



Innovative Integration of PI&AF2
with SCADA for Faster Deployment
of Digital Oil Field Applications

Presented by Chevron and
Accenture

Empowering Business in Real Time
PI Infrastructure for the Enterprise

Agenda

- Introductions & Background
- Problem Description
- OSIsoft PI and AF
- Integration Requirements
- Solution
 - Connector to SCADA
 - AF Structure
 - Data flow
 - Data access
- Results & Benefits
- Future Enhancements

Presenters

- **Jayanta P Sharma, Accenture**
 - Project Manager and Solution Architect; expertise in Enterprise Data Architecture, Technology Architecture. Industry experience in Upstream Oil & Gas and Telecommunications
- **Misha Shemyakin, Accenture Technology Labs**
 - Data Architect; expertise in analytics for equipment performance and in architectures for Integrated Operations. Industry experience in Upstream Oil & Gas, Power Generation

Project Executives



- **Victor Villagran** – Automation & i-field Manager
- **Ray Garcia** – Automation Manager
- **Darrel Carriger** – i-field Manager
- **Mike Anglin** – MCA IT Supervisor
- **Koby Carlson** – i-field Automation Lead
- **Bobby Rana** – Application Architect
- **Martin Leach** – SME Upstream Oil & Gas (Accenture)

About Chevron MCA

- Chevron is one of the world's largest integrated energy companies. Headquartered in San Ramon, California, we conduct business in more than 100 countries. We are engaged in every aspect of the oil and natural gas industry, including exploration and production, manufacturing, marketing and transportation, chemicals manufacturing and sales, geothermal, and power generation. We're also investing in renewable and advanced technologies.
- The MidContinent/Alaska (MCA) Business Unit manages Chevron's onshore oil and gas production assets in the central lower 48 United States, extending from Wyoming to south Texas, as well as its onshore and offshore assets in the Cook Inlet and North Slope regions of Alaska.

About Accenture

- Accenture is a global management consulting, technology services and outsourcing company. Combining unparalleled experience, comprehensive capabilities across all industries and business functions, and extensive research on the world's most successful companies, Accenture collaborates with clients to help them become high-performance businesses and governments. With more than 186,000 people serving clients in over 120 countries, the company generated net revenues of US\$23.39 billion for the fiscal year ended Aug. 31, 2008. Its home page is www.accenture.com.

