
REAL-TIME PERFORMANCE MANAGEMENT FOR THE ENTERPRISE
RtPM
SAN FRANCISCO PHILADELPHIA HOUSTON FRANKFURT
OSISOFT USER CONFERENCES 2005
REAL-TIME PERFORMANCE MANAGEMENT FOR THE ENTERPRISE
RtPM

Foundation

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Survey the Audience

Question 1

- What was the score when you left the baseball game last night?
  - 2 - 1
  - 4 - 1
  - 6 - 1
  - 8 - 1
  - What game?

Question 2

- If you build displays or spreadsheets, how many PI servers do they connect to?
  - 1
  - 2
  - 3
  - 4
  - 5
  - More than 5

Question 3

- Do you build applications using RtPM?:
  - Yes, through programming
  - Yes, through configuration
  - Yes, with both programming and configuration
  - I don’t build applications

Question 4

- When I build RtPM applications, I most frequently use:
  - Performance Equations and Totalizers
  - Advanced Computing Engine (ACE)
  - ProcessBook and VBA
  - DataLink (Excel)
  - AF Analysis Rules

Last Question

- Do you link PI data to non-PI data today?
  - Yes, through ODBC DataSets in ProcessBook
  - Yes, through RtWebParts and RtBaseline Services
  - Yes, using PI OLEDB within SQL Server or Oracle
  - No
  - I want to, but I'm not sure how

Results?

We will revisit the survey at the conclusion

Outline

- Architecture
- Motivation
- Foundation solution approach
- Business solution example
- Summary

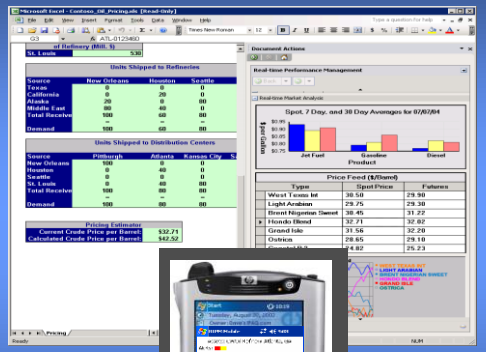
What We Want You to Know

An evolution of RtPM platform to help you provide more value from PI

- Foundation is a configurable:
  - Logical enterprise asset model
    - Include relationships between the assets
  - Way to organize and access all data, whether stored in PI or not
- Foundation:
  - Facilitates agile, incremental projects
  - Extends reach of RtPM-based solutions to include external assets and data

RtPM Platform Functional Description

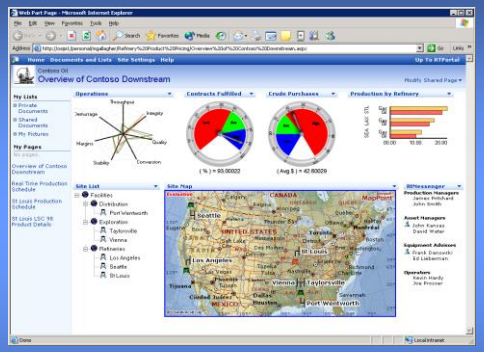
RtPortal



OSIsoft ProcessBook

Microsoft Office

OSIsoft DataLink



Microsoft Office SharePoint Portal Server 2003

Microsoft Office Live Communications Server 2005

MapPoint Web Service

RtAnalytics

Microsoft Visual Studio .net

OSIsoft ACE

SQL Server Analysis /BI

OSIsoft Sigmafine

RtBaseline

Foundation

Unified Aggregation for Time Series and Non Time Series Data
Public Service Oriented Architecture

Microsoft .net

A single, unified data collection, reference, and storage platform

Enterprise Level

Microsoft Windows Server 2003

OSIsoft

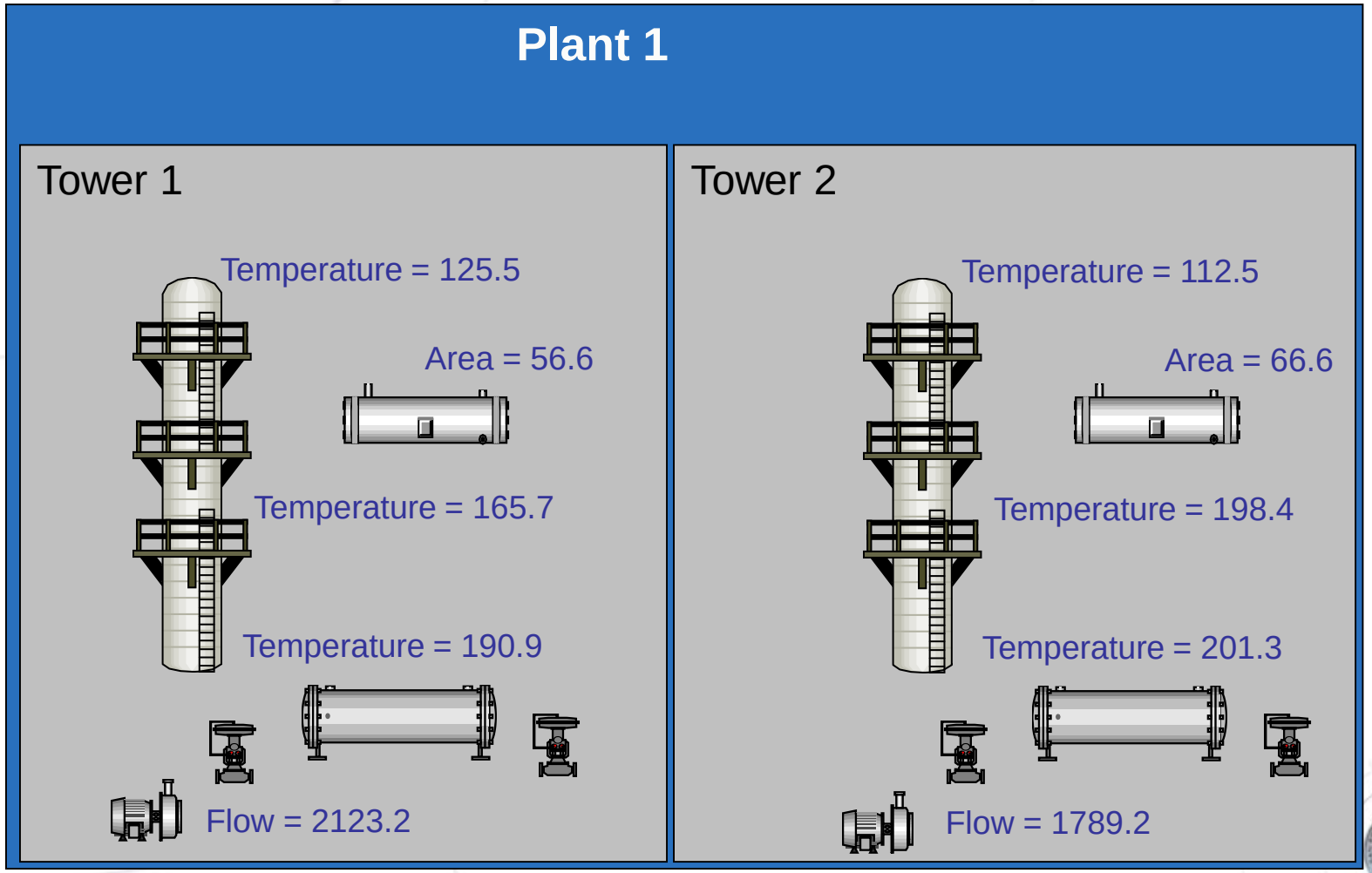
DATA INTEGRATION

Microsoft SQL Server 2000

Real-time Data and Events

Context Database

Organizing a variety of data in a way that helps you solve problems



Motivations for Foundation

- PI System Scalability
- Context
- Foreign Data
- Logical Asset Model
- External Asset Models
- Unification of Data

Motivation: Scalability

- PI scales to over 4 million points
  - This represents a huge accomplishment
  - Users can expand application of PI
  - Track more processes
  - Track more information about processes
- However:
  - How do you organize points?
  - How do you find information?
  - Do supporting functions scale accordingly?
    - Batch Database
    - Asset Database
  - How is this information ***put into context*** ?

Motivation: Context

- A working definition of context:

  The set of information needed to define an appropriate subset of data from all available data to solve a business problem.

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  The set of information needed to define an appropriate subset of data from all available data to solve a business problem.

  - For a trivial problem, context may be simple
    - What was the temperature over the last shift?

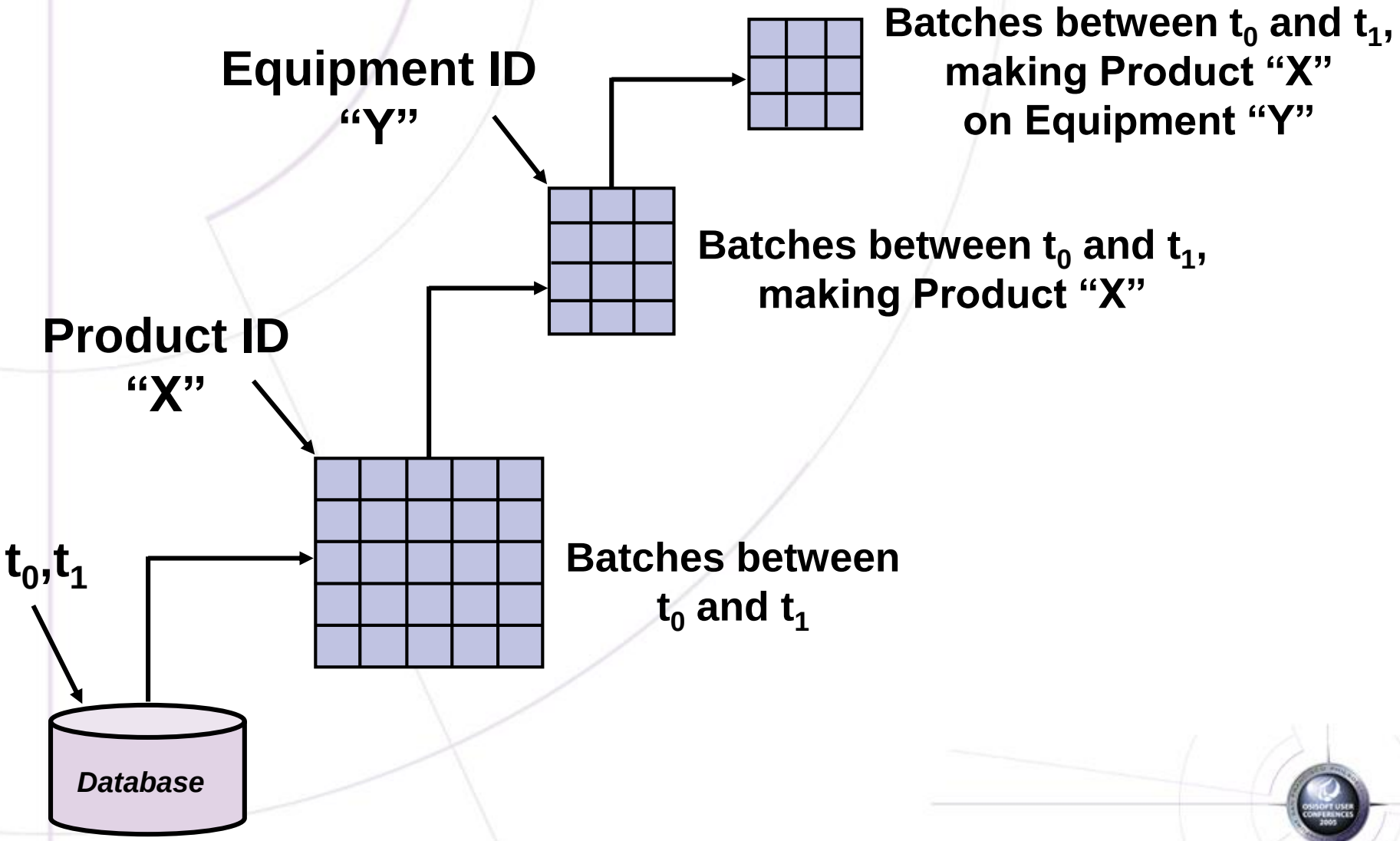
Motivation: Context

- A working definition of context:

  The set of information needed to define an appropriate subset of data from all available data to solve a business problem

  - For a simple problem, context may be simple
    - What was the temperature over the last shift?
  - For a difficult problem, context might be significant and come from a variety of sources
    - Are we scrapping product “X” because of inadequate training of lab technicians?
      - Requires HR and LIMS data

Applying Context



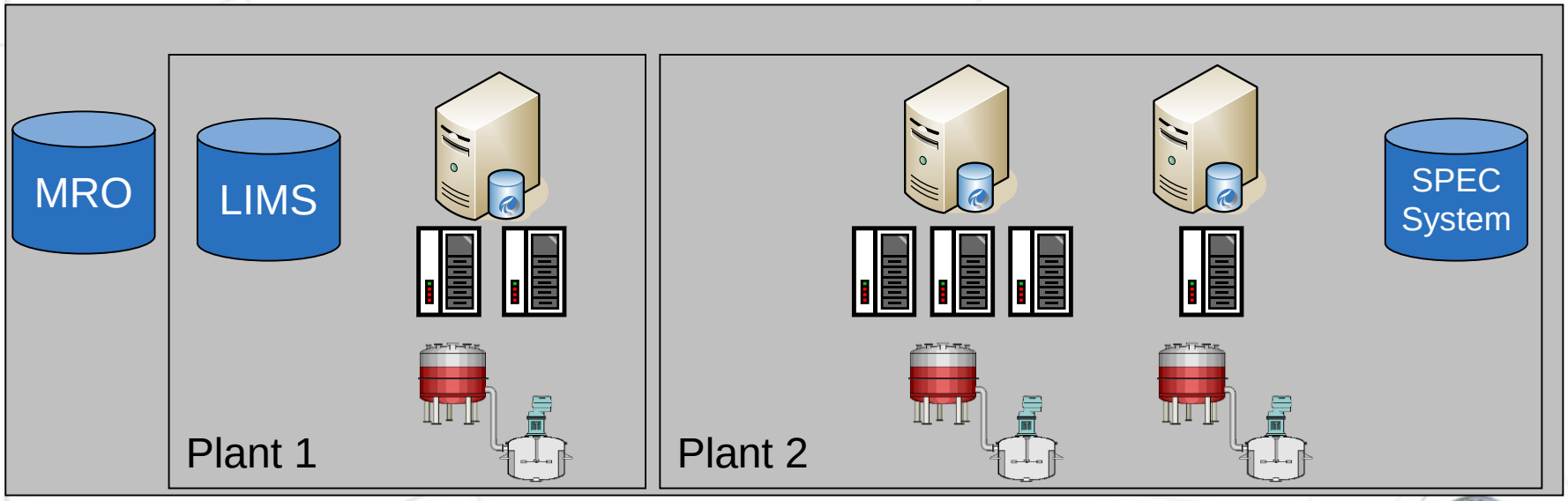
Motivation: Data from Other Systems

Leveraging non-time series data provides value

- ERP – HR
- ERP – Inventory
- Asset Management
- MES
- LIMS
- ProcessPoint
- Document Management
- Planning
- Inventory Management
- Supply Chain
- Other
  - Bill of Lading, Batches (e.g. from PI Batch)

Motivation: System Data Model

- Model of the Data in the systems
- Focuses on where the data is stored within systems
  - What application server stores the data?
  - How does the application server store it?



