

OpenO&M™ Manufacturing Joint Working Group

Open Standards-Based O&M Interoperability

Owner/Operator Collaboration Team

Presenters:

MIMOSA – Alan Johnston

BP Refining – Kent Hill

NOVA Chemicals – Craig Lahtinen

Suncor – Cliff Pedersen

ARC Forum

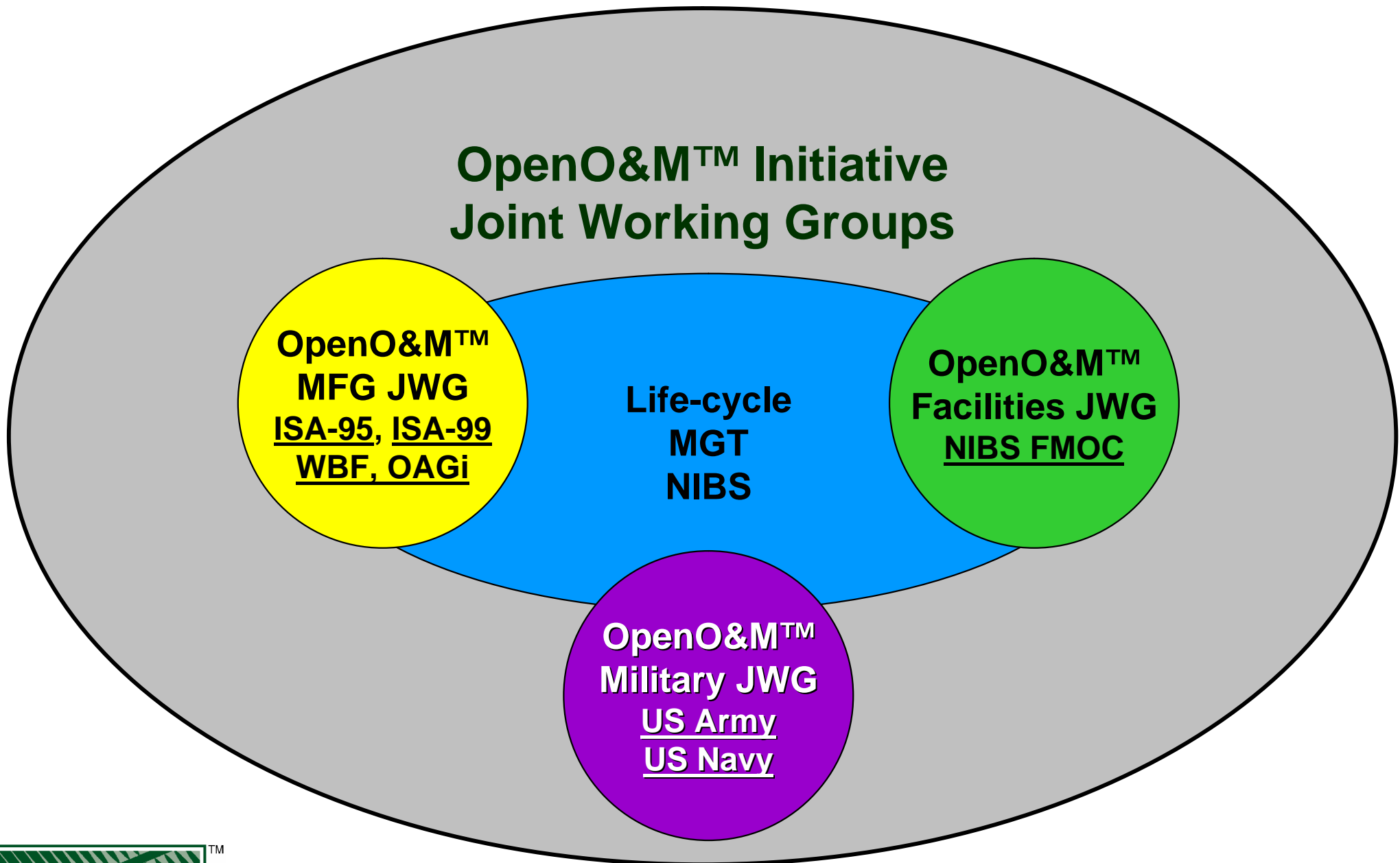
June 28, 2006

Boston, MA

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Participating Standards Organizational Model

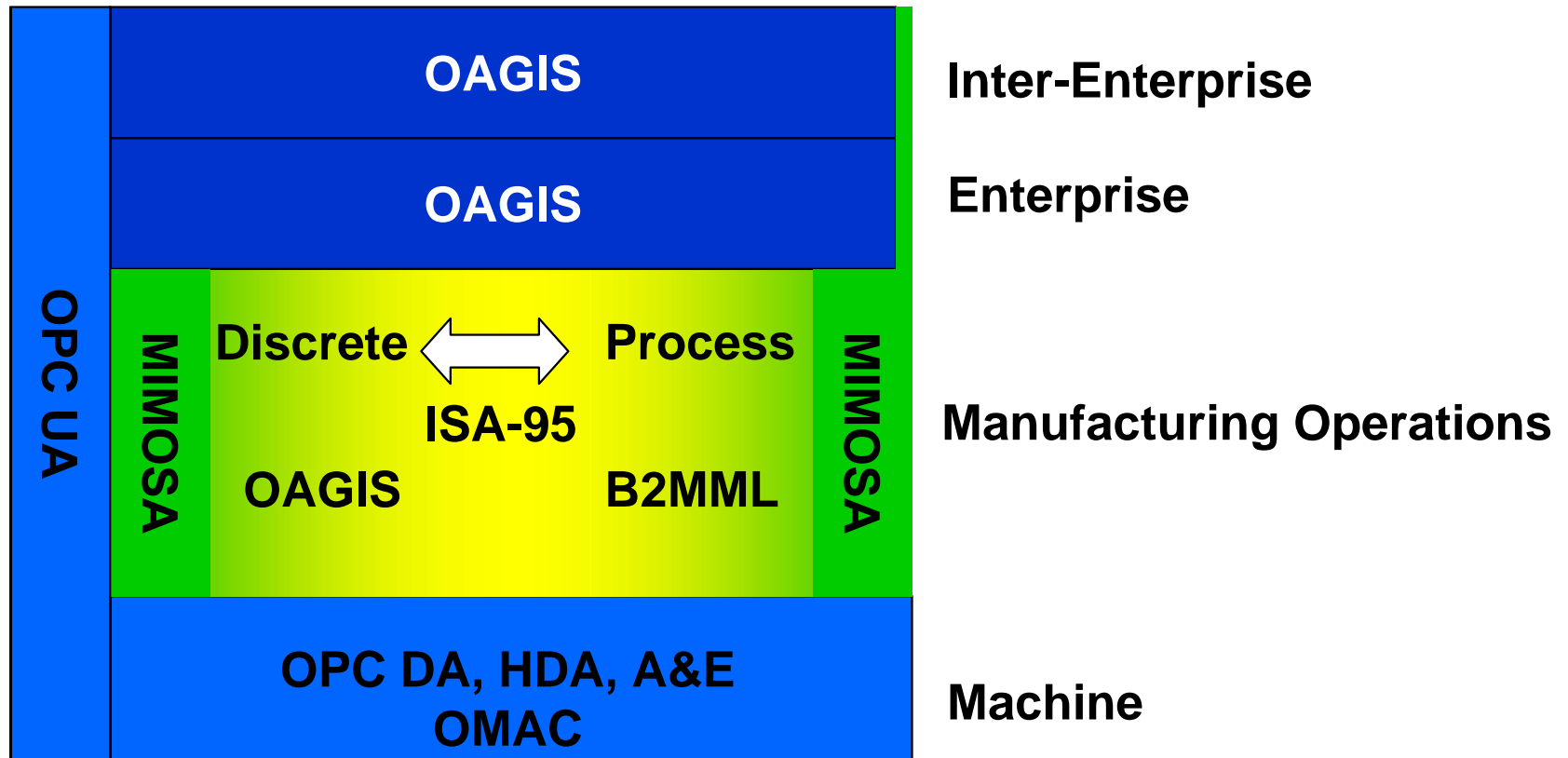


OpenO&M™ Operation

- A virtual organization
 - ✓ Maintained by MIMOSA
 - ✓ No dues, participants volunteer from member groups
- Umbrella Organization - Forum for **collaboration**
- How does the organization work?
 - ✓ OpenO&M does not dictate work or content of member groups standards
 - ✓ OpenO&M issues whitepapers addressing standards related benefits of industry interest
 - ✓ Participants **harmonize** key standards from their respective organizations
 - ✓ Participants **develop and demonstrate reference implementations** based on their **harmonized standards**
 - ✓ Participating organizations work to **cross reference** their related standards and **collaborate** on their content
- **Foci**
 - ✓ **Getting Real Work Done Now**
 - ✓ **Practical Application of Existing, Proven O&M Standards**
 - ✓ **Applied Engineering – Not Research**
 - ✓ **Owner/Operator Leadership With Vendor Support**

