Application of Model Driven Integration

In StatoilHydro's F0B project

Jone F. Aarre

Technical Sales Specialist

IBM Oil and Gas CoE, IBM SWG

CIMug meeting

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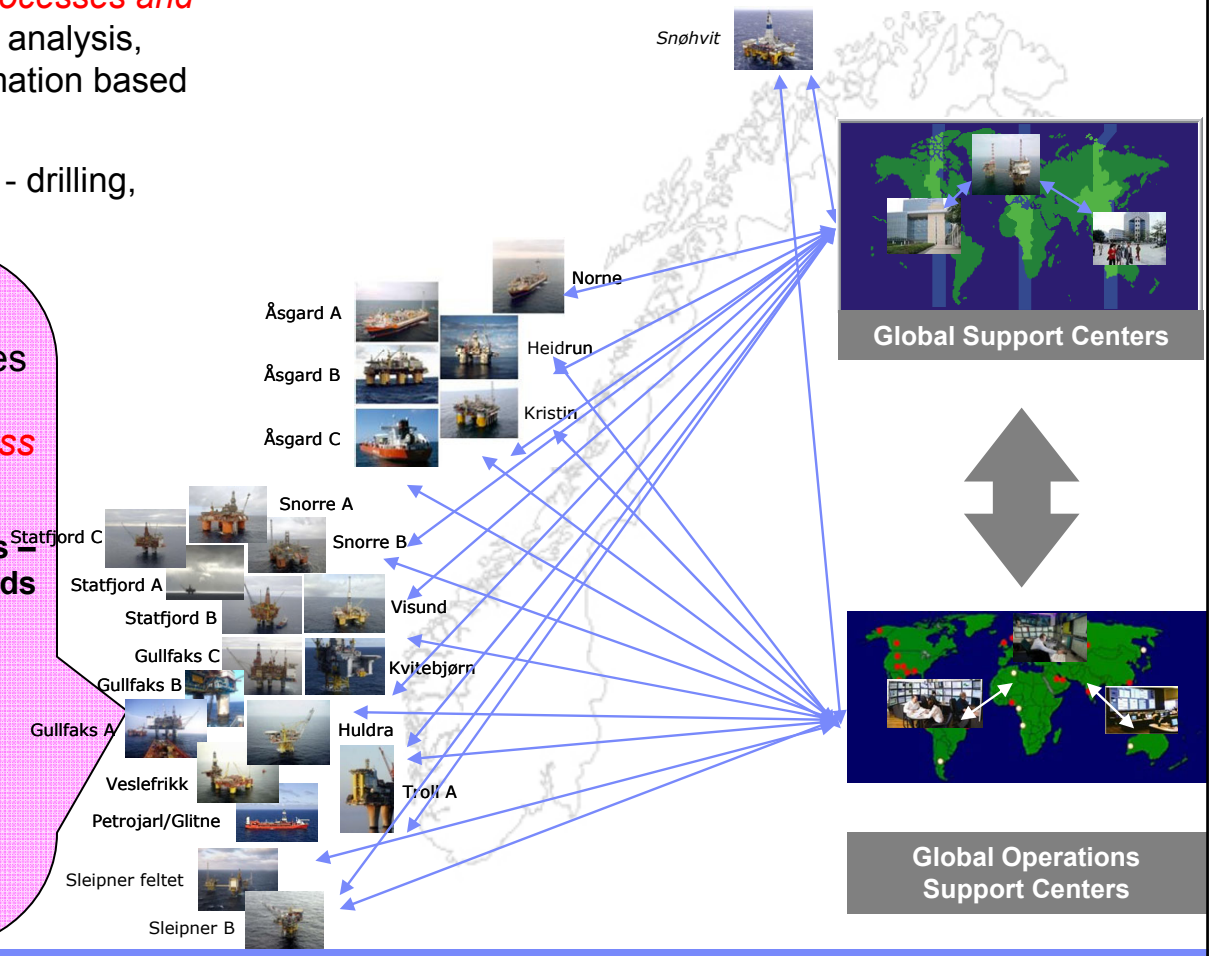
Support for Integrated Operations Generation 2 required

- Operators must have information on drilling, production and operation easily and transparently accessible *across multiple assets & facilities*:
  - for a set of *new corporate work processes and applications* such as performance analysis, improvement, and real time information based decision support processes,
  - within various upstream domains, - drilling, production, operations

- But:
- Operators have many oil & gas facilities with *significantly different applications and configurations, process tag and data naming conventions*,…..
- **Too many isolated and different solutions across many highly variable oil & gas fields**
- **Difficulties implementing common processes**
- **Complex applications & interfaces**
- **Difficult to adapt quickly**
- **Large portion of IT budget spent on maintenance, not on new value add investments**



TAIL- IO project - subprojects

Contribute to improve HSE performance, increase production with 5% and reduce operation costs with 30%

