Bentley
Sustaining Infrastructure

AssetWise Overview

Steen Læssøe, EIM Sales Director, Europe

Agenda

- Sustaining infrastructure with AssetWise
- What is Asset Lifecycle Information Management?
- What problem/pains does AssetWise address?
- What is AssetWise?
- Solutions for target markets
- Summary

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About Bentley

Bentley Subscribers are the *ENR* Top Design Firms:

- 20 of the Top 20 in:
  - General Building
  - Transportation
  - Power
  - Manufacturing
  - Water
  - Sewer/Waste
- 19 of the Top 20 in:
  - Industrial Process/Petroleum
  - Telecommunications
  - Hazardous Waste
- 47 of the Top 50 Designers in International
- 97 of the Top 100 Pure Design Firms

47 out of 50 U.S. State DOTs use Bentley

Bentley is:

#1 in Plant Operations
#1 in Structural Engineering
#1 in Water Modeling
#1 in Roads and Transit Design
#1 in Bridge Engineering
#1 in Building Performance

Global Business:

- Nearly 3,000 colleagues in 45 countries
- $500 million in annual revenues

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What Is Unique about Operating Infrastructure Assets?

Heavily governed and regulated

- Public safety is paramount
- High profile accidents often result in new safety/inspection legislation
- Involve several oversight and reporting agencies

Unique information models

- Comprehensive information network models
- Linear referencing (with overlaid networks)
- Trustworthy information, reports and audit trails

Support many functional departments, users and locations

- Managers, supervisors, crews
- Public officials and the public
- Central, district and field offices
- Connected and disconnected (mobile)

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Lack of Asset Information Management Is Expensive

Infrastructure Projects (CAPEX)

- Increases in capital costs
- Extends project schedules
- Increases project risk

Operation and Maintenance (OPEX)

- Higher operational cost
- Lower asset availability and productivity
- Lost revenues and profitability

Environmental, Health and Safety

- Risk of non-compliance (fines or shutdown)
- Increasing personnel cost and productivity
- Higher rate and cost of incidents

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What are the Key Pain Points for Owner-Operators?

- **Regulatory compliance** (e.g. quality control and auditing)
- **Governance** (e.g. federal funding and filing requirements)
- **Operational efficiency** (access to information you can trust)
- **Maintain service levels** (infrastructure uptime)

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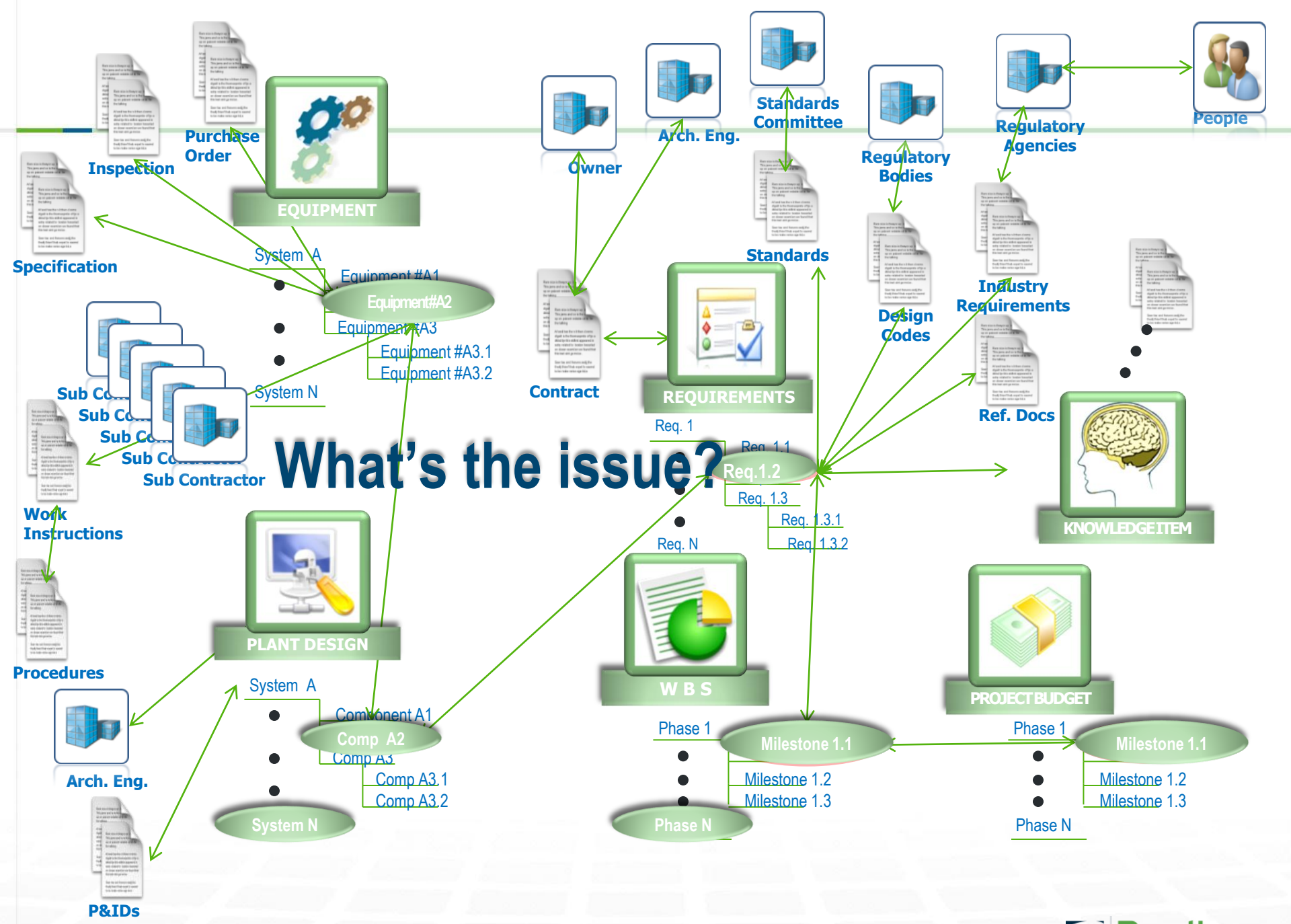
Bentley Sustaining Infrastructure



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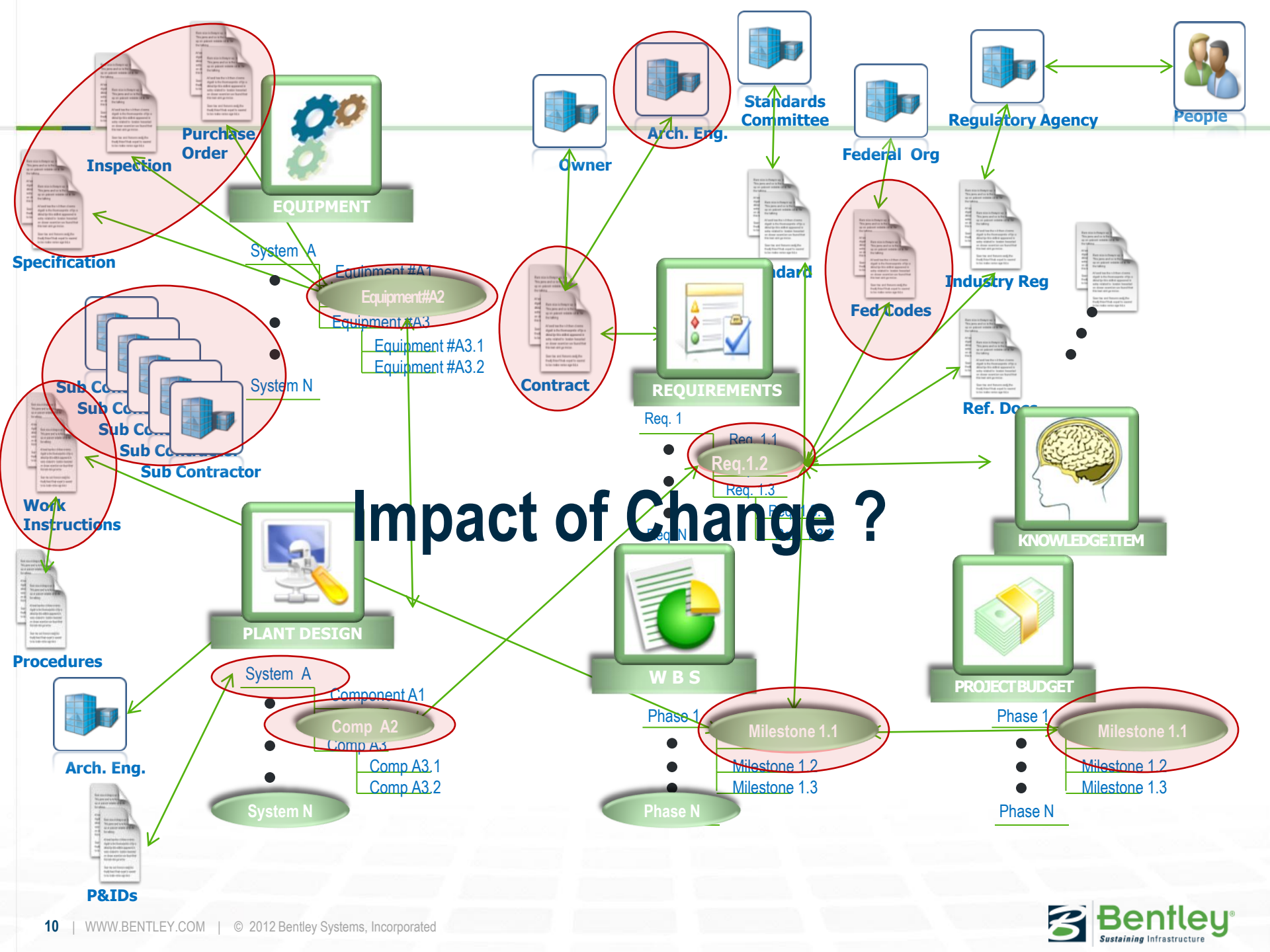
Bentley Sustaining Infrastructure



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AssetWise – So what if we could …..