Vision

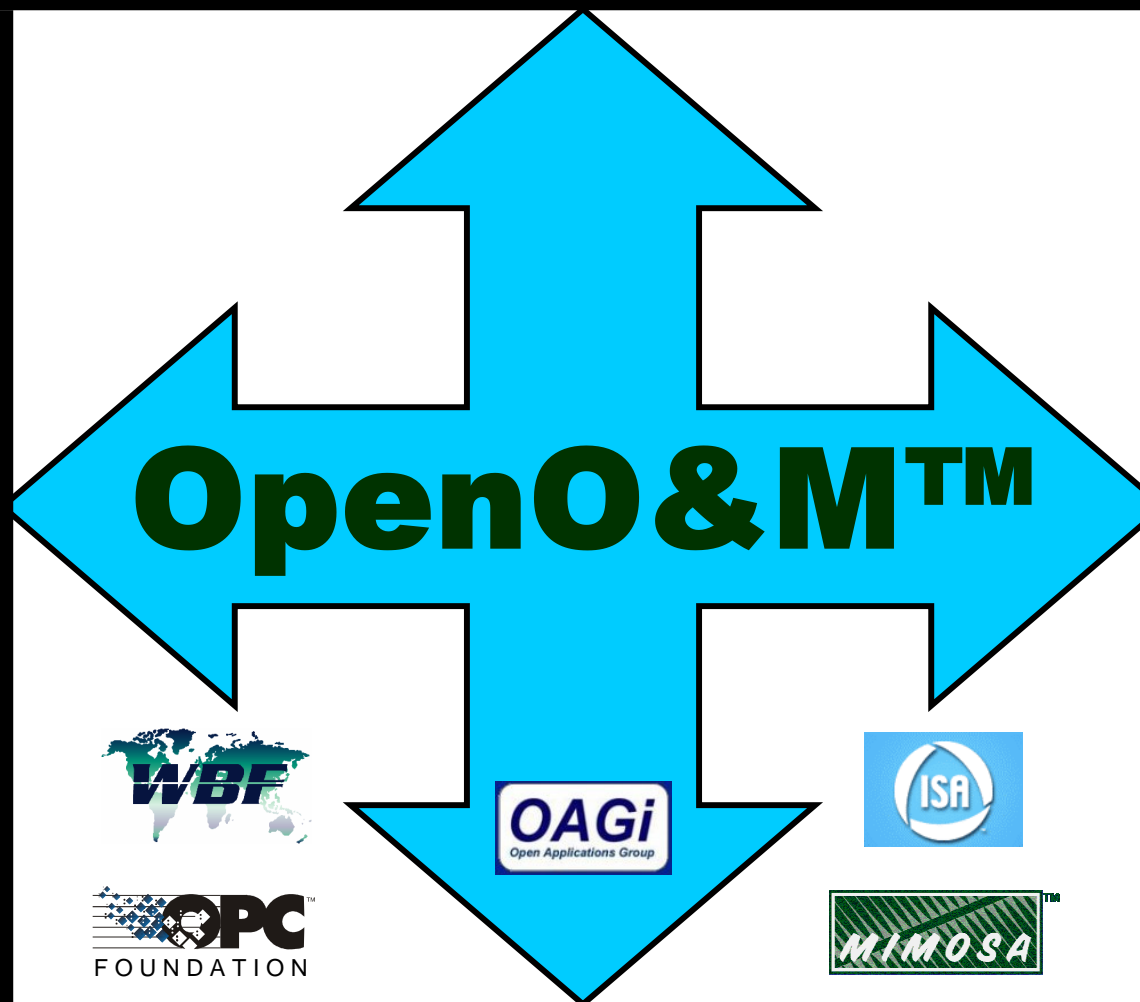
OpenO&M™ Manufacturing Domain Mapping



The OpenO&M™ Solution: Open Standards & Collaboration Fill the Gaps

Operations

Maintenance



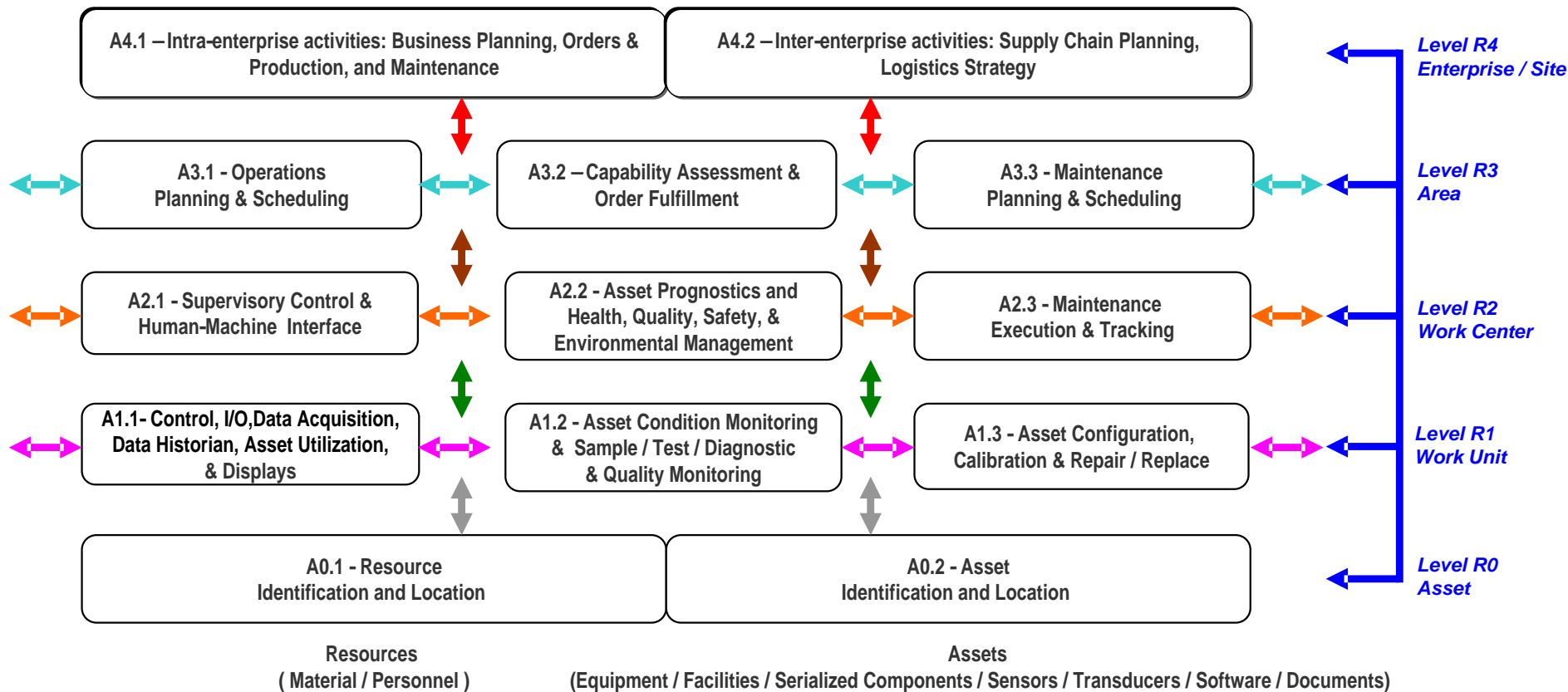
Physical Asset Control
Real-time Systems



DRAFT ISO 18435 Diagram



Activity Domain Integration Diagram



← Part 1: Overview and General Requirements

↔ Part 2: Enterprise / Site and Area Levels [Level 4 to Level 3]

↔ Part 3: Area Level [Within Level 3]

↔ Part 4: Area and Work Center Levels [Level 3 to Level 2 & below]

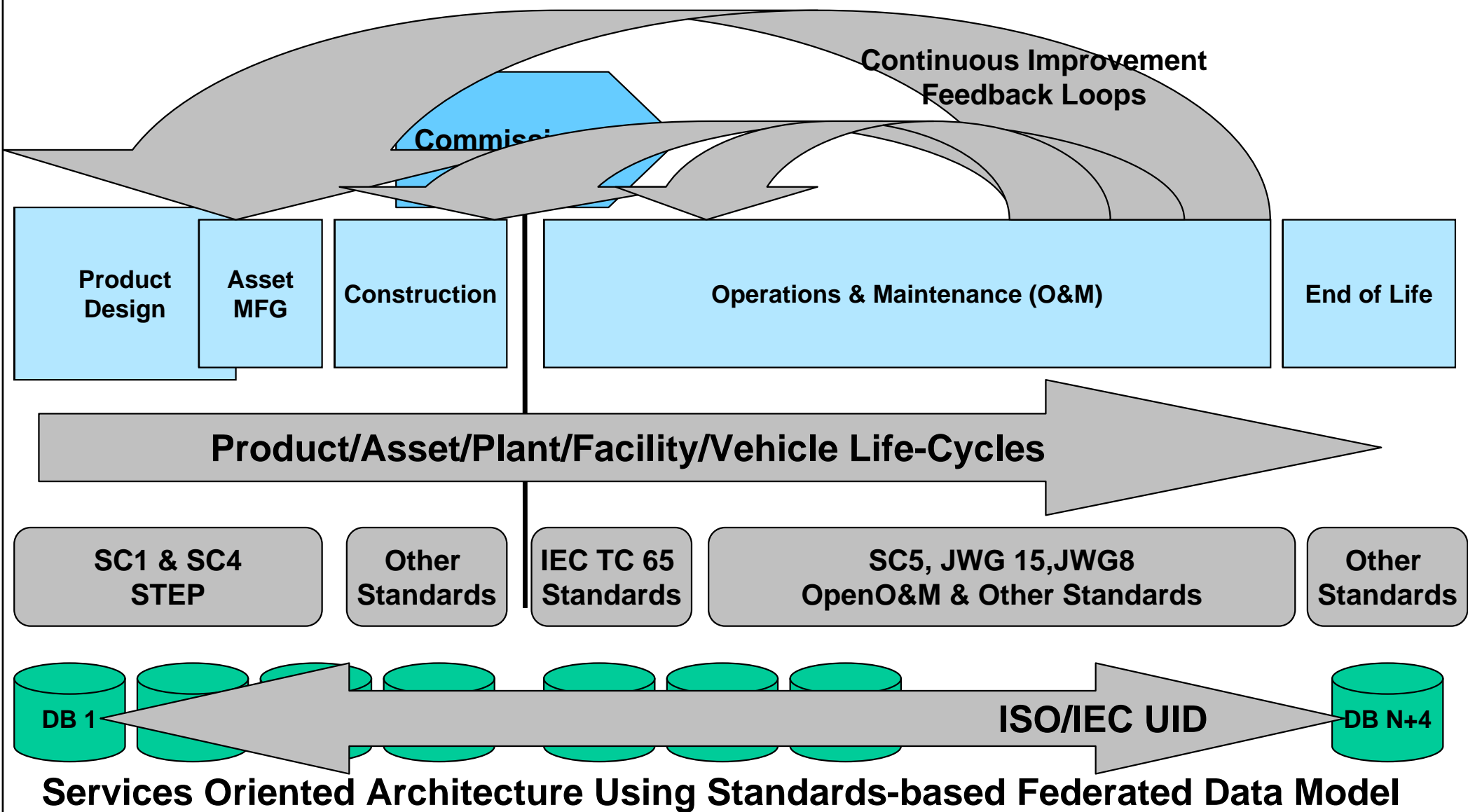
↔ Part 5: Work Center Level [Within Level 2]

↔ Part 6: Work Center and Work Unit Levels [Level 2 to Level 1]

↔ Part 7: Work Unit Levels [Within Level 1]