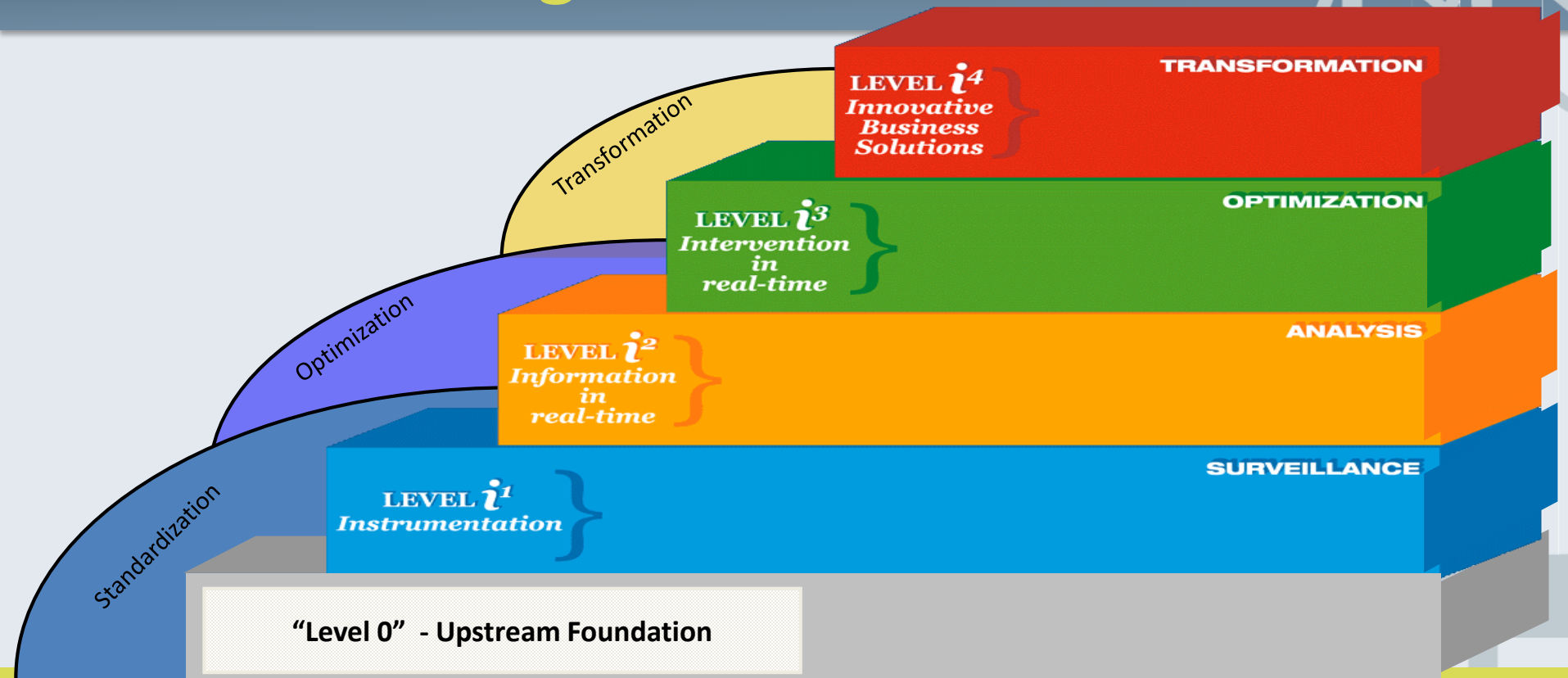
MidContinent/Alaska



Problem Description

- Growing number of business applications to support Integrated Operations that require robust access to real-time process data
- Process data are acquired by SCADA and stored in local historians. No aggregated centralized repository that can serve business applications as a single source of field process data
- Application deployments cannot proceed fast enough due to complex configuration of data access
- Performance issues encountered with process data retrieval from the legacy historian
- Dozens of SCADA Servers
- Tens of thousands Tags

Chevron Digital Oilfield Vision



OSIsoft PI and AF

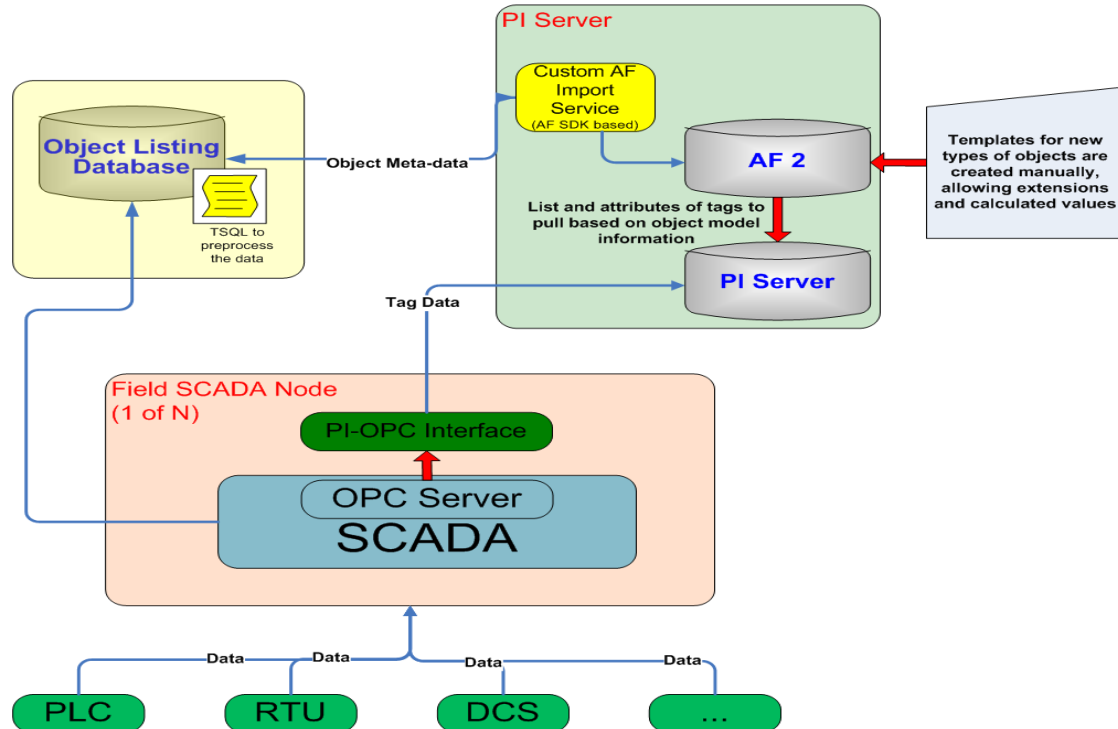
- OSIsoft PI was selected as a central, aggregate historian to serve process data to business applications
- AF was selected to store operational meta-data, object hierarchy and provide context to PI tags
- Includes meta-data about the tags such as their geographical locations and other business properties
- Elements in AF follow the structure defined in the AF Element Templates to ensure uniformity across Elements of a particular type (created from the same Template) to make it easier to deploy applications using this data