F1 CBM — Condition monitoring & early fault detection

F2 Turnarounds — Optimization of turnarounds

F5 Mobile → "Mobile" field operators

F0 Architecture

A – Reference Architecture
B – Real Time Integration Services

F6 Robotics → Robotized facilities

3D vizualisation & collaboration — F4 Collaboration

F3 Wireless → Heavily instrumented & networked facilities

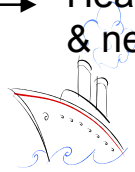


ABB SKF StatoilHydro IBM AKER KVÆRNER

StatoilHydro and IBM agreed to initiate a project to verify the concept proposed by the IMS strategy project

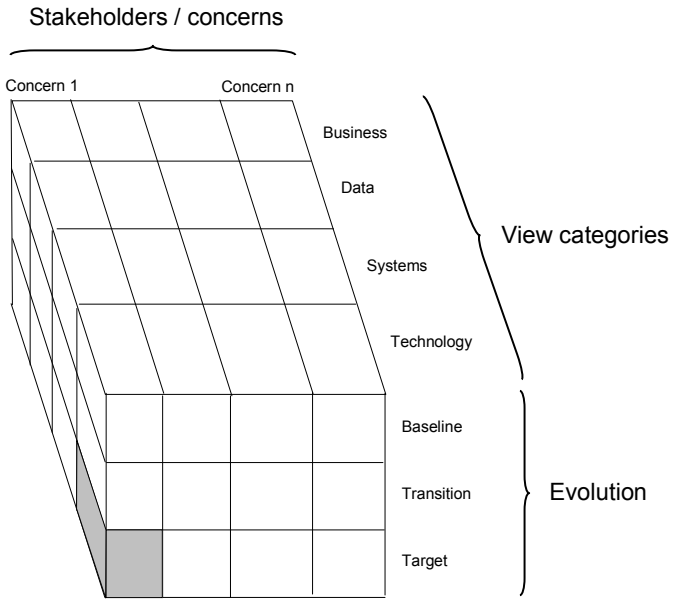
- **Project idea**
  - Test an integration solution based on an open service oriented architecture, and gain insight into the SOA concept as applied to real-time data from multiple plants
  - Give StatoilHydro the assurance required for a staged, company-wide implementation
- **Project goals**
  - The IMS data shall appear in the same, standardised way
  - The IMS data shall be structured so that data flows easily between systems and users can effectively utilise the data
- **Project objectives**
  - Demonstrate an integration solution based on a SOA architecture and XML
  - Demonstrate an implementation of the S95 standard for real-time (OPC) data
  - Demonstrate an implementation process supporting a staged company-wide implementation
  - Demonstrate configurability and maintainability of the integration model
  - *Evaluate concept and present recommendations for further work and implementation*

Targets

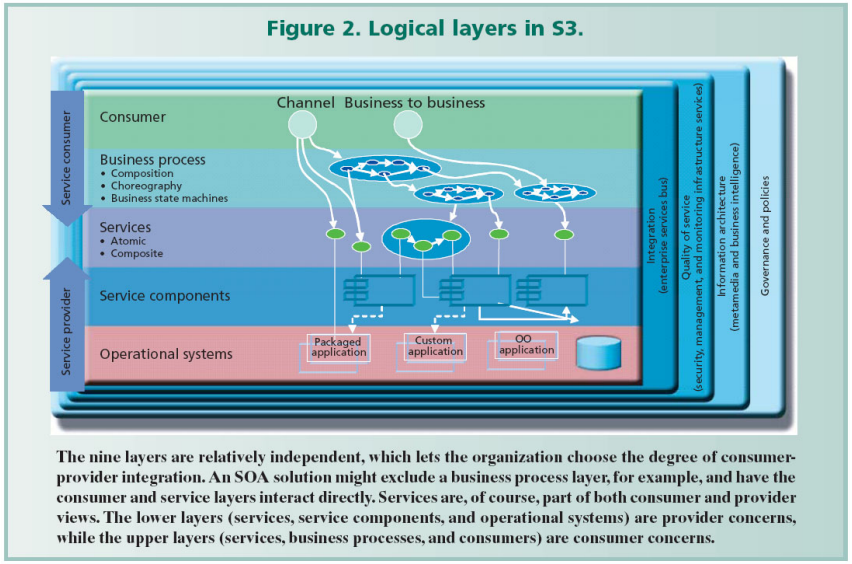
- **Develop a Real-Time Integration Solution (RTIS) based on F0 Common Integration Architecture, IBM's Information Integration Framework and relevant ISA & ISO standards as defined in the project documents**
  - For standardized access to information in Statoil's various IMS applications
- **Ensure and verify that the solution delivers the following capabilities:**
  - Enterprise-wide name space and naming convention that is unique and that is based on industry standards ISO15926, ISA S88/95 and Mimosa
  - Design and creation of asset models and model instances
  - Mapping / management functions supporting configuration and model updates from the DCS and upwards
  - Maintenance, persistence and quality control of data
- **Verify value and functionality through testing of solution on StatoilHydro assets in accordance with selected use cases and tools**
  - Statfjord A and Gullfaks B

Background for architecture viewpoint used in Draft Reference Architecture for OLF Integrated Operations Generation 2 and StatoilHydro TAIL-IO project F0

Aspects to take into account when specifying architecture viewpoints based on IEEE-Std-1471 –