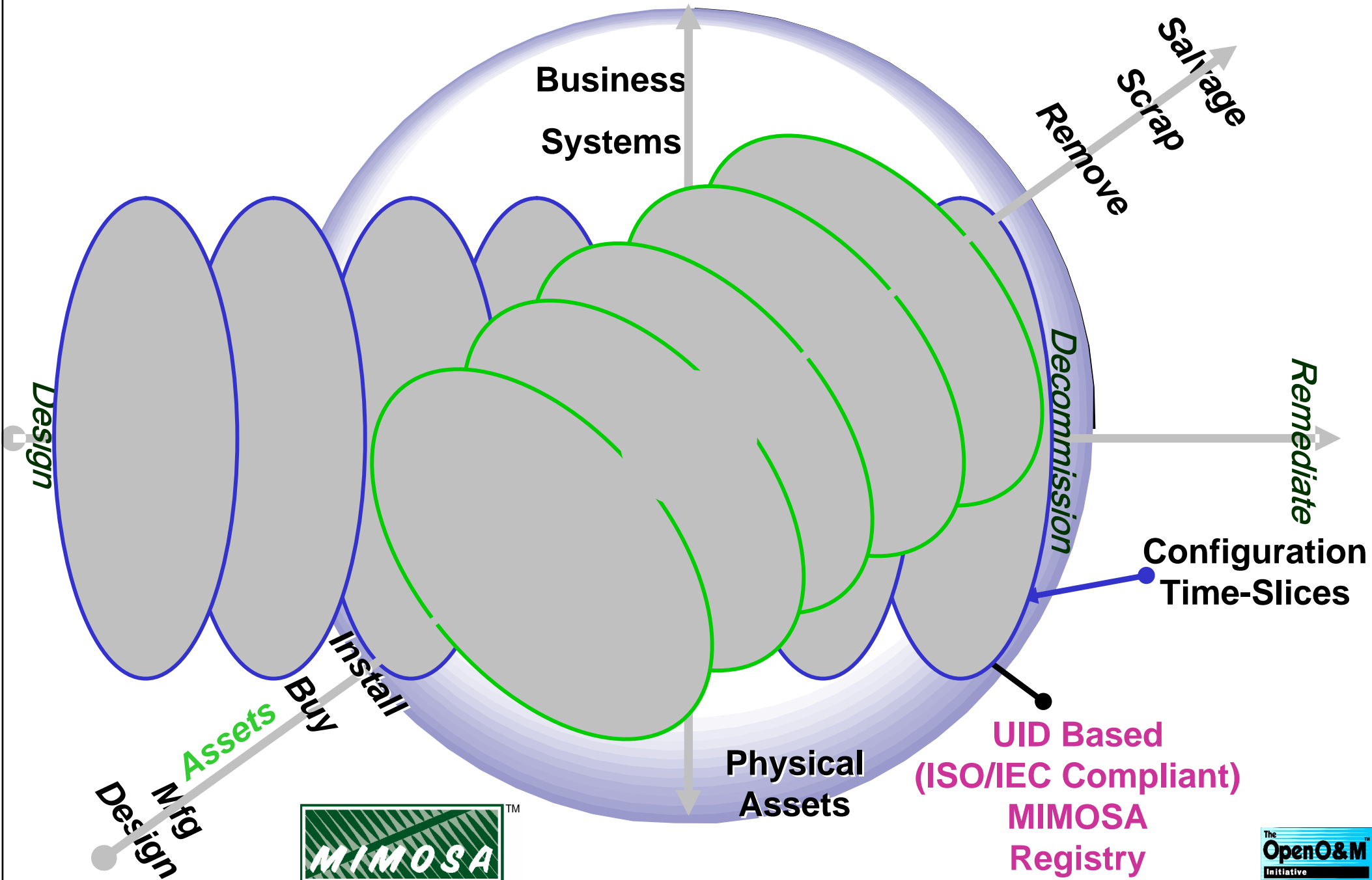
ISO TC184 Manufacturing Asset Management Integration Task Force

Total Life-Cycle Summary-Draft (Federated, Interoperable Implementation Model)



Enabling Collaborative Asset Life-cycle Management

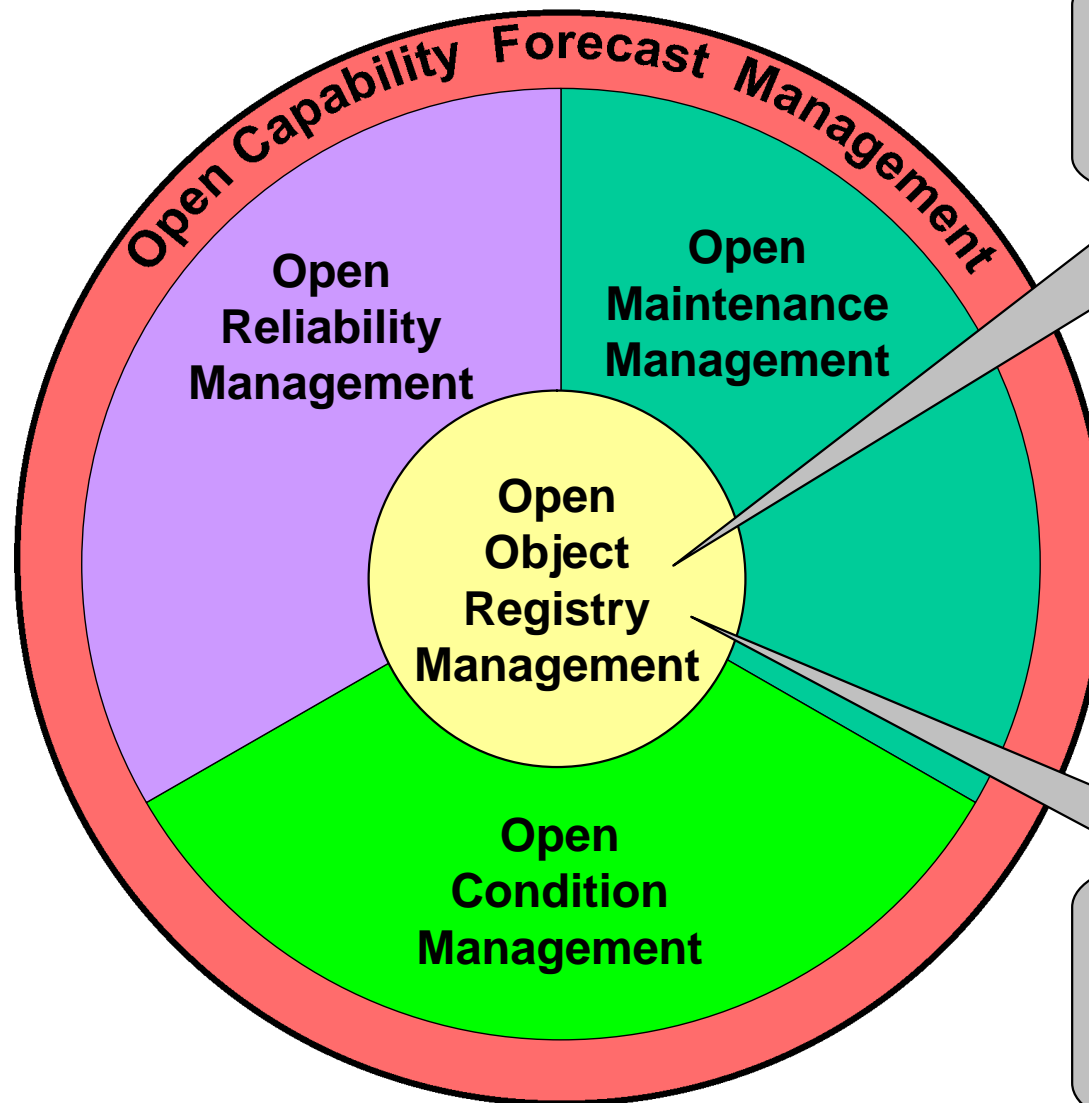
Reliability Management - Configuration Management Model



MIMOSA

Open Interoperability Model

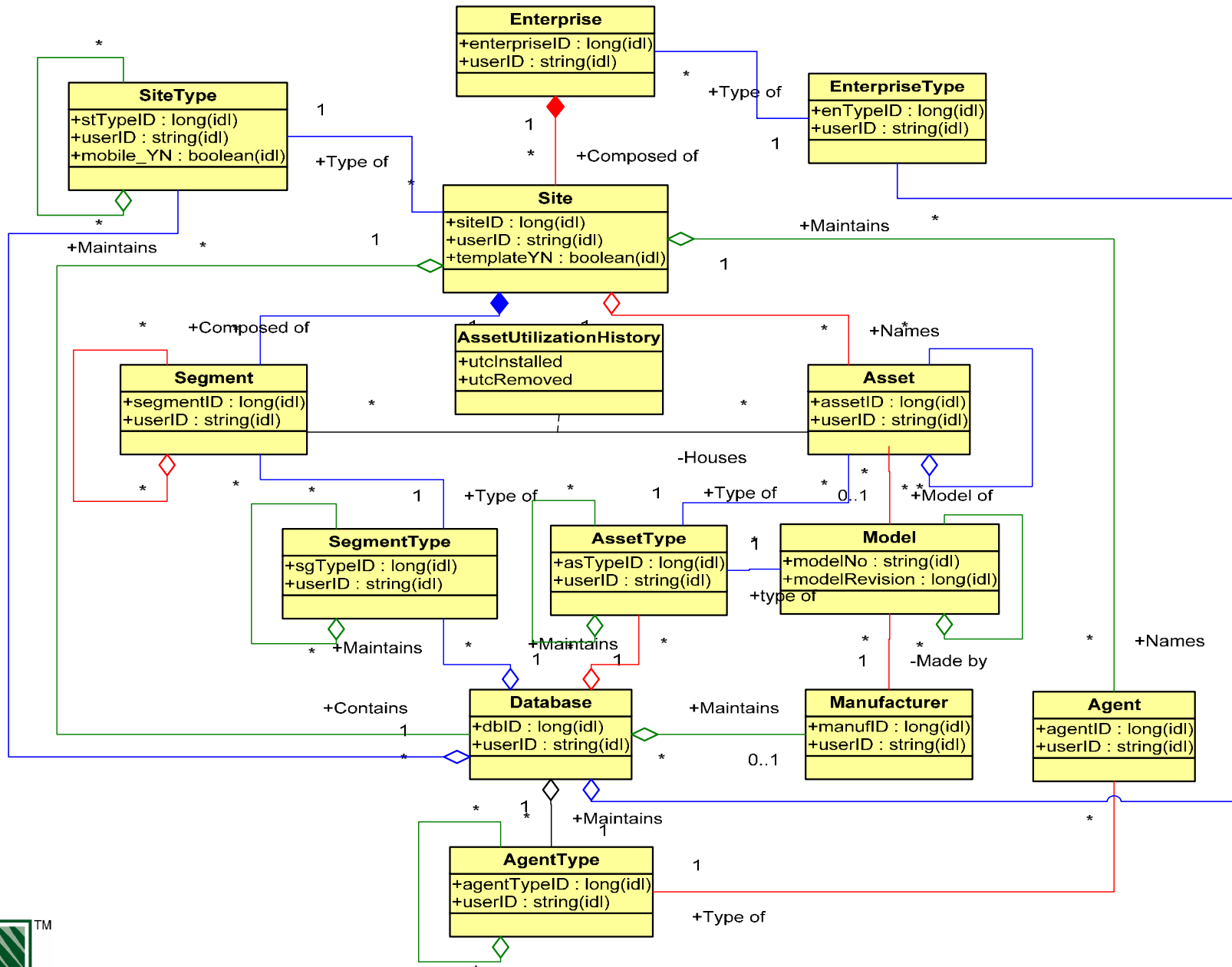
Asset Management Functional Domains








- Open Modeling For:
- Plants
 - Facilities
 - Fleets

- Open Modeling Of:
- Physical Assets
 - Functional Segments
 - Resources
 - Agents