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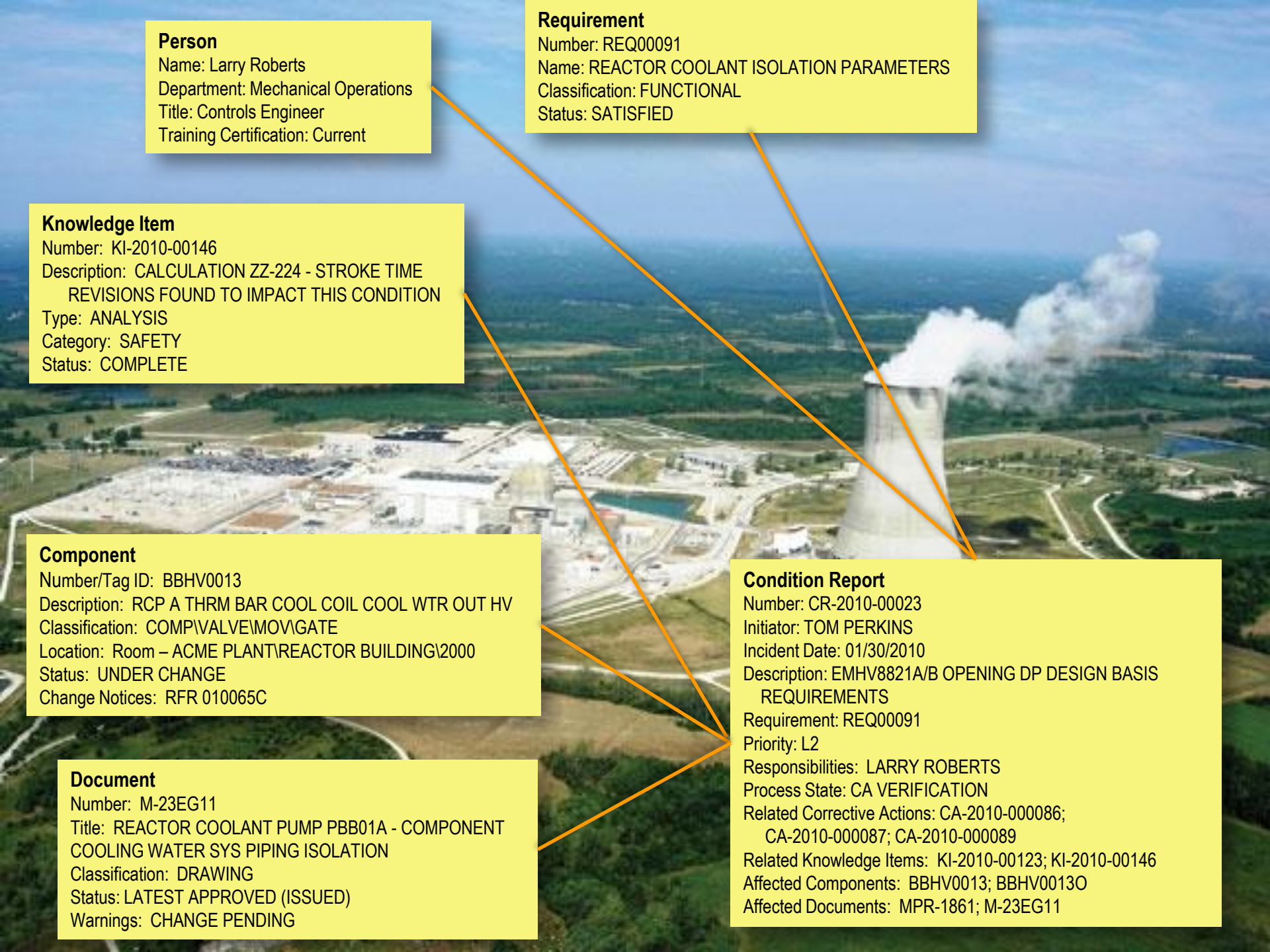
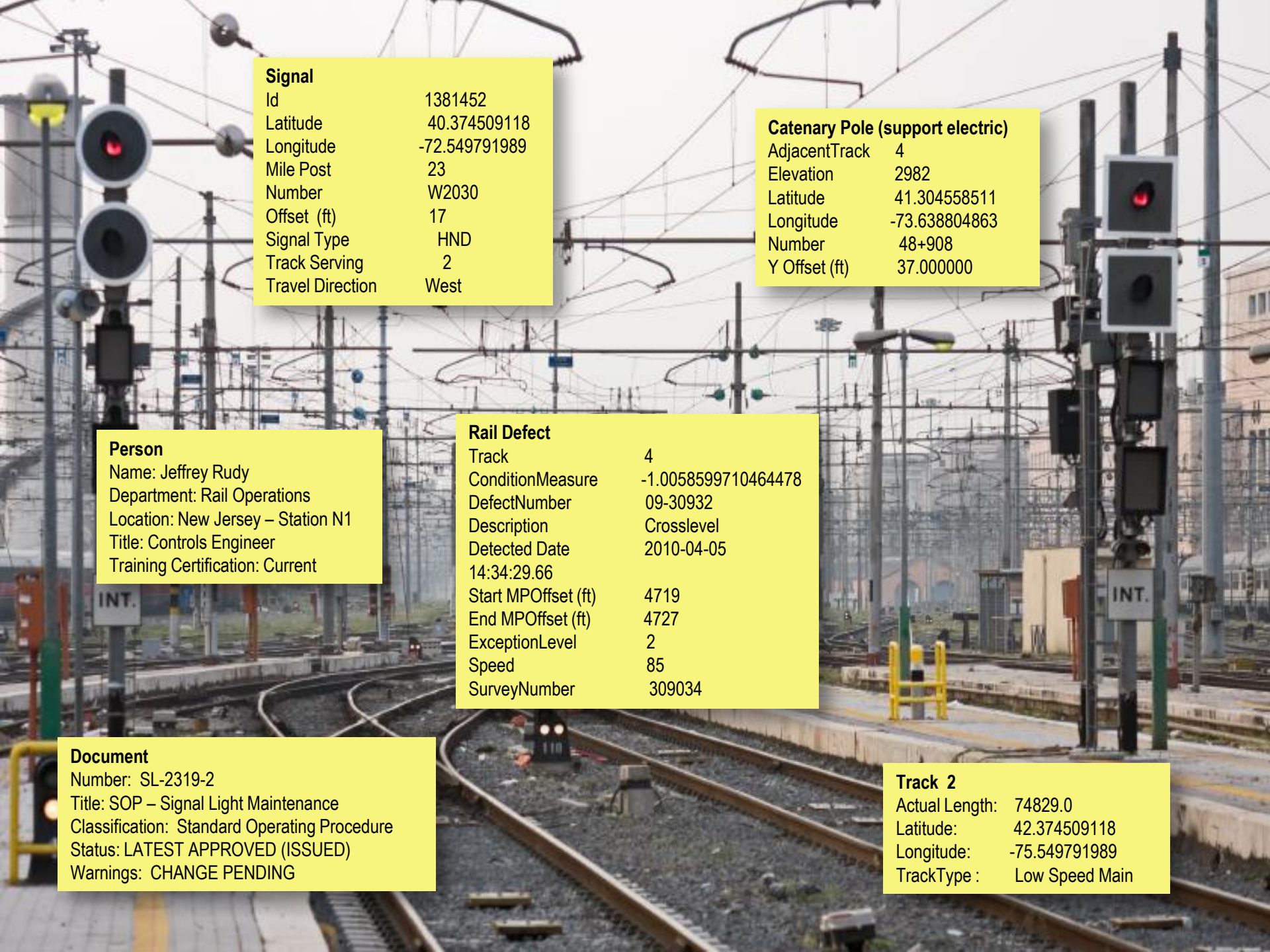

Person
Name: Larry Roberts
Department: Mechanical Operations
Title: Controls Engineer
Training Certification: Current
Requirement
Number: REQ00091
Name: REACTOR COOLANT ISOLATION PARAMETERS
Classification: FUNCTIONAL
Status: SATISFIED
Knowledge Item
Number: KI-2010-00146
Description: CALCULATION ZZ-224 - STROKE TIME REVISIONS FOUND TO IMPACT THIS CONDITION
Type: ANALYSIS
Category: SAFETY
Status: COMPLETE
Component
Number/Tag ID: BBHV0013
Description: RCP A THRM BAR COOL COIL COOL WTR OUT HV
Classification: COMP\VALVE\MOV\GATE
Location: Room – ACME PLANT\REACTOR BUILDING\2000
Status: UNDER CHANGE
Change Notices: RFR 010065C
Condition Report
Number: CR-2010-00023
Initiator: TOM PERKINS
Incident Date: 01/30/2010
Description: EMHV8821A/B OPENING DP DESIGN BASIS REQUIREMENTS
Requirement: REQ00091
Priority: L2
Responsibilities: LARRY ROBERTS
Process State: CA VERIFICATION
Related Corrective Actions: CA-2010-000086; CA-2010-000087; CA-2010-000089
Related Knowledge Items: KI-2010-00123; KI-2010-00146
Affected Components: BBHV0013; BBHV0013O
Affected Documents: MPR-1861; M-23EG11
Document
Number: M-23EG11
Title: REACTOR COOLANT PUMP PBB01A - COMPONENT COOLING WATER SYS PIPING ISOLATION
Classification: DRAWING
Status: LATEST APPROVED (ISSUED)
Warnings: CHANGE PENDING



Signal

Id	1381452
Latitude	40.374509118
Longitude	-72.549791989
Mile Post	23
Number	W2030
Offset (ft)	17
Signal Type	HND
Track Serving	2
Travel Direction	West

Catenary Pole (support electric)

AdjacentTrack	4
Elevation	2982
Latitude	41.304558511
Longitude	-73.638804863
Number	48+908
Y Offset (ft)	37.000000

Person

Name: Jeffrey Rudy
Department: Rail Operations
Location: New Jersey – Station N1
Title: Controls Engineer
Training Certification: Current

