

Integrated BIM

Chris Pennington

Director, Energy & Utilities
Global Sales & Services

Siemens PLM



The *(Construction)* Task Force's ambition for construction is informed by our experience of radical change and **improvement in other industries**, and by our experience of delivering improvements in quality and efficiency within our own construction programmes.

Sir John Egan

Rethinking Construction

Report for the UK Deputy Prime Minister





Challenges & Trends

Information Quality

The right information...

Collaboration

...to the right person...

Project Control

...in the right context

Summary



Challenges & Trends

Information Quality

The right information...

Collaboration

...to the right person...

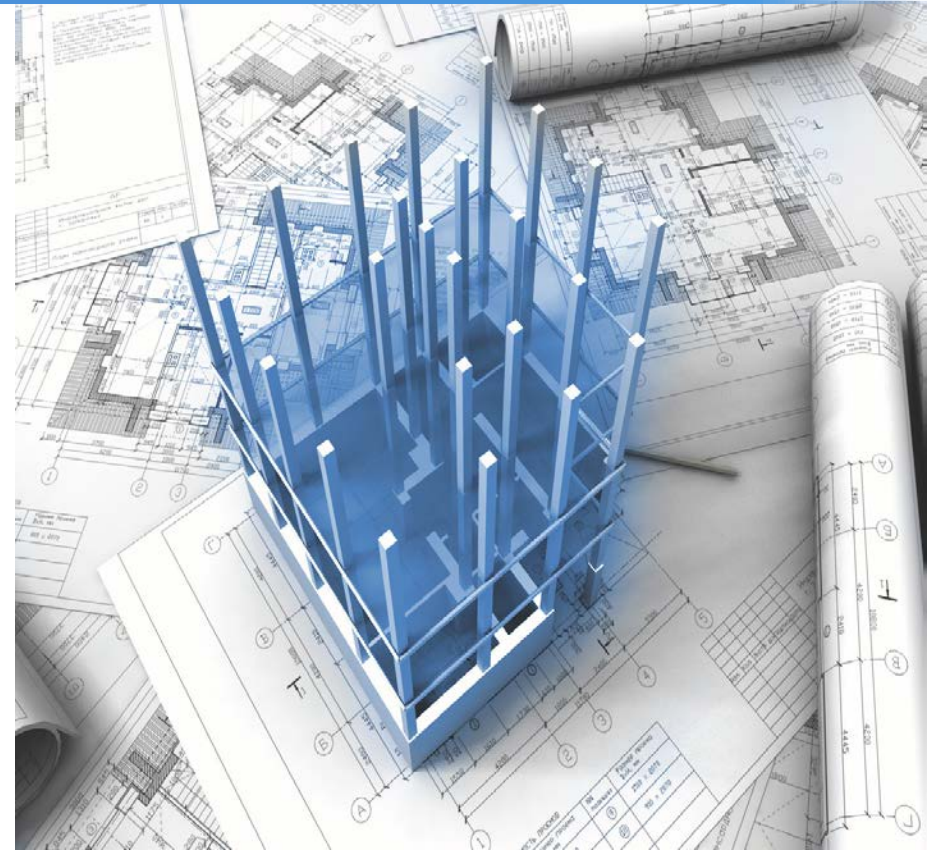
Project Control

...in the right context

Summary

Drivers for BIM

- Predictability & Profitability
 - Accuracy of quote
 - Reduce issues on site
 - Schedule overruns
- Client & stakeholder pressure
 - *Government push*
- Available technology
- Benefits understood



Challenges & Trends

Pre-fabrication

By moving from on-site construction to manufacturing in a controlled factory environment, we can drive down costs while increasing quality



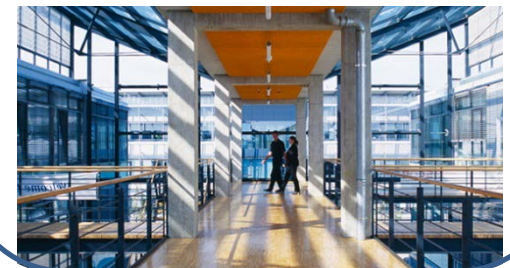
Collaboration

Economic pressures are forcing companies to work globally, increasing the demand for collaboration tools and driving the need for effective digital communication



Complexity

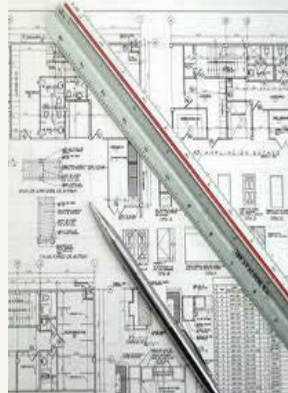
Complex projects put more pressure on companies to perform. When ROI figures are often around two to five percent, cost overruns, delays and mistakes can result in financial loss



AEC Maturity in IT adoption

Lack of project definition

Requirements
2D tools
Error prone
Lacking information
Ambiguous



Inadequate Data Management

Windows folder structures
Excel
Lack of revision control
No traceability



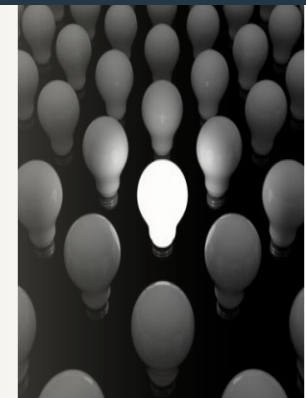
Fragmented delivery organization

Client
Design company
Specialist design agencies
Contractors
Suppliers
Building occupier



Islands of excellence

Infrastructure
4D & 5D simulation
Plant design
Visualization



Product Lifecycle Management

Adding value with PLM

Complexity

- Regulations
- Customer requirements
- Permits / Licenses
- Documents
- Improved project definition results in creation of more data



Project and Process

- Schedule deliverables
- Transmittals
- Collaboration
- Change control
- Handover





Challenges & Trends

Information Quality

The right information...

Collaboration

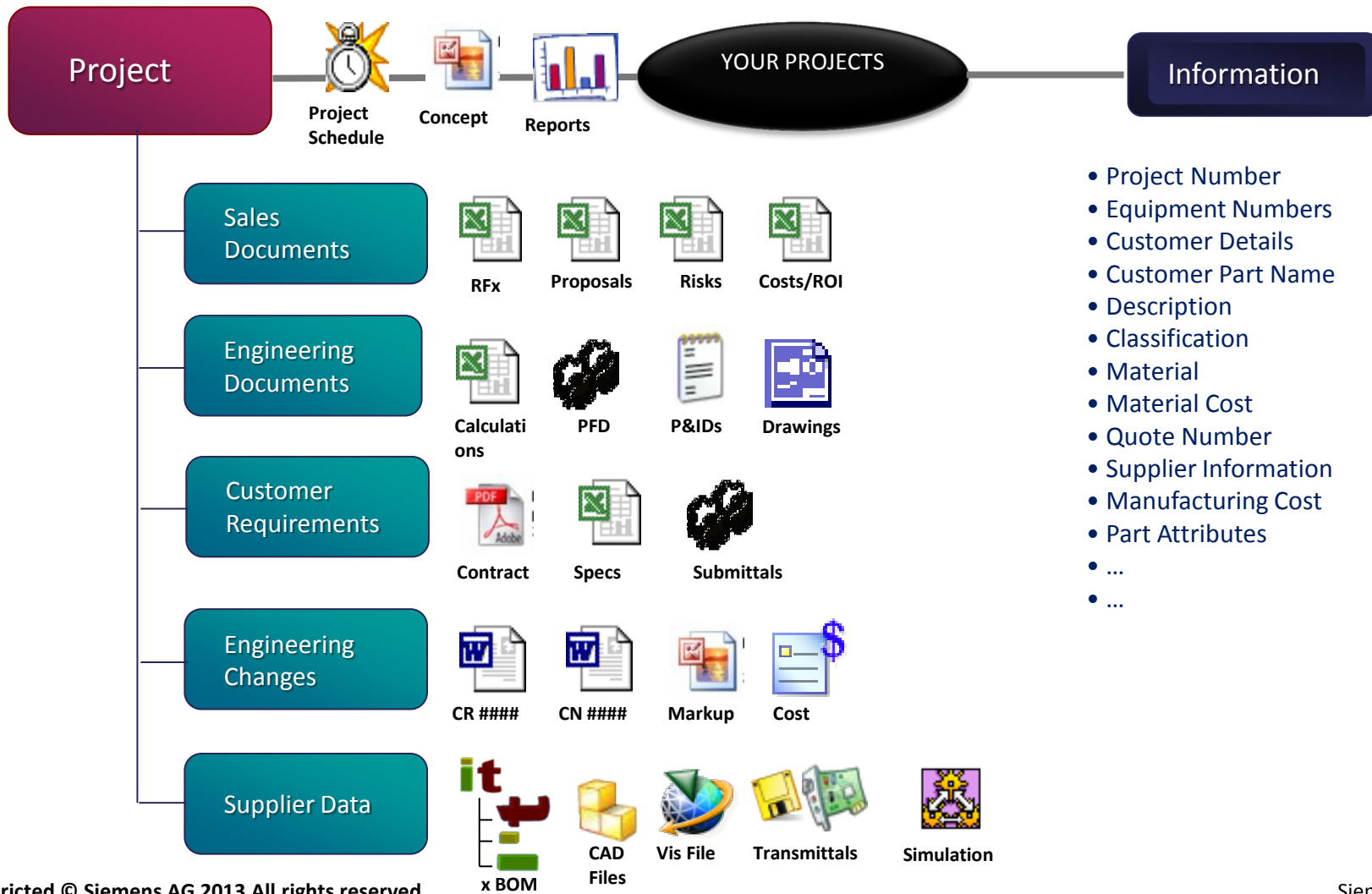
...to the right person...

Project Control

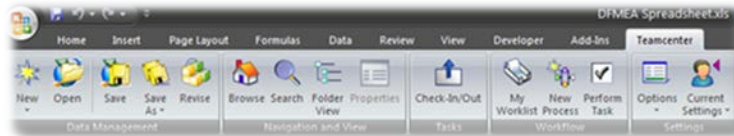
...in the right context

Summary

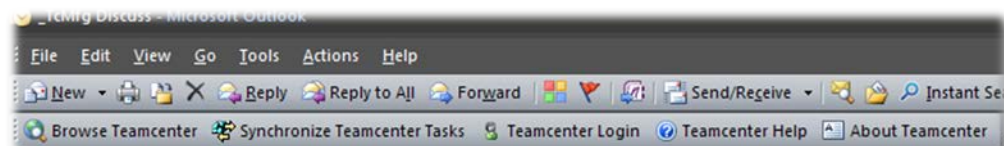
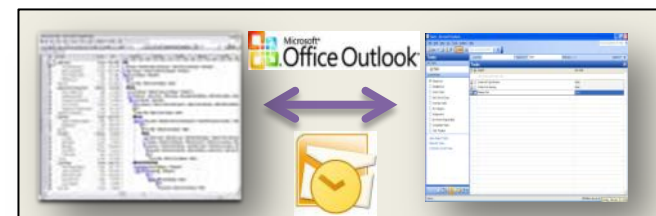
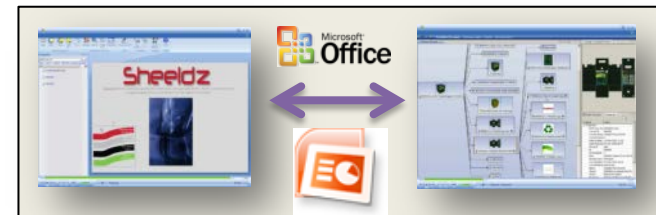
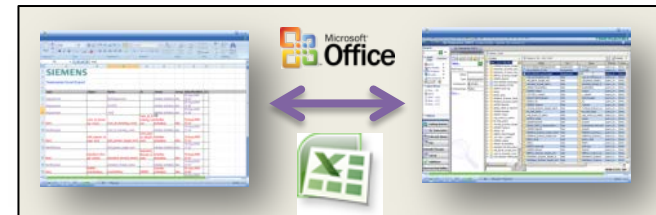
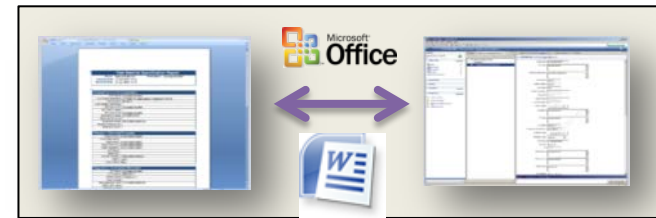
Document Management – unstructured data



