Applying ESBs with CIM

Implementing Enterprise Service Bus solutions to exchange CIM-based data and support business applications for asset management

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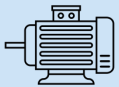
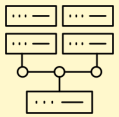
Intro

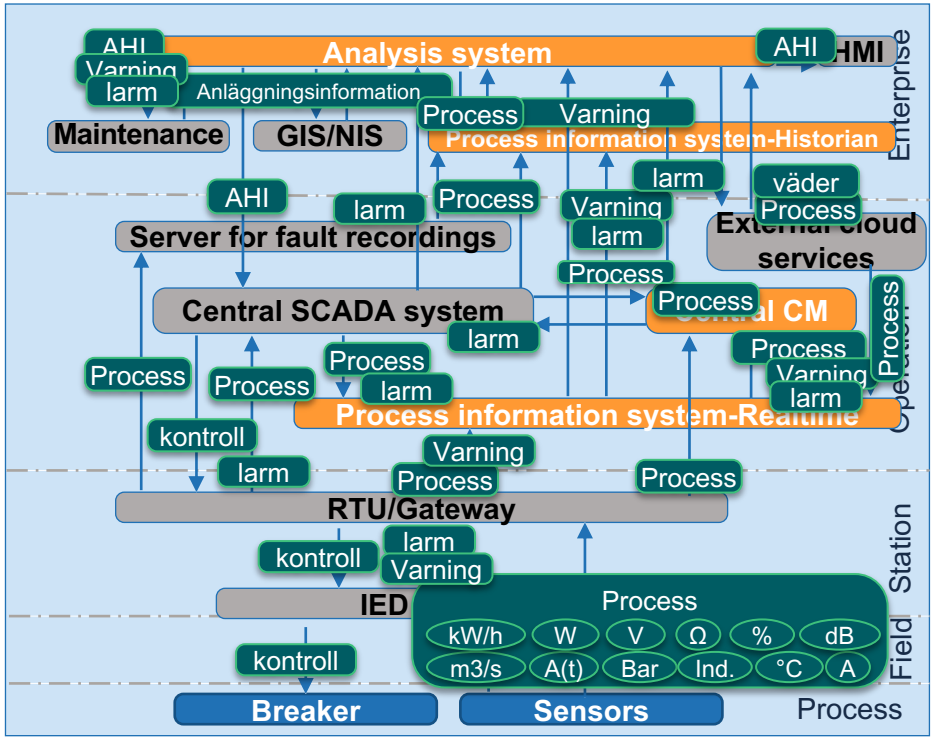
Governance

	Generation	*Distribution*	*Connection*	*Consumption*	*Application*	*Destination*
Electricity value chain						
	Source	**Transport**	**Interface**	**Engine**	**Application**	**Use Case**
Data value chain						
	Data Source	*IT Infrastructure*	*Interface*	*Algorithm*	*Application*	*Business Case*

Governance

Effectively integrating IEC 61968 with IEC 61850 to maximise IT-OT interoperability