Rail Defect

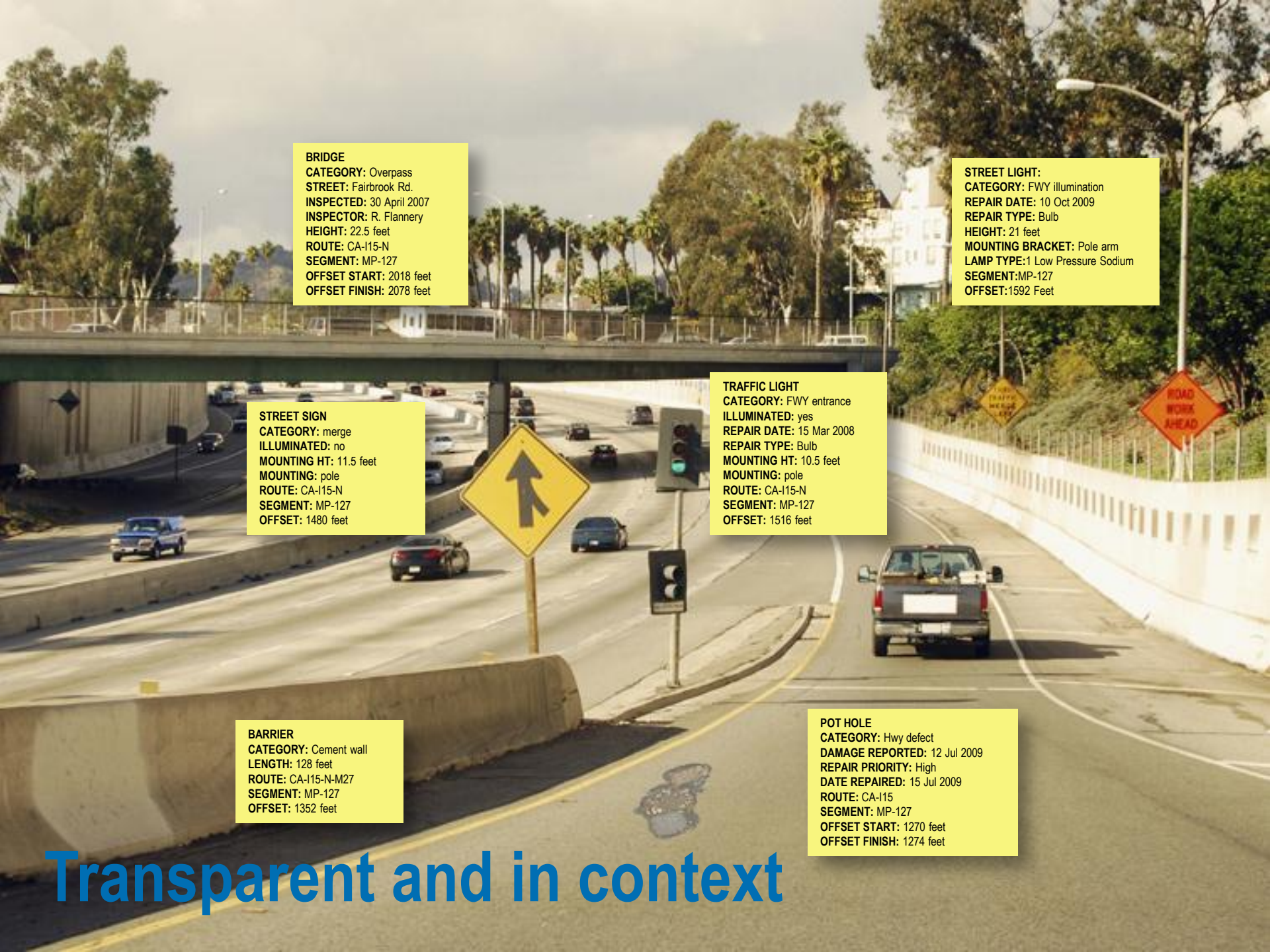
Track	4
ConditionMeasure	-1.0058599710464478
DefectNumber	09-30932
Description	Crosslevel
Detected Date	2010-04-05
14:34:29.66	
Start MPOffset (ft)	4719
End MPOffset (ft)	4727
ExceptionLevel	2
Speed	85
SurveyNumber	309034

Document

Number: SL-2319-2
Title: SOP – Signal Light Maintenance
Classification: Standard Operating Procedure
Status: LATEST APPROVED (ISSUED)
Warnings: CHANGE PENDING

Track 2

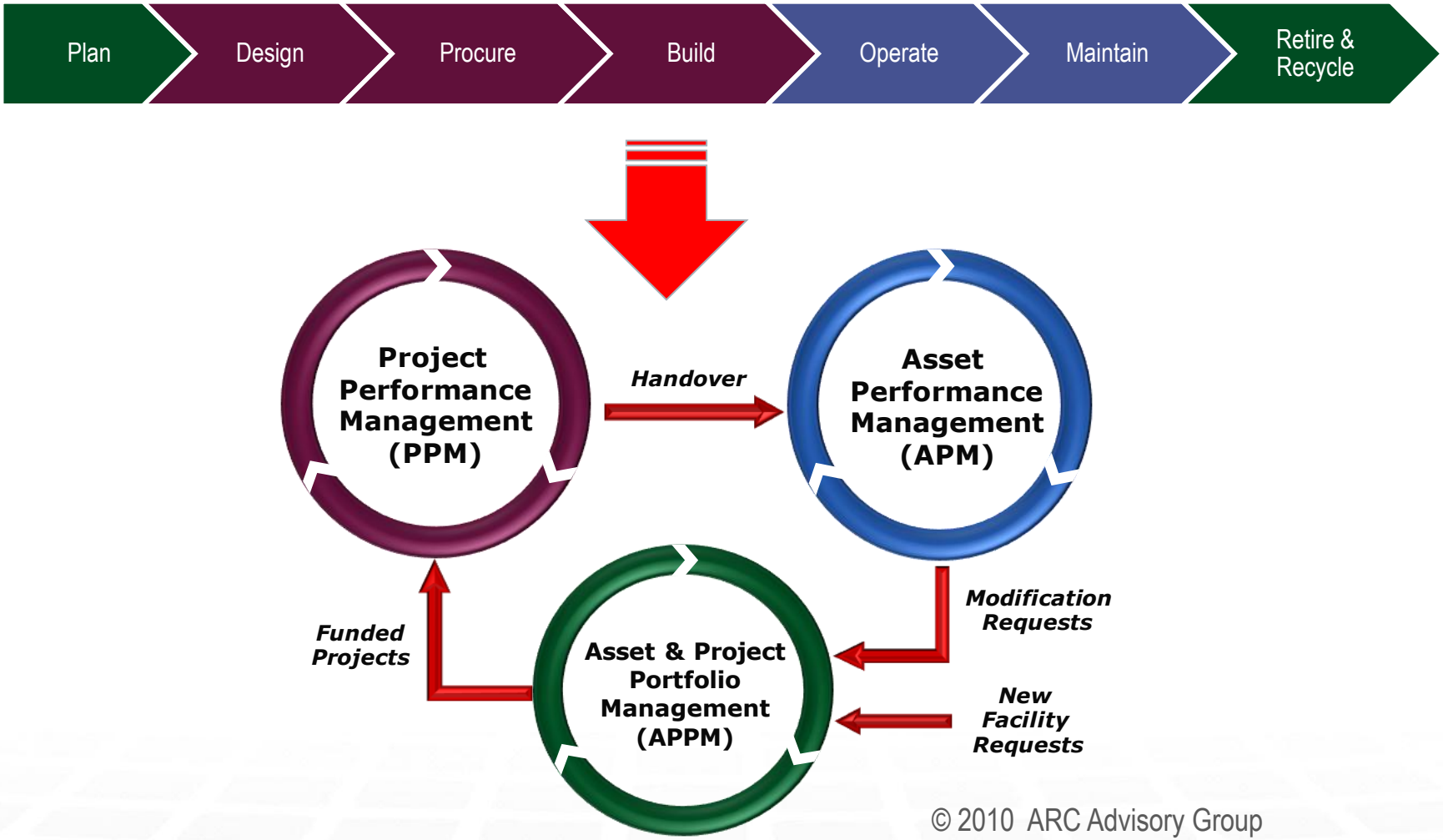
Actual Length:	74829.0
Latitude:	42.374509118
Longitude:	-75.549791989
TrackType :	Low Speed Main



Transparent and in context

AssetWise – Transparent and in context :

The ARC Business View



© 2010 ARC Advisory Group

Asset Lifecycle Information Management

Project Information Management
(PIM)

Management
(ALIM)

Asset Information Management
(AIM)

Plan | Design | Procure | Build | Operate | Maintain | Retire & Recycle

Asset & Project Portfolio Info Management
(APPIM)

Source: ARC Advisory Group
Information Management Strategies for Asset Lifecycle Management
© 2010 ARC Advisory Group

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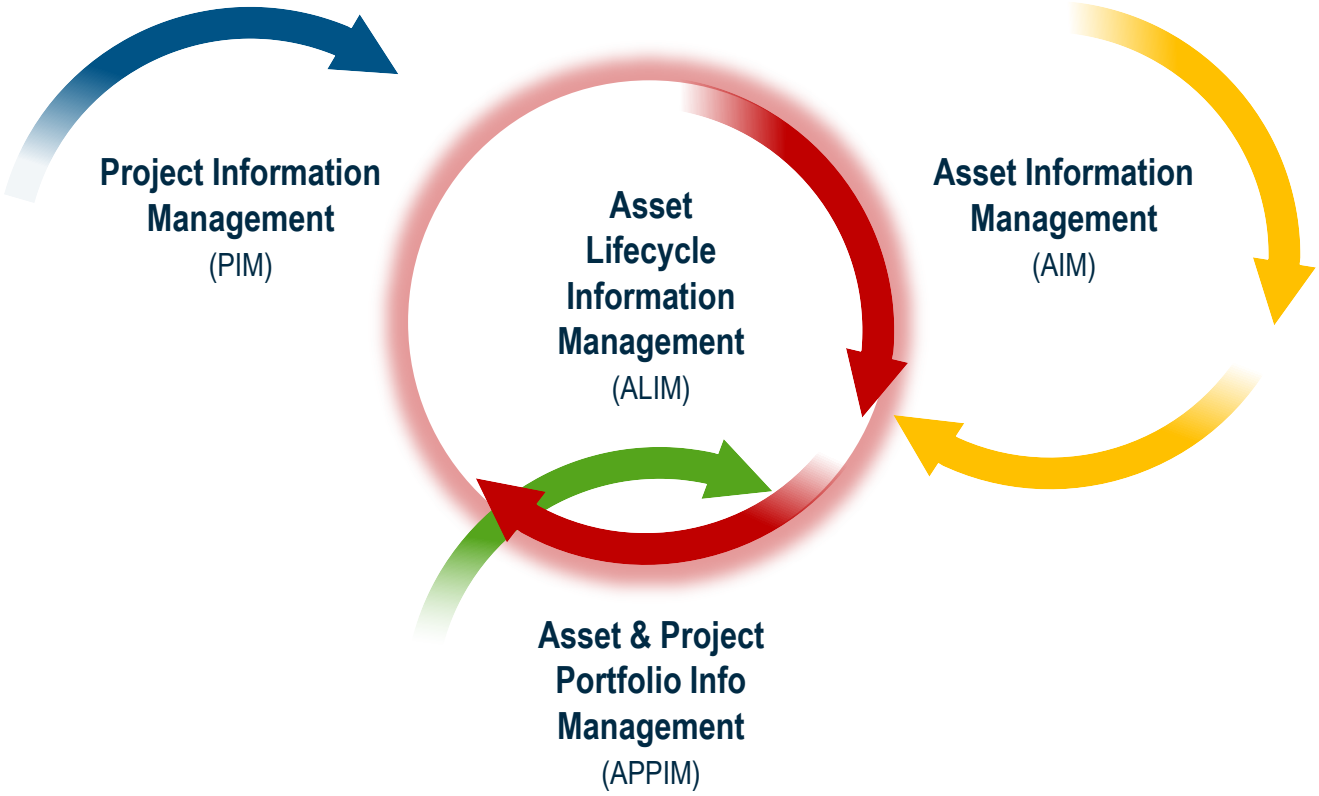
Asset Lifecycle Information Management (ALIM)



