



From BIM to ALIM

Generating value by connecting (building) information models
with asset lifecycle and performance management

Lutz Bettels, Industry Sales Director Building CEE, Bentley Systems

Agenda

- Setting the stage
- BIM authoring for owner/operators
- Aggregating and transforming BIM information for construction and operation
- Maintaining the BIM model through construction
- Connecting the as-built BIM model with operational systems
- Leveraging an up to date IM to optimize asset performance

About Bentley



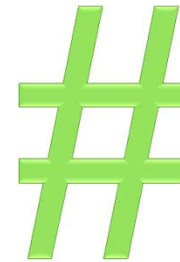
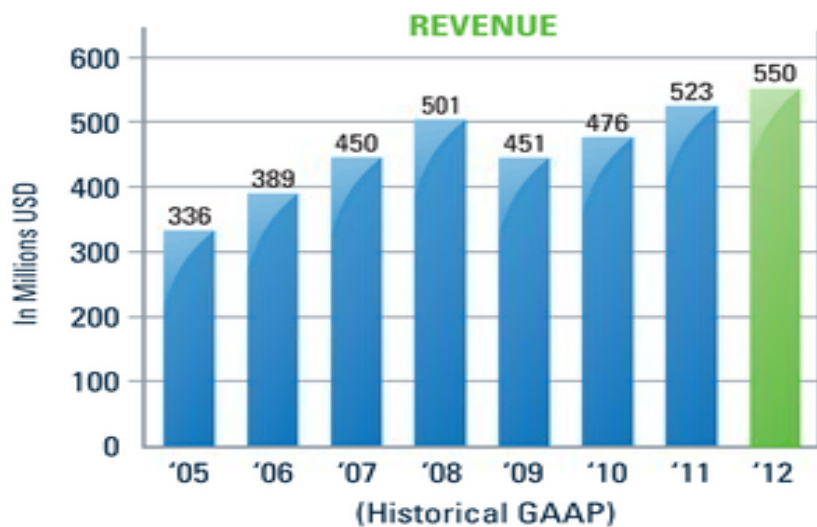
Bentley's mission is to provide innovative software and services for the enterprises and professionals who design, build and operate the world's infrastructure - sustaining the global economy and environment, for improved quality of life.

2012 Annual Report



View or download at:

www.bentley.com/annualreport



- Bridges
- Roads
- Rail and Transit Networks
- Power Plants
- Water and Wastewater Utilities
- Construction Simulation
- Collaboration Services
- Process Plant Operations
- Structural Analysis
- 3D City Modeling

CAMPUSES

- Bentley Map
- Descartes
- Geospatial Server
- AECOsim
- RAM
- STAAD
- Raceway and Cable Management
- GEOPAK
- InRoads
- gINT
- MX
- OpenPlant

RAIL & TRANSIT NETWORKS

- Bentley Rail
- Optram
- InRoads
- MX
- RM
- GEOPAK
- LEAP
- gINT

UTILITY NETWORKS

- Substation
- sisNET
- Descartes
- GEOPAK
- gINT
- InRoads
- MX
- promis•e
- STAAD

London 2012

Sustaining the Infrastructure of 'London 2012'



Crossrail
Crossrail Limited



Park House
Robin Partington Architects



King's Cross Station
John McAslan + Partners



Victoria Station Upgrade
Taylor Woodrow/BAM Nuttall JV

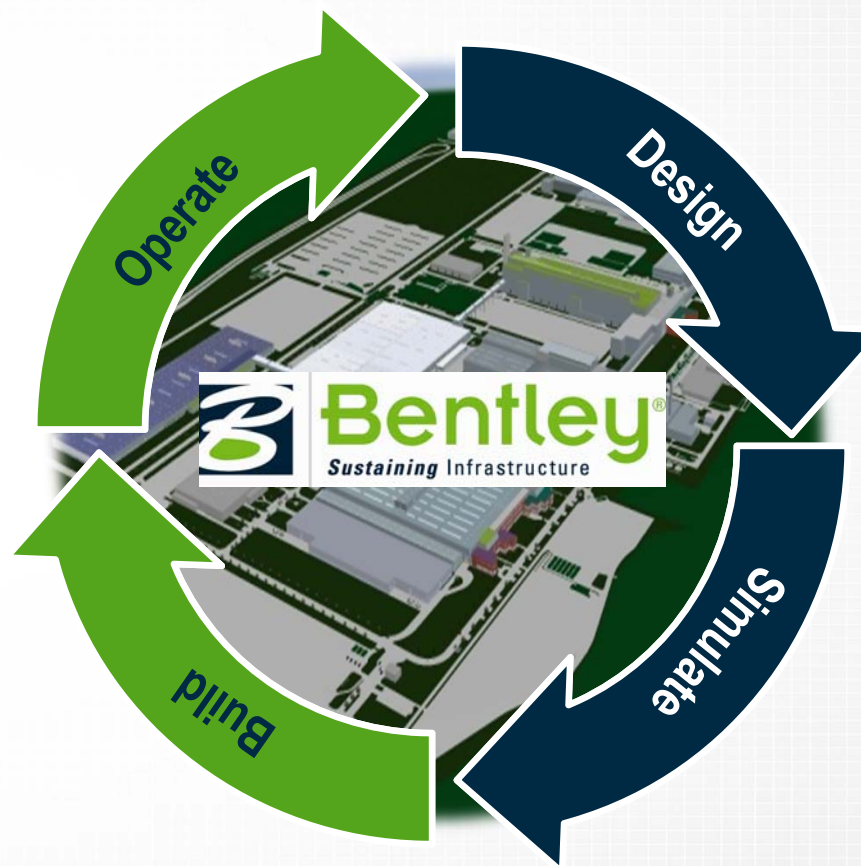
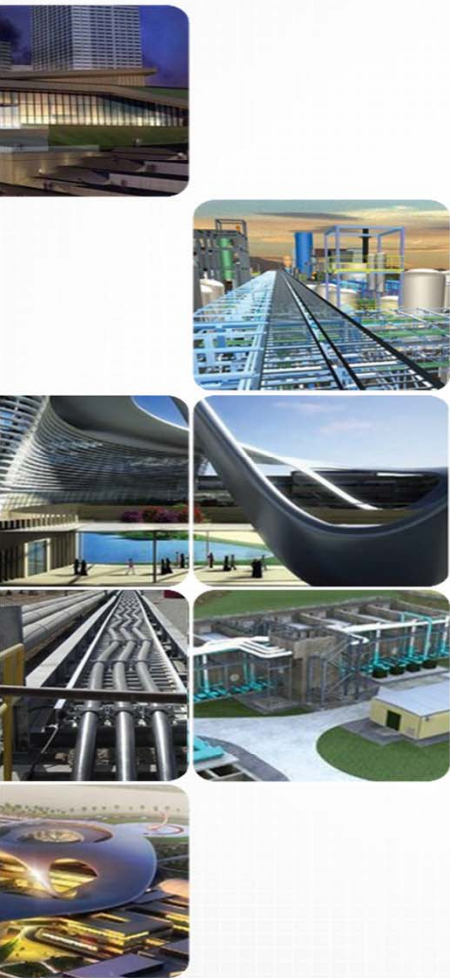


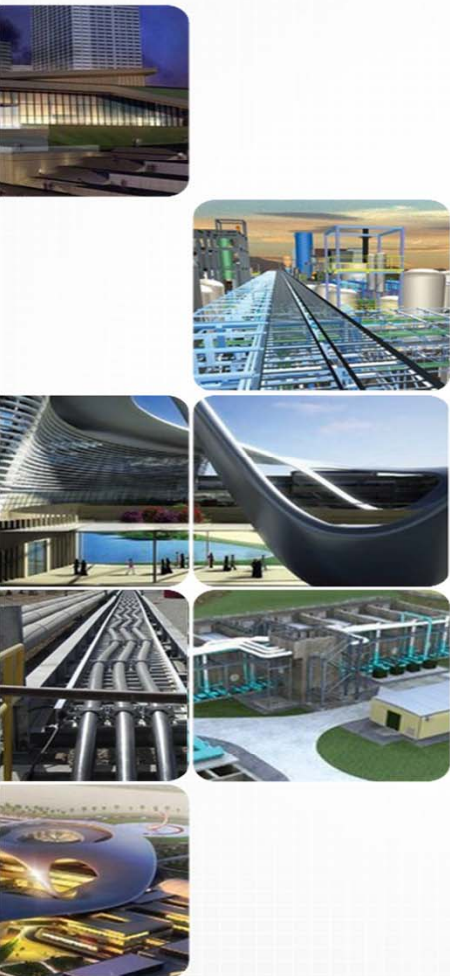
The Francis Crick Institute
HOK - PLP Architecture

Leading AECO organizations, empowered by Bentley Systems software and services, have been instrumental in shaping and sustaining London's infrastructure for close to 30 years. Among their contributions shown here are significant structures within London's skyline and the facilities and transportation systems that helped make the London Olympics such a big success.

London exemplifies the United Kingdom's steadfast commitment to infrastructure development as a key driver of long-term economic growth. And its leadership in the adoption of innovations such as *BS 1192* for managing construction information to help achieve fully collaborative *Building Information Modeling* by 2016, *generative design*, and *intelligent asset management* underpins that strategy. Bentley and AECO organizations working in London and across the U.K. will continue to further advance the use of these innovations in the development of intelligent infrastructure for improved quality of life while increasing the competitiveness of "U.K. PLC" worldwide.







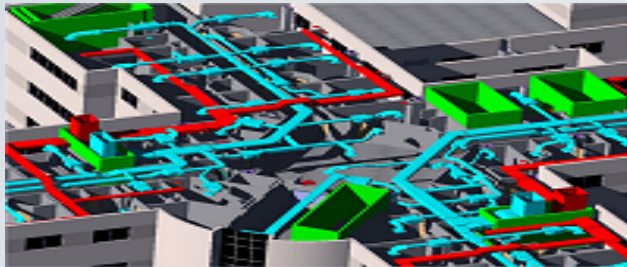
BIM authoring for owner/operators

BIM Authoring Tools

Deliver High Performance Buildings through interdisciplinary building design, analysis, simulation and the production of high quality building and project documentation.

AECOsim Building Designer

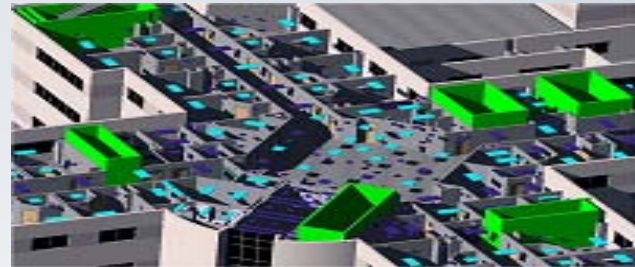
Interdisciplinary Building Information Modeling



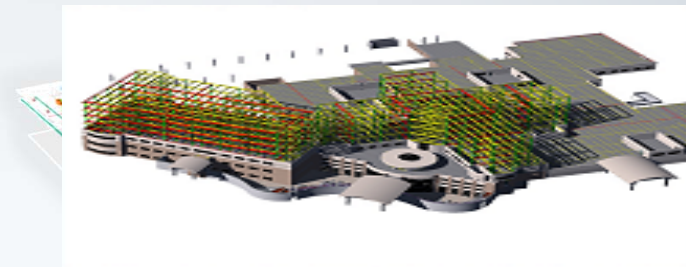
Mechanical/Plumbing



Architectural

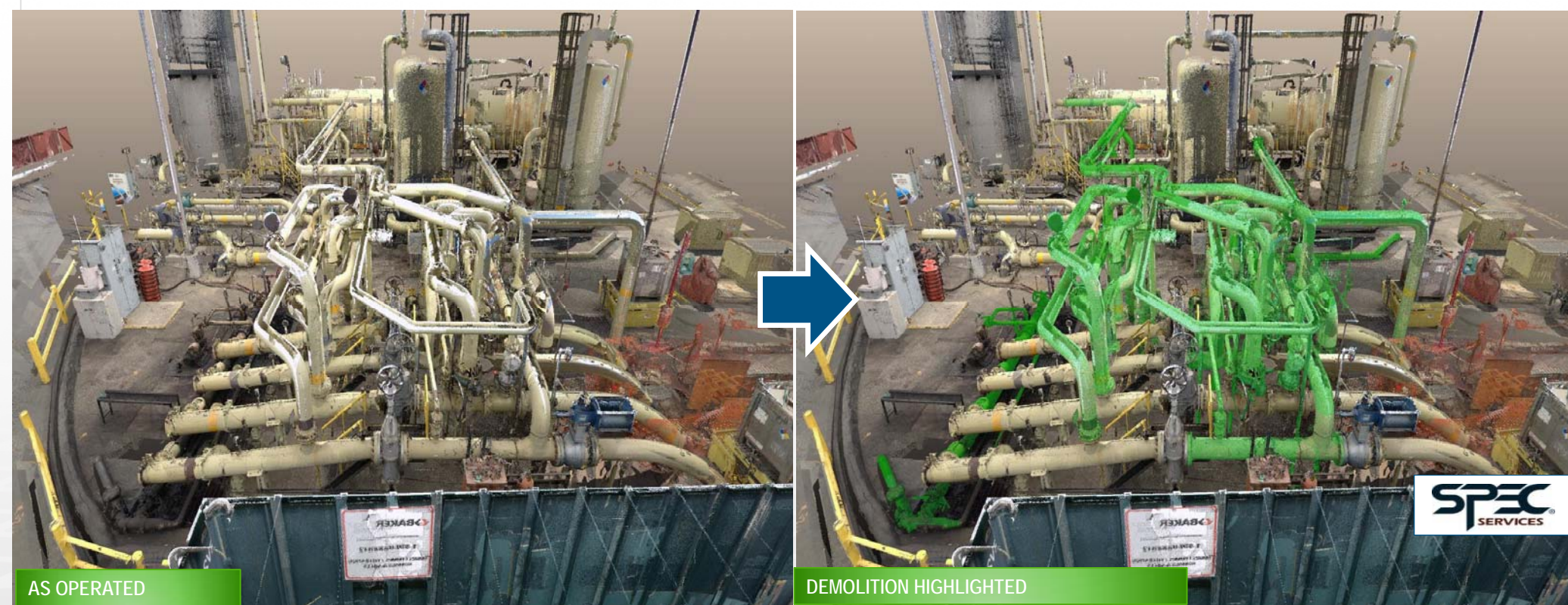


Electrical



Structural

Hybrid Planning 3D models in Point Clouds

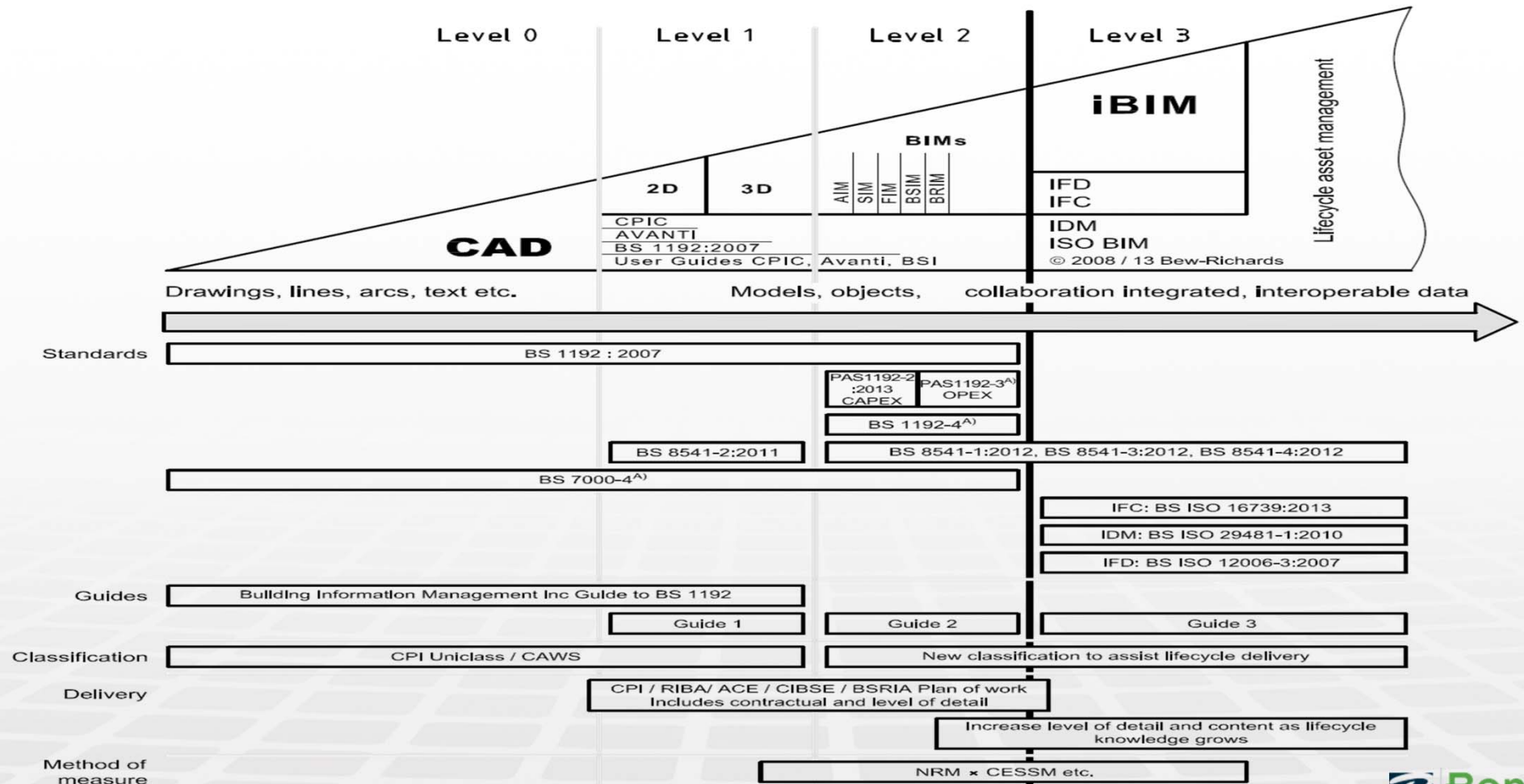


Hybrid Planning 3D models in Point Clouds

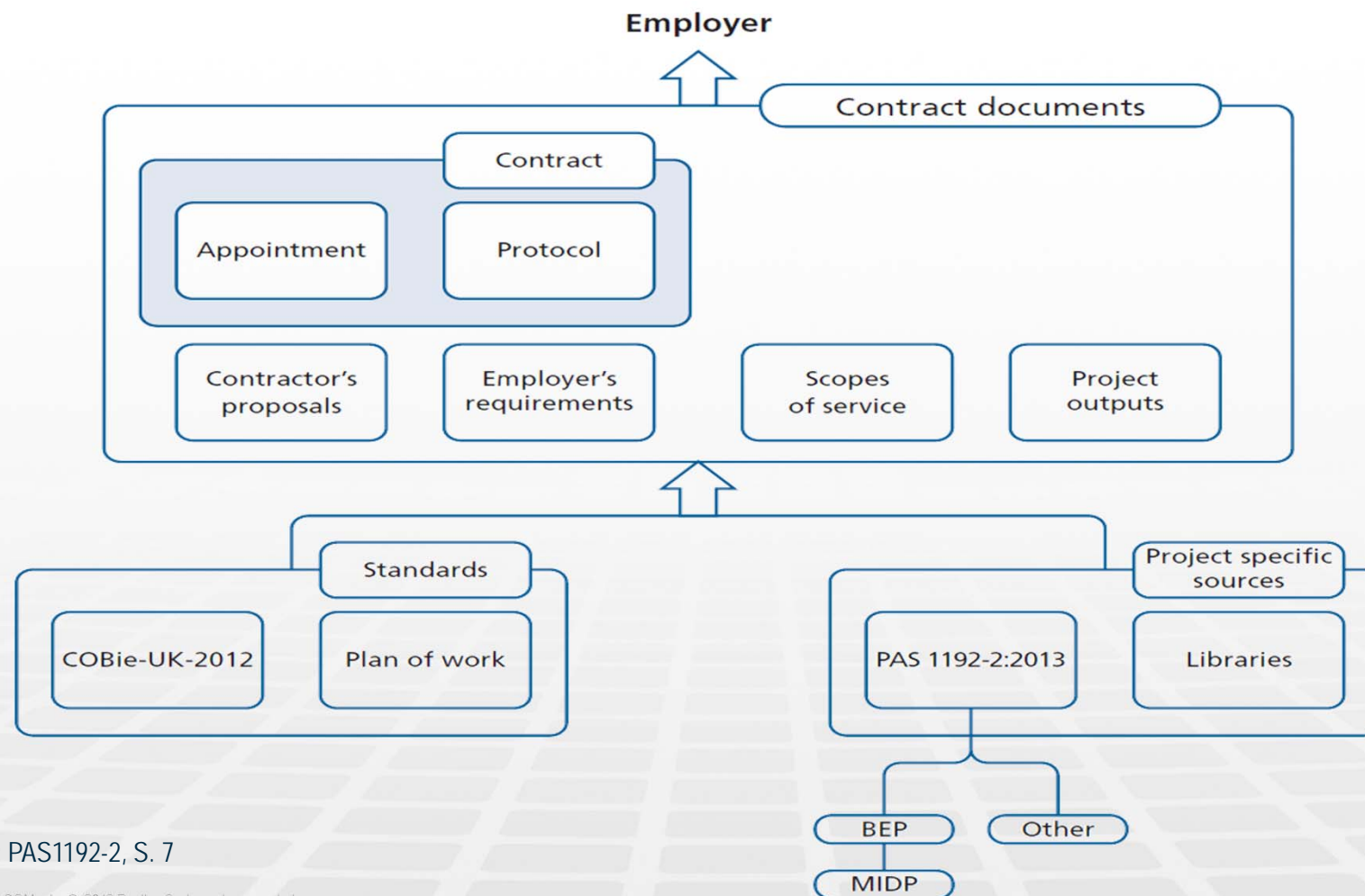


British BIM Standard BS1192

Quelle: B555_Roadmap_JUNE_2013



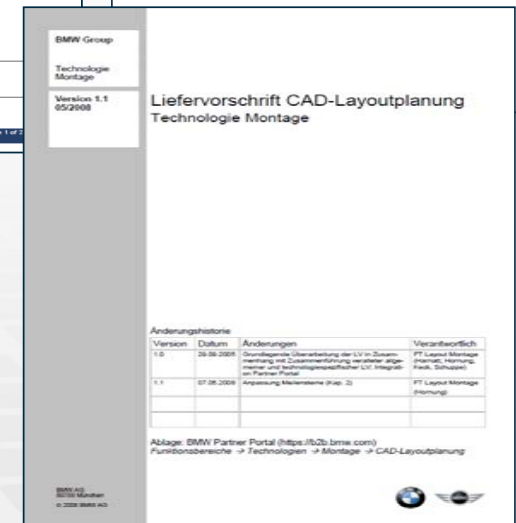
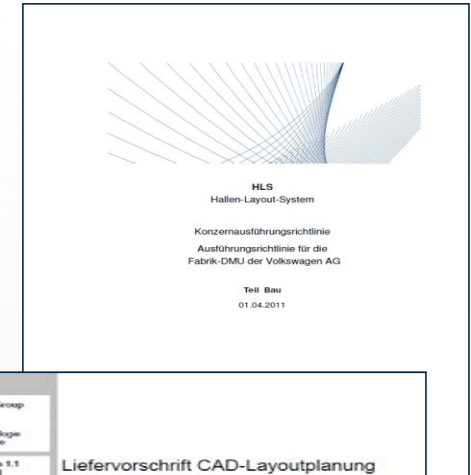
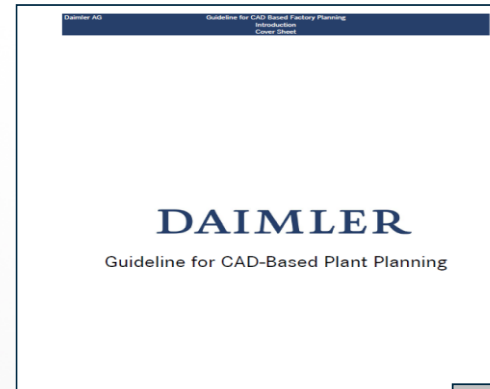
British BIM Standard BS1192