IEEE S3 SOA Reference Model is the baseline for structuring the architecture overview diagrams



http://www.computer.org/portal/cms_docs_itpro/itpro/homepage/2007/may_june/f3010.pdf

IBM C&P IIF
Realtime data and history sensor data integration

Monit Center Engineer

Field Operator

Line Manager

Portal Services

NEW UPSTREAM SERVICES

Condition Monitoring

Operations Reporting

Production Optimization - Visualization

Services,
Services + Business Components

Equipment information, instrument information, tag structures

Integrated Information Framework

Semantic Model,
Enterprise taxonomy
Meta model
Instance model

Realtime and historical measurements

DCS, PLC & Historians

Engineering Systems

Maintenance & Asset Management

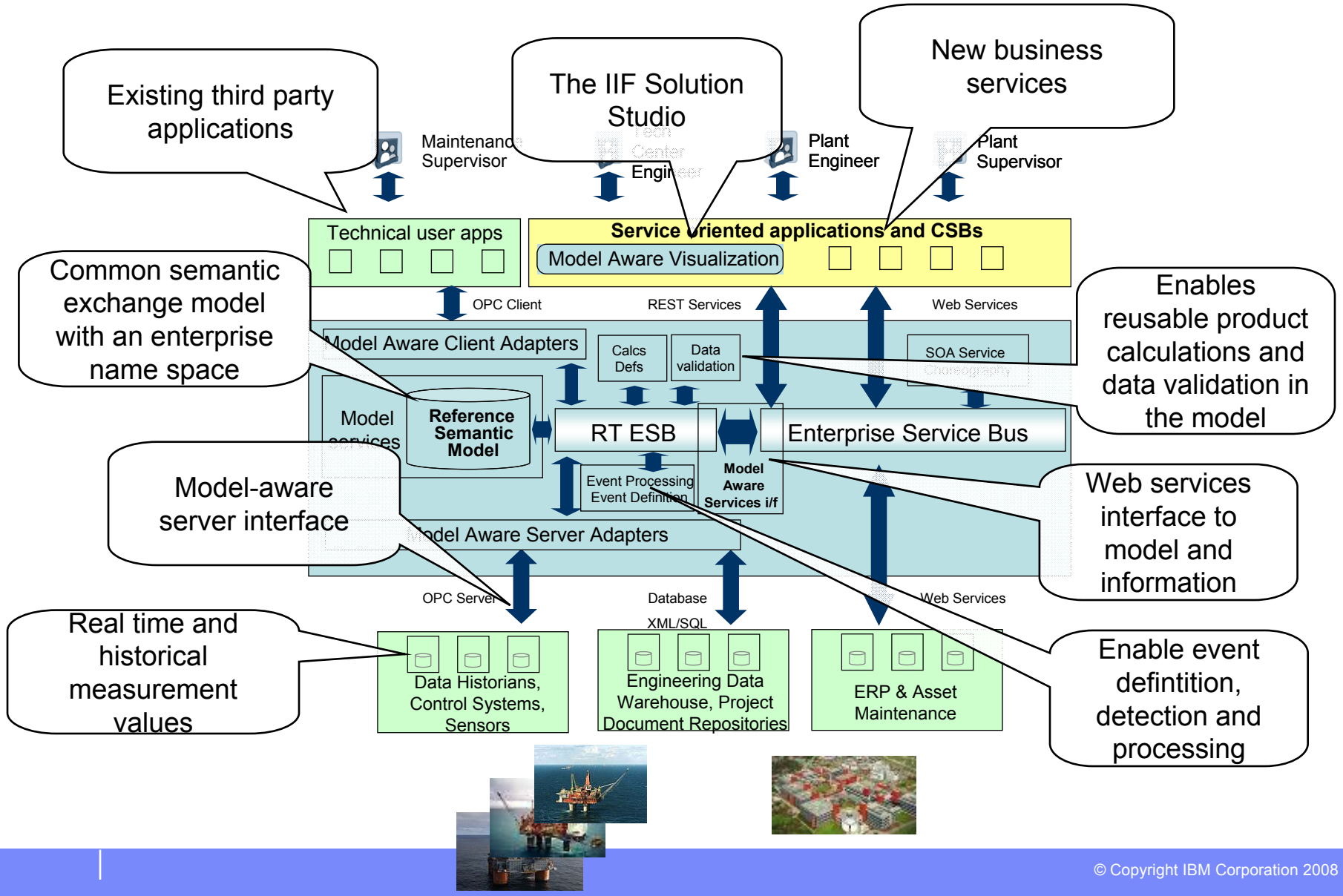
Integration
ESB, Web Services, Messaging, Events, OPC