Motivation: System Data Model

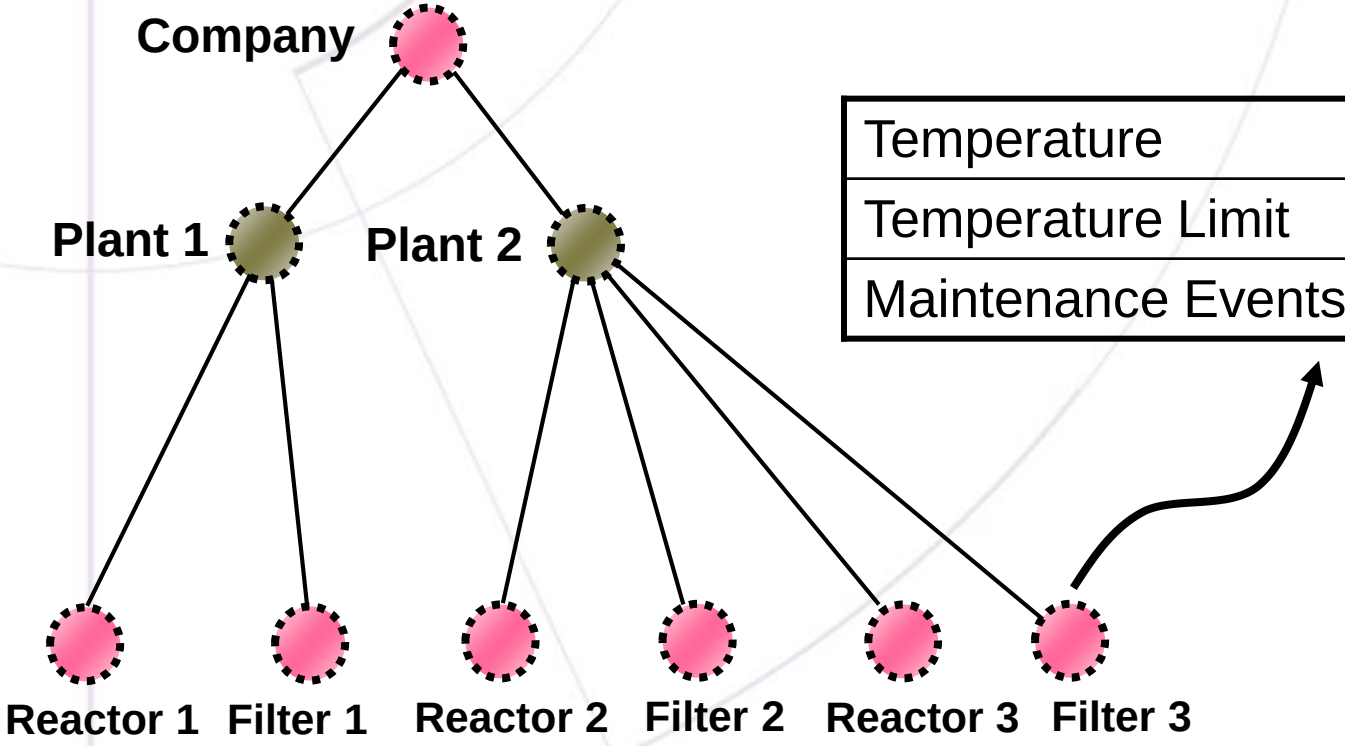
- System data model
  - How does the application retrieve the data?
    - Such as:
      - **\\north_pisvr\tmp125.hh**
    - Or:
      - `select value from limit where fkAttr in (select pk from attribute where name like 'temperature%' and limittype = 3)`
  - An understanding of all necessary data access methods is required

Motivation: Logical Data Model

- Asset model
  - Assets are representations of physical resources
  - Allows association of data with a physical resource
    - To which tank is a level measurement logically associated?
  - For example:
    - Plant1.Reactor1.Temperature.HighLimit
  - An understanding of the process is required

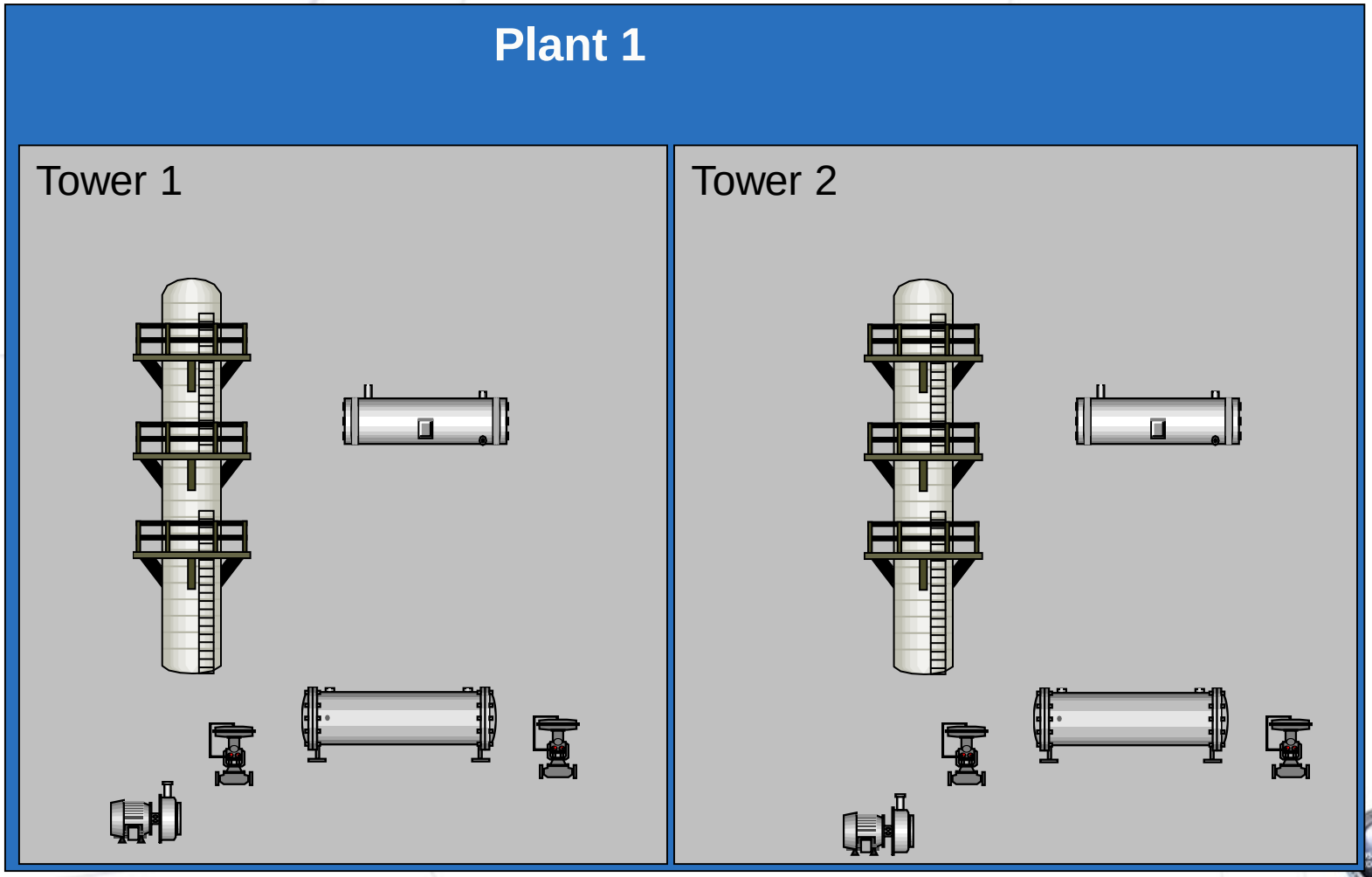
Motivation: Logical Data Model

- A logical representation of physical assets



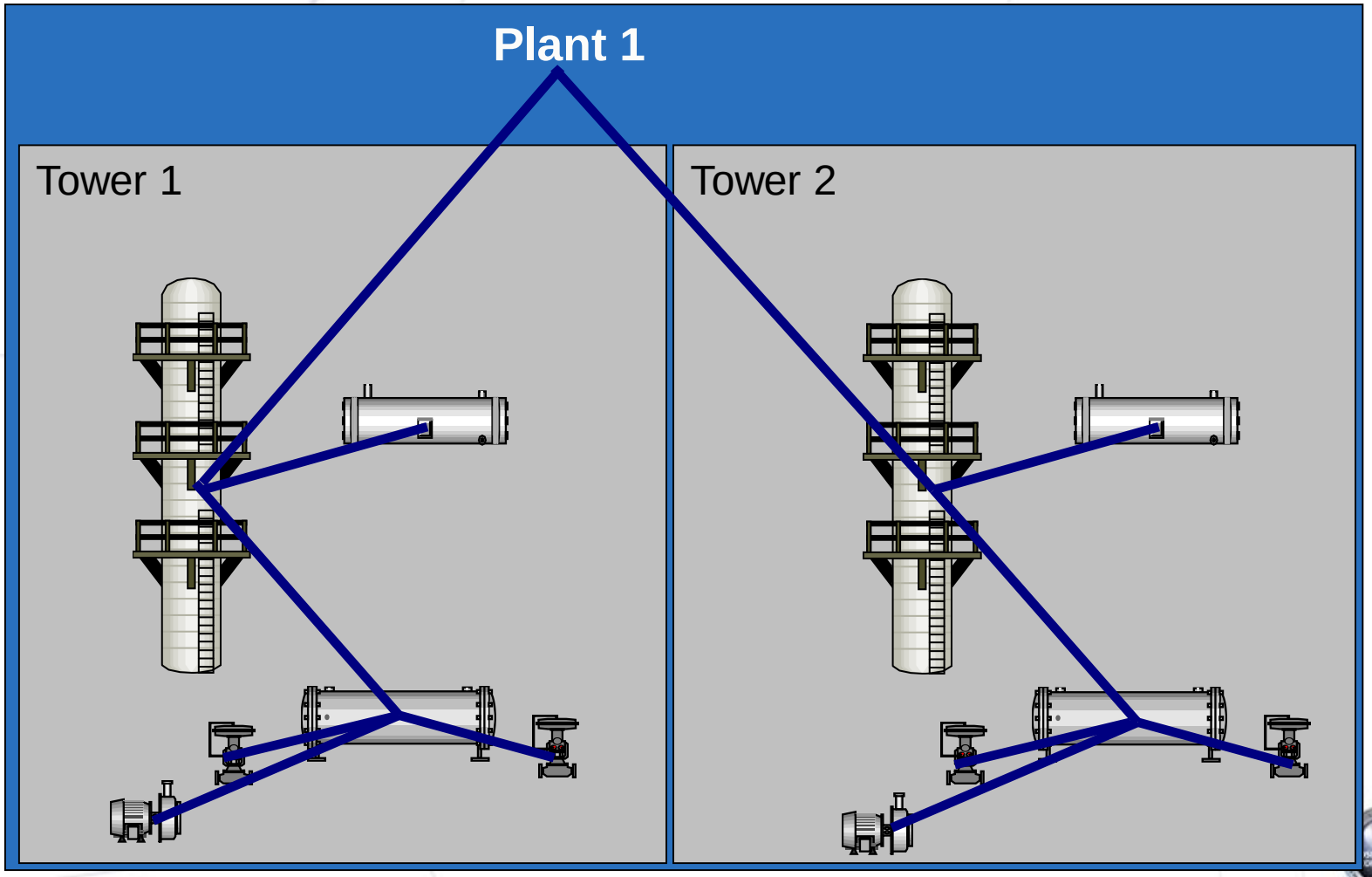
Temperature	PI Point
Temperature Limit	Database
Maintenance Events	Web

Flexible Asset Model



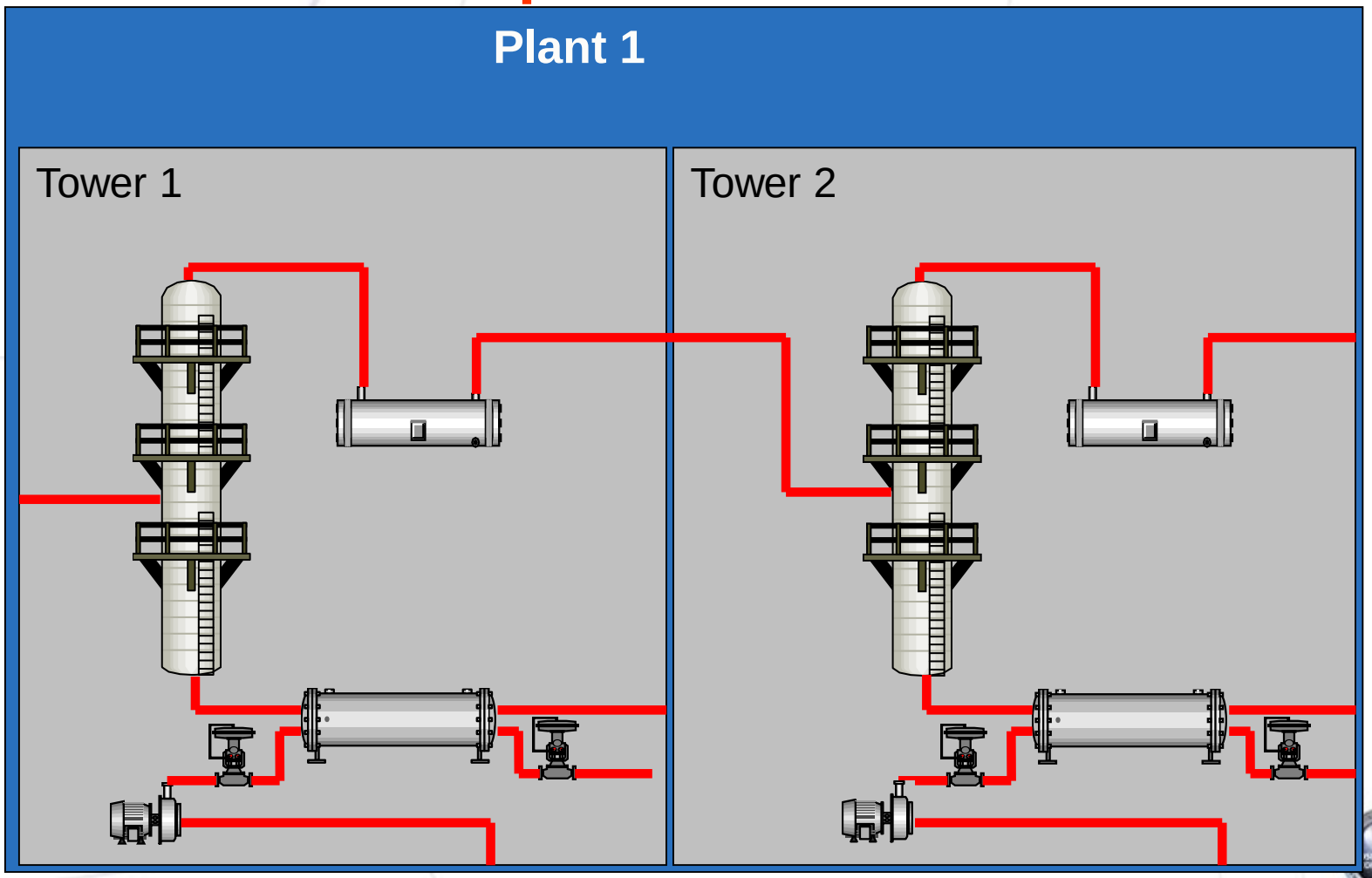
Flexible Asset Model

Hierarchical Relationships



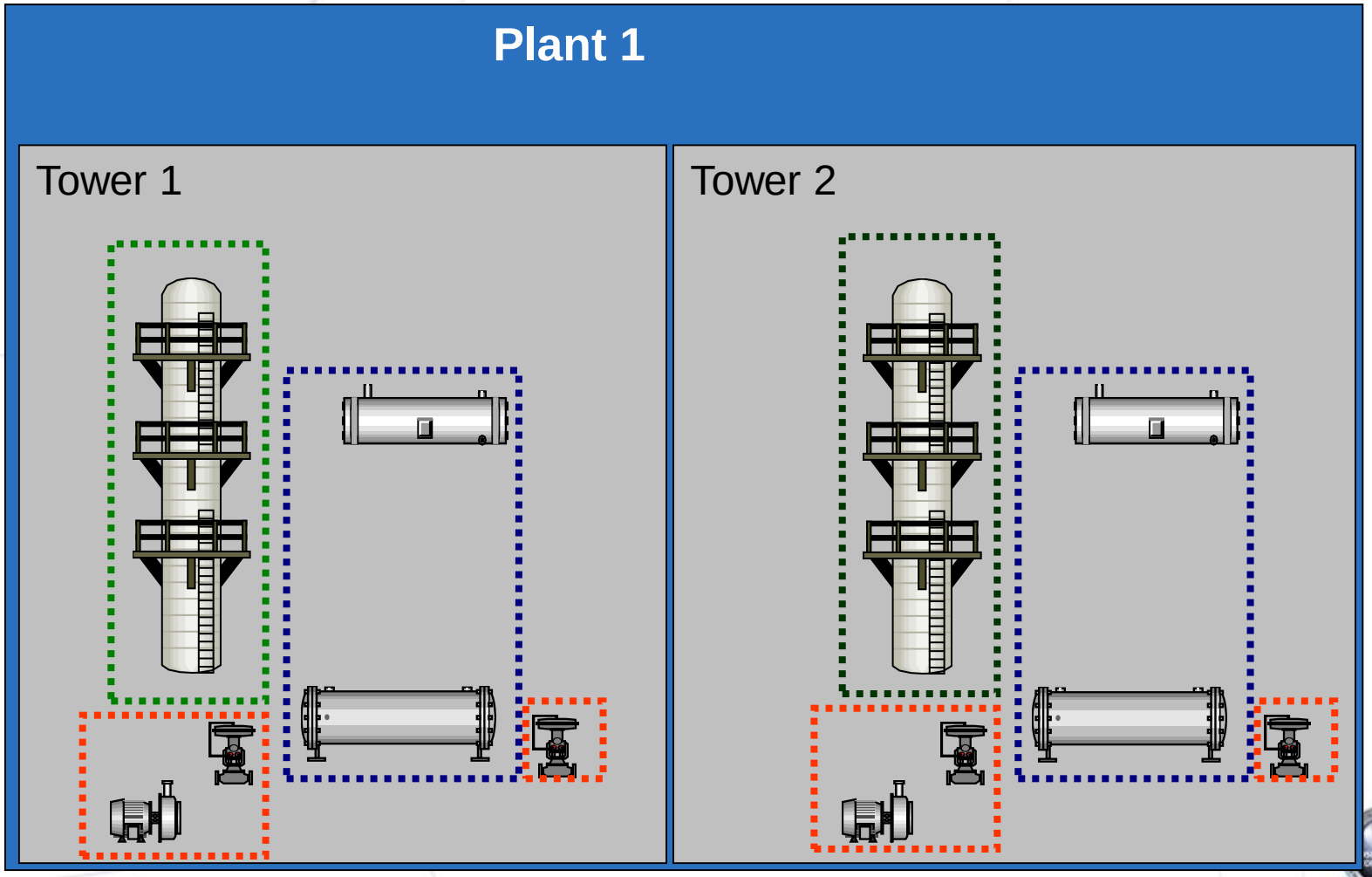
Flexible Asset Model

Flow Relationships



Flexible Asset Model

Role Relationships



Foundation Is:

- A logical enterprise asset model
- Relationships between the assets
- Associations to
  - Data we own
  - Data we don’t own

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- A logical enterprise asset model
- Relationships between the assets
- Associations to
  - Data we own
  - Data we don’t own

- Includes powerful tools to enable creation of business solutions
- Visibility and exposure throughout our product line
- A way of achieving “one version of the truth”

Motivation: Evolution of Existing Technologies

- OSIsoft has experience at creating asset models
  - Analysis Framework
    - Flow relationships
    - Strongly typed templates
    - Data references
  - Module Database
    - Hierarchical relationships
    - History
    - Flexible modeling

Motivation: Evolution of Existing Technologies

- Merging and extending to an enterprise asset model
- Doing this in a way that protects your investment
  - Your data will be migrated
  - Your code will still run against existing SDKs
  - You can choose when to use Foundation

Motivation: External Asset Models

- Other asset databases exist
  - SAP
  - Oracle/PeopleSoft/JD Edwards
  - MRO Maximo
- Each has a logical representation of physical assets
- Any of these may be authoritative in different locations

Motivation: External Asset Models

- Standards exist to facilitate data exchange between asset databases
  - MIMOSA
    - Model of physical equipment
  - ISA S95
    - Model of information systems interaction
  - Both specify XML schema for exchange of data with other systems
- Moving XML documents not difficult
  - MS BizTalk, SAP XI, Vitria, etc.

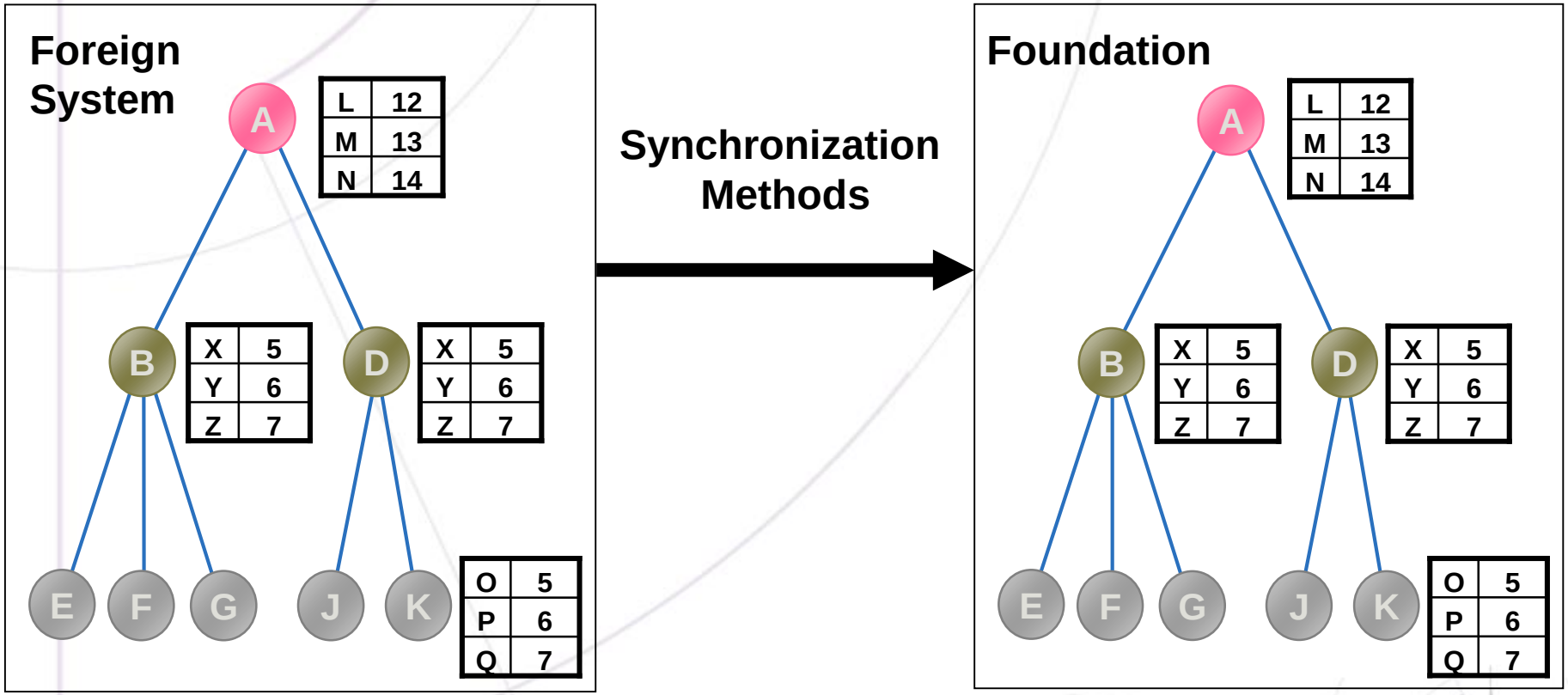
Motivation: External Asset Models

OSIsoft has a history of supporting standards

- OPC DA
- OPC HDA
- DDE
- ODBC
- OLE DB
- XML
- HTML
- SVG

Goal: Asset Synchronization

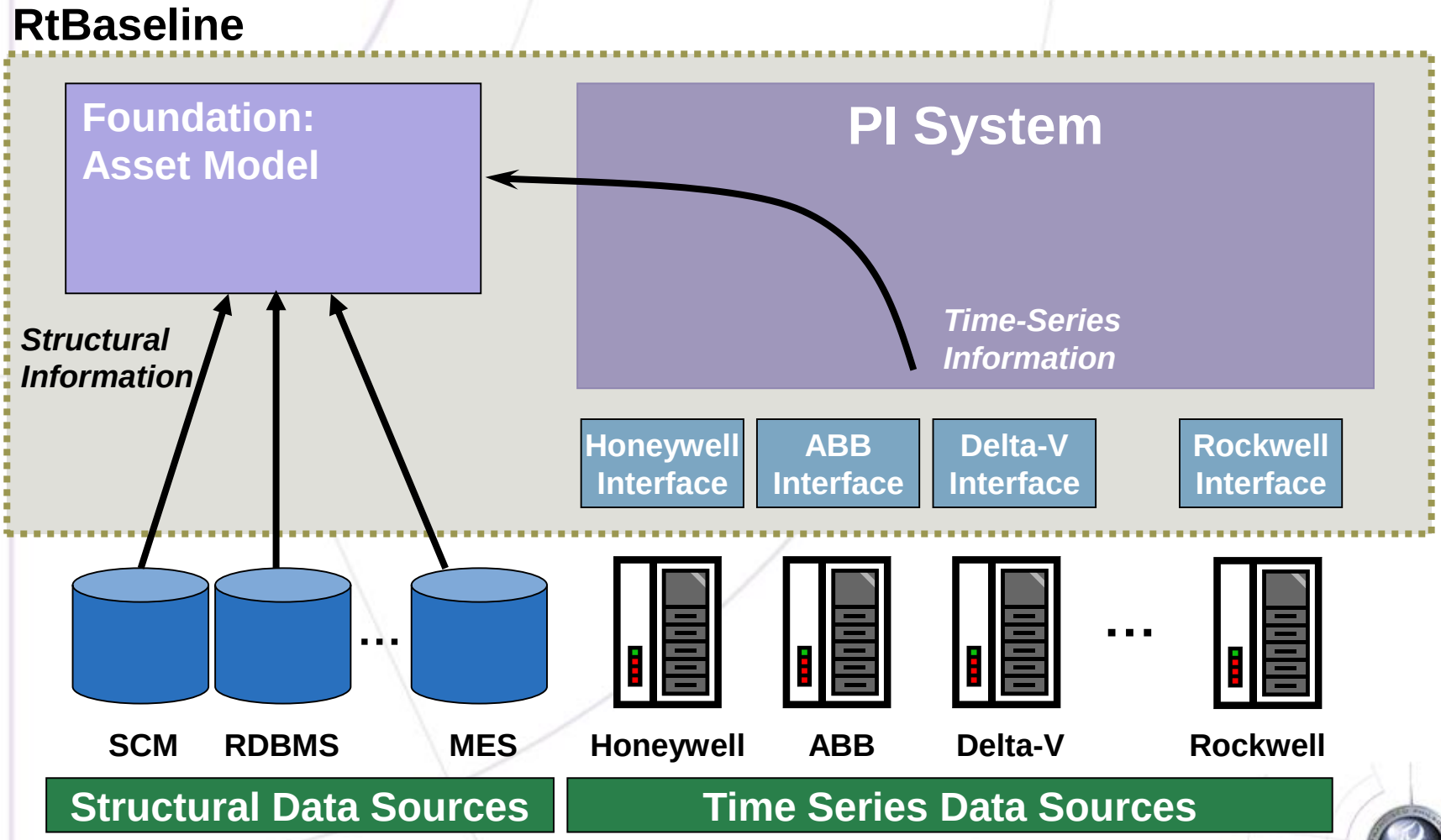
- Either by XML data exchange or real-time mapping



Motivation: Data Integration

- Current capability:
  - Organize time-series data into an asset model
- Evolving to support:
  - Organize foreign and structured data into an asset model
  - Define and organize complex data
    - Row Sets
    - Structures
    - XML Documents
  - Synchronize from an asset model in a foreign system
  - Reference all data via the asset names

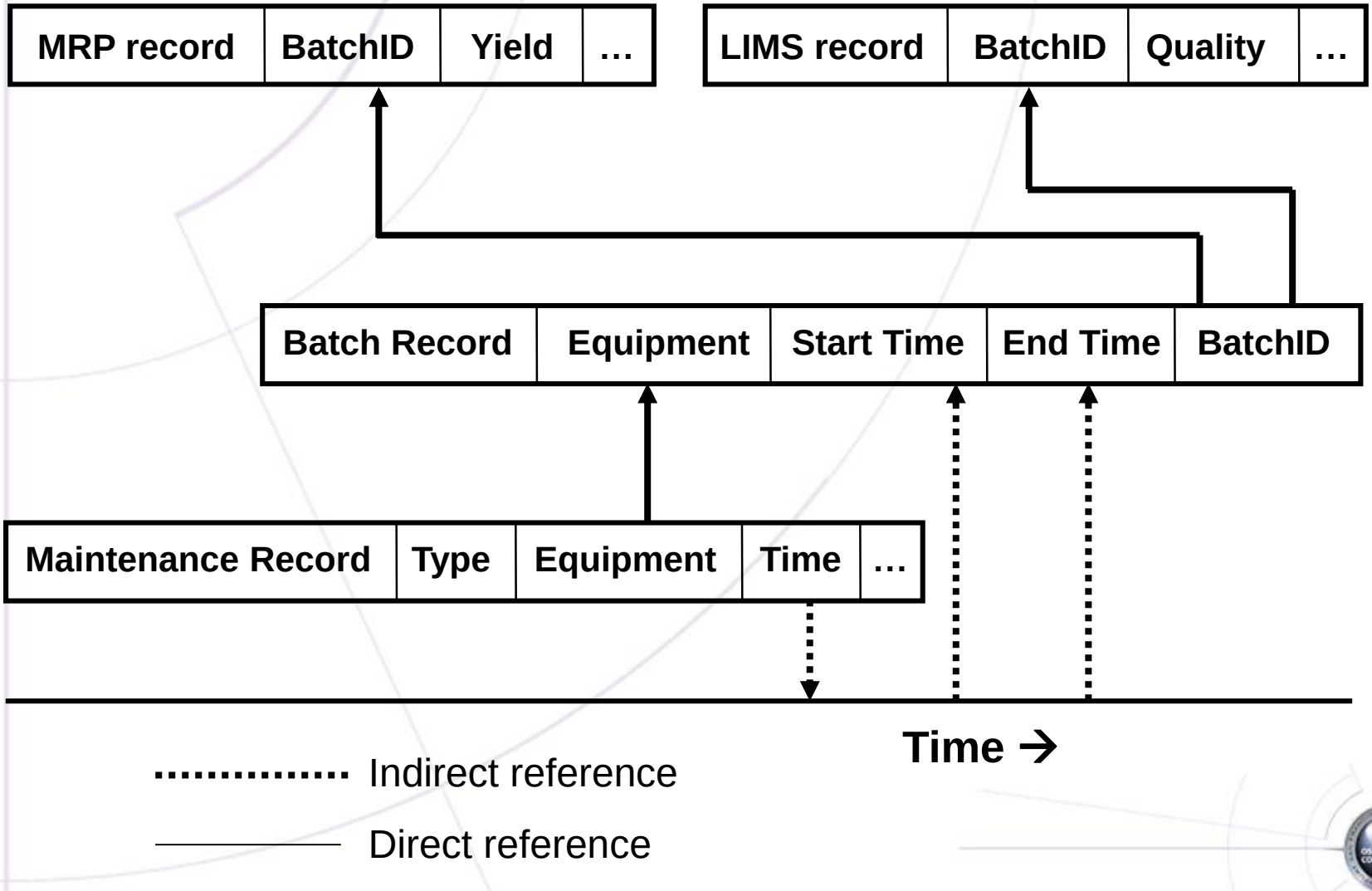
Motivation: Unification of Data



Example Problem: Data Aggregation

- Prove or disprove a process theory
  - Frequency of maintenance affects yield or quality
- Sources of information
  - **PI Batch:** **time-batch relationship**
  - **MRP:** **yield**
  - **LIMS:** **quality**
  - **Maintenance system:** **maintenance events**
  - **PI Archive:** **process information**
- Issue
  - To assemble this information takes significant effort

Example Problem: Data Aggregation



Logical Asset Model

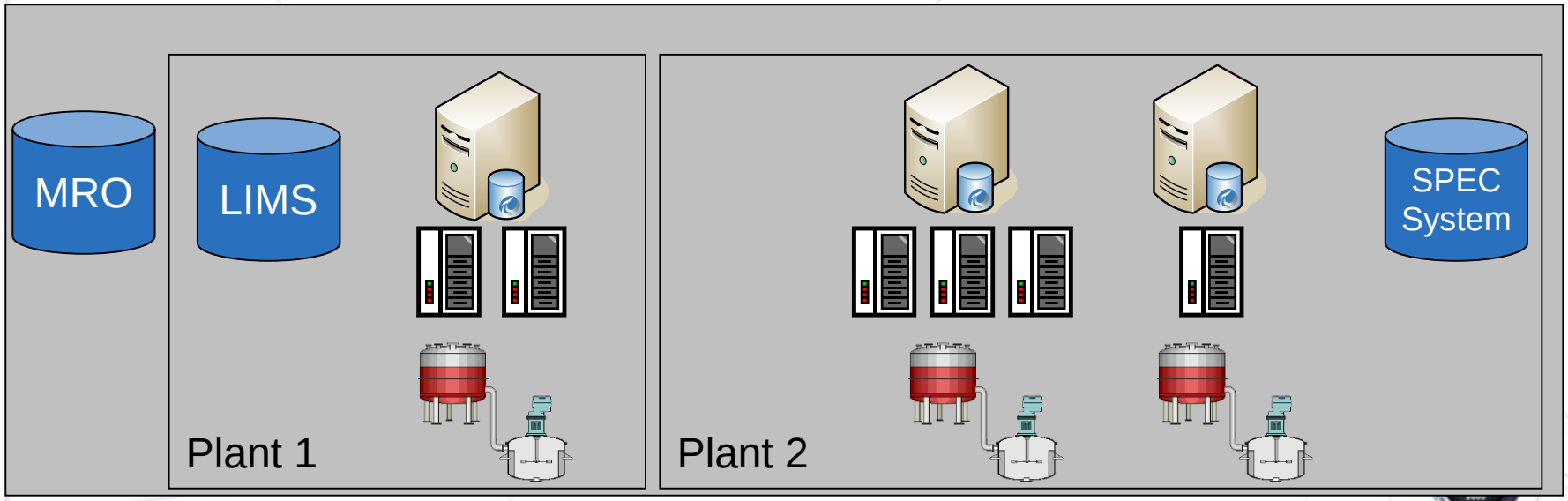
- Foundation provides the mapping from the data model to the asset model
- Primarily based upon existing technology (Analysis Framework)