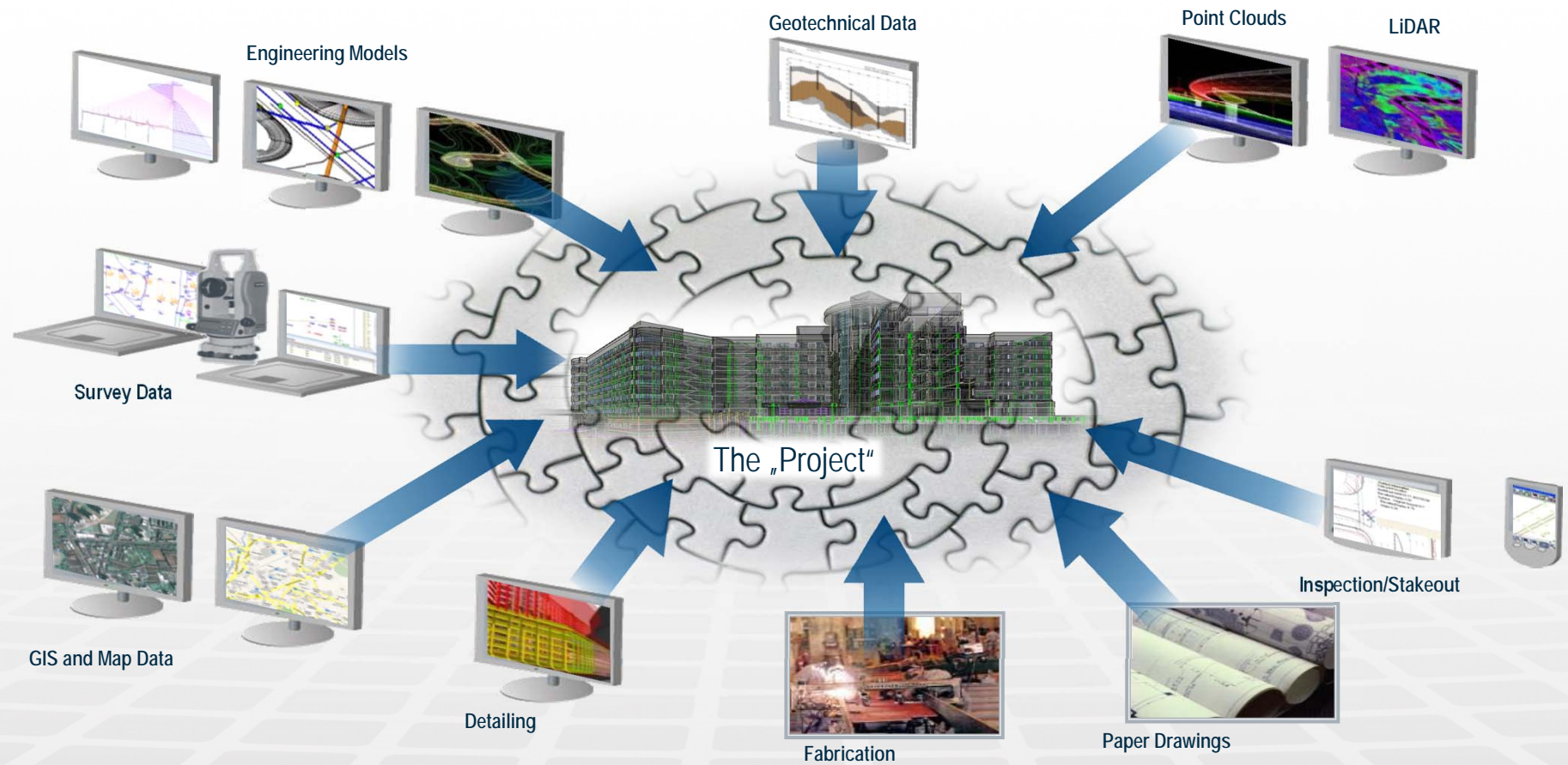
Quelle: PAS1192-2, S. 7

(B)IM Standards of Owner/Operators

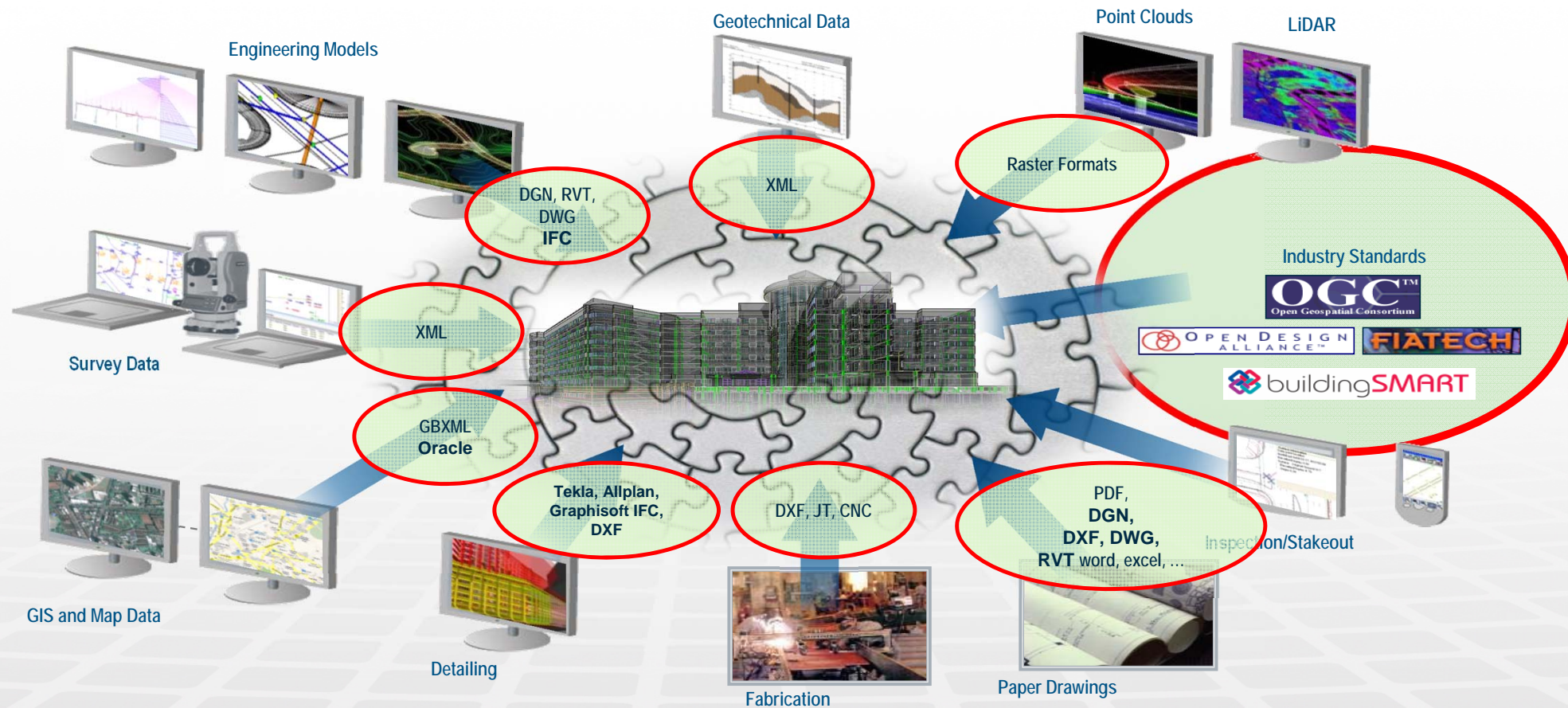
- Auch Industrieunter-nehmen haben ihre (B)IM Standards definiert
- Schreiben diese ihren Planern und Lieferanten verbindlich vor

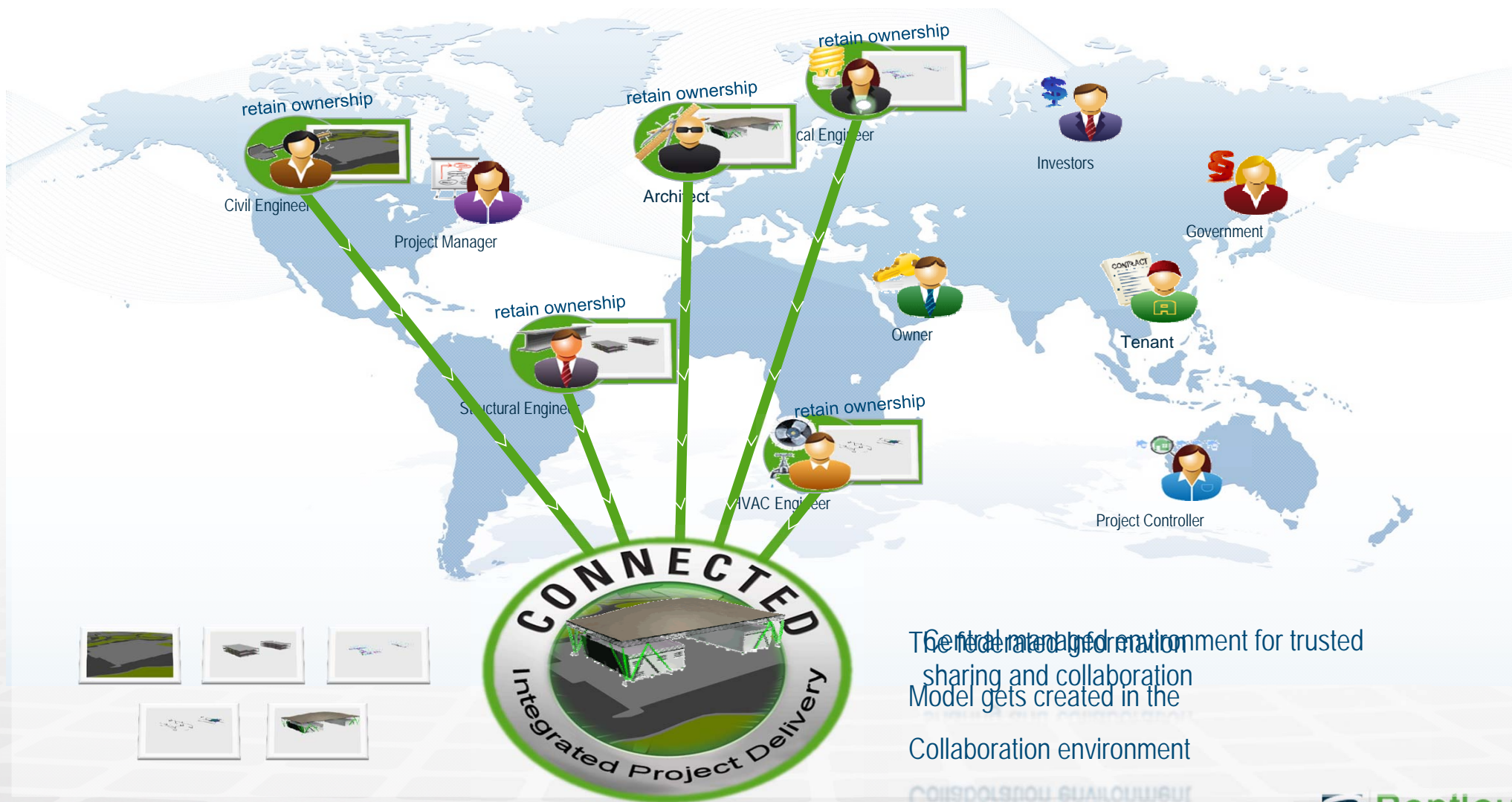


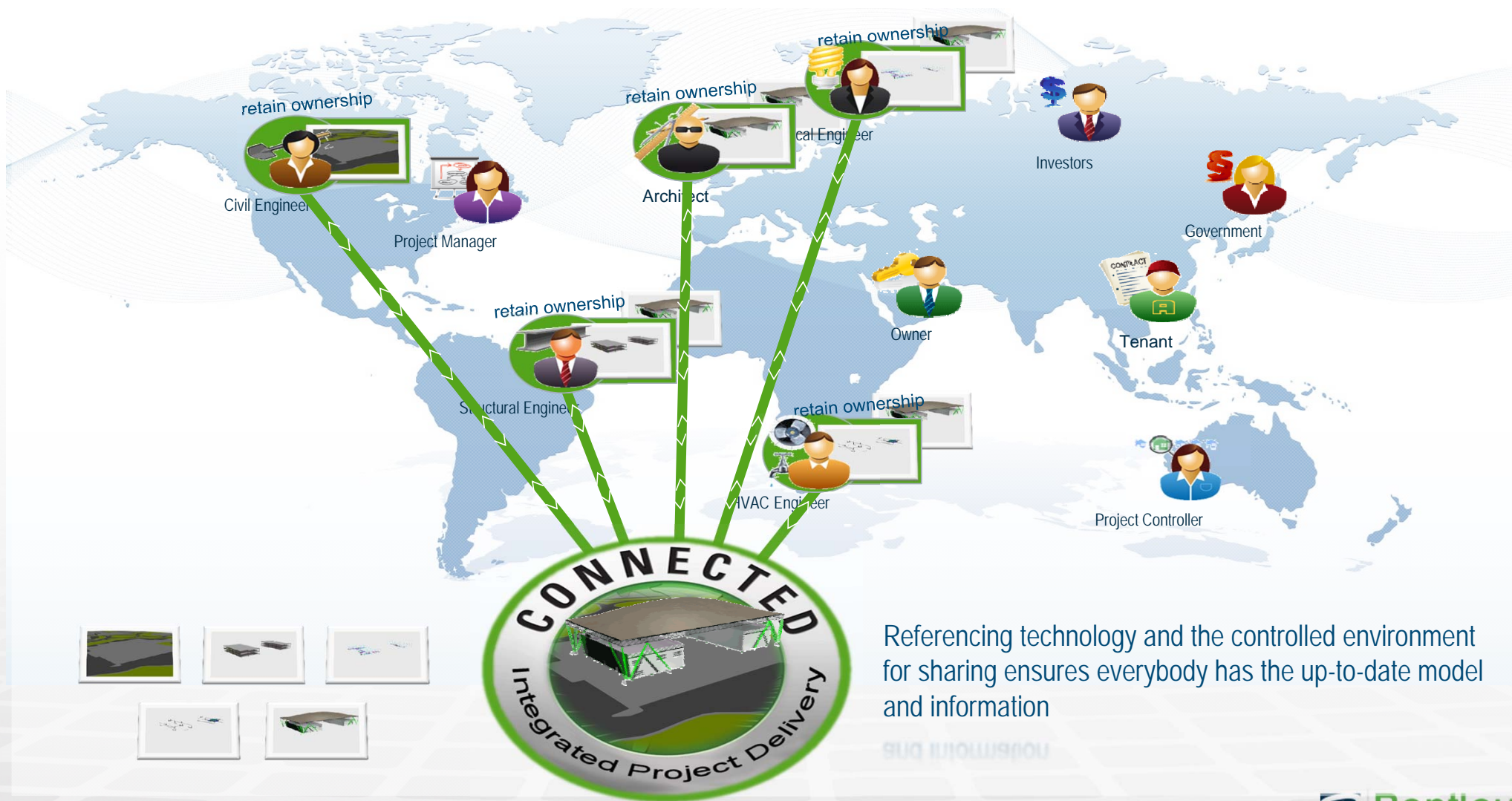
Multi-source Project Integration



Multi-source Project Integration









ProjectWise Core Capabilities

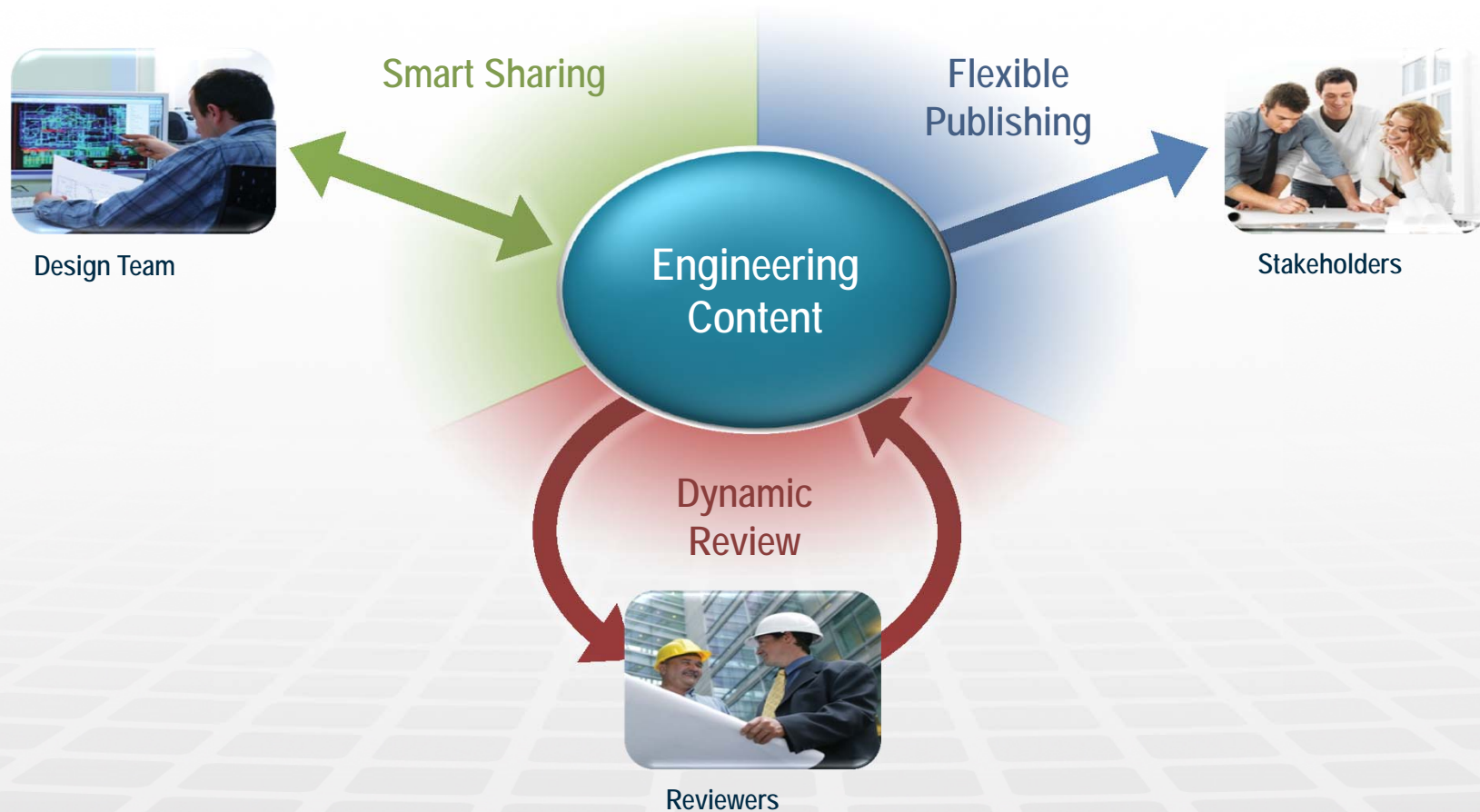
- Core capabilities enable project teams to...
 - **Connect** easily with project information for collaboration
 - **Federate** management, publishing, and review services
 - **Optimize** information access to accelerate workflow

Federated Content
Services



Optimized Information
Workflow

Sharing, Review & Publishing for Infrastructure



Smart Sharing

- Cooperate through a single source of truth for distributed projects

...where the right people quickly and reliably accelerate work-in-progress using infrastructure tools and workflows of choice.



Smart Sharing

- Work in an infrastructure-specific project environment:



- Projects of all sizes
- Inter-related, federated data
- Common infrastructure tools in defined workflows

Flexible Publishing

- Inform project stakeholders

...in a more consistent,
timely and predictable
manner using high
impact deliverables.



Flexible Publishing

- Produce standards-based documents

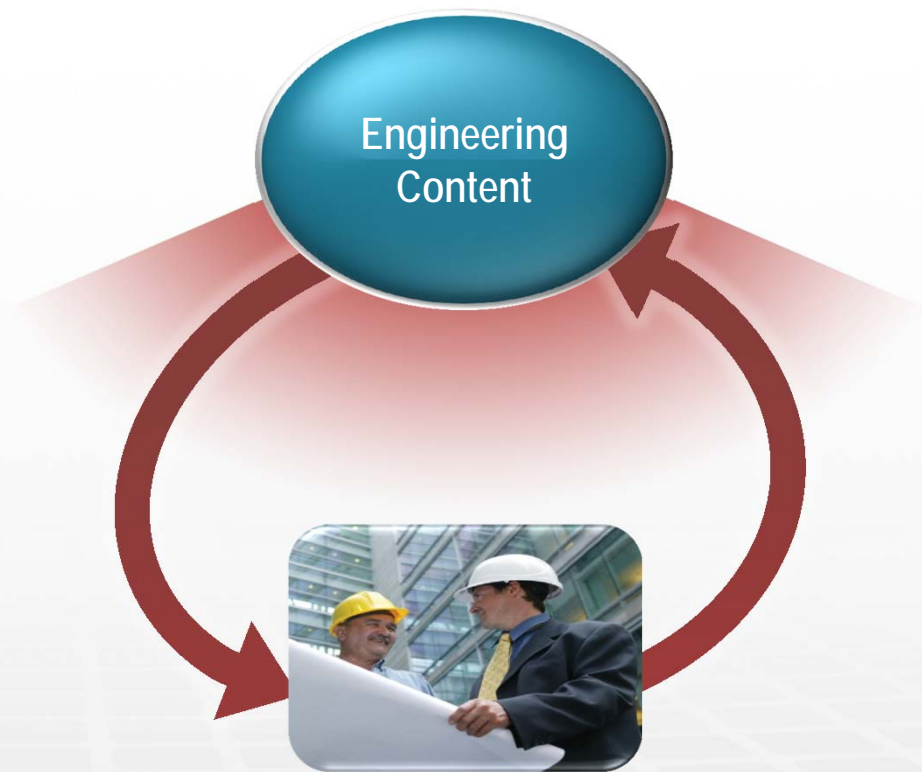


- Automated or on demand
- User-defined standards
- All media types
- All device types

Dynamic Review

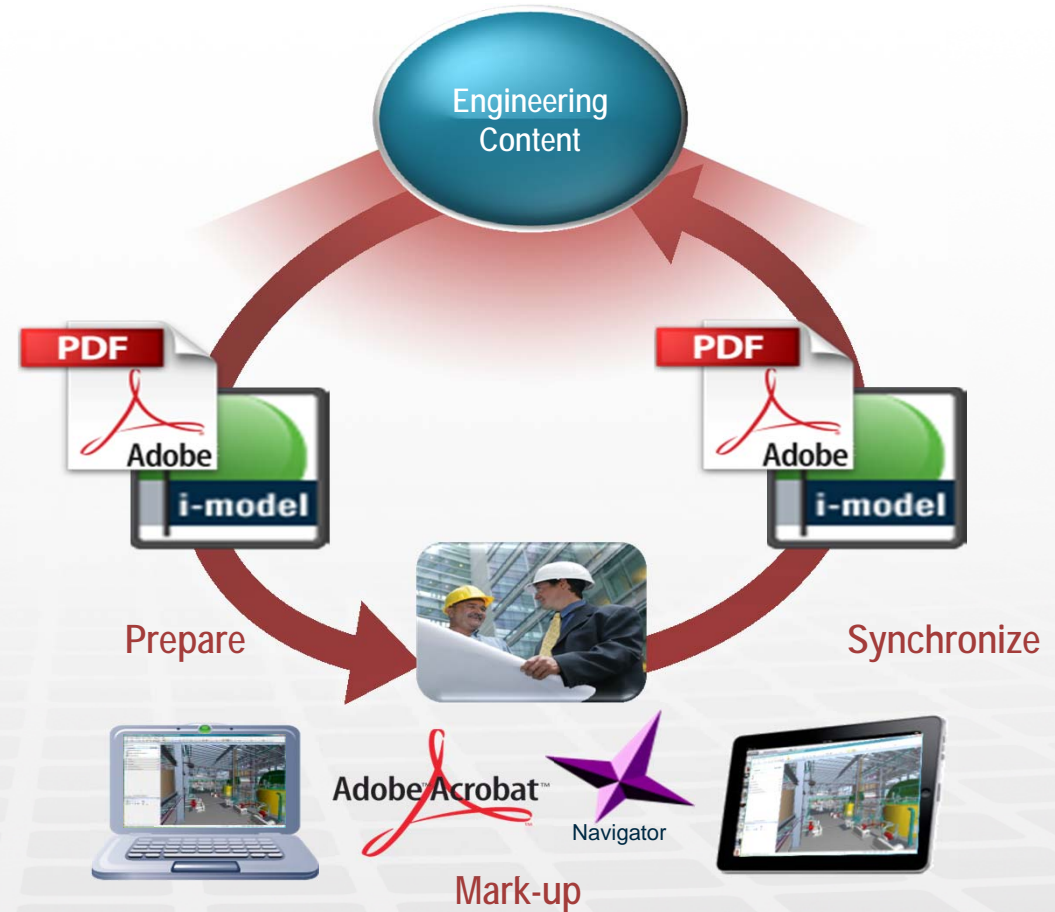
Synchronize comments
to resolve issues
quickly and effectively

...in a 'closed-loop', returning
feedback in context to all the relevant
designers so as to be actionable.



