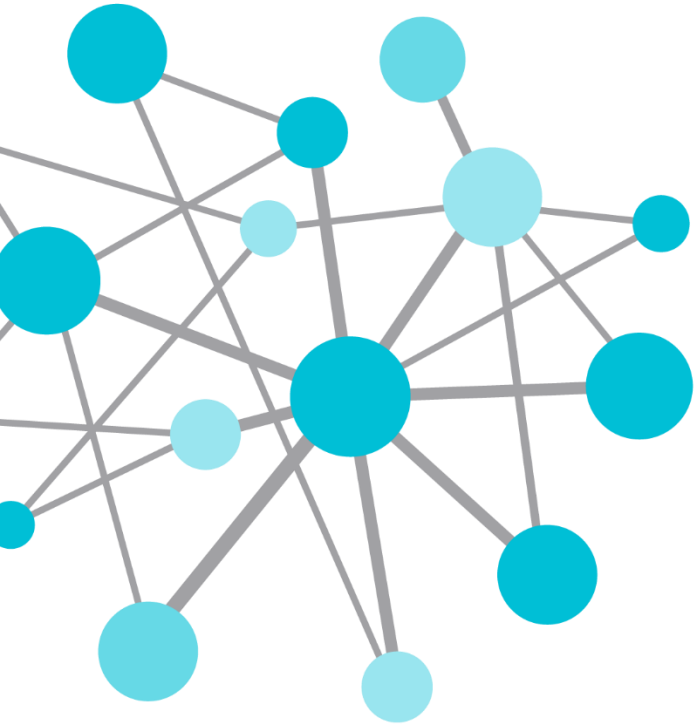
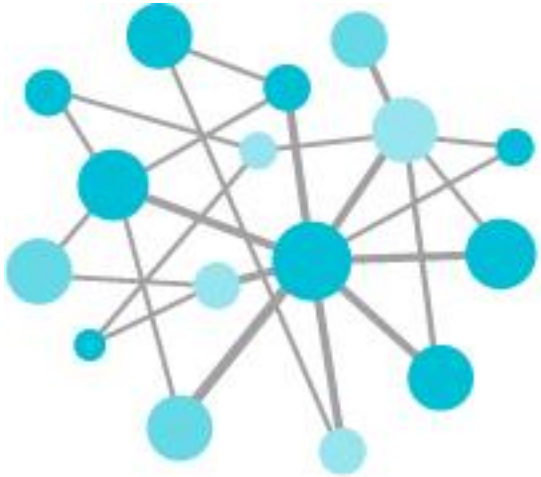