Document Management – through the project life of a

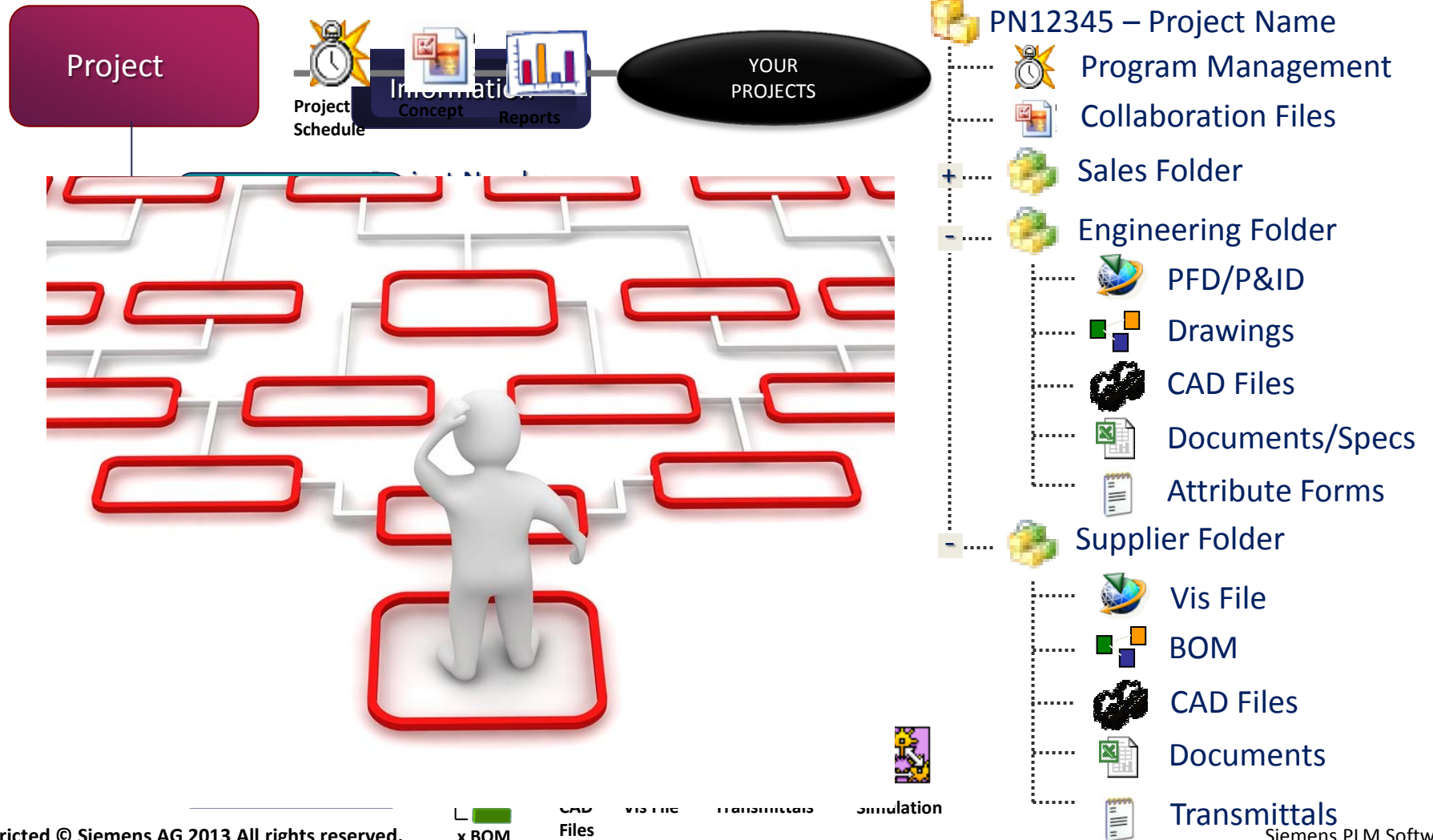


- Access Teamcenter from within Microsoft Office
- Edit Teamcenter data live via Microsoft Office
- Insert data from Teamcenter into Word, Excel, or PowerPoint



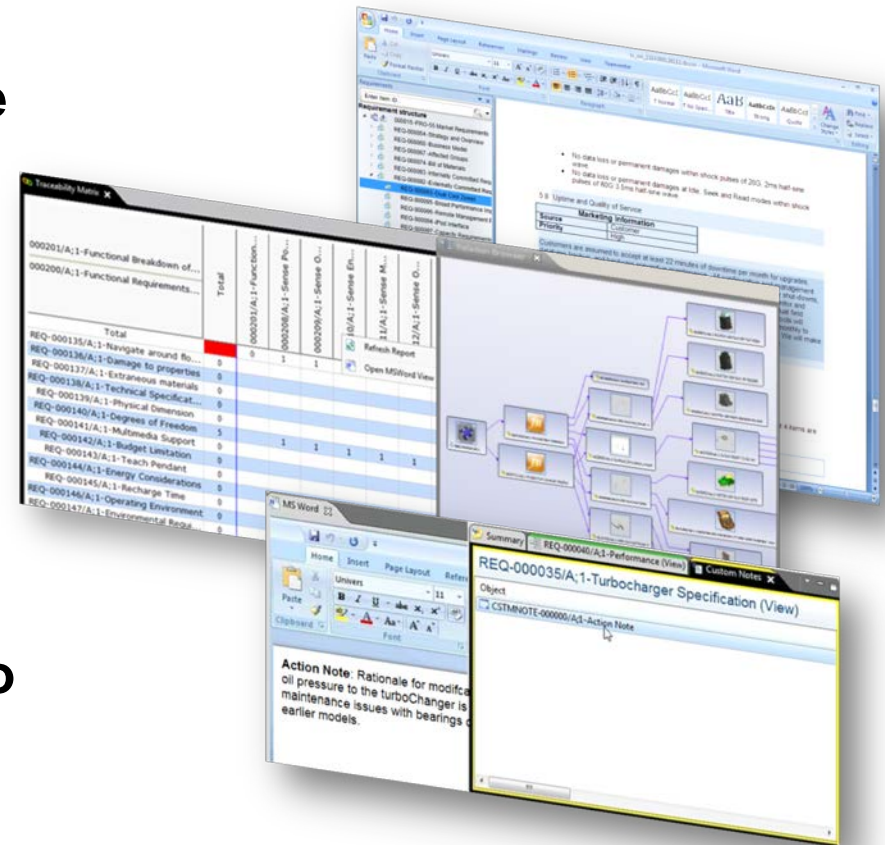
- Save an email to Teamcenter
- Browse & Search Teamcenter from Outlook
- Insert data from Teamcenter in Outlook messages
- Track and Manage Teamcenter tasks in Outlook
- Perform Teamcenter signoff tasks in Outlook

Document Management – structured data



Requirements Management

- Use standard tools such as Microsoft Office client to improve productivity
- Real-time traceability to see allocations and validate compliance
- Rationale and decision capture to enable reuse



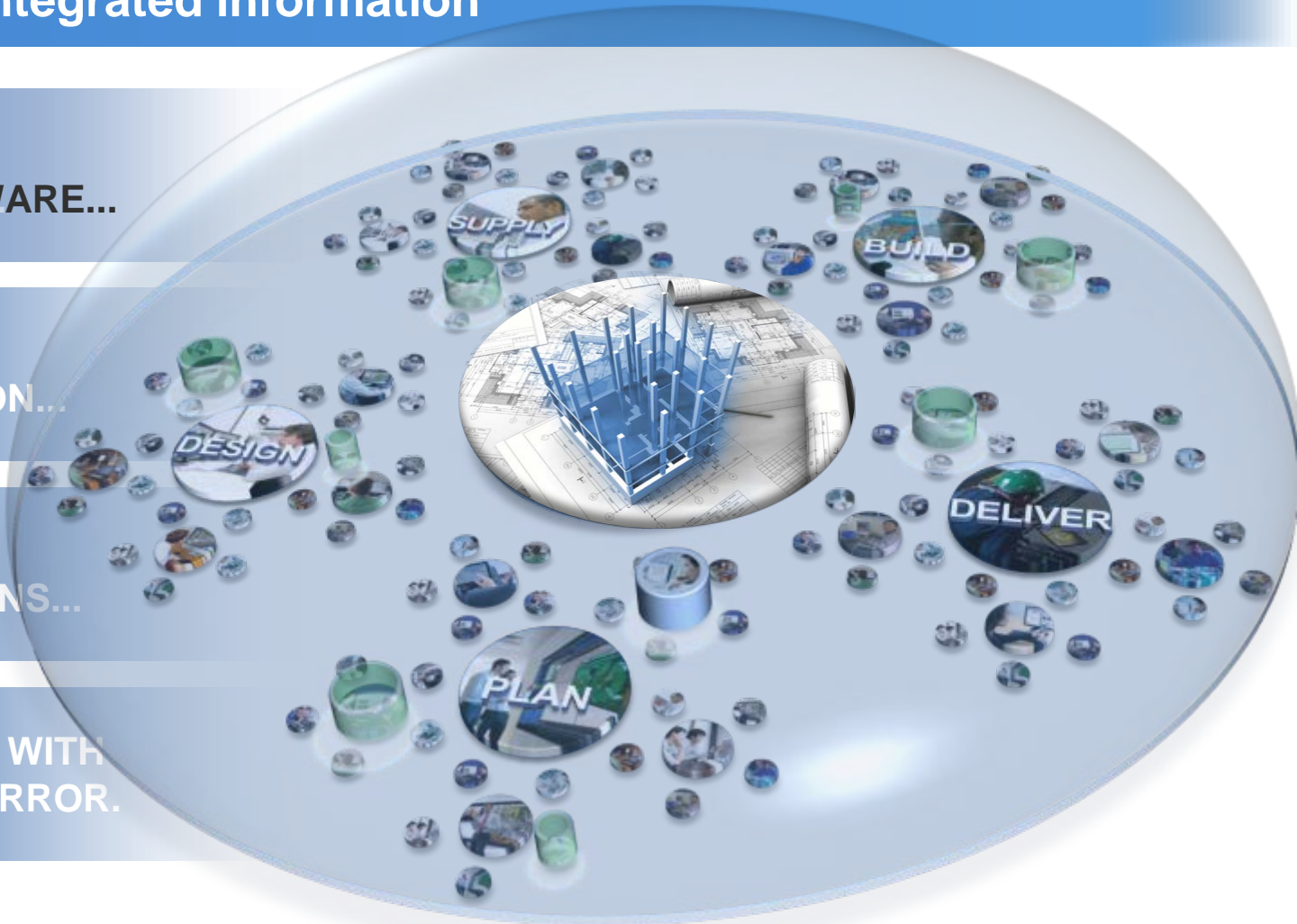
Intelligently integrated information

**MORE PEOPLE
INTRINSICALLY AWARE...**

**SEARCHING FOR
MORE INFORMATION...**

**MAKING COMPLEX
PRODUCT DECISIONS...**

**UNDER PRESSURE WITH
LESS ROOM FOR ERROR.**





Challenges & Trends

Information Quality

The right information...

Collaboration

...to the right person...

Project Control

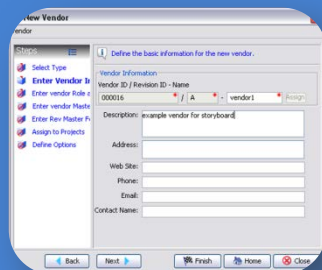
...in the right context

Summary

Transmittals

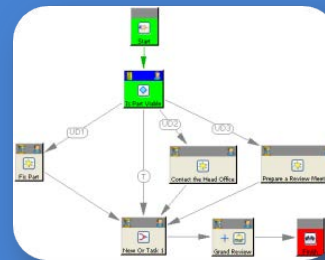
Vendor Management

- Record vendor contact details, contracts, quality agreements
- Create vendor parts
- Manage preferred parts



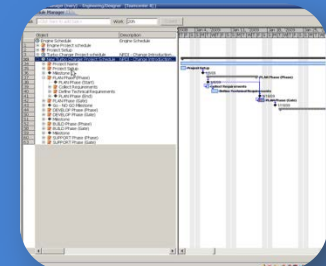
Workflow

- Dynamic Participant for assignments
- Forward / backward branching
- Specify custom signoffs per Task

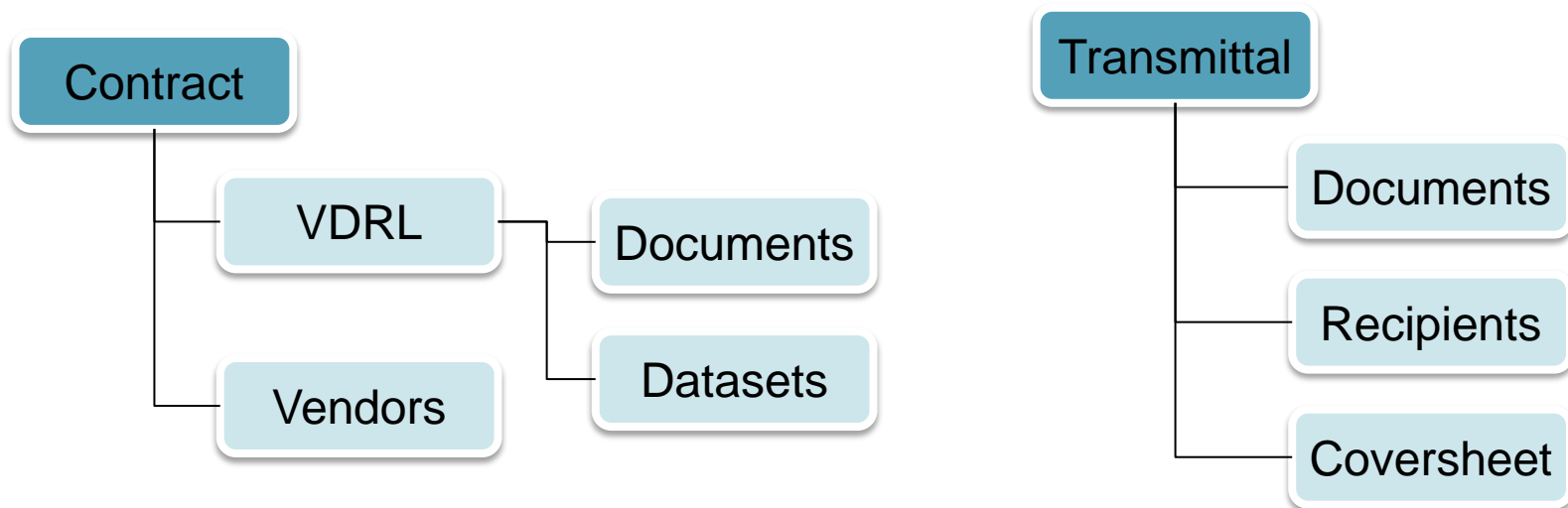


Schedule Manager

- Manage supplier interaction
- Capture target and actual dates
- Report supplier status