PROCESS CONTROL DOMAIN

ENTERPRISE DOMAIN

The Integrated Information Framework

Main building blocks



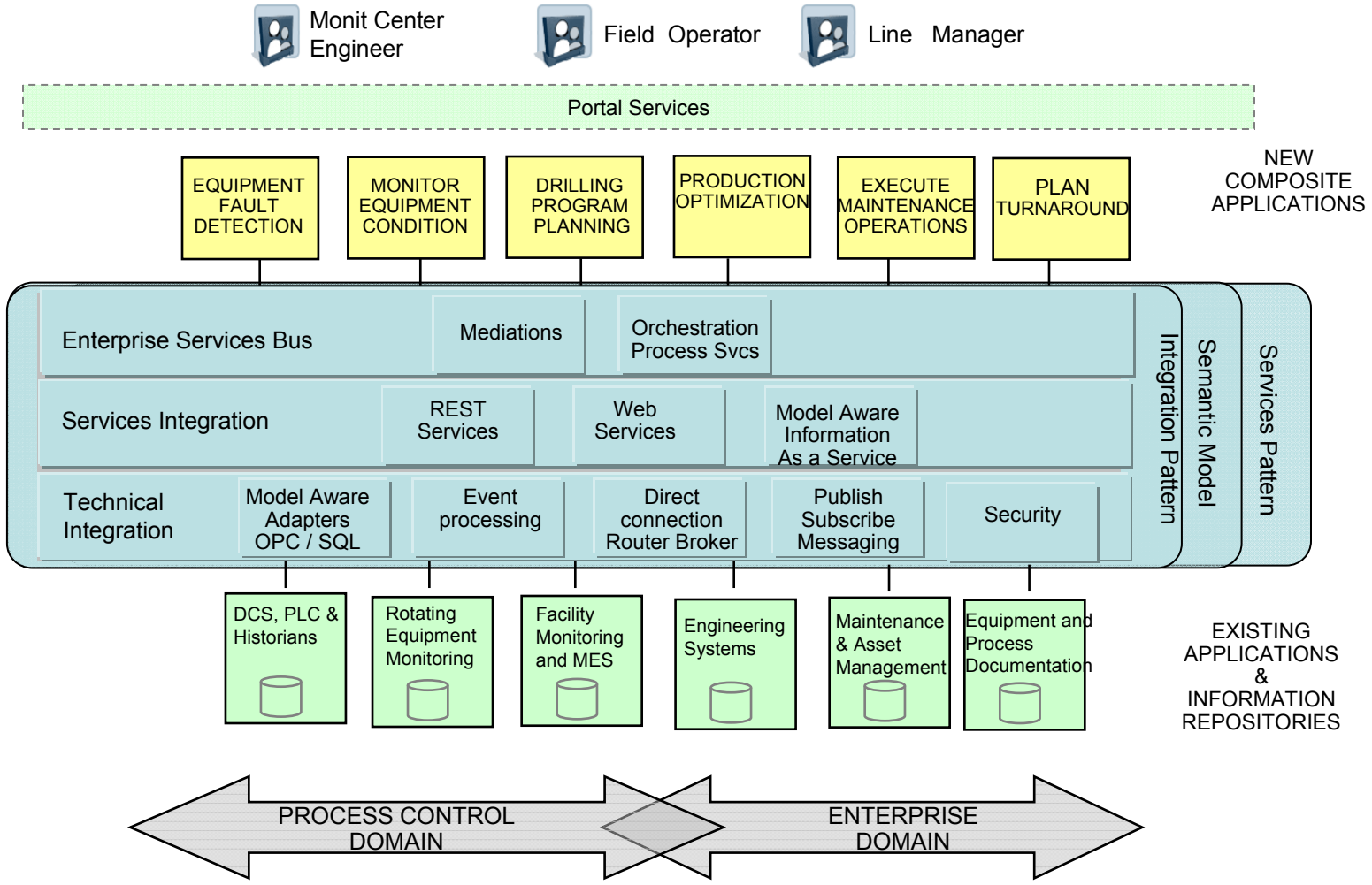
C&P Framework Manufacturing Operations Concept

- **Integrated Information Framework (IIF) is the set of practices and technologies that provides:**
  - Global visibility into manufacturing Information and performance
  - Presentation of information in the context of equipment configurations
  - Easy Maintenance
  - IIF provides:
    - Foundation for internal manufacturing collaboration (Performance Improvement) and execution (Operational Excellence)
    - Ability to effectively maintain equipment relationships, track events and conditions across multiple plants
    - A technology neutral lingua franca reference framework plant model based on recognized global standards
    - A federation of data, not a replication