Dynamic Review

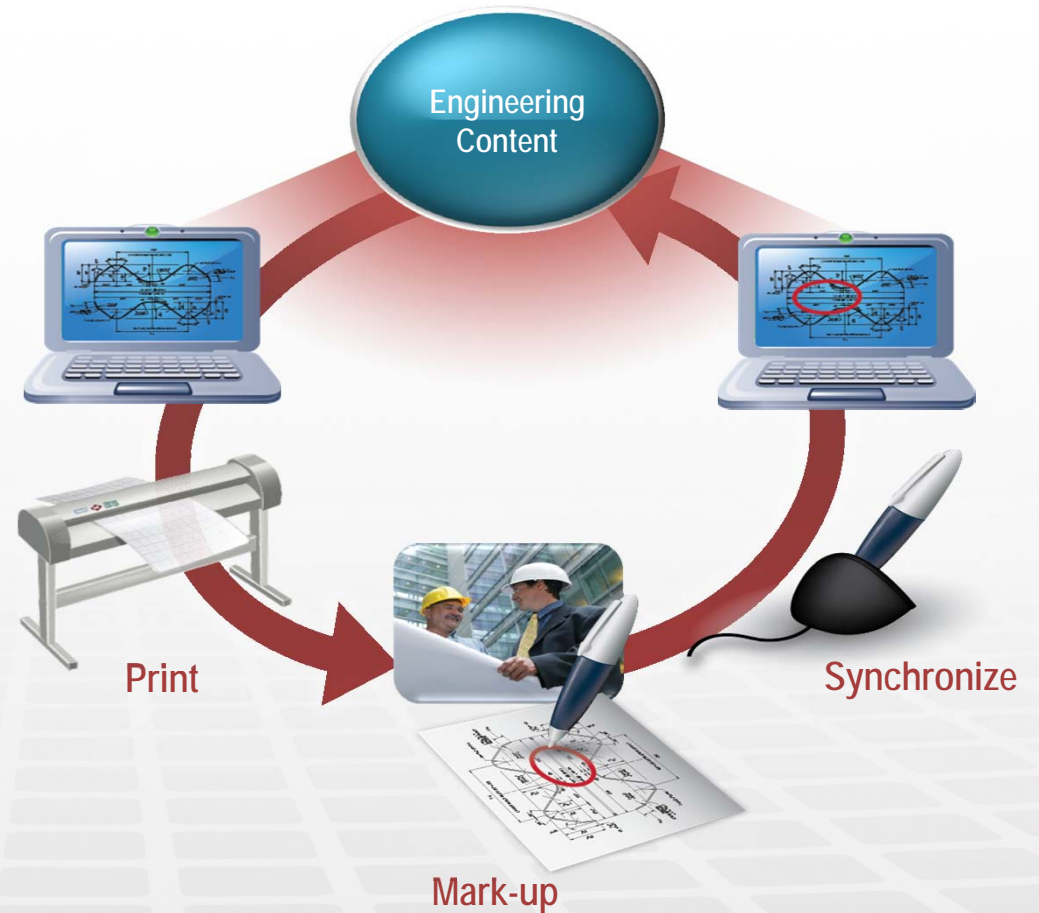
- Synchronize Mark-ups with Bentley Navigator or Acrobat
- Feedback captured anywhere
- Computer or iPad
- PDF or Model-based
- Audit trail

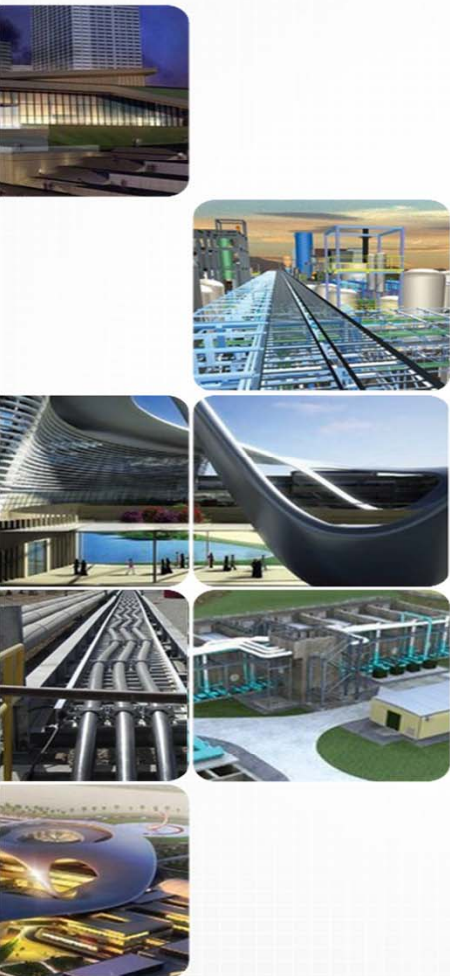


Dynamic Review

Synchronize Mark-ups With Pen and Paper

- Dynamic Plots
- Smart Pens
- Traditional workflow
- "Redlines"



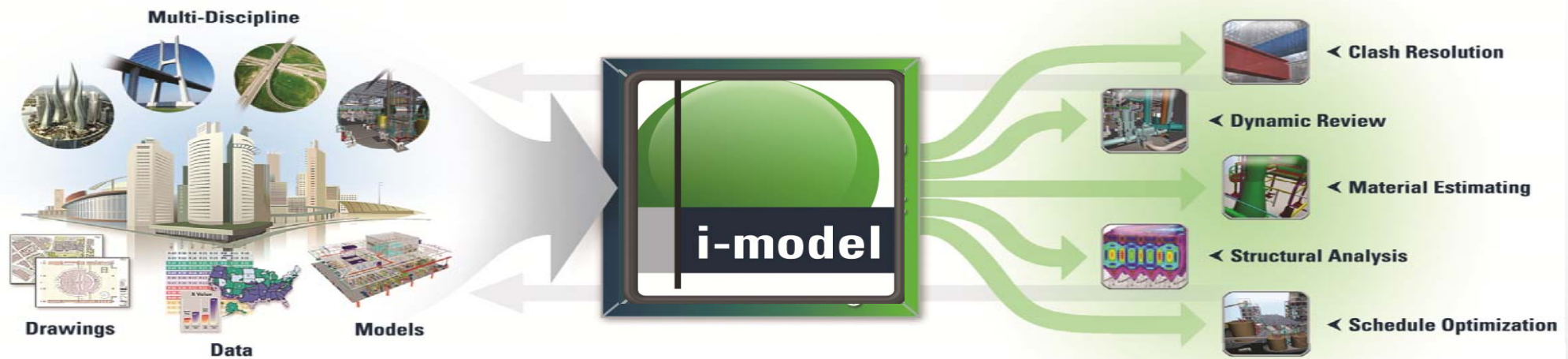


Aggregating and Transforming BIM Information for Construction and Operation

i-model - Currency for Information Exchange

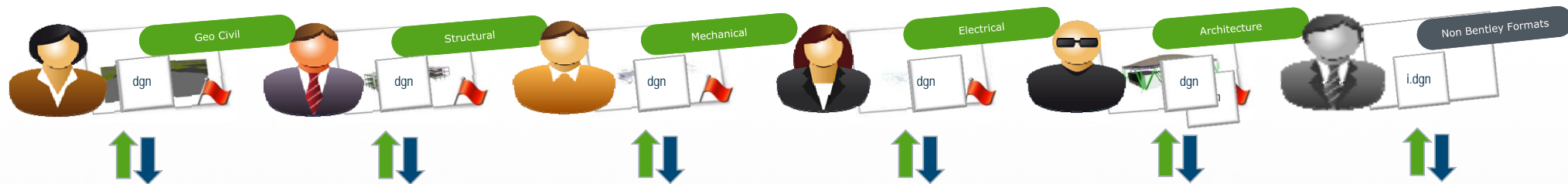
i-models: Containers for Information Exchange