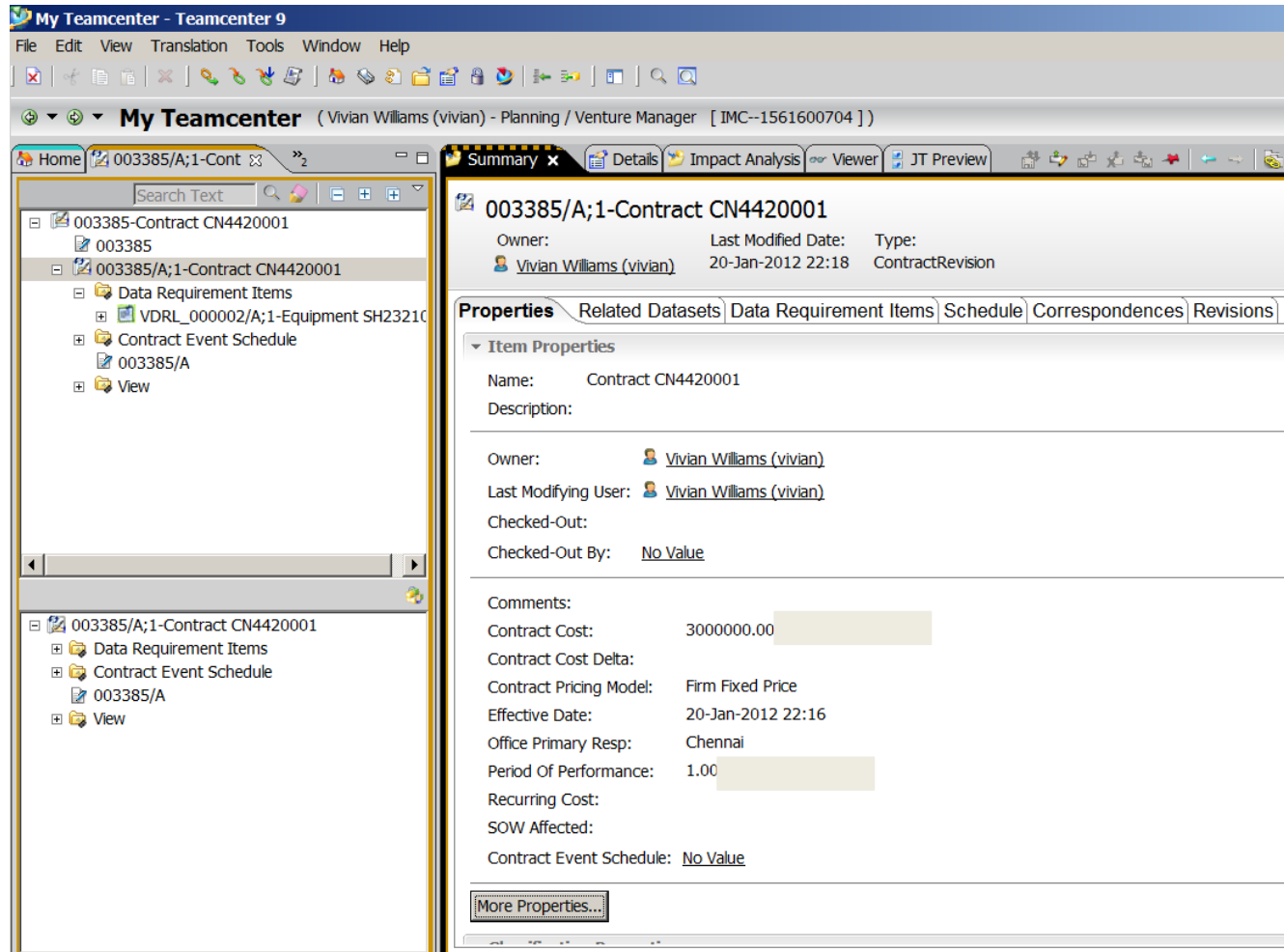
Supplier Interaction



- Capture the agreed supplier terms and conditions, provide direct access to vendor contact information, quality ratings and current tasks.

Record the data sent to the vendor, manage the transfer of data. Automatic generation of cover sheet, and ability to capture vendor response.

Contractors



My Teamcenter - Teamcenter 9

File Edit View Translation Tools Window Help

My Teamcenter (Vivian Williams (vivian) - Planning / Venture Manager [IMC--1561600704])

Home 003385/A;1-Cont Summary Details Impact Analysis Viewer JT Preview

Search Text

- 003385-Contract CN4420001
 - 003385
 - 003385/A;1-Contract CN4420001
 - Data Requirement Items
 - VDRL_000002/A;1-Equipment SH2321C
 - Contract Event Schedule
 - 003385/A
 - View

- 003385/A;1-Contract CN4420001
- Data Requirement Items
- Contract Event Schedule
 - 003385/A
- View

003385/A;1-Contract CN4420001

Owner: Vivian Williams (vivian) Last Modified Date: 20-Jan-2012 22:18 Type: ContractRevision

Properties Related Datasets Data Requirement Items Schedule Correspondences Revisions

Item Properties

Name: Contract CN4420001
Description:

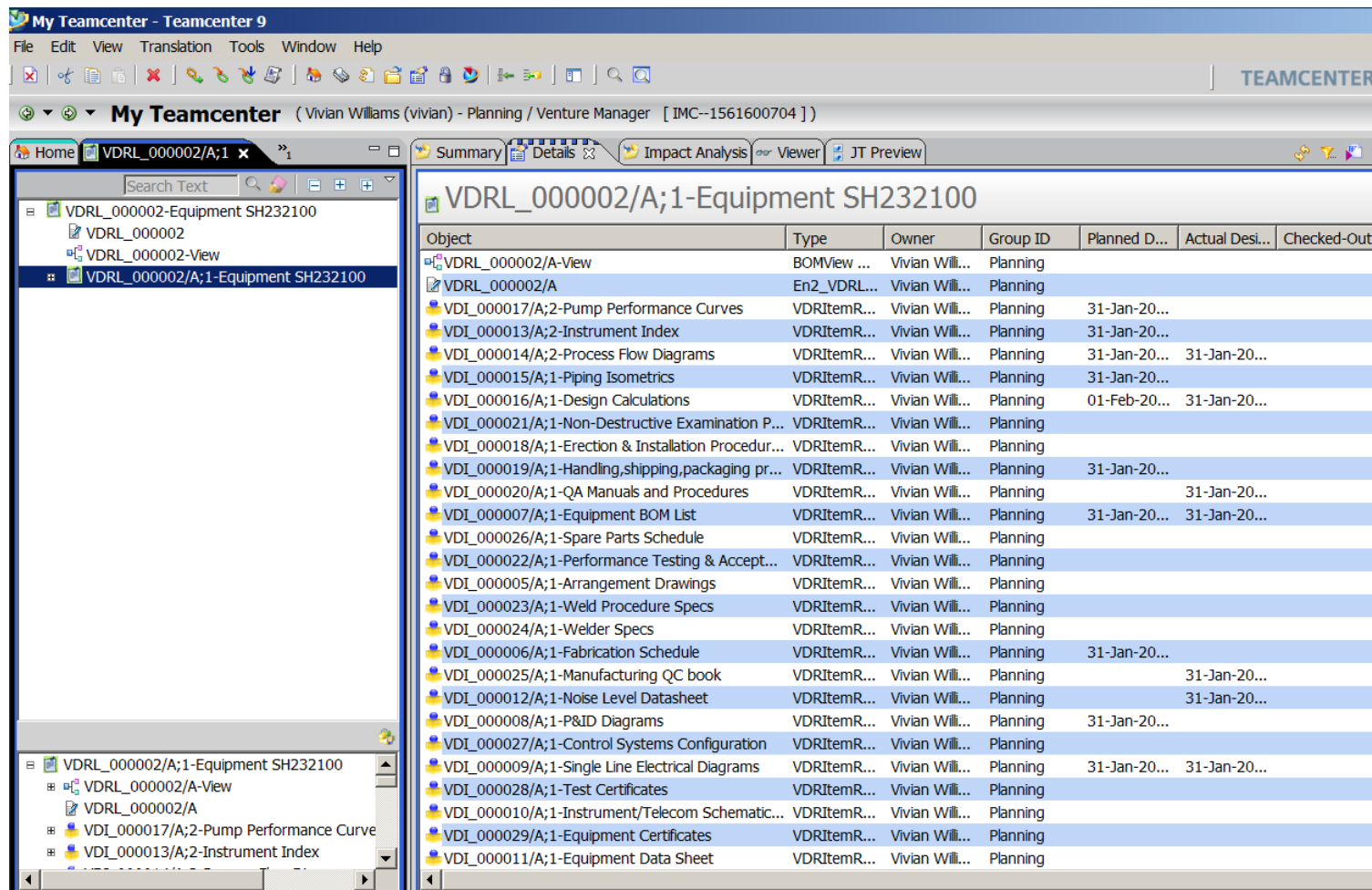
Owner: Vivian Williams (vivian)
Last Modifying User: Vivian Williams (vivian)
Checked-Out:
Checked-Out By: No Value

Comments:

Contract Cost: 3000000.00
Contract Cost Delta:
Contract Pricing Model: Firm Fixed Price
Effective Date: 20-Jan-2012 22:16
Office Primary Resp: Chennai
Period Of Performance: 1.00
Recurring Cost:
SOW Affected:
Contract Event Schedule: No Value

More Properties...

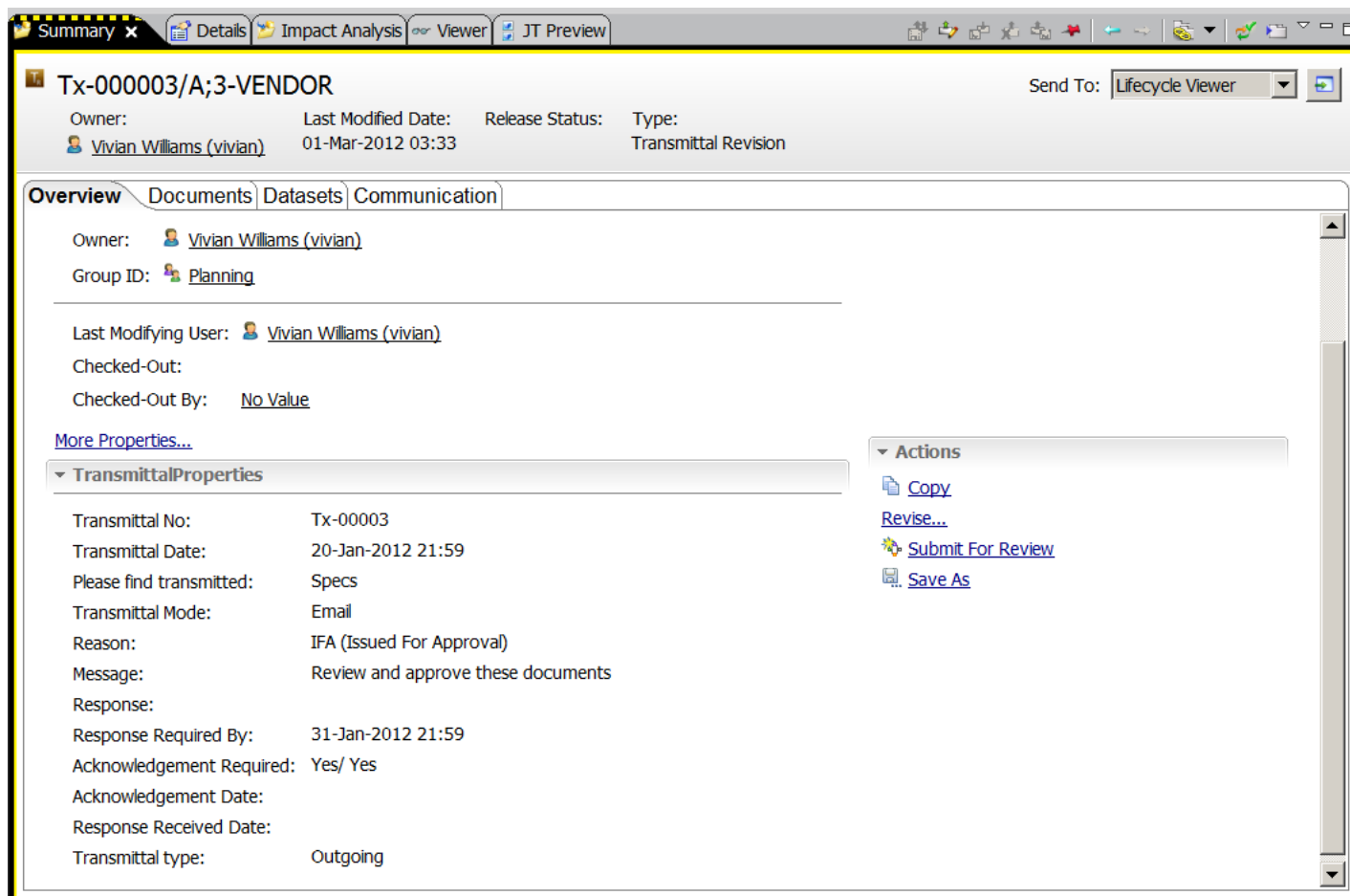
Vendor Data Requirements List (VDRL)



The screenshot displays the Siemens Teamcenter interface. The main window shows a tree view on the left and a detailed table of requirements on the right. The table lists various objects, their types, owners, group IDs, and planned/actual dates.