Asset Model Exposes Data

- All data are exposed the same way
  - As attributes within the asset model
- Various rates of change
  - Time-series (changes often)
  - Configuration (changes infrequently)
- Varying complexity
  - Simple (real, string, etc.)
  - Complex (e.g. recordsets)
- Heterogeneous storage
  - OSIsoft archive or asset model
  - From another system

Enterprise-wide Scope

- Evolving the Asset Model to apply to one PI server or many
- Hides the differences
  - Control Systems are different
  - Inconsistent tag naming
  - Plant 1 has LIMS for managing quality specs
  - Plant 2 has a spec system for the same purpose
  - Maintenance system applies to all systems

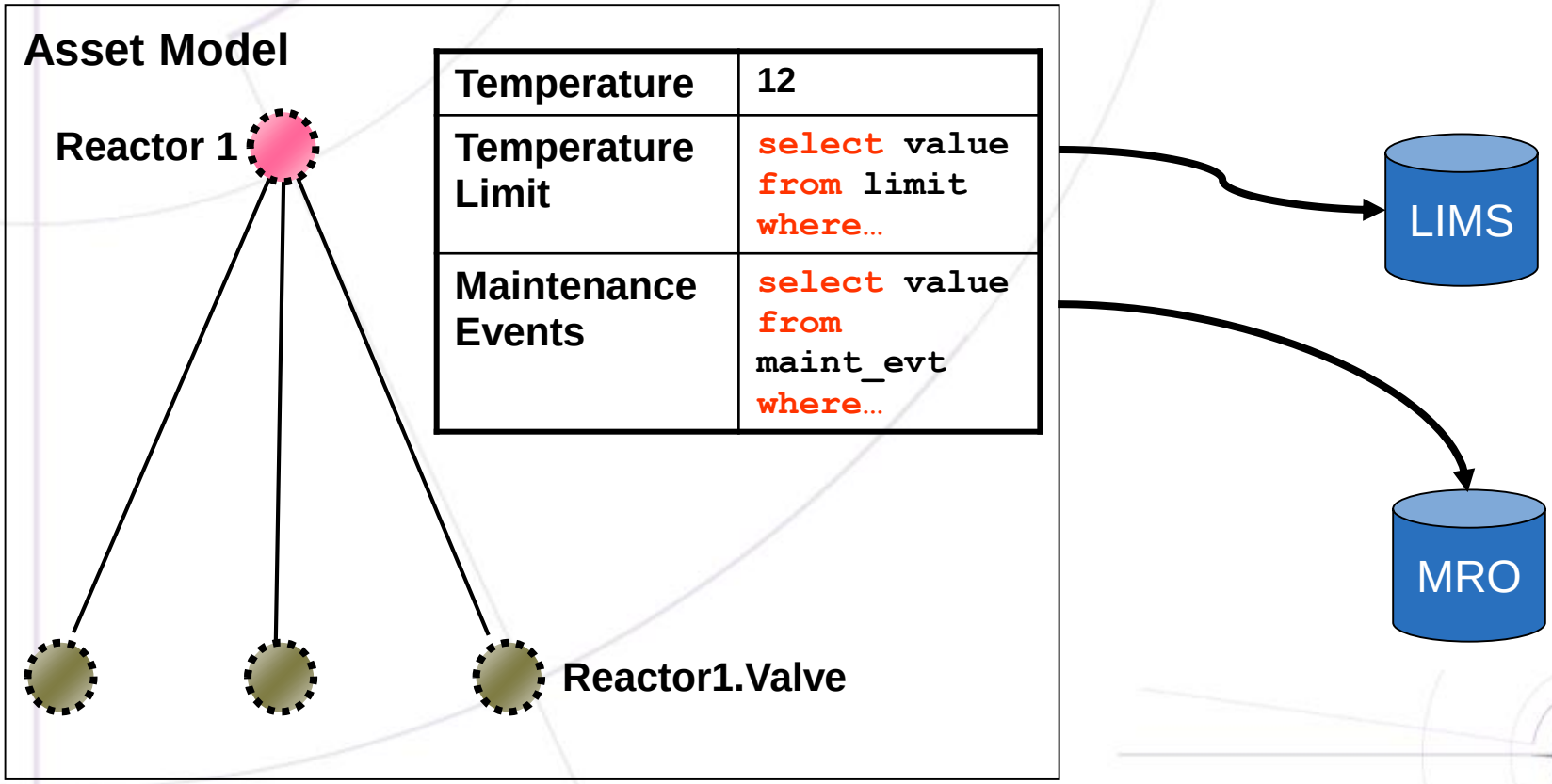


Migrate User Interfaces to Asset Model

- Access to data will be through the asset model
- For such user interface functions as:
  - Adding a value to a screen
  - Referencing a value in a calculation
  - Browsing the asset database
- Requires:
  - A very flexible asset model
  - Good tools for building the asset model
- Results:
  - You are not required to know source of data
  - Universal context engine for all data types

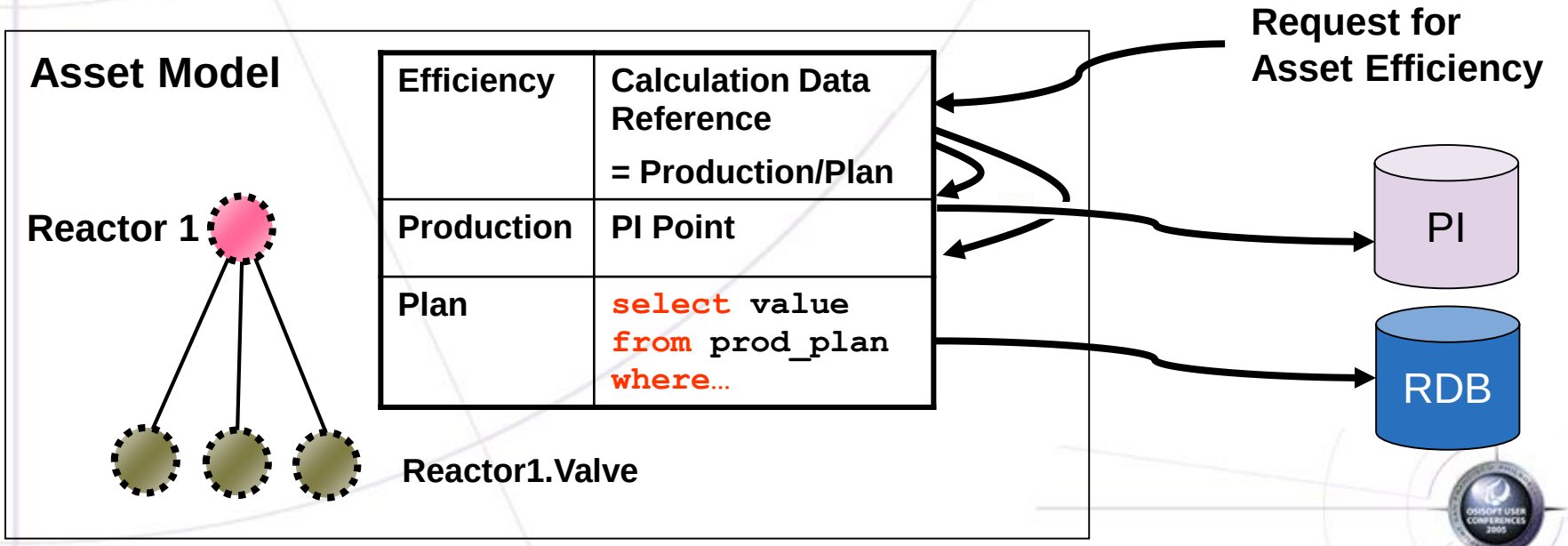
Features: Data References

- Allows mapping of an attribute to a foreign system
- Honors other systems of reference



Features: Data References

- Invoke a user-defined function on an asset
  - For example, an “asset efficiency” KPI
- Retrieve necessary asset attributes
  - Accessing attribute values can invoke user logic as well
  - Asset attributes are part of an asset template and apply to each instance of an asset



Web Services: Technical Philosophy

- The services must:
  - Work well within an SOA
  - Serve useful functions within a business process
  - Minimize number of calls for a logical service
  - Perform well, even if service operation spans systems
- Application to OSIsoft:
  - Re-implementing our PI API on the Web is not appropriate
    - However using contextual information from Foundation to refine data from disparate sources does perform a useful function
  - Foundation will make it easier to create interesting functions

Web Services: Example Service

- Invoke a user-defined function on an asset
  - For example, an “asset efficiency” KPI
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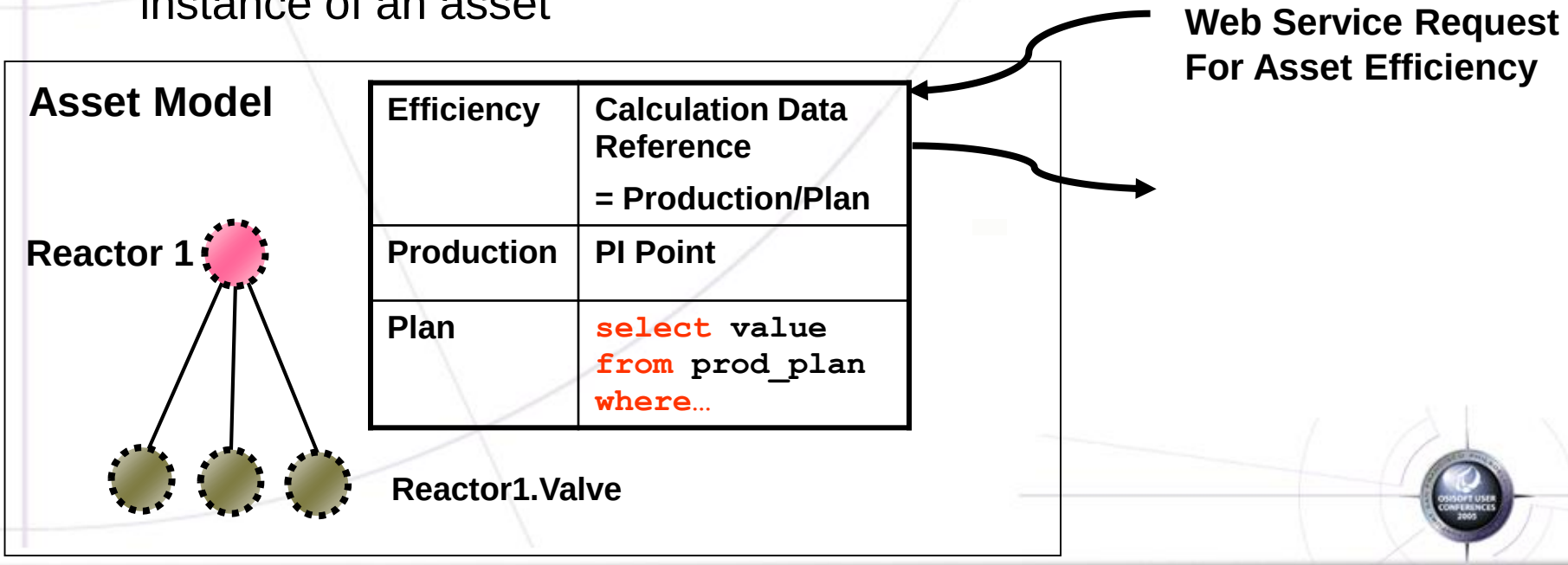
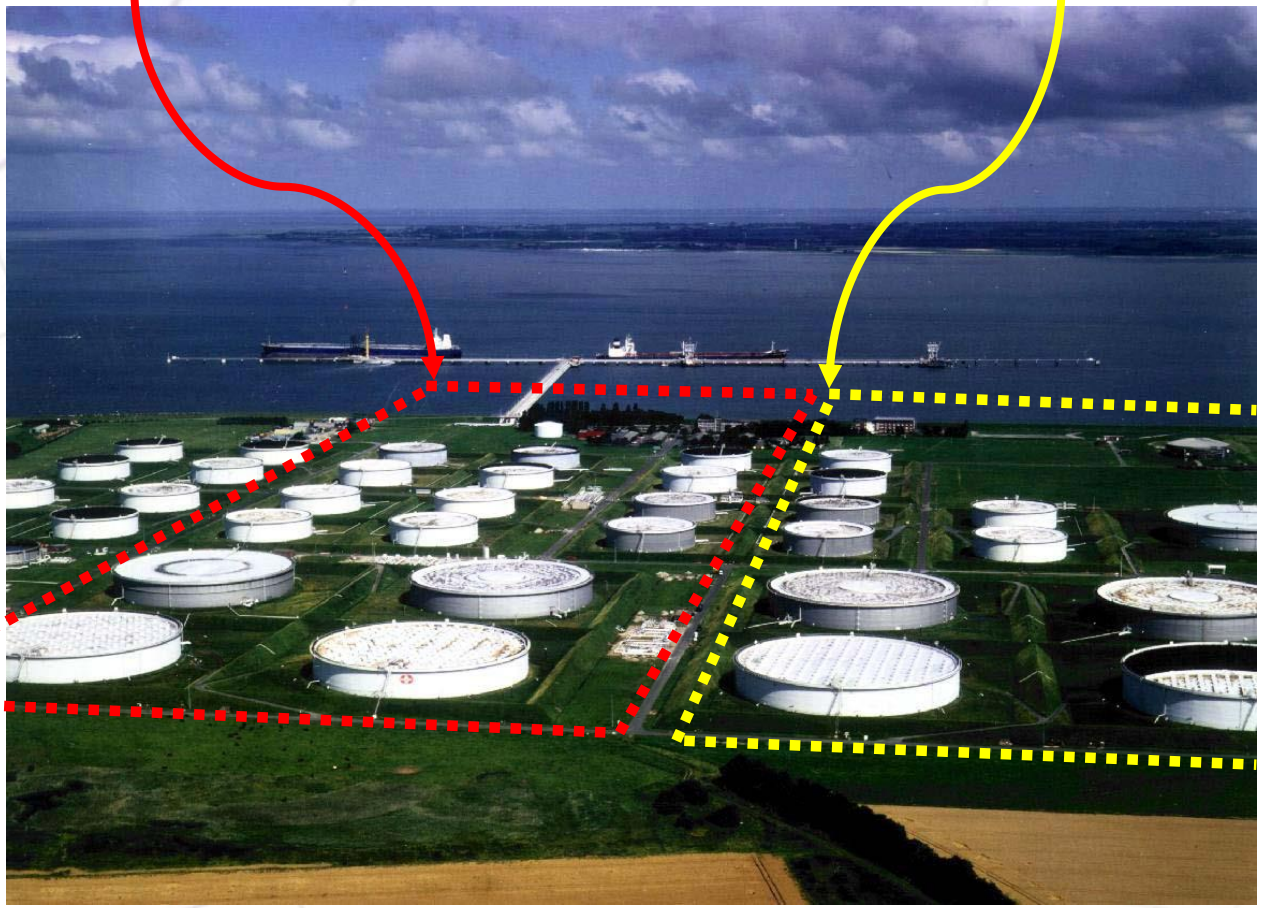


Apply Services to Assets

TankFarm1.AvailableProducts

TankFarm2.AvailableProducts



Features: Asset Type System

- The ability to create asset templates
  - For example, valves and pumps

Class:

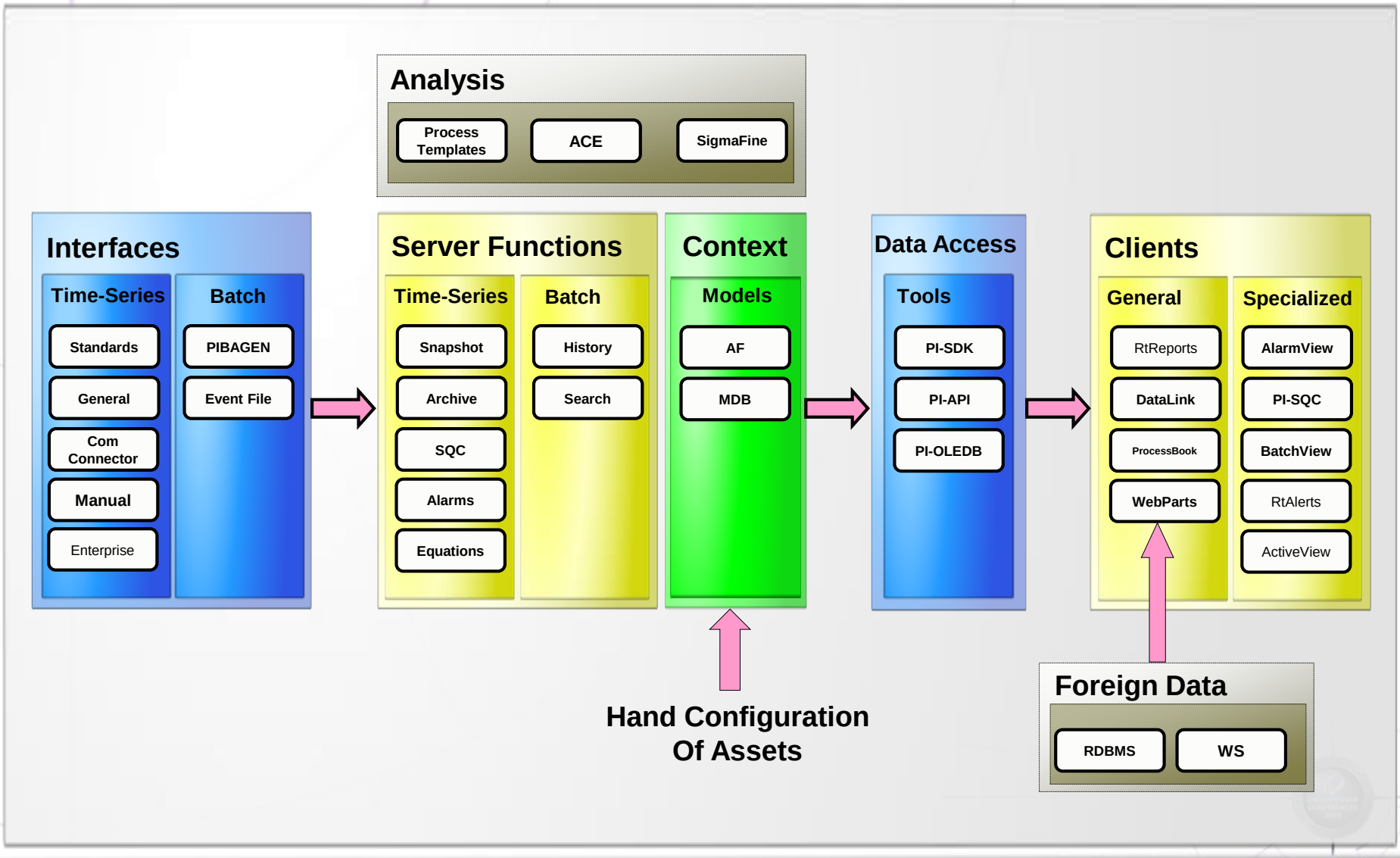
Name	Description	Configuration Item	Category	Value Type	Default Value	UOM	Data Reference
Cargo Type	Type of Ship Truck's Cargo	False		String		<None>	<None>
Empty Weight	Weight of the Ship Truck when Empty	False		Single	0 lb	pound (lb)	<None>
License Number	License Number of Ship Truck	True		String		<None>	<None>
Volume	Maximum Cargo Volume of Ship Truck	False		Single	0 US gal	US gallon (US gal)	<None>
		False			—		

Instance:

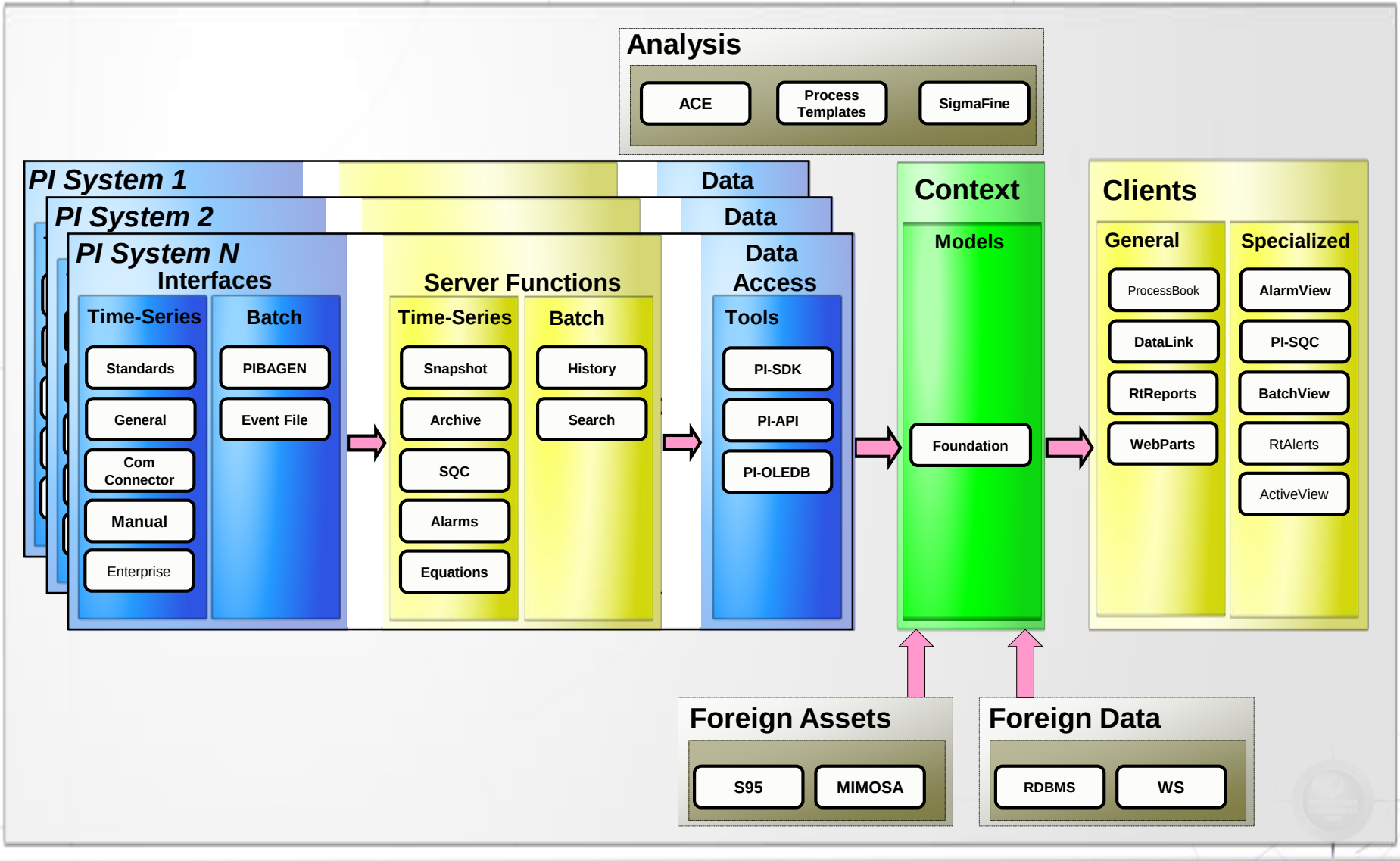
Name	Value	Value Type	Data Reference	Settings
Cargo Type	Chocolate Milk	String	<None>	
Empty Weight	2500 lb	Single	<None>	
License Num...	JKL 217	String	<None>	
Volume	1200 US gal	Single	<None>	

- Allows rapid deployment, easy management of the asset model

RtPM Platform Review…Today



RtPM Platform after Foundation



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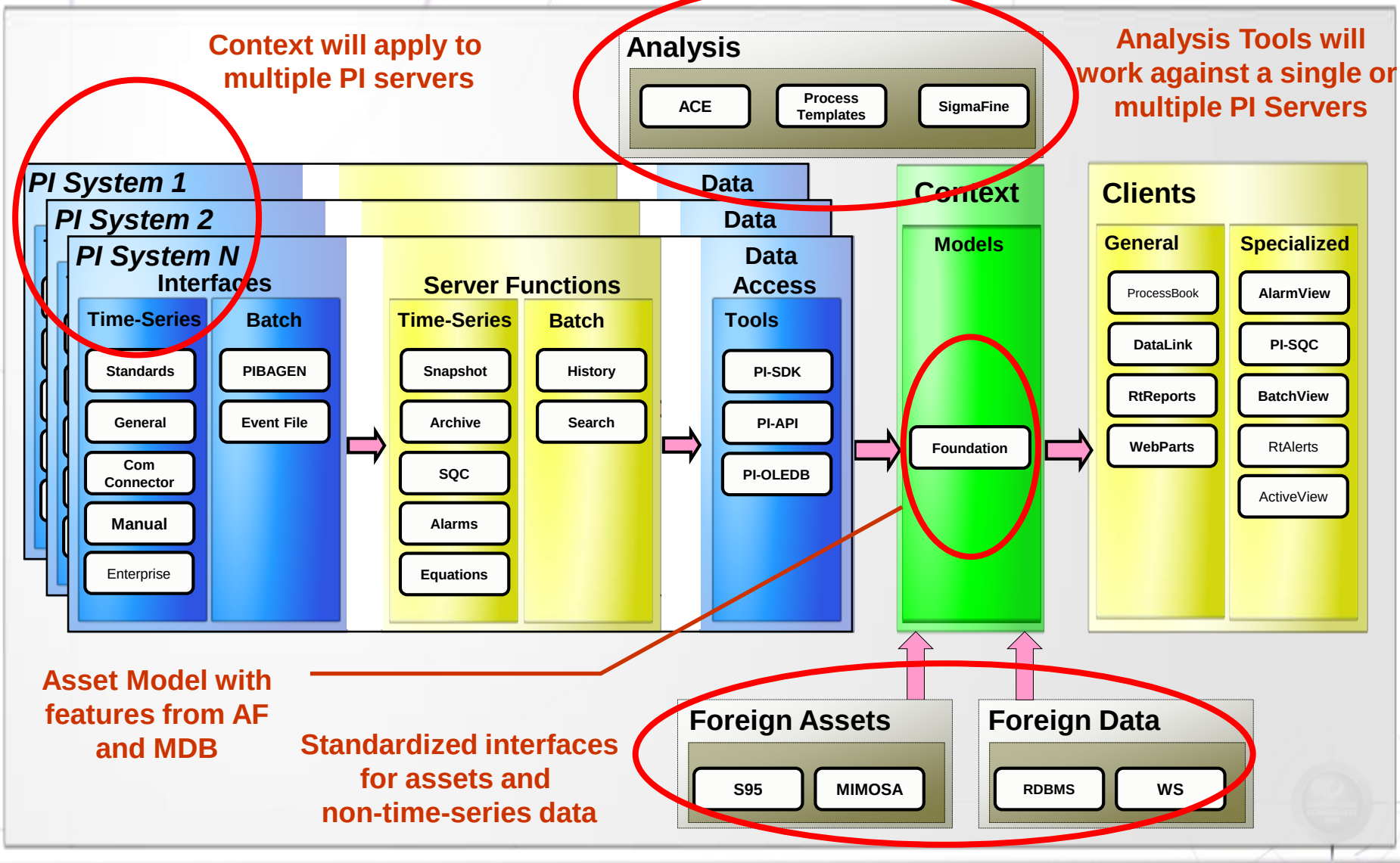


RtPM Platform after Foundation

- This architecture achieves:
  - **“One version of the truth” across operations**
- Because rules are defined and deployed in templates
- Because it honors other systems of reference
  - External Asset models
  - External data
  - Structured data
- Because it exposes this data to a wide variety of client applications

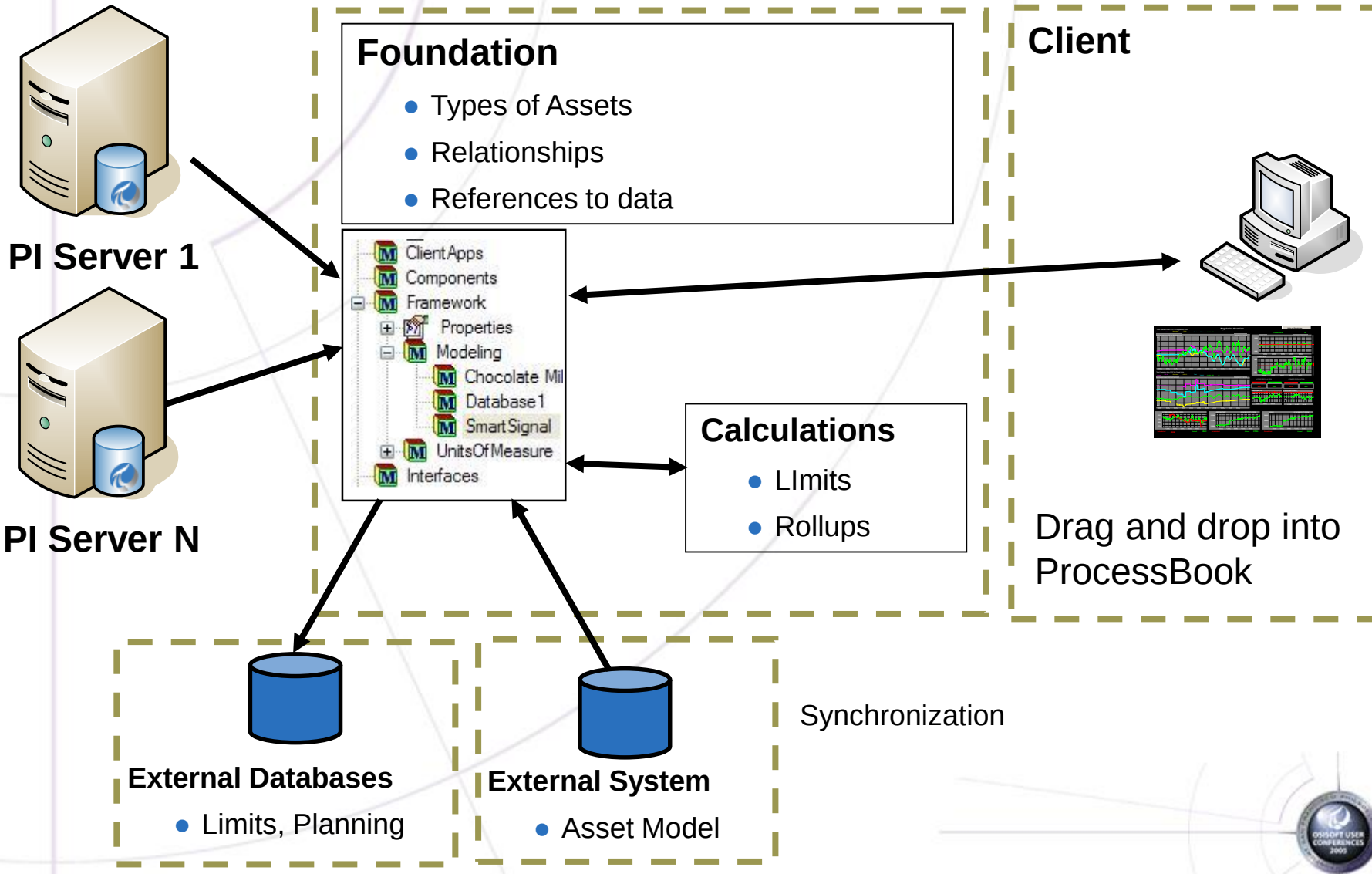
Business Solutions Example

- Example Problem: Standard Operating Conditions
  - Need a way to measure operating performance against expectations
  - Need to roll-up based upon asset hierarchy
  - Need to compare rolled-up performance vs. plan
    - For equipment and production
  - Need to visualize this for quick analysis
  - Need to compare against maintenance events
- Complications:
  - More than one “type” of asset
  - Production plan information in a planning system
  - Equipment is already defined in another system
    - And, this equipment is subject to change
  - Operating performance based upon limits from another system
  - We used actual schemas where applicable

