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# Best Practices for Using and Deploying PI Asset Framework

Presented by **Frank Batke, Global Solutions Architect**  
**Stephen Kwan, Product Manager**



# What does Asset Framework do for me?

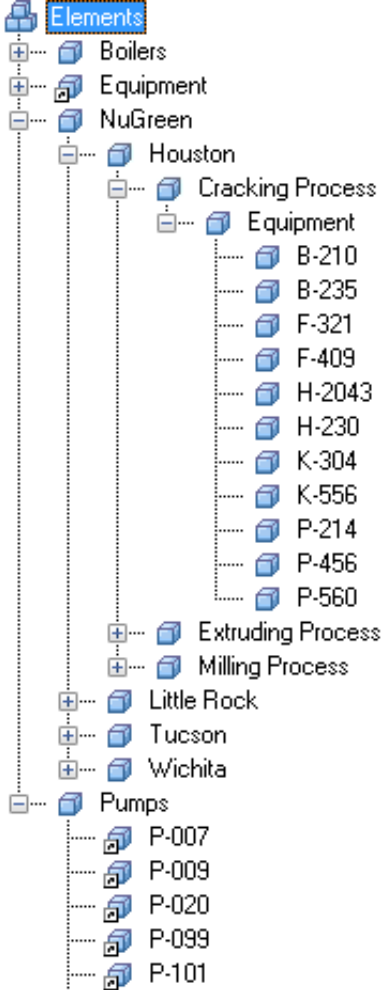


- “Data Dictionary”
  - Aggregate your data
  - Let’s you find the relevant information
- Unify disparate source systems – single version of truth
- Embed domain expertise
- Basis for comparison and collaboration
- Context for searching, analyzing and viewing data

# The Value of AF: Structure



- Asset Framework (AF) is a meta-data structure of the data
  - PI Data Archive supplies “data”
  - AF supplies structure and access across the “data”



# Asset Framework

## Analyses

- Efficiency analysis
- Key Performance Indicators (KPI)

## Time-series

- In-Flow
- Pressure
- Vibration data

## Events

- Downtime
- Startup
- Failure

## Asset details

- Name
- Model
- Manufacturer

## Notifications

- High speed
- Rotor failure
- Low pressure

## External data

- Performance curves
- Last maintenance date
- Design documents
- Best operating procedures





# Things to Keep in Mind



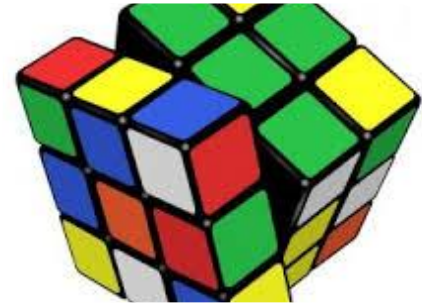
Who will consume  
the data?



There is no “right  
way” to building AF



Start small and  
build up



Solve a specific  
problem

# Before you start to “cook” – prepare “recipe”

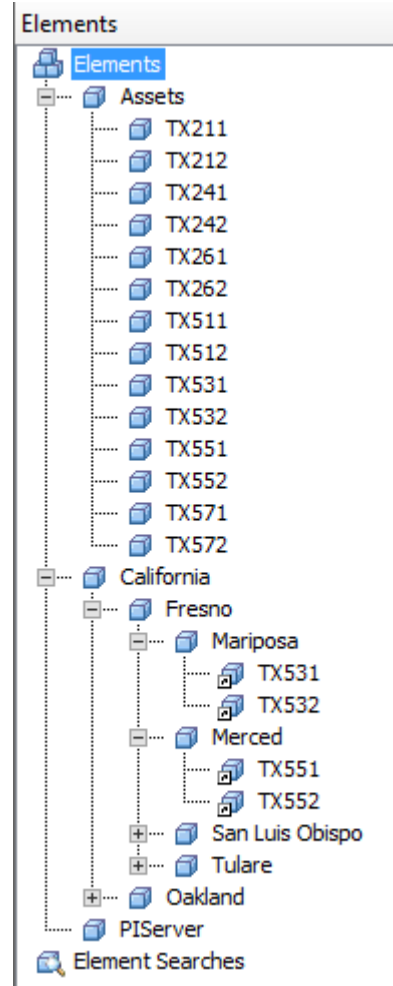
Look for one or two business cases to define:

- Critical assets
- Data sources of
  - Time series
  - Meta data
  - Structure
- Responsibilities for maintenance
- Workflow for changes



# Designing the hierarchy

- Group by geography or business units
- Group by asset types
- Group by problems you need to solve
- Use references for different “views”





# Templates



## Used to define particular class of objects

- Definitions are used throughout the PI System
- Element, attribute, event frame, analysis, notification, etc.



