Big Data Analytics with the PI System

Presented by **Stephane Rioux, Partner Enablement Manager**

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" high **volume**, **velocity**, and/or **variety** information assets that demand cost-effective, innovative forms of information processing that enable insight, decision making, and process automation "

---Gartner

The Benefits of Big Data

6% more profitable

83% improved process cycle times

49% had payback in one year or less

54% report ROIs >100%

27% year-over-year increase in revenue

12% less operating expense

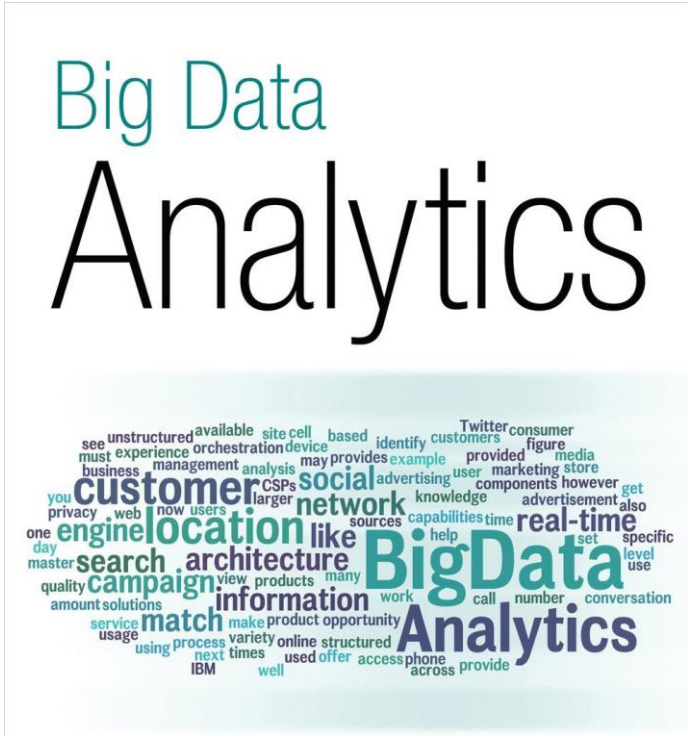
5% more productive

Sources: Harvard Business Review, Forbes, IDB

The Big Data Landscape

From: http://www.bigdatalandscape.com/

Big Data Analytics



- Analytics is required to transform information into intelligence
- More than storage
  - Visual Analytics
  - Machine learning
  - Complex event processing

Is production related to drilling conditions ?

When did the geology change?

How fast the well was being drilled?

What angle was the drill bit?

Sudden changes in production?