Example: How to configure

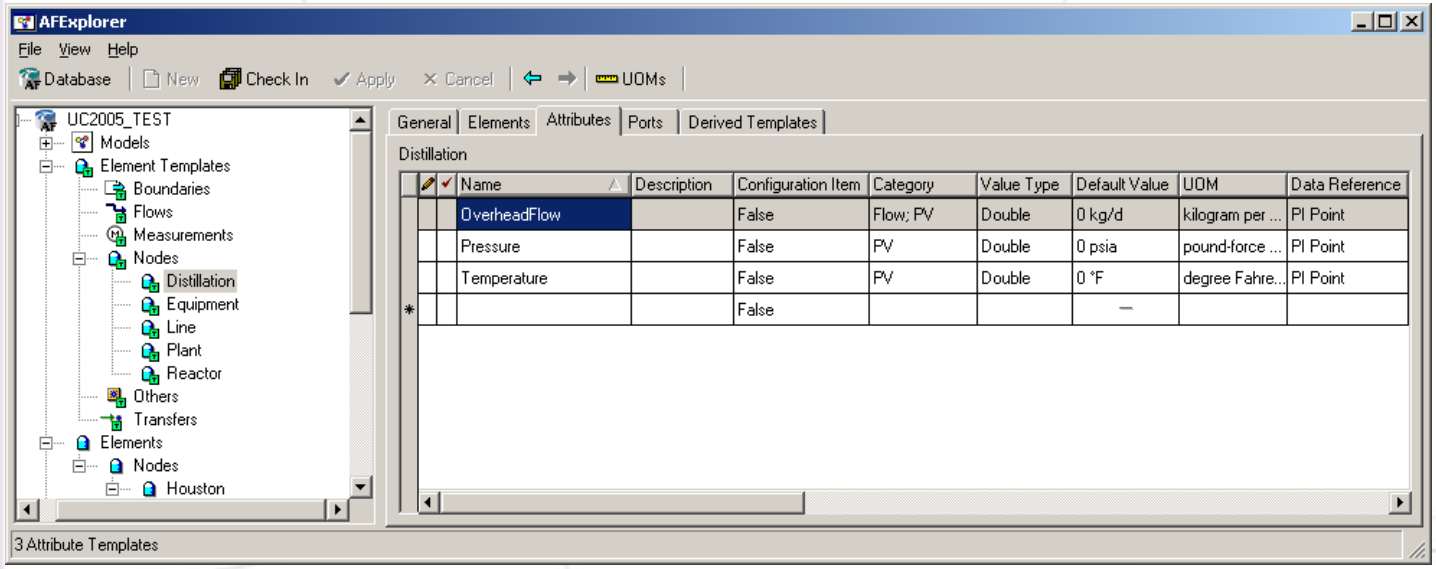
- Starting Point
  - All the process values are in PI
  - Limit, Maintenance, Production Plan information in external systems
- Solution:
  - Asset “types” configured as Templates in Foundation
  - Asset Model copied from the external system
  - Limits configured as data references to the external system
  - Configured calculations
    - equipment performance
    - performance roll-up
    - production performance
  - Process Book to display summary and detail information from the assets

Example: How to configure



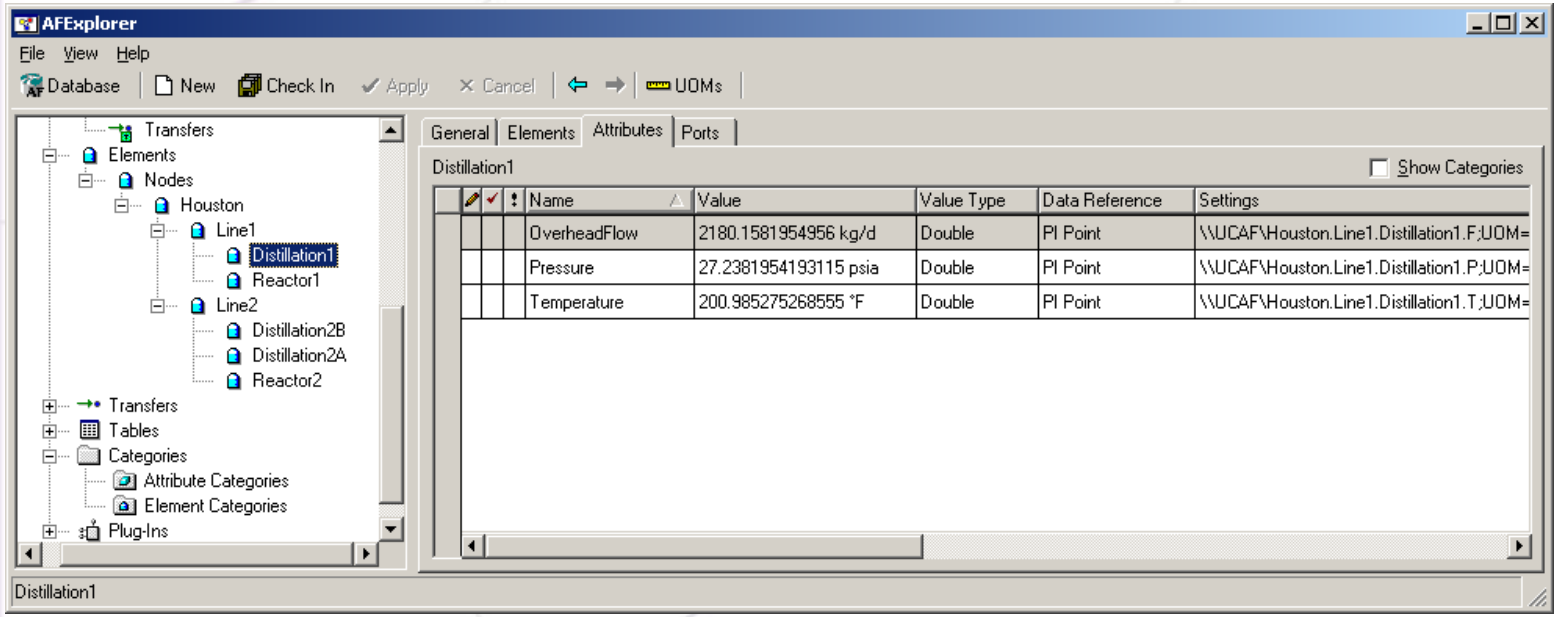
Step 1: Model the PI Data

- Configuration of Templates
  - Reactor
  - Distillation
  - Line
  - Plant



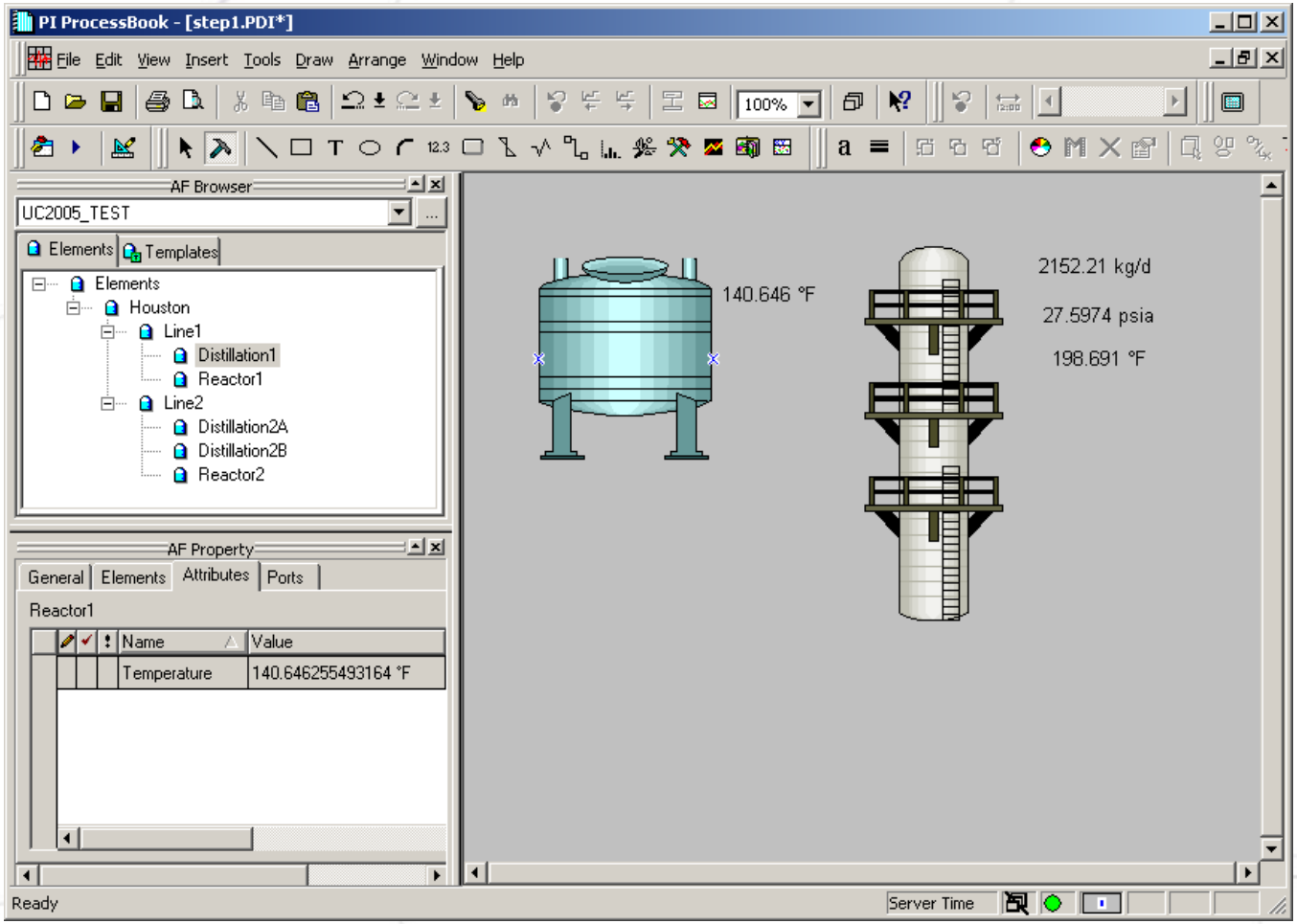
Step 2: Model the PI Data

- Configuration of Houston plant:



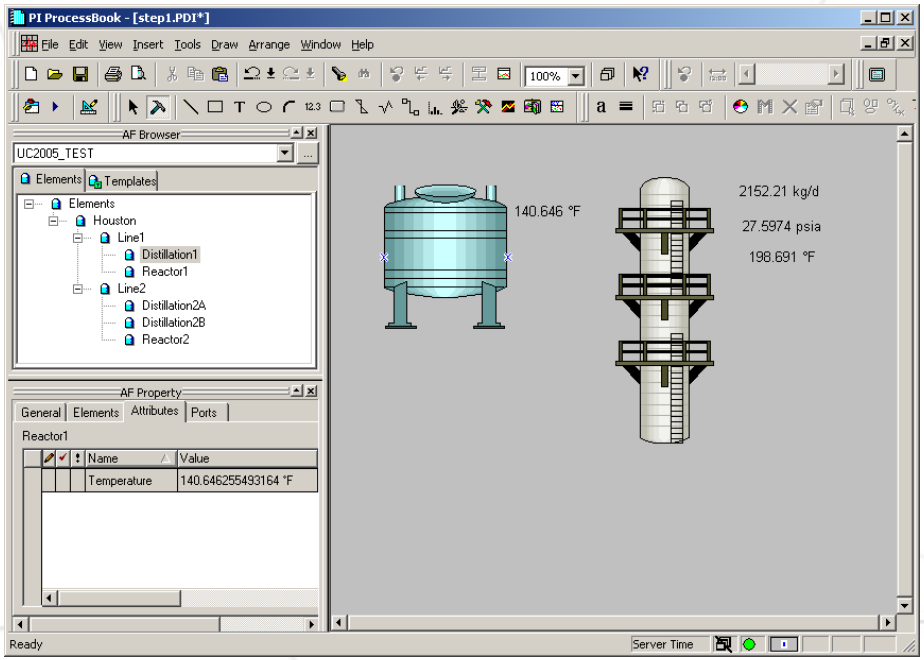
Step 2: Model the PI Data

- Display in ProcessBook:

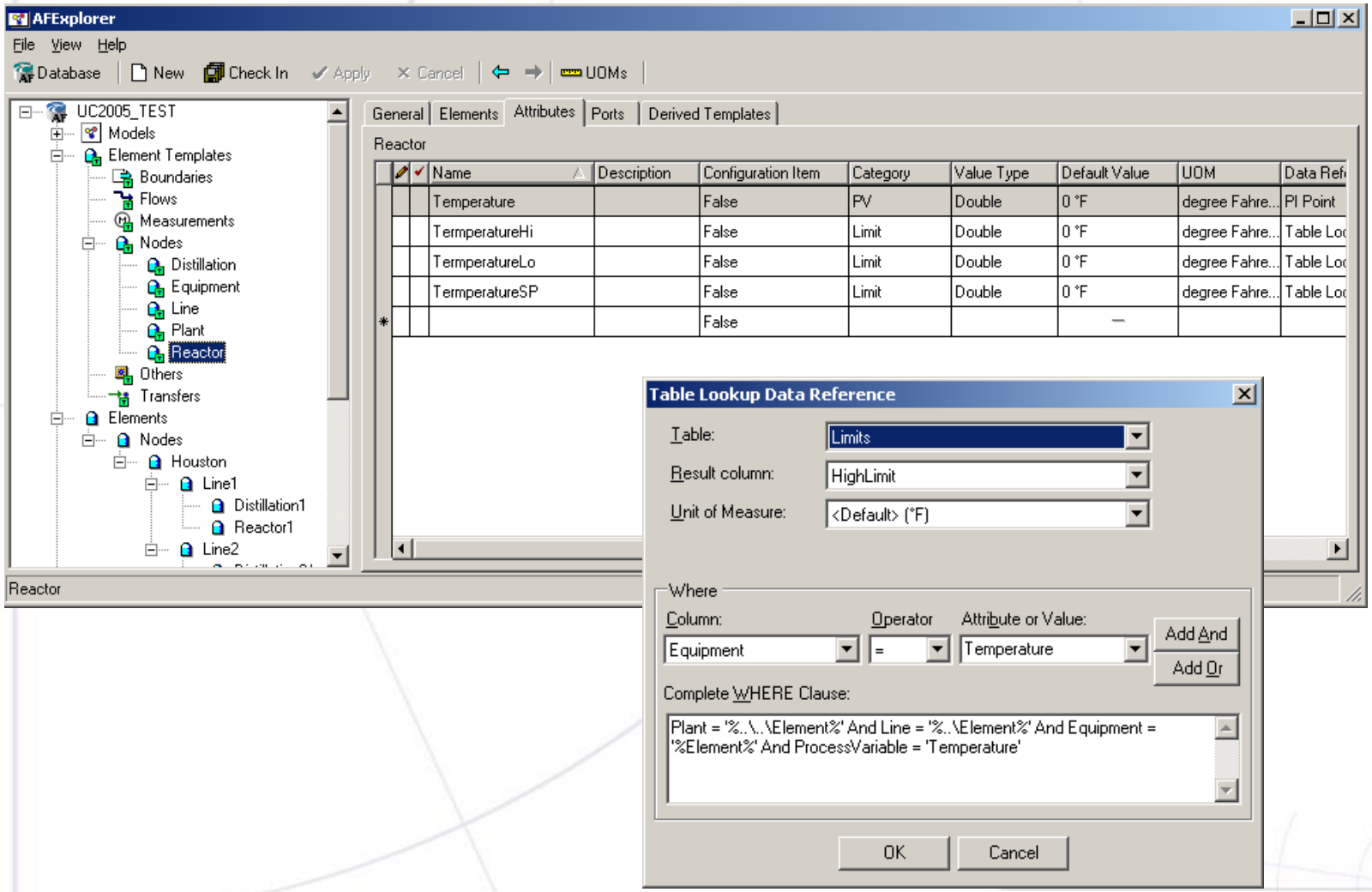


What you just saw…

- Creating templates
- Creating instances
- Drag and drop of the reactor onto ProcessBook
- Drag and drop of attributes onto ProcessBook