A key differentiating technology from Bentley



Portable - Self-Describing - Secure - Provenance

i-model Creation



Dynamic Reviewing process

Supporting the whole Lifecycle

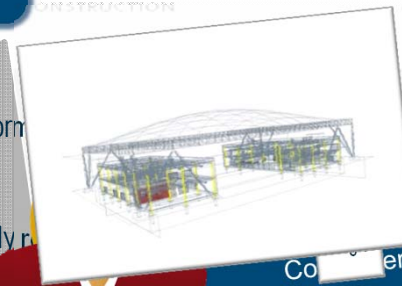


• Inform

• Fully r

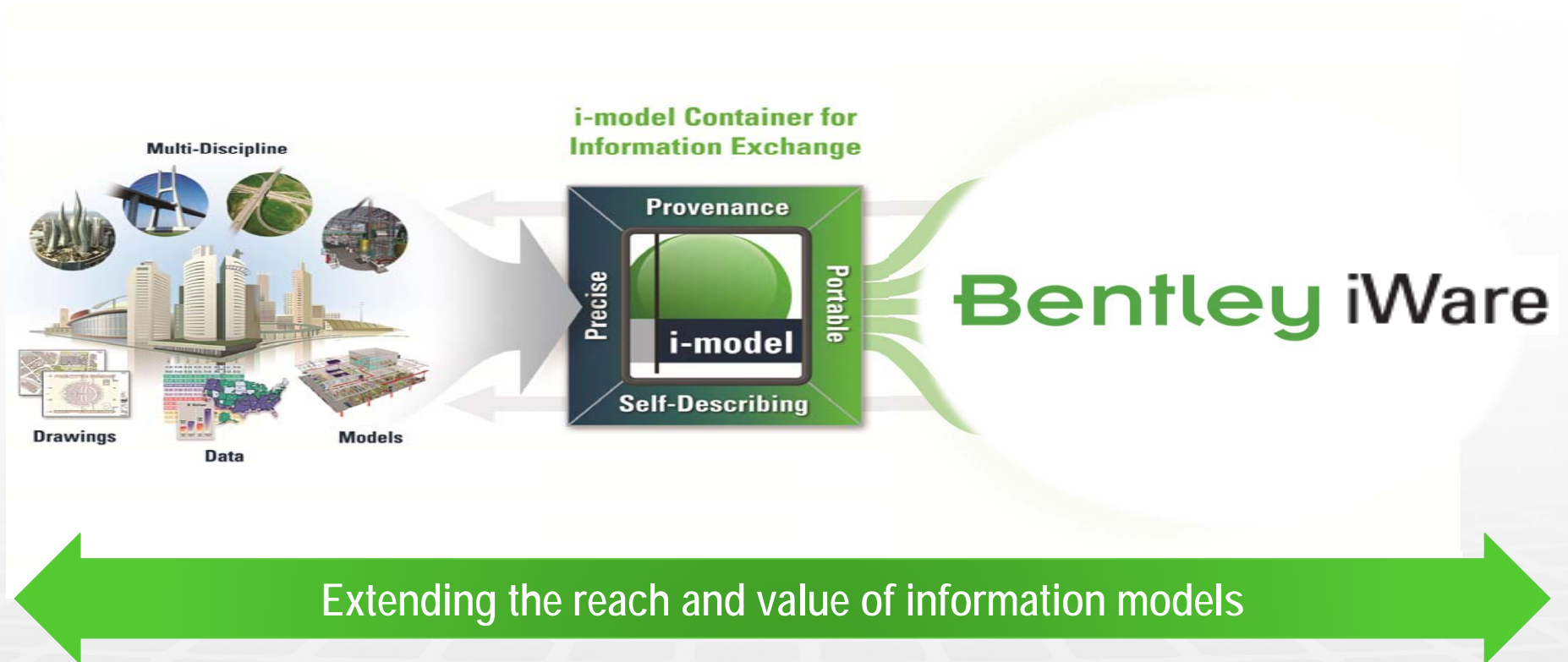
• Optimized to reviewing needs

• Secure format also for archiving

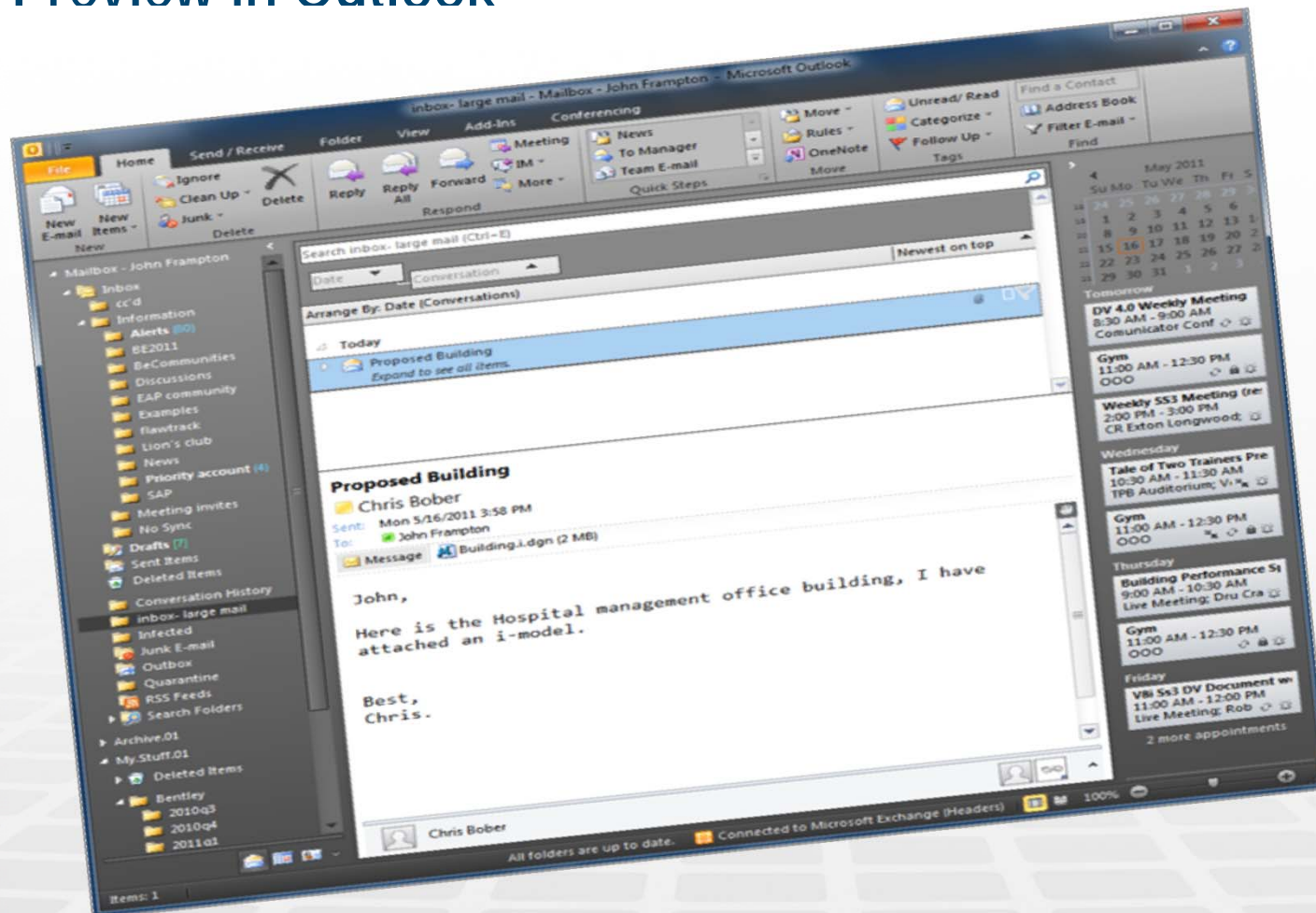


Clash detection
Schedule Simulation

Interoperability

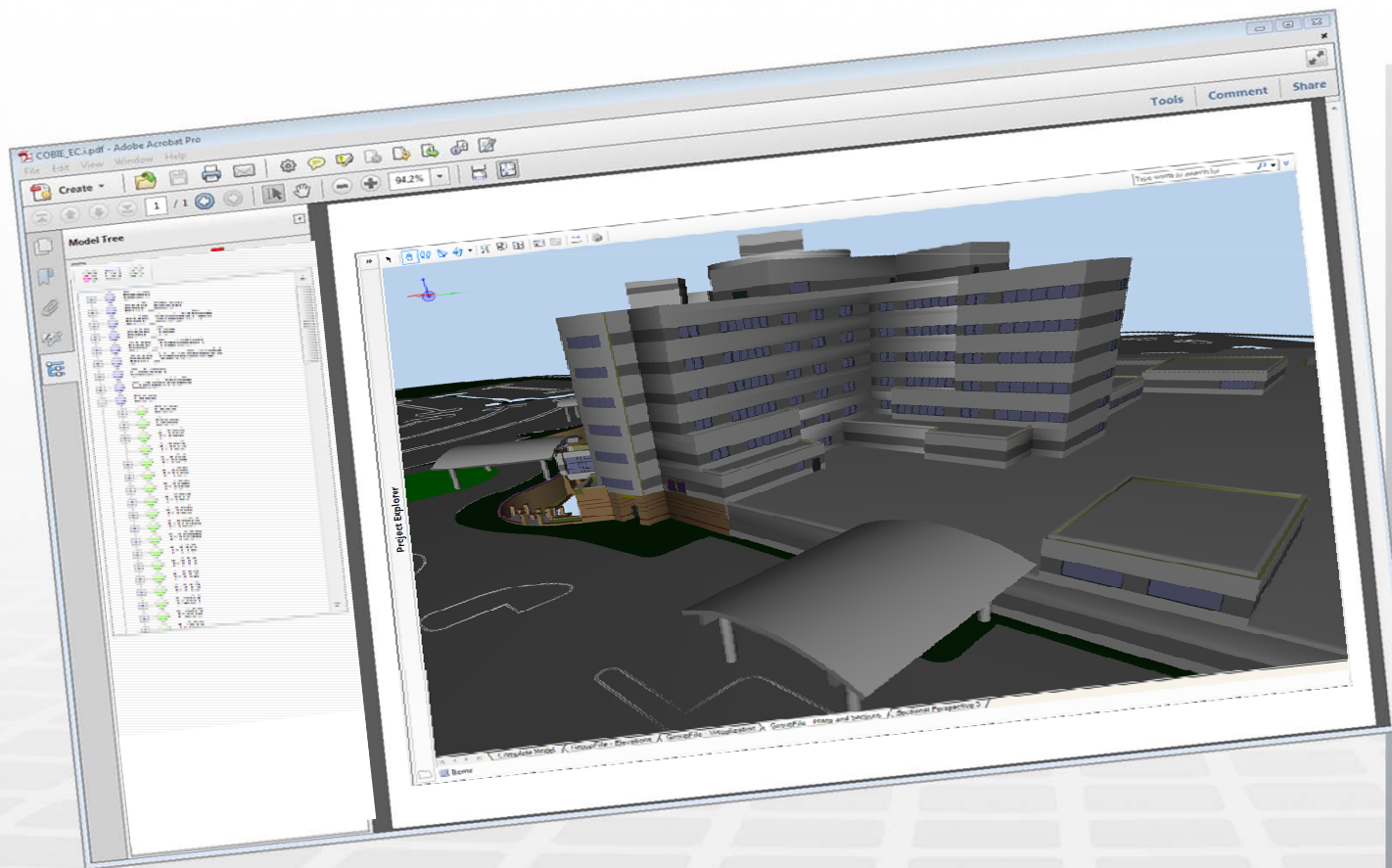


DGN Preview in Outlook



Versatile Content Re-use

i-model Plug-In for Adobe Reader



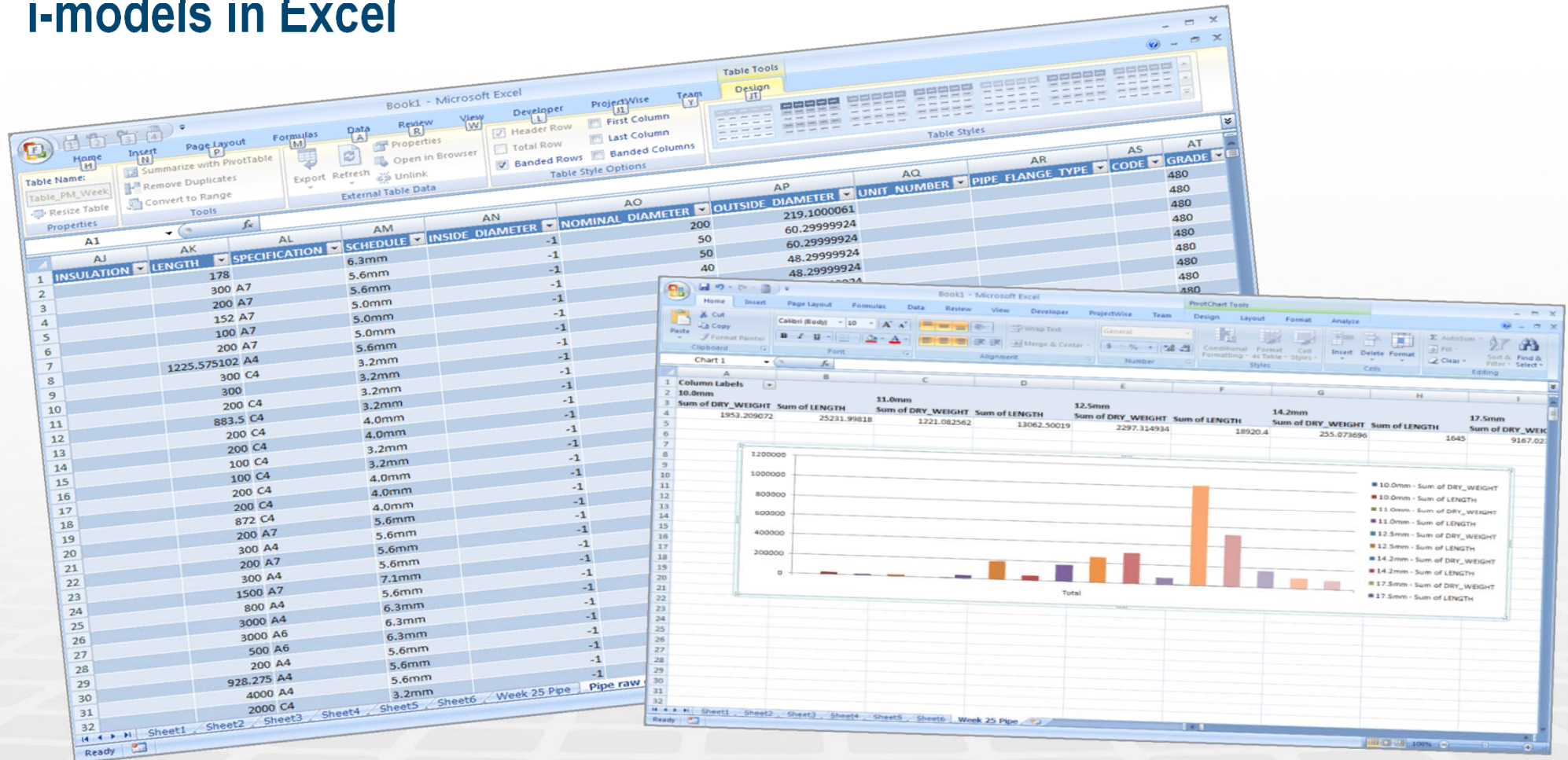
Adobe

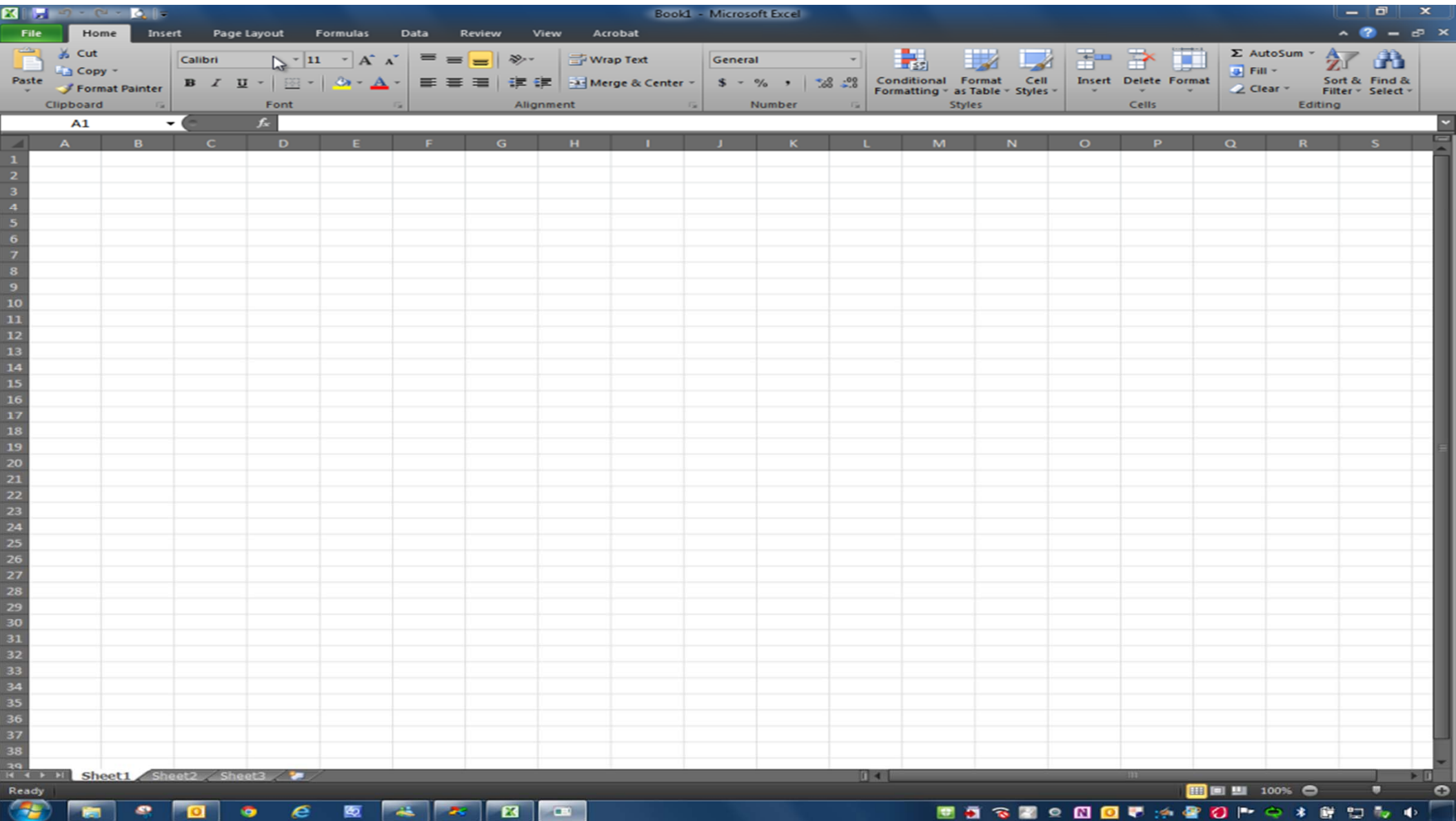


bluebeam®

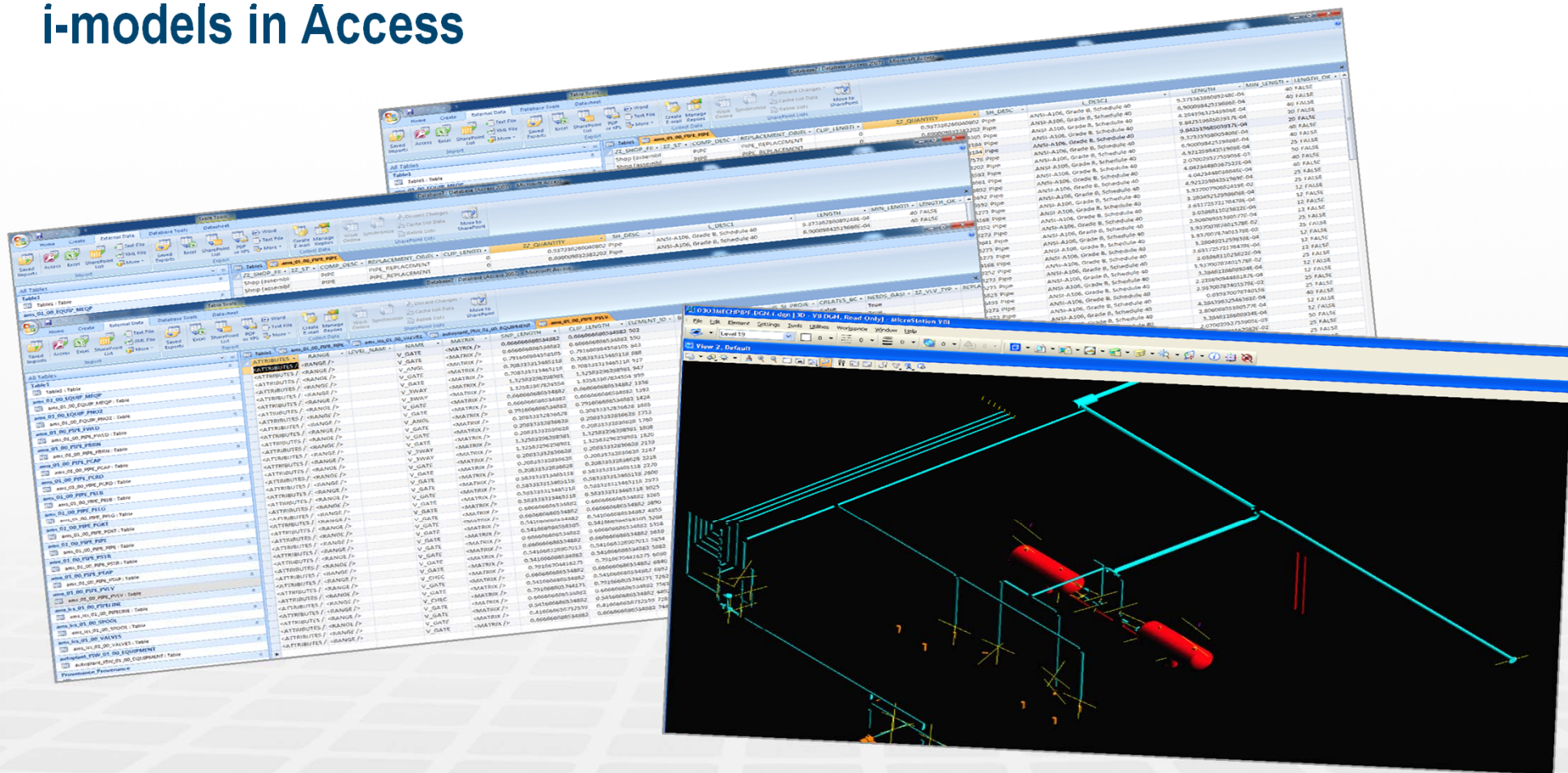
- Available as free plug-in for Adobe Reader and Bluebeam PDF Revu
- Bentley iWare

i-models in Excel





i-models in Access



i-models in Crystal Reports

Wizard

Standard Report Creation Wizard

Data

Choose the data you want to report on.

Available Data Sources:

Database Files

ODBC (RDO)

Make New Connection

Bentley i-model

Add Command

PM_Week 25_i_dgn

OpenPlant_3D_01_i

BALL_VALVE

BLIND_FLANGE

BUTTERFLY_VAL

CONCENTRIC_P

CONTROL_VALV

ECCENTRIC_PIF

EQUAL_PIPE_TE

FLUID_PORT

GATE_VALVE

GENERIC_EQUIP

GENERIC_INSTR

GENERIC_PIPE

Selected Tables:

< Back

Next >

Designer

Field Explorer

MODEL

NOMINAL_SIZE

NAME

DESCRIPTION

ALIAS

ACTIVE

OPPS_CREATE_ID

OPPS_DELETE_ID

OPPS_CHECKOUT_STATUS

EC_InstanceID

OPPS_REFERENCED_ELEMENT

DESIGN_STATE

OPPS_OPERATION_ID

BUO

POV_STATE

COMPONENT_NAME

UNIT

SPECID

LENGTH_EFFECTIVE

DESIGN_LENGTH_CENTER_TO_BRANCH_END_I

DESIGN_LENGTH_CENTER_TO_JUNCTION_I

DESIGN_LENGTH_CENTER_TO_RUN_END_EFF

WALL_THICKNESS

UPDATE_GRAPHICS

Formula Fields

Parameter Fields

Group Name Fields

Group #1 Name

Running Total Fields

SQL Expression Fields

Special Fields

Time Date

PIR Time

Modification Date

Modification Time

Data Date

Data Time

CrystalReport1.cr (Design)

CrystalReport1.rpt*

Section1 (Report Header)

Section2 (Page Header)

Print Def

STOCK NUMBER

NOMINAL DIAMETER

DRY WEIGHT

GRADE

SPECIFICATION

Section3 (Detail)

STOCK NUMBER

NOMINAL DIAMETER

DRY WEIGHT

GRADE

SPECIFICATION

Section4 (Report Footer)

Page Number

Section5 (Page Footer)

Page Number

Result

9/7/2010

STOCK NUMBER

NOMINAL DIAMETER

DRY WEIGHT

GRADE

SPECIFICATION

10.0mm

A6PIPE12

300.00

38.71

480

A6

A6PIPE12

300.00

38.71

480

A6

A6PIPE12

300.00

38.21

480

A6

A6PIPE12

300.00

294.16

480

A6

A6PIPE12

300.00

38.70

480

A6

A6PIPE12

300.00

107.72

480

A6

A6PIPE12

300.00

407.33

480

A6

A6PIPE12

300.00

179.23

480

A6

A6PIPE12

300.00

38.71

480

A6

A6PIPE12

300.00

54.44

480

A6

A6PIPE12

300.00

584.53

480

A6

A6PIPE12

300.00

132.77

480

A6

11.0mm

A6PIPE13

350.00

800.94

480

A6

A6PIPE13

350.00

119.33

480

A6

A6PIPE13

350.00

300.82

480

A6

i-models in Visual Studio (VB, C#)

Visual studio

ADO.NET

```
using System;
using System.Data.Odbc;

namespace testODBC
{
    public partial class Form1 : Form
    {
        OdbcConnection connection;
        public Form1 ()
        {
            InitializeComponent ();
            string connectionString = "DSN=Bentley i-model;";
            connection = new OdbcConnection (connectionString);
            connection.Open ();
        }

        private void Setup ()
        {
            // Do work here.
            DataSet ds = new DataSet ();

            OdbcDataAdapter adapter = new OdbcDataAdapter (textBox1.Text, connection);
            adapter.Fill (ds);

            BindingSource bs = new BindingSource ();
            bs.DataSource = ds;
            bs.DataMember = ds.Tables[0];

            dataGridView1.DataSource = bs;
            dataGridView1.Refresh ();
        }

        private void button1_Click ()
        {
            Setup ();
        }
    }
}
```

There are no usable controls in this group. Drag an item onto this text to add it to the toolbox.

namespace i_model
{
 public class GeneralEquipment
 {
 }
}

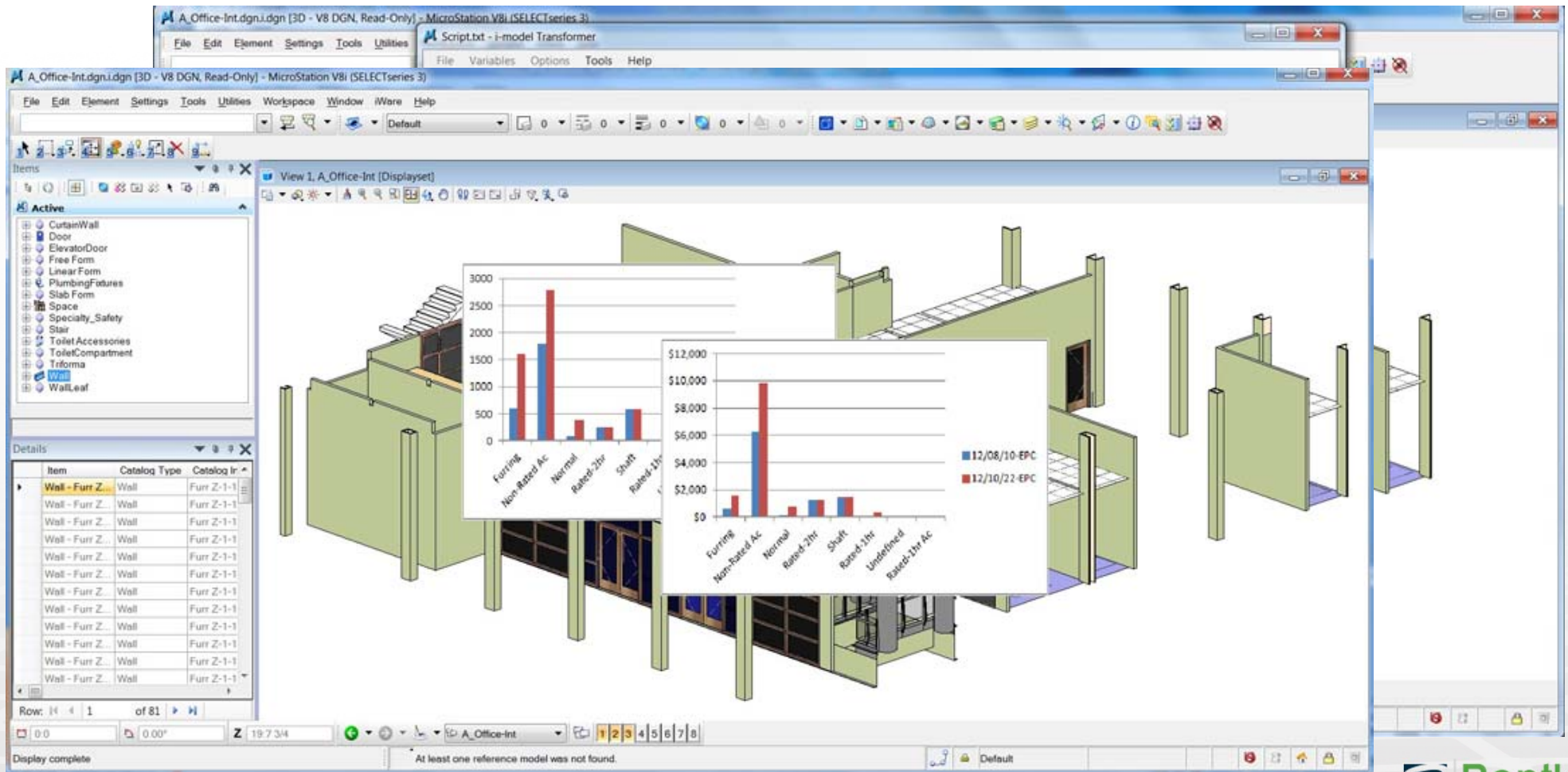
STATUS Column
(Name) STATUS
Column Size int, week 25, J_dg
Data Type OdbcType.NVarChar
Length 14
Ordinal Unknown
Scale 14
Schema OperPlant_3D_01_01
Table GENERIC_EQUIPMENT
Type Name VVARCWB

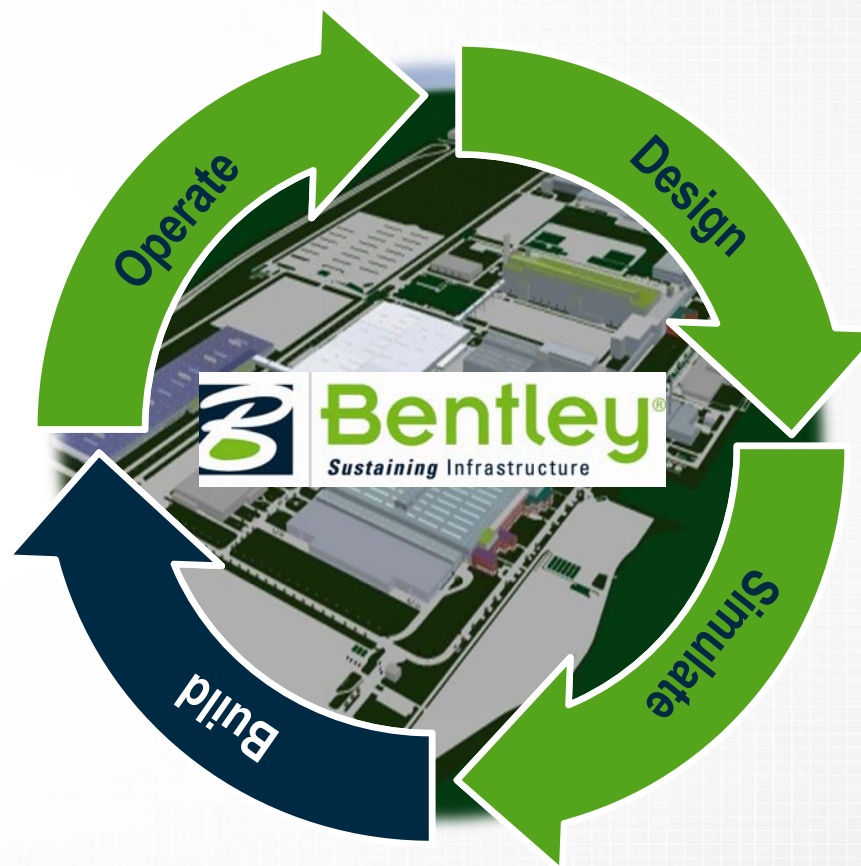
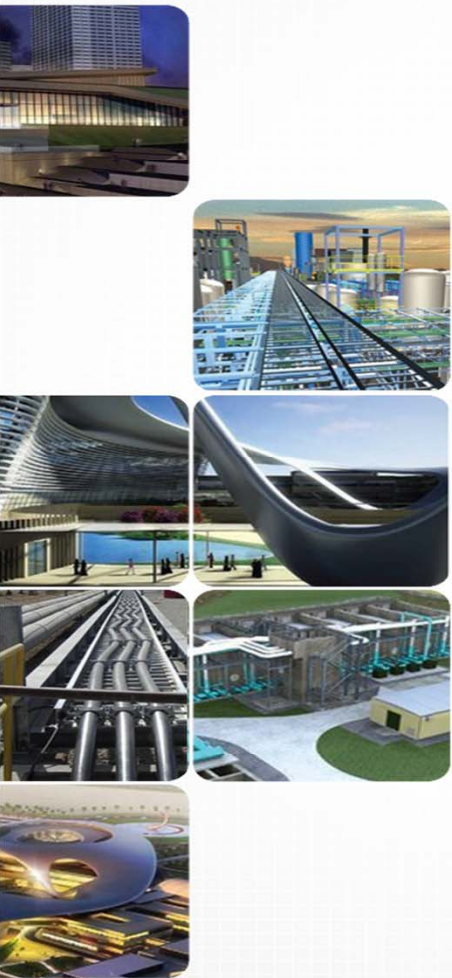
STOCK_NUMBER	DRY_WEIGHT	SCHEDULE	NOMINAL_DIAMETER
AAPPE09	11.2349996566772	5.6mm	150
AAPPE10	33.000001	6.3mm	200
AAPPE09	11.2349996566772	5.6mm	150
AAPPE09	11.2349996566772	5.6mm	150
AAPPE10	4.30662984230536	6.3mm	200
AAPPE10	5.844003	5.2mm	200
AAPPE10	9.9180004119823	5.2mm	200
AAPPE10	65.1282027053833	6.3mm	200
AAPPE10	66.120003	6.3mm	200
AAPPE10	70.6806429443359	6.3mm	200
AAPPE10	70.9550279474258	6.3mm	200
AAPPE10	16.5300003666455	6.3mm	200
AAPPE10	58.5323191843122	6.3mm	200
AAPPE09	6.74099979400635	5.6mm	150
AAPPE09	44.8501186254556	5.6mm	150
AAPPE10	180.24205666399	6.3mm	200
AAPPE05	2.26500005722046	5.6mm	50
AAPPE05	3.265375	5.6mm	50
AAPPE05	17.2648508488691	5.6mm	50
AAPPE05	2.13655	5.6mm	50
AAPPE05	1.51	5.6mm	50
AAPPE05	0.765000019073486	5.6mm	50
AAPPE10	133.32839254301	6.3mm	200
AAPPE10	21.4228808898526	6.3mm	200
AAPPE10	30.5805012702542	6.3mm	200

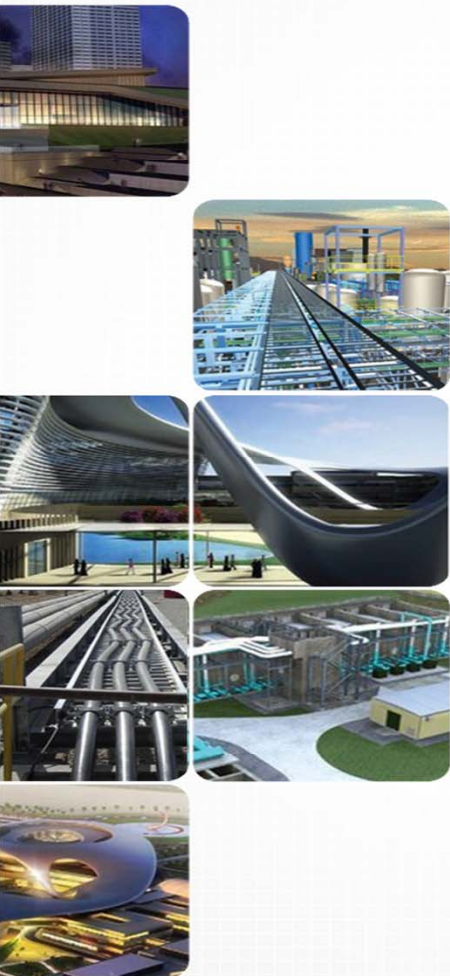
Select STOCK_NUMBER, DRY_WEIGHT, SCHEDULE, NOMINAL_DIAMETER from PIPE Where SPECIFICATION='A4'