MIMOSA Open Object Registry Reg Core



Data Model - mapping of Industry standards to requirements

-  PISTEP / PIDX
-  ISA-95
-  MIMOSA
-  OPC
-  ISO 14224



Plant Lifecycle					
Engineering	Procurement	Construction	Operations	Capability (Maintenance & Reliability)	
Material Specifications	Piping Specifications Material Master Catalogs	Tool Catalogs	Crude Assay MSDS	Spare Parts Lists Stores Inventory Material Reliability Data Model Part Reliability Data	<i>Materials Model</i>
Vendor Contracts Engineering Contracts Eng. Capability Assess.	Service Contracts	Contracted Services Tracking	Operator Un. Knowledge	Trade Skills Register Root Cause Analysis Data	<i>Personnel Model</i>
Design Requirements	Purchase Requests	Construction Schedule	Shift Roster Daily Plans Stock Progressions Price Sets	RCM/FMECA Analysis Data Work Requests TAR Plans PM Program Inspection Schedule Maintenance Roster Equipment Calibrations Equip. Capability Forecast	<i>Plant Model</i>
Calculations Project P&ID's	Purchase Orders Invoices	As-built P&ID's Hazard Minutes	Tag/Monitoring Locations Process Data Tank Inventories Lab Results Bill of Lading Transfer Advices Operator Logs	TAR Reports Fault Data w/ Op. Param. CBM Data / Exceptions Component Tracking Inspection Records Work Order History Work Permits	<i>Actuals Model</i>

Shared Domain with interoperability implementation based on MIMOSA & other OpenO&M stds

OpenO&M™ Initiative Key Related Activities

Opportunities to Participate

- **ARC's Fourteenth Annual Forum:**
 - ✓ Driving Enterprise Performance through Next Generation Manufacturing Concepts
 - ✓ June 26-28, 2006 - Boston, Massachusetts
 - ✓ MFG JWG Panel to present collaborative efforts
 - ✓ Manufacturing Interoperability Guideline (MIG) Working Group Meeting
- **MIMOSA Fall Technical Committee Meetings**
 - August 29-September 1, 2006
 - Suncor Corporate Offices – Calgary Canada
 - Interoperability Demonstration Workshop
 - OpenO&M Joint Working Group Meetings
 - ISO TC184 Manufacturing Asset Management Integration Task Force Meeting
- **ISO TC184 SC5 WG7 Meetings**
 - ✓ September 11-13, 2006
 - ✓ Tokyo, Japan
- **ISA Expo 2006**
 - ✓ October 17-19, 2006
 - ✓ Reliant Center - Houston Texas
 - ✓ Discuss Pilot Projects & Upcoming Demo
- **2006 International Maintenance Conference (IMC)**
 - ✓ December 5-8, 2006 – Daytona Beach, Florida
 - ✓ OpenO&M Interoperability Demonstration



BP Kent Hill



Refining & Marketing Digital & Communications Technology (DCT) Enterprise Architect

For the last twenty-three years Mr. Hill has worked for BP and has held many increasingly influential positions covering most technical and organizational issues related to delivering Information Technology (IT) services, projects, tactics, and strategies within a large multinational business. Mr. Hill combines his understanding of the IT field and the strategic requirements of the business to develop and promote game-changing approaches to business problems.

For the last five years Mr. Hill has held an Enterprise Architect position in the Refining and Marketing Segment. He has focused on improving the management of data as a true asset of the company through cooperation between Business and IT communities.



ARC – OpenO&M™ Presentation

Kent Hill, R&M DCT Enterprise Architect

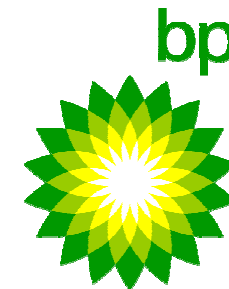
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BP Business

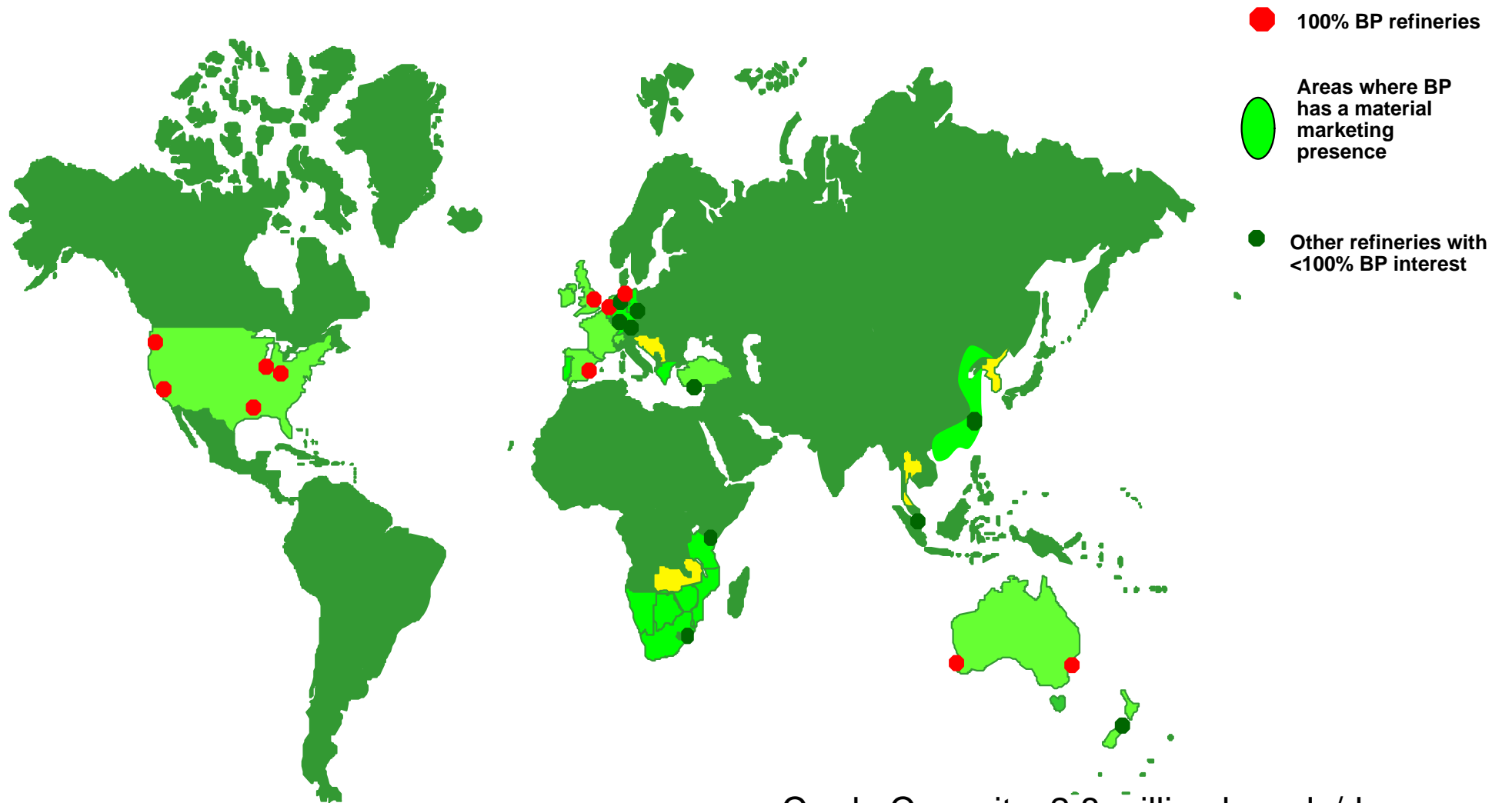


Our business is about finding, producing and marketing the natural energy resources on which the world depends

- Number 2 in Fortune Global 500
- 2005 Revenue ~\$320B
- 1998 Revenue ~\$40B
- 100+ Countries
- 28,000 Service Stations
- 30 Plants



BP Refining Operations



Crude Capacity: 2.8 million barrels/day
Refined Product sales: 6.4 million barrels/day

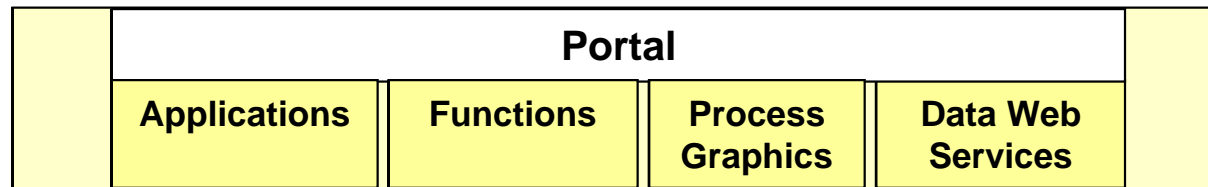
OpenO&M Usage Scenario 1 – Application Integration