Integration Pattern – bridging real time with enterprise systems

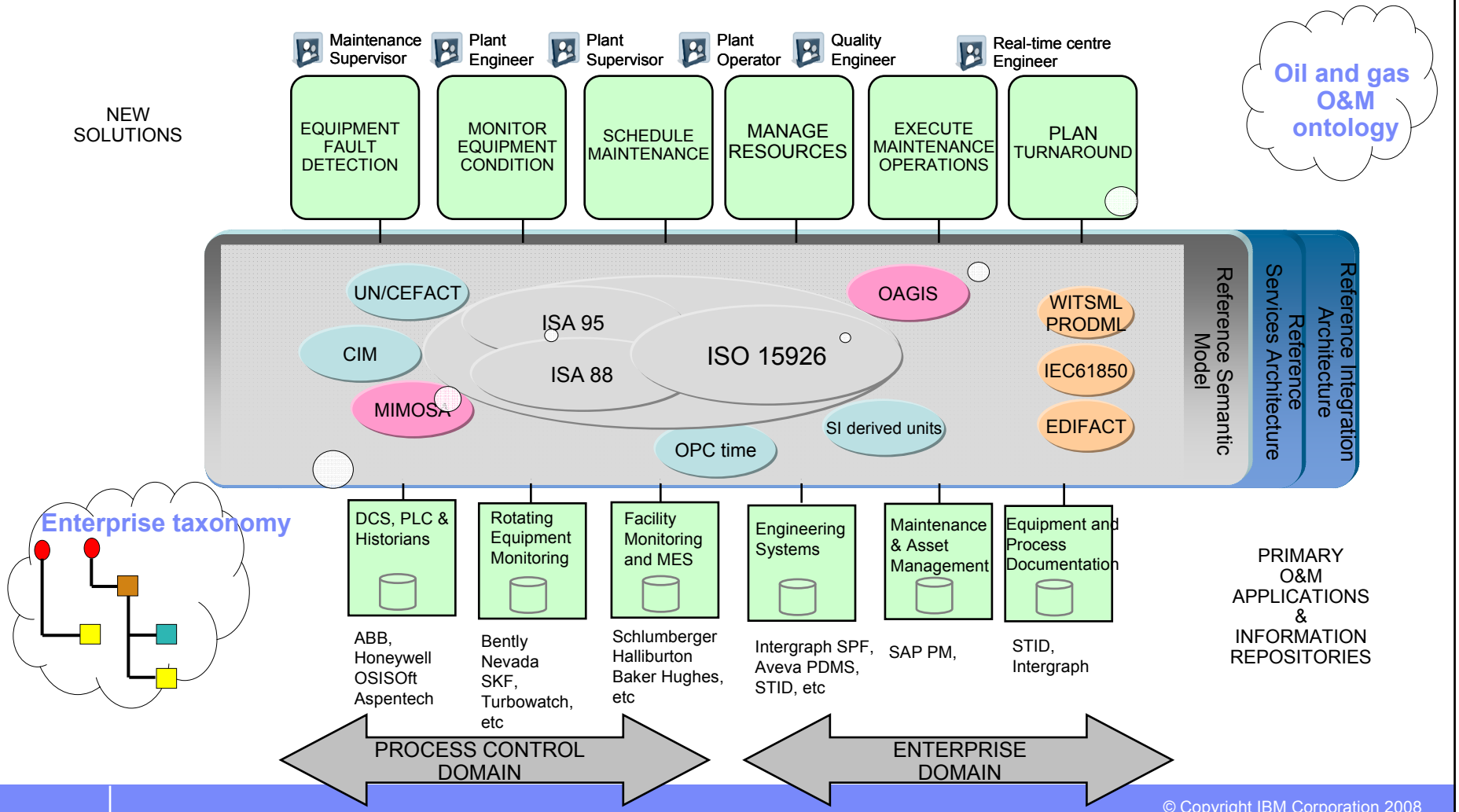
- Access to the RT data directly at its master source, - data currency optimized
- Accessing OPC, and Web Services, or any Enterprise Application asset through ESB eliminates information barriers

Architecture instantiated through IIF



Semantic Model – integration using common industry model

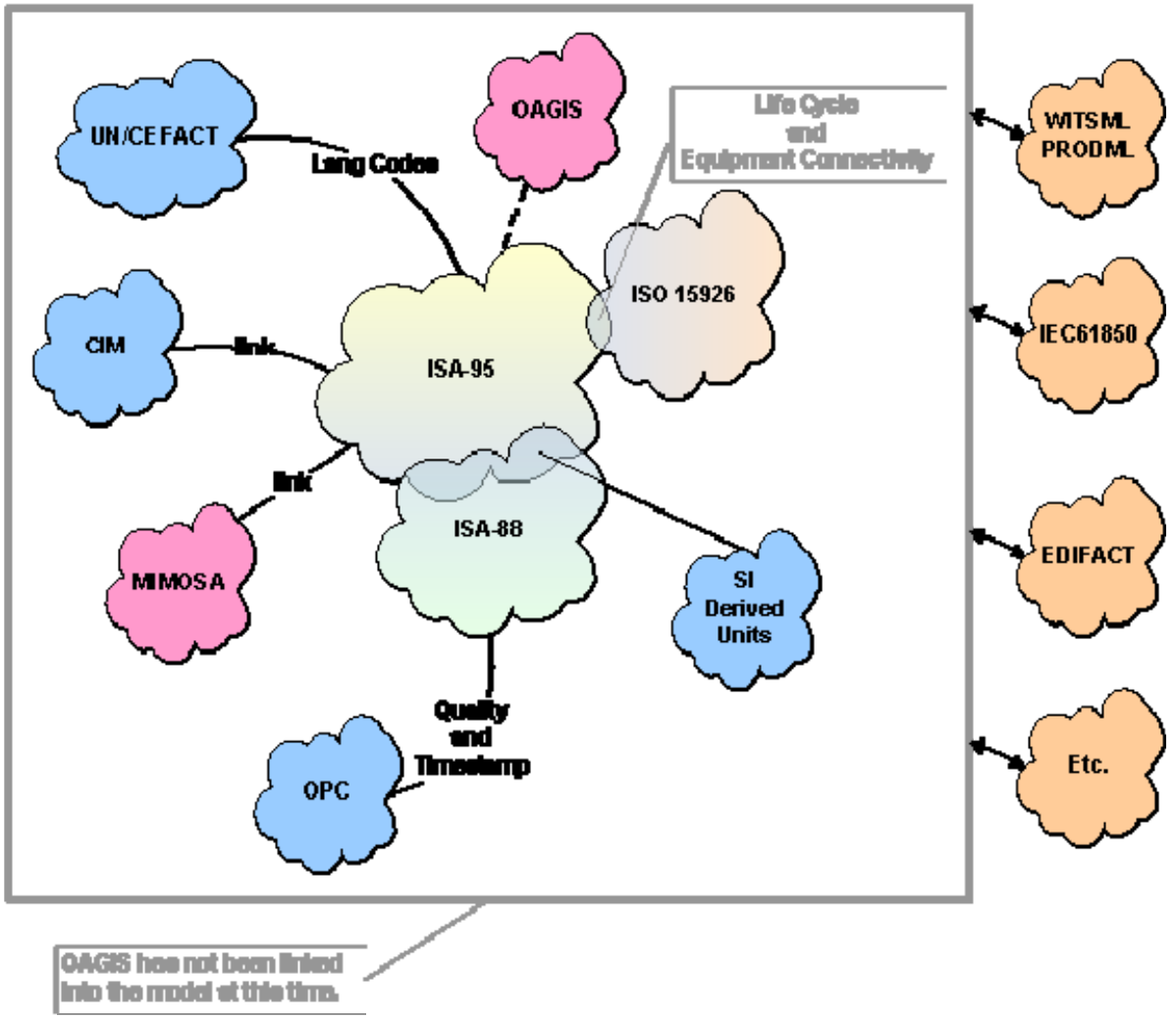
- Standards based ontology.
- Common asset model across facilities and systems
- No change in the local plants