Source: ARC Advisory Group

Information Management Strategies for Asset Lifecycle Management, January 2010

© 2010 ARC Advisory Group

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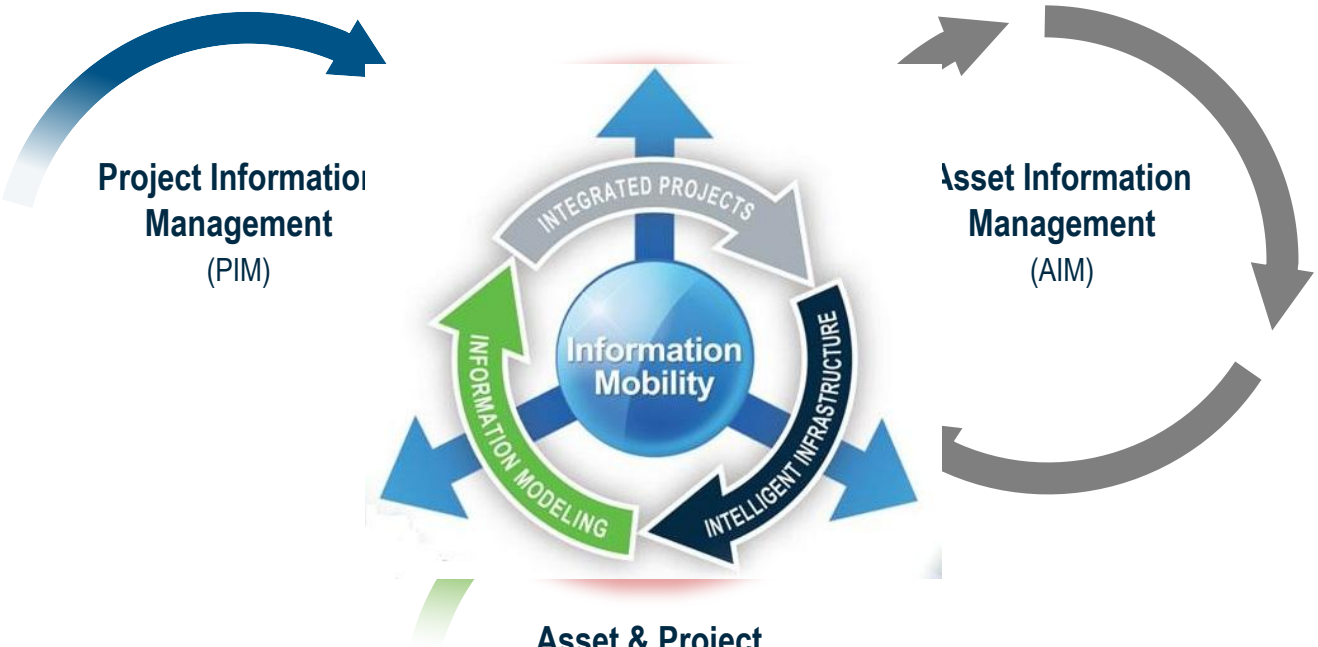
Delivering ALIM :



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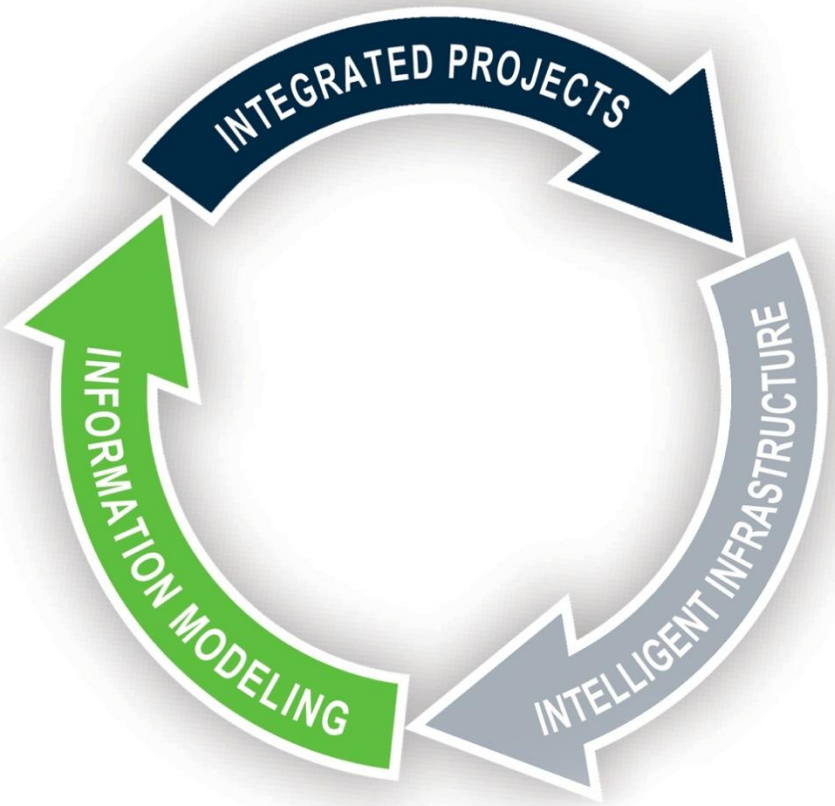
Information Modeling

through

Integrated Projects

for

Intelligent Infrastructure



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AssetWise Use Cases

eB Insight Use Cases

- Corrective Action
- Master Equipment List / Configuration Control
- Management of Change
- Relationship Management
- Drawing Management
- Document Control
- Document Management
- Cyber Security
- Operating Experience
- Benchmarking & Observations
- Requirements Management

Other Use Cases

- Exor
- SUPERLOAD
- Optram
- sisNET
- InspectTech
- Ivara (APM)

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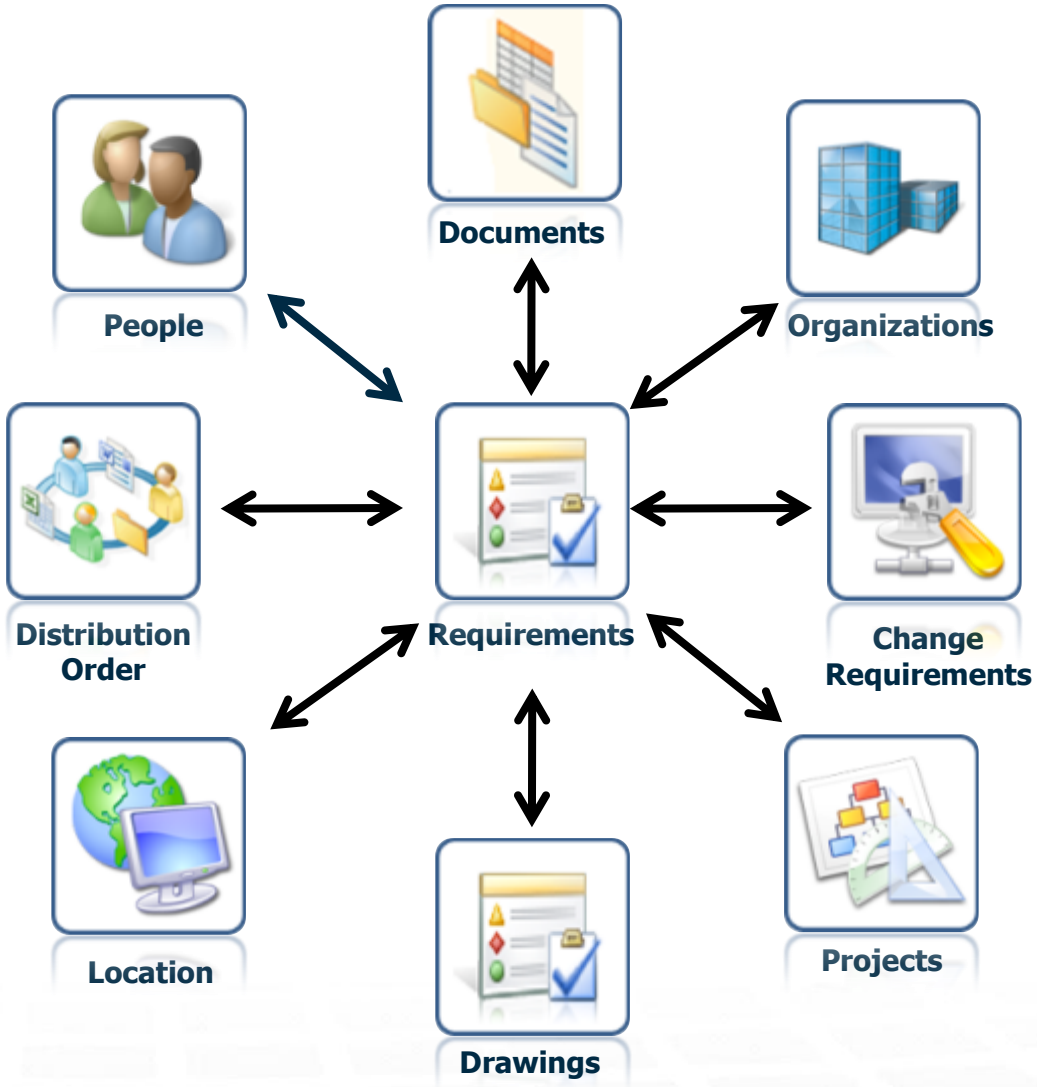
AssetWise: Operations Information Modeling

- Manages much more than documents…
- Relates structured and unstructured information to teams, organization & the enterprise
- Focuses on how the information is related to the relationships
- Records conditions, incidents, events and corrective actions
- Captures, tracks, facilitates and transmits changes
- Creates auditable sequences of how and why information changed