Step 3: Configure data references to external data



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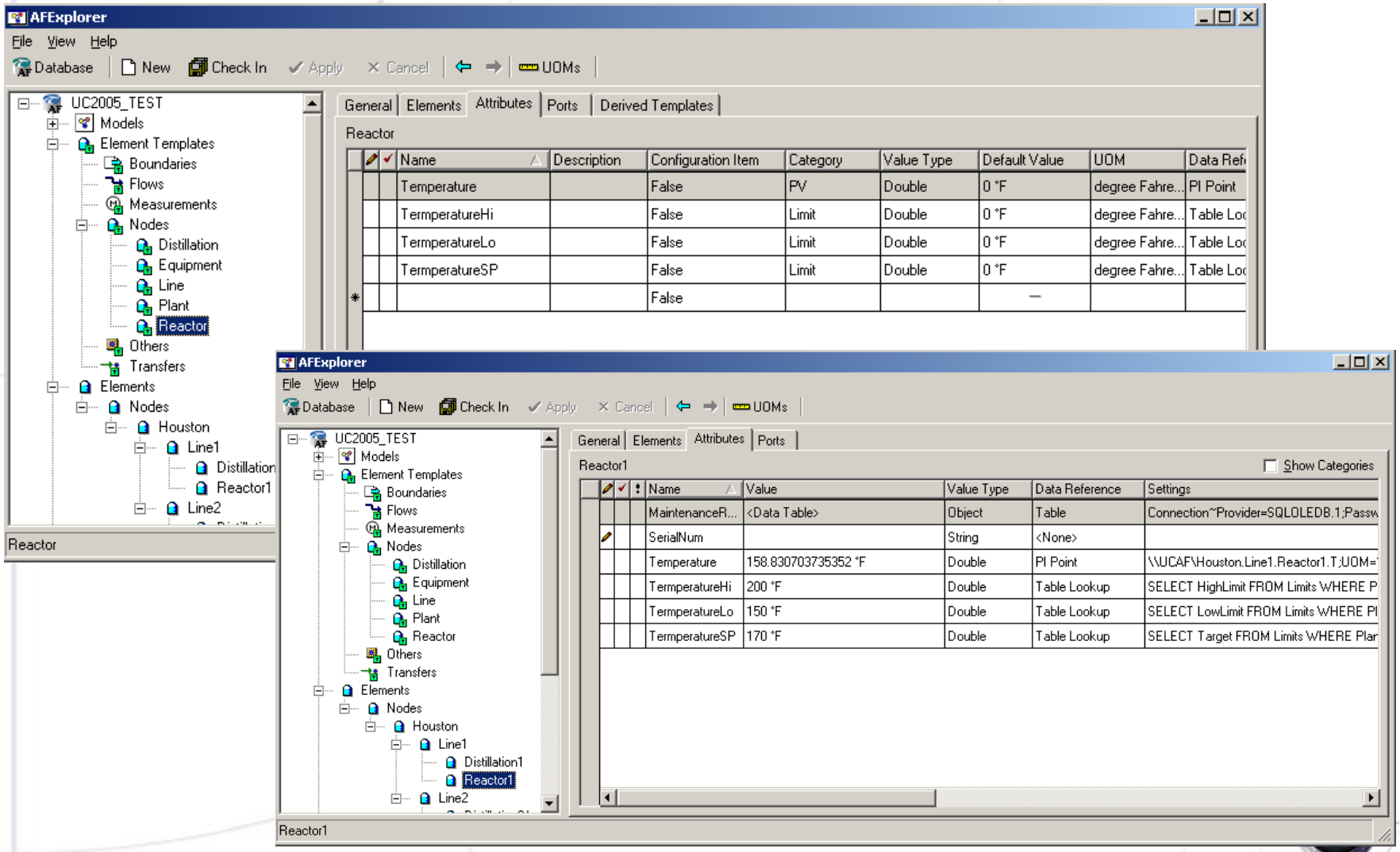
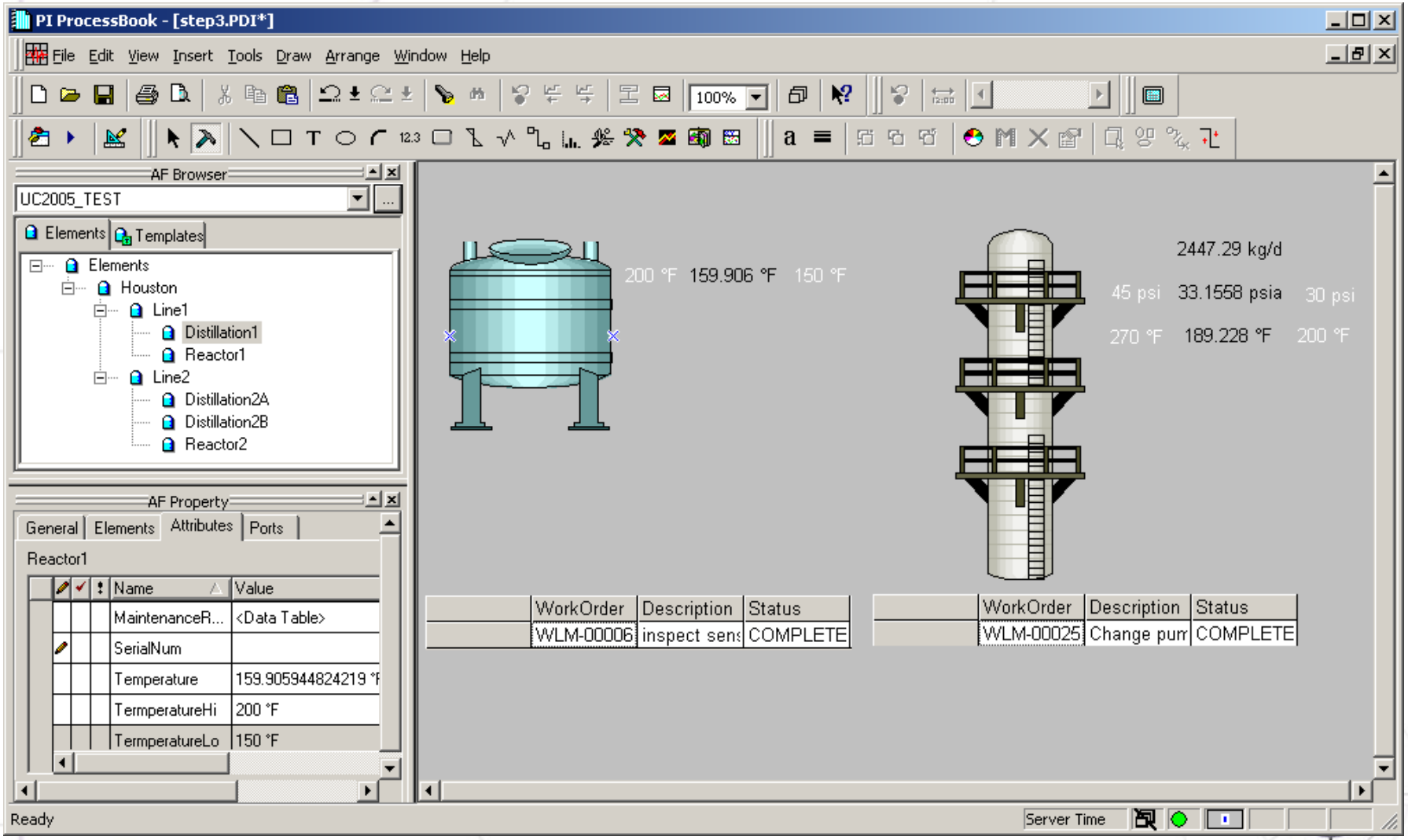
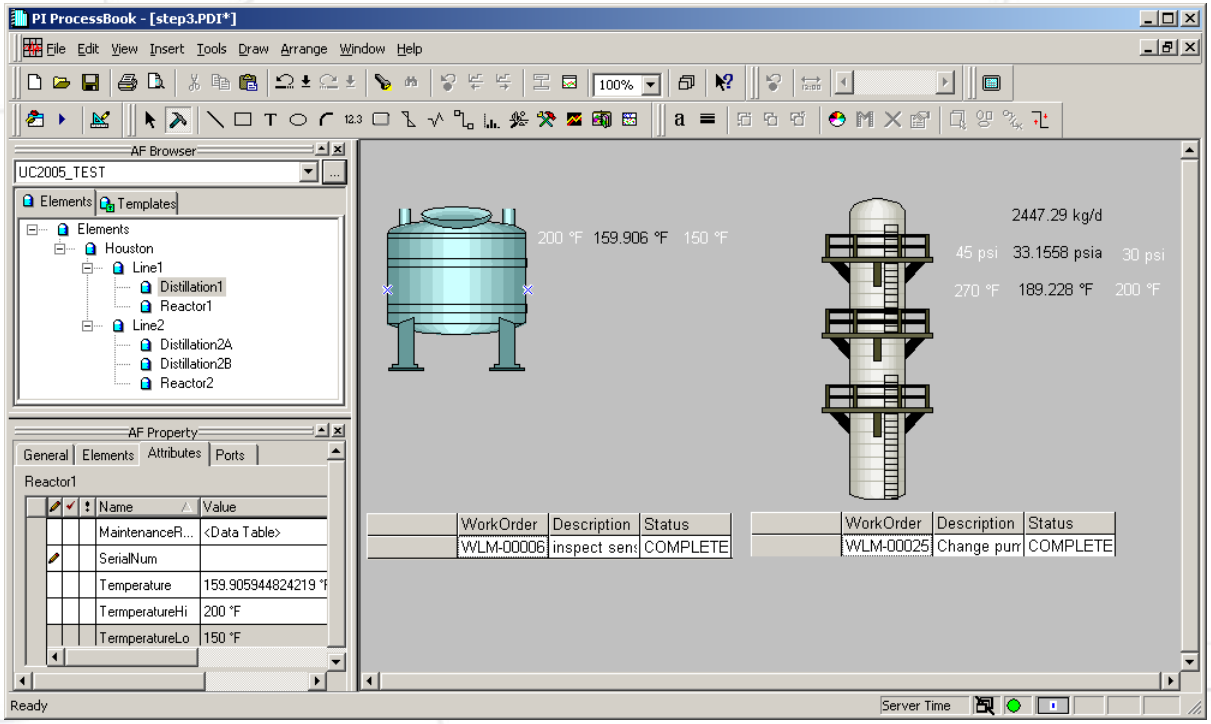


Step 3: Display the attributes in ProcessBook

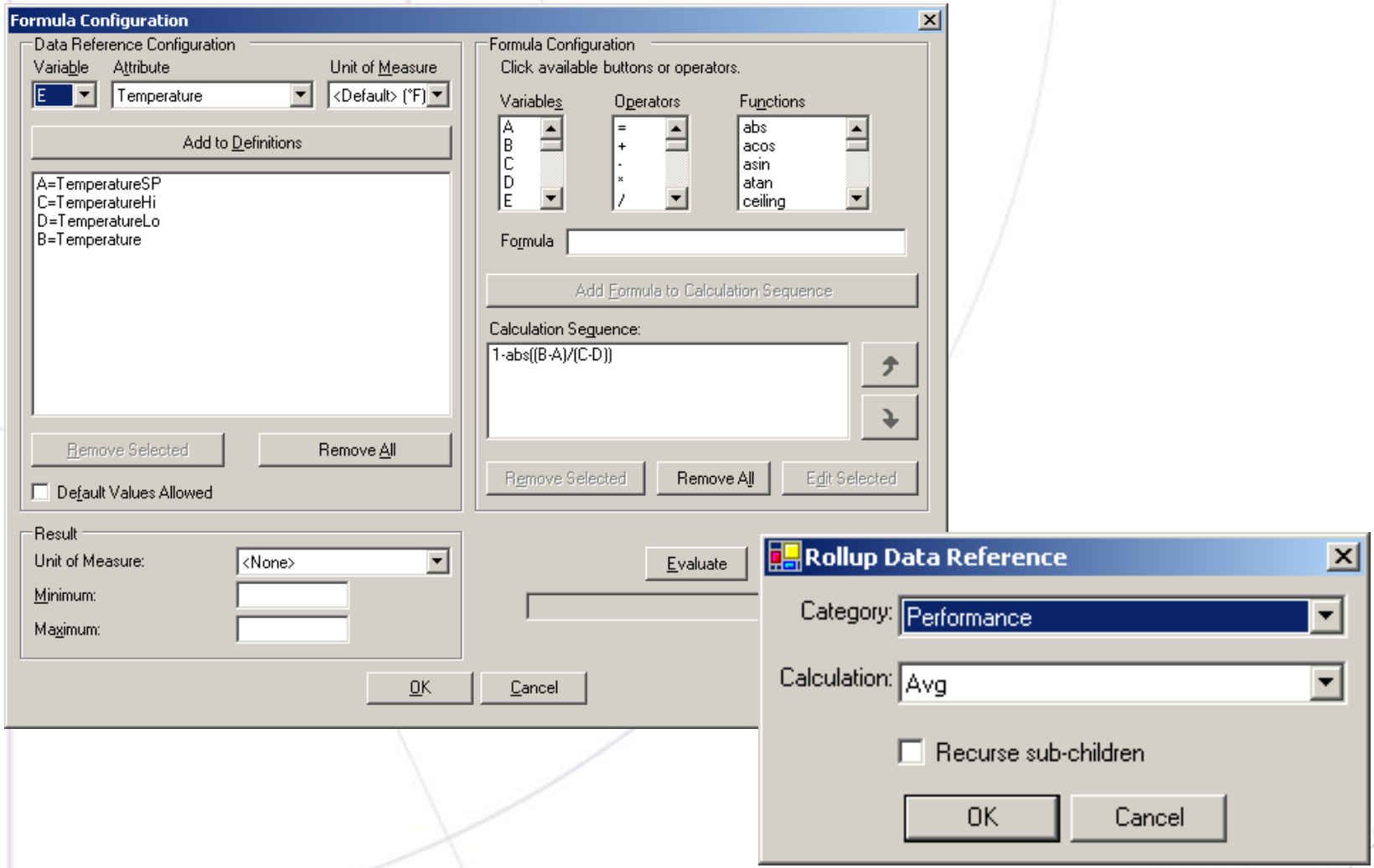


What you just saw….

- Creating references to other systems of reference
- Drag and drop of the simple attributes onto ProcessBook
- Drag and drop of data tables onto ProcessBook



