' tab is active, showing a table of attributes for the selected asset. The table has columns for 'Name', 'Value', and 'Time Stamp'. The attributes listed include WT_STOP_TRIGM, WT_STOP_VALUE, WT_STOP_VALUEB, WT_STOP_VALUEM, WTG, WTG_ACTIVEPOWER, WTG_AMBIENTTEMP, WTG_CAPACITYFACTOR, WTG_COSPHI, WTG_GENSPED, WTG_GRIDHZ, WTG_NACELLETEMP, WTG_OK, WTG_PITCHANG, WTG_REACTIVEPOWER, WTG_ROTORSPEED, WTG_TURBINESTATUS, and WTG_WINDDIR. The values and time stamps are displayed for each attribute.

Name	Value	Time Stamp
WT_STOP_TRIGM	0	9/4/2017 6:42:26 PM
WT_STOP_VALUE	0	8/29/2019 6:50:27 PM
WT_STOP_VALUEB	0	8/29/2019 6:50:27 PM
WT_STOP_VALUEM	0	8/29/2019 6:50:27 PM
WTG	WT01	1/1/1970 12:00:00 AM
WTG_ACTIVEPOWER	-5.5 kW	9/3/2019 12:37:45 PM
WTG_AMBIENTTEMP	29 °C	9/3/2019 12:53:15 PM
WTG_CAPACITYFACTOR	0 %	9/3/2019 12:37:45 PM
WTG_COSPHI	0.54 °	9/3/2019 12:37:45 PM
WTG_GENSPED	10 °	9/3/2019 12:37:45 PM
WTG_GRIDHZ	49.98 °	9/3/2019 12:37:45 PM
WTG_NACELLETEMP	34 °C	9/3/2019 12:53:15 PM
WTG_OK	Data was not available for attribute 'TimeRun': PI Data...	9/3/2019 10:08:42.626 PM
WTG_PITCHANG	91 °	9/3/2019 12:37:45 PM
WTG_REACTIVEPOWER	-8.8 °	9/3/2019 12:37:45 PM
WTG_ROTORSPEED	0.1 rpm	9/3/2019 12:37:45 PM
WTG_TURBINESTATUS	0	9/3/2019 12:37:36 PM
WTG_WINDDIR	I/O Timeout	12/20/2018 3:26:37 PM

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 attributes of an element continuously

`https://localhost/piwebapi/streamsets/{webid}/channel`



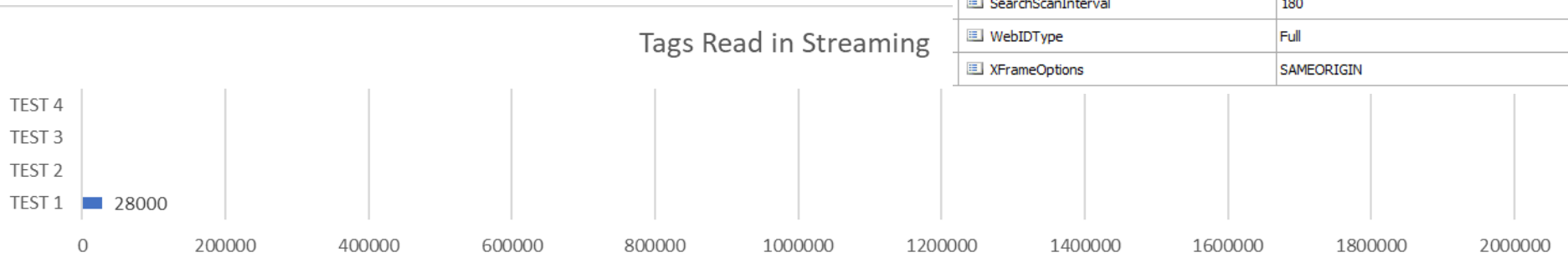
Return Continuously
incoming data of each
Attr of Element