The PI System and Hadoop: Unleash the Power of Big Data

Presented by **Vito Ruggieri and Matt Ziegler**



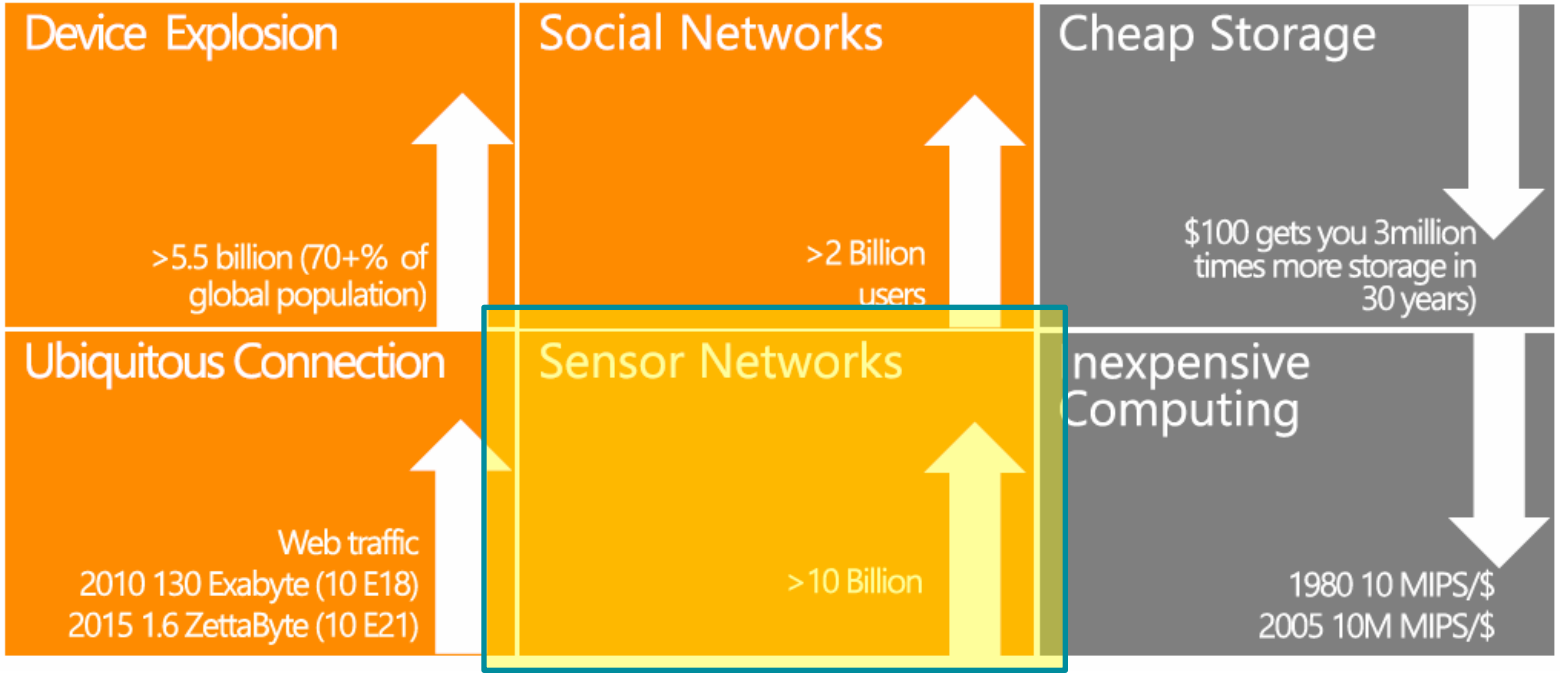
OSIsoft.

