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# EMEA USERS CONFERENCE 2016



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# Predictive Analytics: The Why and How behind IIoT and Big Data

Presented by **John Baier**  
**Director, Integration Technologies**



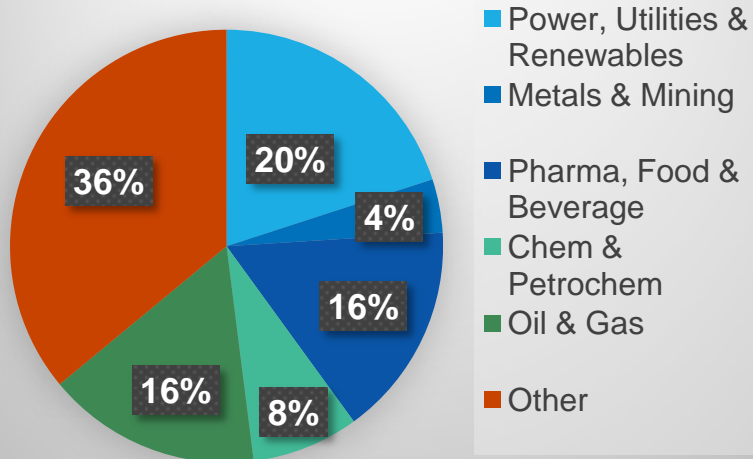


# The Why

# GETTING READY FOR BIG DATA SURVEY RESULTS

Based on 25 responses from registered attendees for the "Getting Ready for Big Data" forum at OSIsoft's 2016 EMEA Users Conference.

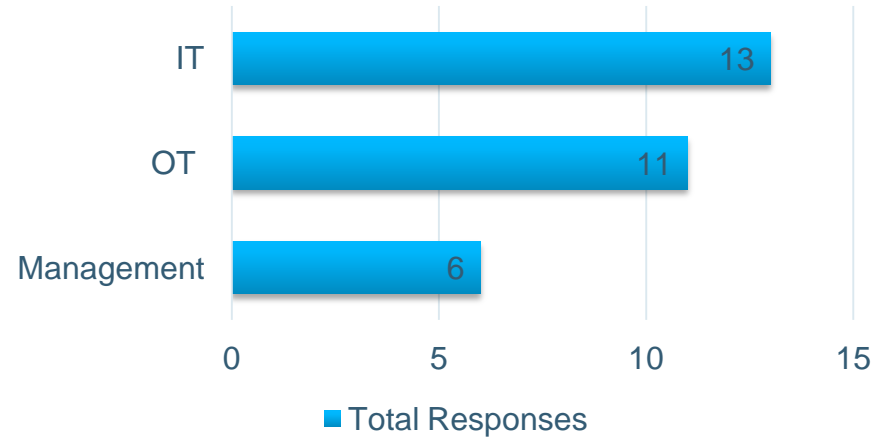
## Interest by Industry



### Other Industries include:

Dredging and land reclamation, GIS-IT, streaming analytics, predictive analytics, tire industry, life science, research/academic

## Business Role



### Other Roles include:

Sales, combination of IT and OT

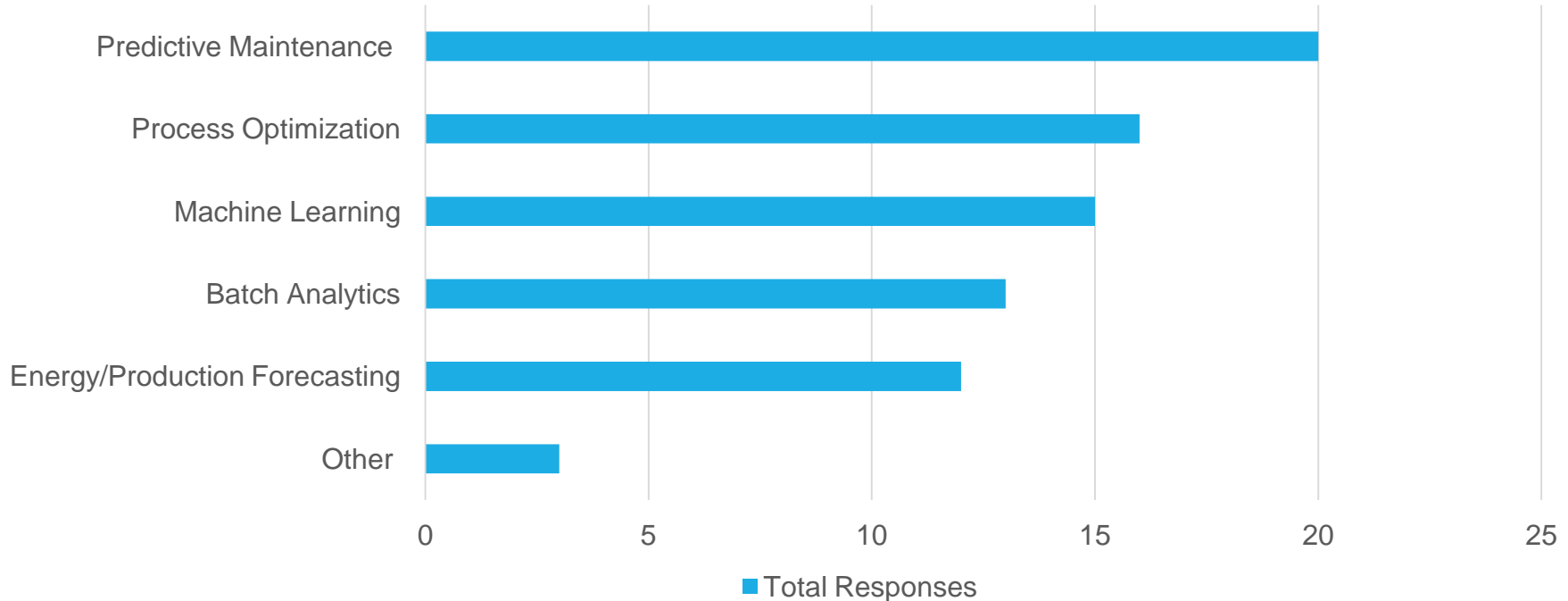


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# Why are people talking about Big Data?



**Other Responses include:**  
“streaming analytics,” “reporting improvements,” and “open to suggestions”



# Interest in Big Data Analytics v. Experience with Big Data Technology



**Interest in Big Data analytics is high, but experience with Big Data technology is low.**





## Oil and Gas

Drilling and production  
comparisons Information  
Distribution



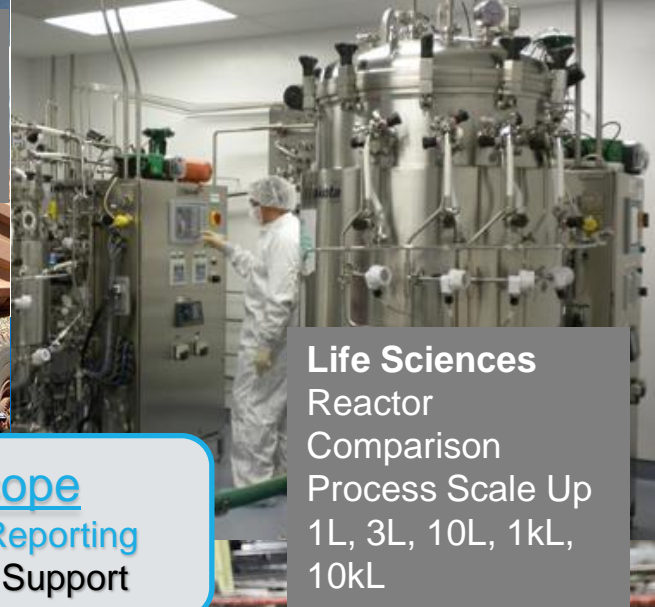
## Mining

Route optimization  
Energy Reduction  
300 haul trucks



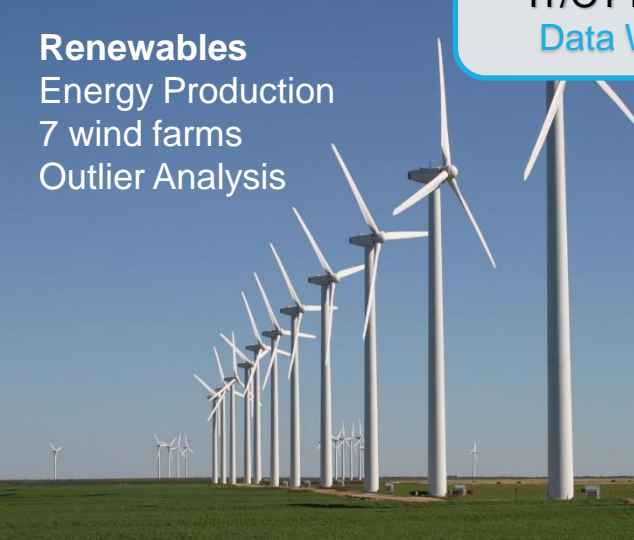
## Life Sciences

Reactor  
Comparison  
Process Scale Up  
1L, 3L, 10L, 1kL,  
10kL

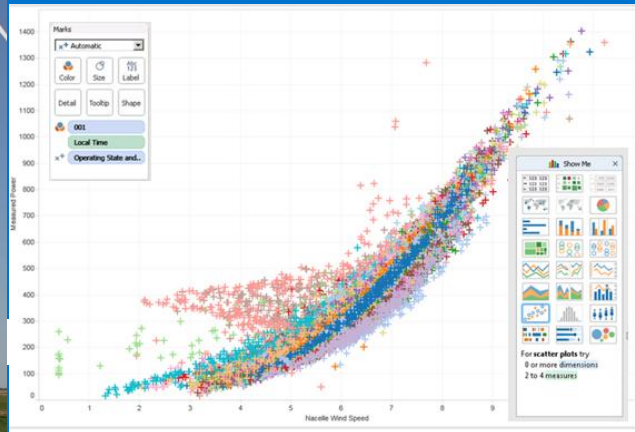


## Renewables

Energy Production  
7 wind farms  
Outlier Analysis



Predictive Analytics: Industry Scope  
IT/OT Integration | Business Intelligence and Reporting  
Data Warehouse Integration | Broad Platform Support