Execute

i-model Transformer



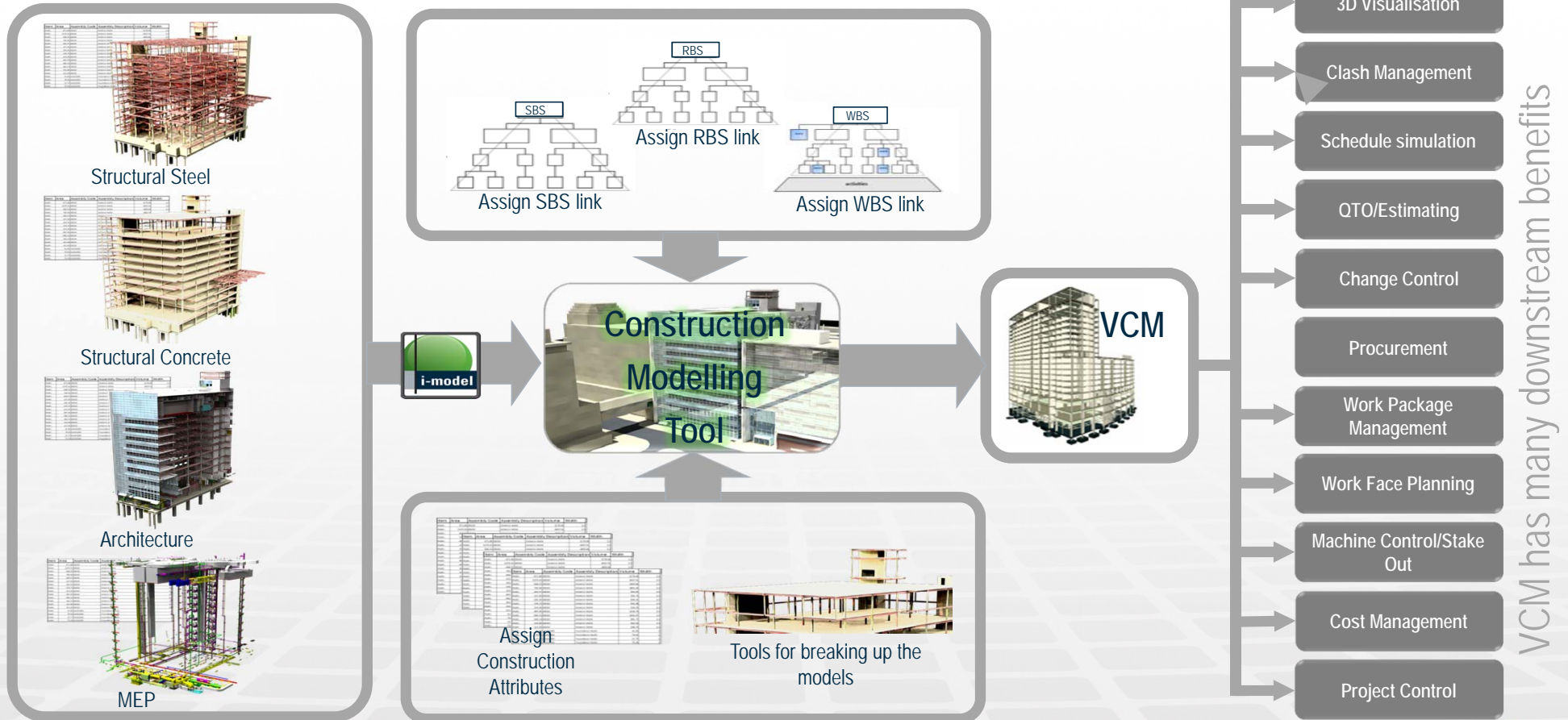




Maintaining the BIM model through construction

Transforming BIM into VCM and manage the Information Model

Design for Construction



ProjectWise Construction Work Package server

All work package data
accessible in one place

Project info

- [Project data](#)
- [Lists](#)



Engineering

- [Import/create EWP](#)
- [Engineering work packages](#)



Work packaging

- [Create work packages](#)
- [Construction work packages](#)
- [Installation work packages](#)
- [Test work packages](#)



Construction

- [Upload construction documents](#)



Progress

- [Progress reports](#)



Work Package Definition

Work Package - [Pipe - CAAA - L2.2 - CPAL22PS11 - 03] - Edit

Selected Item(s):

Title	Type	Selection Level
BOLTUP-01 (PCAAA00-1P-19080.02)	PIPE_BOLTUP	Pipe Iso
MC-01 (PCAAA00-1P-19080.02)	PIPE_LINEITEM	Pipe Sheet Component
SPOOL PCAAA00-1P-19080.02-SPL1	PIPE_SPOOL	
SPOOL PCAAA00-1P-19080.02-SPL2	PIPE_SPOOL	
SUPT010 - XSH20-R-G-150 (PCAAA00-1P-19080.02)	PIPE_SUPPORT	
SUPT010 - XU10-A-100-100 (PCAAA00-1P-19080.02)	PIPE_SUPPORT	
SUPT011 - XU10-A-100-100 (PCAAA00-1P-19080.02)	PIPE_SUPPORT	
SUPT011 - XU10-B-160-40 (PCAAA00-1P-19080.02)	PIPE_SUPPORT	

Task List: Tasks: 16, Hrs: 1356.413, EA: 6

Title	Bdg Hrs	QTY	UOM
STEP 1 - ESP - SPOOL PCAAA00-1P-19080.02-SPL1	301.8...	31...	LM
STEP 3 - CEO - SPOOL PCAAA00-1P-19080.02-SPL2	68.97...	10...	LM
Complete - MC-01 (PCAAA00-1P-19080.02)	0.899...	1	EA
STEP 4 - TRSP - SPOOL PCAAA00-1P-19080.02-SPL2	68.97...	10...	LM
Complete - BOLTUP-01 (PCAAA00-1P-19080.02)	0.899...	1	EA
STEP 2 - CE1 - SPOOL PCAAA00-1P-19080.02-SPL1	201.2...	31...	LM
STEP 4 - TRSP - SPOOL PCAAA00-1P-19080.02-SPL1	201.2...	31...	LM
Complete - SUPT011 - XU10-A-100-100 (PCAAA00-1P-19080.02)	0.899...	1	EA
Complete - SUPT010 - XSH20-R-G-150 (PCAAA00-1P-19080.02)	0.899...	1	EA
STEP 2 - CE1 - SPOOL PCAAA00-1P-19080.02-SPL2	68.97...	10...	LM

Color Legend

- Current pack (Blue)
- Other pack (Green)
- Not in a pack (Grey)
- Not available (White)

Buttons: New, OK, Cancel, Apply

Find Results: Results

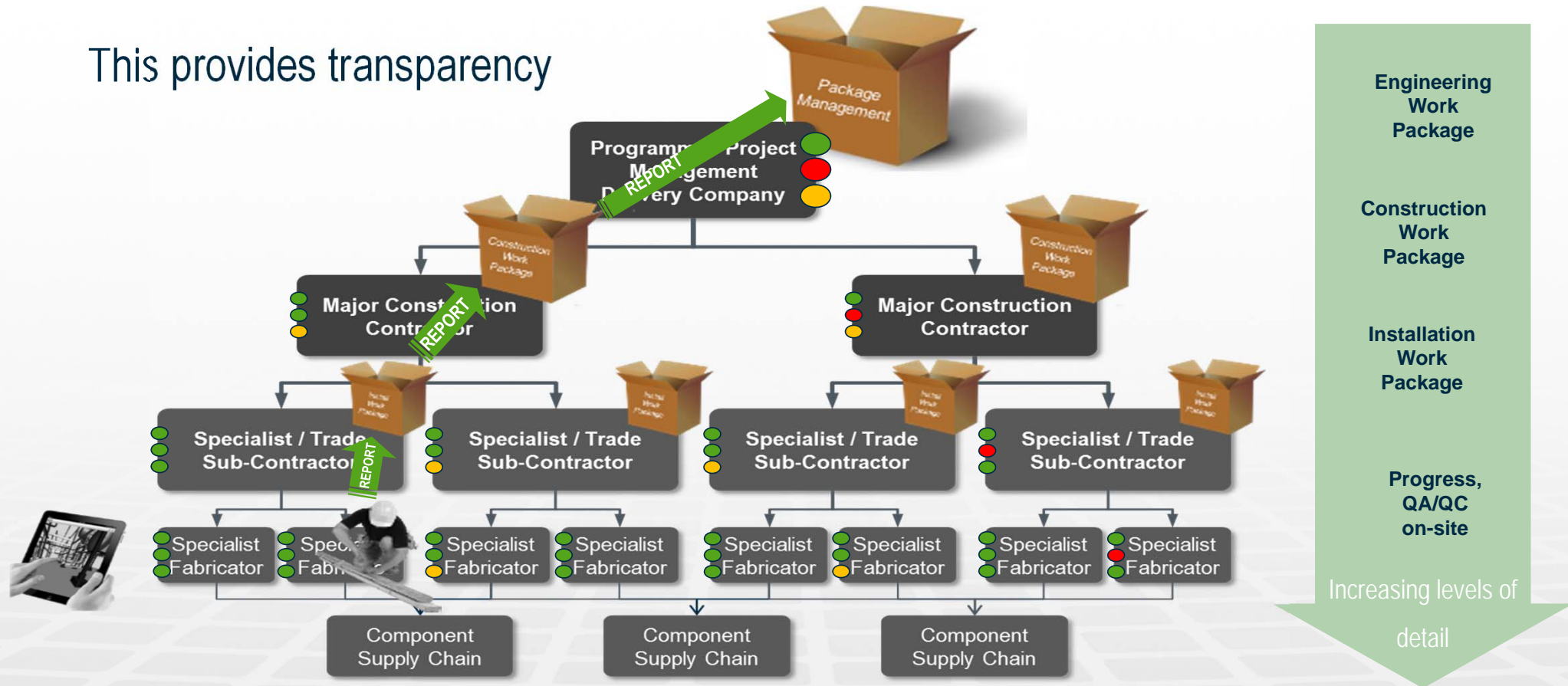
Find Results: Attribute

Pan View > Select View

731.5377, 866.3986, 35.9063

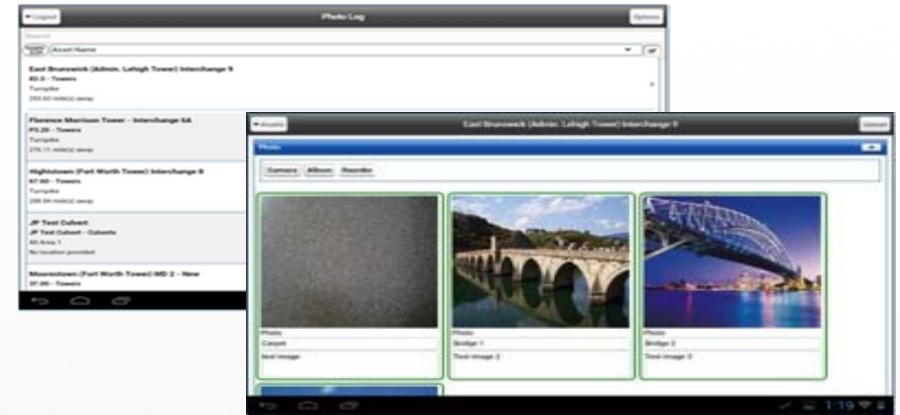
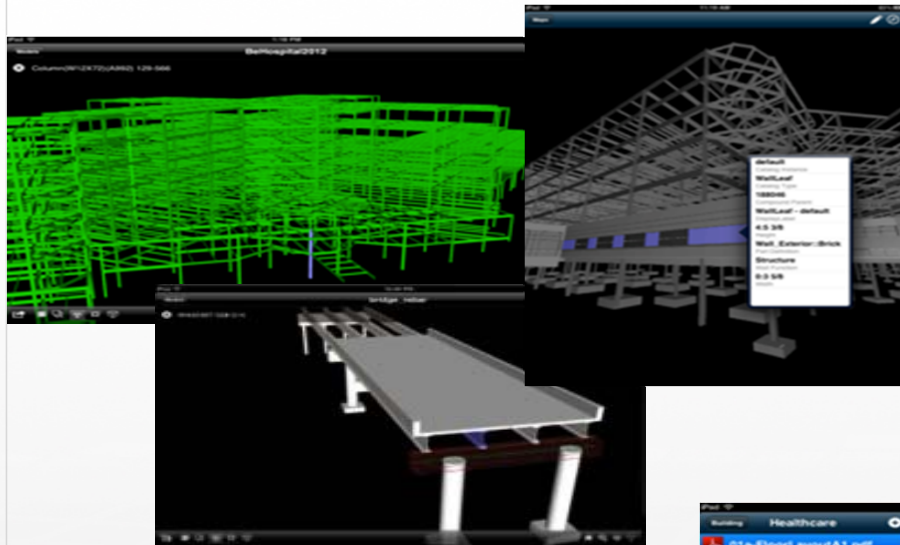
Information distribution workflow ...

This provides transparency



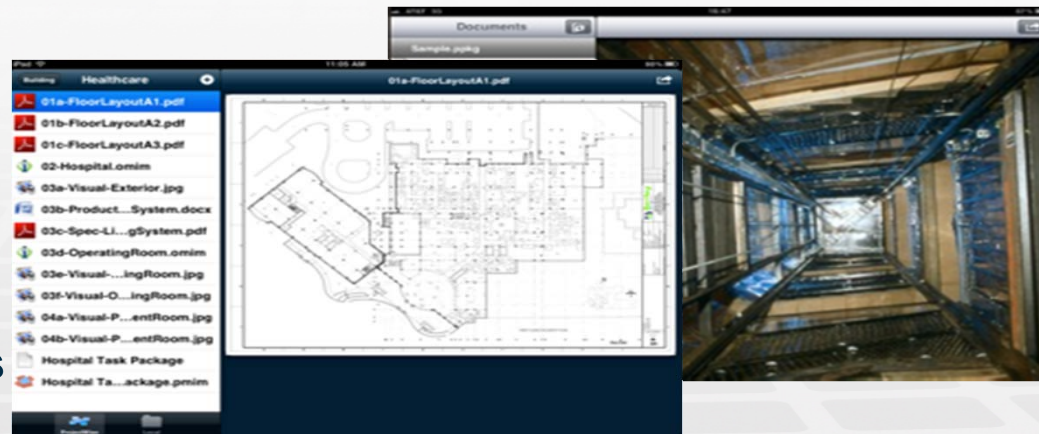
Types of Bentley Apps

Inspections






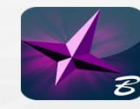




Graphically Rich

Project Data Access



Bentley Mobile Apps

	APM Supervisor Dashboard	At-a-glance, actionable, 24x7 view of asset health
	Field Supervisor	Create personalized views into project data
	InspectTech Collector Mobile	Inspect transportation assets, capture photos, and create reports
	Bentley Map Mobile	View <i>Bentley Map</i> information models
	Navigator Mobile	Review 3D models and documents
	Navigator Pano Review	Review 3D design models
	ProjectWise Explorer Mobile	Create, browse, and view ProjectWise documents
	Structural Synchronizer View	View structural models

ProjectWise Construction Work Package server

[Home](#) [Engineering](#) [Work packaging](#) [Construction](#) [Progress](#) [Quality](#)

[Help](#) [ADMIN person](#) [Log off](#)

BGRSmall535A

WP8 - WP8

Update progress



General information Schedule Contract Tasks Drawings Documents									
Mark as completed		Type keyword to search the list							
	Title	Component Id	Quantity Done	Quantity All	UOM	Hours Done	Hours All	%	Actual Progress
<input type="checkbox"/>	Complete - BOLTUP -01 (03A-45383-01)	03A-45383-01	5.85	1	EA	5.85	5.85	100	100% completed
<input type="checkbox"/>	Receive - SPOOL 03A-45384-02-2	03A-45384-02	0.85	17	LF	0.85	17	100	100% completed
<input type="checkbox"/>	Fit-Up - SPOOL 03A-45384-02-1	03A-45384-02	0.4	1.5	LF	0.4	1.5	27%	
<input type="checkbox"/>	Erect - SPOOL 03A-45384-02-2	03A-45384-02	3.4	17	LF	3.4	17	20%	
<input type="checkbox"/>	Complete - WELD W-03 (03A-45384-02)	03A-45384-02	0	0	EA	0	0	0	
<input type="checkbox"/>	Stage - SPOOL 03A-45384-02-2	03A-45384-02	0	0	EA	0	0	0	
<input type="checkbox"/>	Stage - SPOOL 03A-45383-01-1	03A-45383-01	0	0	EA	0	0	0	
<input type="checkbox"/>	Stage - SPOOL 03A-45384-02-1	03A-45384-02	0	0	EA	0	0	0	
<input type="checkbox"/>	Receive - SPOOL 03A-45384-02-1	03A-45384-02	0	0	EA	0	0	0	0%, not started
<input type="checkbox"/>	Receive - SPOOL 03A-45383-01-1	03A-45383-01	0	14.7	LF	0	0.73	0	0%, not started

Quantities can either be reviewed or progressed

Details of components and associated tasks

Percent complete can either be reviewed or progressed

Hours can either be reviewed or progressed

Status Visualization

The screenshot displays a 3D model of an industrial facility, likely a refinery or chemical plant, with various pipes and storage tanks. A 'Status Visualization' dialog box is open, showing a table of component status and controls for filtering and coloring.

Status Visualization Dialog Box:

Status Model Selection

Component Type: PIPE

Status Type: Spool Fabrication

Status Fields:

Title	Color
Spool Fabrication-All	
DWG_NOT_YET_R...	f.
DWG_RECEIVED	f.
IN_SHOP	0
SHOP_COMPLETED	0
SHIPPED	0
NO_DATA	0

Apply Color Changes

Component Status

SPOOL	STRTYPE
SPOOL PAAAA00-1B-11341.01-SPL1	PIPE_SPOOL
SPOOL PAAAA00-1B-11345.01-SPL1	PIPE_SPOOL
SPOOL PAAAA00-1B-11345.01-SPL2	PIPE_SPOOL
SPOOL PAAAA00-1B-11349.01-SPL1	PIPE_SPOOL
SPOOL PAAAA00-1B-11350.01-SPL1	PIPE_SPOOL
SPOOL PAAAA00-1B-11350.01-SPL2	PIPE_SPOOL
SPOOL PAAAA00-1B-11351.01-SPL1	PIPE_SPOOL
SPOOL PAAAA00-1B-11351.01-SPL2	PIPE_SPOOL
SPOOL PAAAA00-1B-11352.01-SPL1	PIPE_SPOOL
SPOOL PAAAA00-1B-11352.01-SPL2	PIPE_SPOOL
SPOOL PAAAA00-1B-11353.01-SPL1	PIPE_SPOOL
SPOOL PAAAA00-1B-11353.01-SPL2	PIPE_SPOOL
SPOOL PAAAA00-1B-11354.01-SPL1	PIPE_SPOOL
SPOOL PAAAA00-1B-11354.01-SPL2	PIPE_SPOOL
SPOOL PAAAA00-1B-11355.01-SPL1	PIPE_SPOOL

Find Components: Find Next

Number of components listed: 405

Colorize

Color All

Color Selected

☒ Unselect

☐ Incremental

Reset Colors

Focus

Focus All

Focus Selected

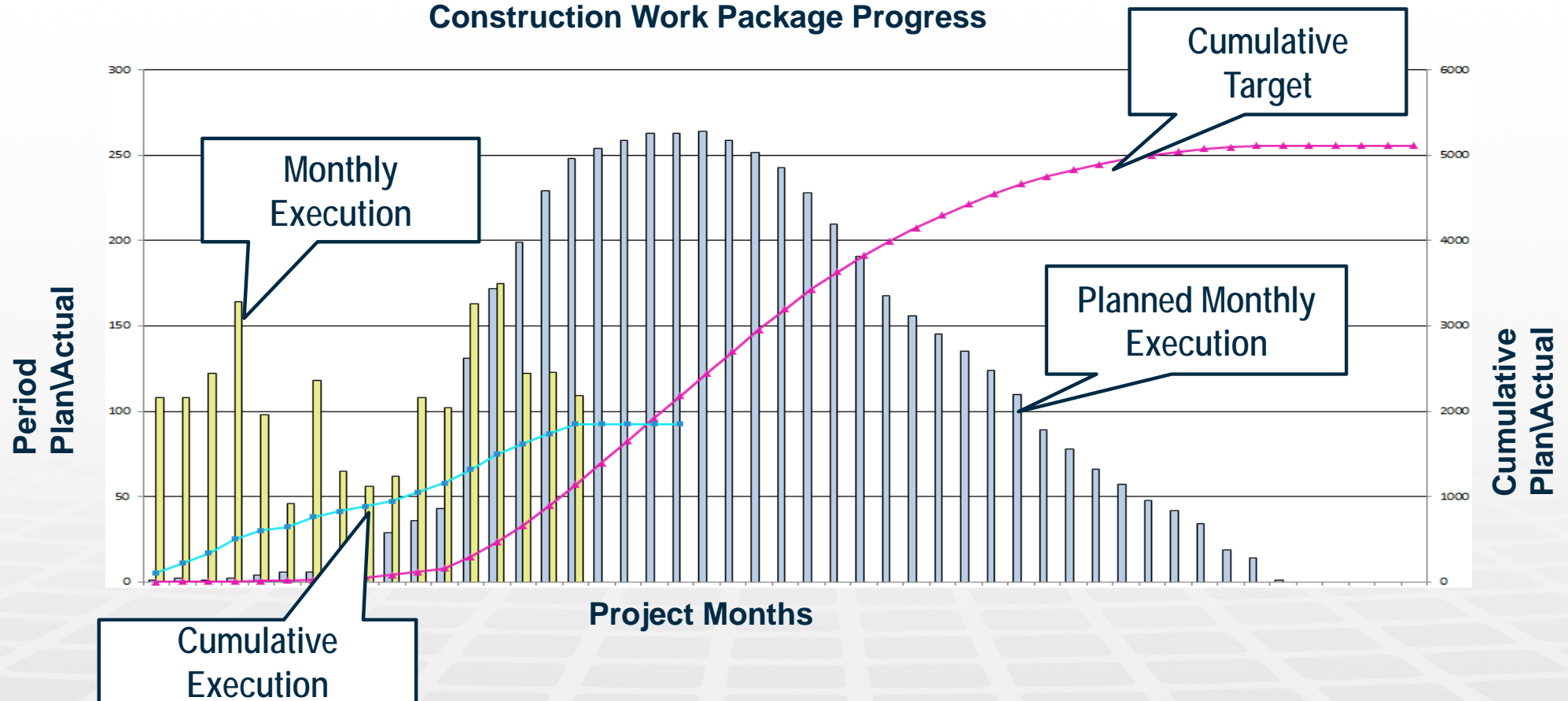
Refresh

Configure ...