Integration Requirements

- Reuse the object model already in place in SCADA
- Minimize manual tasks to bring new data into PI and AF
- New objects deployed in SCADA must appear in AF automatically as Elements
 - Tags for these objects must be automatically created in PI
 - Data flow must start without any manual intervention
- Object updates and deletions must also propagate to PI and AF automatically

High Level Architecture

Object Definition and Data Propagation from SCADA to PI and AF2



Connector to SCADA

- A series of scripts on the SQL Database identify data coming from SCADA as new objects, deletions, or edits
- The Connector reads object information from the SQL Database
- For new items,
 - Find the corresponding template in AF
 - Instantiate the Element based on the template
 - Create PI Points for the attributes
 - Properties imported from the SCADA DB
- Similarly, AF Attributes and tag properties are updated for edits
- Objects that are deleted in SCADA, are labeled as inactive in AF and corresponding PI Points set to Scan=off

AF Element Structure

- The team designed AF Elements to contain a combination of attributes with
 - PI Points
 - Strings containing business information
 - AF Formulae
 - PI Performance Equations
- Calculated Values – both AF Formulae and PI Performance Equation Tags – are created automatically
 - Settings encoded in the template, ensuring consistency across Elements
 - Calculation definitions stored in a single location (AF Element Template), avoiding governance and data maintenance issues

AF Element Template Example

OrificeMeterRun

General | Attribute Templates | Port

OrificeMeterRun

Search

Name	Description	Default Value
AP	Instantaneous static pressure at t...	0 psia
ApplicationID	Describing the application	
Area	Container for other areas and obj...	
AreaName	Container for other areas and obj...	
AssetTeam	Asset Team for FMT (Field Manag...	
Avg90DayVolume	90 Day Average of Volume	0 MCF
AvgMonthlyVolume	30 Day Average of Volume	0 MCF
AvgWeeklyVolume	7 Day Average of Volume	0 MCF
Class	Archestra Base Class of the obje...	
CurrentHour	Time that has passed since the l...	0 h
Delta90DayVolume		0 MCF
Delta90DayVolumePercent		0 %
DeltaMonthlyVolume		0 MCF
DeltaMonthlyVolumePercent		0 %
DeltaWeeklyVolume		0 MCF
DeltaWeeklyVolumePercent		0 %
DeltaYesterdayVolume		0 MCF
DeltaYesterdayVolumePercent		0 %
DP	Instantaneous differential pressur...	0 inH2O
FlowRate	Instantaneous gas flowrate being...	0 MCFD

PI Point

Business Attribute

Calculation

Name: AP

Description: Instantaneous static pressure at the meter

Configuration Item: ☐

Categories:

UOM: pound-force per square inch (customa...