Food and  
Beverage  
Utility Usage  
Process Analytics



# Large Industrial Power Company

- Implemented Operations Diagnostic Center
  - Using off the shelf pattern recognition software
  - Local Subject Matter Experts
  - Predictive Maintenance over several sites
- Saved \$400-500k in single incident avoiding major outage
- Overall ROI close to \$2 million

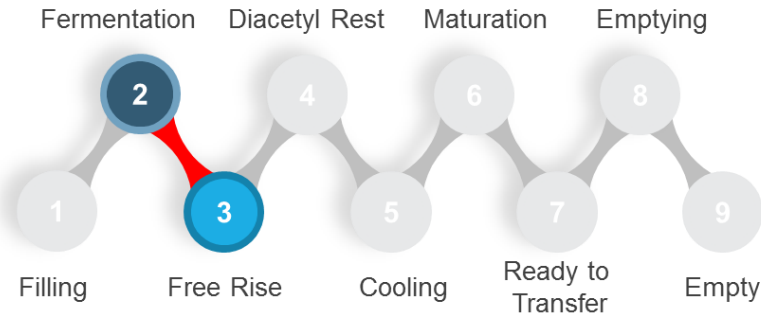


# Freeport McMoRan Copper and Gold



- CIO sponsored Big Data Project – Hadoop Ecosystem
- Route Optimization (1 year) - \$4M out of \$14M potential)
- Predictive Maintenance (1 year) - \$1M out of \$4M potential

# Need to Predict Transition from Fermentation to Free Rise



## Challenges

- Transition occurs between manual density measurements
- Each batch of beer requires **data preparation**
- **Predictions** need to be **accurate and operationalized** to enable action
- Batch variety and brand diversity require **predictive model to learn**

# Leveraging the PI System and Cortana Intelligence to Increase Process Efficiency



## COMPANY and GOAL

Deschutes Brewery is the 7th largest craft brewery in US, and wanted to maximize production with its existing infrastructure to fund construction of a 2<sup>nd</sup> brewery in Roanoke, VA

## CHALLENGE

Batch's phase transition happens between manual density measurements occurring every 8-10 hours

- Impact: Losing up to 72 hours in production time

## SOLUTION

Use data science to achieve accurate predictive analytics for determining a batch's density measurements

- PI System
- PI Integrator for Microsoft Azure
- SQL Data Warehouse
- Azure Machine Learning
- Azure Data Factory

## RESULTS

Ability to eliminate production time losses and increase production capacity

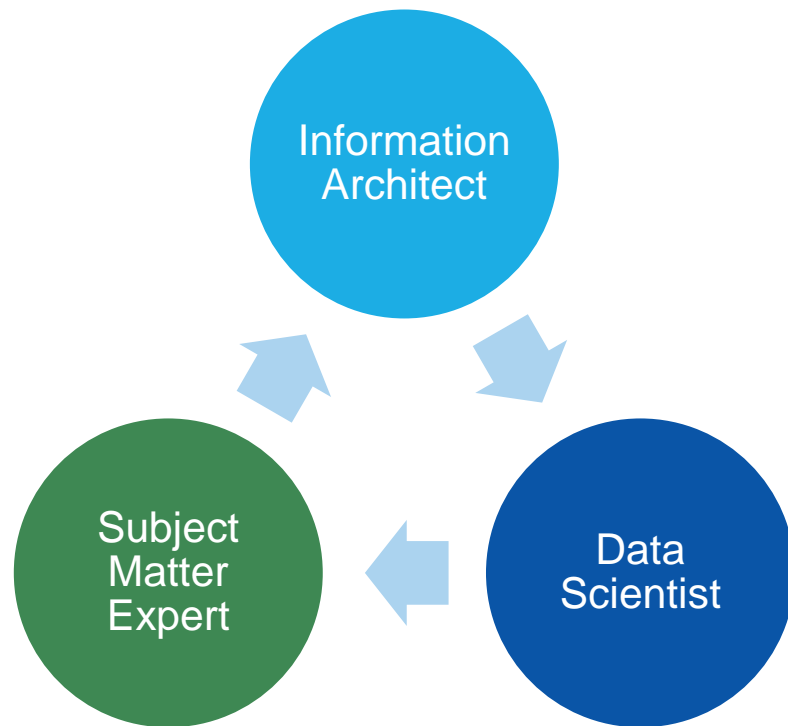
- Accurate predictions of when a batch's phase transitions from fermentation to free rise