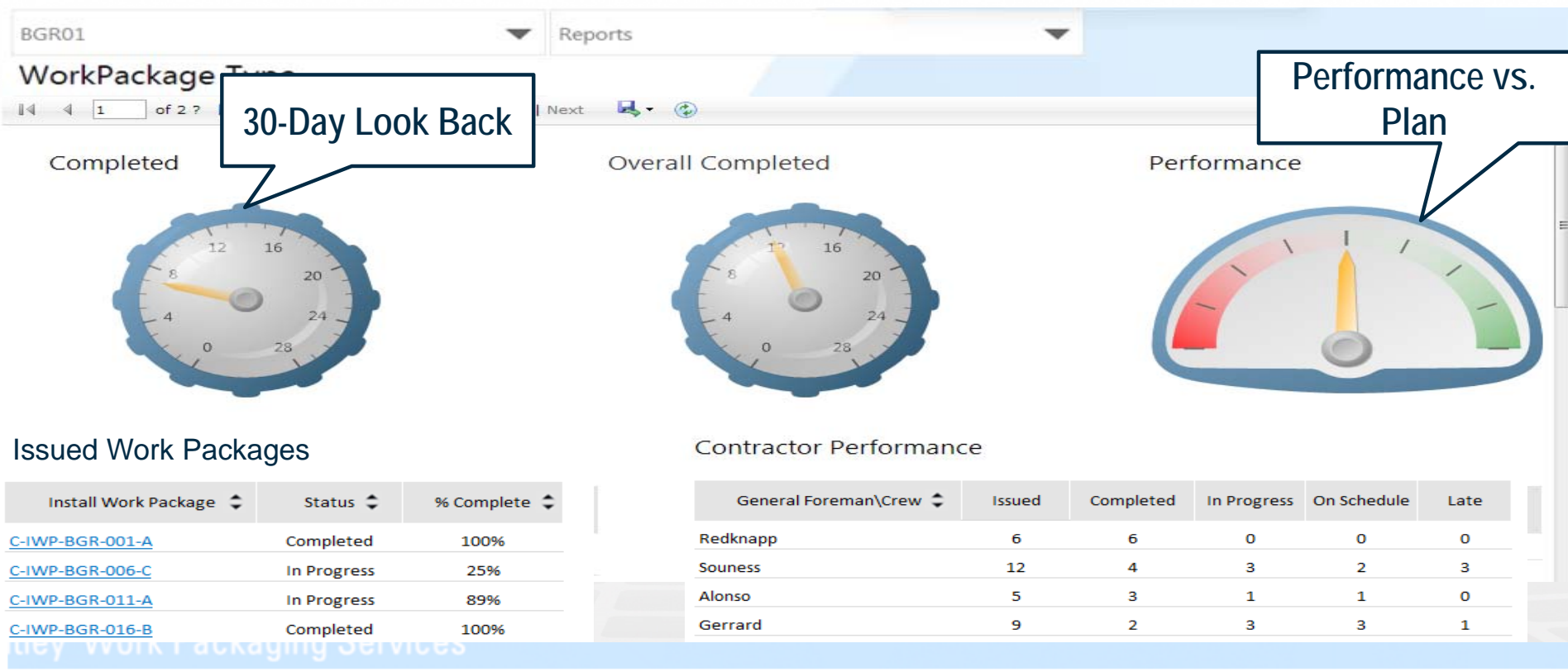
Close

Reporting Progress vs. Plan

Construction Work Package Progress



Concrete Contractor Evaluation Dashboard



Configurable Reports / Scorecards

Material Lists

Progress Reporting

Progress Test Certificate

Spool List		Pipe Work Pack - Spool List									
Work Pack: P - FIWP - CWA 01 - 006											
Spool ID	ISO	Rev	Size	Material	Spec	Area	Service	By	QTY	UOM	
SPJ001-0100-001-CWA-SPH-1	0100-001-001-CWA	0	2	CS	CSA	CWA-01 - Line NGS	0100		3.51	LF	
SPJ001-0100-001-CWA-SPH-1	0100-001-001-CWA	0	2	CS	CSA	CWA-01 - Line NGS	0100		0.61	LF	
SPJ001-0100-001-CWA-SPH-1	0100-001-001-CWA	0	2	CS	CSA	CWA-01 - Line NGS	0100		0.12	LF	
SPJ001-0100-001-CWA-SPH-1	0100-001-001-CWA	0	16	CS	CSA	CWA-01 - Line NGS	0100		50.47	LF	
SPJ001-0100-001-CWA-SPH-15	0100-001-001-CWA	0	16	CS	CSA	CWA-01 - Line NGS	0100		4.14	LF	
SPJ001-0100-001-CWA-SPH-15	0100-001-001-CWA	0	8	CS	CSA	CWA-01 - Line NGS	0100		0.12	LF	
SPJ001-0100-001-CWA-SPH-16	0100-001-001-CWA	0	2	CS	CSA	CWA-01 - Line NGS	0100		0.61	LF	
SPJ001-0100-001-CWA-SPH-16	0100-001-001-CWA	0	2	CS	CSA	CWA-01 - Line NGS	0100		5.91	LF	
SPJ001-0100-001-CWA-SPH-16	0100-001-001-CWA	0	8	CS	CSA	CWA-01 - Line NGS	0100		0.12	LF	
SPJ001-0100-001-CWA-SPH-16	0100-001-001-CWA	0	8	CS	CSA	CWA-01 - Line NGS	0100		1.78	LF	
SPJ001-0100-001-CWA-SPH-14	0100-001-001-CWA	0	8	CS	CSA	CWA-01 - Line NGS	0100		5.92	LF	
SPJ001-0100-001-CWA-SPH-15	0100-001-001-CWA	0	1	CS	CSA	CWA-01 - Line NGS	0100		0.31	LF	
SPJ001-0100-001-CWA-SPH-16	0100-001-001-CWA	0	8	CS	CSA	CWA-01 - Line NGS	0100		0.12	LF	
SPJ001-0100-001-CWA-SPH-16	0100-001-001-CWA	0	8	CS	CSA	CWA-01 - Line NGS	0100		3.69	LF	
SPJ001-0100-001-CWA-SPH-16	0100-001-001-CWA	0	8	CS	CSA	CWA-01 - Line NGS	0100		1.97	LF	
SPJ001-0100-001-CWA-SPH-16	0100-001-001-CWA	0	8	CS	CSA	CWA-01 - Line NGS	0100		3.69	LF	
SPJ001-0100-001-CWA-SPH-1	0100-001-001-CWA	0	2	CS	CSA	CWA-01 - Line NGS	0100		1.16	LF	
SPJ001-0100-001-CWA-SPH-1	0100-001-001-CWA	0	2	CS	CSA	CWA-01 - Line NGS	0100		1.16	LF	
SPJ001-0100-001-CWA-SPH-1	0100-001-001-CWA	0	2	CS	CSA	CWA-01 - Line NGS	0100		0.94	LF	


Pipe Shop Fabrication Tracking													
Progress Milestones													
Speed ID	ISO	Rev	Material	Weld	Weld	Weld	Weld	Weld	Weld	QTY	Holds		
											Location	Len	UDM
2100-001-FMS-870-SPR-1	2100-01-165-SPC	0	0	0	0	0	0	0	0	1.0	0	0	0
2100-001-FMS-870-SPR-2	2100-01-165-SPC	0	0	0	0	0	0	0	0	1.0	0	0	0
2100-001-FMS-870-SPR-4	2100-01-165-SPC	0	0	0	0	0	0	0	0	2.4	0	0	0
2100-008-FMS-COA-SPR-1	2100-01-165-COA	0	0	0	0	0	0	0	0	35.1	0	0	0
2100-008-FMS-COA-SPR-2	2100-01-165-COA	0	0	0	0	0	0	0	0	35.1	0	0	0
2100-001-FMS-COA-SPR-1	2100-01-165-COA	0	0	0	0	0	0	0	0	0.8	0	0	0
2100-001-FMS-COA-SPR-10	2100-01-165-COA	0	0	0	0	0	0	0	0	3.9	0	0	0
2100-001-FMS-COA-SPR-11	2100-01-165-COA	0	0	0	0	0	0	0	0	3.9	0	0	0
2100-001-FMS-COA-SPR-12	2100-01-165-COA	0	0	0	0	0	0	0	0	1.3	0	0	0
2100-001-FMS-COA-SPR-13	2100-01-165-COA	0	0	0	0	0	0	0	0	2.1	0	0	0
2100-001-FMS-COA-SPR-14	2100-01-165-COA	0	0	0	0	0	0	0	0	2.8	0	0	0
2100-001-FMS-COA-SPR-15	2100-01-165-COA	0	0	0	0	0	0	0	0	0.9	0	0	0
2100-001-FMS-COA-SPR-16	2100-01-165-COA	0	0	0	0	0	0	0	0	2.8	0	0	0
2100-001-FMS-COA-SPR-18	2100-01-165-COA	0	0	0	0	0	0	0	0	3.6	0	0	0
2100-001-FMS-COA-SPR-2	2100-01-165-COA	0	0	0	0	0	0	0	0	18.9	0	0	0
2100-001-FMS-COA-SPR-22	2100-01-165-COA	0	0	0	0	0	0	0	0	41.2	0	0	0
2100-001-FMS-COA-SPR-3	2100-01-165-COA	0	0	0	0	0	0	0	0	23.6	0	0	0
2100-001-FMS-COA-SPR-4	2100-01-165-COA	0	0	0	0	0	0	0	0	18.9	0	0	0
2100-001-FMS-COA-SPR-6	2100-01-165-COA	0	0	0	0	0	0	0	0	3.8	0	0	0
2100-001-FMS-COA-SPR-7	2100-01-165-COA	0	0	0	0	0	0	0	0	5.7	0	0	0
2100-001-FMS-COA-SPR-8	2100-01-165-COA	0	0	0	0	0	0	0	0	2.8	0	0	0
2100-001-FMS-COA-SPR-9	2100-01-165-COA	0	0	0	0	0	0	0	0	36.2	0	0	0

ConstructSim - Test Pack Status Data Entry				
Test Pack ID	Walk-down	Punch Clear	Test	Re-instate
TP-100-002	4/8/2009			
TP-100-003	4/8/2009	4/13/2009		
TP-100-004				
TP-100-005	4/8/2009	4/13/2009	4/13/2009	
TP-100-006				
TP-100-007				
TP-100-008				
TP-100-009				
TP-100-010				
TP-100-011				
TP-100-012	4/8/2009	4/13/2009		
TP-100-013				
TP-100-014				
TP-100-015				
TP-100-016	4/8/2009	4/13/2009		
TP-190-001				
TP-190-002				
TP-190-006				
TP-190-009				
TP-230-001	4/8/2009			
TP-230-002				
TP-230-006				
TP-230-007				
TP-240-001				
TP-240-002				
TP-240-003	4/8/2009			
TP-240-004				
TP-240-005				

Expedited Reports

Spools Not Yet Fabricated

Drawings Not Yet Released

	<h1 style="margin: 0;">Pressure Test Record</h1>	Exhibit _____ Revision _____ Contract No. _____
---	--	---

Test Package: **TP-570-001**

System: 570

Design Code: ASME B31.3	ASME: 31.1	CSA: B62	Type:
--------------------------------	-------------------	-----------------	--------------

TEST DATA

Test Pressure (MPaG) <u>27.5</u>	Rated Value Setting (MPaG) _____	Test Medium: <u>H</u>
Holding Time (Min) <u>15</u>	Ambient Temp Limit (C) _____	Min Material Temp (C) _____

TEST SCOPE

Isometric	Rev	PID	Rev	Isometric	Rev	PID	Rev
0570-004-DR-A01	0	12118		0570-006-DR-A01	0	12118	
0570-005-DR-A01	0	12118		0730-012-DR-A01	0	12118	

NDE / PWVT Clearance By: _____ Date: _____	Release for Pressure Test By: _____ Date: _____
--	---

TEST INSTRUMENTS

Date of Calibration _____	Gauge(s) _____	RDI _____
Date of Calibration _____	Gauge(s) _____	RDI _____
Date of Calibration _____	Gauge(s) _____	RDI _____

TEST RESULTS

Actual Test Pressure (MPaG): _____	Actual Ambient Temp (C): _____
Actual Time: _____	Actual Material Temp (C): _____

PRESSURE TEST COMPLETED	CHECKING / DRYING / PRESERVATION METHOD
Creosote / Date: _____ Reason / Date: _____	Checkmate Spec _____ Code _____ Presoak Method _____ Drying Method _____ Preservation Method _____

Pipe Work Packs - ISO Drawings to Expedite

Work Pack	P - FWWP - CWA 01 - 001	Date Start	02-Jun-08		
ISO	Status	Size	Matr	Prod	Service Notes
	3743-033 DR A02	ISO_in_CND	1"	5.0	12191 W.02 DR
Work Pack	P - FWWP - CWA 01 - 004	Date Start	23-Jun-08		
ISO	Status	Size	Matr	Prod	Service Notes
	3743-033 DR A03	ISO_in_CND	1"	5.0	12191 W.02 DR
Work Pack	P - FWWP - CWA 01 - 005	Date Start	30-Jun-08		
ISO	Status	Size	Matr	Prod	Service Notes
	3743-031 DR A02	ISO_in_CND	1"	5.0	12191 W.02 DR
Work Pack	P - FWWP - CWA 01 - 007	Date Start	14-Jul-08		
ISO	Status	Size	Matr	Prod	Service Notes
	3728-032 DR A04	ISO_in_CND	2"	5.0	12192 W.02
	3728-032 DR A04	ISO_in_CND	4"	5.0	12192 W.02
Work Pack	P - FWWP - CWA 01 - 010	Date Start	14-Aug-08		
ISO	Status	Size	Matr	Prod	Service Notes
	3728-033 DR A10	ISO_in_CND	2"	5.0	12192 W.02, FW
Work Pack	P - FWWP - CWA 01 - 011	Date Start	11-Aug-08		
ISO	Status	Size	Matr	Prod	Service Notes
	3743-033 DR A01	ISO_in_CND	1"	5.0	12191 W.02
Work Pack	P - FWWP - CWA 01 - 013	Date Start	28-Aug-08		
ISO	Status	Size	Matr	Prod	Service Notes
	3728-034 DR A01	ISO_in_CND	1"	5.0	12192 W.02
	3728-034 DR A01	ISO_in_CND	1"	5.0	12192 W.02, 13, 37
	3728-034 DR A01	ISO_in_CND	1"	5.0	12192 W.02, 13, 37
	3728-034 DR A01	ISO_in_CND	1"	5.0	12192 W.02, 13, 37

Pipe Work Packs - Spools to Expedite

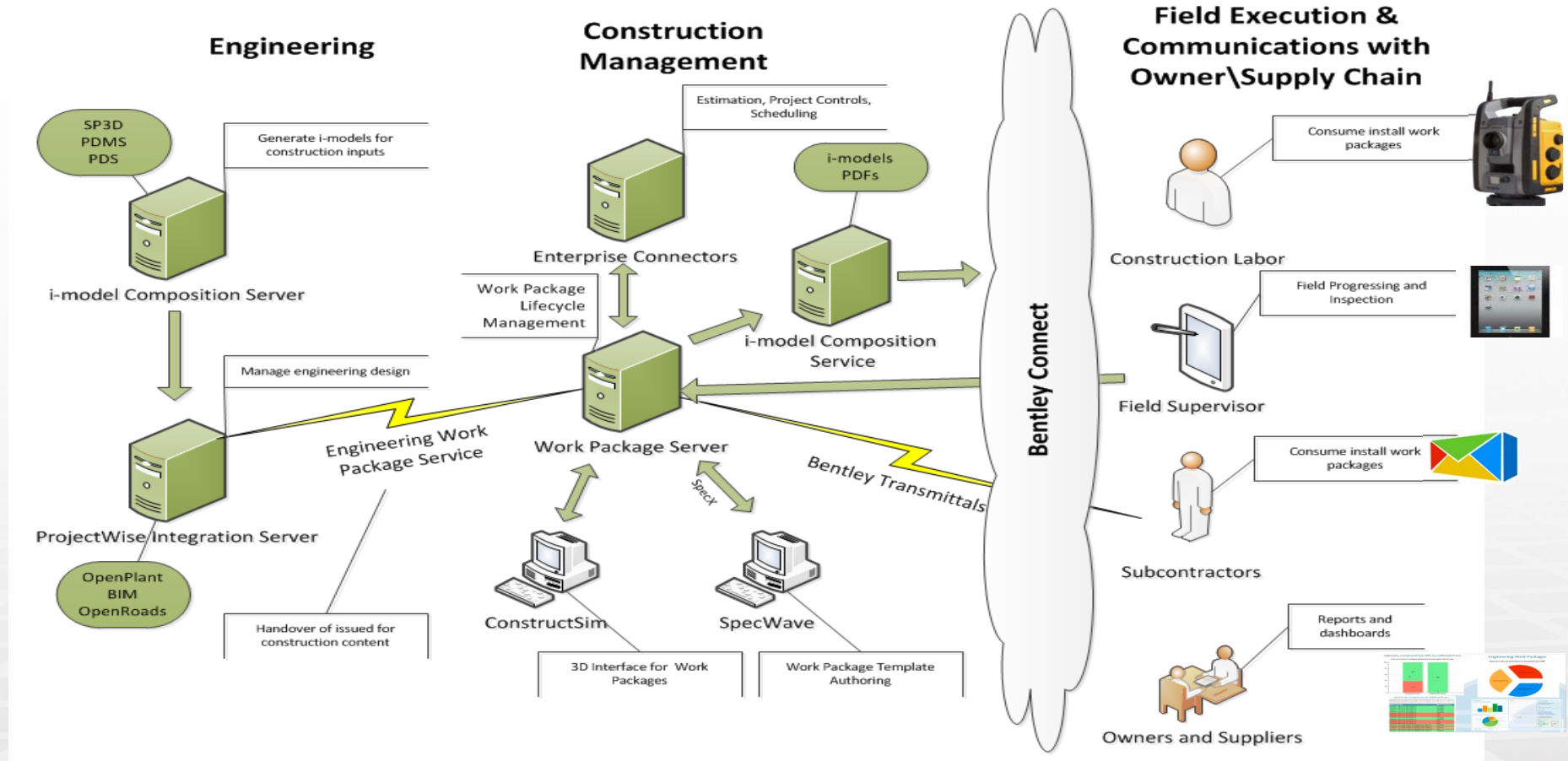
Work Pack # - FIWIP - CWA # - 0-01				Date Start 02-Jun-08			
Spool ID	Status	Size	MTAT	QTY	UOM	Notes	
01001-0505-DR-AB2-SP1-1	Issued	8	CS	1.0	LF		
Work Pack # - FIWIP - CWA # - 0-02				Date Start 09-Jun-08			
Spool ID	Status	Size	MTAT	QTY	UOM	Notes	
01001-0402-DR-AB2-SP1-1	Issued	8	CS	2.0	LF		
01001-0402-DR-AB2-SP1-2	Issued	8	CS	34.1	LF		
01001-0402-DR-AB2-SP1-3	Issued	8	CS	2.0	LF		
01001-0402-DR-AB2-SP1-4	Issued	8	CS	27.0	LF		
01001-0402-DR-AB2-SP1-5	Expedite	8	CS	38.7	LF		
01001-0402-DR-AB2-SP1-6	Expedite	8	CS	38.7	LF		
01001-0402-DR-AB2-SP1-7	Issued	8	CS	38.7	LF		
01001-0402-DR-AB2-SP1-8	Expedite	8	CS	41.0	LF		
01001-0402-DR-AB2-SP1-9	Issued	8	CS	41.0	LF		
Work Pack # - FIWIP - CWA # - 0-05				Date Start 10-Jun-08			
Spool ID	Status	Size	MTAT	QTY	UOM	Notes	
01001-0001-DR-AB2-SP1-1	Expedite	2	CS	12.0	LF		
01001-0001-DR-AB2-SP1-2	Expedite	2	CS	2.0	LF		
01001-0001-DR-AB2-SP1-3	Expedite	2	CS	17.0	LF		
01001-0001-DR-AB2-SP1-4	Expedite	2	CS	18.0	LF		
Work Pack # - FIWIP - CWA # - 0-06				Date Start 07-Jul-08			
Spool ID	Status	Size	MTAT	QTY	UOM	Notes	
01001-0100-DR-CA-SP1-1	Issued	2	CS	3.0	LF		
01001-0101-DR-CA-SP1-1	Expedite	2	CS	3.0	LF		
01001-0100-ATC-SP1-2	Issued	18	CS	36.0	LF		
01001-0100-ATC-SP1-3	Issued	18	CS	36.0	LF		

Pressure

Test

Record

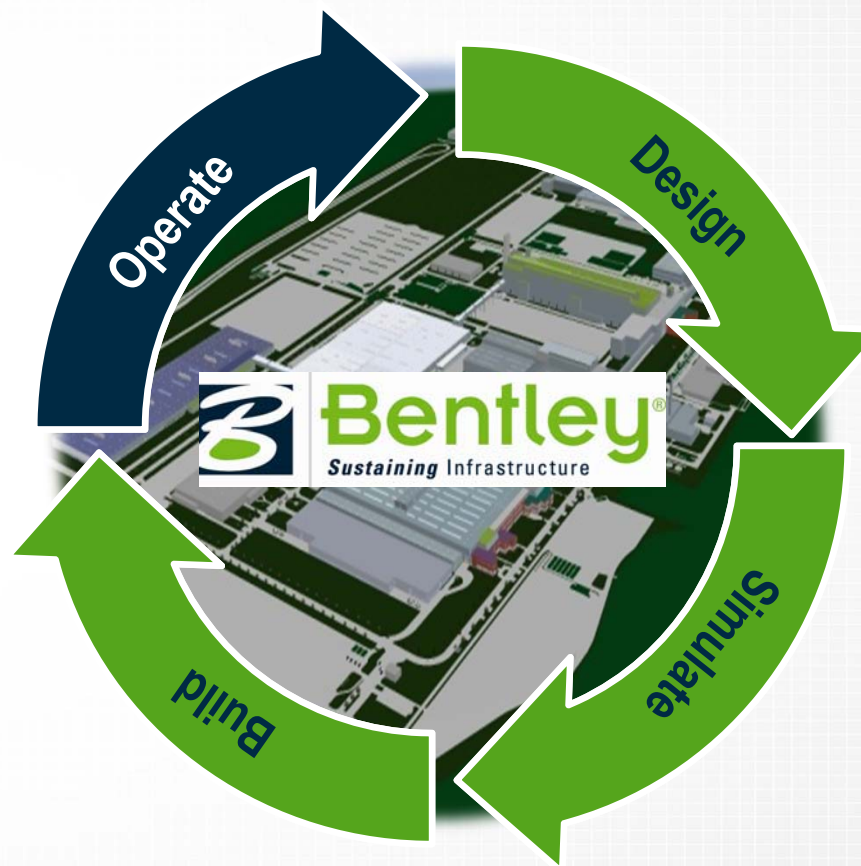
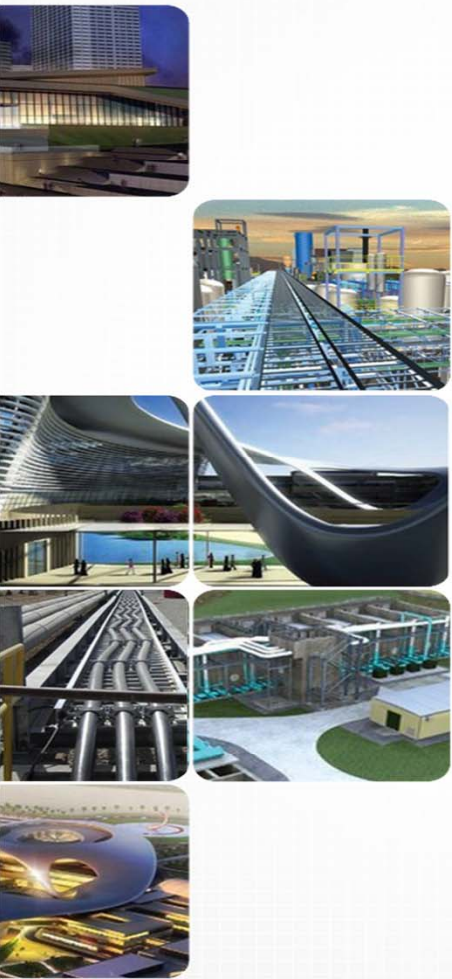
Solution Overview