Object	Type	Owner	Group ID	Planned D...	Actual Desi...	Checked-Out
VDRL_000002/A-View	BOMView ...	Vivian Willi...	Planning			
VDRL_000002/A	En2_VDRL...	Vivian Willi...	Planning			
VDI_000017/A;2-Pump Performance Curves	VDRItemR...	Vivian Willi...	Planning	31-Jan-20...		
VDI_000013/A;2-Instrument Index	VDRItemR...	Vivian Willi...	Planning	31-Jan-20...		
VDI_000014/A;2-Process Flow Diagrams	VDRItemR...	Vivian Willi...	Planning	31-Jan-20...	31-Jan-20...	
VDI_000015/A;1-Piping Isometrics	VDRItemR...	Vivian Willi...	Planning	31-Jan-20...		
VDI_000016/A;1-Design Calculations	VDRItemR...	Vivian Willi...	Planning	01-Feb-20...	31-Jan-20...	
VDI_000021/A;1-Non-Destructive Examination P...	VDRItemR...	Vivian Willi...	Planning			
VDI_000018/A;1-Erection & Installation Procedur...	VDRItemR...	Vivian Willi...	Planning			
VDI_000019/A;1-Handling,shipping,packaging pr...	VDRItemR...	Vivian Willi...	Planning	31-Jan-20...		
VDI_000020/A;1-QA Manuals and Procedures	VDRItemR...	Vivian Willi...	Planning		31-Jan-20...	
VDI_000007/A;1-Equipment BOM List	VDRItemR...	Vivian Willi...	Planning	31-Jan-20...	31-Jan-20...	
VDI_000026/A;1-Spare Parts Schedule	VDRItemR...	Vivian Willi...	Planning			
VDI_000022/A;1-Performance Testing & Accept...	VDRItemR...	Vivian Willi...	Planning			
VDI_000005/A;1-Arrangement Drawings	VDRItemR...	Vivian Willi...	Planning			
VDI_000023/A;1-Weld Procedure Specs	VDRItemR...	Vivian Willi...	Planning			
VDI_000024/A;1-Welder Specs	VDRItemR...	Vivian Willi...	Planning			
VDI_000006/A;1-Fabrication Schedule	VDRItemR...	Vivian Willi...	Planning	31-Jan-20...		
VDI_000025/A;1-Manufacturing QC book	VDRItemR...	Vivian Willi...	Planning		31-Jan-20...	
VDI_000012/A;1-Noise Level Datasheet	VDRItemR...	Vivian Willi...	Planning		31-Jan-20...	
VDI_000008/A;1-P&ID Diagrams	VDRItemR...	Vivian Willi...	Planning	31-Jan-20...		
VDI_000027/A;1-Control Systems Configuration	VDRItemR...	Vivian Willi...	Planning			
VDI_000009/A;1-Single Line Electrical Diagrams	VDRItemR...	Vivian Willi...	Planning	31-Jan-20...	31-Jan-20...	
VDI_000028/A;1-Test Certificates	VDRItemR...	Vivian Willi...	Planning			
VDI_000010/A;1-Instrument/Telecom Schematic...	VDRItemR...	Vivian Willi...	Planning			
VDI_000029/A;1-Equipment Certificates	VDRItemR...	Vivian Willi...	Planning			
VDI_000011/A;1-Equipment Data Sheet	VDRItemR...	Vivian Willi...	Planning			

Create/update Transmittals



Summary x Details Impact Analysis Viewer JT Preview

Tx-000003/A;3-VENDOR Send To: Lifecycle Viewer

Owner: Vivian Williams (vivian) Last Modified Date: 01-Mar-2012 03:33 Release Status: Type: Transmittal Revision

Overview Documents Datasets Communication

Owner: Vivian Williams (vivian)
Group ID: Planning

Last Modifying User: Vivian Williams (vivian)
Checked-Out:
Checked-Out By: No Value

[More Properties...](#)

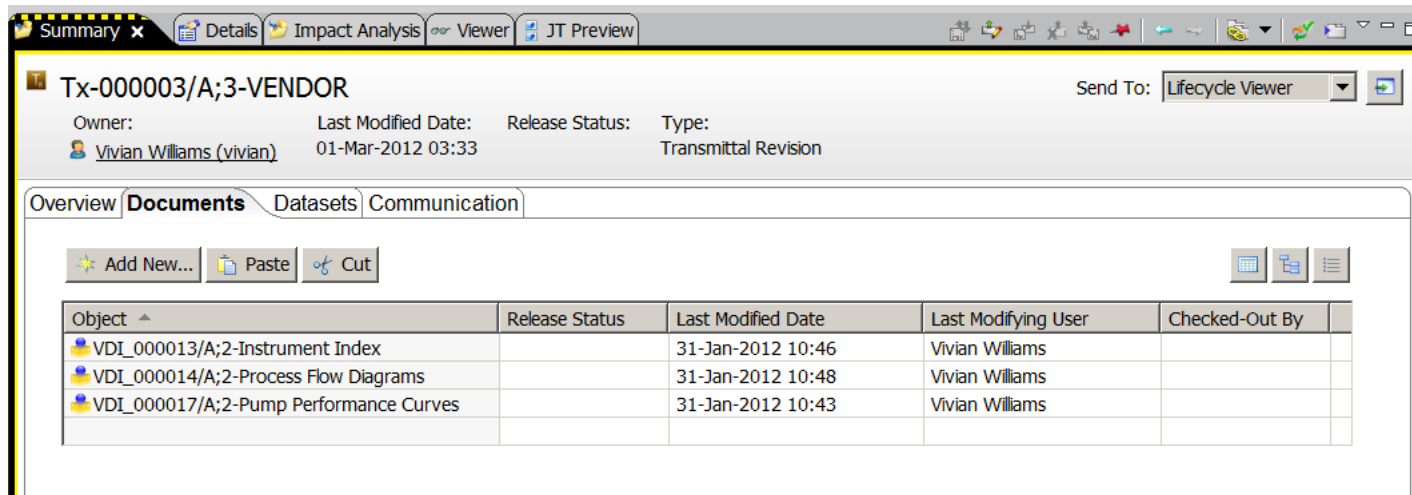
TransmittalProperties

Transmittal No: Tx-00003
Transmittal Date: 20-Jan-2012 21:59
Please find transmitted: Specs
Transmittal Mode: Email
Reason: IFA (Issued For Approval)
Message: Review and approve these documents
Response:
Response Required By: 31-Jan-2012 21:59
Acknowledgement Required: Yes/ Yes
Acknowledgement Date:
Response Received Date:
Transmittal type: Outgoing

Actions

- Copy
- Revise...
- Submit For Review
- Save As

Documents being sent for review



The screenshot shows a software interface with a toolbar at the top containing icons for Summary, Details, Impact Analysis, Viewer, and JT Preview. The main content area displays the following information:

Tx-000003/A;3-VENDOR Send To: Lifecycle Viewer

Owner: Vivian Williams (vivian) Last Modified Date: 01-Mar-2012 03:33 Release Status: Type: Transmittal Revision

Navigation tabs: Overview | **Documents** | Datasets | Communication

Buttons: Add New... | Paste | Cut

Object	Release Status	Last Modified Date	Last Modifying User	Checked-Out By
VDI_000013/A;2-Instrument Index		31-Jan-2012 10:46	Vivian Williams	
VDI_000014/A;2-Process Flow Diagrams		31-Jan-2012 10:48	Vivian Williams	
VDI_000017/A;2-Pump Performance Curves		31-Jan-2012 10:43	Vivian Williams	

Transmittal Recipients

Summary x Details Impact Analysis Viewer JT Preview

Tx-000003/A;3-VENDOR Send To: Lifecycle Viewer

Owner: Vivian Williams (vivian) Last Modified Date: 01-Mar-2012 03:33 Release Status: Type: Transmittal Revision

Overview Documents Datasets **Communication**

From

To

Add New... Paste Cut

Contact	Email	Phone	Address	Web Site
Jambunathan G	jambunathan.gowrishankar@siemens.com	+91-80-23233322	Bangalore	www.helxe.com

CC

Add New... Paste Cut

Contact	Email	Phone	Address	Web Site
Senthil Kumar	senthilkumar@siemens.com	+91-44-2322422	Chennai	

Automatic email & cover sheet

New Process Dialog

Process Name: Tx-000003/A;3-VENDOR

Description:

Process Template: **Transmittal Send Mail**

Show Under Construction Templates

Attachments | Process Template | Assign All Tasks

Task Attachments

- Targets
- Tx-000003/A; DOR**
- References

Message: Tx-000003--A--VENDOR Teamcenter Vendor Document Submittals

From: senthilkumar@siemens.com

To: Gowrishankar, Jambunathan; Kumar, Senthil

Cc:

Subject: Tx-000003--A--VENDOR Teamcenter Vendor Document Submittals

Attachments: pump_ratio_performance.pdf (412 KB), GSFC-X-673-64-1F.pdf (721 KB), Inst_Index.pdf (53 KB), n04pfd.pdf (2 MB), Coversheet.pdf (165 KB)

Please refer to the attached docs

Summary | Details | Impact Analysis | Viewer | JT Preview

Tx-000003/A;3-VENDOR

Owner: Vivian Williams (vivian) | Last Modified Date: 01-Mar-2012 03:33 | Release Status: | Type: Transmittal Revision

Overview | Documents | **Datasets** | Communication

Add New... | Paste | Cut

Object	Release Status	Last Modified Date
Coversheet-Tx-000003		01-Mar-2012 02:05

Coversheet.pdf - Adobe Reader

From: Vivian Williams

To: 1) Jambunathan G Bangalore, 2) Senthil Kumar Chennai

Transmittal No: Tx-000003/A

Please find transmitted:
 Transmitted By :Email
 Reason :IFA (Issued For Approval)
 Message :Review and approve these documents
 Response :31/01/12

ITEM	DOCUMENT NUMBER	DESC	REV	STS	TITLE
1	VDL_000017	Pump Performance Curves	A	IFA	pump_ratio_performance.pdf,GSFC-X-673-64-1F.pdf,
2	VDL_000013	Instrument Index	A	IFA	Inst_Index.pdf,
3	VDL_000014	Process Flow Diagrams	A	IFA	n04pfd.pdf,

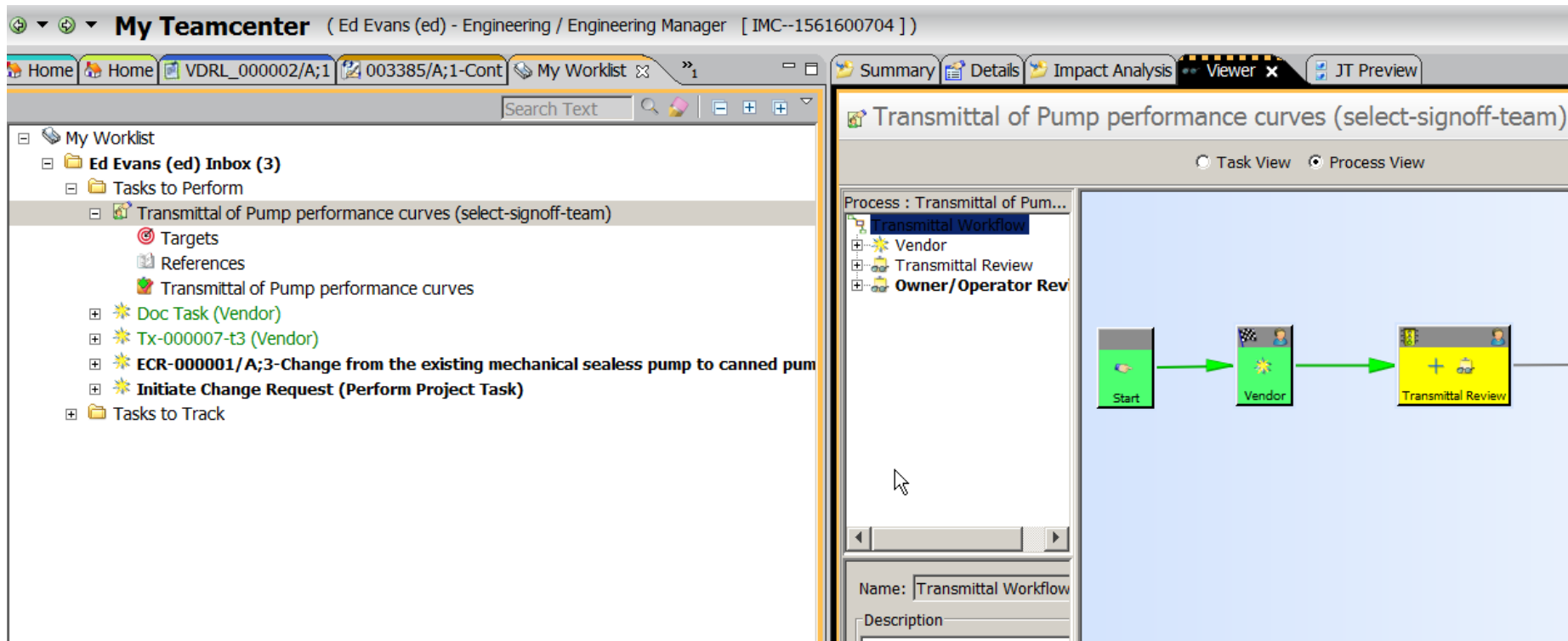
LEGEND: IFA=Issued For Approval, IFD=Issued For Design, IFF=Issued For Procurement, IFC=Issued For Construction