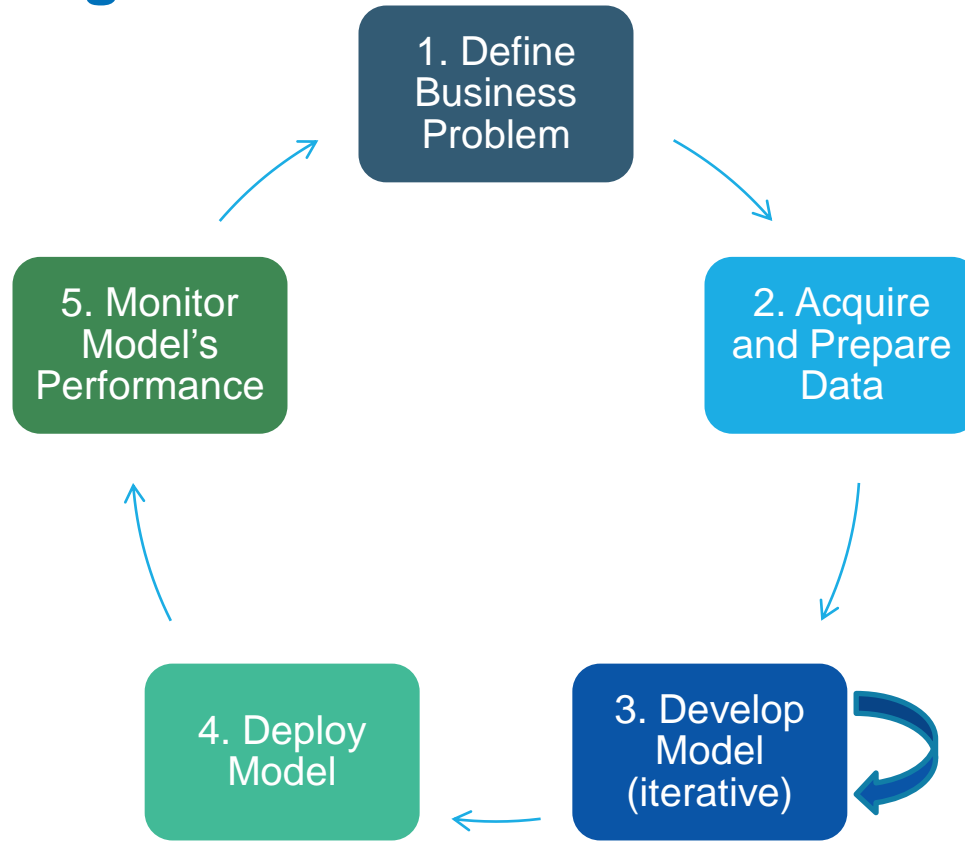
# The How

# The Actors in Data Science

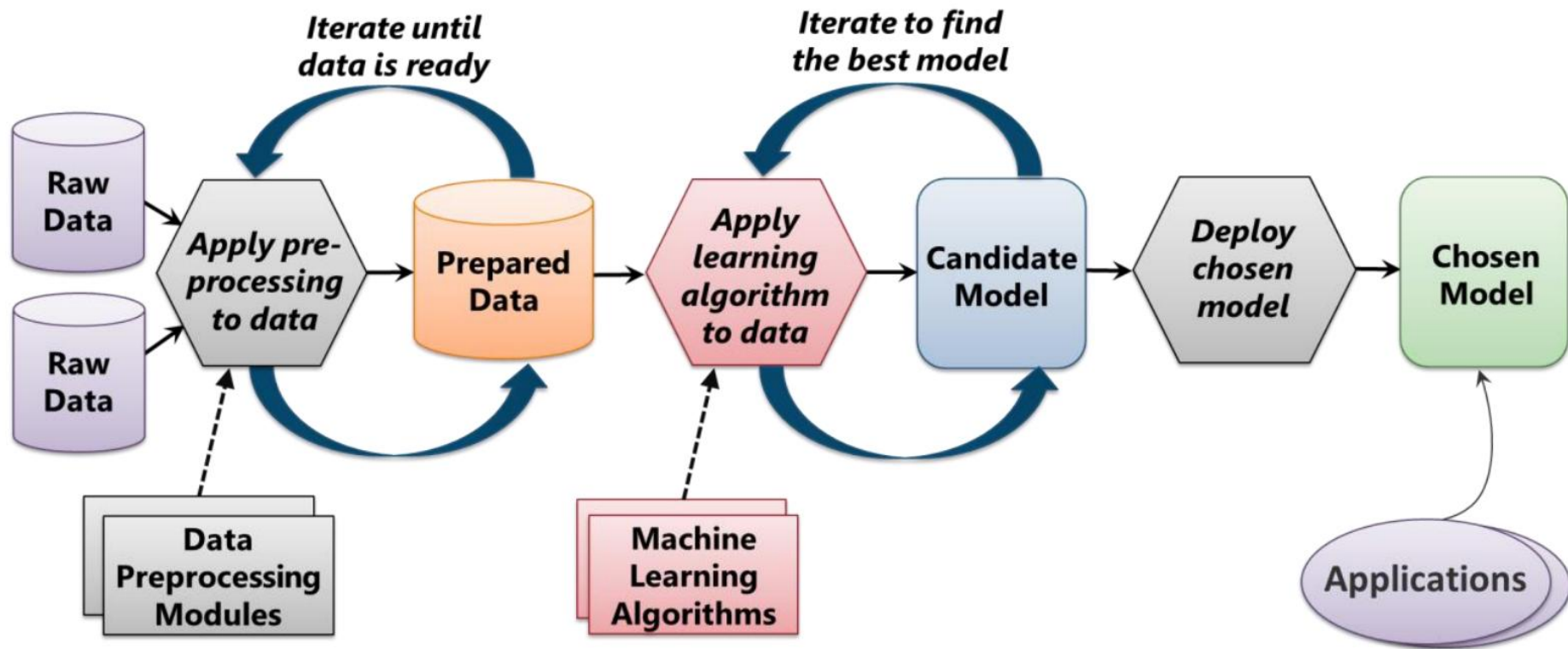




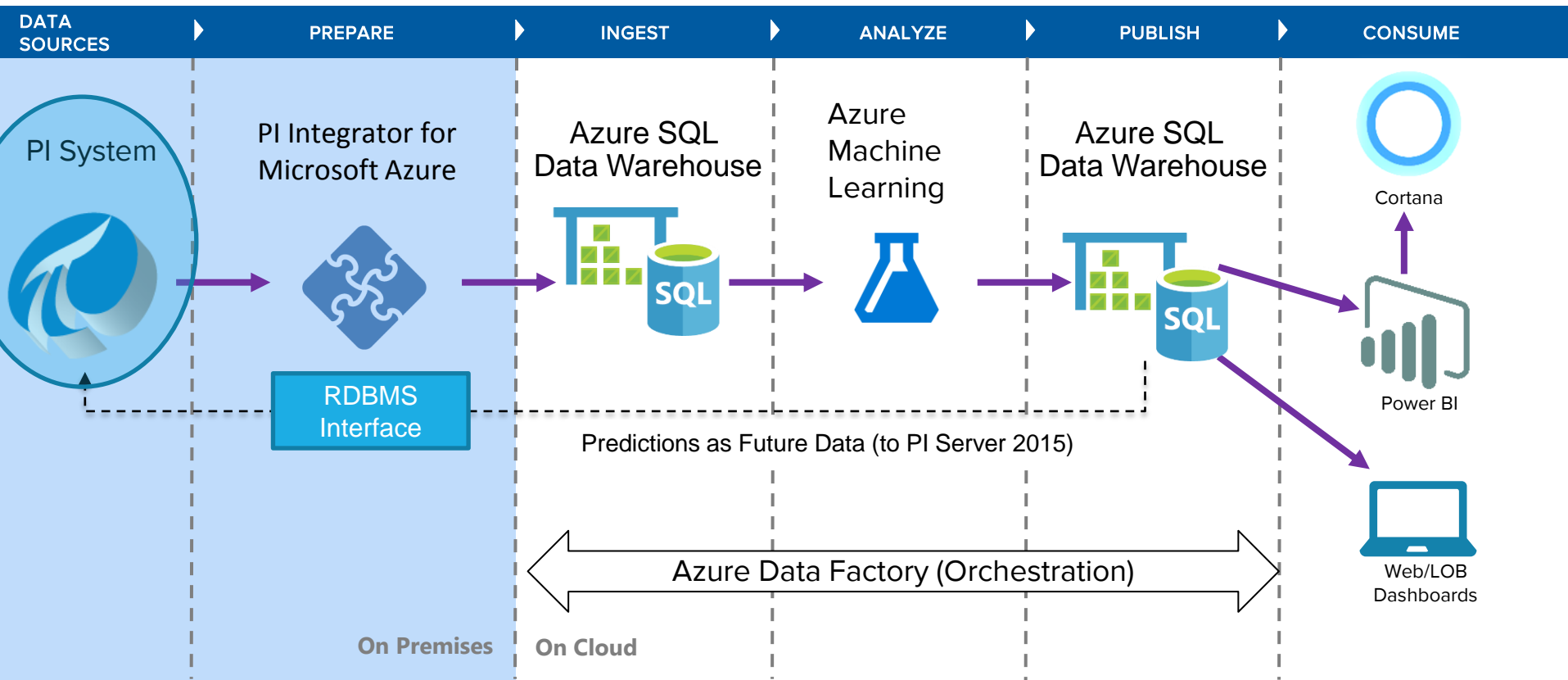
# Data Science High Level



# Machine Learning Process

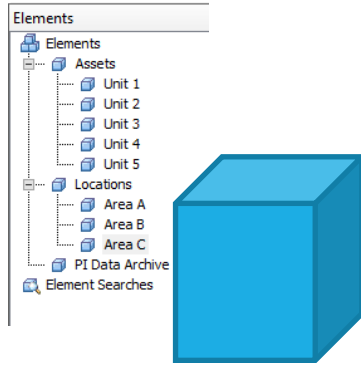


# Get PI System Ready with AF Model and Event Frames

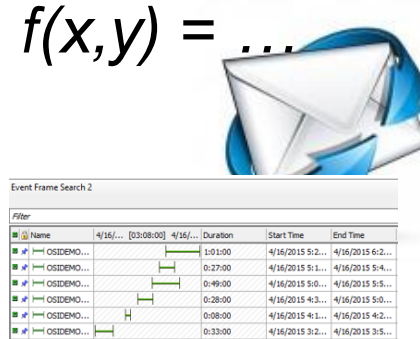


# Asset Based PI Jumpstart

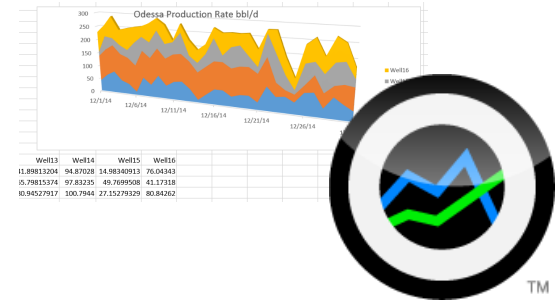
## Around a business problem you identify, learn...



How to define &  
build an asset model  
to fit your needs



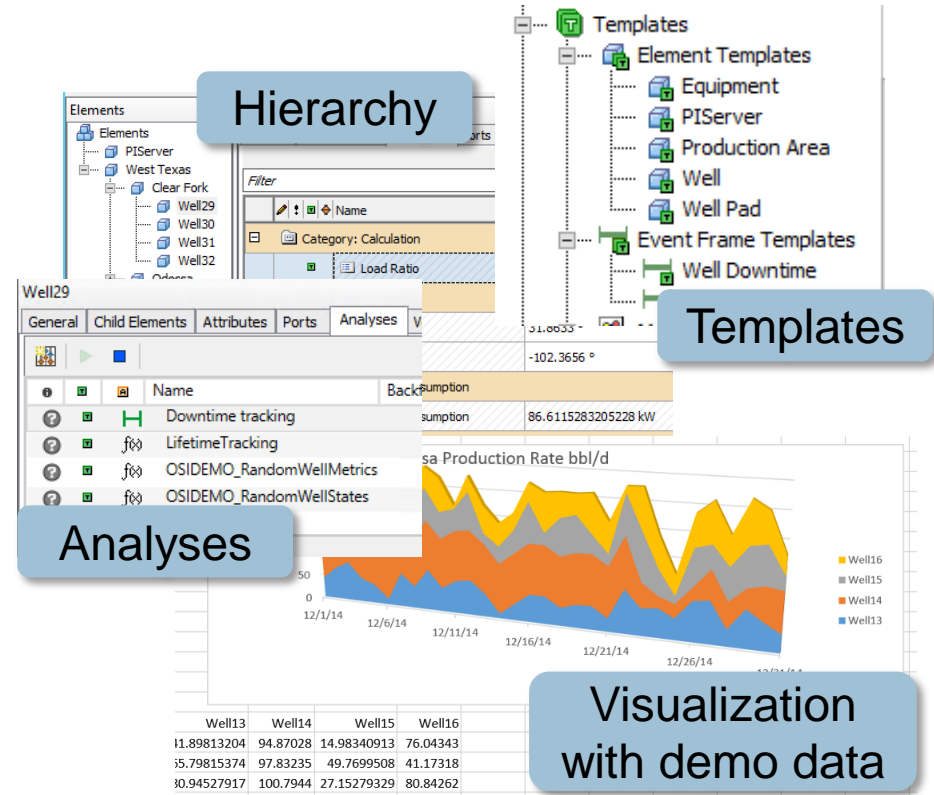
How to develop  
automated calculations,  
event tracking &  
alerting



How to visualize  
what you've built

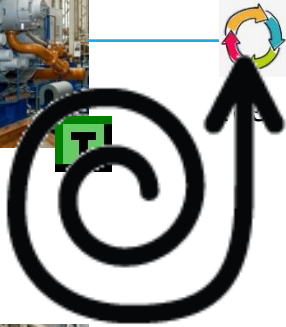
# What's an Asset Based PI Example Kit?