## Can be used to auto-create PI Points

- Ensure PI Point naming consistency



## Template inheritance

- Further define relationships between assets
- Start small and grow as needed



# Elements and Attributes

## Elements

- Physical object
- Logical entity
- E.g. Pump, motor, California, New York, etc.

## Attributes

- Element properties
- E.g. Temperature, pressure, flow, manufacturer, model name, etc.

## Data and data references

- Static data
- Data references
  - Analysis, Formula, PI Point, PI Point Array, String Builder, Table Lookup, URI Builder

Well1

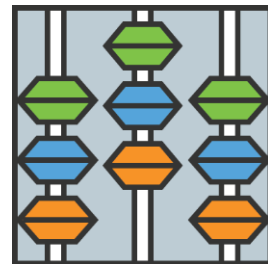
General Child Elements Attributes Ports Analyses Version

Filter

	Name	Value
Category: Location		
	Latitude	31.8633 °
	Longitude	102.3656 °
Category: Power Consumption		
	Power Consumption	56.0296424692635 kW
Category: Pressure		
	Bottom hole pressure	8566.92281345228 psia
	Casing pressure	1674.35956852248 psia
	Line Pressure	1293.01026221039 psia
	Tubing pressure	1205.05609722112 psia
Category: Production		
	30 Day Production Total forecast	261371.060310946 Mscf
	IP	830 mscfd
	P30	21073.7592401507 Mscf
	P60	42037.2686356412 Mscf
	P90	62993.2170116624 Mscf
	P180	125900.79756186 Mscf
	Production Rate	652.232350852449 mscfd



# Analyses



- 150+ built in functions
- Use variables in expressions for readability
- Scheduled analyses should write outputs to PI Points
- Ensure PI Analysis Service has proper security
- Use templates for standardization and scalability
- Preview/test/export for flexible deployment
- Backfill and Manual recalculation

# Event Frames (EF) and notifications

- Use EF to define important events for assets
  - Batch processes
  - Start-ups and shutdowns
  - Shifts & crew shift reports
  - Tests on operating equipment (e.g. well tests)
  - Downtime, curtailment, production loss tracking
- Use templates for standardization and scalability
- Notify at start and end of events



# Best Practice



- Only model what you have understood
- Only invest in resources if you have the use case



Don't try to boil the ocean or find theory of everything !

# Some Best Practices



## Organize your hierarchy

- Elements of the same type at each level
- Use industry standards for your hierarchy
- Use traits such as Hi/Lo, Geolocation

## Use templates

- Easier maintenance
- Dimension for BI analyses and reports

## Use categories

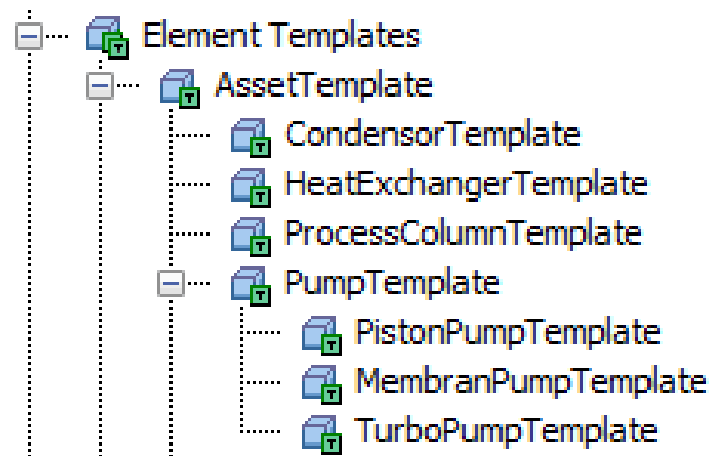
- Elements, attributes, analyses, notification rules
- Easier searches
- Easier maintenance
- Dimension for BI analyses and reports



# Some Best Practices



- Use units of measure (UOM)
  - Critical for calculations and reporting
- Build separate “views” based on needs
  - Weak references
  - Search on these views
  - Linking elements, attributes
- Use inherited templates



# Some Best Practices

- Use enumerations
  - Minimize mistakes
- Use distinct element names
  - Less confusing
  - Easier reporting
- Keep relation data in relational database
  - Use AF tables
- Add as much context as possible so all clients would benefit