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

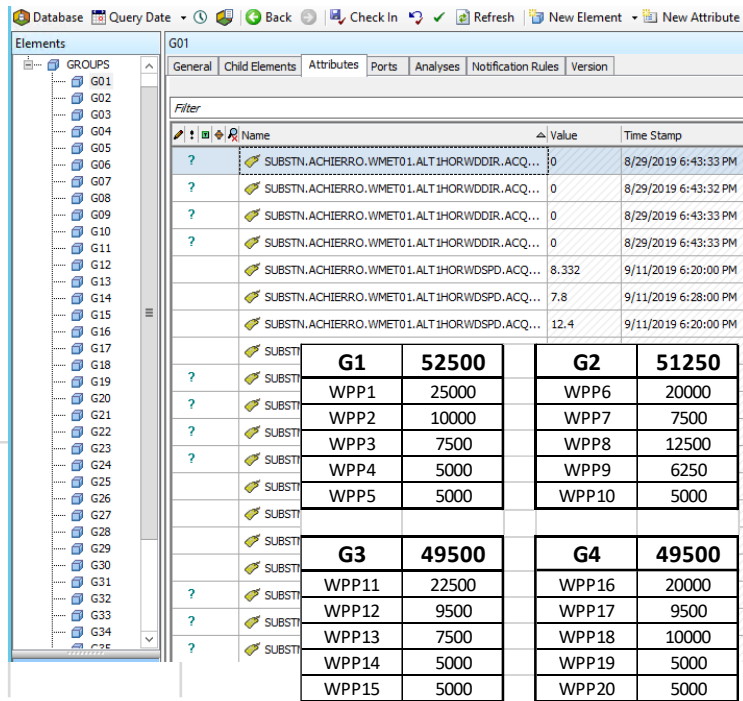
Name	Value
AuthenticationMethods	String Array
CorsExposedHeaders	Allow, Content-Encoding, Content-Length, Date, I
CorsHeaders	
CorsMethods	GET, OPTIONS
CorsOrigins	
CorsSupportsCredentials	False
DisableWrites	False
EnableCSRFDefense	True
SearchBoosts	Single Array
SearchPointAttributes	String Array
SearchScanInterval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



Second Test

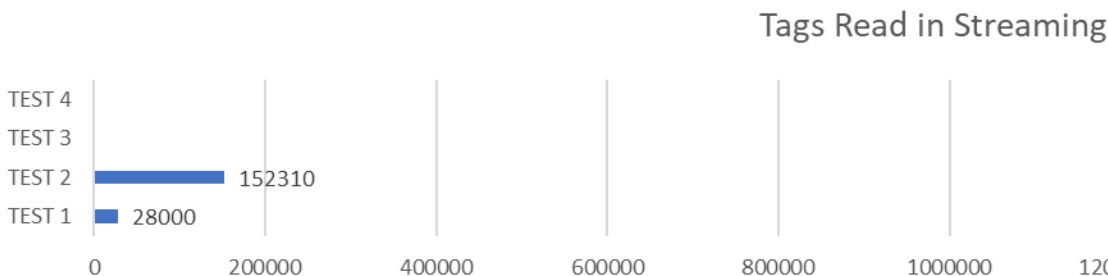
Default Configuration, New AF Model, Using 1 PIWEB API

- 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



The screenshot shows the PIWEB API interface. On the left, a tree view lists groups G01 through G39. On the right, a table displays tag counts for four groups: G1, G2, G3, and G4. Each group has a total count and a list of 10 specific tags with their counts.

Group	Total	WPP1	WPP2	WPP3	WPP4	WPP5	WPP6	WPP7	WPP8	WPP9	WPP10
G1	52500	25000	10000	7500	5000	5000					
G2	51250						20000	7500	12500	6250	5000
G3	49500	22500	9500	7500	5000	5000					
G4	49500						20000	9500	10000	5000	5000