User Access



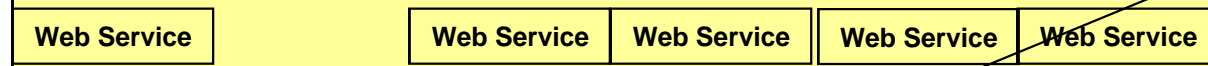
Environment & Applications



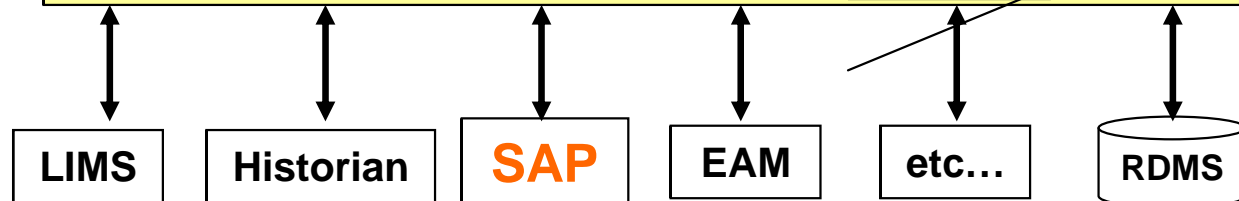
Data Mgmt



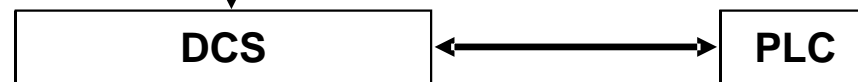
Data Interfaces



Legacy Systems



Controls

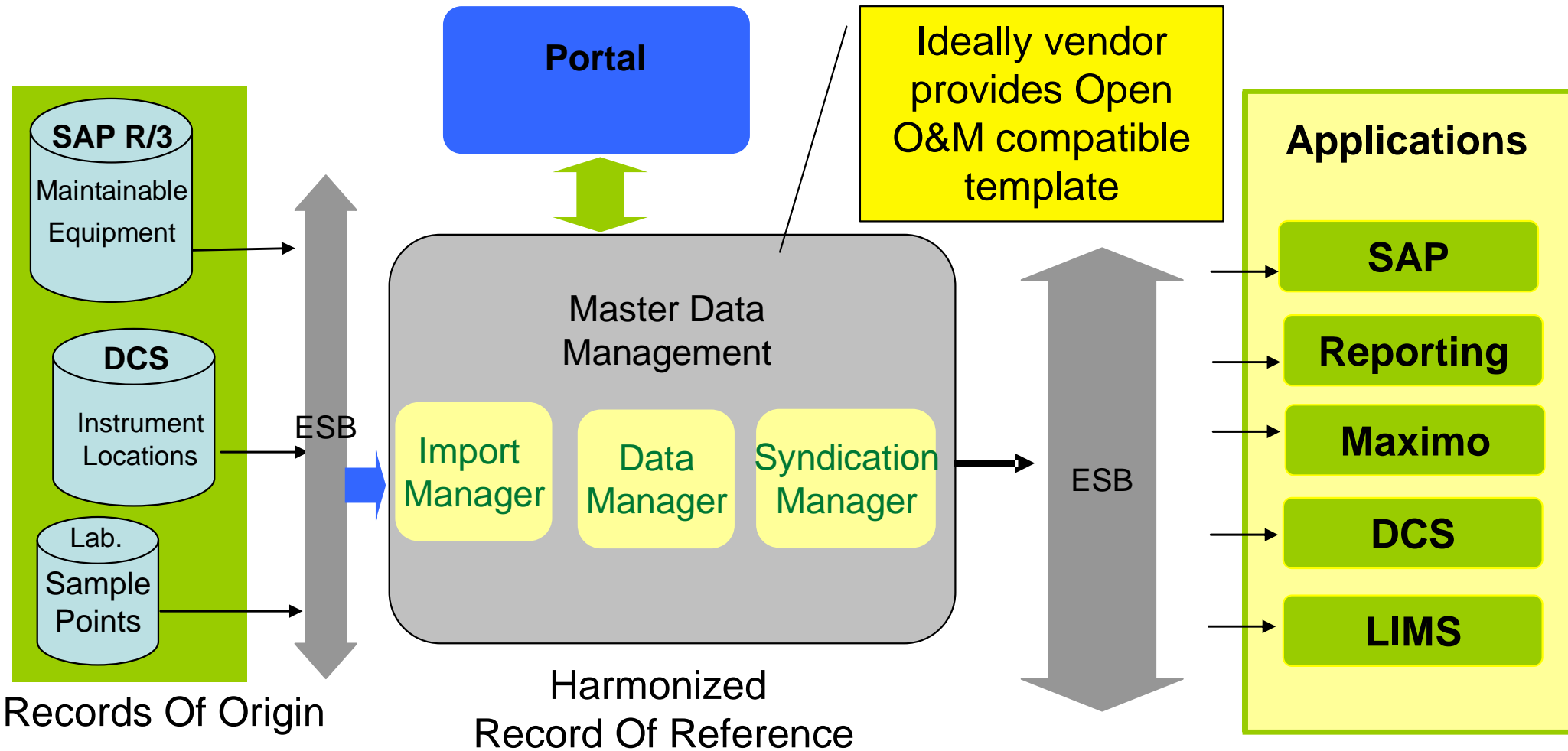


Equipment & Devices



Ideally application provides OpenO&M compatible Web Service

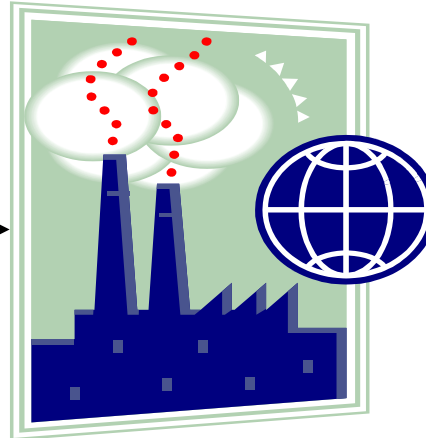
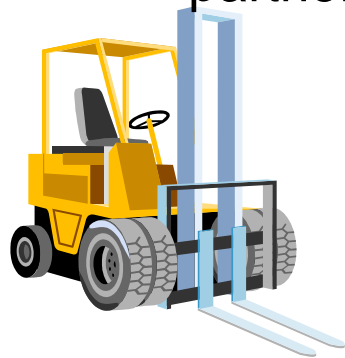
OpenO&M Usage Scenario 2 – Master Data Management



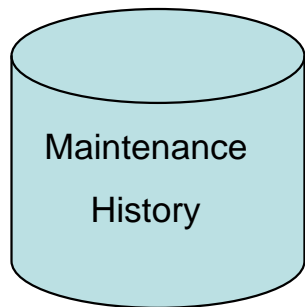
OpenO&M Usage Scenario 3 – B2B Exchange



Equipment maintained or new equipment delivered by partner



Data delivered electronically.



Ideally data provided in Open O&M format

Principles



- Whenever there is an opportunity for a data owner to adopt data models, data standards, metadata, XML services or similar resource from a recognised industry standards setting body, then we should be supportive.
- Adopting industry standard models would foster better B2B relationships, and would let our data owners focus on value added activities rather than enabling activities.
- Where data standards have typically faced difficulties is the somewhat different attitude taken by the major package suppliers.
- Projects often make non-value comprises to connect industry-standards to third party proprietary packages

Where we are today



- Current Applications suite being embedded in the business
 - Application owner teams
 - General environment (data model) has business ownership
- Mimosa Data Model maps to our Operations & Maintenance requirements
- **MIMOSA is being used as more than an interface standard – it is the heart of our portal integration solution and will form a significant portion of our future Refining Roadmap and the basis of links to the trading organisation**
- So what next

Summary



- Equipment manufacturers, Maintenance companies, Software Application providers all need to support the OpenO&M information models and interchange standard.
 - MIMOSA
 - ISA-95
- Companies can gain value by custom development of interfaces to / from propriety formats to the standards. However far greater value can be gained if the standards are natively supported.

NOVA Chemicals

Craig Lahtinen



Engineering Stream Leader, Manufacturing Excellence

Engineering and Engineering Systems are part of the Manufacturing Excellence program which is designed to consistently implement a portfolio of projects and to create and promote an environment where all manufacturing employees' expertise is leveraged throughout the company. As the Engineering Stream Leader, Craig Lahtinen is responsible for managing projects designed to improve the overall contribution of Engineering and Manufacturing.

Craig is currently leading the Engineering & Technical Data/Document Management Project Team as the Project Manager reporting to the VP of Corporate Engineering. Craig has 15 years of broad project background, including prior hands on experience with engineering data and document management implementations.

Prior to joining the EDM project in 2004, Craig held positions of increasing accountability in Information Technology at NOVA Chemicals. He was the Plant Management Business Consultant reporting to the CIO before assuming his current role in Engineering. Craig is a graduate of Robert Morris University.

Topics

- Design / Engineering Systems Strategy
- Engineering Data Management Business Case
- Pathforward

Engineering Systems Strategy

DRAFT "As-Is" Engineering Application Inventory by Discipline

*** Strictly Confidential per NOVA Information Protection Policy - For internal NOVA Chemicals use only ***

- Notes:
- 8 Suppliers and products are shown in colored boxes if NOVA already owns or is actively evaluating them. Other products that we do not own are shown in grey boxes.
 - 8 Boxes colored NOVA blue indicate in-house custom-developed applications.
 - 8 All of the AspenTech software listed is licensed on a token system and is not necessarily used at all sites even though it is available to all sites.

Business Perspective:	
Engineering	
Author:	Creation Date:
Kevin Claerhout	April 5, 2004
Last Revised By:	Revision Date:
Kevin Claerhout	January 12, 2005
Diagram Type:	Status:
Application Inventory by Discipline	DRAFT

Options <small>(Note: These option lists are not necessarily complete, but represent larger suppliers or those who have recently contacted NOVA)</small>	Engineering Discipline	EPC Partners (SNC)	NRTC	Corunna	Sarnia Styrene	Joffre <small>(MI includes Pipeline/Cogen and PE1 includes HOG)</small>						Moore	SCRS	Bayport Styrene	Chesapeake	Belpre	Decatur	Springfield	Montreal	Beaver Valley				Painesville	Breda		Ribecourt	Carrington		Berre
		SPS	EPS	Dylark	Arce	Pilot Plant	E3	E2	E1	MI	PE1	PE2	B Line	Pilot Plant	SPS	EPS	Dylark	Arce	Pilot Plant	SPS	EPS	Tach Cir	SPS	EPS	SPS	EPS				
Aspen Invenys PRO/II Others?	Simulation and Optimization	No Information	Aspen HYSYS, Plus, Properties, Custom Modeler, Dynamics, Polymers Plus, FLARENET, OnLine, ProFES											No Information (at this time)																
Aspen Invenys Hextran Others?	Equipment Design and Rating	No Information	Aspen HTFS, ACOL, MUSE, TASC, FIHR											No Information (at this time)																
Aspen Others?...	Conceptual Engineering	No Information	Aspen HX-NET, DISTIL											No Information (at this time)																
ABB TRAC Dyadem PHAWorks Exida, Asset Integrity Management, ACM Automation...	Hazard Analysis / SIL	No Information (at this time)	Dyadem PHAWorks											Some sites using PHAPro6																
Berwanger PPM Others?	Relief System Design	No Information (at this time)	Berwanger PPM (unsure of extent of Joffre implementation)											No Information (at this time)																
Centurion Others?	Management of Change (MOC)	No Information (at this time)											Centurion	No Information (at this time)																
NOVA-developed MS Access/Excel Others?	Electrical Information	No Information (at this time)											MS Access/Excel																	
Intergraph INtools Others?	Instrumentation Design	No Information (at this time)	INtools											MS Access/Excel	SAP/PM	No Information (at this time)				SAP PM Module	No Information (at this time)				N/A	N/A				
Intergraph PDS BitWise ActiveISO/PID, Pipe2D CAD Work Others?	Piping/Flow Diagrams	PDS	ActiveISO/PID, Pipe2D	ActiveISO/PID, Pipe2D	ActiveISO/PID, Pipe2D	PDS	ActiveISO/PID, Pipe2D	PDS	ActiveISO/PID, Pipe2D	PDS	CADWork	No Information (at this time)				CAD Worx	No Information (at this time)													
CODECALC, CAEPIPE, CAESAR, ALGOR	Pipe Stress Analysis	No Information (at this time)	CAEPIPE, ALGOR		CODECALC CAESAR				CAEPIPE, ALGOR				No Information (at this time)																	
AxiPro, K-Flange	Flange Design	No Information (at this time)	AxiPro, K-Flange		No Information (at this time)																									
Aspen Zyqad Others?	Integrated Engineering	No Information	Aspen Zyqad											No Information (at this time)																
Intergraph SmartPlant BitWise Plant AIM Directa ePRISM Virtual Vault	Information Management	No Information (at this time)	Plant	Plant	AIM Directa				BitWise Plant	ePRISM	No Applications				Virtual Vault		No Information (at this time)													
AutoCAD MicroStation Others?	CADD (+Raster)	No Information (at this time)	MicroStation I/RAS B											CAD Overlay	AutoCAD				CAD Overlay		No Information (at this time)									
SAP PM Module PM Plus, Active Project...	Project Management	SAP PM Module											SAP PM Module																	
SAP PM Module MS Project Primavera (+Claim Digger) Others?	Project Scheduling	Still gathering information.	Primavera	SAP PM Module MS Project				Still gathering information.				Primavera	SAP PM Module				Still gathering information.													
Aspen Icarus Others?	Estimation	No Information	Aspen Icarus											No Information (at this time)																