- Learning tool
  - How to use AF for an industry-specific use case
  - Templates to visualization
- Starting point for solving problems
  - Simple
  - Broadly applicable to an industry

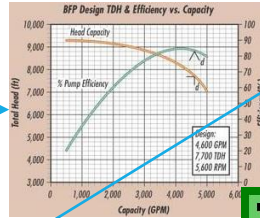




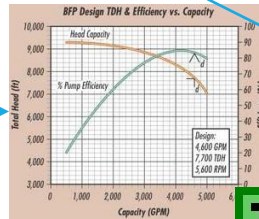
# Event Frames Use Case



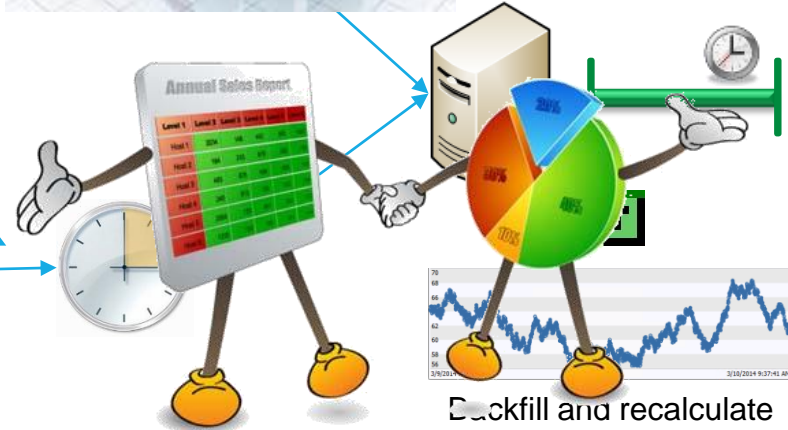
Test



Calculations



Calculations



Backfill and recalculate

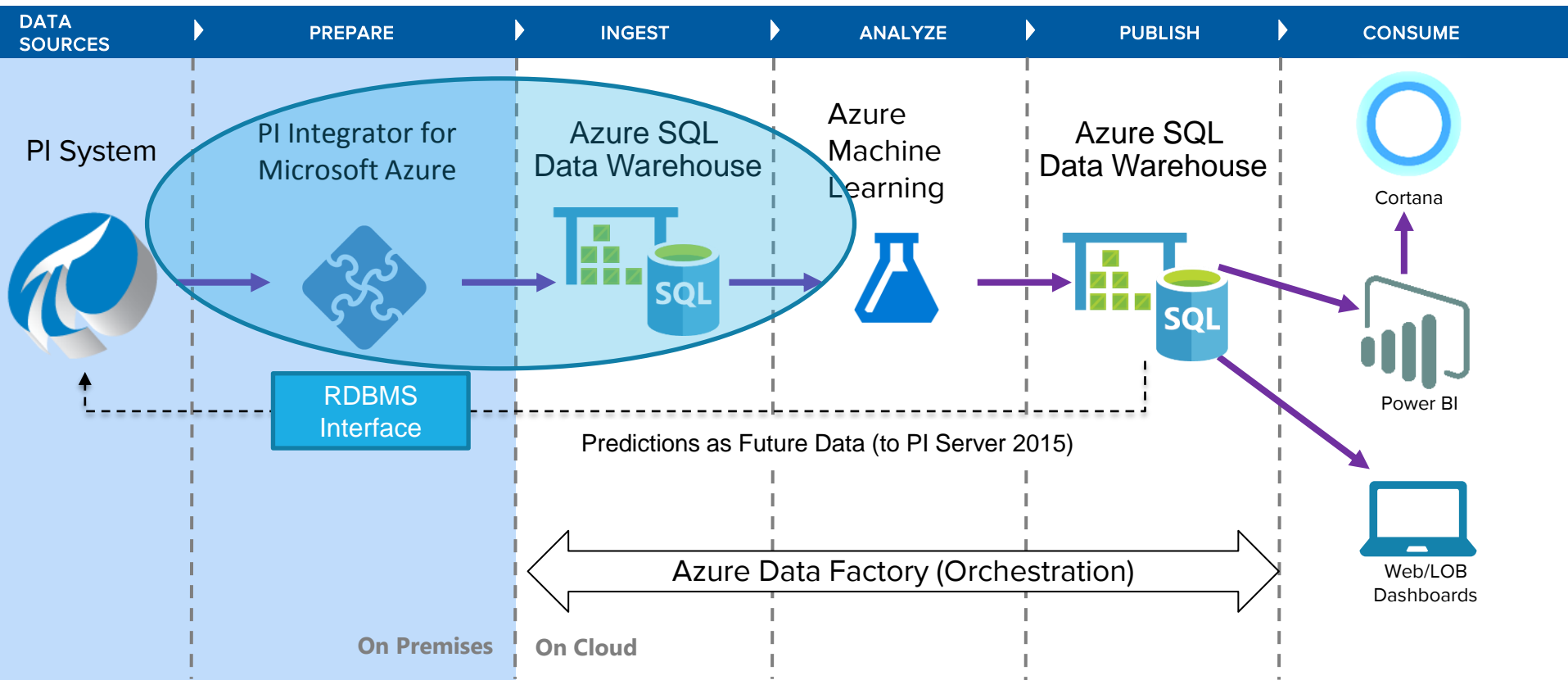


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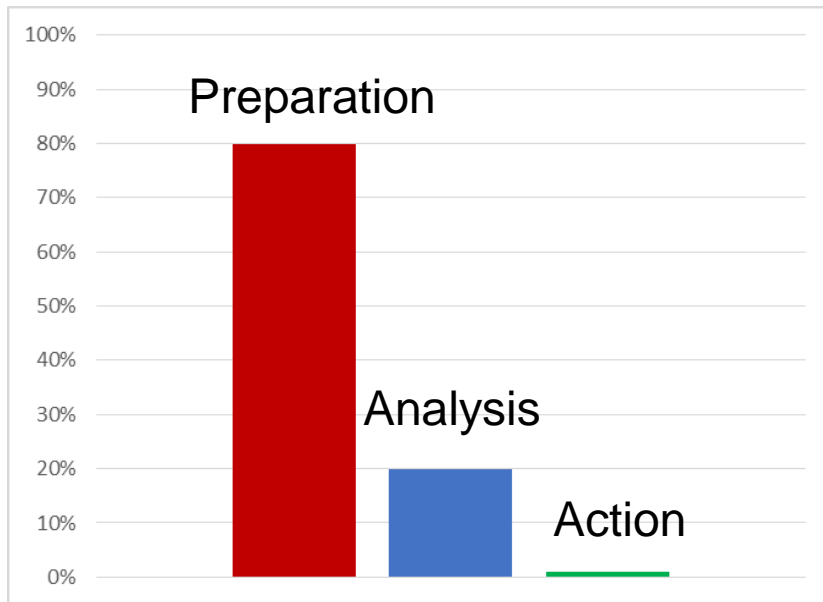
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# Need to Prepare and Transmit Data to the Cloud