Big data analytics and the PI System

Statistical Analytics

Analytical Insight

Visual Analytics

Time Series

Relational

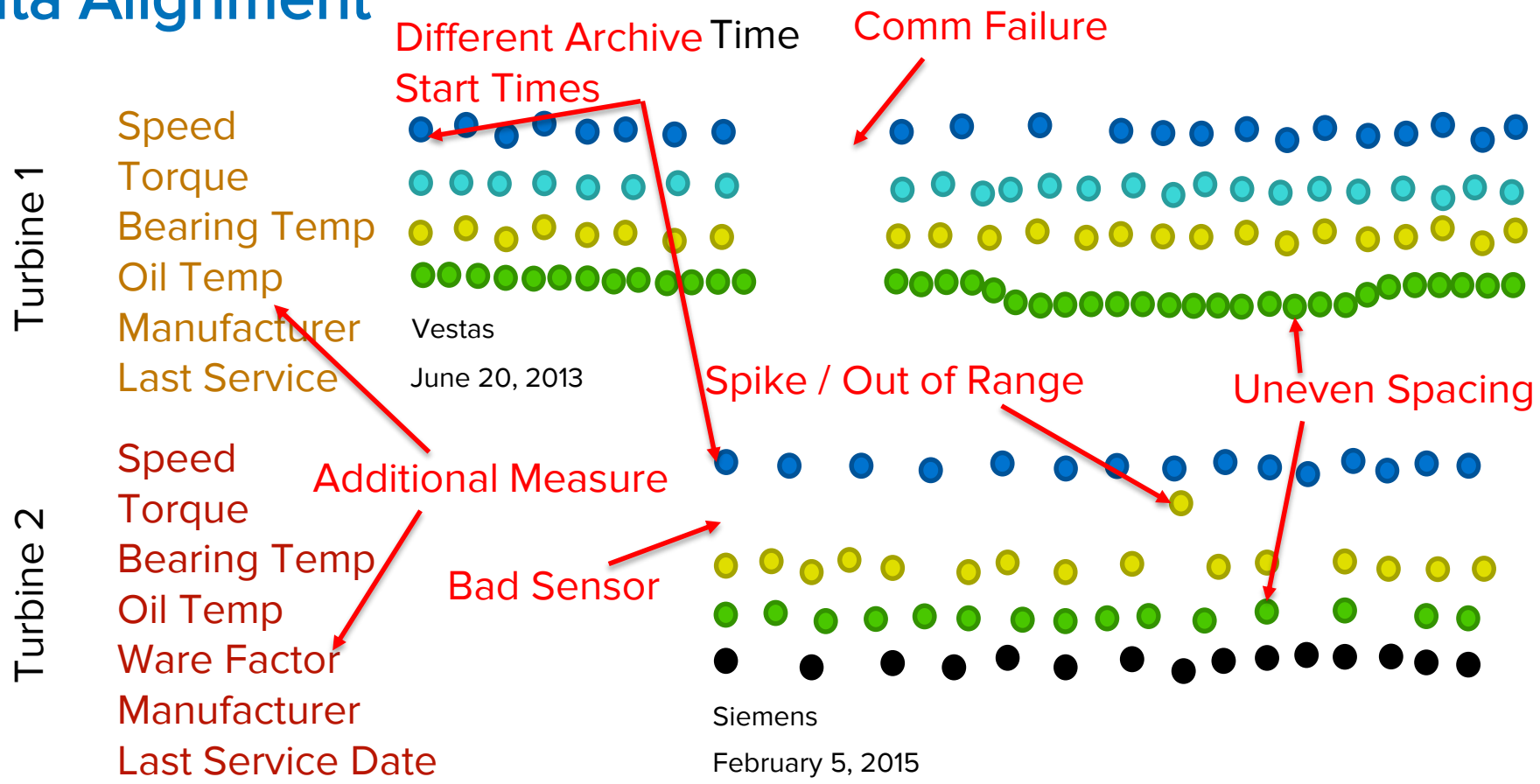
Unstructured

GIS

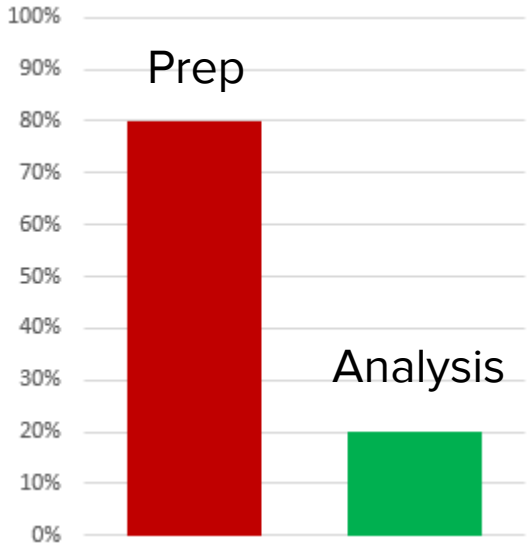
Real-time time series data isn’t perfect

- Naturally incomplete
  - data delays
- Doesn’t look like SQL
  - Asset Context
- Not evenly spaced
  - time is framed by events
- Subject to errors in measurement

Data Alignment



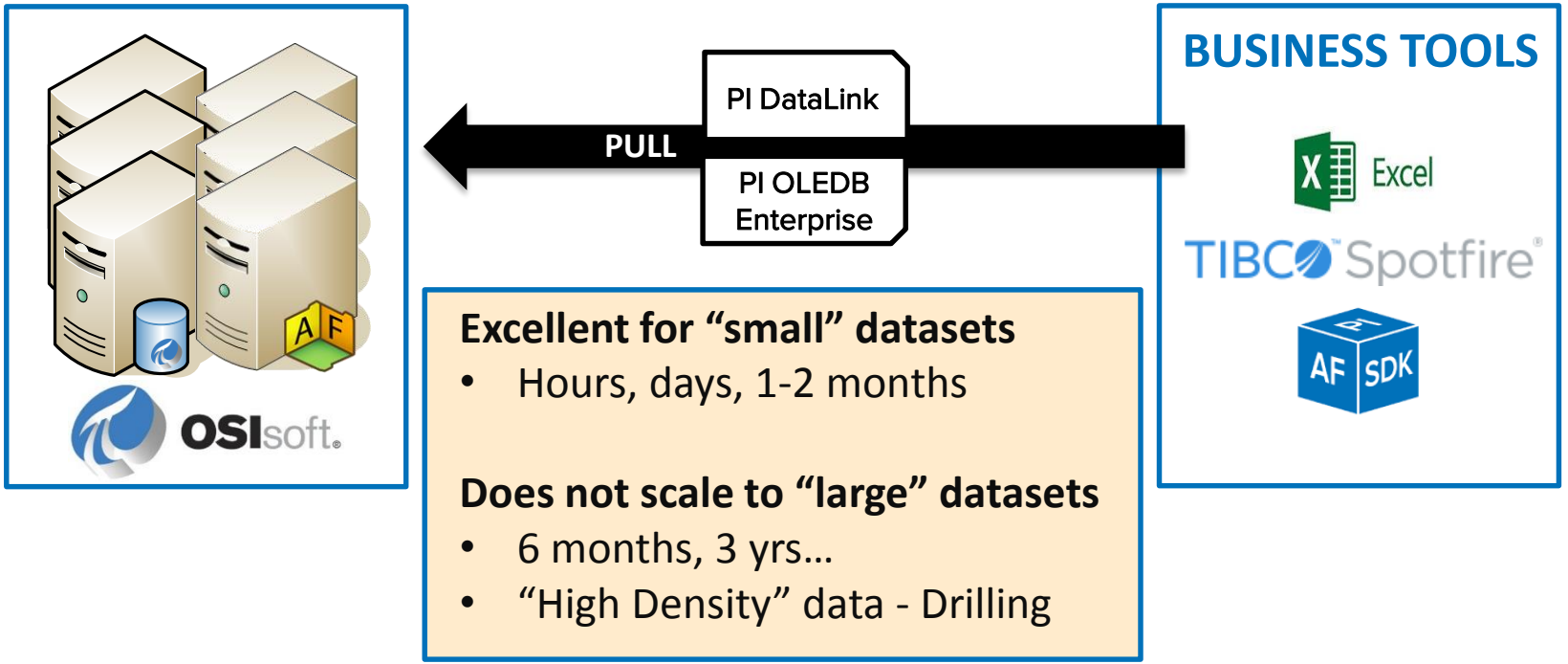
Data Wrangling



Data cleansing and preparation tasks can take 50-80% of the development time and cost

https://hbr.org/2014/04/the-sexiest-job-of-the-21st-century-is-tedious-and-that-needs-to-change/