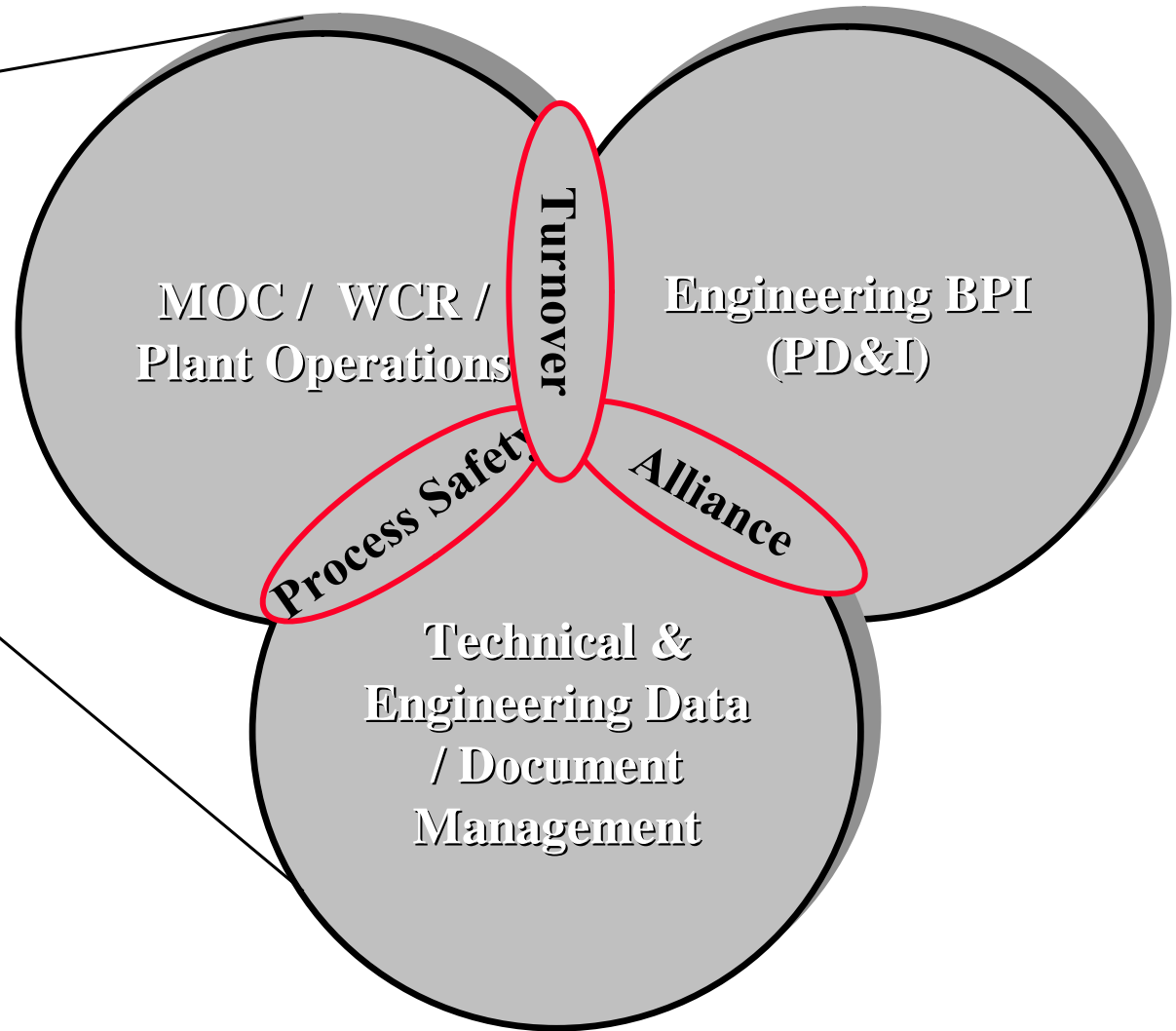
Development of a To-Be state is first on the agenda...



business excellence | people excellence | functional excellence

The Case for Engineering Data Management

Facilitate the integration and collaboration of Key business process intersection points



Interoperability within the “gray space” is the goal

Interoperable Processes

- Facilitates Common Engineering Alliance
 - Standard systems and tools to facilitate resource sharing etc.
 - Concurrent engineering capabilities
- Enables Achieving Project Benchmarking Metrics
 - Reduced cycle time and TIC by re-using engineering intellectual capital
- Engineering Turnover / Commissioning and start-up
 - Managed transition between project and as-built state to allow operations to see (or get to) project changes faster
- Supports and enables Maintenance strategies
 - Facilitation of project and as-built state to allow maintenance to build functional location and equipment records in SAP and expedite the PM process
- Supports Responsible Care initiatives and directives
 - Enables effective Management of Change processes and the audit ability required to meet our obligations for Process Safety Management
- Enables Data Integrity for plant reliability and safety
 - Managing Engineering Records in Plant and Project configurations

Adopt existing solutions to facilitate these interoperations

Path Forward

- Describe where the various Initiative Groups operate within the DOM Model
- Describe where the various Standard Groups are used or support the DOM Model
- Describe where our Technology Providers fit and what Standards and Initiatives Groups they are aligned with
- Based on NCX portfolio, determine which Initiative Groups and Standards Groups support MfgX objectives

NCX is participating in the OpenO&M Manufacturing Joint Working Group

Suncor Cliff Pedersen



C.C. (Cliff) Pedersen, M.A.Sc, P.Eng., P.Mgr.

Clifford C. Pedersen is Manager, Product Production Processes at Suncor Energy Inc. accountable for all process control and real-time applications used in plant operations for the entire company. During the last 21 years he has been accountable for advanced process control applications, real-time process optimization, major reinstrumentation projects and information technology, primarily at Sarnia Refinery. Before 1984, he worked for Shell Canada Products Ltd. in Toronto and Sarnia as a Staff Engineer and supervised systems development in the Process Computer Applications Dept. Previous to that, he was with Imperial Oil Enterprises Ltd. in Sarnia and Montreal as an Applications Engineer and a Project Engineer and pioneered some of the first multivariable constrained closed-loop computer control. Cliff received his B.Sc. in Chemical Engineering from University of Alberta in 1969 and his M.A.Sc. in Systems Design in 1976 from University of Waterloo. He is a member of the CScE, NPRA and ISA, is a registered professional engineer (P. Eng.) in the province of Ontario, Canada, and holds a professional manager designation (P. Mgr.) from the Canadian Institute of Management.

P2B Integration at Suncor - OpenO&M, Please!

Suncor Energy Inc.

Presented by: Cliff Pedersen
Manager, Product Production Processes
Suncor Energy Services Inc.

June 28, 2006

Boston, MA



Legal Notice

- This presentation contains certain forward-looking statements, including statements about Suncor's growth strategy and expected future production, operating and financial results that are based on Suncor's current expectations and assumptions. The forward-looking statements, identified by words such as “targets”, “strategy”, “estimates”, “pending”, “plans” and “objectives”, are not guarantees of future performance. Actual results may differ materially as a result of risks, uncertainties and other factors, such as changes in general economic, market, regulatory and business conditions; fluctuations in commodity prices and currency exchange rates; the successful and timely implementation of capital projects; the accuracy of cost estimates; labour and material supply issues; and uncertainties resulting from potential delays or changes in plans, among others. See Suncor's current Annual Report and other documents Suncor files with securities regulatory authorities for further details, copies of which are available from the company. The forward-looking statements speak only as of the date hereof and Suncor undertakes no duty to update these statements to reflect subsequent changes in assumptions (or the trends or factors underlying them) or actual events or experience.
- Unless noted otherwise, financial information is for the most recent quarter or year end.
- A boe conversion ratio of six thousand cubic feet of natural gas: one barrel of crude oil is based on an energy equivalency conversion method primarily applicable at the burner tip and does not represent a value equivalency at the wellhead. Accordingly, boe's may be misleading if used in isolation.

Suncor Energy at a Glance

- Integrated energy company - upstream, refining, & marketing, pipelines and wind power
- Market capitalization \$33 billion (US\$28 billion)
- Original and single largest investor in the Athabasca oil sands
- Production capacity of nearly 300,000 BOE/day
- More than 5,000 employees
- Sustainability: benefiting all stakeholders

Suncor Operating Areas

Natural Gas
and Renewable
Energy

- Oil Sands
■ Fort McMurray
- Edmonton
- Calgary



Energy Marketing
and Refining

- Toronto
- Sarnia

Refining and
Marketing, U.S.A.

- Cheyenne
- Denver

Alberta Oil Sands & Heavy Oil

- Alberta area oil sands & heavy oil deposits contain 2.5 trillion barrels - **41%** of world's known petroleum reserves (greater than **combined** Middle East, United States, Soviet Bloc, Western Europe, Australia, Asia, & Africa)
- Alberta deposits cover 77,000 sq km (~30,000 sq mi)
- Athabasca deposits = 950 B barrels
- 20% within 250 ft. of surface

Oil Sands - the Resource

- Thick, sticky mixture of sand, water and bitumen
- About 8 to 9 degrees API
- Suncor leases cover 1,800 square kilometres
- Reserves and resources in place to produce a potential 11 billion barrels of crude oil
- Produced 1 billion barrels since 1967