USERS CONFERENCE 2014

The Power of Data

DECISION READY IN REAL-TIME

Key Trends



Insight

Time Series

Relational

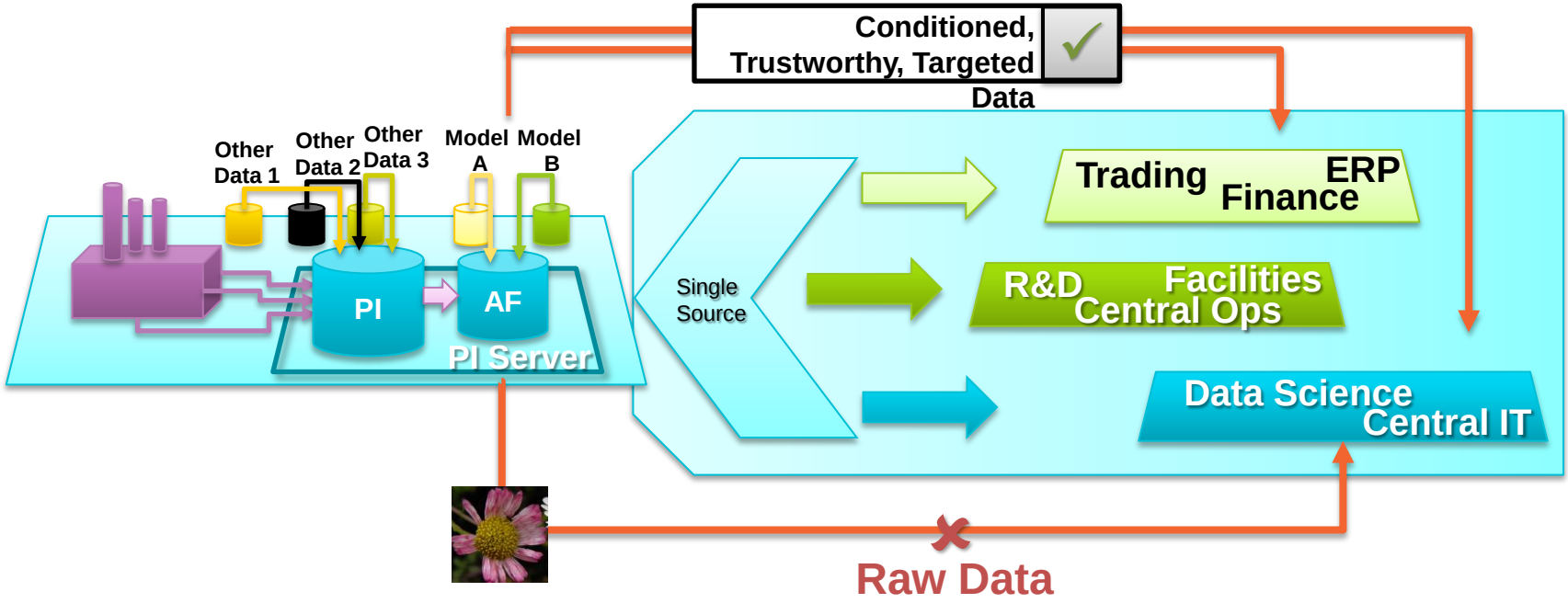
Unstructured

Real-time Data isn’t perfect

The Truth about Real-time Data

- Naturally incomplete
- Doesn’t look like SQL (unevenly spaced, no transactions)
- Subject to errors in measurement
- Varies in fidelity

Decision-Ready Data



Big Data and the PI System

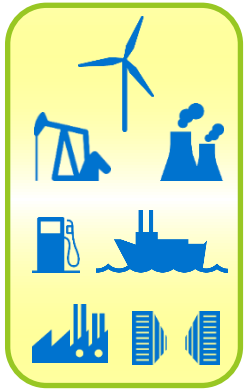
From an OSIsoft perspective Big Data is three separate categories of things:

Bring calculations to the data

Systems of engagement vs systems of record

Identify the conversation

PI Infrastructure for Visual Analytics



Connect via Internet or PI Interface

DATA

Visual Analytics – BI Tools

Excel Power BI

Spotfire

Tableau

Qlikview

In Memory DB

Business User

Aggregate / Augment

Transmit

Cleanse

Shape

Data CAST

DATA

PI Data Archive

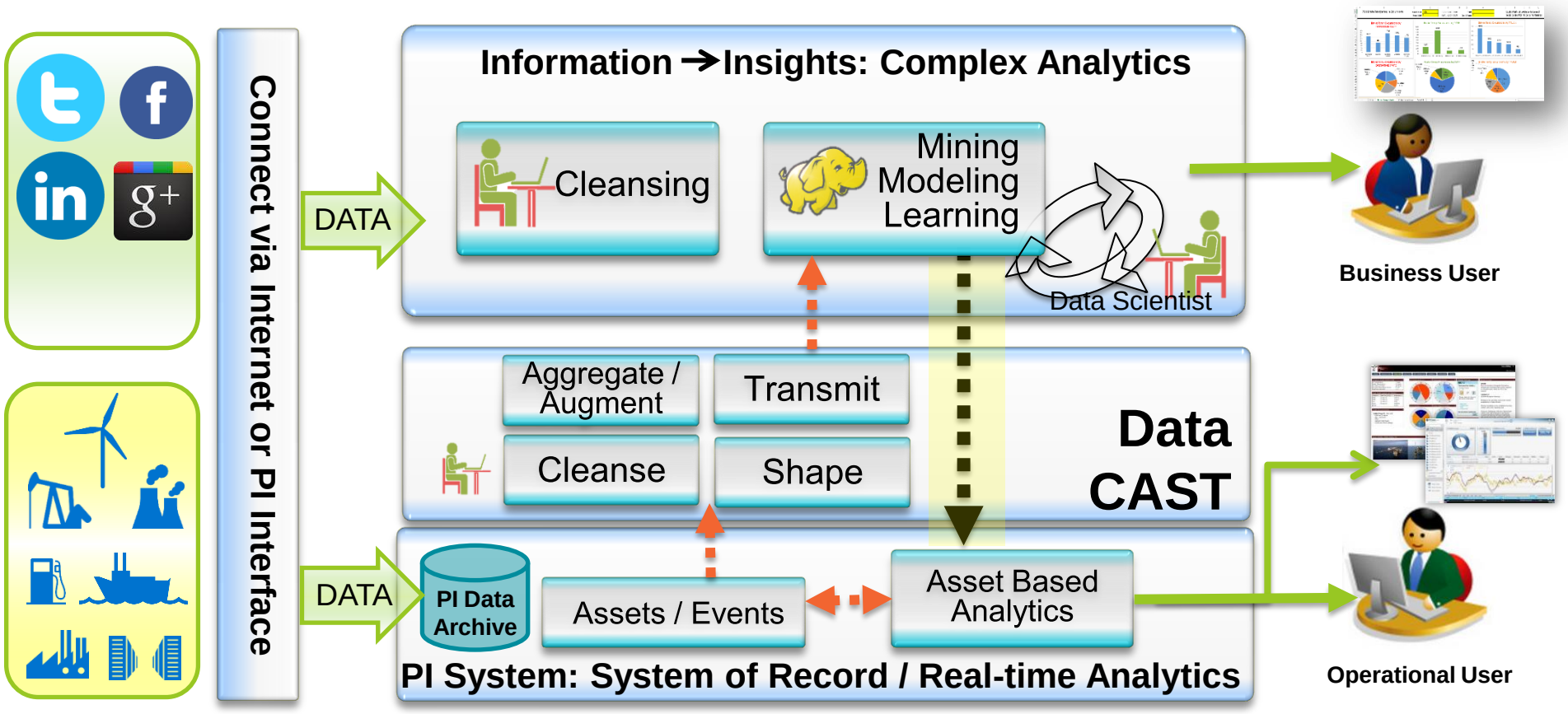
Assets / Events

Asset Based Analytics

PI System: System of Record / Real-time Analytics

Operational User

PI Infrastructure for Statistical Analytics



What is OSIsoft project ‘Data CAST’

- New set of Big Data oriented functionality in the PI System
- Goal: allow Operations SME to create trusted, conditioned, decision ready **data publications**.
- Publications can be used in a variety of Business Intelligence, Machine Learning, and Big Data Analytic tools over the Enterprise.

Opportunity to better leverage on PI Infrastructure

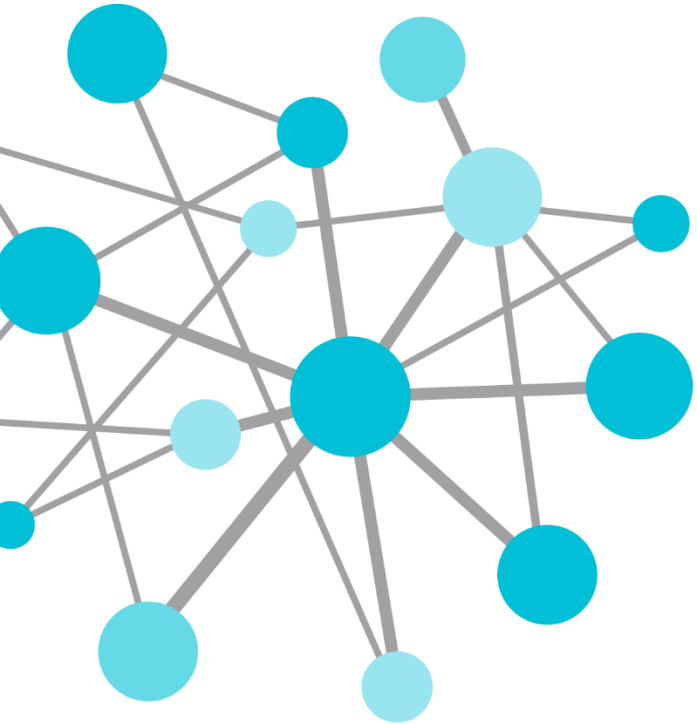
- **Open PI System data** to a new category of users over the enterprise
- Accomplish the need for **extended data analytics**
- **Pushing** data out of PI System, Pulling is not enough
- Need for curated, **decision ready** time series data
- The best Data Scientists are already in the business
- The analytic tool market will continue to evolve rapidly
- Some customers prefer Cloud Services, some prefer On-Premise (Box) product