Traditional Data Delivery



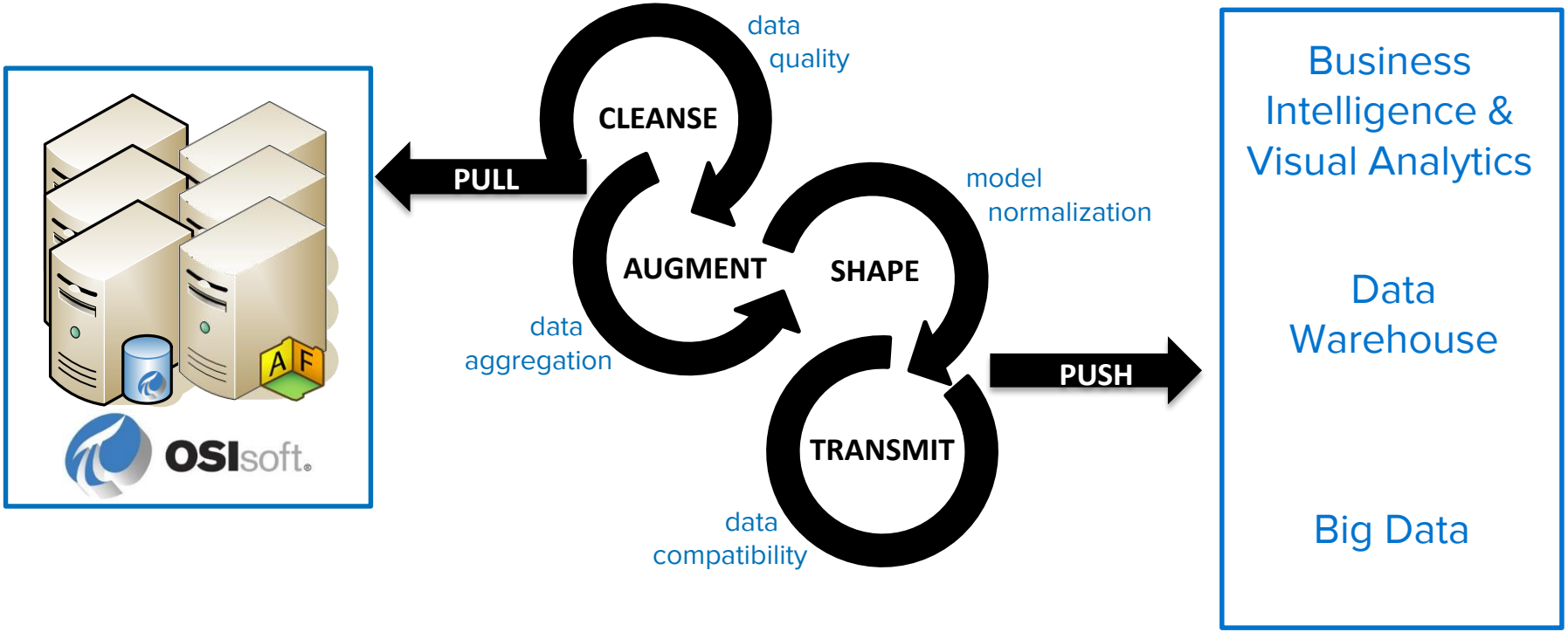
Excellent for "small" datasets

- Hours, days, 1-2 months

Does not scale to "large" datasets

- 6 months, 3 yrs…
- "High Density" data - Drilling

PI Integrator for Business Analytics

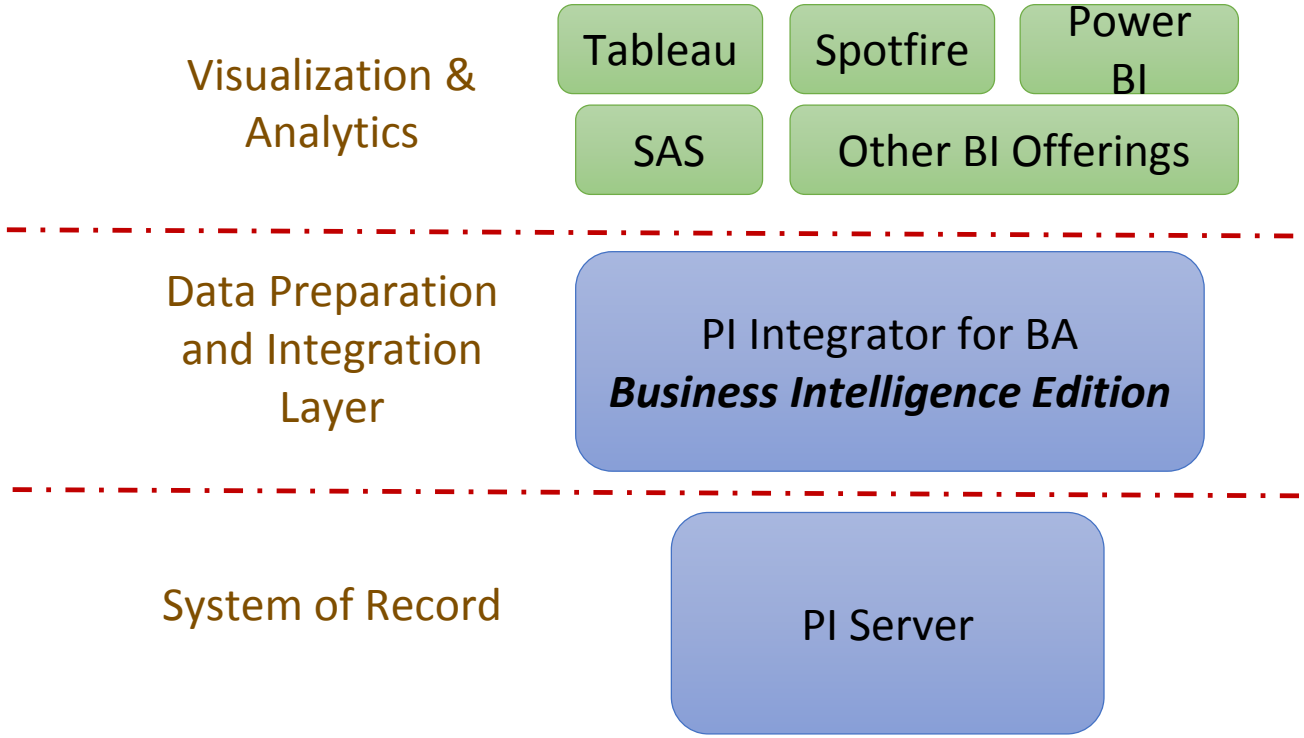


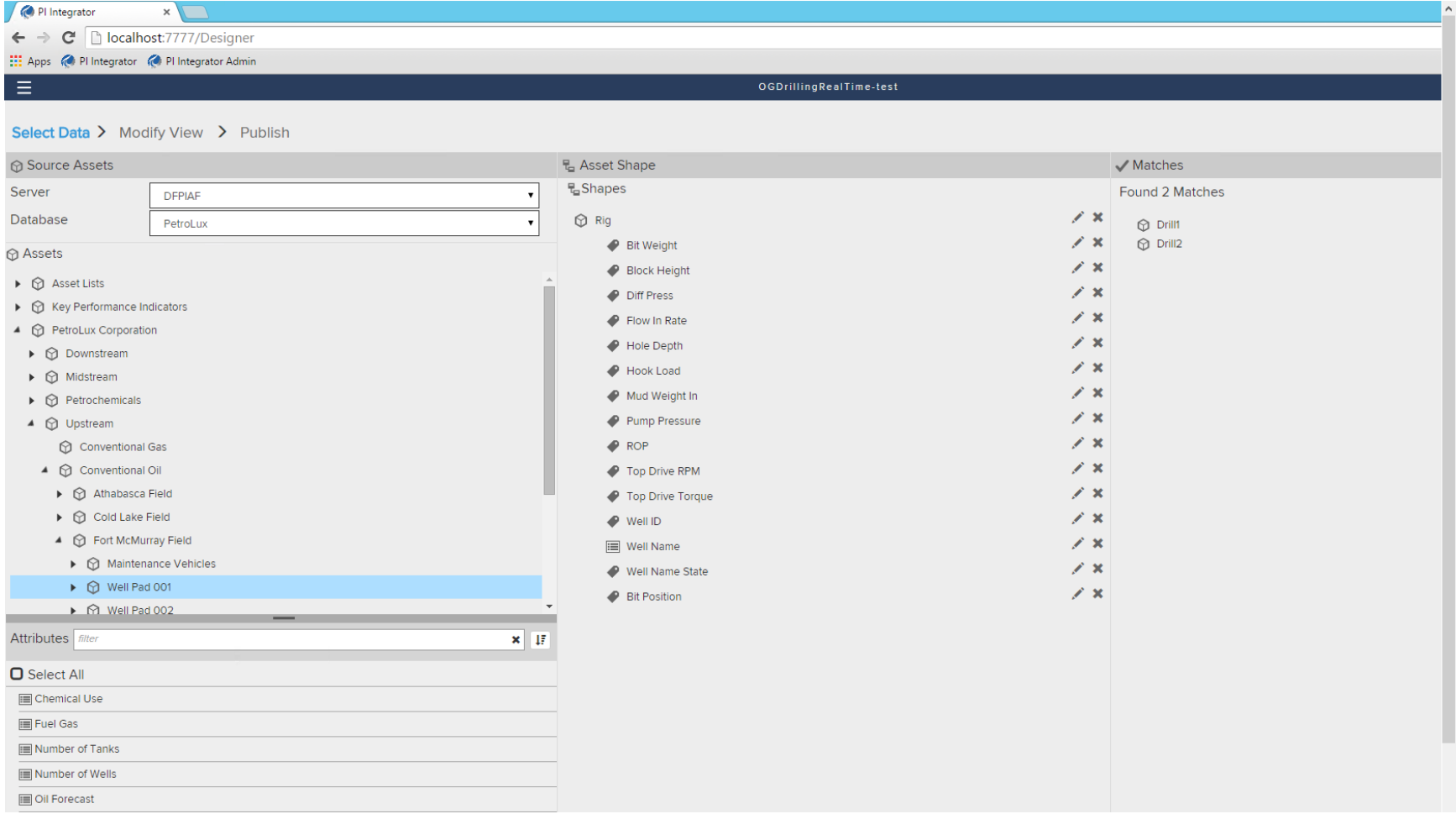
Video placeholder (see video replay).

PI Integrator for Business Analytics: BI edition

- Create PI Views
- Access decision ready data via ODBC
- Best solutions to provide access to analytics tools
  - Tibco Spotfire, Tableau, Microsoft Power BI
  - SAS, Cognos, Oracle
  - Most Dashboarding tools