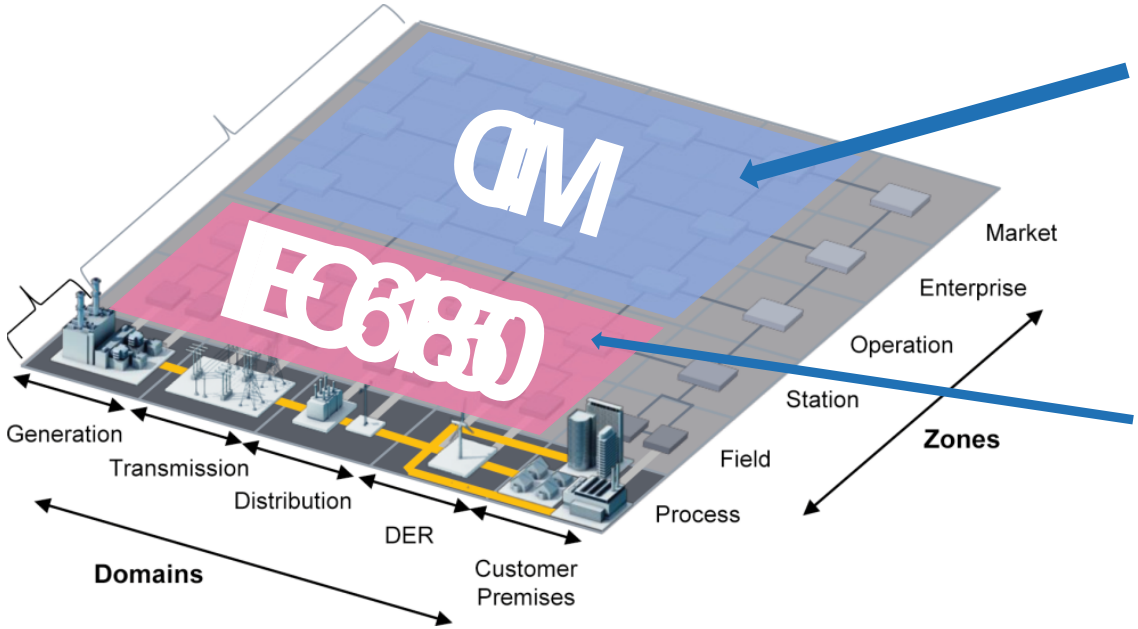
RA – Information flow



Example - Information exchange for calculation of Asset Health Index – **Breaker**

- Creation of online Process information.
- Reporting of disturbance recordnings.
- Creation of historic process information.
- Make process information and disturbance records available for analysis system.
- Make asset information available for analysis system.
- Provide calculated AHI for maintenance.

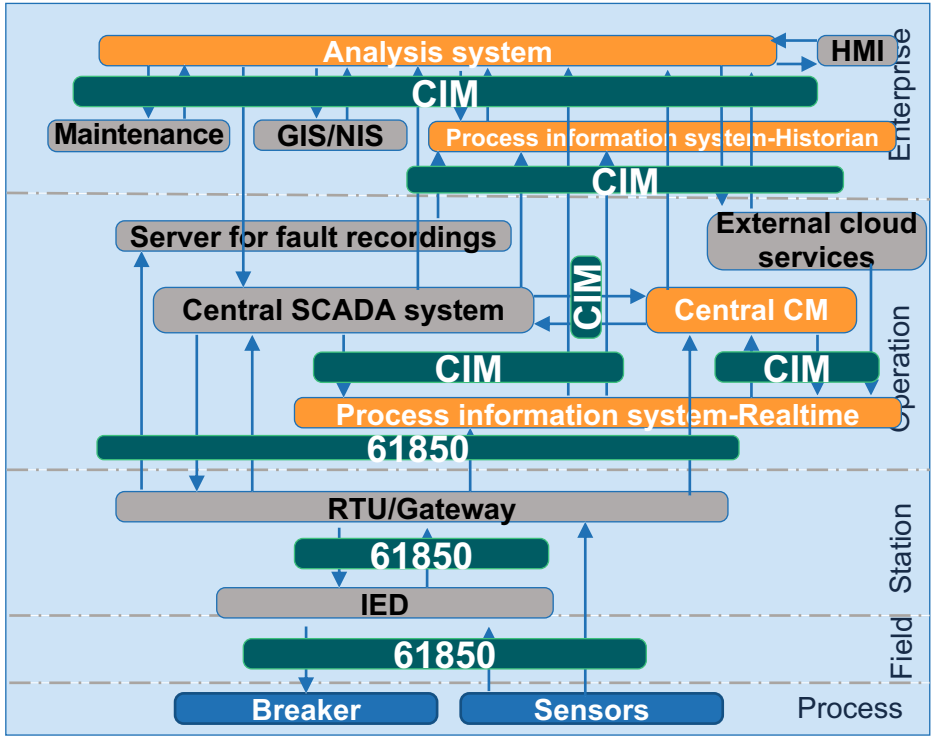
RA – Information flow



Defines an common information structure for exchanging information between central systems