**ControllerMode**

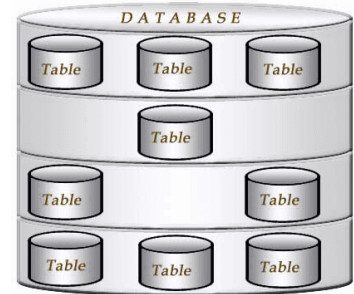
General

Name:

Description:

☐ Hexadecimal [Security](#)

	Value	Name	Description
	0	Manual	Manual Mode
	1	Auto	Automatic Mode
	2	Cascade	Cascade Mode
▶	3	Program	Program Mode
	4	Prog-Auto	Automatic Program Mode
*			



# More Tools

## Moving or copying

- XML import/export
- CSV import/export

## Define relationships

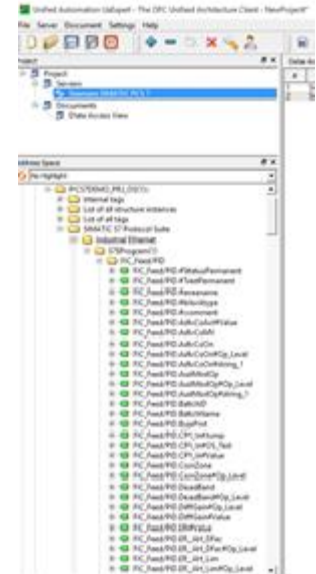
- Use reference types
- Parent/Child, Composition, Weak
- Adds another level of context

## Mass edits

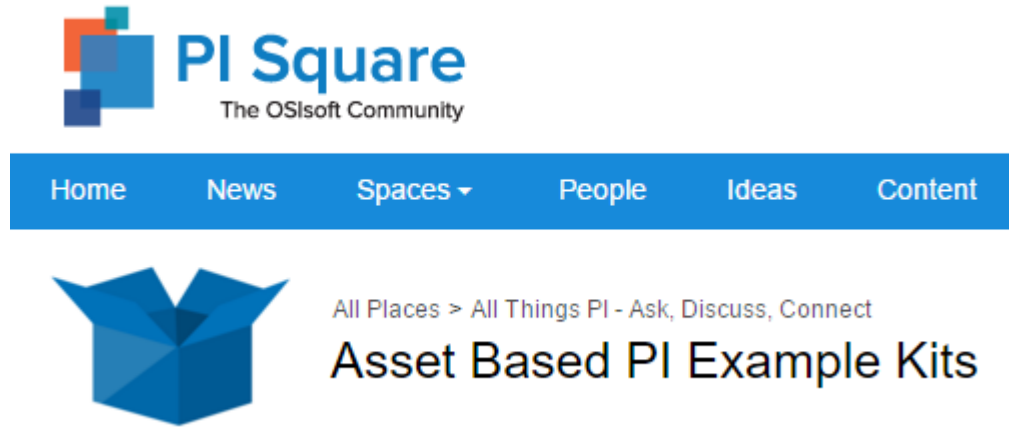
- Use PI Builder
- Avoid single instances – use templates

## Leverage other PI System components

- Use PI Connectors to replicate known source systems



# Need Example to get Started?



- Customer examples - <http://www.osisoft.com/templates/presentation-list.aspx?id=1818>

# Deployment and Architecture

- Segregate PI Data Archive, AF Server, SQL Server and PI Analysis Service based on performance and IT requirements
- Be aware of SQL Server Express limitations
  - Single threaded
  - Limited DB size
  - Limited RAM
  - No AF audit tables
  - No High Availability



# Deployment and Architecture

- Factors affecting performance
  - Network latency between client and server
  - SQL Server
    - More **RAM**
    - Fast disks (IOPS)
- Data access
  - AF Server never talks to PI Data Archive
  - Optimize client to server connection





# Deployment and Architecture

- Load balanced AF Server with SQL Server Always-On is preferred HA solution
- Windows Clustering for PI Analysis Service and PI Notifications Service