Business Intelligence & Visual Analytics





Select Data > Modify View > Publish

Add Column
20 Columns

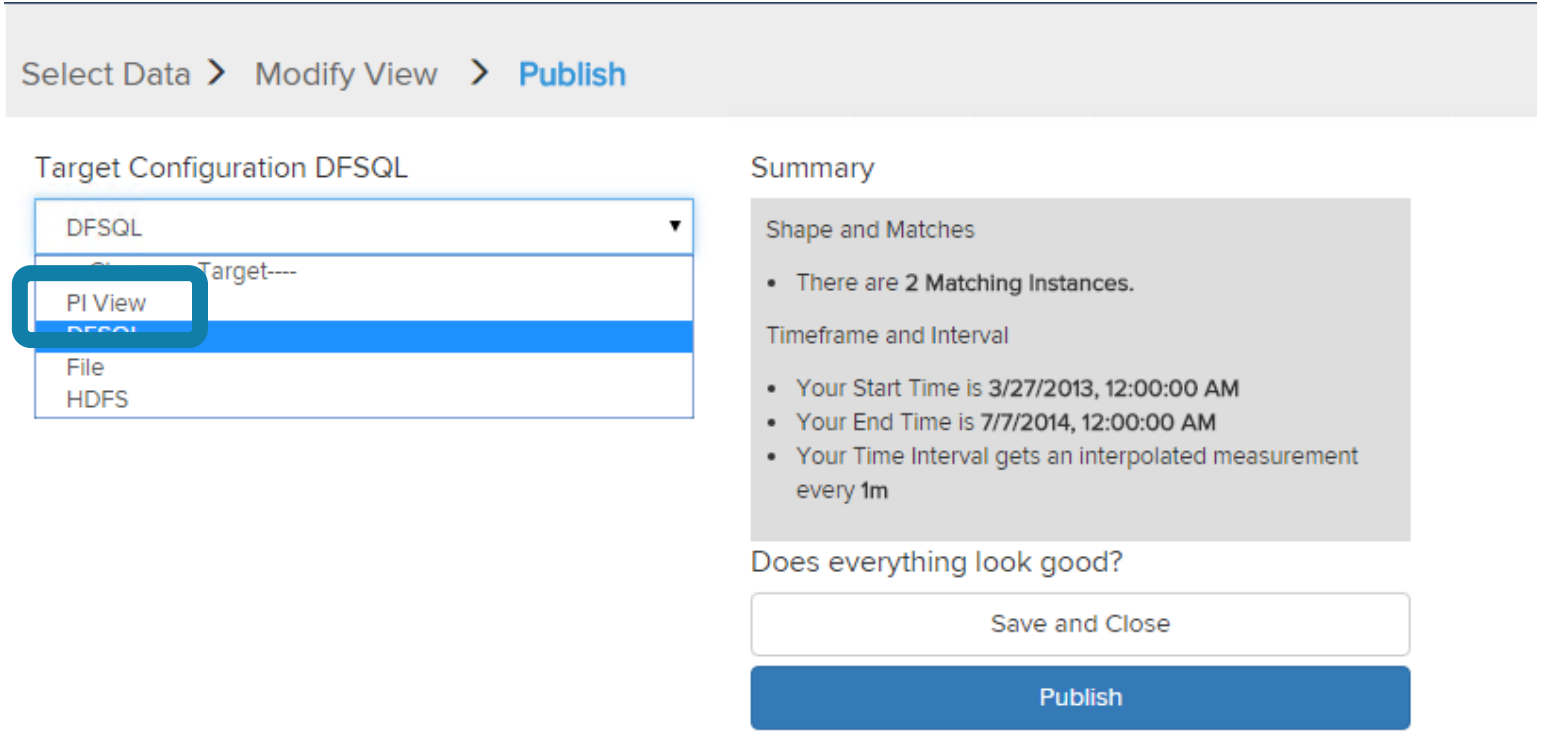
Edit Row Filters
1 Row Filters

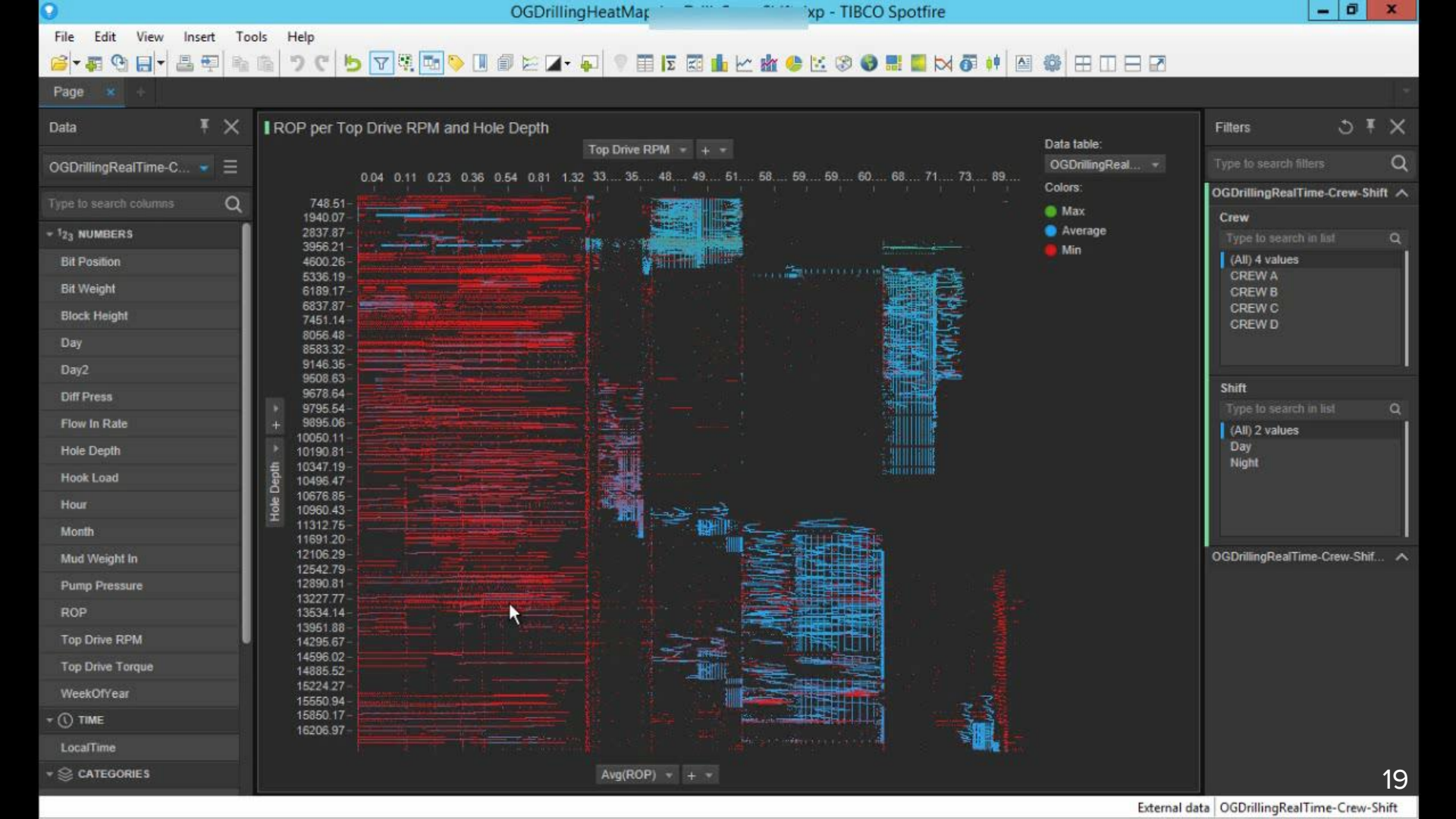
Edit Value Mode
Interpolated Values
Every 1 seconds