For any Queries, Please contact :Vivian Williams

Please acknowledge receipt of this Transmittal

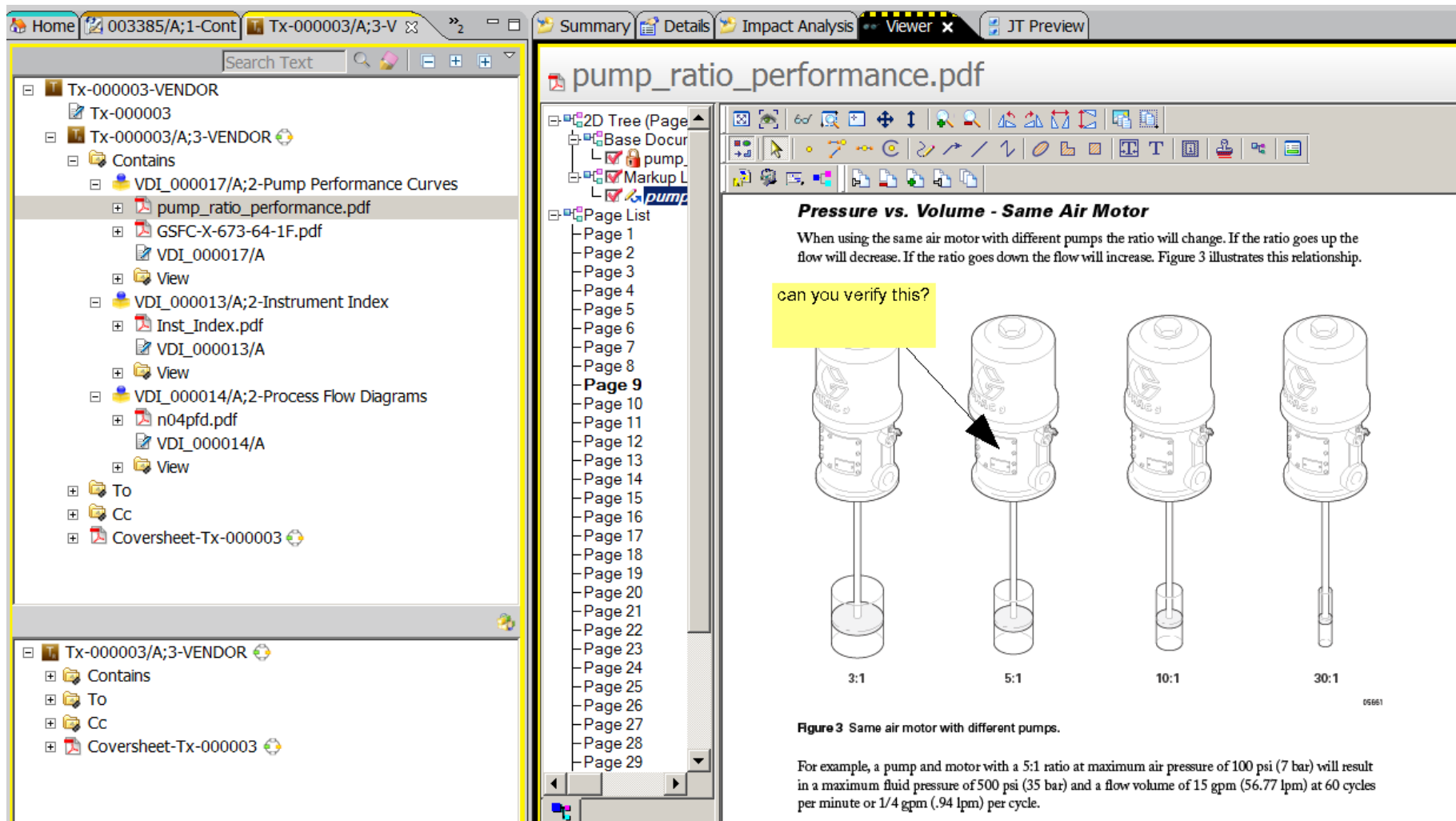
REGARDS

Review & Approval



The screenshot displays the Siemens Teamcenter user interface. The top navigation bar includes 'Home', 'VDR_L_000002/A;1', '003385/A;1-Cont', 'My Worklist', 'Summary', 'Details', 'Impact Analysis', 'Viewer', and 'JT Preview'. The left sidebar shows a tree view under 'My Worklist' with 'Ed Evans (ed) Inbox (3)' expanded to show 'Tasks to Perform', including 'Transmittal of Pump performance curves (select-signoff-team)'. The main workspace shows a 'Process View' for the selected task, displaying a workflow diagram with three steps: 'Start', 'Vendor', and 'Transmittal Review'. A task list on the left of the process view includes 'Transmittal Workflow', 'Vendor', 'Transmittal Review', and 'Owner/Operator Rev'. Below the process view, there are input fields for 'Name: Transmittal Workflow' and 'Description'.

View & Markup of Documents



The screenshot shows a software interface with a file explorer on the left, a central document viewer, and a right-hand panel. The file explorer shows a tree structure for 'Tx-000003-VENDOR' containing various PDF files, with 'pump_ratio_performance.pdf' selected. The central viewer displays the PDF content, which includes a title 'Pressure vs. Volume - Same Air Motor', a paragraph of text, a diagram with four water dispensers labeled with ratios (3:1, 5:1, 10:1, 30:1), and a caption 'Figure 3 Same air motor with different pumps.' A yellow callout box with the text 'can you verify this?' points to the 5:1 ratio dispenser. The right-hand panel shows a '2D Tree' and a 'Page List' for the document.

Pressure vs. Volume - Same Air Motor

When using the same air motor with different pumps the ratio will change. If the ratio goes up the flow will decrease. If the ratio goes down the flow will increase. Figure 3 illustrates this relationship.

can you verify this?

3:1 5:1 10:1 30:1

Figure 3 Same air motor with different pumps.

For example, a pump and motor with a 5:1 ratio at maximum air pressure of 100 psi (7 bar) will result in a maximum fluid pressure of 500 psi (35 bar) and a flow volume of 15 gpm (56.77 lpm) at 60 cycles per minute or 1/4 gpm (.94 lpm) per cycle.

Project Handover

Open model for document-based data exchange

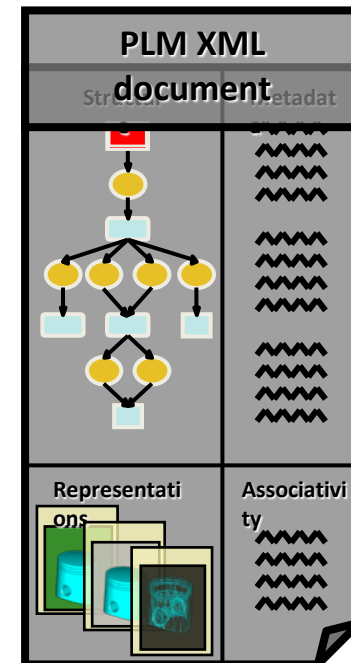
Transfer neutral files using mechanism of choice –
email, ftp etc

Provides flexibility for a rapidly changing environment

Separation of application internal data model from external view
Support for data model extensions

Simple mapping to other data models

Enables us to map to standards-of-choice



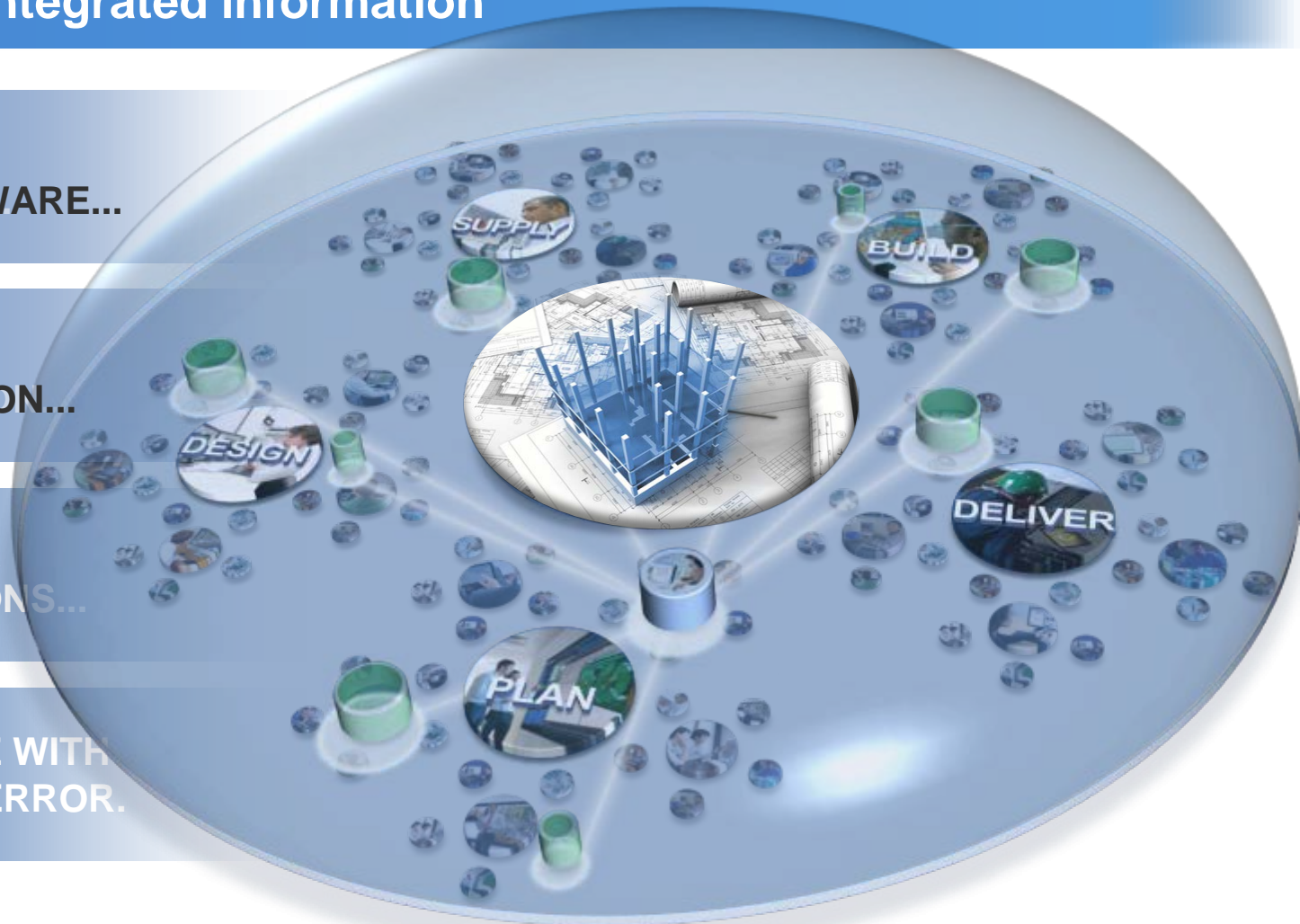
Intelligently integrated information

**MORE PEOPLE
INTRINSICALLY AWARE...**

**RECEIVING THE
RIGHT INFORMATION...**

**MAKING COMPLEX
PRODUCT DECISIONS...**

**UNDER PRESSURE WITH
LESS ROOM FOR ERROR.**



Supported on the platforms that you use in your enterprise

Client Operating Systems

- On premise



Server Operating Systems

- On premise



Cloud Enabled Server Solutions

- On premise or Off-premise

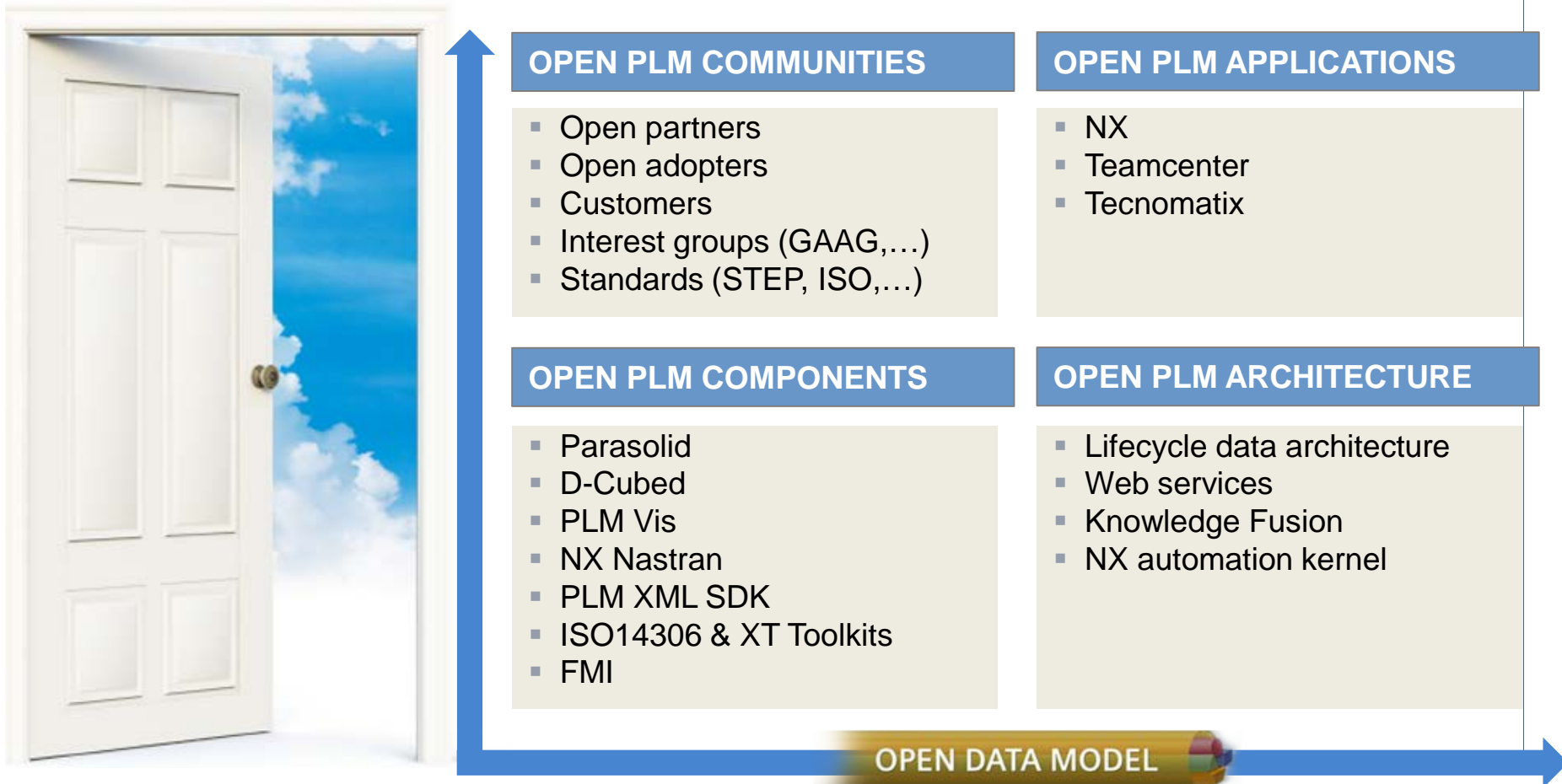


Cloud Service Providers

- Off-premise only
- Optional connect to On premise servers



Business Philosophy





Challenges & Trends

Information Quality

The right information...