Accompanying as built documentation



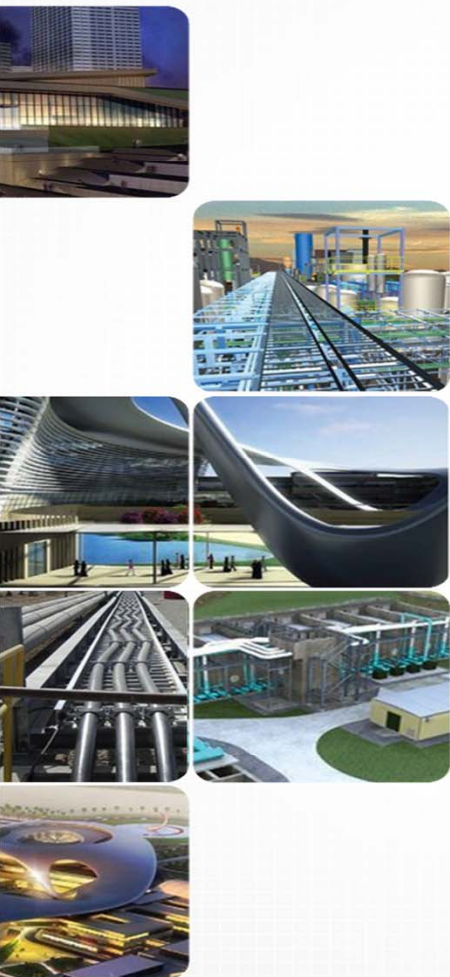
Courtesy of Volvo Cars



Compare As-Designed vs. As-Built



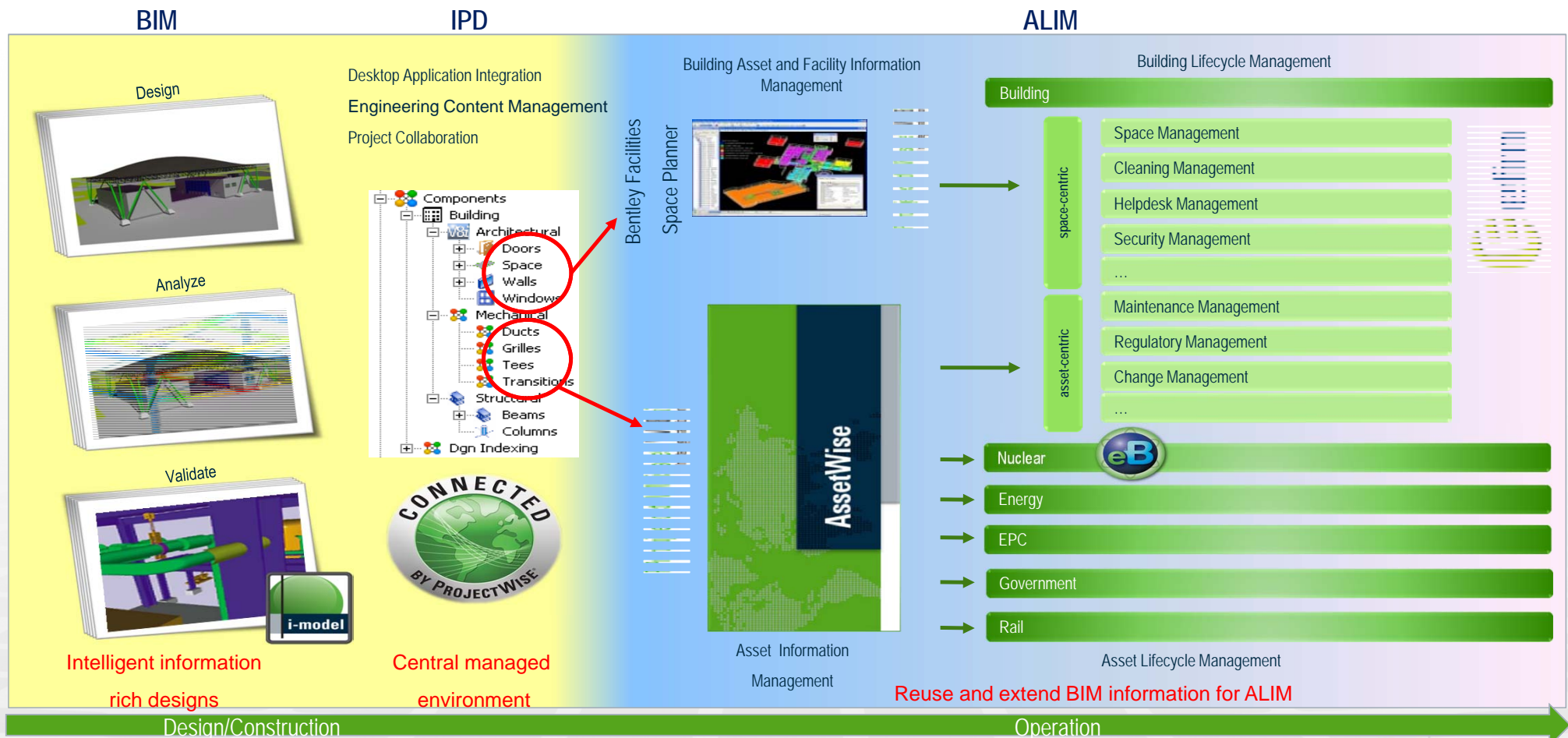
Courtesy of Volvo Cars



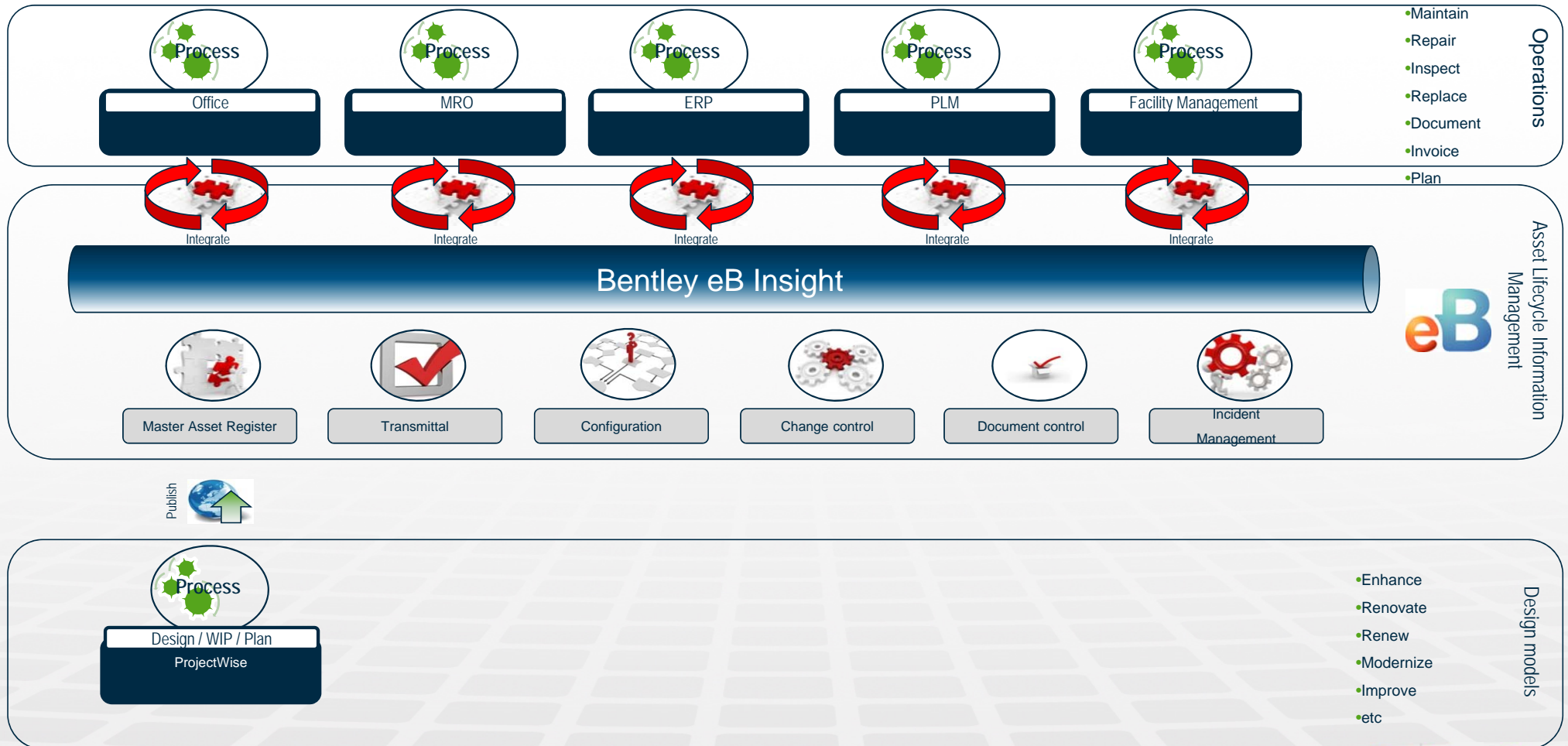
Connecting the as-built BIM model with operational systems

enterprise Bridge (eB) – bridging the information gap

Use of Planning Information for Documentation and Asset Lifecycle Management



eB – enterprise solution architecture



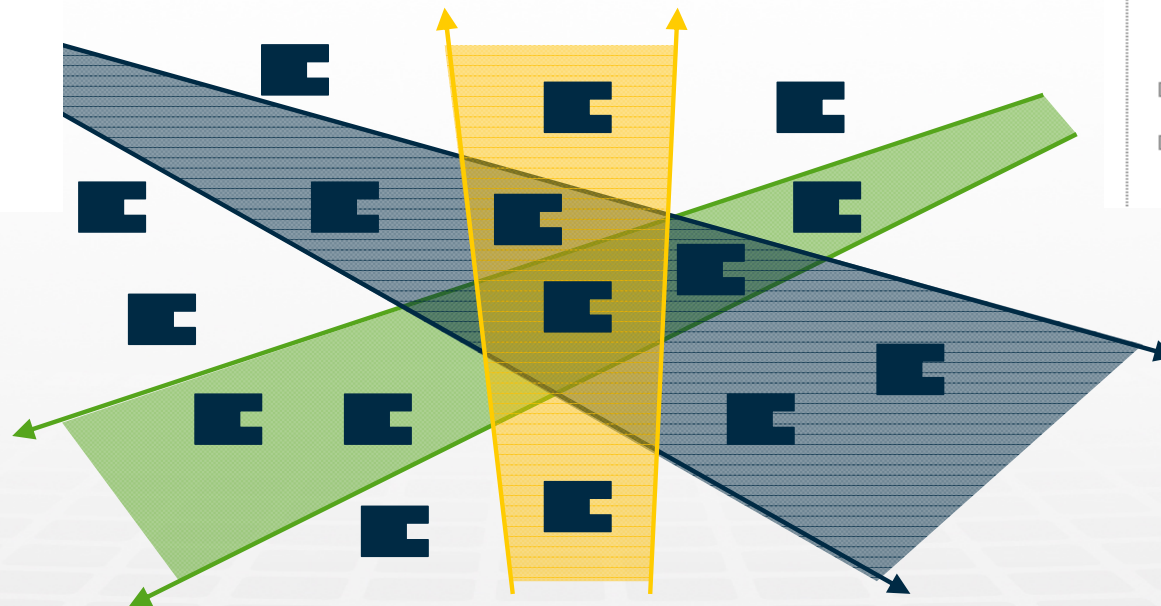
Flexibility with Data

- [-] Royal Oak Portal
 - [-] Royal Oak Portal Level 1
 - [+] ROP - L1 - Access Corridor
 - [+] ROP - L1 - Communications Equipment Room
 - [+] ROP - L1 - Emergency Switch Room
 - [+] ROP - L1 - Escape Landing
 - [+] ROP - L1 - Fan Room
 - [+] ROP - L1 - Fire Equipment Room
 - [+] ROP - L1 - Fire Suppression Room 1
 - [+] ROP - L1 - Fire Suppression Room 2
 - [+] ROP - L1 - HV Switch Room 1
 - [+] ROP - L1 - HV Switch Room 2
 - [+] ROP - L1 - Intervention Corridor
 - [+] ROP - L1 - Intervention Stairs
 - [+] ROP - L1 - LV Switch Room 1
 - [+] ROP - L1 - LV Switch Room 2
 - [+] ROP - L1 - Motor Control Centre

Location

Where is the asset?

Pool of Asset Tags



- [-] Crossrail Functional Breakdown
 - [+] FB-BS - Building Systems
 - [+] SB-BS-C - Cable Routing
 - [+] SB-BS-DR - Drainage rain water
 - [+] SB-BS-DW - Drainage waste water
 - [+] SB-BS-E - Electrical
 - [+] SB-BS-EL - Emergency Lighting
 - [+] SB-BS-ES - Escalator
 - [+] SB-BS-FD - Fire Detection
 - [+] SB-BS-FS - Fire Suppression
 - [+] SB-BS-H - HVAC
 - [+] SB-BS-L - Lift
 - [+] SB-BS-LG - Lighting

Function

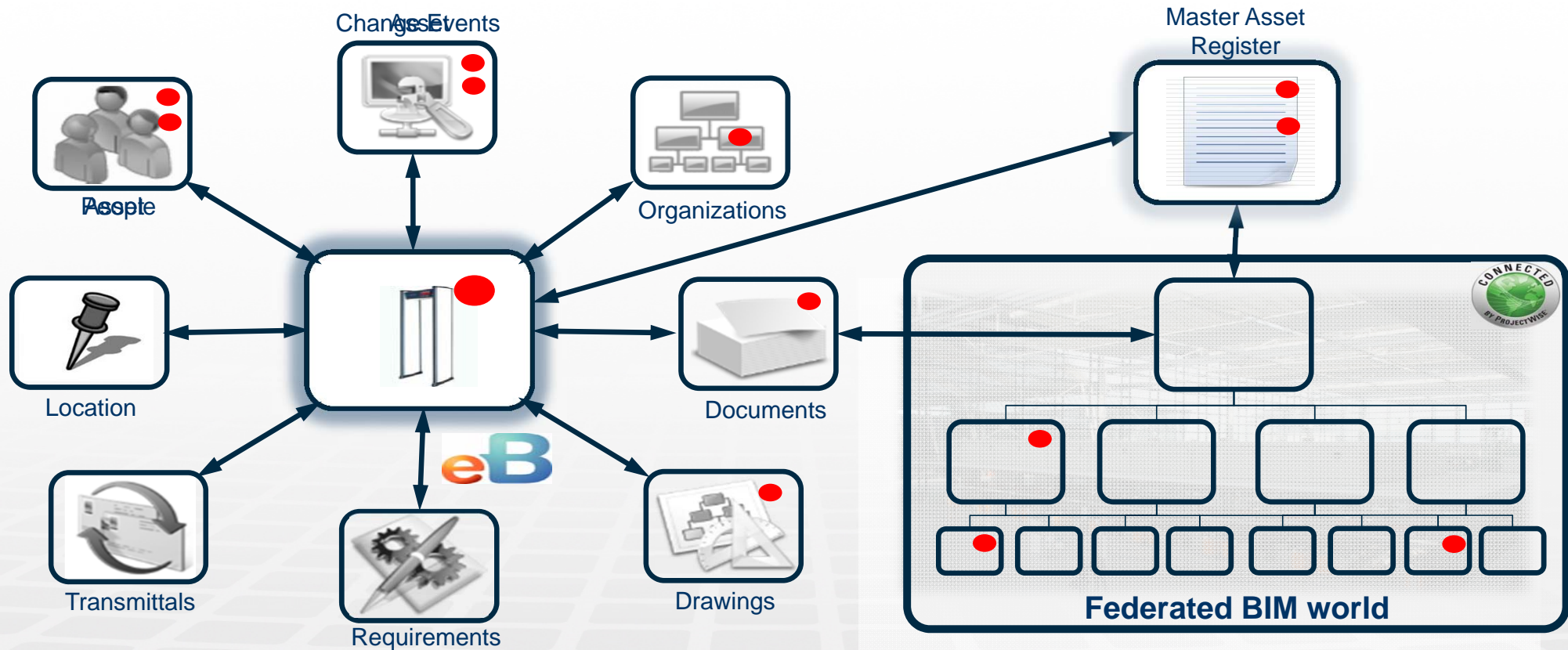
What is the asset designed to perform?

Classification

What type of asset is it?

- [-] L - Construction Products
 - [-] L1 - Ground treatment and retention products
 - [+] L11 - Ground anchorages
 - [+] L12 - Ground improvement
 - [+] L13 - Land/field drainage
 - [+] L14 - Sheet piling, revetments

Bentley eB bridging the information gap



● Impact analysis

Solution Architecture – Incident Management

Design Engineering

Condition Reporting
Human Performance



- Version MEL Configuration
- Change Status of Work Order
- Update Drawings
- Update Procedures, etc.
- Notify Users
- Update Design Basis
- Complete Records
- Update KPIs if required

Change Request

Approved Change

Complete
Change Order

Change Order

Relate Work Order

Work Management

Schedule & Plan Work

Implement Change

Plant (MEL) Configuration,
Documents,
Design Base,
Supporting Documents

to Change Order

Work Order Complete

- Asset Released for Work
- Work Packages Created
- Work Scheduled

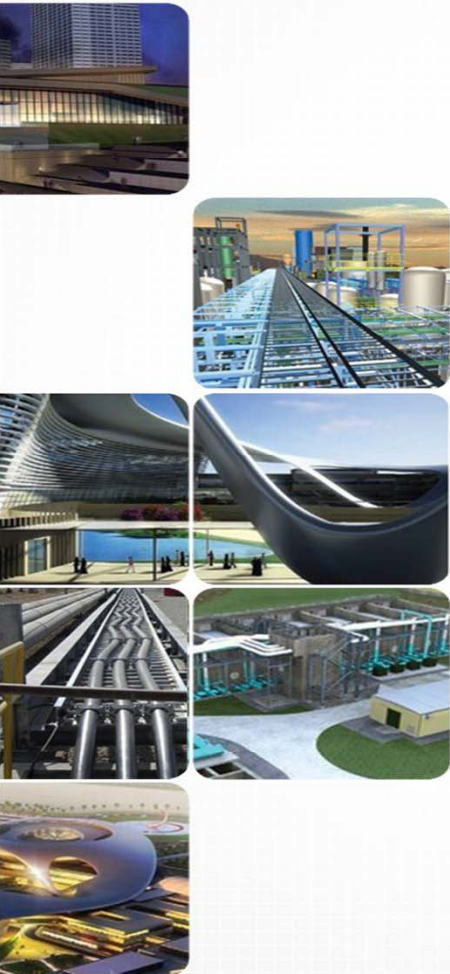
Create
Work Order(s)

Work Order

Work Package

- Plant (MEL) Configuration
- Documents
- Design Base
- Supporting Documents

Do Work

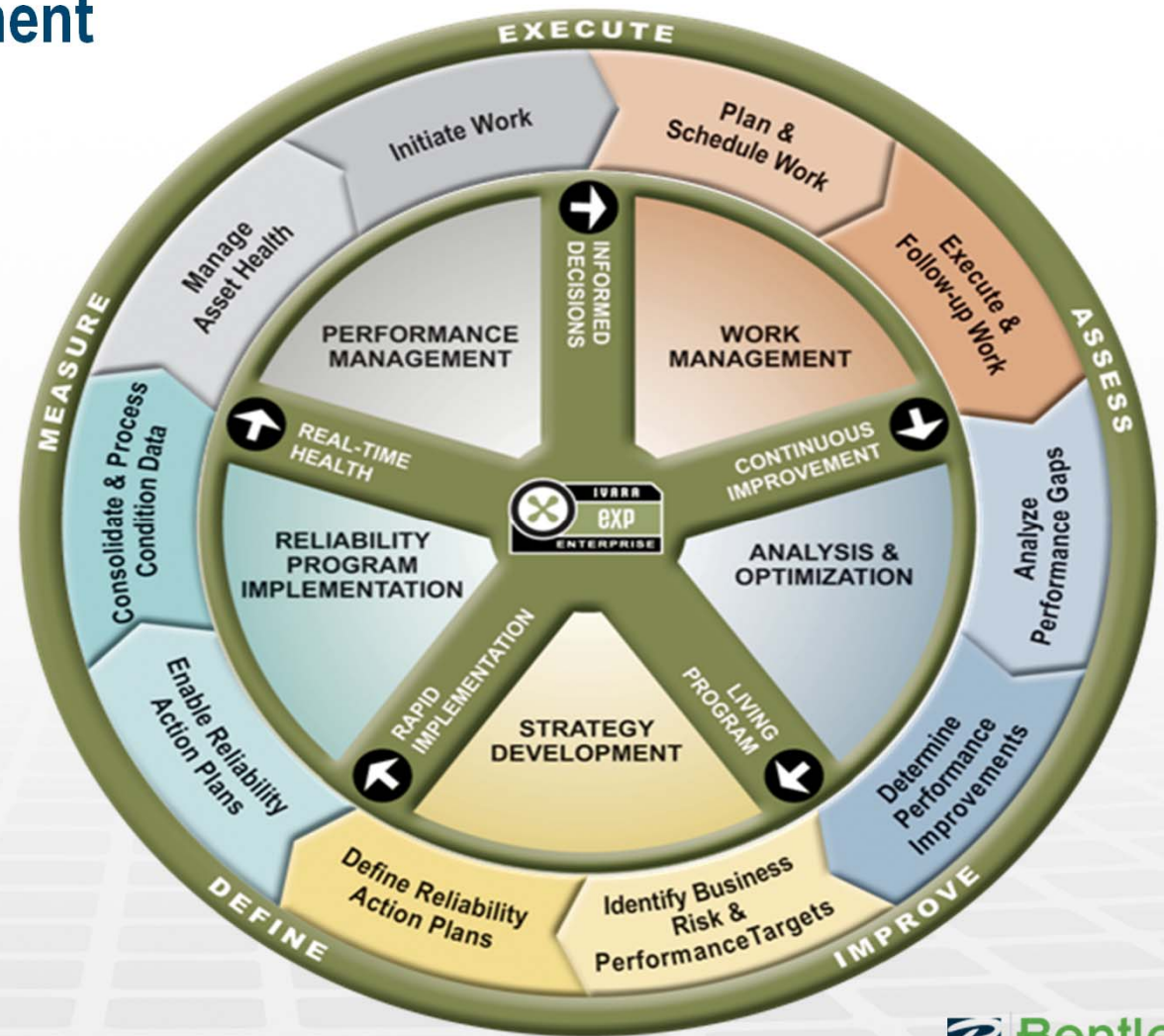


Leveraging an up to date IM to optimize asset performance

Asset Performance Management with Ivara

Asset Performance Management

A comprehensive process comprising the stages and activities required to effectively manage physical asset performance



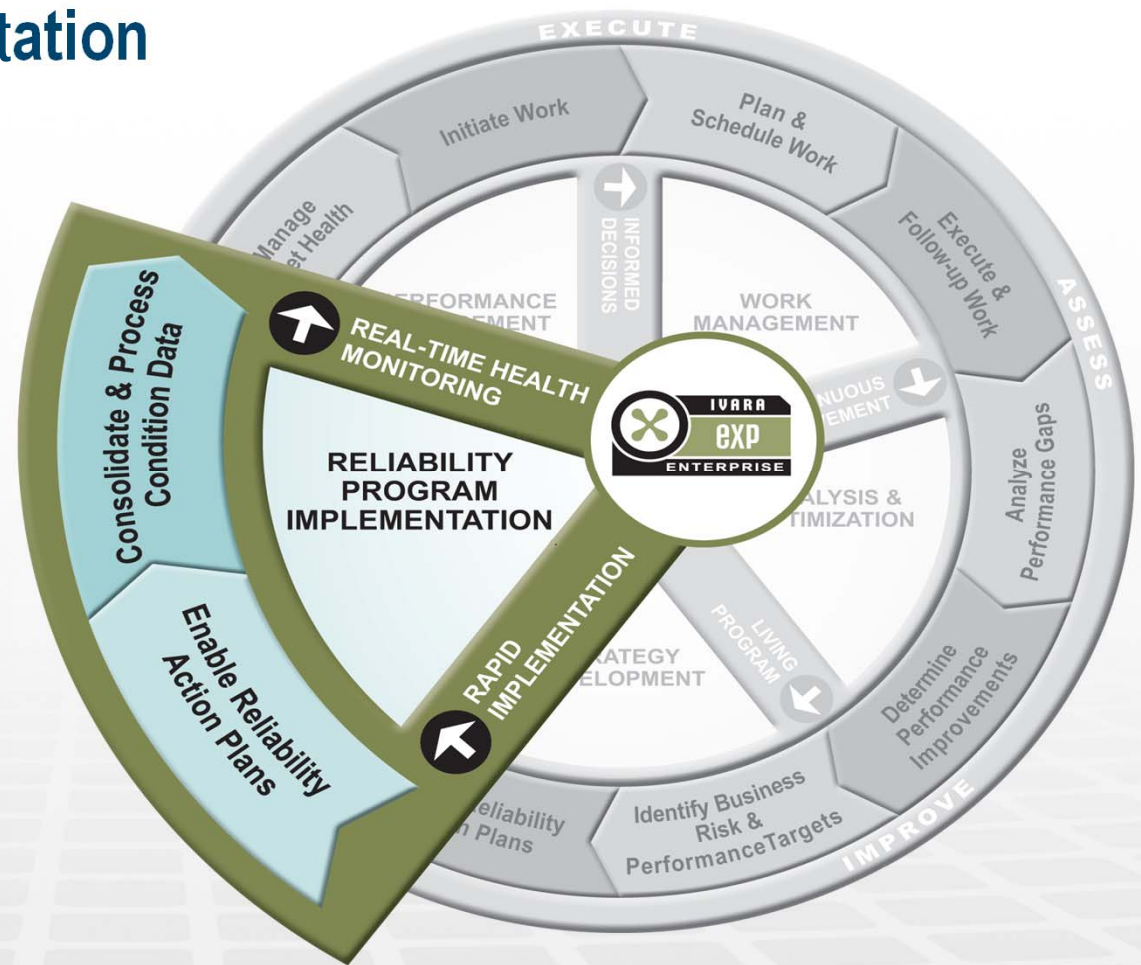
Strategy Development

- ◆ Develop business case
- ◆ Objectively quantify operational and non-operational risks
- ◆ Analyze assets and manage failure modes
- ◆ Develop action plans