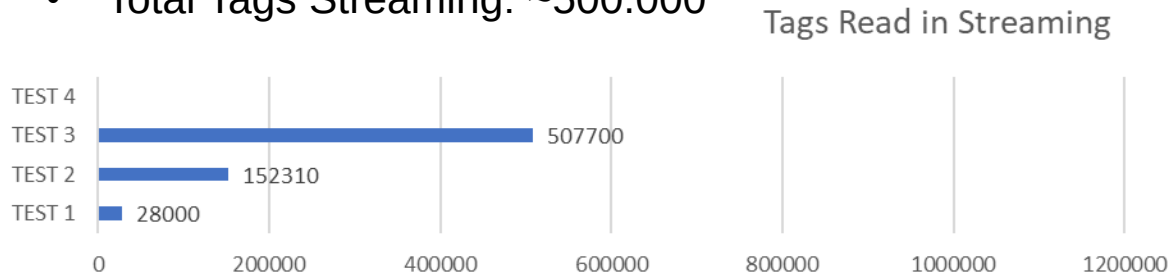


Third Test

New Configuration, New AF Model, Using 1 PIWEB API

Only With
OSIsoft
Recommendations!

- 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

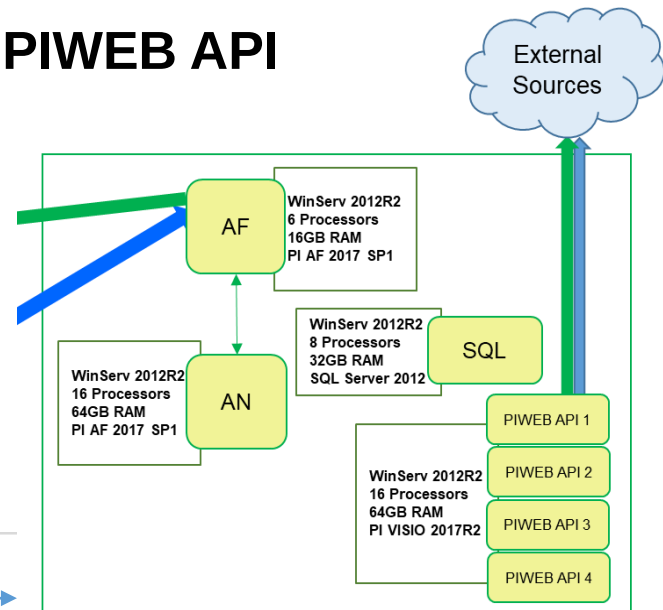


Name	Value
AFCacheMaxObjects	40000
AFCacheTime	600
AuthenticationMethods	String Array
CorsExposedHeaders	Allow,Content-Encoding,Co...
CorsHeaders	content-type,requestverific...
CorsMethods	GET,OPTIONS,POST
CorsOrigins	https://edproppmspocweb1,h...
CorsSupportsCredentials	True
DisableWrites	False
EnableCSRFDefense	True
MaxAccepts	40000
MaxRequestQueueLength	40000
MaxReturnedItemsPerCall	20000000
QueryCountMax	10000
RateLimitMaxRequests	40000
SearchBoosts	Single Array
SearchPointAttributes	String Array
SearchScanInterval	180
WebIDType	Full
XFrameOptions	SAMEORIGIN