CAST Features

- Fully leveraging PI AF/EF on any PI AF Model, any style
- Curated, Trusted Data Publication
- Published Data is complete and relevant
- Support Small and Large Publications
- Evergreen Publications
- Enable Collaboration
- Feedback into the PI System

SME directly defines Publications

- Define what data goes into a publication
- Shape the data into appropriate columns
- Decide on what timeframes used for extraction
- Define rules for cleansing, augmenting, and aggregating data
- Specify how and where the data is published
- Execute and Monitor the Publication Process



USE CASES

Enabling the Smart Grid

Conservation Voltage Regulation (CVR)

ANSI C-84.1 → 114 – 226V

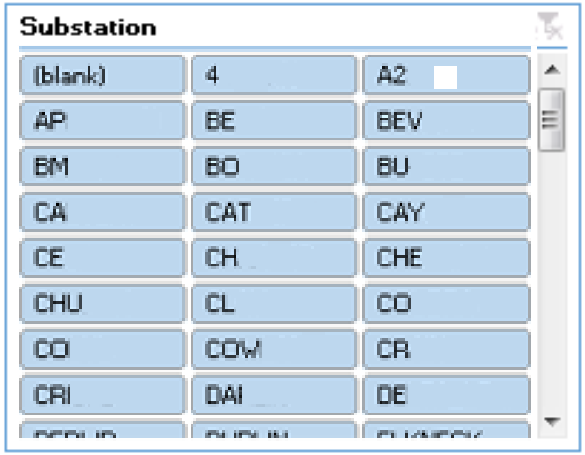
- Utilities operate at the high end of range
- Potential 3% continuous energy savings
- 6,500 MW*Years (56.9 MM MW*hrs)

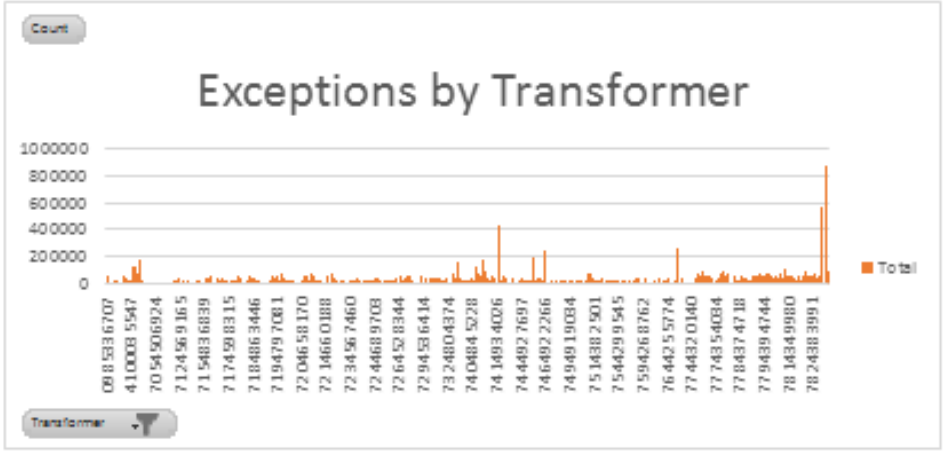
Violation defined as 5 consecutive reads under 115V