# 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/>

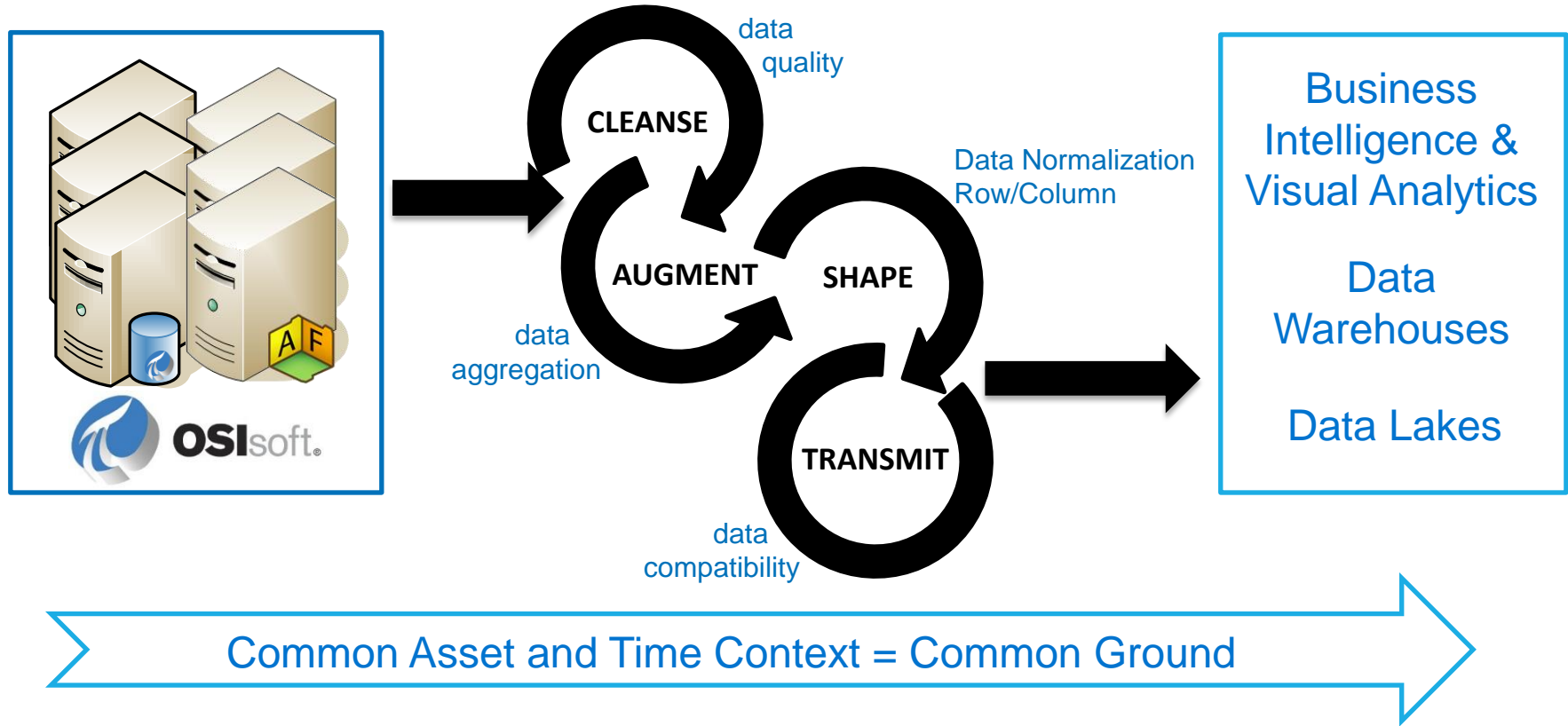


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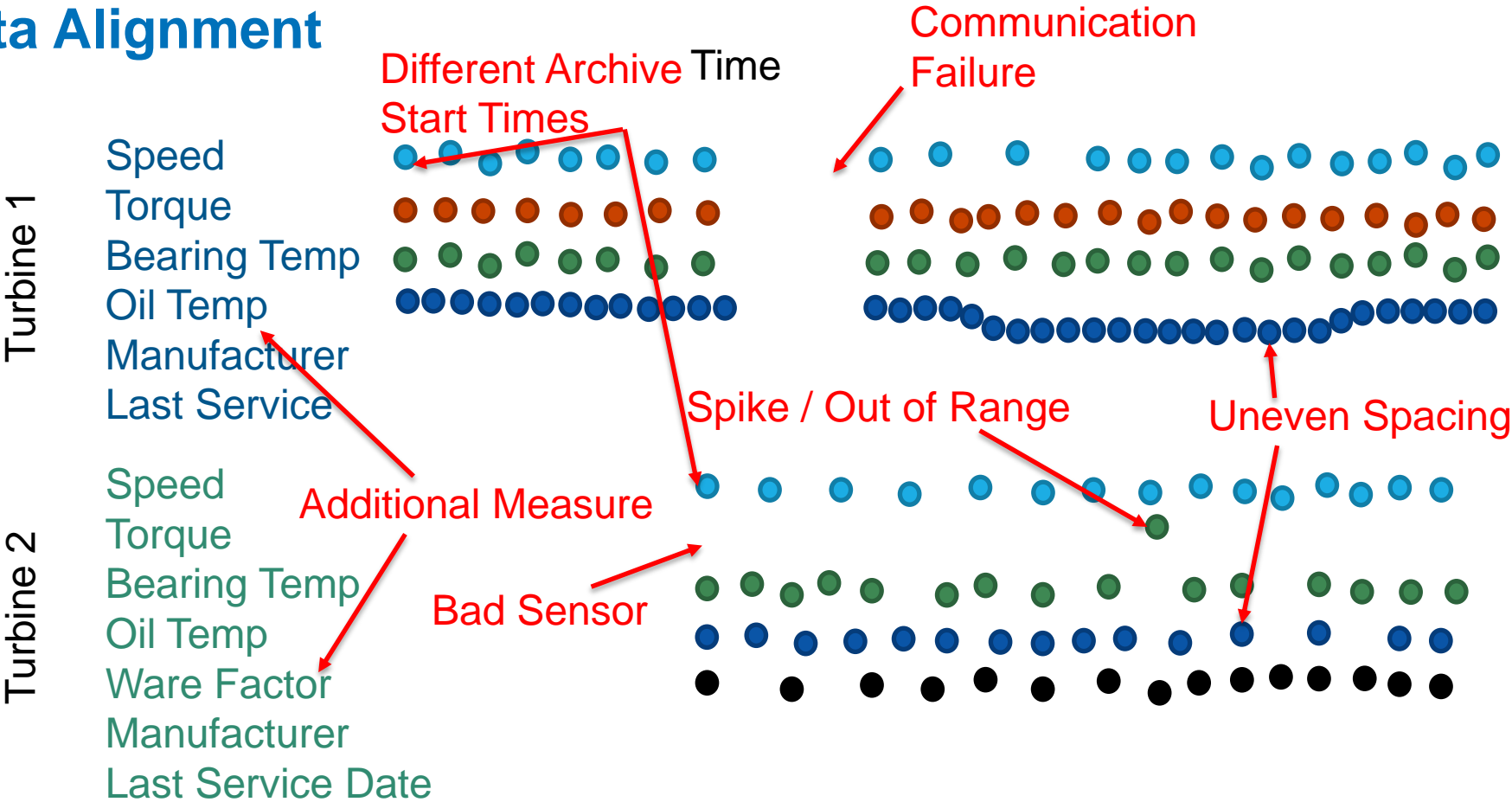
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# PI Integrator for Business Analytics