Data model that represents assets and functions at process and station level

RA – Information models

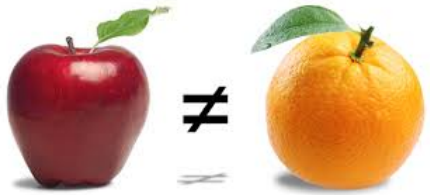


CIM

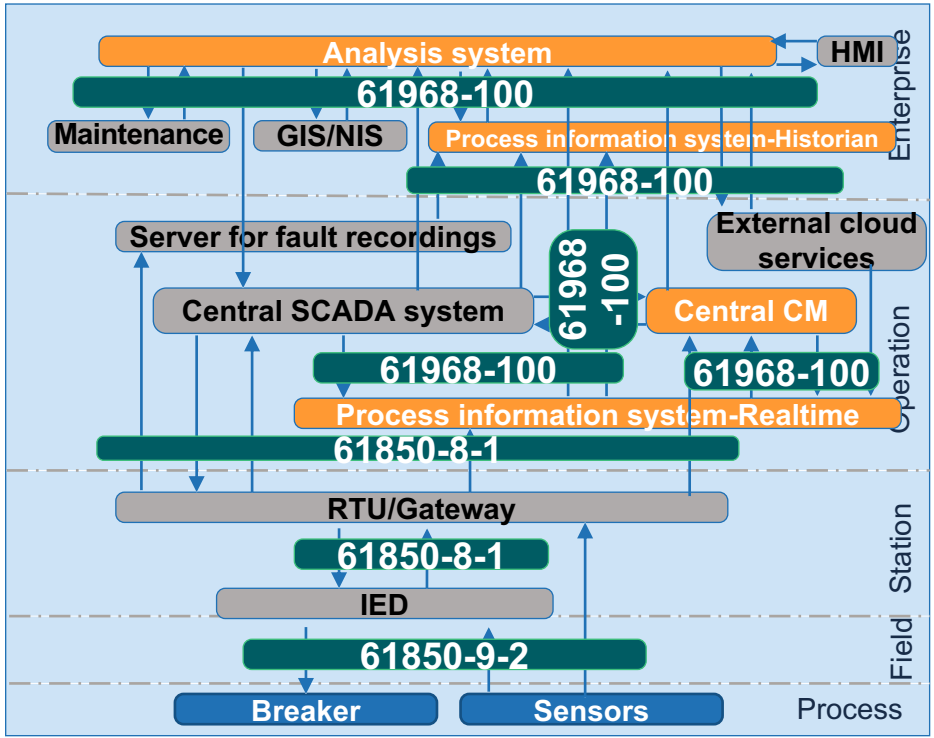
- Between central systems

61850

- From station level to central systems.

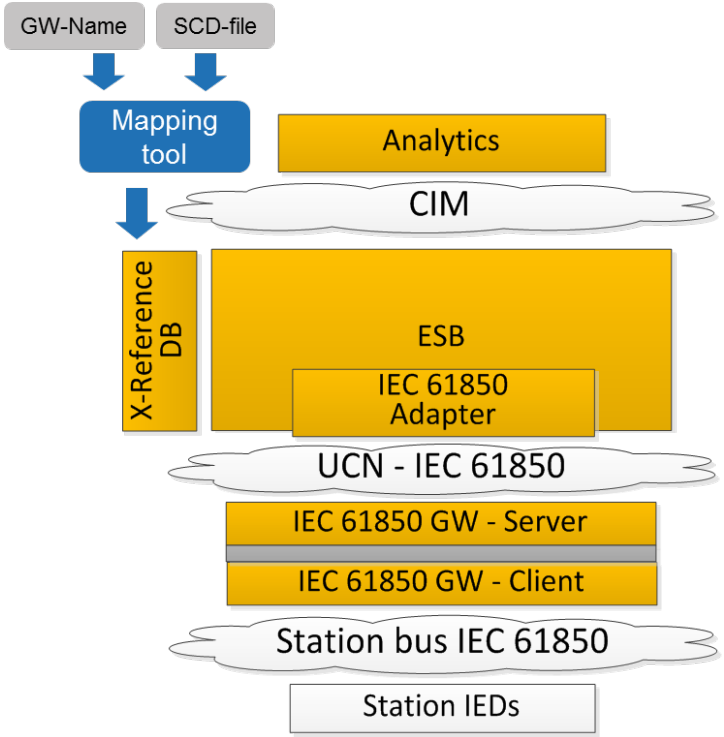


RA – Communication



- CIM: Between central systems
- 61850 or CIM: Between central systems and station
- 61850: Between station components and process level.

RA – Information models



- The pilot shows that it is possible to provide information from primary substations to central applications using industry standards.
- The pilot shows that it is compatible for the current 61850 engineering process.
- The pilot shows that through a loose coupled architecture, we are able to reuse information flows to provide the same information to several applications.