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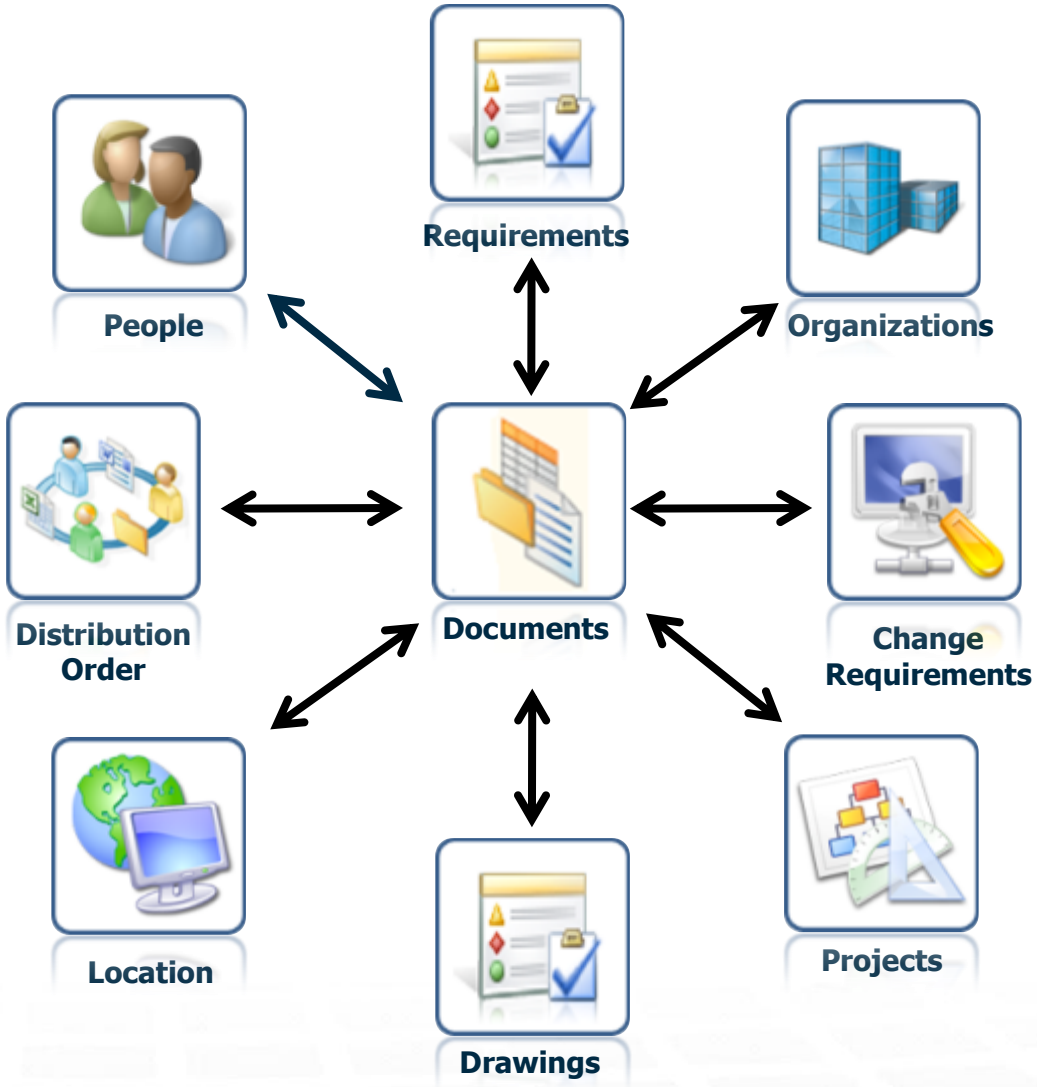

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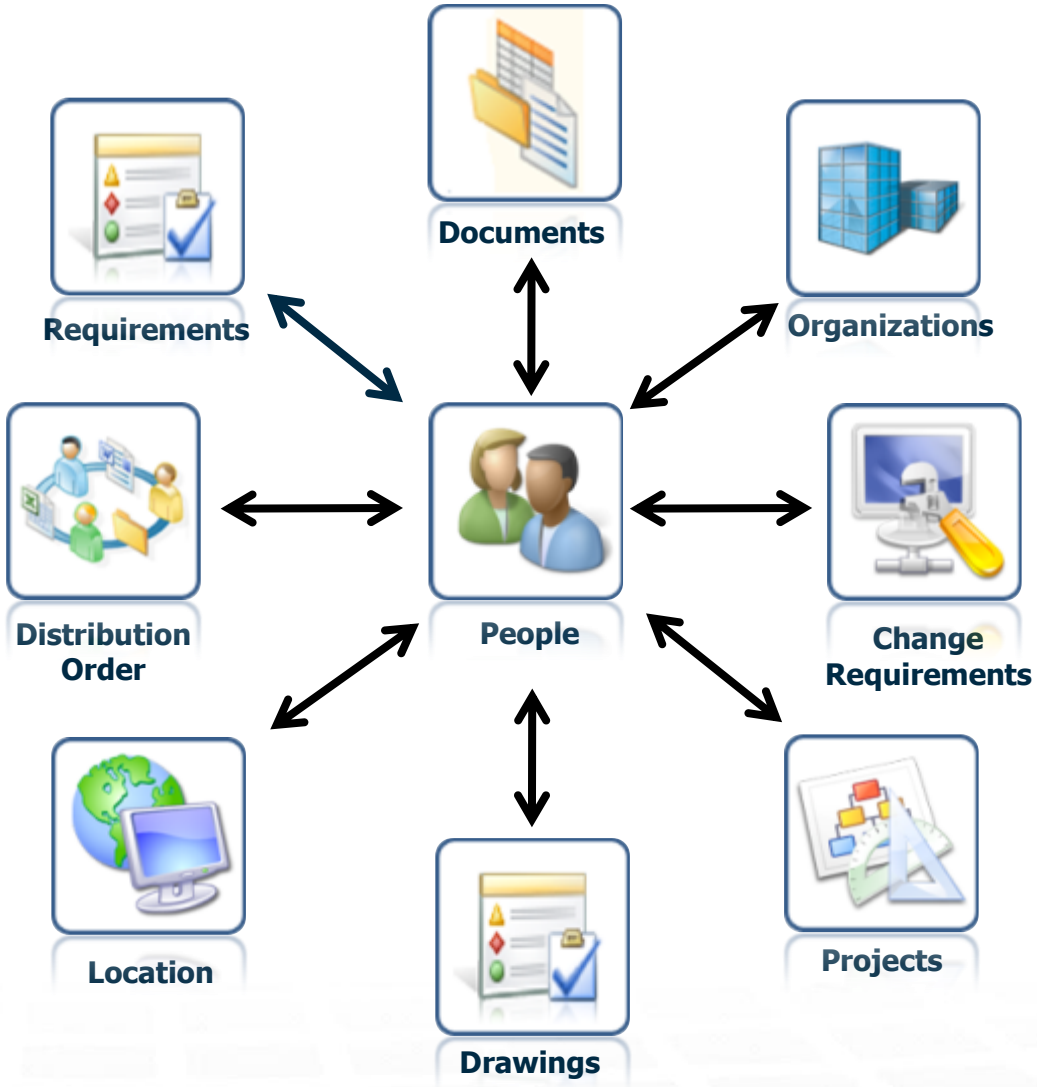

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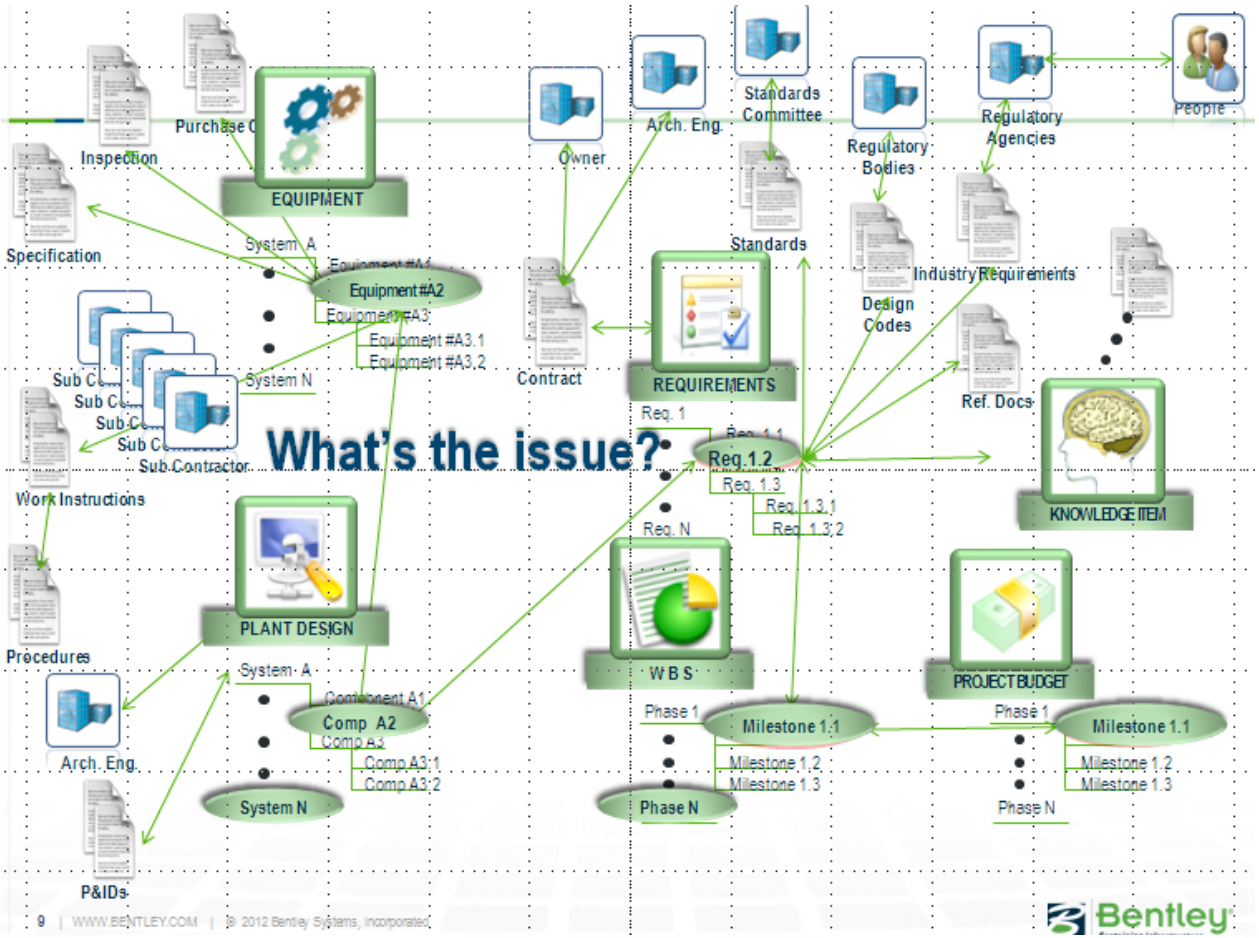
Bentley Sustaining Infrastructure