Collaboration

...to the right person...

Project Control

...in the right context

Summary

Teamcenter – Project Management Backbone

Workflow

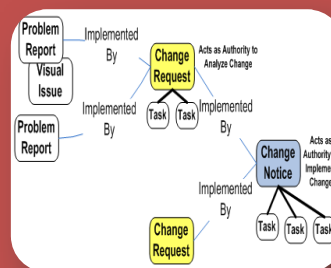
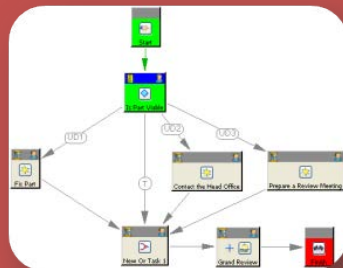
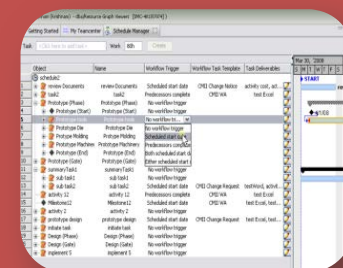
- Dynamic Participant for assignments
- Forward / backward branching
- Specify custom signoffs per Task

Schedule Manager

- Task Focused User Interface
- Specialized Change Objects
PR → ECR → ECN
- Work Breakdown Structures tasks

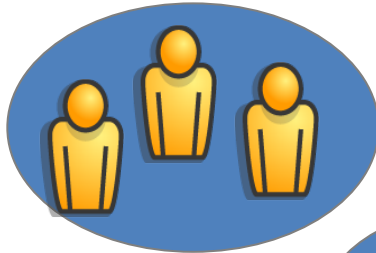
PPM Connector

- Associate Deliverables and Reference Information with tasks
- Master/Sub-Schedule Management
- Extensible scheduling architecture

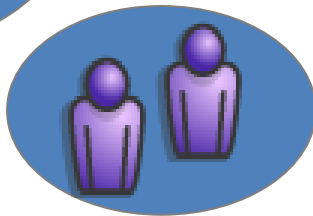
Task	Name	Start/End	Task Definition
00000001	Project Kick-off	2013-01-01 / 2013-01-05	Project Kick-off
00000002	Requirements Gathering	2013-01-06 / 2013-01-15	Requirements Gathering
00000003	System Architecture	2013-01-16 / 2013-01-25	System Architecture
00000004	Software Development	2013-01-26 / 2013-02-15	Software Development
00000005	Testing	2013-02-16 / 2013-02-25	Testing
00000006	Deployment	2013-02-26 / 2013-03-05	Deployment

Program Management & Execution - Process Participants & Responsibilities



Leadership Team

- Business unit managers, finance / operations, executives
- *Business initiative success*



PMO (program management office)

- Planners, program managers, project managers
- *Program definition, planning and management*

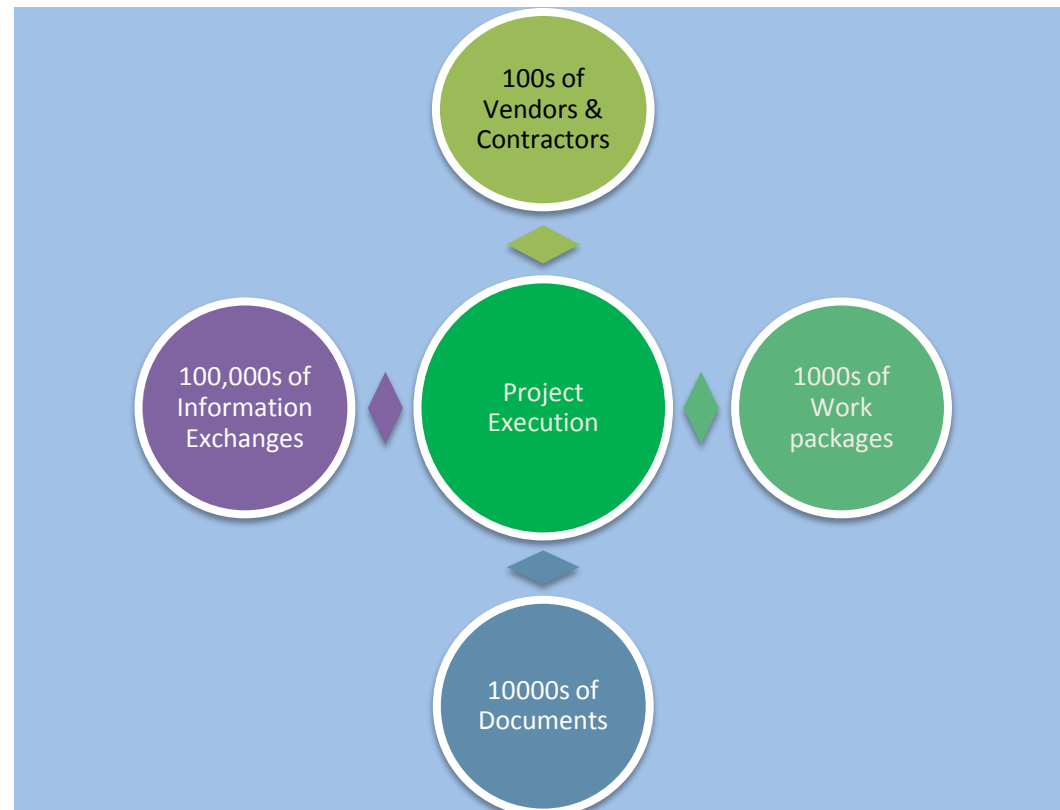


Products/Operations Organization

- Managers, team leaders / coordinators, team members
- *Program execution & delivery*

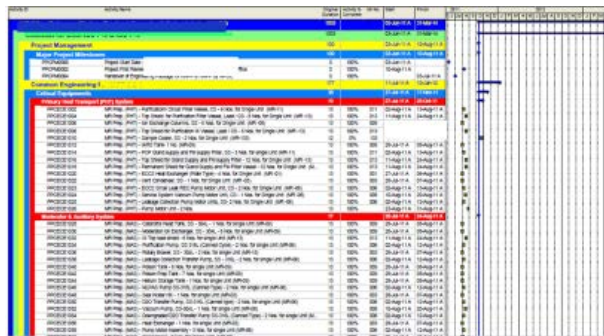
Project Execution Challenge - Typical Project Complexity

- Concrete – 460,000 cubic yards (not including concrete for site preparation).
 - Reinforcing Steel and Embedded Parts – 46,000 tons.
 - Structural Steel, Miscellaneous Steel, and Decking – 25,000 tons.
 - Large Bore Pipe (> 2½ inch) – 260,000 feet.
 - Small Bore Pipe – 430,000 feet.
 - Cable Tray – 220,000 feet.
 - Conduit – 1,200,000 feet.
 - Power Cable – 1,400,000 feet.
 - Control Wire – 5,400,000 feet.
 - Process and Instrument Tubing – 740,000 feet
- 1000+ Equipment tag items

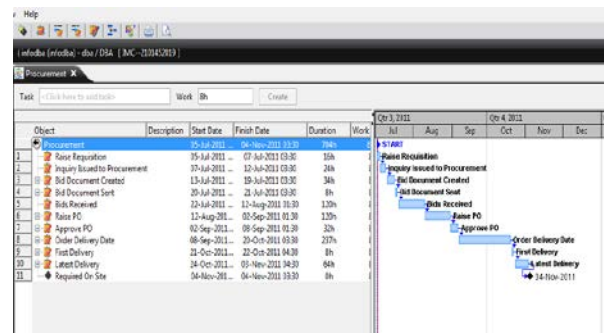


Source : IAEA (Gen III+ Plant)