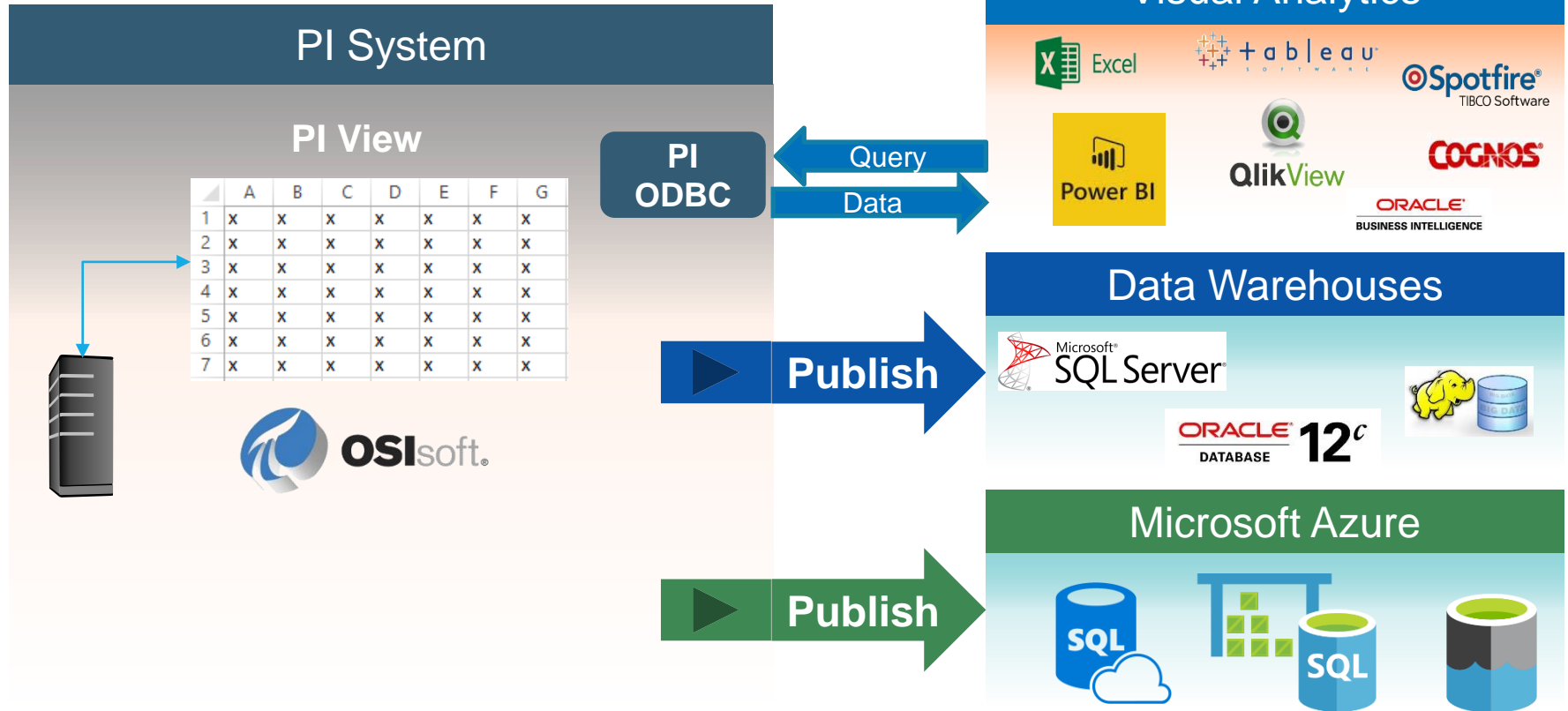


# Data Alignment

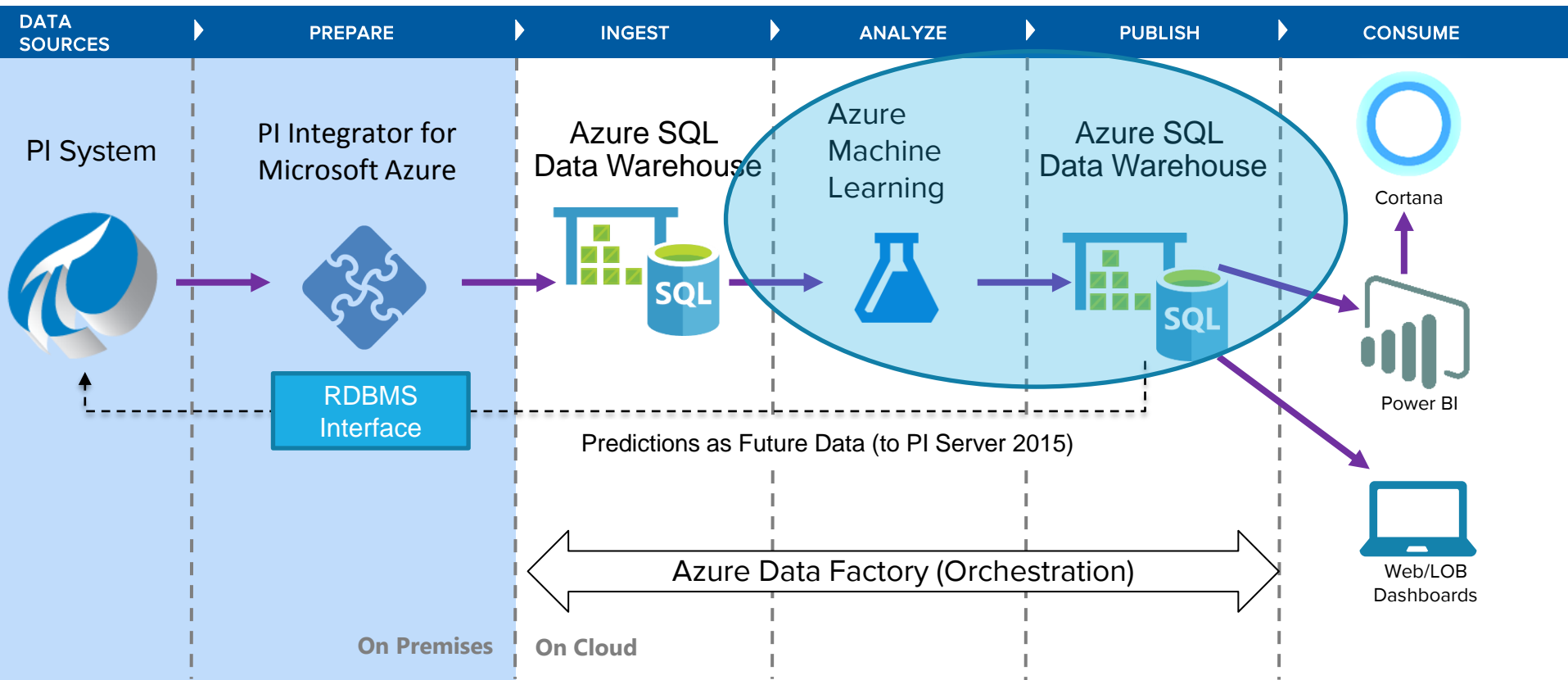




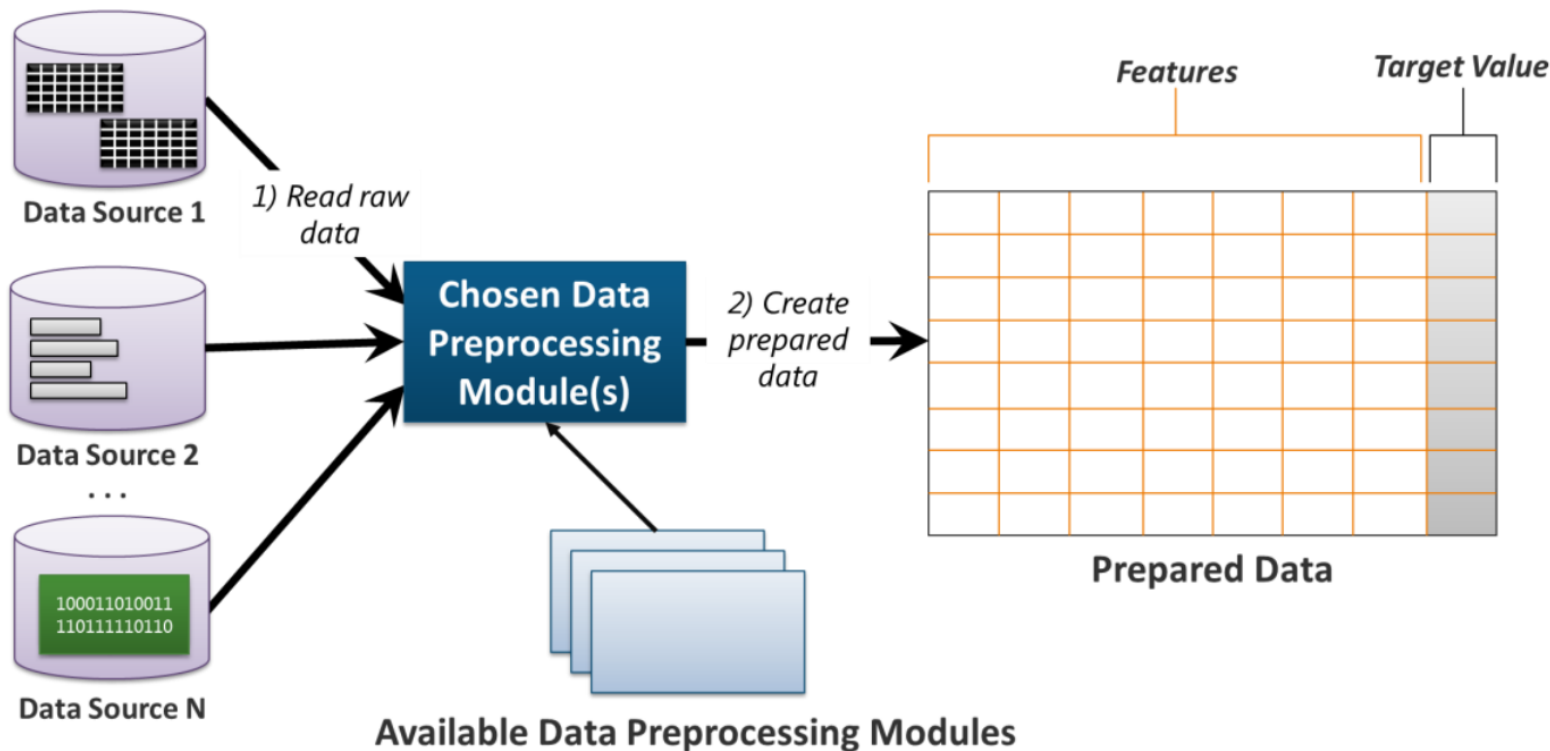
# PI Integrator for Business Analytics



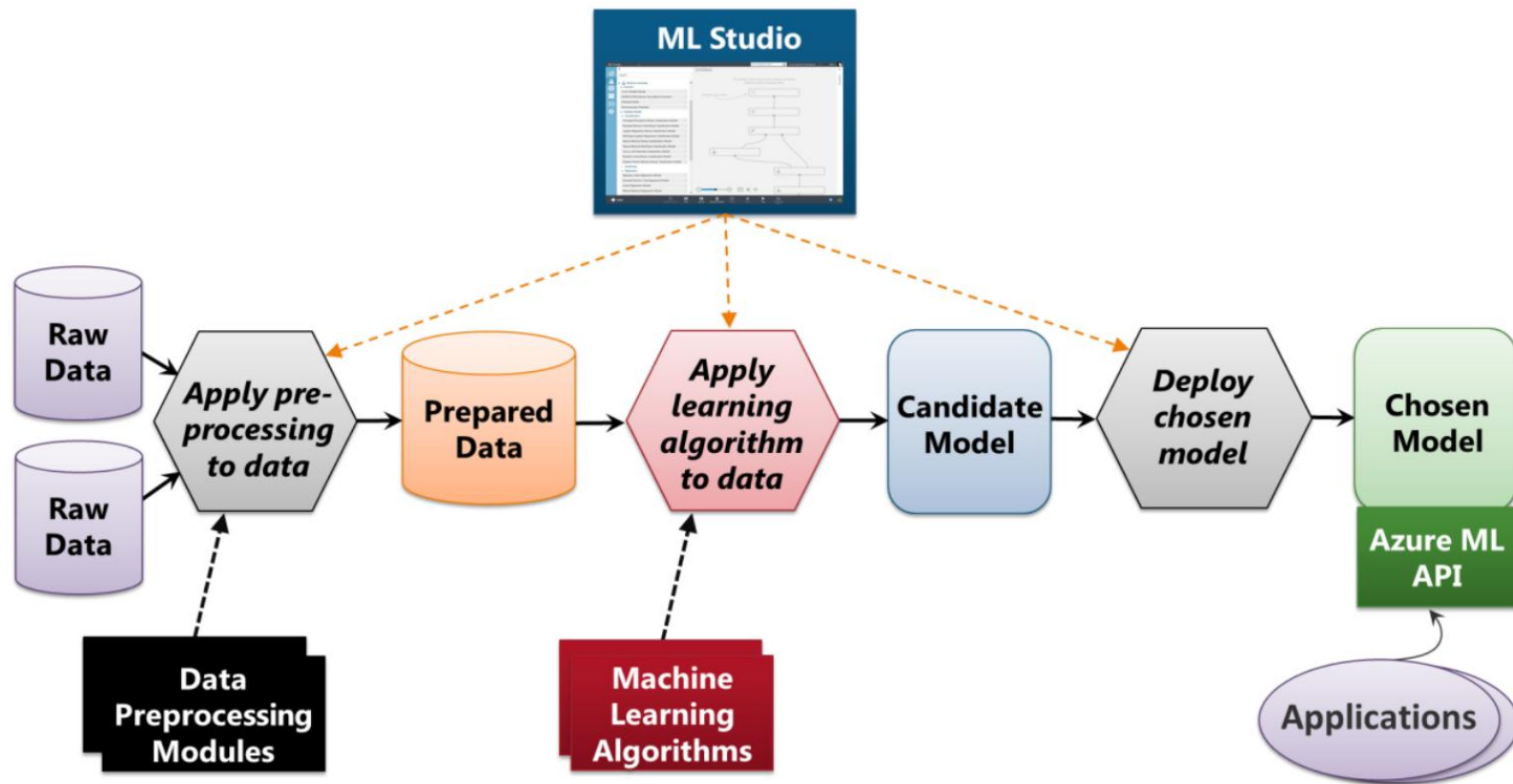
# How to Operationalize Predictions



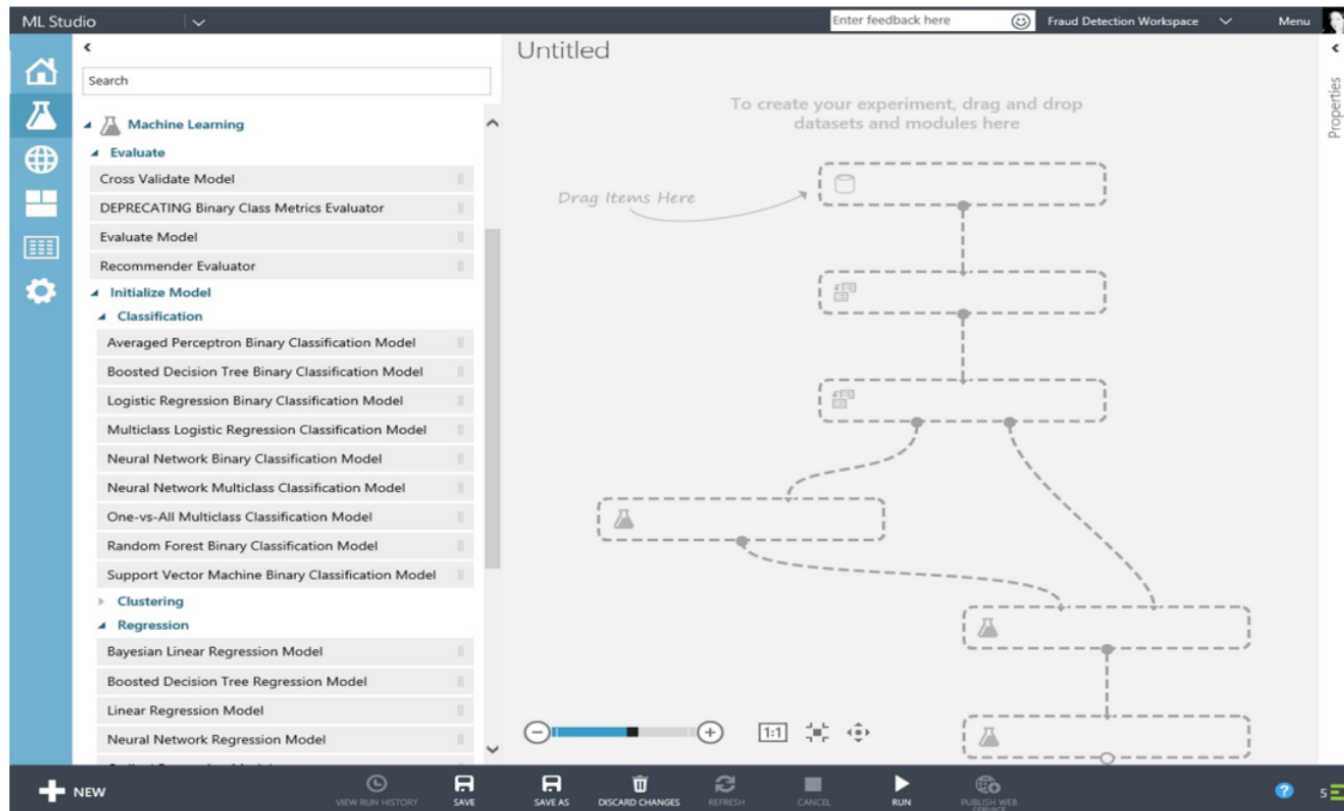
# Choose Features and Prediction Target



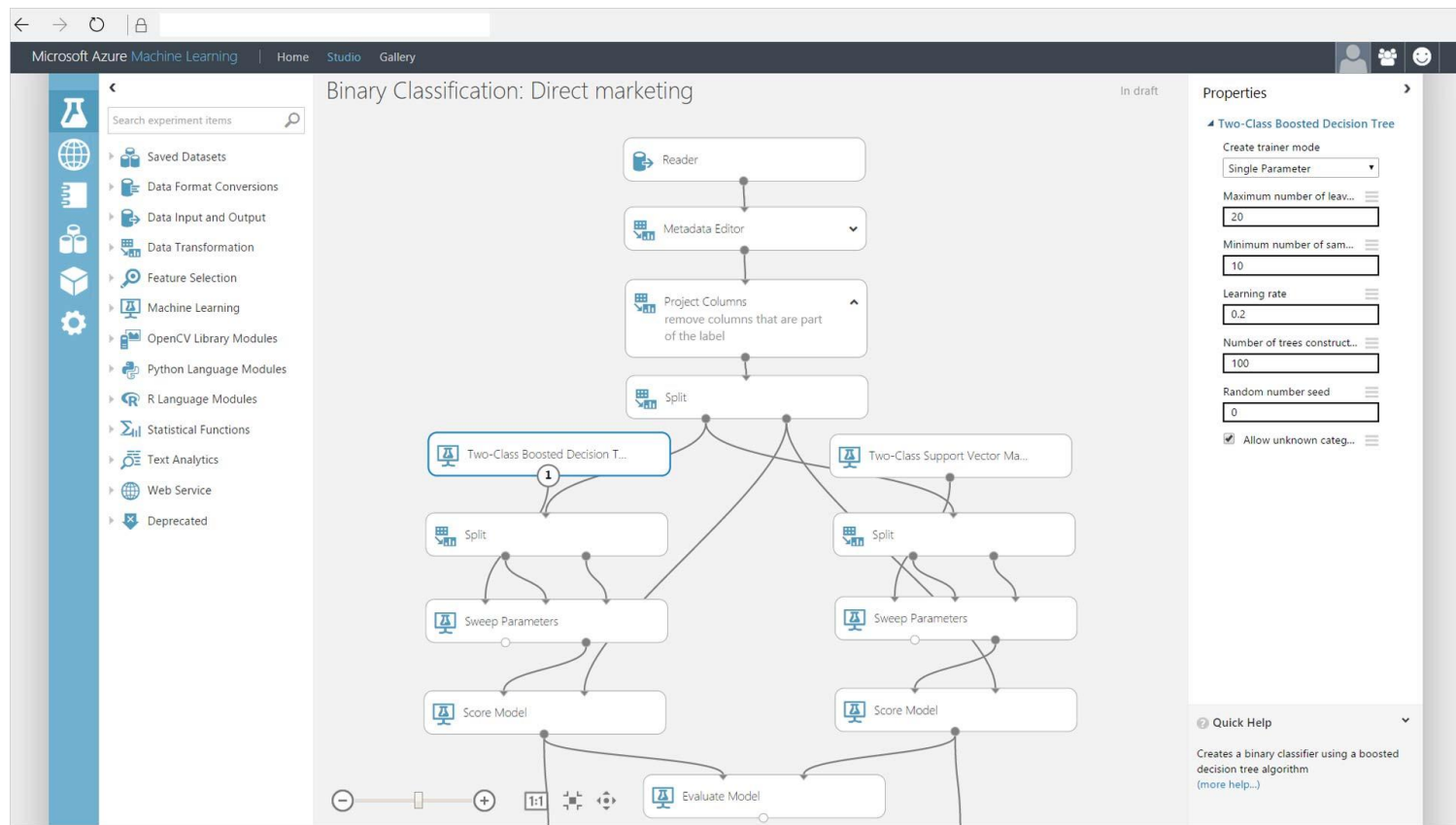
# Azure ML Studio



# Azure Machine Learning



# Azure Machine Learning



# Deschutes Model

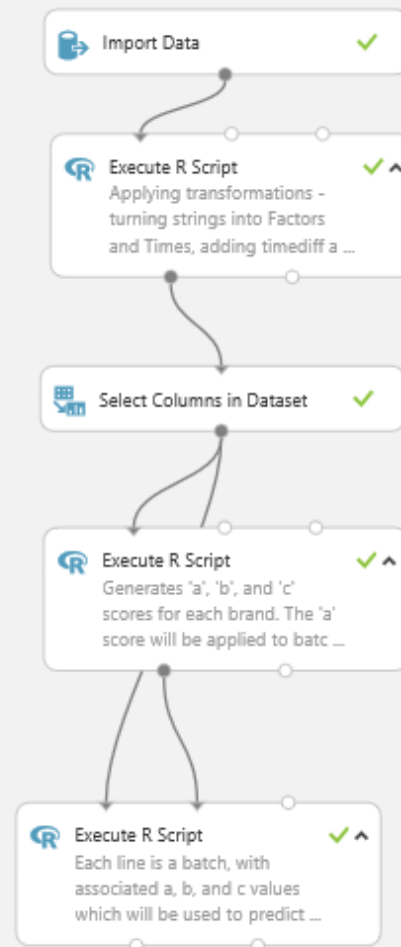