Configuration Management

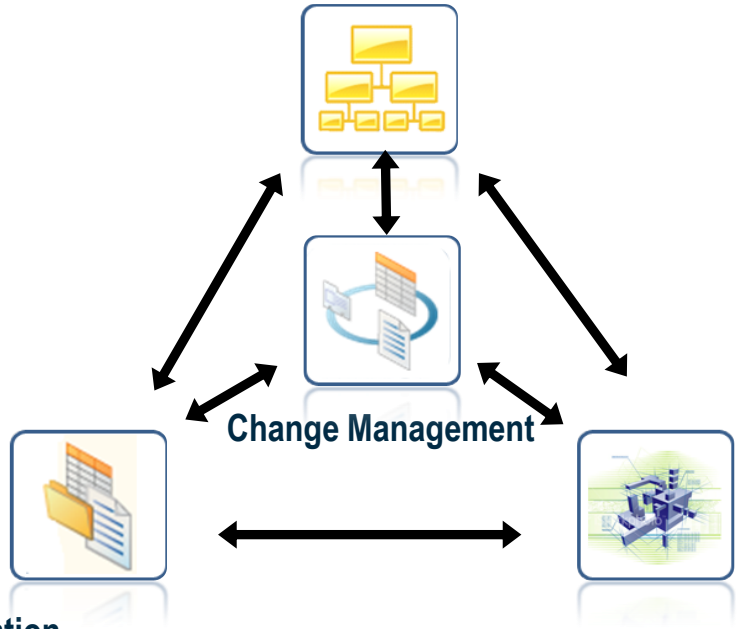


Bentley Sustaining Infrastructure

Configuration Management

Design Basis / Requirements / Regulations / Contracts / Permits / Licenses

"What is allowed to be there"



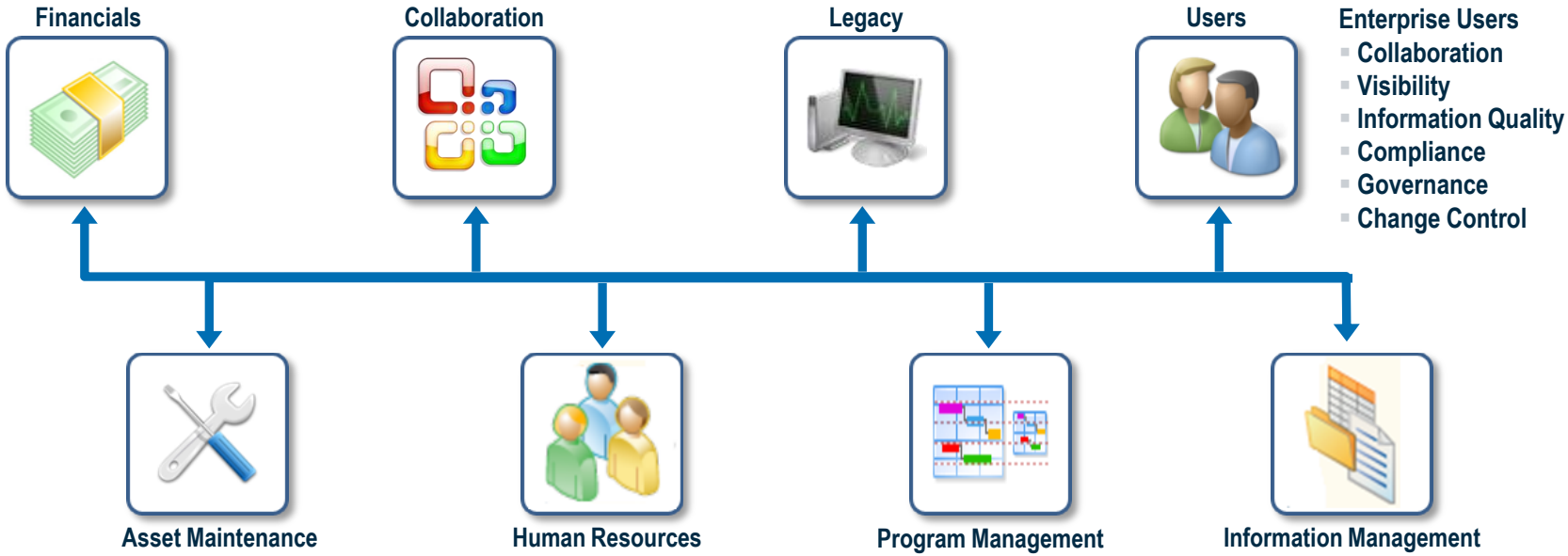
Information Management

"What we say is there"

Physical Configuration

"What is there"

Enterprise Integration



Enterprise Users

- Collaboration
- Visibility
- Information Quality
- Compliance
- Governance
- Change Control

AssetWise

- Configuration Control
- Controlled Docs
- Records Management
- Engineering Design
- Corrective Action
- Human Performance
- Knowledge Management

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Bentley Sustaining Infrastructure

Design Engineering
(Cable Raceway, Design Basis, Modifications)

Work Management

Condition Reporting
Human Performance

Change Request

Approved Change

Change Order

Complete
Change Order

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

Implement Change

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

Relate Work Order to Change Order

Work Order Complete

Schedule & Plan Work

- 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

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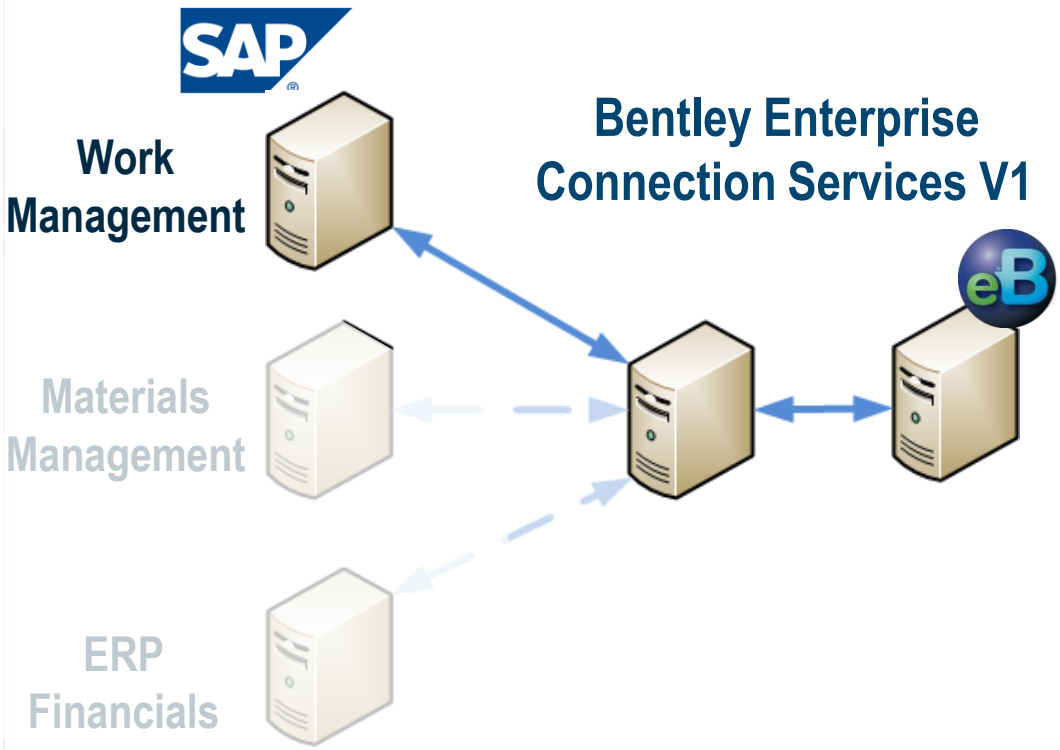
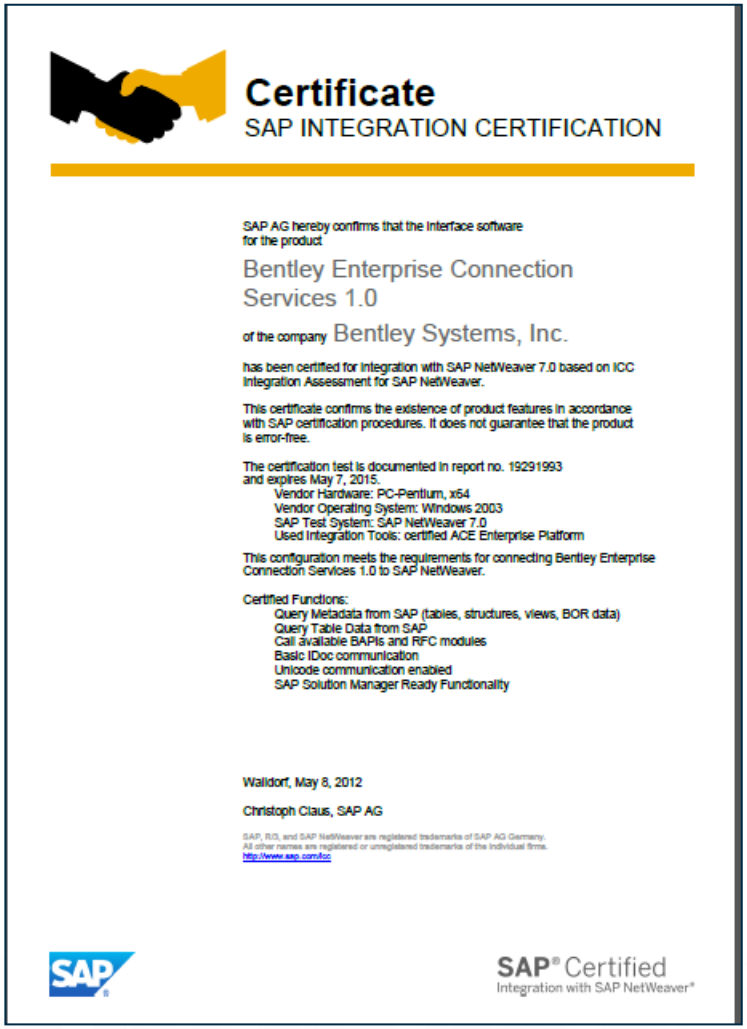
Bentley Sustaining Infrastructure

Bentley Enterprise Connection Services Offers Certified SAP Integration





Certificate
SAP INTEGRATION CERTIFICATION

SAP AG hereby confirms that the interface software for the product

Bentley Enterprise Connection Services 1.0

of the company Bentley Systems, Inc.

has been certified for integration with SAP NetWeaver 7.0 based on ICC Integration Assessment for SAP NetWeaver.

This certificate confirms the existence of product features in accordance with SAP certification procedures. It does not guarantee that the product is error-free.

The certification test is documented in report no. 19291993 and expires May 7, 2015.

- Vendor Hardware: PC-Pentium, x64
- Vendor Operating System: Windows 2003
- SAP Test System: SAP NetWeaver 7.0
- Used Integration Tools: certified ACE Enterprise Platform

This configuration meets the requirements for connecting Bentley Enterprise Connection Services 1.0 to SAP NetWeaver.