Some challenges we found

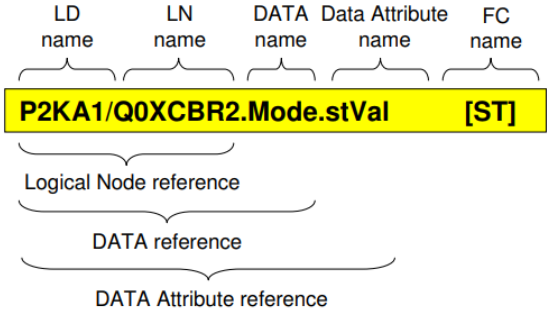
61850 semantic is standardised but:

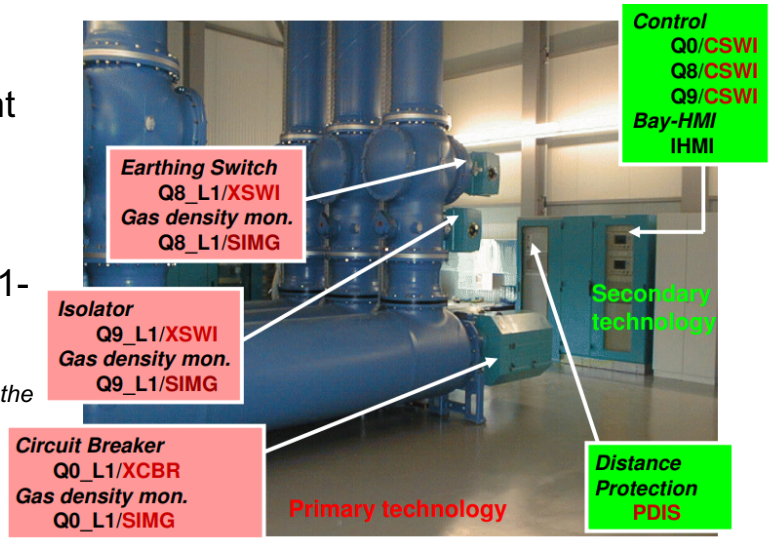
- Not at instance level (.tmp1 vs .tmp2)
- Although it is standardised, different vendor can interpret semantic slightly differently
  - Means it is very difficult to have generic rules at semantic level
  - Means it has to be managed using routines

CIM and 61850 are not very harmonized at measurement level

- No perfect rule to go from data object/data attribute to measurement/measurementValue
- Our best try is using recommendations in 62361-102 (TS)*

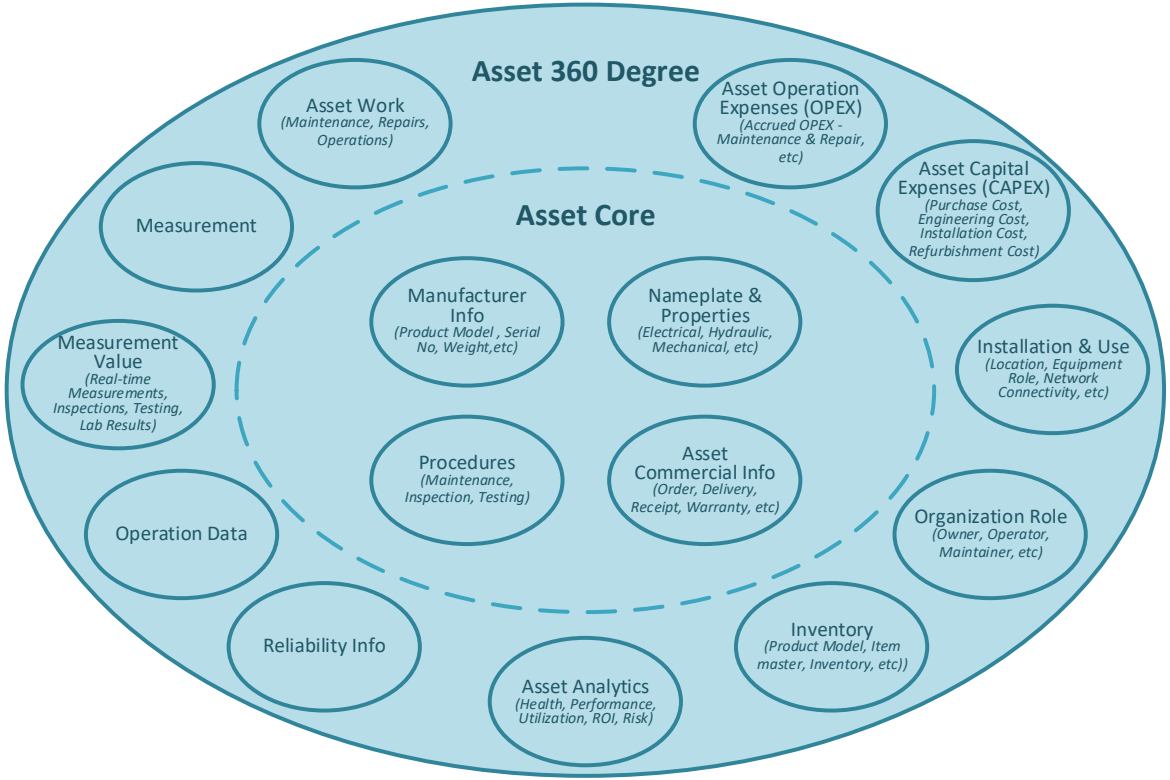
Power systems management and associated information exchange – Interoperability in the long term – Part 102: CIM – IEC 61850 harmonization