Start Time: 3/27/2013, 12:00:00 AM

End Time: 7/7/2014, 12:00:00 AM

Rig Name	LocalTime TimeStamp	Day Day	Hour Hour	WeekDay Day of the Week	Bit Weight Value	Block Height Value	Diff Press Value	Flow In Rate Value	Hole Depth Value	Hook Load Value	Mud Weight In Value	Pump Pressure Value	ROP Value	Top Drive RPM Value	Top Drive Torque Value	Well ID Value	Well Nam Value
Drill1 (80)																	
Drill1	2013-03-27 03:19:00	27	3	Wednesday	0.00	78.78	1.43	50.00	1.42	48.30	10.90	123.04	0.00	0.00	0.00	Well-23708671	Well1 Drilli
Drill1	2013-03-27 03:20:00	27	3	Wednesday	0.00	78.85	1.01	50.00	1.42	48.30	10.90	122.63	0.00	0.00	0.00	Well-23708671	Well1 Drilli
Drill1	2013-03-27 03:21:00	27	3	Wednesday	0.00	78.83	1.11	50.00	1.42	48.40	10.90	122.71	0.00	0.00	0.00	Well-23708671	Well1 Drilli
Drill1	2013-03-27 03:22:00	27	3	Wednesday	0.00	78.80	1.56	50.00	1.42	48.10	10.90	123.31	0.00	0.00	0.00	Well-23708671	Well1 Drilli
Drill1	2013-03-27 03:23:00	27	3	Wednesday	0.00	78.81	0.74	50.00	1.42	48.10	10.90	122.41	0.00	0.00	0.00	Well-23708671	Well1 Drilli
Drill1	2013-03-27 03:24:00	27	3	Wednesday	0.00	78.81	1.23	50.00	1.42	48.30	10.90	122.63	0.00	0.00	0.00	Well-23708671	Well1 Drilli
Drill1	2013-03-27 03:25:00	27	3	Wednesday	0.00	78.80	0.55	50.00	1.42	48.50	10.90	122.14	0.00	0.00	0.00	Well-23708671	Well1 Drilli
Drill1	2013-03-27 03:26:00	27	3	Wednesday	0.00	78.83	1.58	50.00	1.42	48.40	10.90	123.38	0.00	0.00	0.00	Well-23708671	Well1 Drilli
Drill1	2013-03-27 03:27:00	27	3	Wednesday	0.00	78.78	1.96	50.00	1.42	48.30	10.90	123.24	0.00	0.00	0.00	Well-23708671	Well1 Drilli
Drill1	2013-03-27 03:28:00	27	3	Wednesday	0.00	78.81	1.77	50.00	1.42	48.60	10.90	123.53	0.00	0.00	0.00	Well-23708671	Well1 Drilli
Drill1	2013-04-02 22:40:00	2	22	Tuesday	11.60	32.64	33.16	595.00	10025.69	231.40	10.20	2744.59	0.00	0.00	1562.00	Well-23708671	Well1 Drilli
Drill1	2013-04-02 22:41:00	2	22	Tuesday	10.40	32.46	35.36	595.00	10025.69	232.50	10.20	2741.70	0.00	0.00	1601.00	Well-23708671	Well1 Drilli
Drill1	2013-04-02 22:42:00	2	22	Tuesday	10.60	32.57	32.28	595.00	10025.69	232.60	10.20	2742.31	0.00	0.00	1605.00	Well-23708671	Well1 Drilli
Drill1	2013-04-02 22:47:00	2	22	Tuesday	14.90	32.25	6.53	596.00	10026.21	228.30	10.20	2721.55	0.00	0.00	1543.00	Well-23708671	Well1 Drilli
Drill1	2013-04-02 22:49:00	2	22	Tuesday	0.00	36.25	6.78	595.00	10026.21	237.20	10.20	2713.55	0.00	0.00	1581.00	Well-23708671	Well1 Drilli
Drill1	2013-04-02 22:50:00	2	22	Tuesday	0.00	35.08	46.28	596.00	10026.21	236.60	10.20	2703.22	0.00	0.00	1593.00	Well-23708671	Well1 Drilli
Drill1	2013-04-02 22:51:00	2	22	Tuesday	0.00	34.28	68.94	596.00	10026.21	242.60	10.20	2714.47	0.00	0.00	1574.00	Well-23708671	Well1 Drilli
Drill1	2013-04-02 22:52:00	2	22	Tuesday	0.00	33.82	8.39	595.00	10026.21	239.30	10.20	2656.50	0.00	0.00	1574.00	Well-23708671	Well1 Drilli
Drill1	2013-04-02 22:53:00	2	22	Tuesday	0.00	33.05	35.55	595.00	10026.21	237.50	10.20	2680.76	0.00	0.00	1582.00	Well-23708671	Well1 Drilli
Drill1	2013-04-02 22:54:00	2	22	Tuesday	0.00	32.67	99.61	595.00	10026.21	238.40	10.20	2749.77	0.00	0.00	1587.00	Well-23708671	Well1 Drilli
Drill1	2013-04-09 21:26:00	9	21	Tuesday	0.00	96.00	77.60	590.00	16964.25	267.30	10.80	3587.81	0.00	0.00	1530.00	Well-23708671	Well1 Drilli
Drill1	2013-04-09 21:27:00	9	21	Tuesday	0.00	95.86	106.55	590.00	16964.25	266.10	10.80	3619.76	0.00	0.00	1519.00	Well-	Well1 Drilli




OGDrillingHeatMap - TIBCO Spotfire
File Edit View Insert Tools Help
Page
Data
OGDrillingRealTime-C...
Type to search columns
NUMBERS
Bit Position
Bit Weight
Block Height
Day
Day2
Diff Press
Flow In Rate
Hole Depth
Hook Load
Hour
Month
Mud Weight In
Pump Pressure
ROP
Top Drive RPM
Top Drive Torque
WeekOfYear
TIME
LocalTime
CATEGORIES
ROP per Top Drive RPM and Hole Depth
Top Drive RPM
0.04 0.11 0.23 0.36 0.54 0.81 1.32 33.... 35.... 48.... 49.... 51.... 58.... 59.... 59.... 60.... 68.... 71.... 73.... 89....
Hole Depth
748.51
1940.07
2837.87
3956.21
4600.26
5336.19
6189.17
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Avg(ROP)
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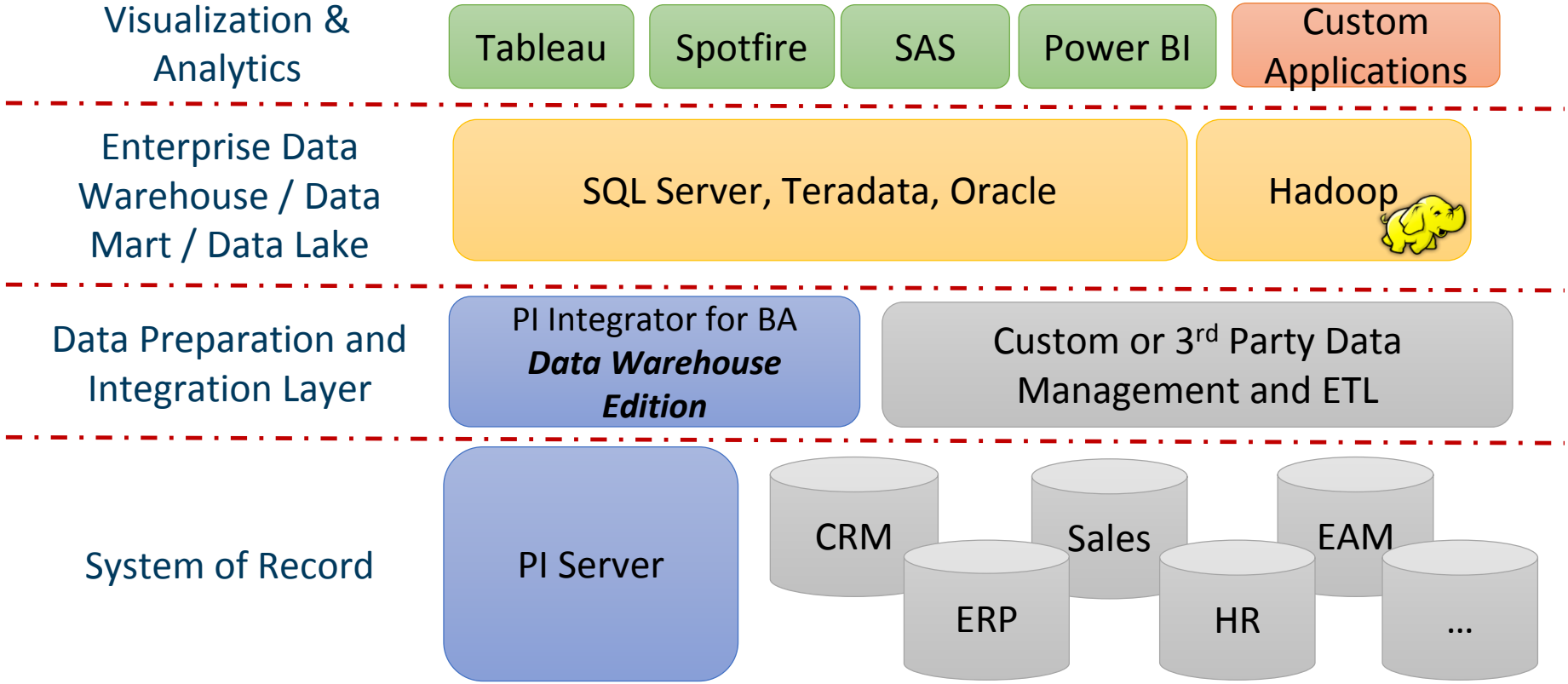
Max
Average
Min
Filters
Type to search filters
OGDrillingRealTime-Crew-Shift
Crew
Type to search in list
(All) 4 values
CREW A
CREW B
CREW C
CREW D
Shift
Type to search in list
(All) 2 values
Day
Night
OGDrillingRealTime-Crew-Shif...
External data
OGDrillingRealTime-Crew-Shift