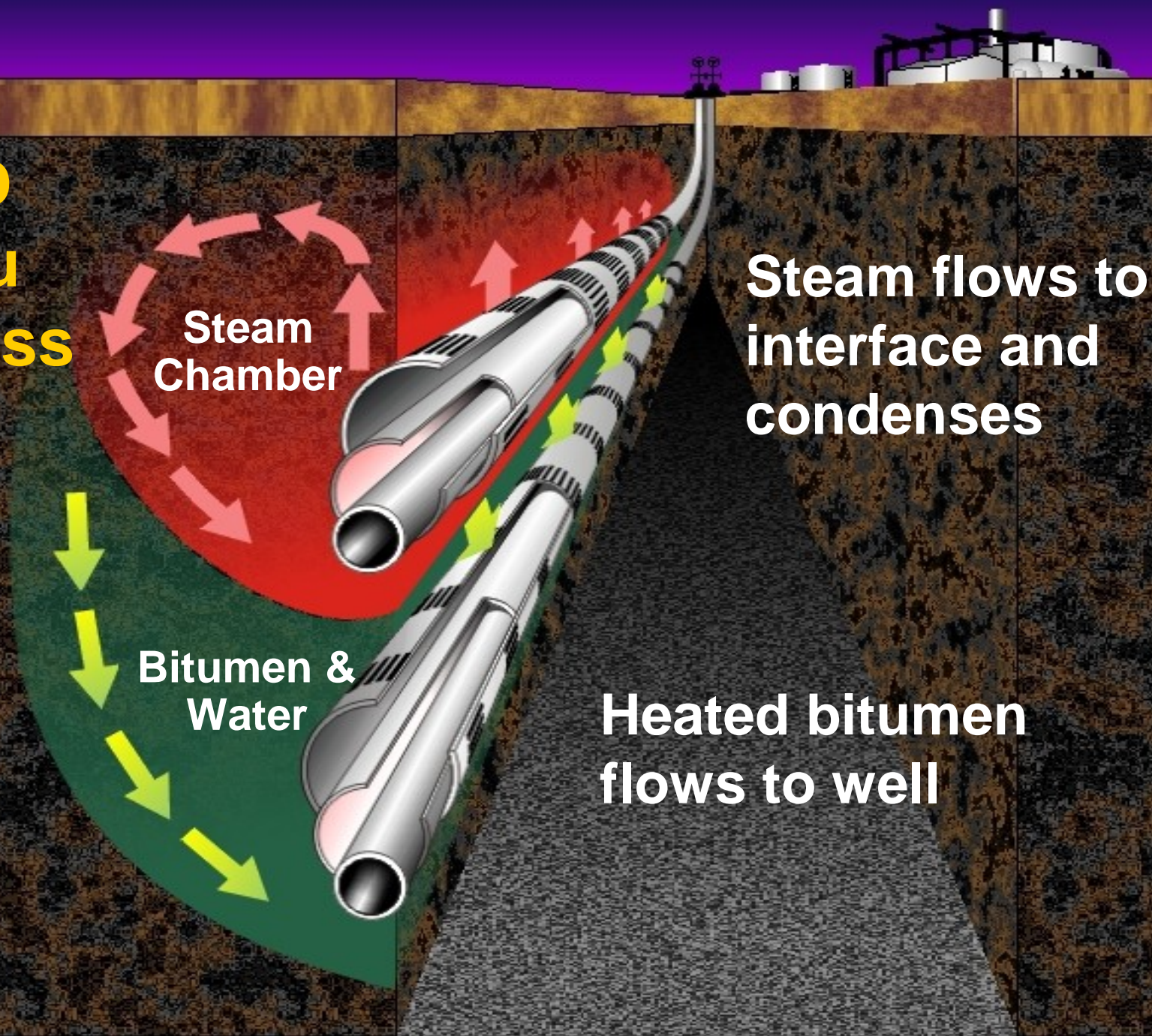


Includes proved and probable reserves and resources presented on a gross basis evaluated as at December 31, 2004 by our independent reserves evaluators. For a description the pricing assumptions used to evaluate these reserves (CSA Staff Notice 51-315), see page 30 of our 2004 Annual Report. As U.S. companies follow different reporting requirements, Suncor's reserve and resource estimates will not be comparable to those made by U.S. companies. Under U.S. reporting requirements, Suncor has proved reserves of 939 million barrels of oil as at December 31, 2004.

Oil Sands - Mining



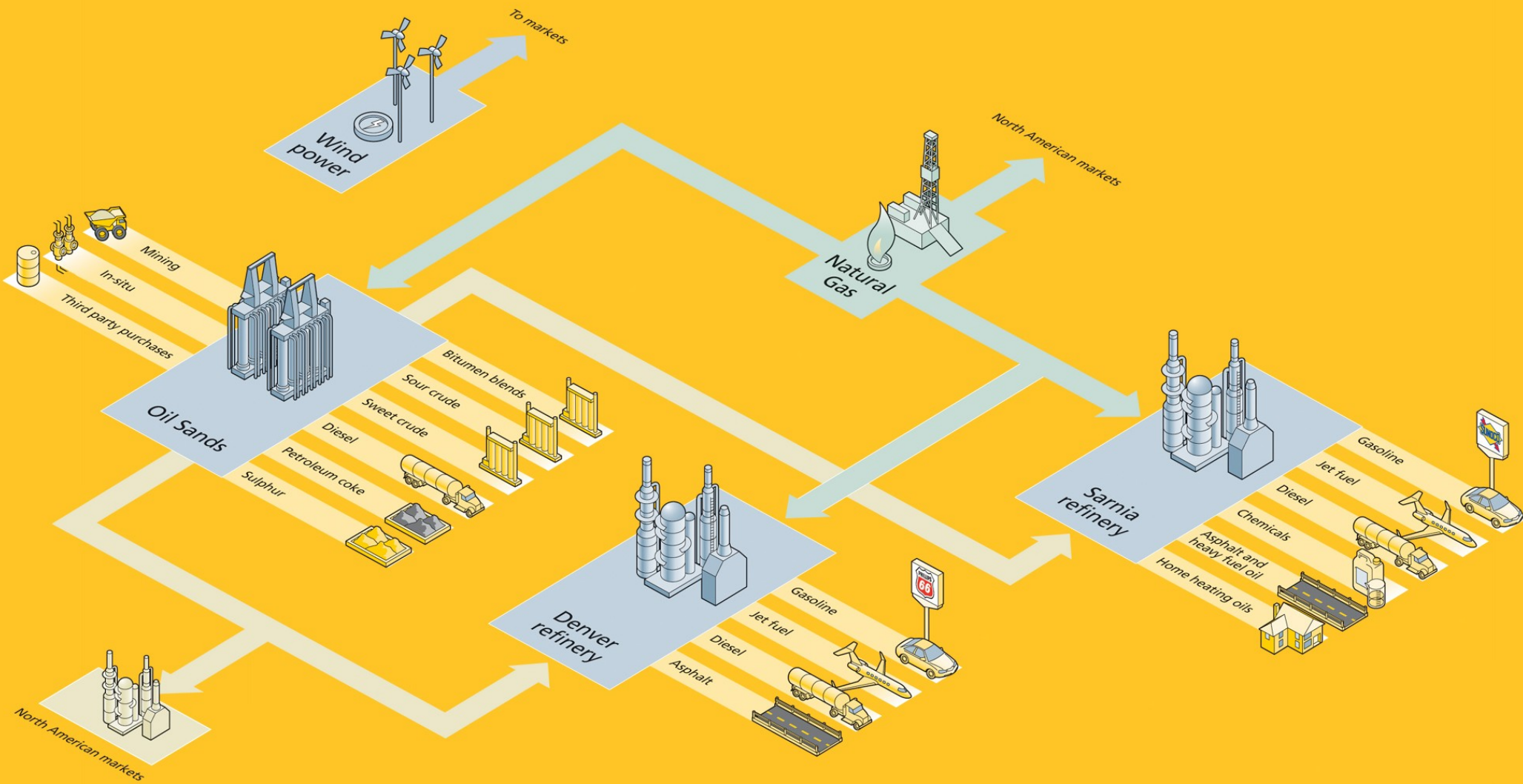
SAGD In-situ process



Oil Sands - Extraction and Upgrading



Suncor Products



Suncor Growth Plans – ½ Million BPD

Project	When	Production
Millennium	2004	260,000 bpd
Cornerstone (ERP)	2006	Business Processes
Genesis / Odyssey	2006	DeSulphurization
Ethanol	2006	200 M l/yr
Coker / Extraction	2008	350,000 bpd
Firebag 3 (Insitu)	2010 to 2012	500 – 550,000 bpd
Voyageur (UG3)		

The BIG Gap: How to Integrate Plant/Machinery to ERP

Enterprise Business Systems
Enterprise Resource Planning (ERP)

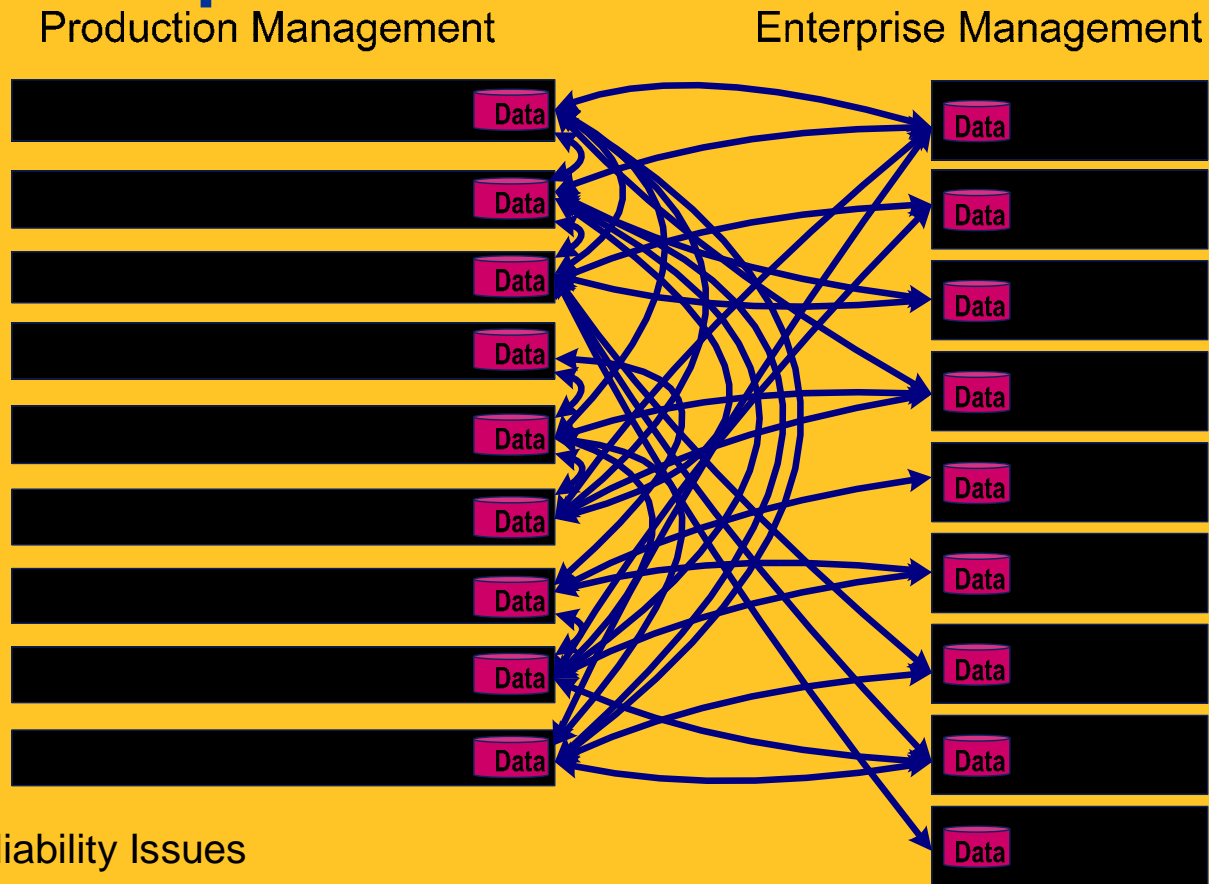
Operations

????????