Value Type: Single

Default Value: 0 psia

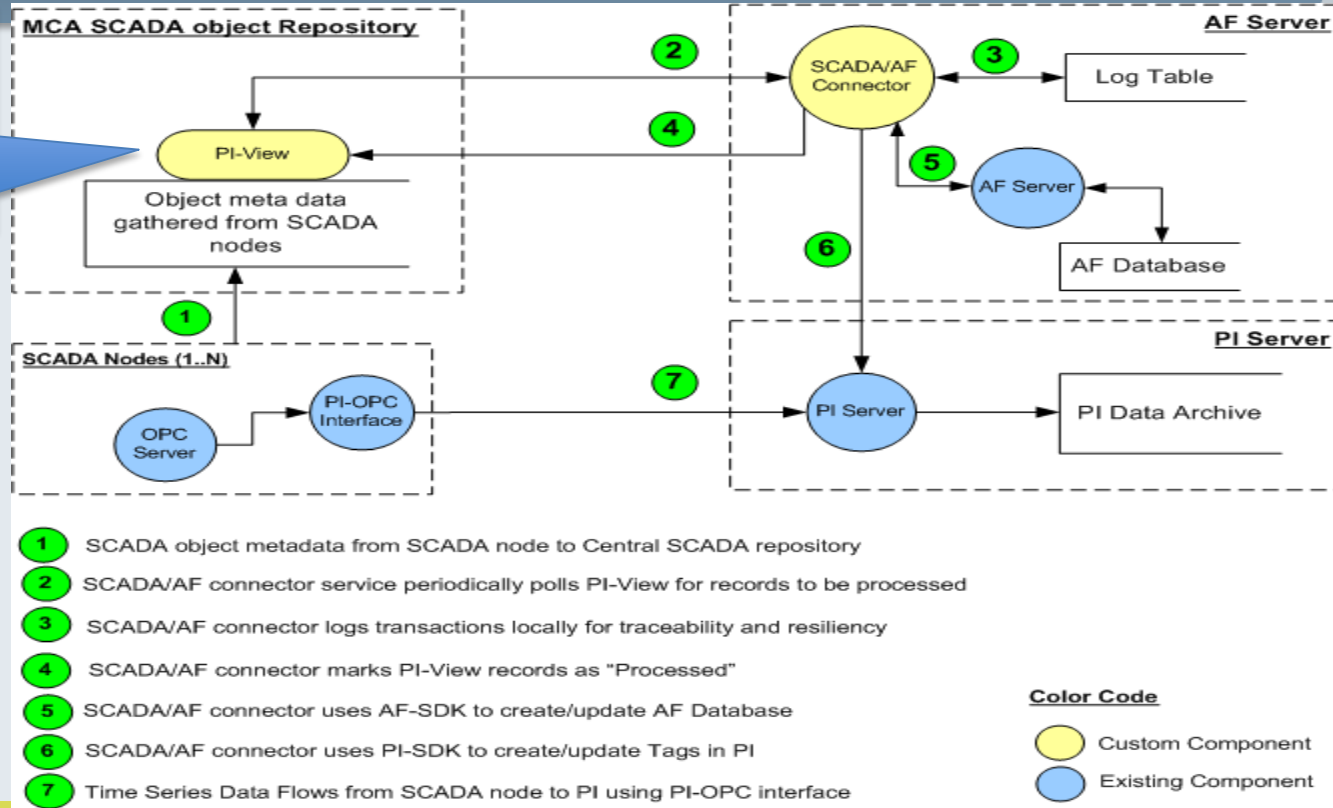
Data Reference: PI Point

Settings...

\\%Server%\%Element%\%Attribute%

Data Flow

Possibly replaced with Web Services in the future



PI and AF Data Access

- Web Services access layer based on AF SDK to provide standard access methods for applications
 - Independent of platform
 - Re-useable by many applications
 - Possible integration into a Service Oriented Architecture (SOA)
 - Abstraction of internal SCADA and PI/AF2 workings – applications see a single Web Services interface, regardless of the original source of data

Results & Benefits

Successfully demonstrated that the Connector can keep SCADA and PI/AF2 in sync

- Quicker deployments of i-Field applications across the business unit
- Digital Oil Field (i-field) applications for Production Monitoring, Optimization, Equipment Performance Monitoring, Tools for Spill Reduction and Surveillance will use MCA PI solution as the standard platform for time series process data
- Applications do not need to know specific tag names to retrieve process data – searches done by business attributes
- No additional workload on the SCADA teams to keep AF and SCADA in sync after initial deployment of PI/AF2 – no impact on existing work flow