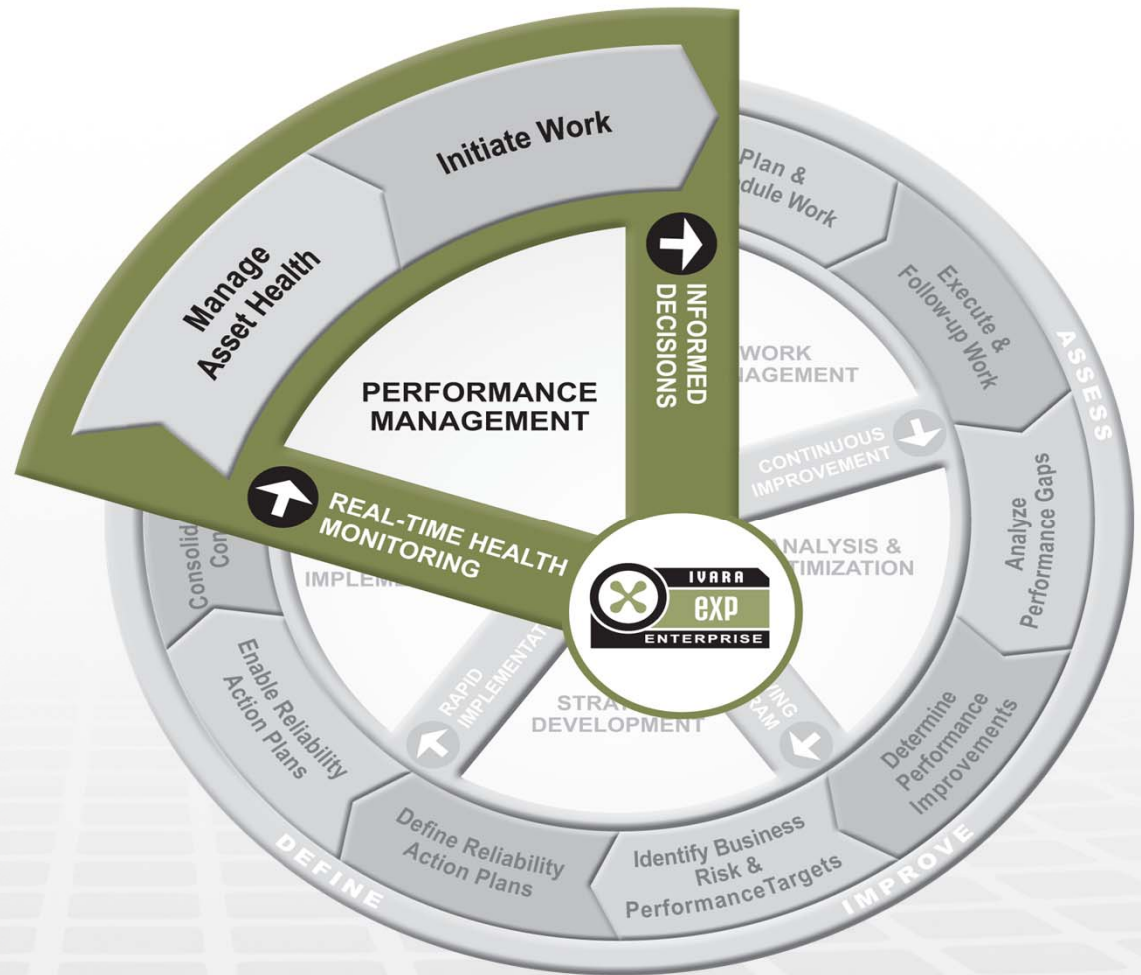
Reliability Program Implementation

- ◆ Rapidly implement a sustainable program
- ◆ Collect, consolidate and analyze equipment condition data



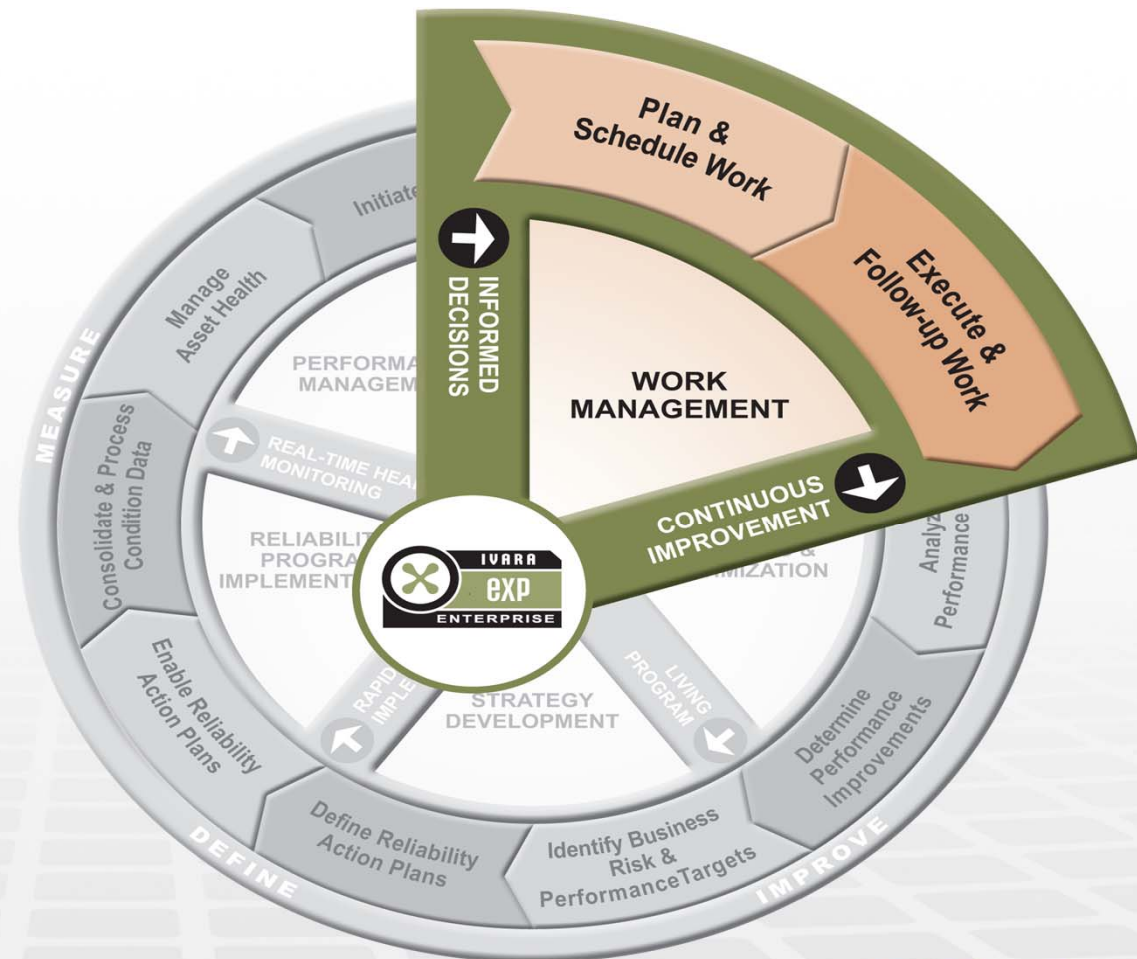
Performance Management

- ◆ Control asset and plant performance
- ◆ Drive accountability to overall business goals
- ◆ Automatically trigger work



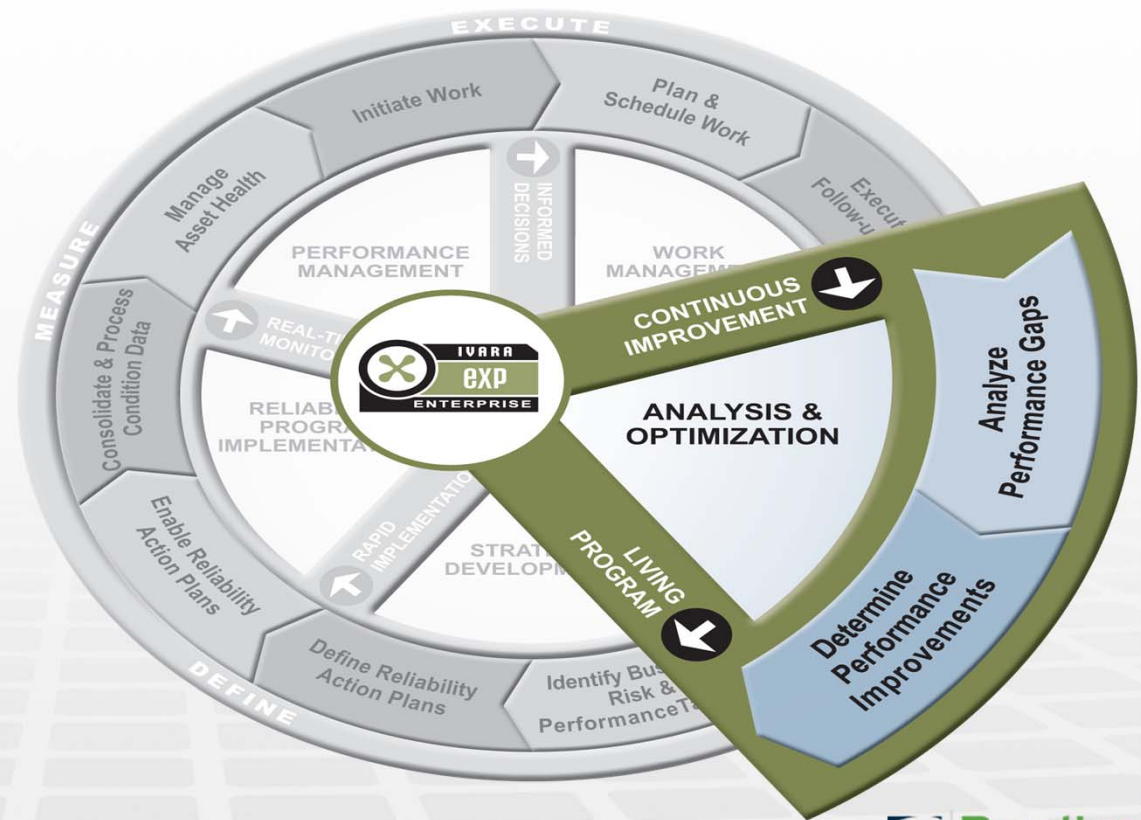
Work Management

- ◆ Synchronize with EAM / CMMS
- ◆ Pre-planned jobs triggered from EXP are reviewed and scheduled
- ◆ Work completion is tied back to EXP



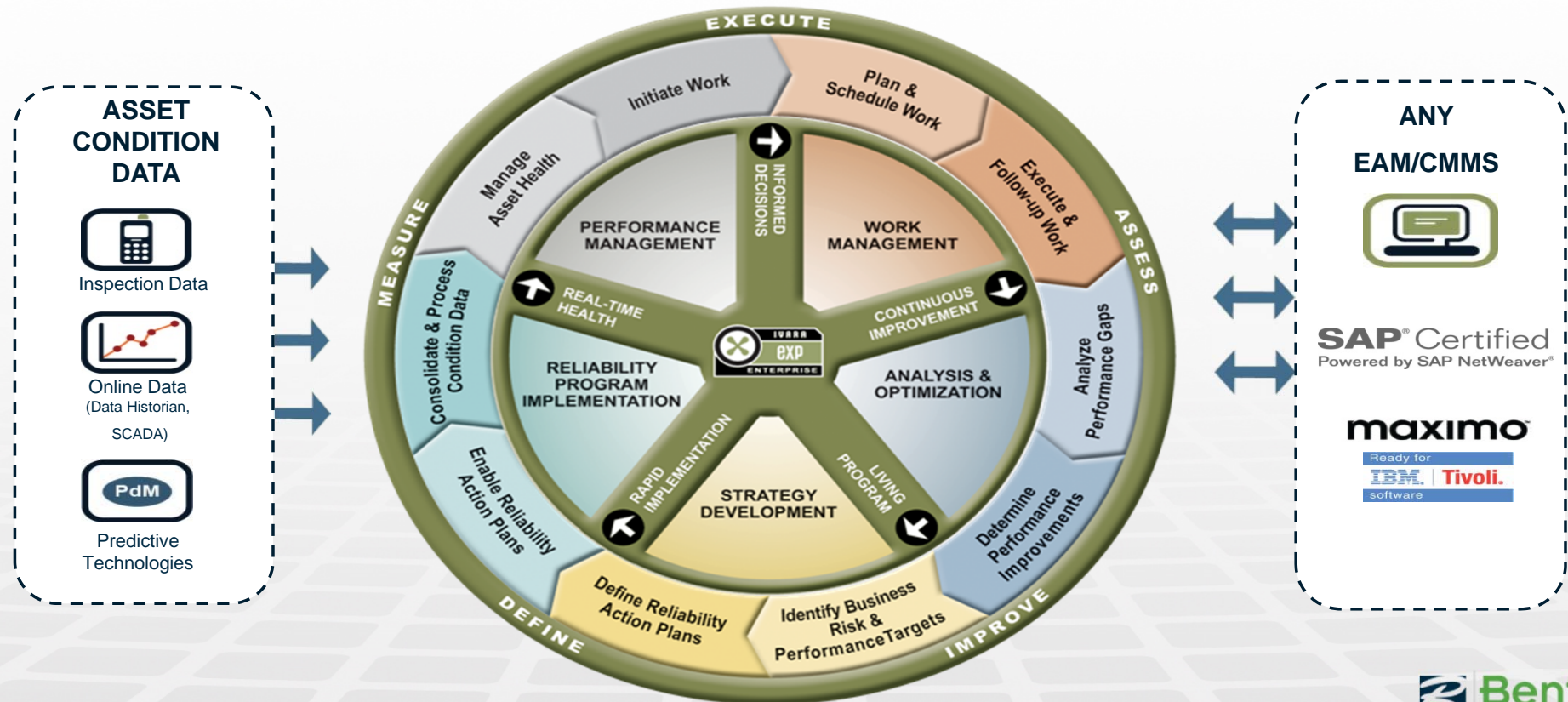
Analysis & Optimization

- ◆ Analyze and evaluate data
- ◆ Identify opportunities for improvement

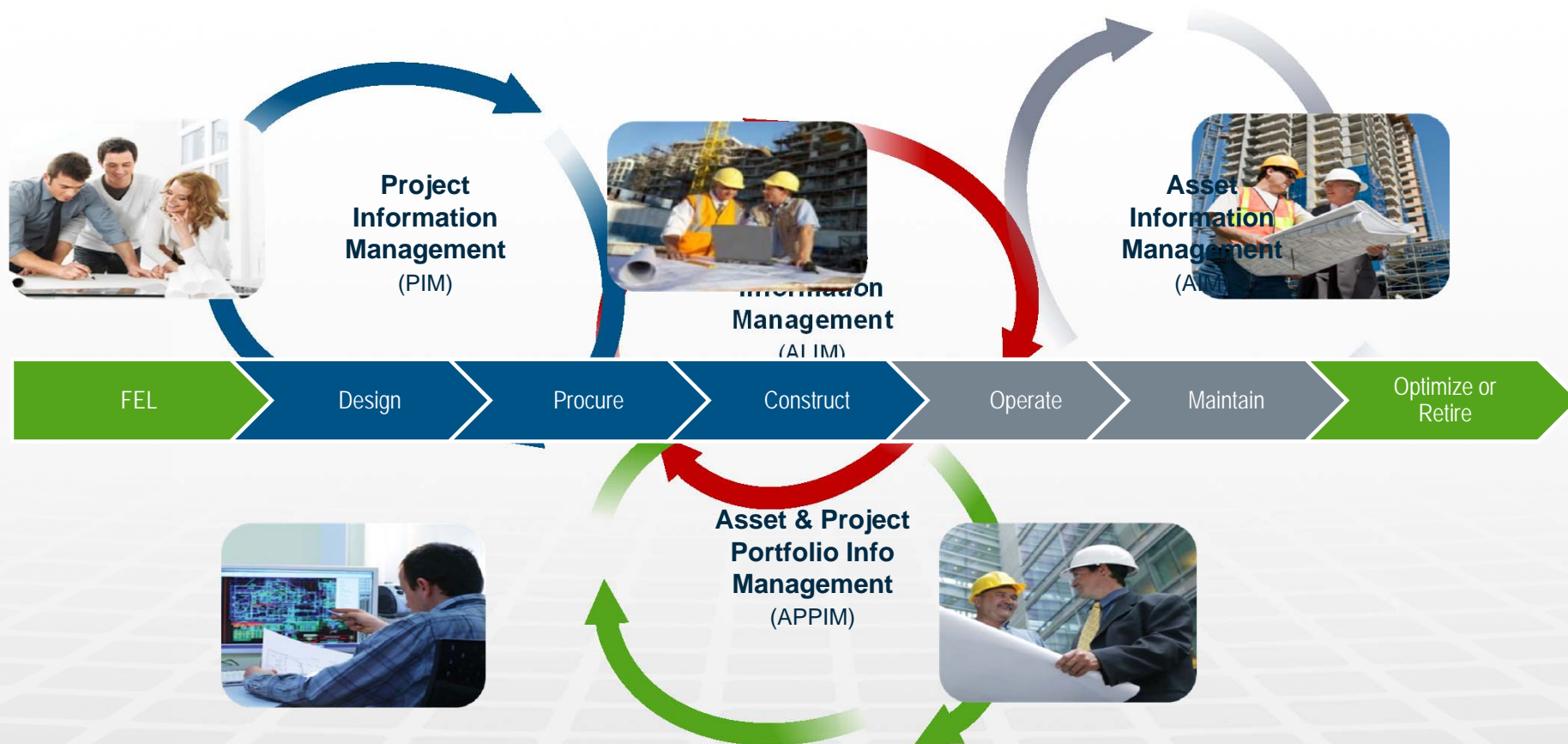


Ivara® EXP and Asset Performance

EXP provides technology, processes and practices to maximize Asset Performance



Bentley Is an ALIM Solutions Provider





Sustaining Infrastructure

Bentley's Solutions

• MicroStation • ProjectWise • AssetWise • Navigator



CONSTRUCTION

- ConstructSim
- ProjectWise
- Navigator
- ProStructures
- MicroStation

WATER & WASTEWATER

- WaterGEMS
- SewerGEMS
- AutoPLANT
- OpenPlant

MINING

- STAAD
- OpenPlant
- Raceway and Cable Management
- InRoads
- Bentley Map
- Descartes
- GEOPAK
- gINT
- RAM

BUILDINGS

- AECOsim
- GenerativeComponents
- RAM
- ProStructures
- speedikon
- gINT

ROADS

- InRoads
- GEOPAK
- MX
- SUPERLOAD
- LEAP
- RM
- Exor
- gINT

RAIL & TRANSIT NETWORKS

- Bentley Rail
- Optram
- InRoads
- MX
- RM
- GEOPAK
- LEAP
- gINT

SUBSURFACE UTILITIES

- WaterGEMS
- SewerGEMS
- sisNET
- Exor
- GEOPAK
- gINT
- InRoads
- MX

3D CITIES

- Bentley Map
- Geo Web
- Publisher
- Descartes
- InRoads
- AECOsim
- Geospatial Server

COMMUNICATIONS NETWORKS

- Bentley Fiber
- Bentley Coax
- Inside Plant

BRIDGES

- RM
- LEAP
- SUPERLOAD
- GEOPAK
- InRoads
- gINT
- MX
- ProStructures

NUCLEAR

- eB
- AutoPIPE
- OpenPlant
- Raceway and Cable Management

POWER PLANTS

- AutoPLANT
- OpenPlant
- AutoPIPE
- STAAD
- ProStructures
- Raceway and Cable Management
- AECOsim
- RAM
- gINT
- Descartes
- GEOPAK
- InRoads
- Bentley Map

PROCESS PLANTS

- OpenPlant
- AutoPLANT
- eB
- Raceway and Cable Management
- promis.e
- AutoPIPE
- ProStructures
- STAAD

OFFSHORE

- SACS
- FormSys
- AutoPIPE
- STAAD
- ProStructures
- ConstructSim

WIND FARMS

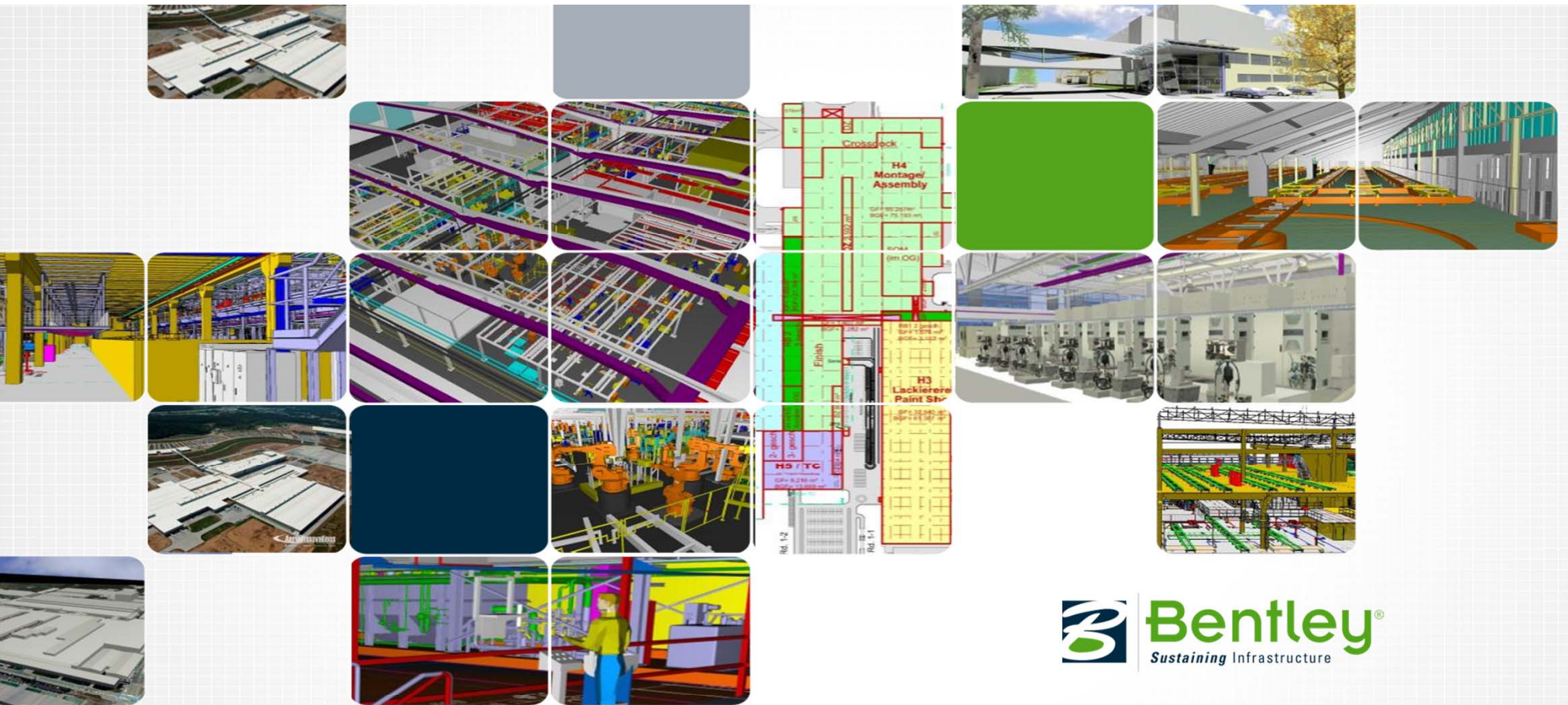
- SACS
- STAAD
- ProStructures
- Substation

UTILITY NETWORKS

- Substation
- sisNET
- Descartes
- GEOPAK
- gINT
- InRoads
- MX
- promis.e
- STAAD

CAMPUSES

- Bentley Map
- Descartes
- Geospatial Server
- AECOsim
- RAM
- STAAD
- Raceway and Cable Management
- GEOPAK
- InRoads
- gINT
- MX
- OpenPlant



Questions & Answers

Lutz Bettels, Industry Sales Director Building CEE, Bentley Systems