Certified Functions:

- Query Metadata from SAP (tables, structures, views, BOR data)
- Query Table Data from SAP
- Call available BAPIs and RFC modules
- Basic IDoc communication
- Unicode communication enabled
- SAP Solution Manager Ready Functionality

Walldorf, May 8, 2012

Christoph Claus, SAP AG

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All other names are registered or unregistered trademarks of the individual firms.
http://www.sap.com/cc

SAP® Certified
Integration with SAP NetWeaver®

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Platform Technology

- Servers: Affordable .NET Windows Servers
- Database: MS SQL or Oracle
- User Interfaces: .NET Windows Clients, IIS Web
- SharePoint Connection Services

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Hand-over Becomes *Hands-on!*

Project Information Management
Simulate (Design) & Construct (Build)

Asset Information Management
(Operate & Maintain)

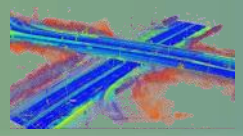
ProjectWise — Continuous Handover — AssetWise

"Work in Progress"

"Management of Change"

SHARED SERVICES

- Records Management
- Point -cloud Streaming



- Transmittals
- Dynamic Rights Management

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Bentley Sustaining Infrastructure

AssetWise Market Segments

- Target Markets
  - Transportation (Road/Bridge Networks)
  - Transportation (Rail Networks)
  - Power Generation (Nuclear and APM)
  - Oil & Gas (Existing and New Plant, APM)
  - Mining (APM)
  - All Solutions (Document Control)

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Bentley Sustaining Infrastructure

AssetWise for Road/Bridge Networks

Pains

- Lack of accurate linear asset information
  - Delays and/or reduces federal funding allocations
  - Impacts decision making and priority setting
  - Increases project delays and cost of maintenance
  - Increases risk to public safety

Advantages

- Accurate linear asset information
  - Ensures asset information integrity to improve operational efficiency
  - Supports federal and public funding initiatives to increase allocations
  - Supports public transparency and safety to lower cost/risk of regulatory compliance

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AssetWise Users for Road/Bridge Networks

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AssetWise for Rail Networks

Pains

- Lack of accurate Rail asset information
  - Increases risk to public safety
  - Impacts decision making and priority setting
  - Increases project delays and cost of maintenance
  - Delays asset renewals and capacity improvement

Advantages

- Accurate Rail asset information
  - Improves public safety decisions and priorities
  - Asset knowledge avoids run-to-fail situations
  - A “single source of truth” of asset information
  - Empowers maintenance decision support
  - Supports asset renewals and capacity improvements projects

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AssetWise Users for Rail

Network Rail

carillion

Trinity Industries, Inc.

MTA Long Island Rail Road
Going your way—the safe way

CSX

marta

SOUTH AFRICAN RAIL COMMUTER CORPORATION LTD

transport
Department: Transport
REPUBLIC OF SOUTH AFRICA

signalling solutions

metro

AMTRAK

Virgin trains

Crossrail

Balfour Beatty

ALSTOM

RTD

TRAFIKVERKET

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AssetWise for Nuclear Power Generation

Pains

- Lack of accurate asset information
  - Higher risk of non-compliance with NRC regulations
  - Increases cost and duration of plant shutdowns
  - Delays asset renewals and capacity improvement
  - Increases “wrench-time” and re-work

Advantages

- Accurate asset information
  - Meets regulatory requirements reducing risk of non-compliance
  - Manages the impact of change efficiently and reliably
  - Captures and retains operating experience and knowledge
    - improves plant safety and security
    - shortens plant shutdowns
    - lowers operational costs

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AssetWise Users for Nuclear

FPL

Nuclear Fuel Services, Inc.

Sempra Energy

CH2MHILL

NuStart Energy

Westinghouse

Ameren

ENERGYSOLUTIONS

Entergy

Constellation Energy

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AssetWise for Oil and Gas

Pains

- Lack of accurate asset information
  - Time needed to locate accurate, up-to-date asset information to support operational activities (maintenance, inspection)
  - Asset data spread across systems increases time to find and can compromise operational efficiencies and asset integrity.

Advantages

- Accurate asset information
  - Maximizes system availability by providing easy/quick access to trustworthy information to yield faster response times
  - Minimizes downtime and improves overall asset performance, availability and safety
  - Supports progressive, continuous handover

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AssetWise Oil and Gas Users

bp

Husky Energy

QGC
A BG Group business

Chevron

Pan American ENERGY

SUNCOR ENERGY

PETRONAS
Petroliam National Berhad

Petrofac

EXXON

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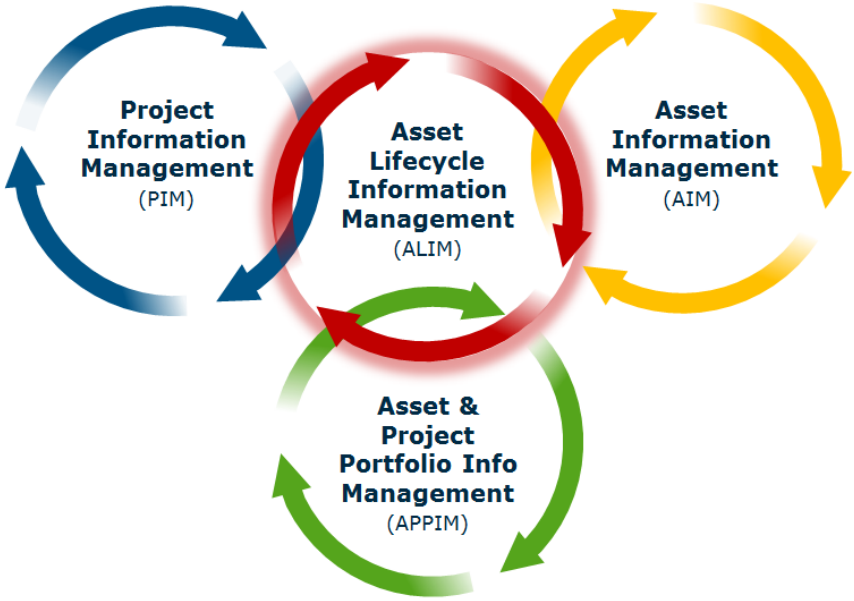
Asset Lifecycle Information Management

Ensuring trustworthy information throughout the lifecycle of infrastructure

- Continuous, Managed Handover
- Configuration Management
- Change Management
- Records Management
- Knowledge Management
- Workflow Processes
- Compliance



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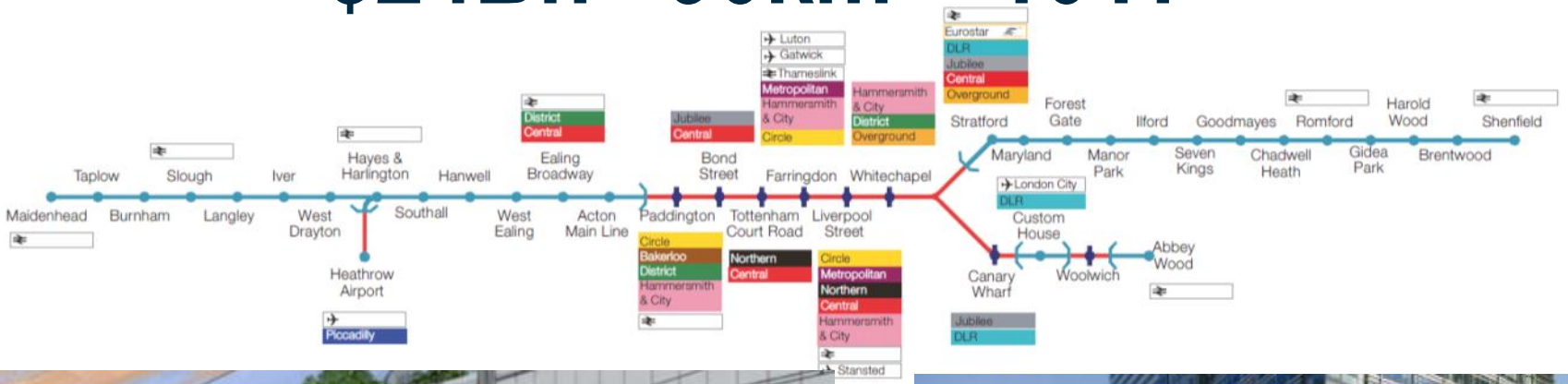
Bentley Sustaining Infrastructure

Crossrail – *a Vision to Integrate*

$24Bn 90km 10Yr



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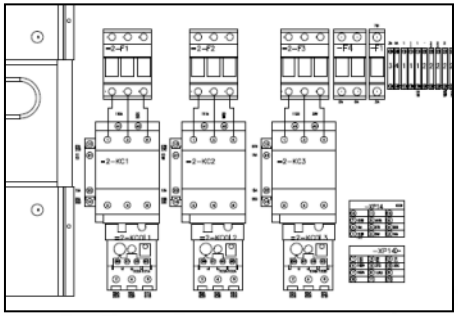
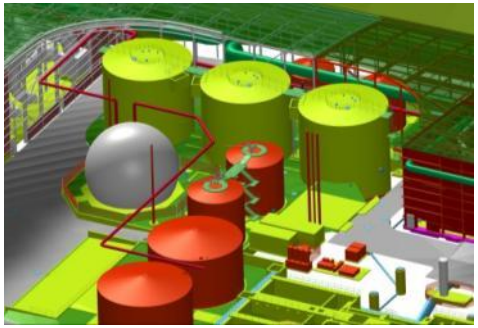
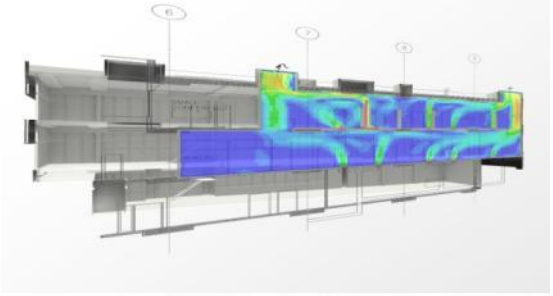
Bentley Sustaining Infrastructure

Lifetime Aspirations…

1980's	2000's	2010's
2D	+ 3D	+ Simulation
"Schematic"	+ "Physical"	+ "Performance"
• Design • Documentation	• Design • Visualization • Construction	• Design • Visualization • Construction • Operations & Maintenance







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Bentley Sustaining Infrastructure

Announcement

Big data meets big infrastructure as Bentley

Bentley's Acquisition of Ivara Redefines Asset Performance Management: Integrating OPEX with CAPEX!

September 18, 2012

Source: Bentley Systems, Inc.

Bentley Systems, Incorporated, the leading company dedicated to providing comprehensive software solutions for sustaining infrastructure, today announced that it has acquired Ontario, Canada-based Ivara Corporation, a leading provider of asset performance management (APM) software solutions for organizations in asset-intensive industries, including mining and metals, power generation and utilities, oil and gas, and petrochemical. The Ivara EXP solution – a core system mission critical to operations and maintenance, combined with a proven implementation methodology and the Aladon Network's seasoned reliability practitioners – helps owner-operators to obtain the best performance, reliability, and safety from their assets. APM software supplements and leverages value in transaction-oriented enterprise asset management systems such as IBM Maximo and SAP EAM by helping to build and implement asset-specific reliability strategies. Ivara is an IBM Member-Level Partner with Certified Ready for Tivoli integration as well as an SAP Software Solution Partner with SAP Certified - Powered by NetWeaver integration.