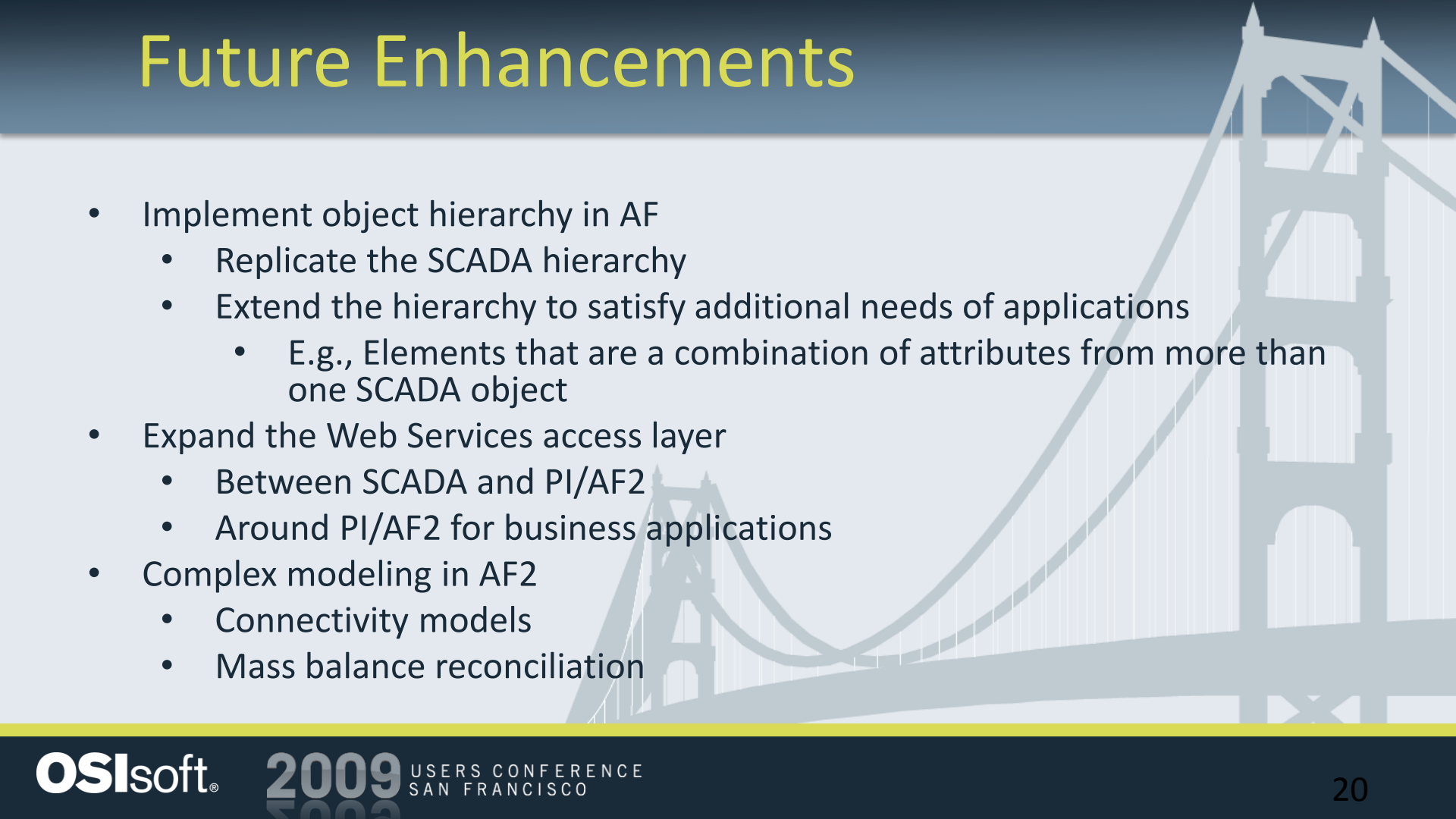
Results & Benefits (Cont...)

The MCA PI/AF solution has resulted in several benefits:

- Reduced turnaround time for projects sourcing and delivering real time data streams from **5 months to 2 weeks**
- Rationalized process control naming standards from several (before PI) to **one uniform standard** across the business unit
- Enabled development and deployment of centralized & reusable services to source data from PI for multiple applications, thereby **significantly reducing development time** for such applications.

Bobby Rana,
Data Asset & Analytics Division,
Chevron Information Technology Company

Future Enhancements



- Implement object hierarchy in AF
 - Replicate the SCADA hierarchy
 - Extend the hierarchy to satisfy additional needs of applications
 - E.g., Elements that are a combination of attributes from more than one SCADA object
- Expand the Web Services access layer
 - Between SCADA and PI/AF2
 - Around PI/AF2 for business applications
- Complex modeling in AF2
 - Connectivity models
 - Mass balance reconciliation

Questions