Teamcenter delivers Project Execution



**Master Schedule
Management in Primavera**



**Project Execution
Management in Teamcenter**

Drawings

Documents

Requirements

CAD

Specifications

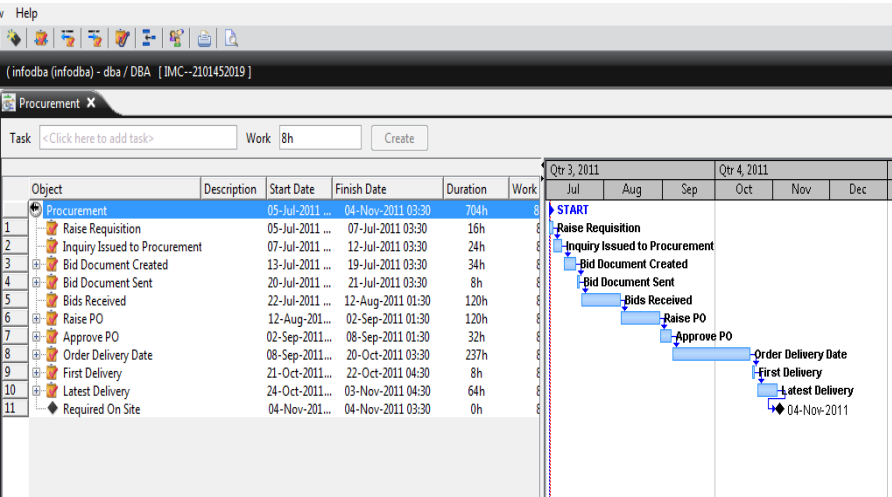
Processes

Project Execution Management in Teamcenter

Reduce time delays

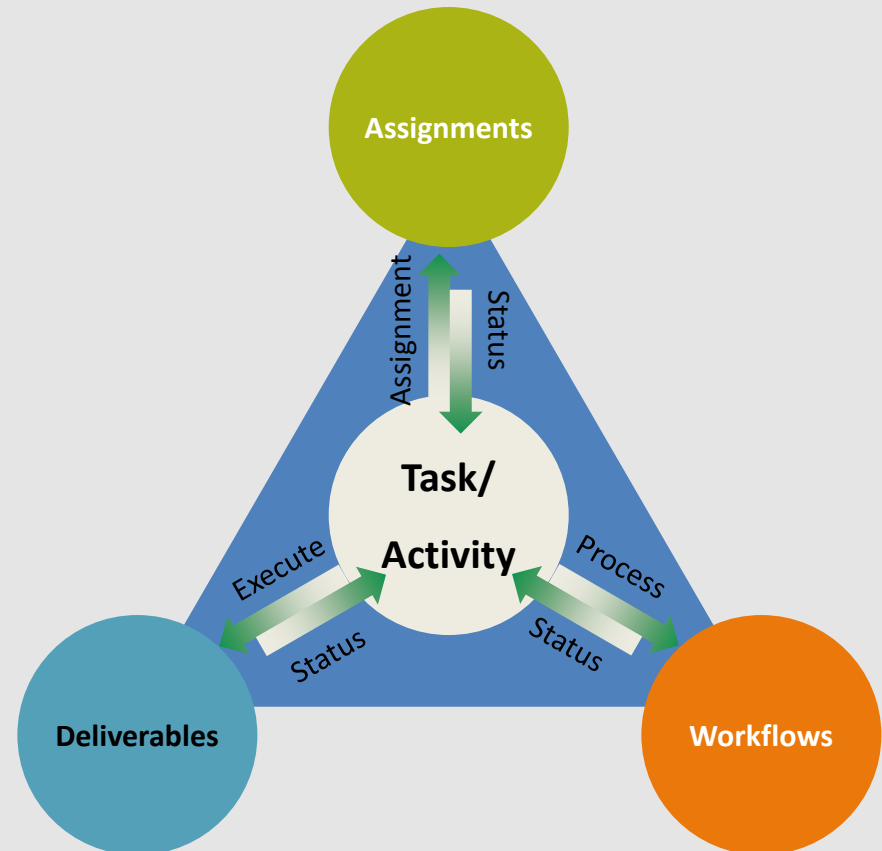
Reduce Costs

Increase productivity



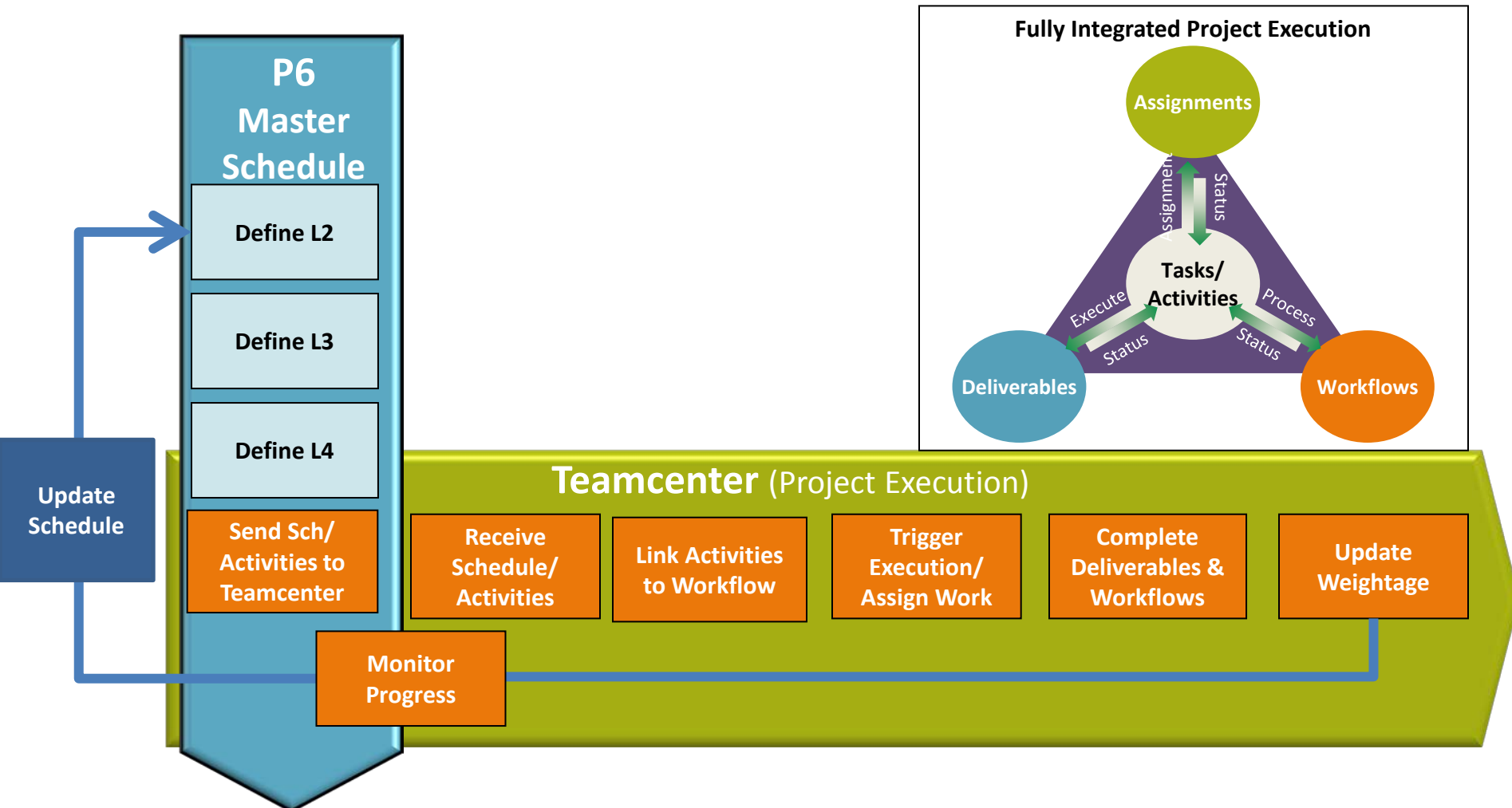
Object	Description	Start Date	Finish Date	Duration	Work
1	Procurement	05-Jul-2011 ...	04-Nov-2011 03:30	704h	
2	Raise Requisition	05-Jul-2011 ...	07-Jul-2011 03:30	16h	
3	Inquiry Issued to Procurement	07-Jul-2011 ...	12-Jul-2011 03:30	24h	
4	Bid Document Created	13-Jul-2011 ...	19-Jul-2011 03:30	34h	
5	Bid Document Sent	20-Jul-2011 ...	21-Jul-2011 03:30	8h	
6	Bids Received	22-Jul-2011 ...	12-Aug-2011 01:30	120h	
7	Raise PO	12-Aug-2011 ...	02-Sep-2011 01:30	120h	
8	Approve PO	02-Sep-2011 ...	08-Sep-2011 01:30	32h	
9	Order Delivery Date	08-Sep-2011 ...	20-Oct-2011 03:30	237h	
10	First Delivery	21-Oct-2011 ...	22-Oct-2011 04:30	8h	
11	Latest Delivery	24-Oct-2011 ...	03-Nov-2011 04:30	64h	
12	Required On Site	04-Nov-2011 ...	04-Nov-2011 03:30	0h	

Fully Integrated Project Execution

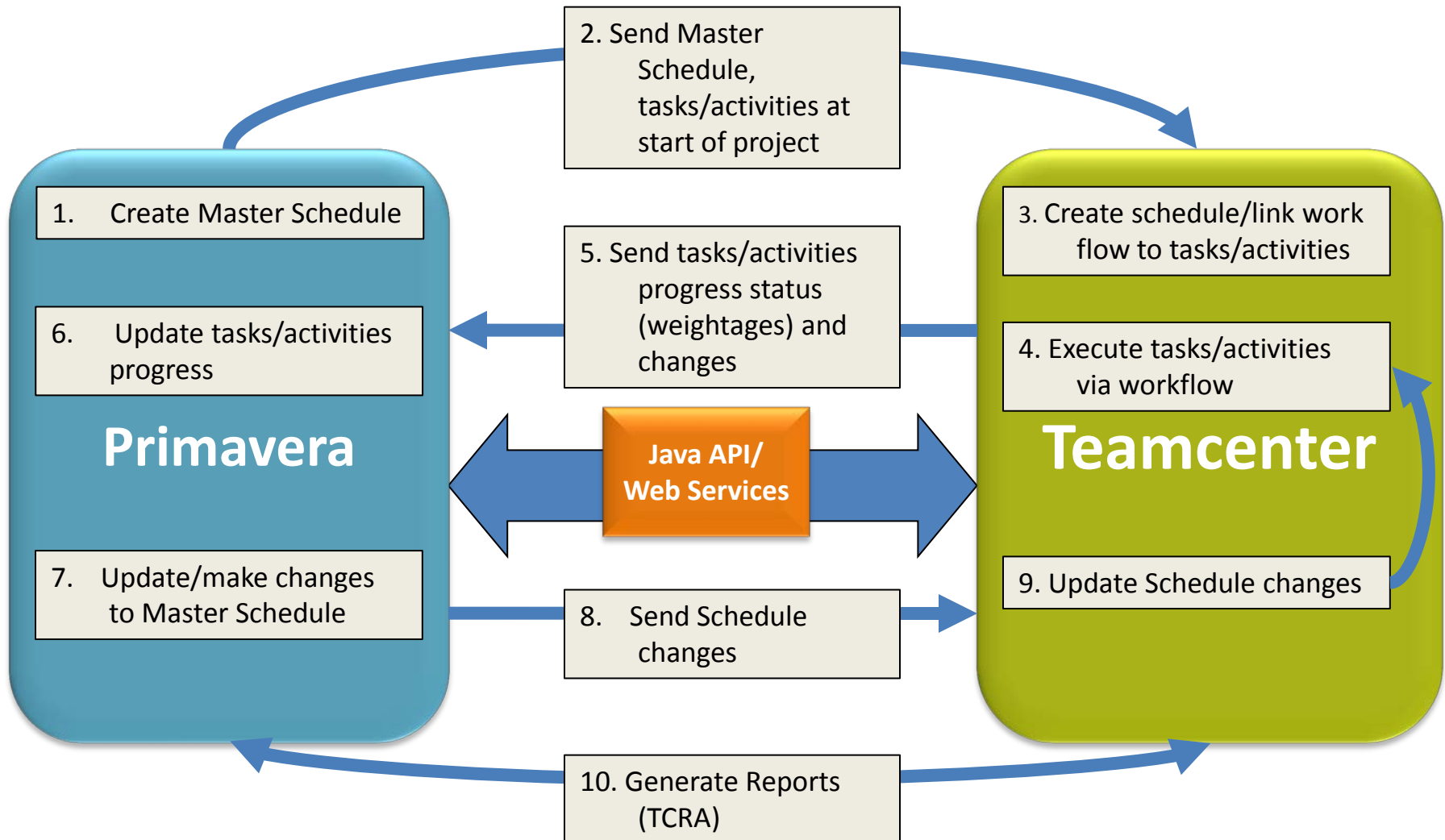


Drive Operational Execution Excellence Consistent with Strategy

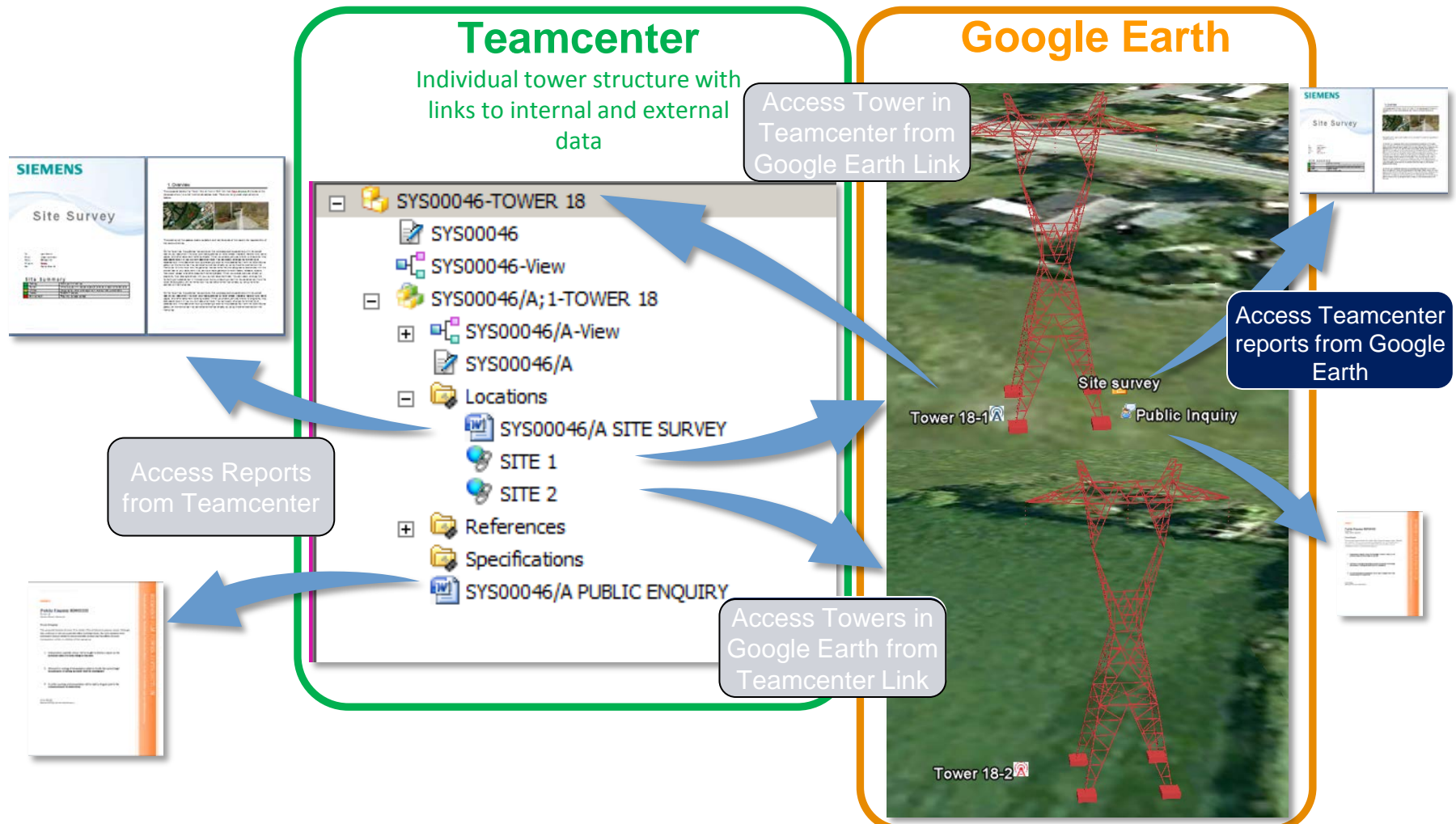
Linking Master Schedule and Project Execution