PI Integrator for Business Analytics: Data Warehouse and Big Data Edition

- Data Warehouse Edition
  - Export to SQL server
  - Export to text file
  - Other DB coming soon: Oracle, Teradata

- Big Data Edition
  - Export to Hadoop (HDFS)
  - Hortonworks, MapR, Cloudera and others

Data Warehouse Architecture

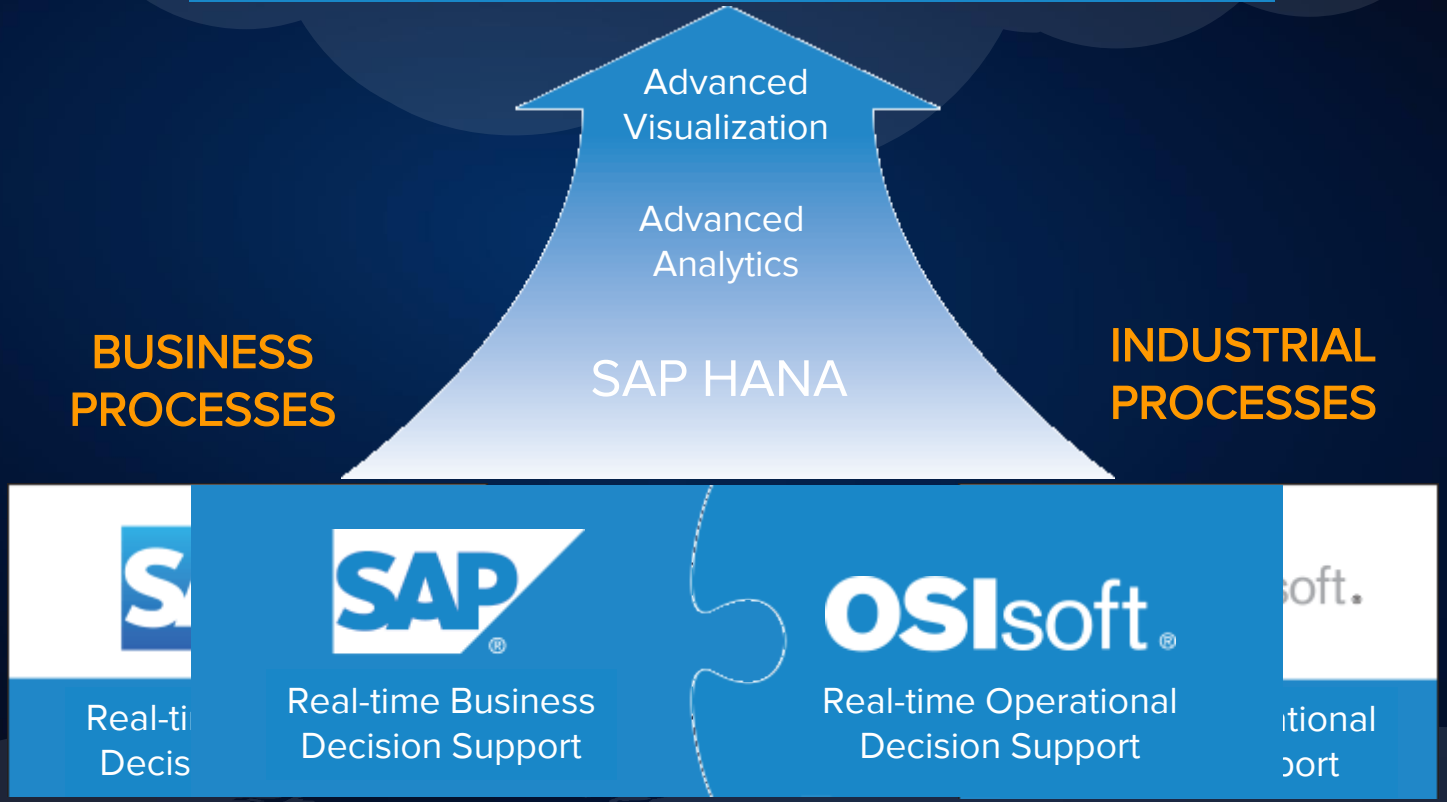


PI Integrator for SAP Hana

- Native Integration with HANA Smart Data Access (SDA)
- Data is brought into memory on demand
- Focus on BI, Reporting, and Predictive Analytics

- Please welcome Laura Childerson from SAP

Novel and Actionable Insights



Enabling the Internet of Things with SAP solutions

SAP Predictive Maintenance & Service

SAP Connected Manufacturing

SAP Connected Logistics

SAP Augmented Reality

IT/OT integration examples redefining Oil and Gas

- O&G companies are pursuing IT/OT integration to reduce drilling-days per well, extend the life of existing production assets, and improve overall operational awareness.
- Business processes supported include:

Drilling Optimization	Geospatial Integration	Asset health management and predictive maintenance	Leakage Detection
Fuel Management	Feedstock supply optimization	Transmission Line-Pack Management	Regulatory Compliance

Conclusion

PI Complements Big Data Solutions

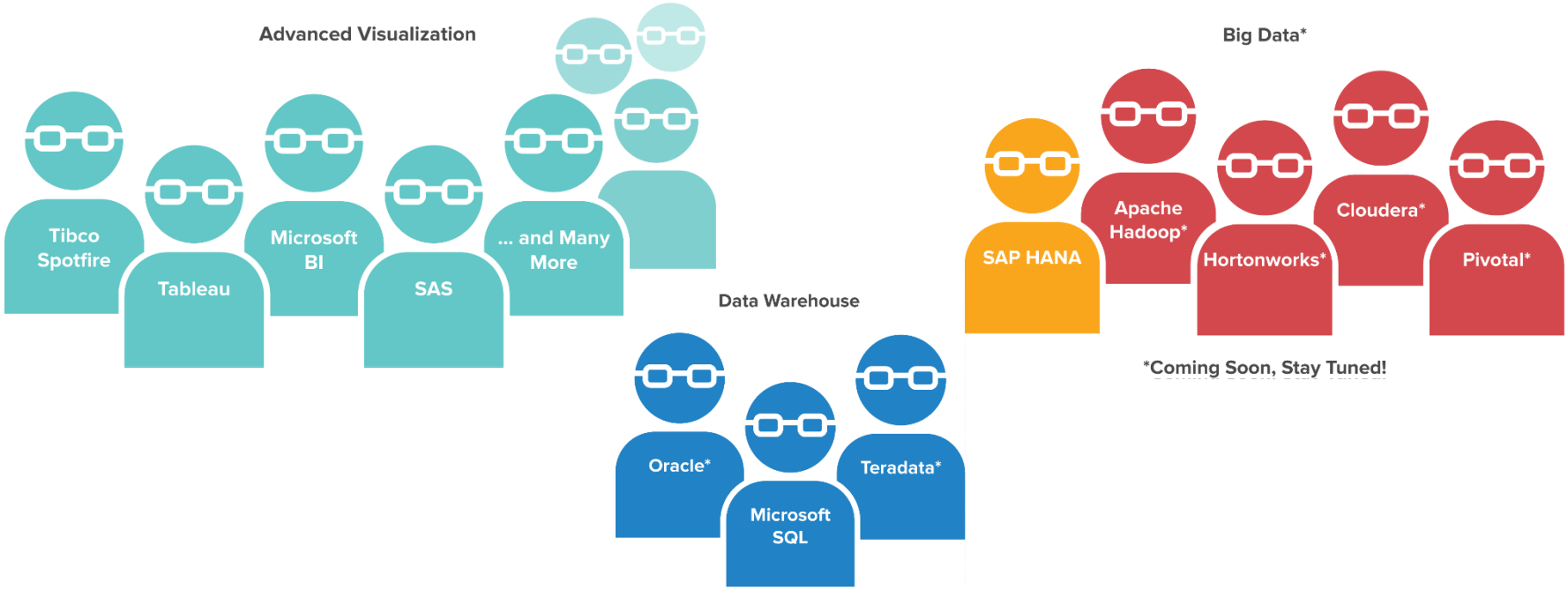
Problem	PI System	Big Data	Why?
Collect and store data from a variety of real-time and operational sources	✓		The PI System contextualizes your data, collects natively from a variety of sources and efficiently stores data at less that 10% of the size of big data
Ask questions about a few to hundreds of data points	✓		The PI System is highly tuned for instantaneous answers about your data vs. waiting for minutes or hours for your answer to come from a big cluster
Ask questions about the entire PI archive		✓	Big data is excellent for asking questions about large data sets and finding hidden patterns. Requires writing code and doing analysis in batches vs real-time
Operationalizing and capturing knowledge from analyses	✓		The PI System is the best place to capture knowledge from big data and visual analytics and apply it in real time across all your assets and operations
Deriving correlations and insights from the entire PI archive and external data		✓	Big data is essential for large inspection queries that require complex descriptive analytics, pattern searching, and joining non-PI data

Before you get started

- Ask internally, at your company, if there is a Big Data Initiatives and which tools are already in used
  - Leverage existing infrastructure

- Organizing the data is key:
  - Proper AF structure required
  - Link to Metadata (ID)

What Systems Are Supported?



Proven technology - Early Adopter Program

Merck

Regeneron

EDF-RE

Cemex

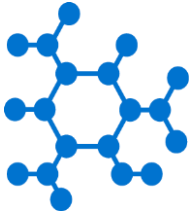
Alcoa GRP

Freeport McMoRan

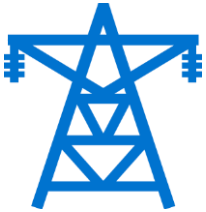
Devon Energy

Noble Energy

NOV



BASF



China Southern Grid

SDG&E

	BI Edition (Q4-2015)	Data Warehouse Edition (Q4-2015)	Big Data Edition (2016)	SAP Hana Edition (Q4-2015)
PI Views - Client side ODBC	X	X	X	
Native Connections				
- SQL Server		X	X	
- Flat File		X	X	
- SAP Hana				X
- Oracle		(2016)	X	
- Hadoop			X	

Questions

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

State your **name & company**

Please remember to…

Complete the Survey for this session

The Power of Data
DECISION READY IN REAL-TIME

Evaluation Form (Seminar Location - Date)

Name:_____ Company: _____

Email:_____

Quality and content of the presentations	Poor	Good	Excellent	N/A
Welcome	○	○	○	○
The Journey To Real-Time Operational Intelligence	○	○	○	○
The Power of Connection	○	○	○	○
Tank Level Management System	○	○	○	○
Using the PI System to Aid in Troubleshooting Operational Aspects of Oil and Gas Well Drilling and Completion	○	○	○	○
Unleash your Infrastructure	○	○	○	○
Information on the Spot	○	○	○	○
Wrap-up/Seminar Conclusion	○	○	○	○

Quality and organization of the seminar				
Choice of date	○	○	○	○
Time allowed for lunch/breaks	○	○	○	○
Choice of presentations	○	○	○	○
Pace and time allowed for the presentations	○	○	○	○

감사합니다

谢谢

Danke

Merci

Gracias

Thank You

ありがとう

Спасибо

Obrigado