Business benefits of Ivara EXP include maximized availability and utilization; reduced operational costs; extended asset life; structured compliance with safety, environmental, and other regulations; and the systematic capture and application of asset performance knowledge and industry best practices. Ivara EXP also provides dashboards for asset health monitoring, allows organizations to understand and manage the risks associated with equipment failures, and turns th volumes of operational data into actionable information, enabling timely and accurate maintenance decisions.

With this acquisition, Bentley uniquely extends its AssetWise asset lifecycle information management software and services to comprehensively improve asset performance, providing new value-adding opportunities not only for owne operators, but also for the engineering/procurement/construction firms who design, build, and commission their infrastructure. The compelling ROI driver of enhanced performance for existing assets is underscored by the Bentle Infrastructure 500 tabulation of Top Owners – whose net infrastructure investment is cumulatively valued at over 14 dollars!

For additional information about Bentley's AssetWise asset lifecycle information management offerings, visit www.bentley.com/AssetWise. For additional information about Bentley's new Ivara EXP asset performance management solution, visit www.bentley.com/Ivara

Bentley Sustaining Infrastructure

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management (APM) software solutions for organizations in asset-intensive industries, including minin metals, power generation and utilities, oil and gas, and petrochemical. Bentley will integrate Ivara into i existing AssetWise portfolio. This deal gives Bentley new hooks into aspects of enterprise IT beyond engineering and operations, linking engineering data and as-built data with the rest of the organization infrastructure.

Bentley will use Ivara technology to bring new analytic opportunities to the mass of data collected in plants and utilities.

Bentley says Ivara's EXP solution helps owner-operators obtain the best performance, reliability, and safety from their assets. APM software works with transaction-oriented enterprise asset management systems su as IBM Maximo and SAP EAM by helping to build and implement asset-specific reliability strategies. Ivara is IBM Member-Level Partner with Certified Ready for Tivoli integration and an SAP Software Solution Partner w SAP Certified—Powered by NetWeaver integration. Terms of the deal were not disclosed; both companies a privately held.

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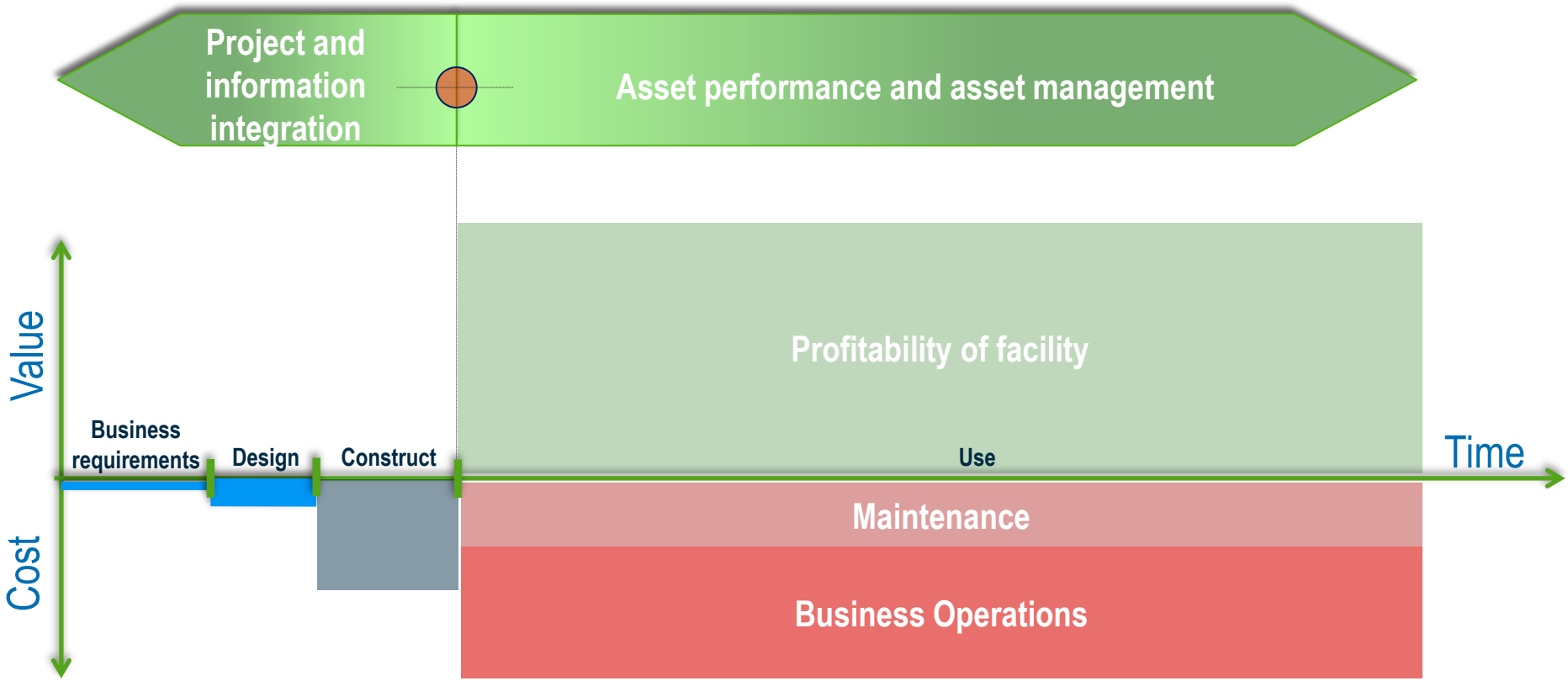
Why Asset Performance Management is important



Adapted from DPR Consulting and
Dr. Martin Fischer, CIFE IAB, 2011

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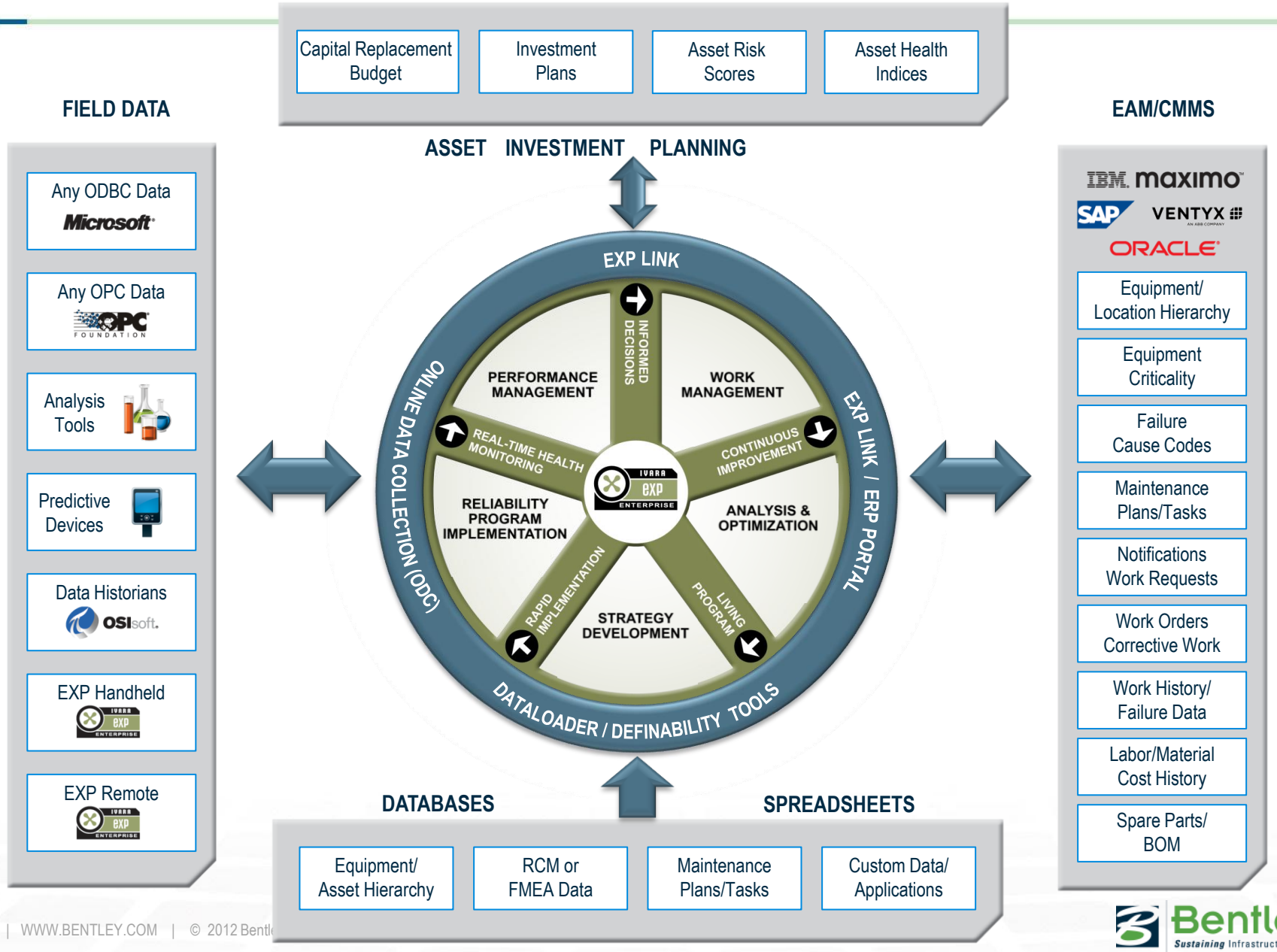
Asset Intelligence from Consolidated Data Sources



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Asset Performance Management (APM)

- An asset management program comprising
  - **Reliability** programs for **operational assets**
  - Ongoing **performance monitoring**
  - Ongoing **performance improvement** program
- Implementing APM program includes
  - An APM **strategy**
  - Reliability and performance **extensions** to **Asset Register**
  - Integration with **work management**
  - **Analytics, KPIs, dashboards, monitoring**

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What is RCM2 ?

- An established and respected process within the maintenance community
- Frames what must be done to ensure a physical asset, system or process meets performance objectives
- Ivara owns the intellectual property for RCM2

John Moubray

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Ivara Users

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Summary

- AssetWise provides superior asset lifecycle information management for owner-operators with highly engineered assets.
- AssetWise improves engineering information management integrity and operational efficiency while streamlining the business processes associated with sustaining infrastructure assets over their lifecycles.
- AssetWise provides maximized availability and asset utilization, reduced operational costs, and compliance with safety, environmental, and other regulations

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AssetWise Overview