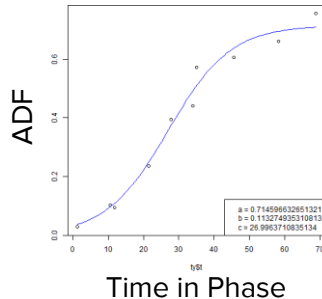
## Proposal

Early Density Readings → Transition Time

## Hypothesis

Transition time influenced by

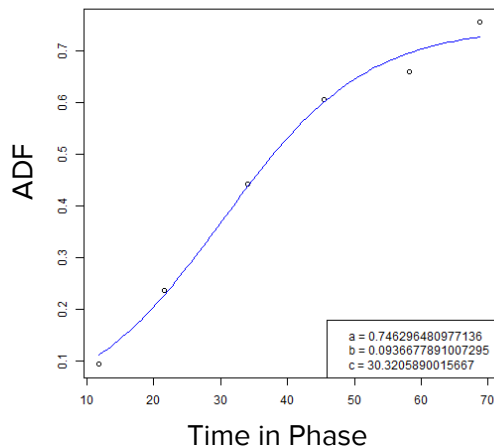
- Brand of beer
- Fermentation dynamics (temperatures, pressures,..)
- Vessel's dimensions & volume



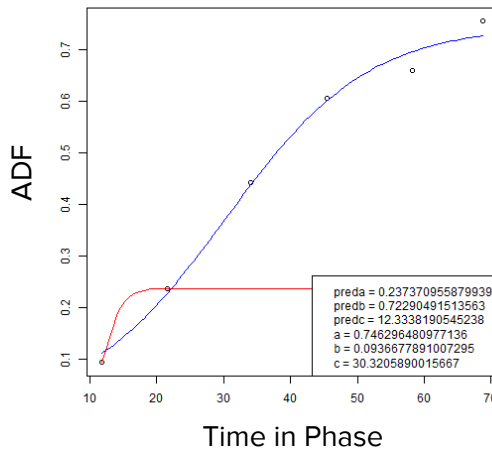


# Azure ML Predicts Accurate Transition Time

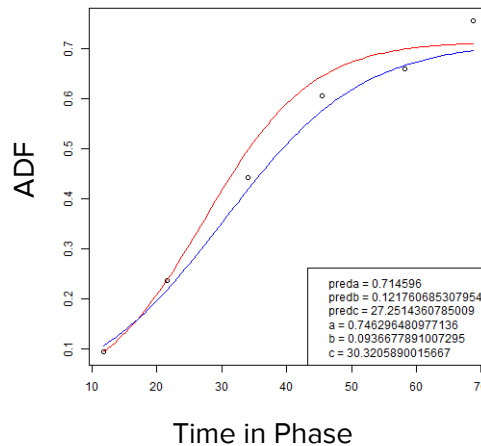
**Benchmark:** Measure accuracy against a standard (based on historical data)