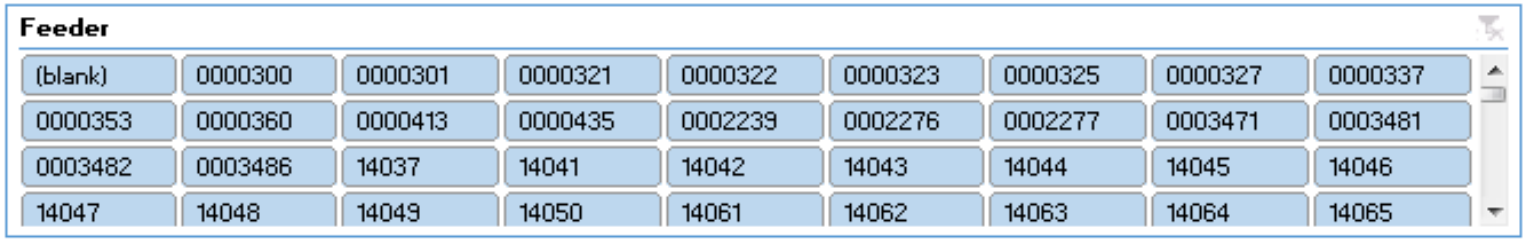
Grand Coulee Dam: #1 US Producer

Direct Visual Analytics

Transformer	Count
0985336707	52279
3945435251	8308
3945935235	4217
3946635311	12848
3946835212	4217
3947235159	17414
3958335267	4381
4020234162	4386
4020334115	2919
4024534242	10006
4025234237	10264
4025734267	12153
4026135386	1388
4028735584	12278
4031635525	8628
4031735581	13155
4035235461	4385
4036034309	18250
4036135113	4265
4036835416	12953
4039235252	4282
4039335116	4385
4040435355	12229