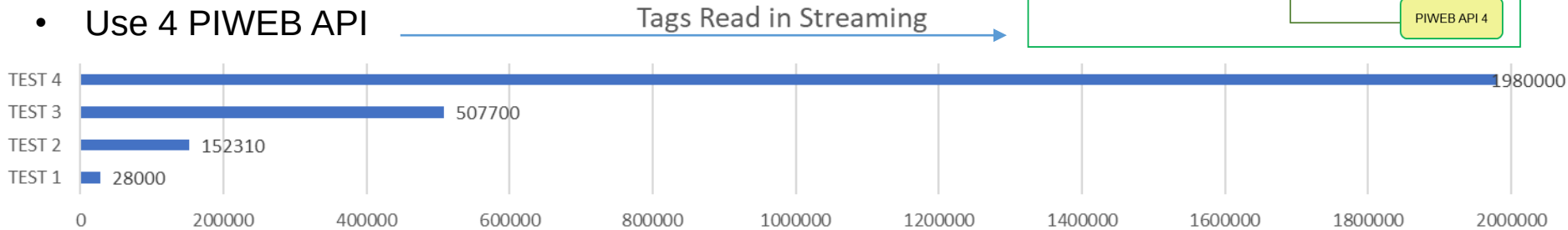
Fourth Test

New Configuration, New AF Model, Using 4 PIWEB API

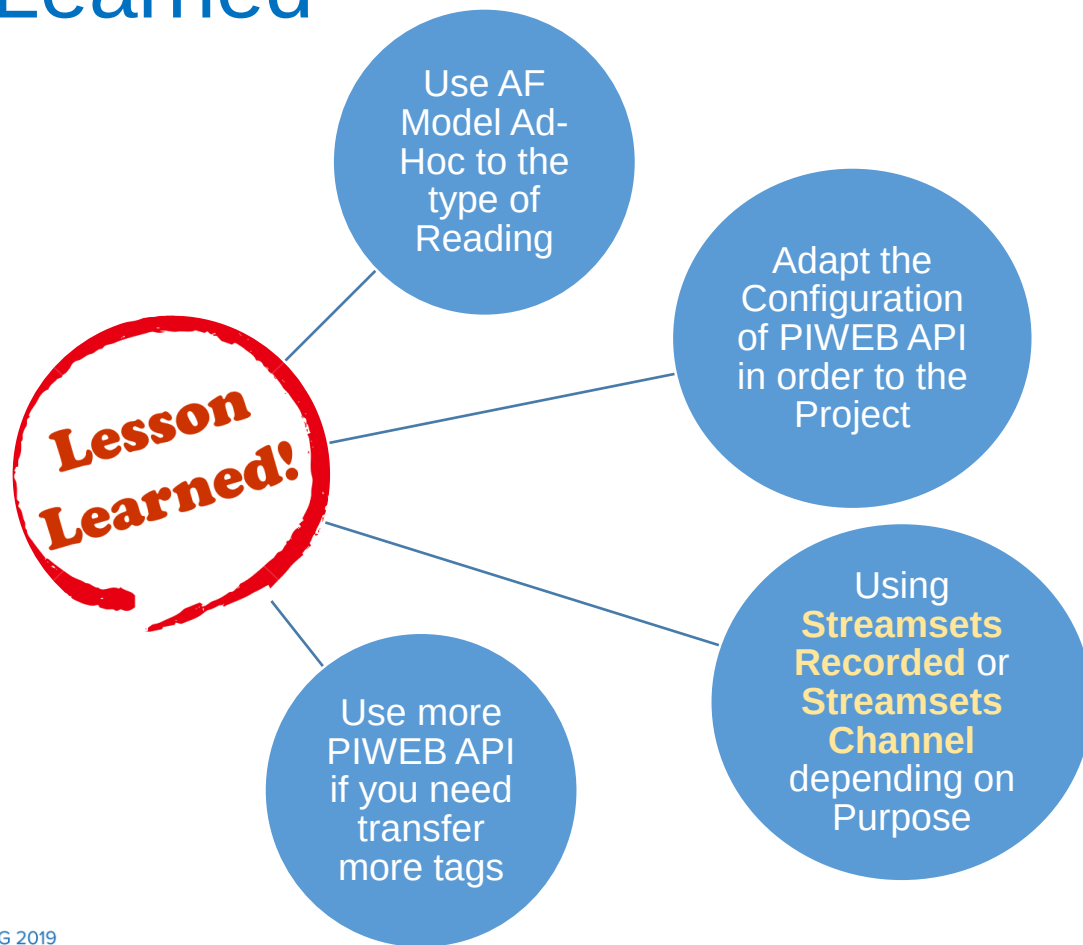
- New Configuration PIWEB API
- New Model by Groups of ~50.000 Tags each one (39) in Heterogeneous distribution
- Run with 39 Elements without constrictions
- Total Tags Streaming: ~2.000.000



- 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 Recommendations
 - Field Service Activities
 - Asset Monitoring
 - Audit Plans

CHALLENGES

Improve Key Processes of the Company 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 execution time of processes
- Increase the analytic tools to improve our processes



- **Sergio Valencia**
- svalencia@edpr.com
- ROPI Technical Services Manager
- **EDP Renewables**

Questions?

Please wait for
the **microphone**

State your
name & company



Please remember to...

Complete Survey!

Navigate to this session in
mobile agenda for survey