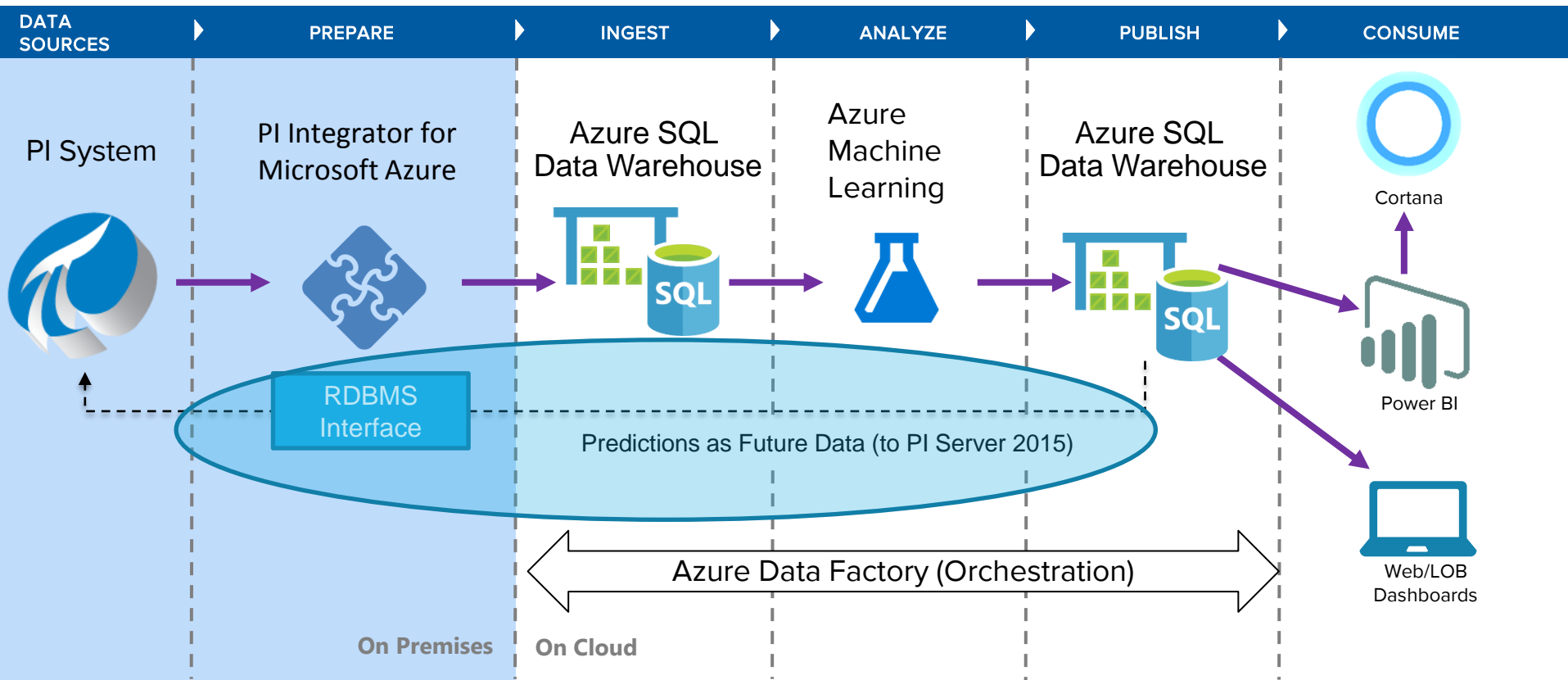
**Predict:** Use 2 early densities to estimate transition time



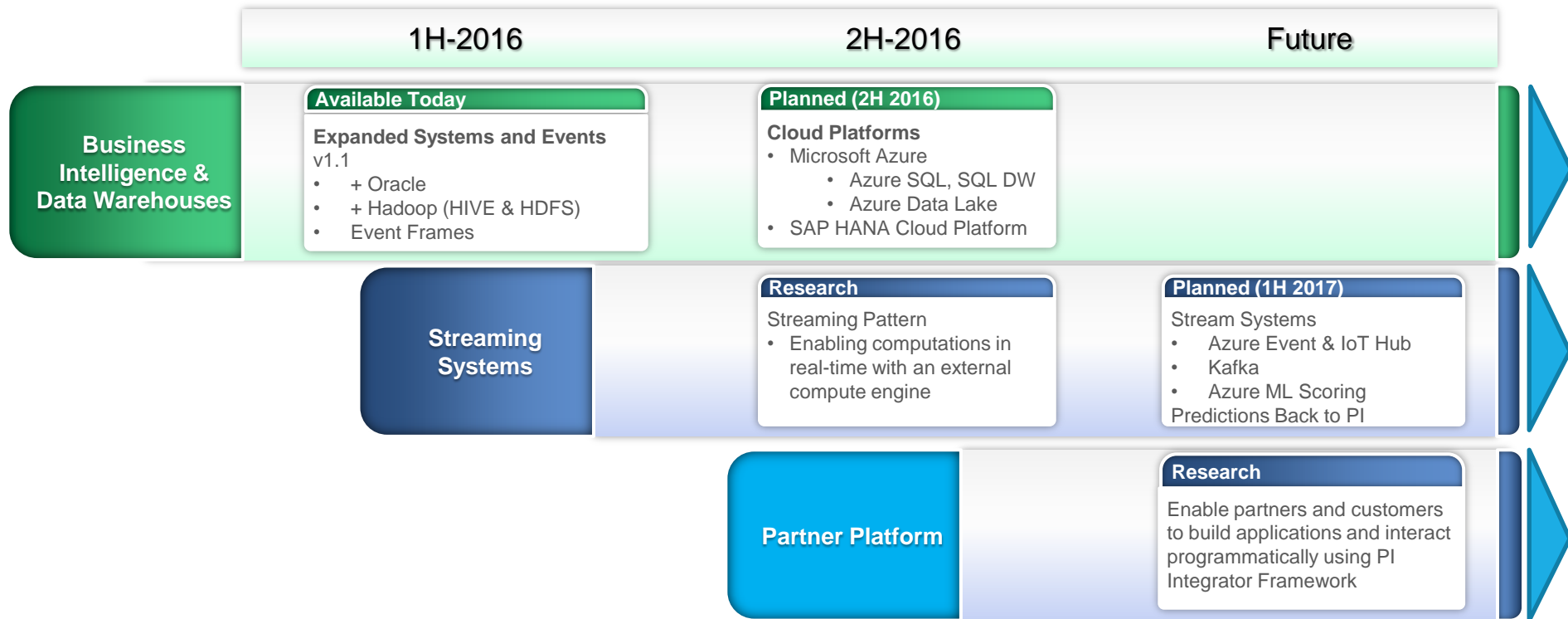
**Refine:** base predictions on brand for greater accuracy



# Brining Predictions into the PI System



# PI Integrator Roadmap



## Call to Action

- Define your Business Case
- Get your PI System in order – AF Model
- Pick your partners:
  - Analytic Product(s)
  - Data Science Partner
  - Subject Matter Experts
- Leverage PI Integrators to accelerate data preparation
- Start with one problem and Iterate
- Continually Re-evaluate and Improve Model

## Questions

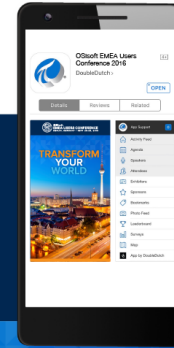
Please wait for the **microphone** before asking your questions



State your **name & company**

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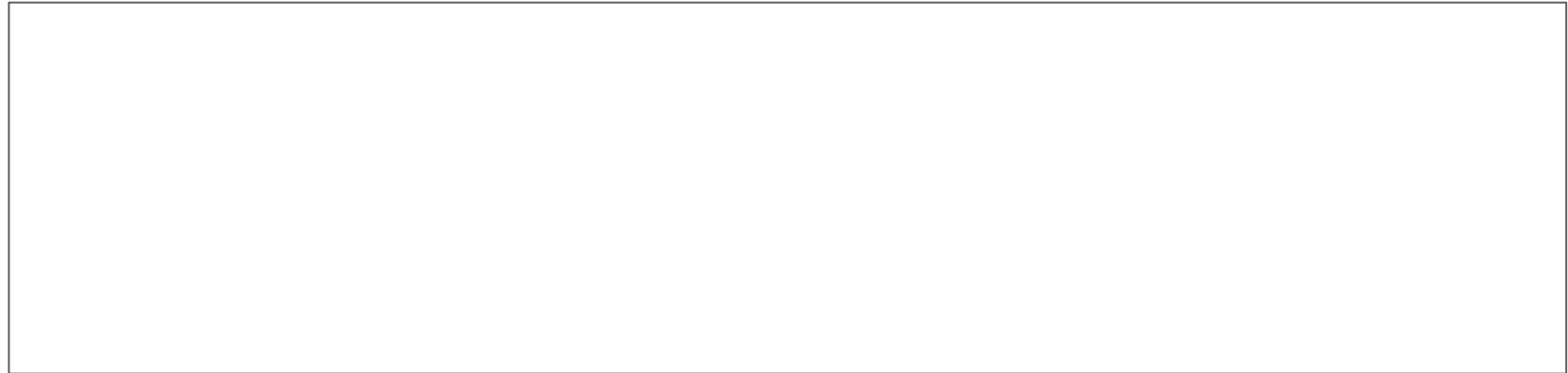


## Contact Information

**John Baier**

[jbaier@osisoft.com](mailto:jbaier@osisoft.com)

Director, Integration Technologies  
OSIssoft



감사합니다

谢谢

Danke

Merci

Gracias

Thank You

ありがとう

Спасибо

Obrigado



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