Energy Optimization

Carnegie Mellon University

Target 30% Energy reduction

University, public, and private assets

Visibility with Microsoft PowerBI

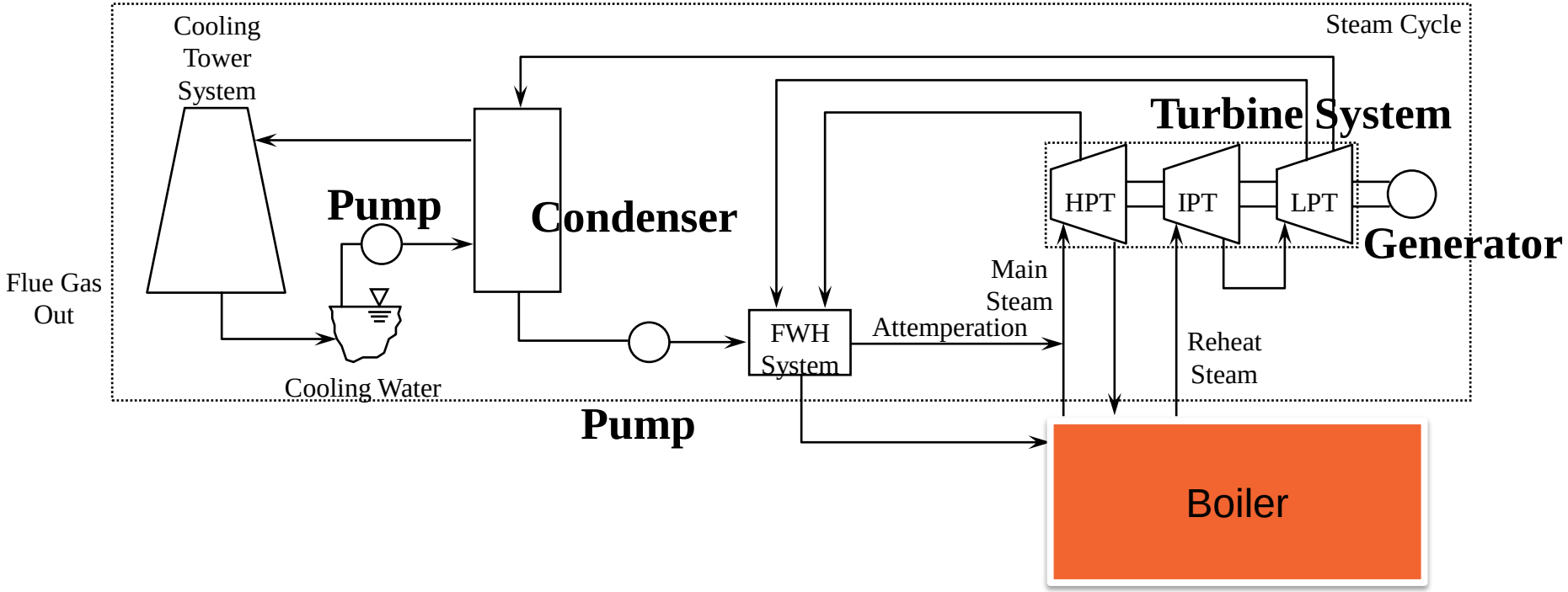
Modeling and optimization with Azure ML

Steam Cycle Statistical Analytics

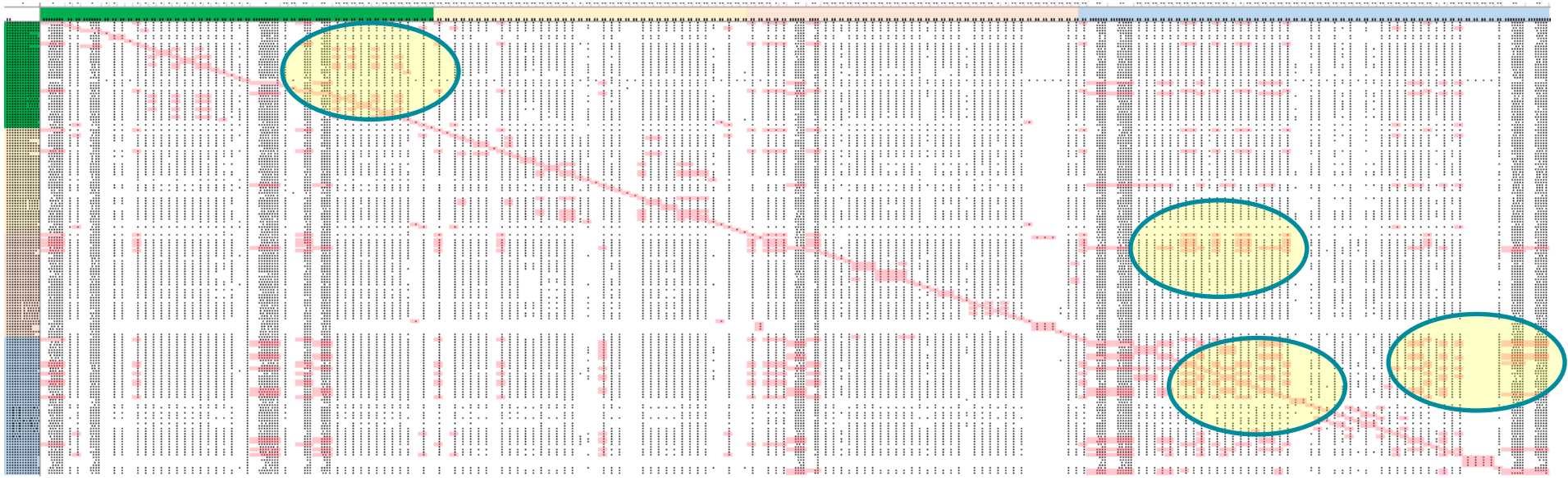
```
File dependencies to include with job:
[Auto-detected] MapReduce.exe
[Auto-detected] Microsoft.HadoopMapReduce.dll
[Auto-detected] Microsoft.Hadoop.WebClient.dll
14/03/20 22:11:27 INFO streaming.StreamJob: C:\
/bin/hadoop job  -Dmapred.job.tracker=jobtracke
_0038
14/03/20 22:11:27 INFO streaming.StreamJob: Tra
030/jobdetails.jsp?jobid=job_201403100641_0038
14/03/20 22:11:28 map 0%  reduce 0%
14/03/20 22:12:10 map 10%  reduce 0%
14/03/20 22:13:59 map 50%  reduce 0%
14/03/20 22:15:47 map 90%  reduce 0%
14/03/20 22:16:11 map 99%  reduce 0%
14/03/20 22:16:17 map 100%  reduce 0%
14/03/20 22:17:48 map 100%  reduce 17%
14/03/20 22:17:54 map 100%  reduce 33%
14/03/20 22:17:57 map 100%  reduce 67%
14/03/20 22:21:01 map 100%  reduce 90%
14/03/20 22:22:25 map 100%  reduce 100%
14/03/20 22:22:33 Job complete: job_2014031006
14/03/20 22:22:33 Output: asv://energy@blobtes

Job Completed [0] in 701.993 sec.
Reading Results...
Reading Results...Done.
Calculating.......
Calculating.......Done
```