IIF – RSM Metamodel
RSM - standards approach and industry participation

RSM Team

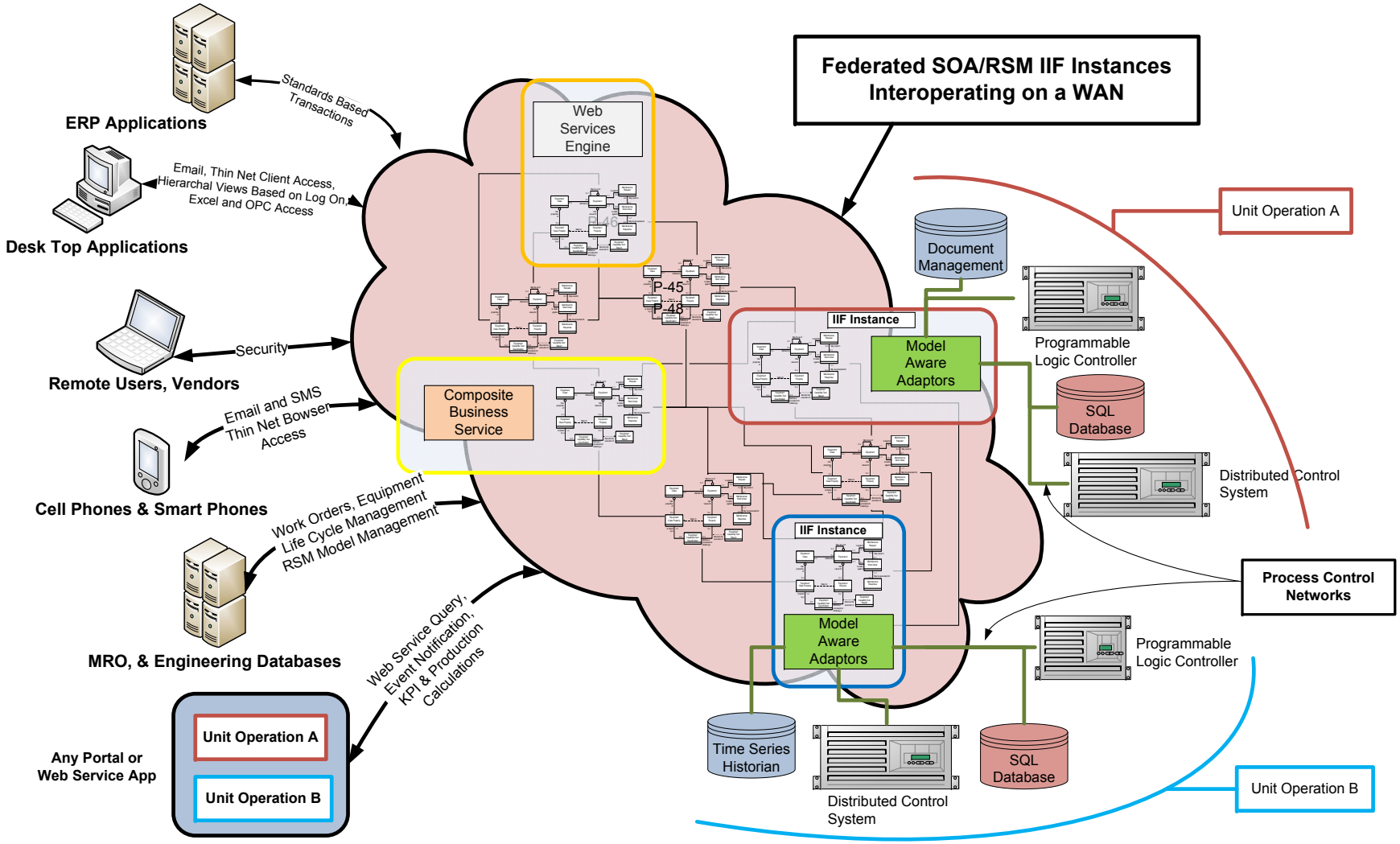
- **ISA 88 – Dennis Brandl**
- **ISA 95 – Keith Unger**
- **PCA/OLF – Nils Sandsmark, Thore Langeland, Magne Valen Senstad**
- **MIMOSA- Alan Johnston, Ken Beaver**
- **OAGi – Dave Connelly**
- **WBF – Dave Emerson**
- **OSIsoft – Jack Aude**
- **DOW – Russ Dickinson**
- **SISCO – Herb Falk**
- **IBM – Vishwanath Narayan**