Maintenance

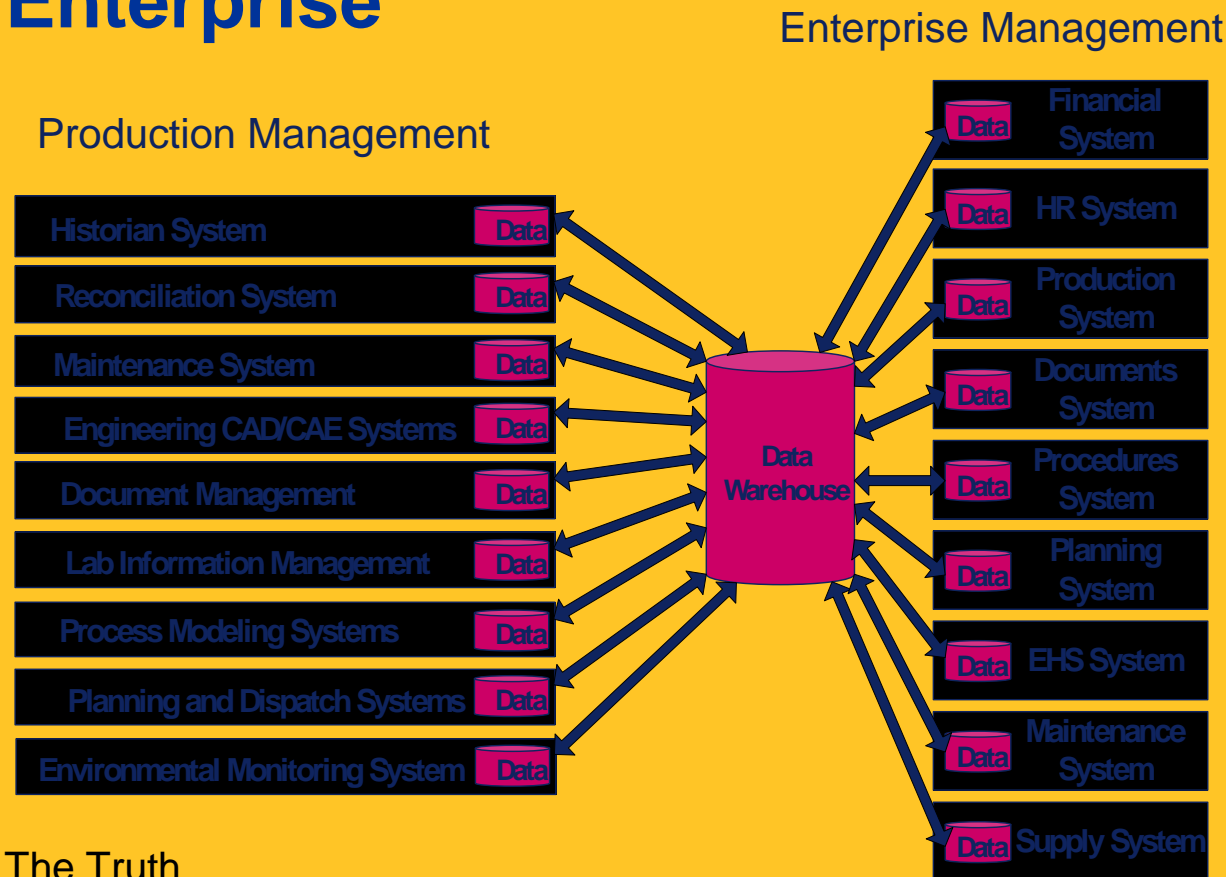
Physical Asset Control
Real-time Systems

A Direct Interface Approach to Data Exchange within the Enterprise



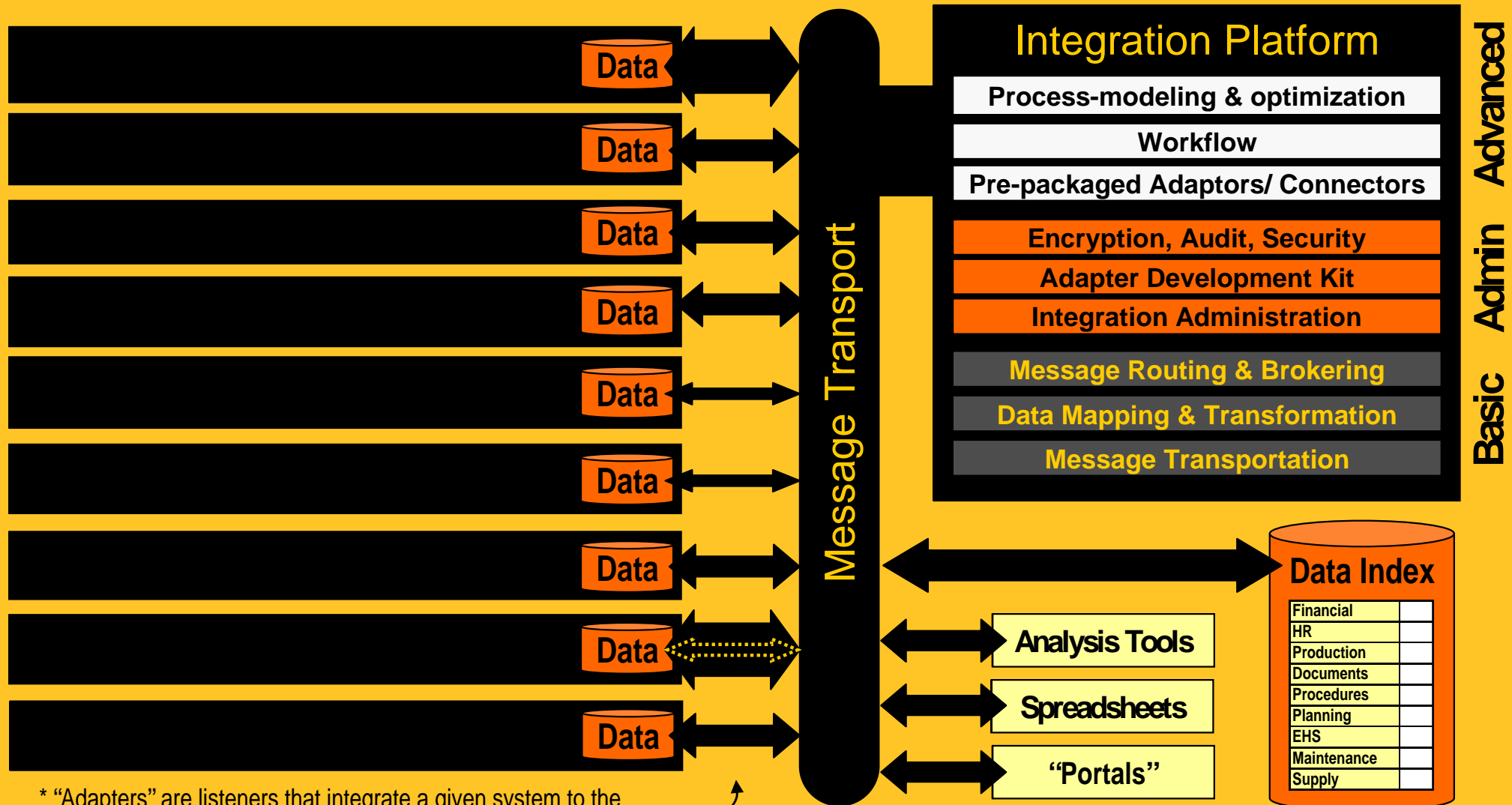
- System Stability And Reliability Issues
- No Single Version Of The Truth
- System Maintenance Issues
- Difficult Access To Multiple Systems
- ***Don't want to do this anymore....***

A Data Warehouse Approach to Data Exchange within the Enterprise



- No Single Version Of The Truth
- Single Point Of Failure
- Difficult Access To Multiple Systems
- ***Don't want to do this either.....***

A Coordinated Approach to Full Integration within the Enterprise



* "Adapters" are listeners that integrate a given system to the integration platform making it "visible" to the enterprise.

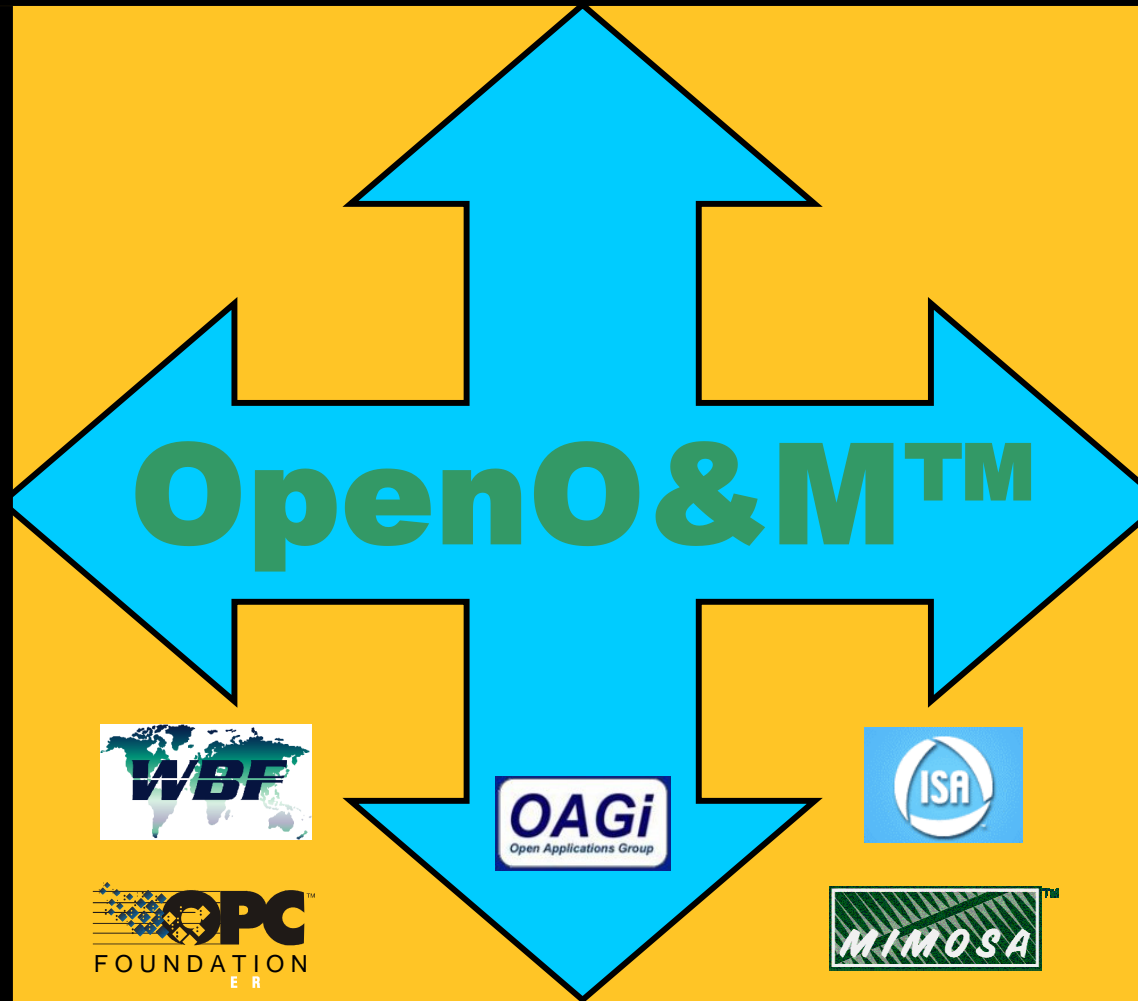
The OpenO&M™ Solution:

Open Standards & Collaboration Fills the Gaps

Enterprise Business Systems
Enterprise Resource Planning (ERP)

Operations

Maintenance



Physical Asset Control
Real-time Systems



What's Needed Now?

- Open Architecture Solution to integrate process/operational, maintenance & business processes/systems
- By 2007
- NOT more research
- Field Proven Solution (i.e. BP's eRTIS) – IT WORKS!!
- All software vendors to write Adapters to talk OpenO&M
- Manufacturing Industry to demand compliance to OpenO&M standards
- **Get Involved – *Lead, Follow, Support!***