Typical Steam Cycle plant



Cluster Analysis



Conclusions

R2	GEN GROSS WATTS PRIMARY	N
GEN NET VARS	0.280356162	
GEN MAX STAT AMPS VECTORMETER	0.284610808	
MTG GEN BUS AIR	0.74887239	
MTG H2 GAS TMP LVG COOLERS	0.737921258	
GEN GROSS WATTS PRIMARY	1	
MTG MAIN STEAM PRESS	0.905606472	
MAIN STM ENT'G TURBINE-SOU	0.905188527	
MN STM ENT MTG AHEAD OF 'Y	0.797062644	
MN STM ENT MTG AHEAD OF 'Y	0.797568377	
THROTTLE STEAM TEMP	0.794375313	
MTG MAIN STEAM CHEST PRESSURE	0.90162384	
MTG MAIN STEAM PRESS	0.905607292	
CALCULATED FIRST STAGE STM TEMP	0.696087978	
MTG 1ST STAGE PRESSURE	0.994995909	
MTG 1ST STAGE PRESSURE N	0.998423531	
CRH ENTERING ATTEMP TEMP -	0.899808207	
CRH STEAM TEMP	0.537046771	
CRH LEAVING TURBINE PRESS-	0.998216351	
HRH ENTERING TURB TEMP - N	0.8491605	

- Need Higher Fidelity Data
- Change my model
- Add more data
- Add facets (time of day, temperature, coal quality)

High Pressure Steam does more Work

DEMO

What we've learned today

- PI Server is your trustable System of Records
- PI Server makes the connection between the OT and Business/Visual Analytics Big Data world enabling you to get value out the Systems of Engagements

PI Server is always close to you - ready to face with your fast growing needs!

Call to Action

- Come visit the BI booth for demo and hands-on.
- Stayed tuned for more details in the closing keynote
- Register for broader Customer Technology Preview (CTP) at cast@osisoft.com

Vito Ruggieri

vruggieri@osisoft.com

Enterprise Program Manager

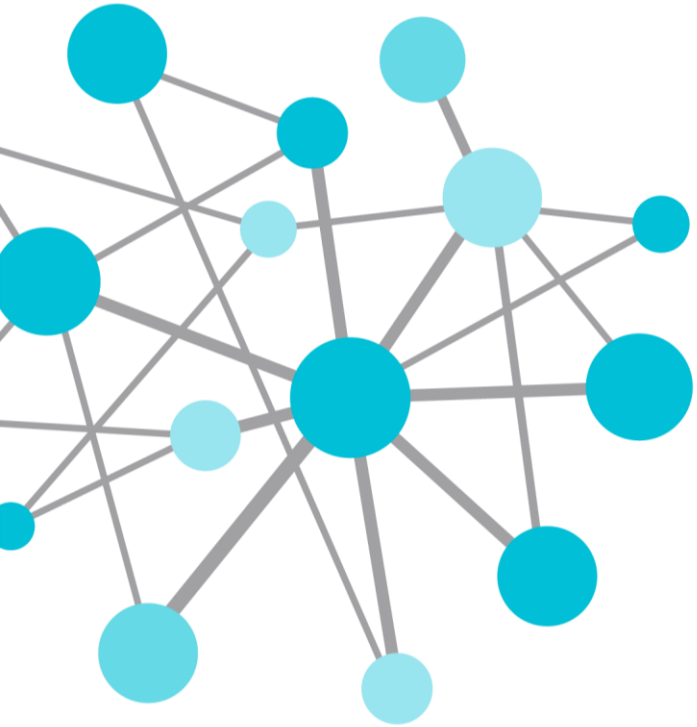
OSIsoft Italy, srl

Matt Ziegler

mziegler@osisoft.com

Product Manager

OSIsoft, LLC



THANK YOU

Brought to you by OSIsoft.

Please don’t forget to…

Complete the online survey for this session

eventmobi.com/emeauc14

Share with your friends

#UC2014