Step 4: Configure Calculation, Rollups



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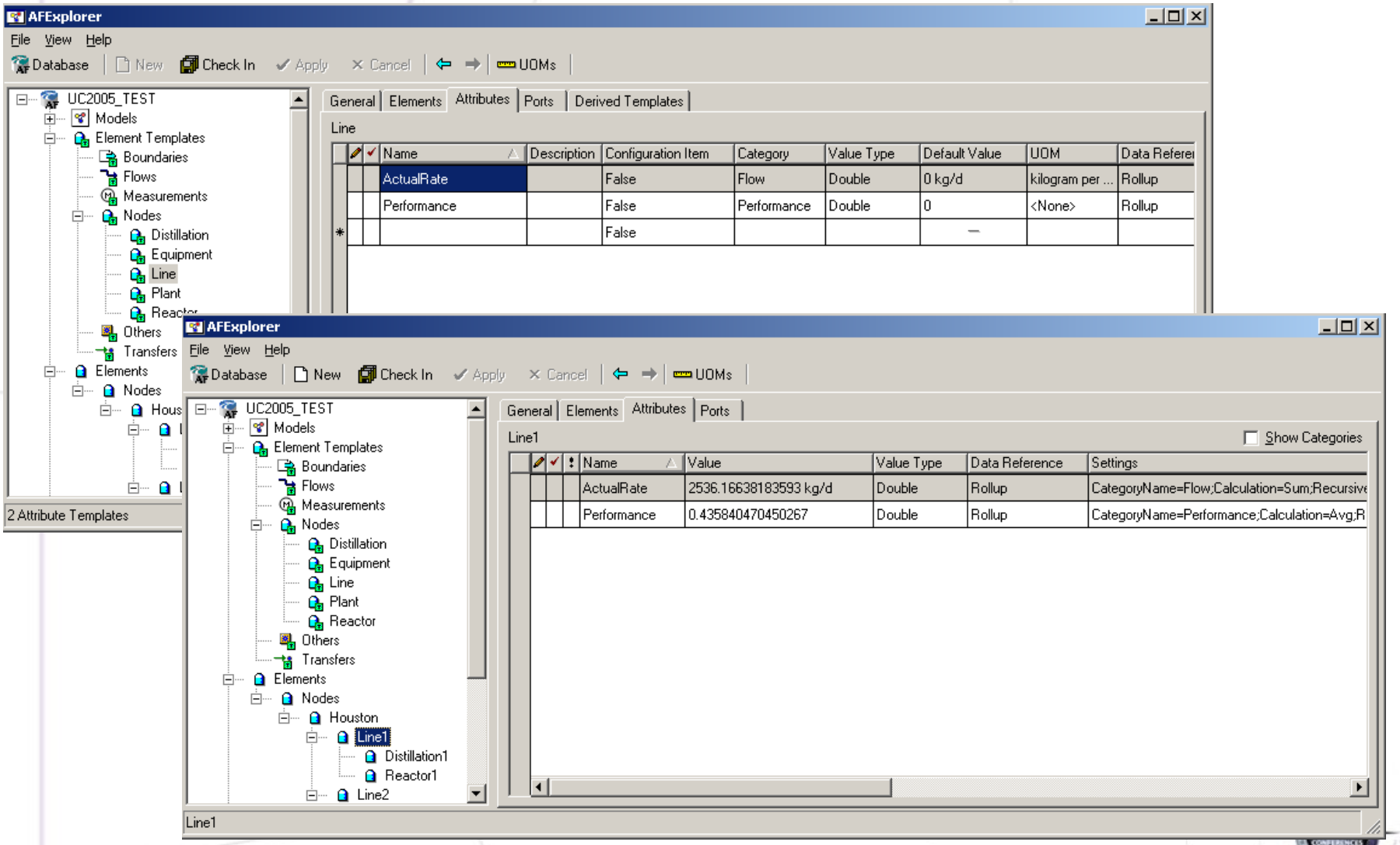
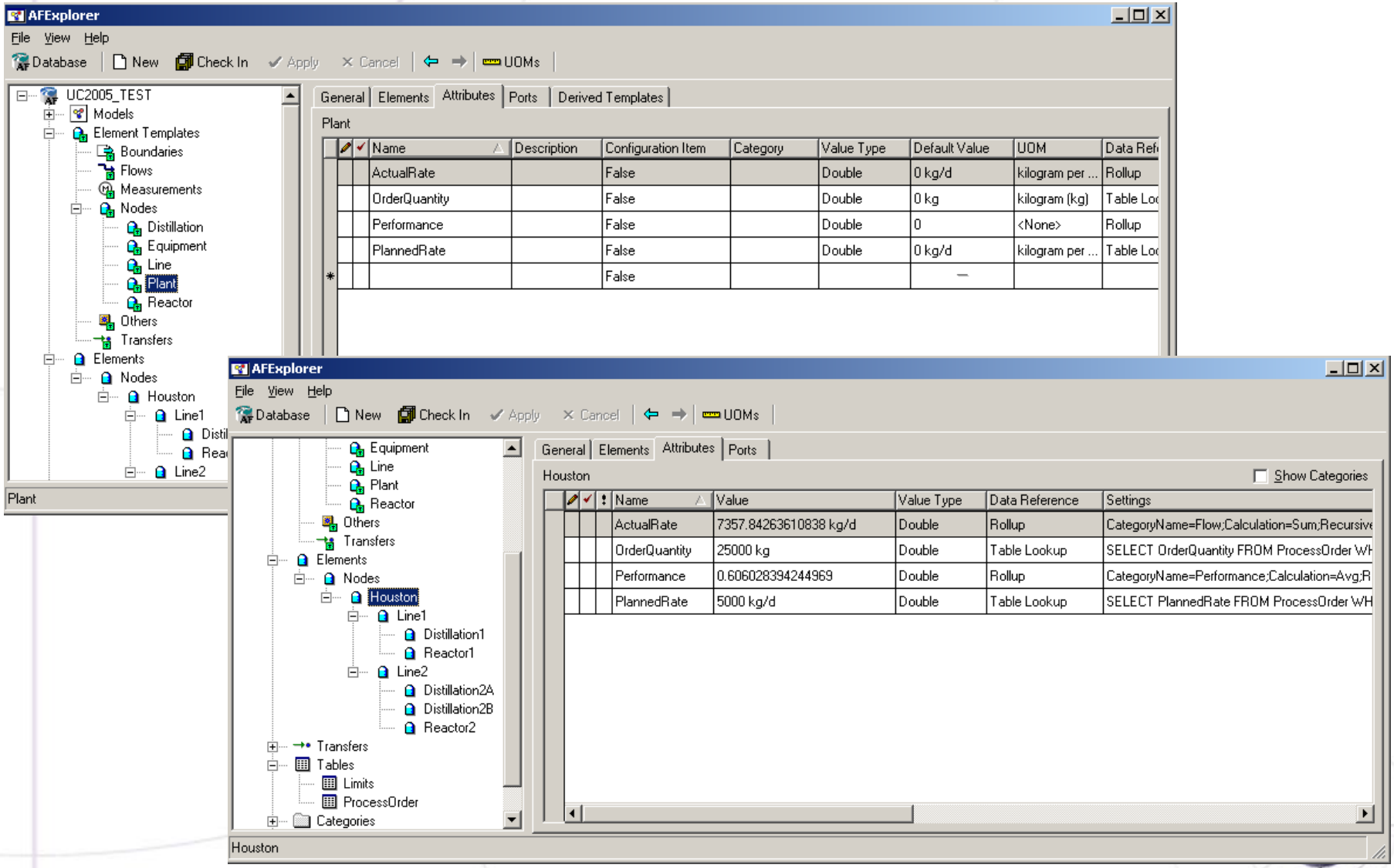
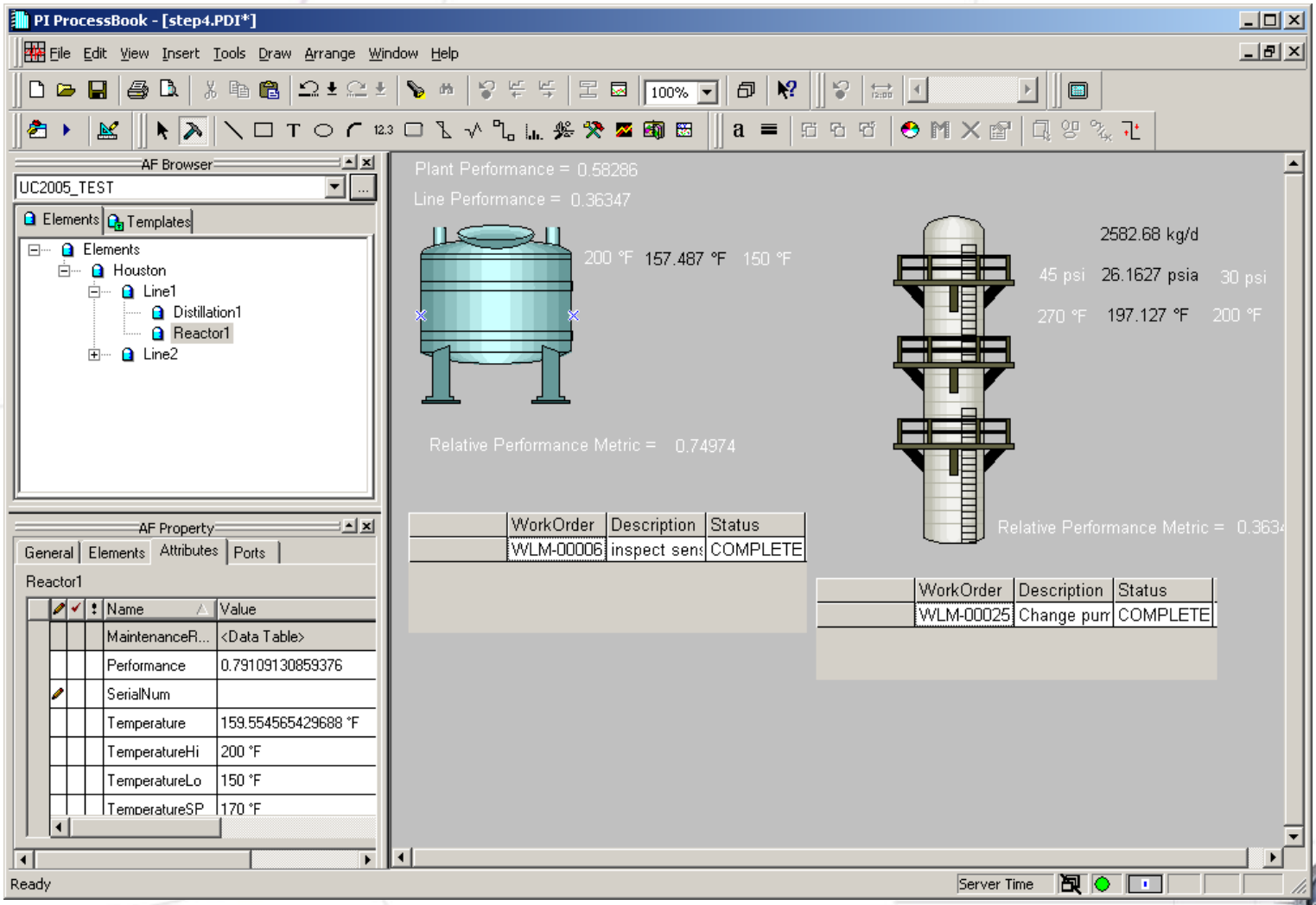


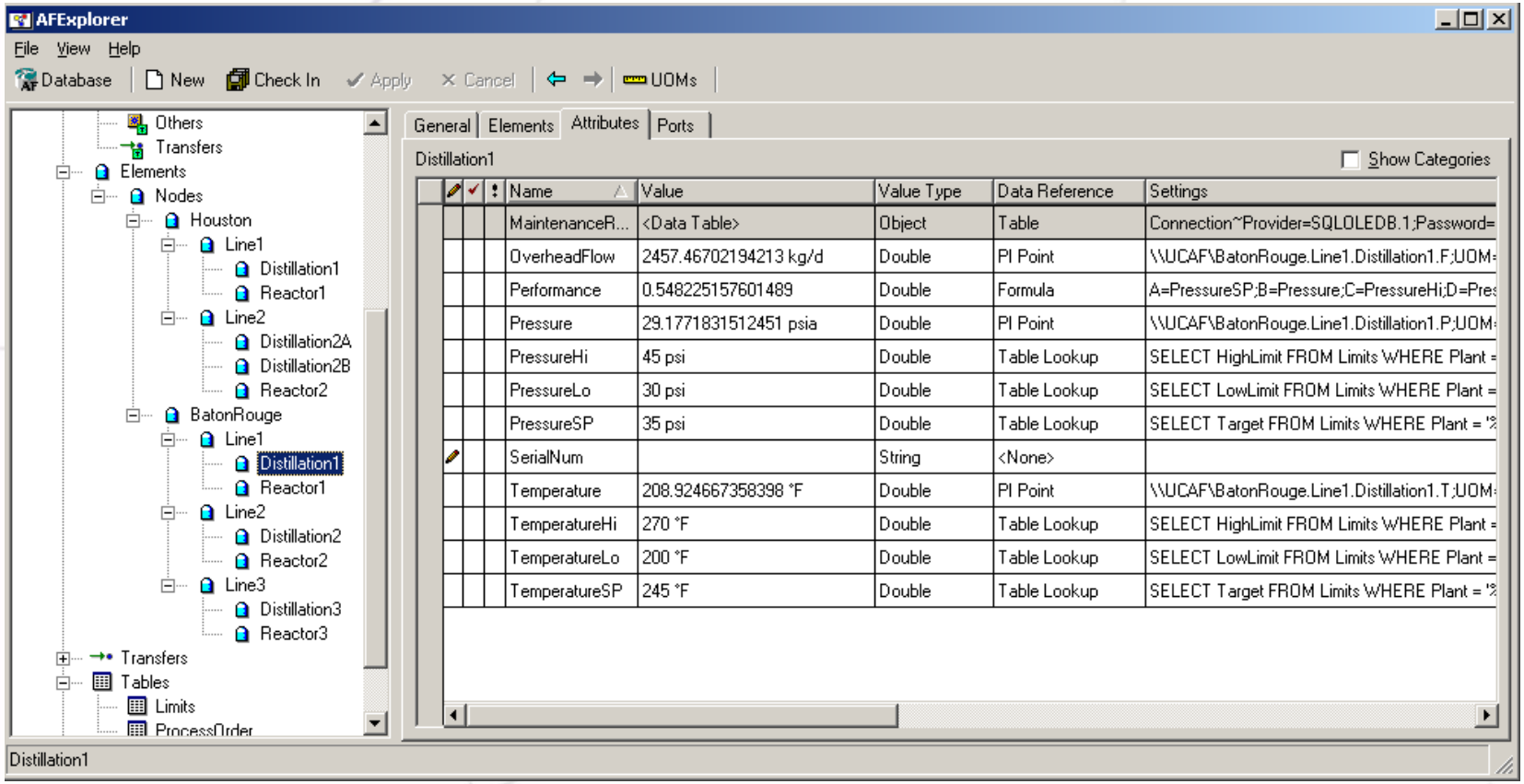
Step 4: Configure Calculation, Rollups



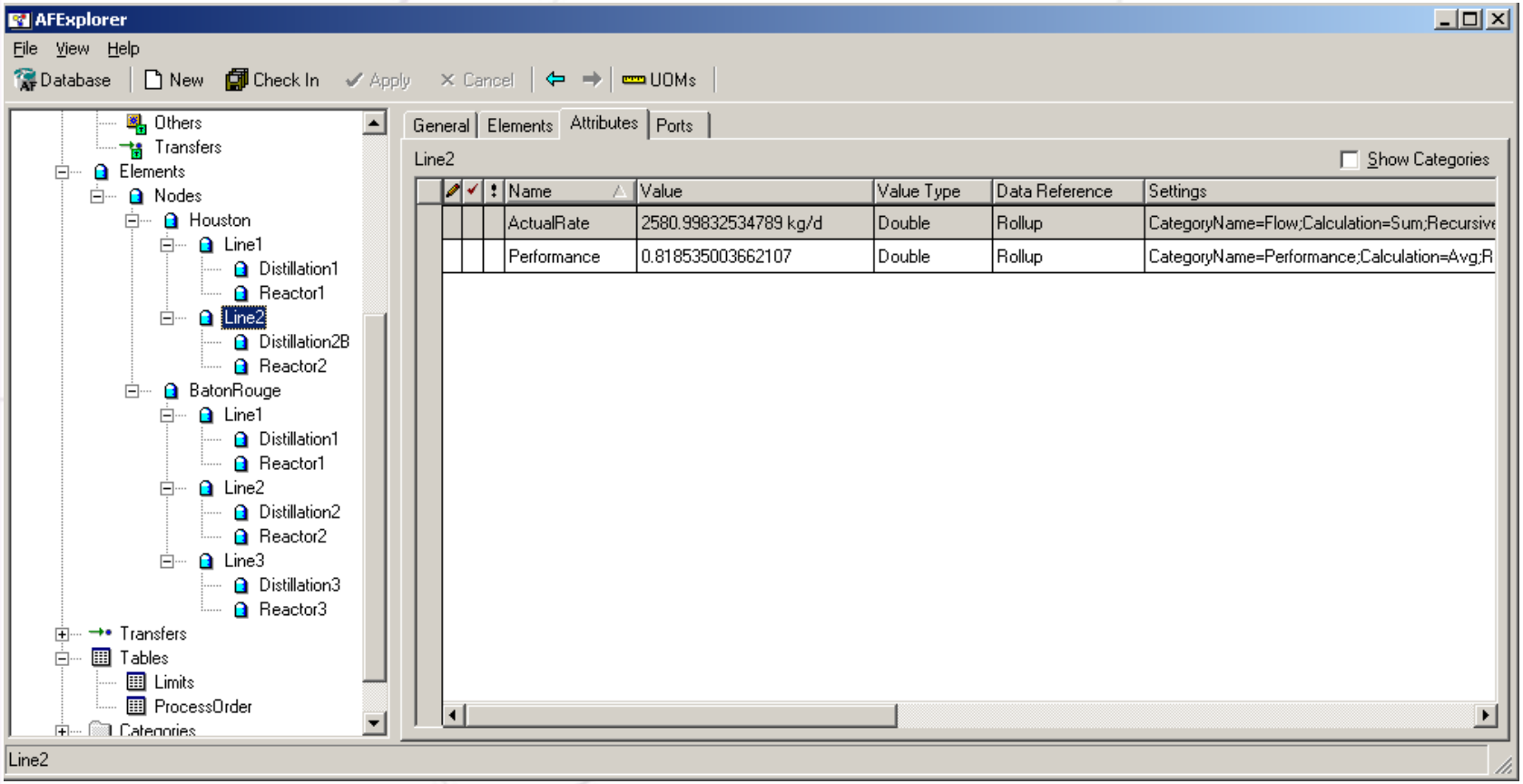
Step 4: Configure in ProcessBook



Deployment: Creating a second plant



Maintenance: Changing the Equipment



Demonstration Summary:

- An interesting application can be quickly configured
- The data comes from many sources
  - PI and external systems (Limits, Maintenance, Planning)
- Application includes configured calculations
  - Performance, Production vs. Plan
  - Logic is applied through the asset relationships
- The model information was applied to ProcessBook
  - Time-Series and relational data from business systems
- Simple deployment and maintenance
- Ensures one version of the truth across your operations

Foundation is…

An evolution of RtPM platform to help you provide more value from PI

- Like Mission Control, Foundation organizes a variety of data in a way that helps you solve problems
- Foundation is a configurable:
  - Logical enterprise asset model
    - Include relationships between the assets
  - Way to organize and access all data, whether stored in PI or not
- Foundation:
  - Facilitates agile, incremental projects
  - Extends reach of RtPM-based solutions to include external assets and data