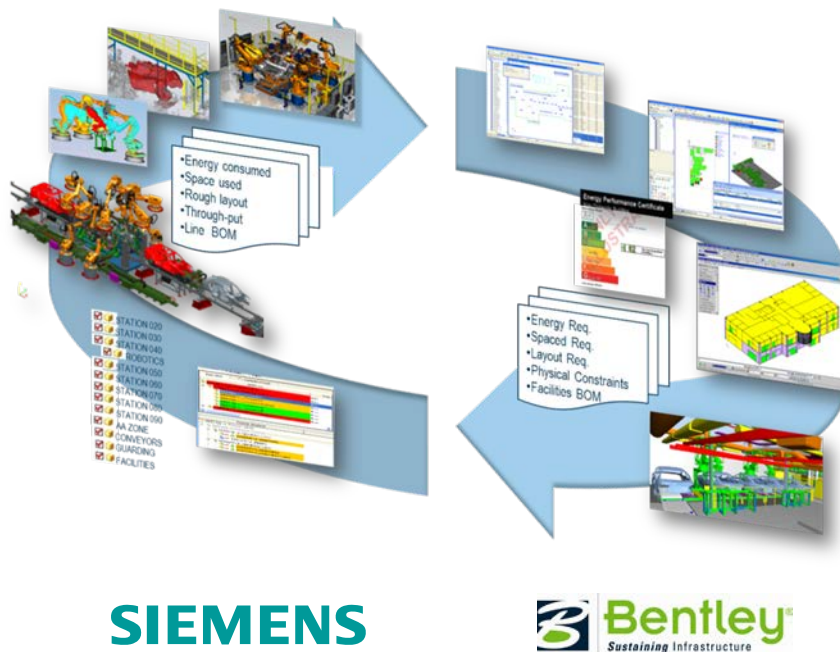
Integration Approach



Google Earth Integration



Strategic Collaboration – Bentley Systems



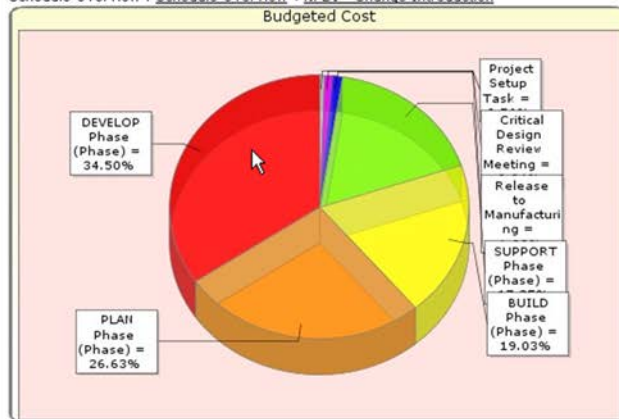
- Bi-directional transfer of information using ISO14306 (JT)
- Better design coordination
- Share knowledge between integrated lifecycles
- Predictable asset design and installation
- Reduction in launch time and costs

Siemens PLM and Bentley Systems – Redefining the Digital Factory

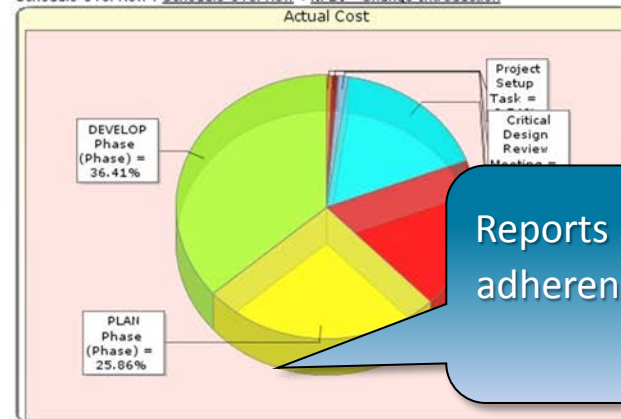
Transparency – Management Dashboards

Schedule Overview

Budgeted Cost - DEVELOP Phase (Phase) = 11,095.00 (34.50%)
 Schedule Overview : Schedule Overview->NPDI - Change Introduction

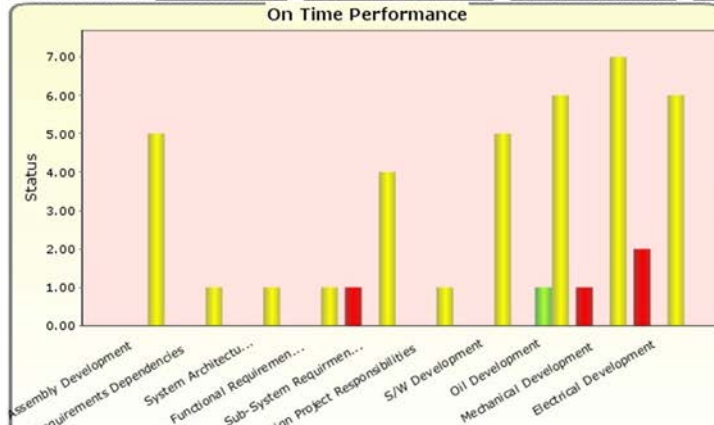


Schedule Overview : Schedule Overview->NPDI - Change Introduction
 Actual Cost



Reports showing Schedule adherence, by Budget and Time

Schedule Overview : Schedule Overview->NPDI - Change Introduction->DEVELOP Phase (Phase)->Devel



Schedule Overview	Budgeted Cost	Actual Cost	Actual Eff
☐ Schedule Overview	32,157.00	33,122.00	
☐ NPDI - Change Introduction	32,157.00	33,122.00	
Milestone	0.00	0.00	
GO / NO-GO Milestone Meeting	0.00	0.00	
Release to Production	0.00	0.00	
Project Setup Task			
☐ Critical Design Review Meeting			
Final Issue Resolution			
Change Administration			
Update Requirments			
Update eBOM / CAD-eBOM Alignment			
Project Plan Update			
Update Dashboard			
Release to Manufacturing			
☐ SUPPORT Phase (Phase)			
Quarterly Service Review			
On-going Service Sustainment			
☐ Support Phase Start	5,400.00	5,400.00	

Reports showing status, based on Maturity and filtered by Project Phase

Continuous visibility

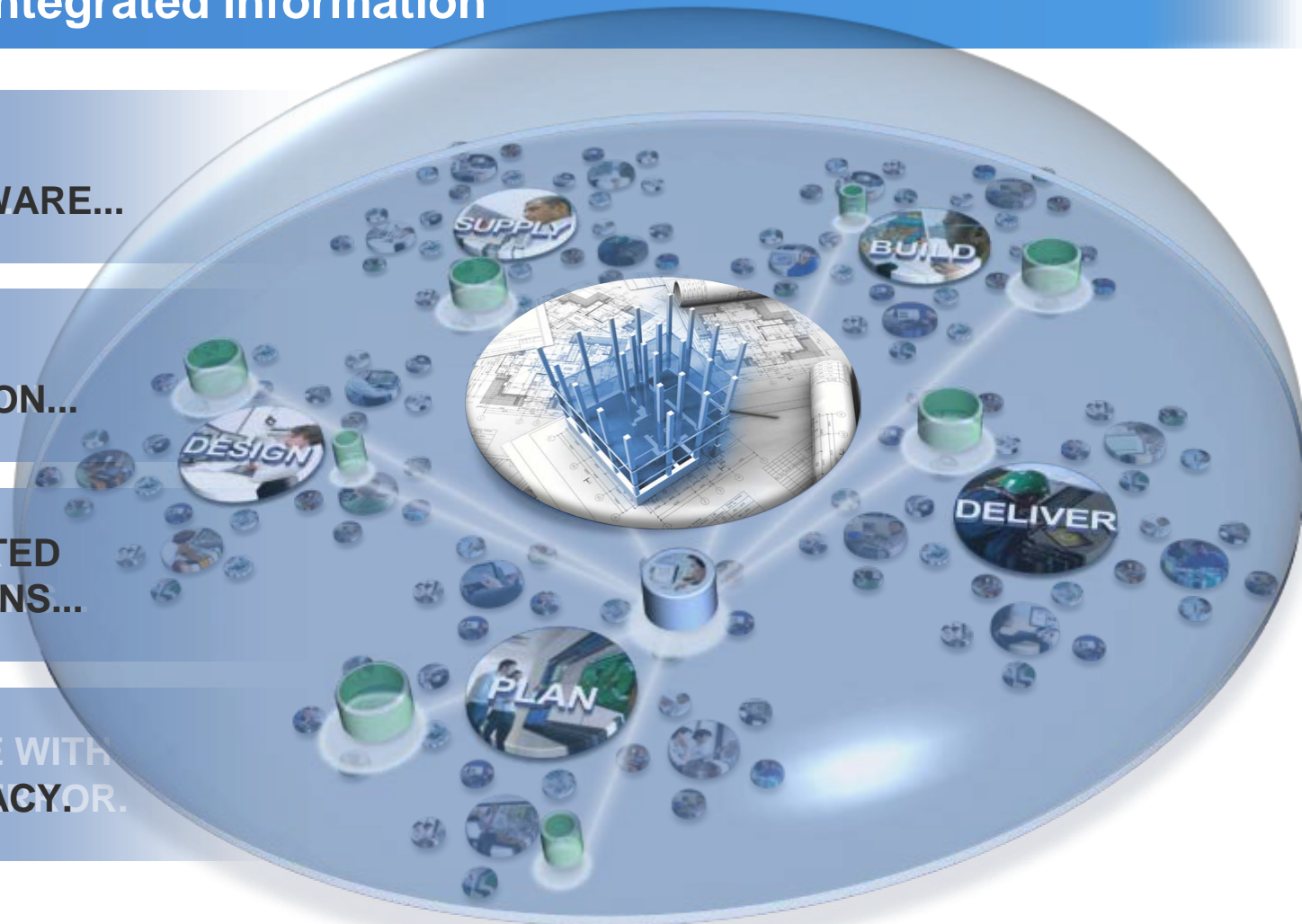
Intelligently integrated information

**MORE PEOPLE
INTRINSICALLY AWARE...**

**RECEIVING THE
RIGHT INFORMATION...**

**MAKING INTEGRATED
SYSTEMS DECISIONS...**

**ON TIME WITH PURE WITH
GREATER ACCURACY OR.**





Challenges & Trends

Information Quality

The right data...

Collaboration

...to the right person...

Project Control

...in the right context

Summary



Siemens PLM is committed to AEC

The strong position of Siemens AG provides us with unrivalled access to industry information



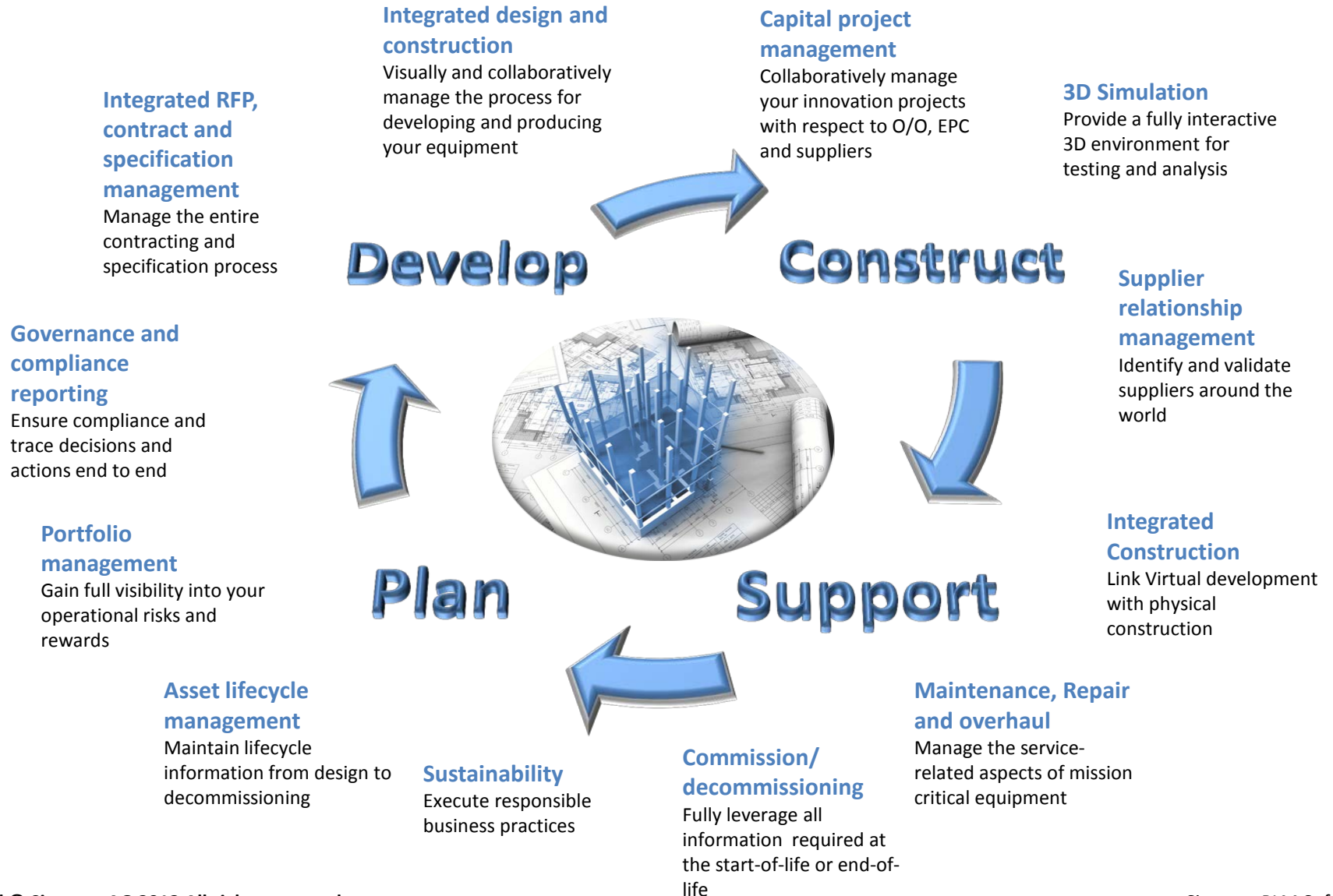
Open Tools

Our 'open solutions' approach enables the integration with other software tools – ERP, Program Management and Authoring



Support the entire lifecycle

PLM has a role to play throughout the industry lifecycle, from portfolio planning through to product decommissioning



Making the HD-PLM Vision a Reality
 HD-PLM Investments Delivered in Every Product



**Delivering
 the Vision**

TEAMCENTER DEVELOPMENT

Intelligently Integrated
 Information

**ENTERPRISE
 FOUNDATION**

**The backbone for
 intelligently integrated
 information**



Future-proof
 Architecture

**PERFORMANCE, QUALITY
 AND DEPLOYMENT**

**The underpinnings
 of our architecture**



High-definition User
 Experience

**PERSONALIZED
 AND PROACTIVE**

**Teamcenter is
 made for you!**