# What's new in 2016 and 2016 R2

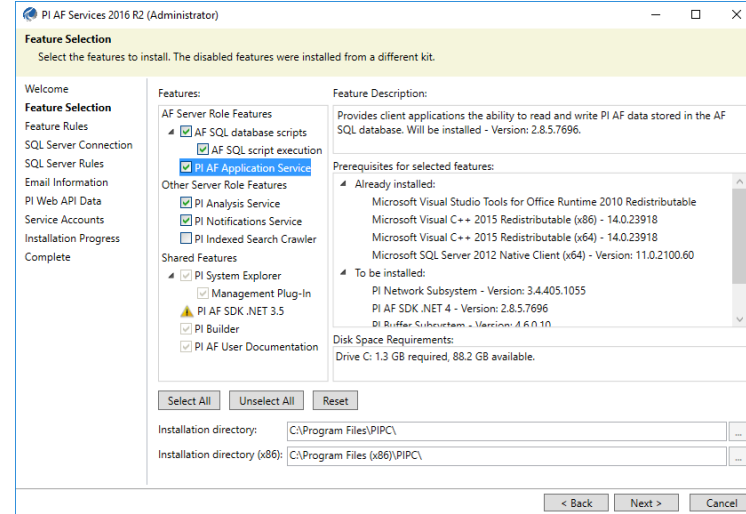
# Notifications

- Complete rewrite of notifications
  - Based on event frames
  - Scalability and performance
- Released with PI AF 2016 R2



# Manageability

- Integrated Services install
- PI Builder support for notifications
- Microsoft SQL Server 2016 support



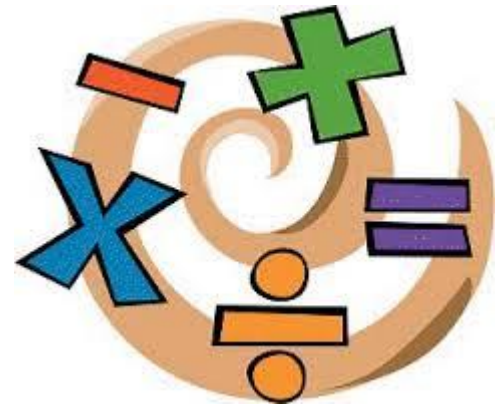
# Elements, attributes and event frames

- Well defined traits for attributes
  - Limits
  - Forecasts
  - Geolocation
- Element annotations
- Event frames enhancements
  - Severity
  - Acknowledgements
  - Annotations



# Analytics

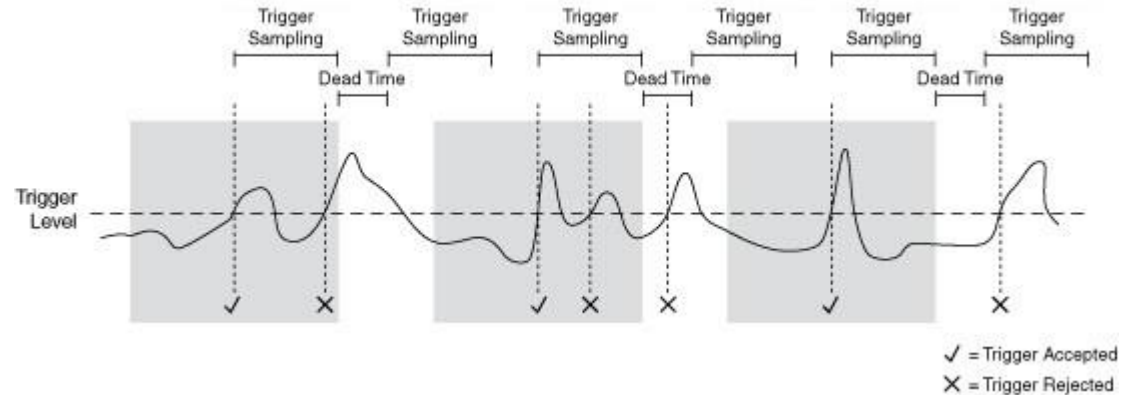
- Manual recalculation via PI System Explorer
  - Programmatic access via AF SDK
- Windows Clustering support for PI Analysis Service
- SQC – Western Electric Rules





# Event Frame Generation Analyses

- More flexible triggering options
  - Multiple start triggers
  - Individual time true
- Assign severity



# Performance Improvements

- New search methods in AF SDK
- Data Access
  - Asynchronous data access calls  
Replace/Delete events over a time range
  - Bulk retrieval for an array of timestamps  
and a mode
- Reduced Memory usage in client



# Product Booth

**Product Manager  
Developers  
Demo  
Q&A**



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## Questions

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

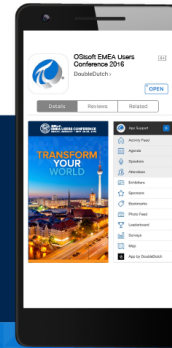


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감사합니다

谢谢

Danke

Merci

Gracias

Thank You

ありがとう

Спасибо

Obrigado



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