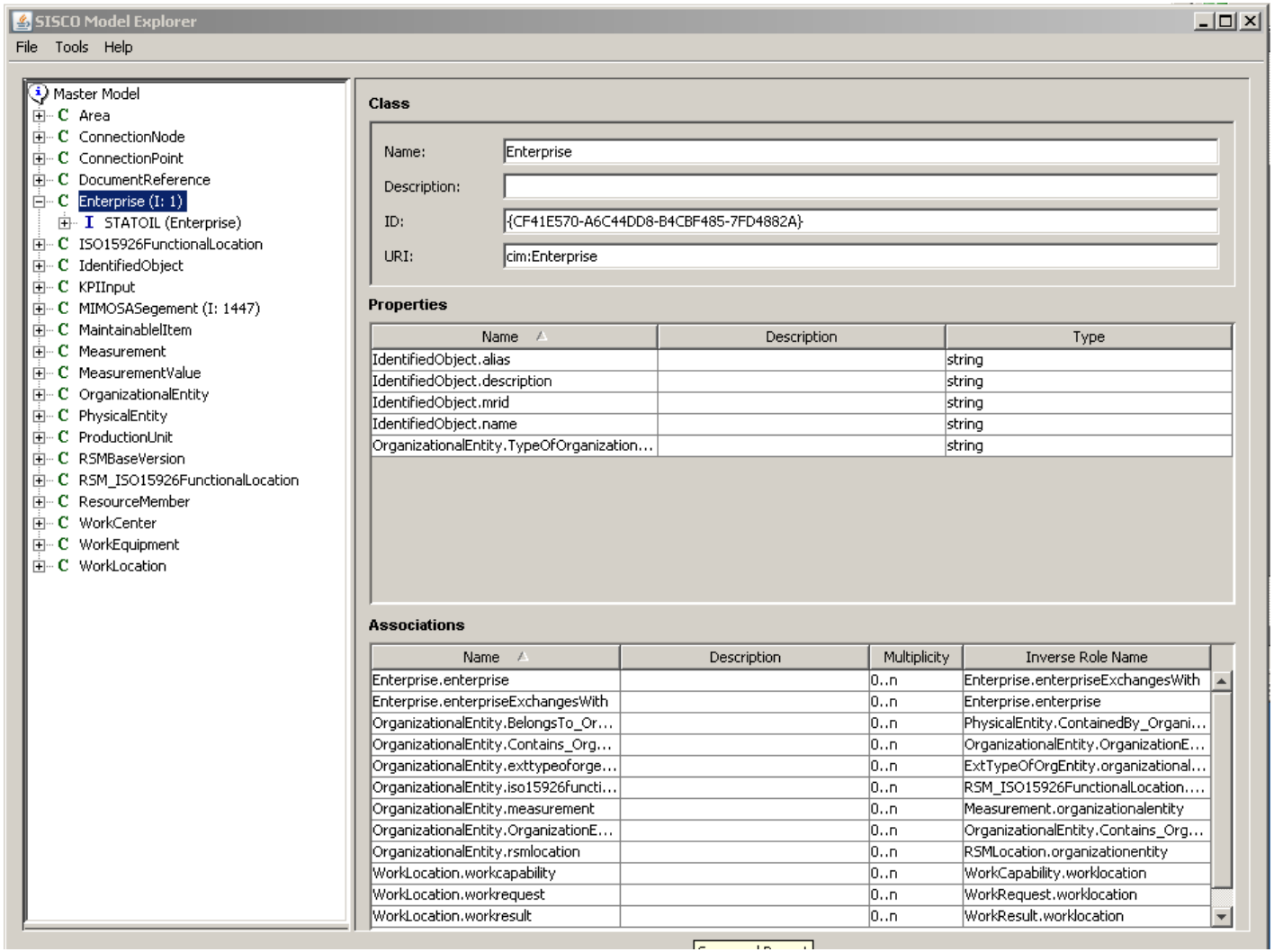
Reference Semantic Model Objectives and Functions

- **The RSM essentially answers the** Open Operations and Maintenance **model requirements**
- Connects **measurements, equipment, planning and scheduling, life cycle management, etc. throughout an enterprise**
- **The RSM is** not a data model **and does not constrain the way applications implement the information contained within the model.**
- **The RSM facilitates** the exchange of information **it does not store or replicate data. Federates Instances of the IIF/RSM across the Enterprise.**
- **The RSM provides a "**Contextual Naming Service **for equipment and measurements, keeps track of "**equipment and process states"**.**
- **The RSM provides** multiple enterprise navigation methods **that allows the access of process equipment, measurements, and document connectivity for visualization, and provides a "role based" information capability**
- **The RSM can be** "queried" **to find equipment and related information to like documents and "pseudo static" data by Web Service based applications.**
- **The RSM provides a base for** "Model Aware Adapters"

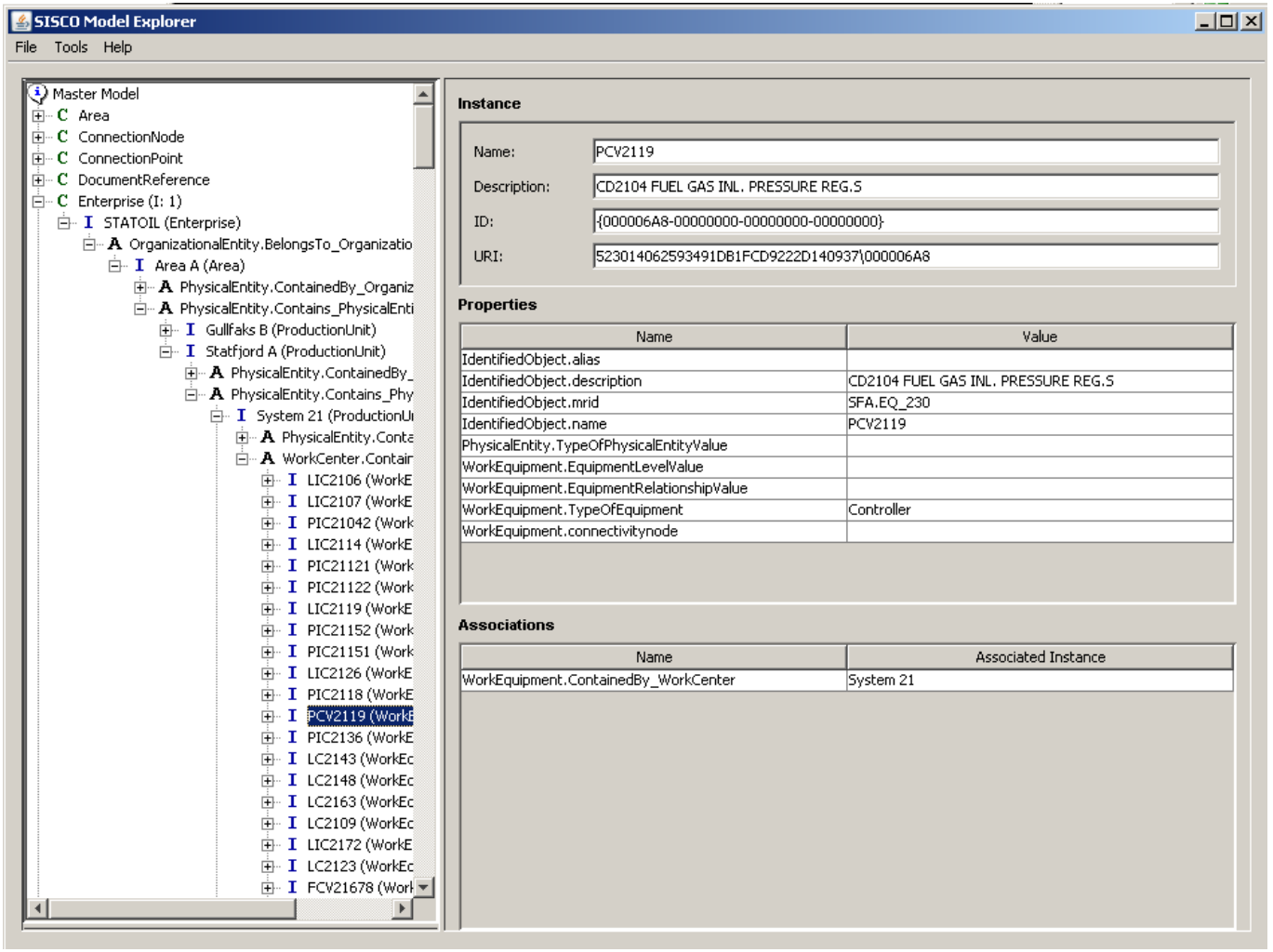
The RSM and SOA Provides a True Industry Content Base for an Enterprise



The RSM in action



Instantiated for StatoilHydro



F0 B Real-Time Integration Solution
Physical Infrastructure Architecture - Pilot