Highlighting the benefits of full ESB-CIM integration across all aspects of asset lifecycles

Asset 360 – Good decision requires information



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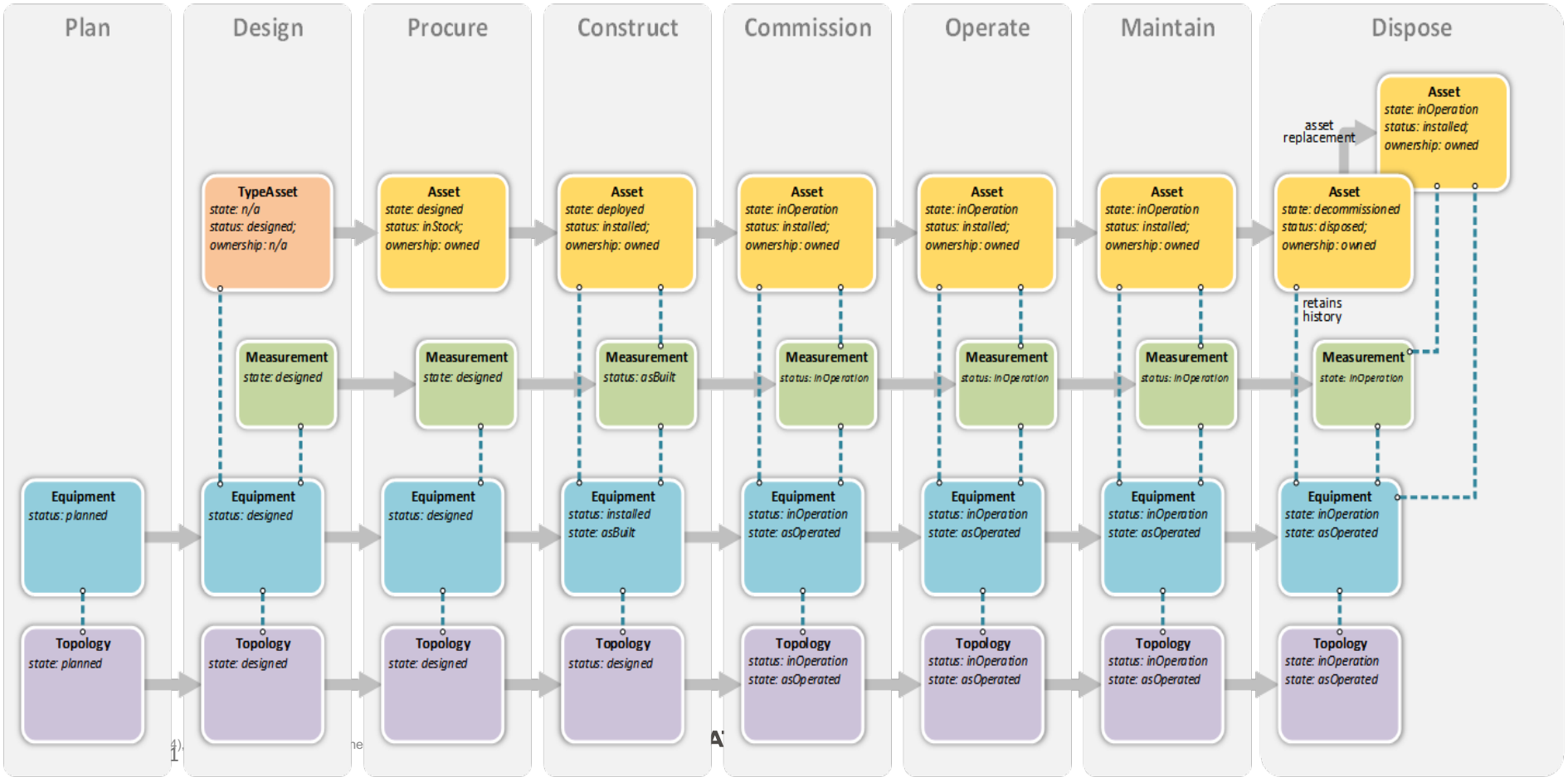
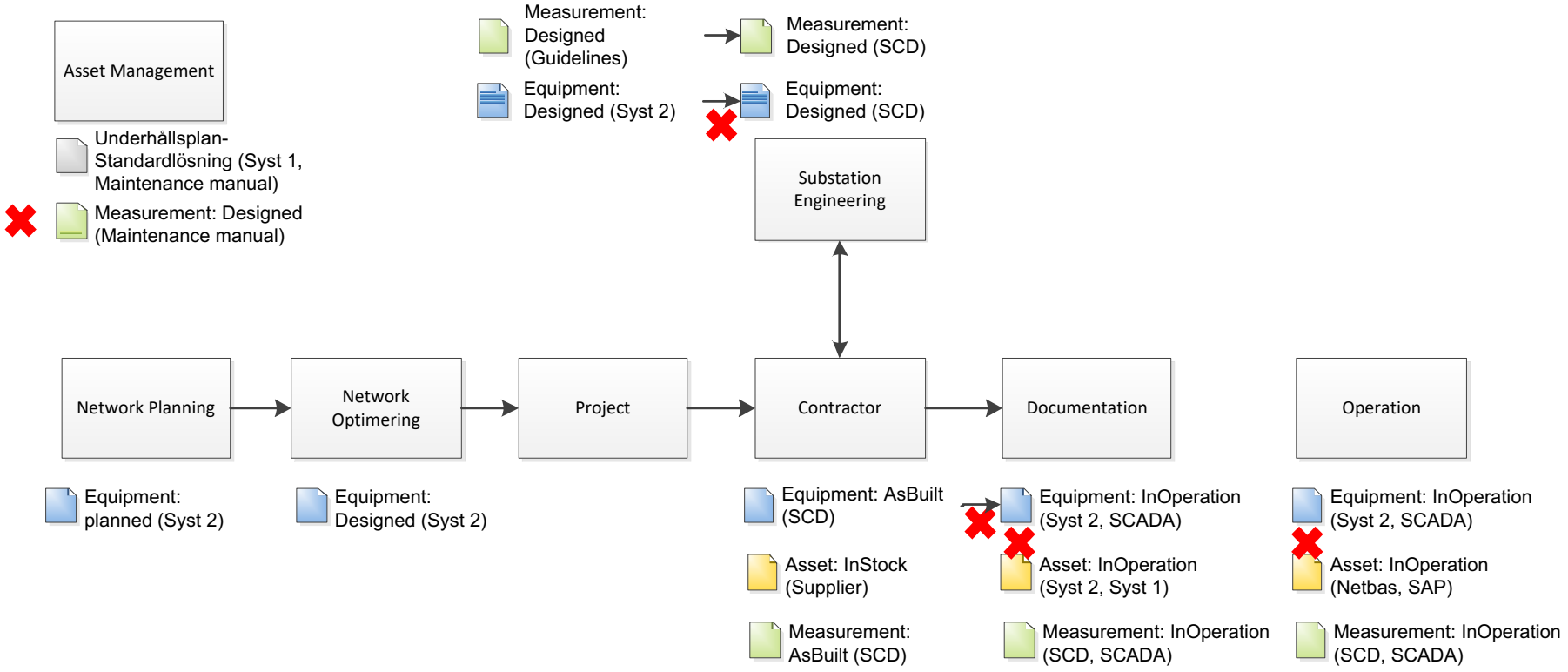
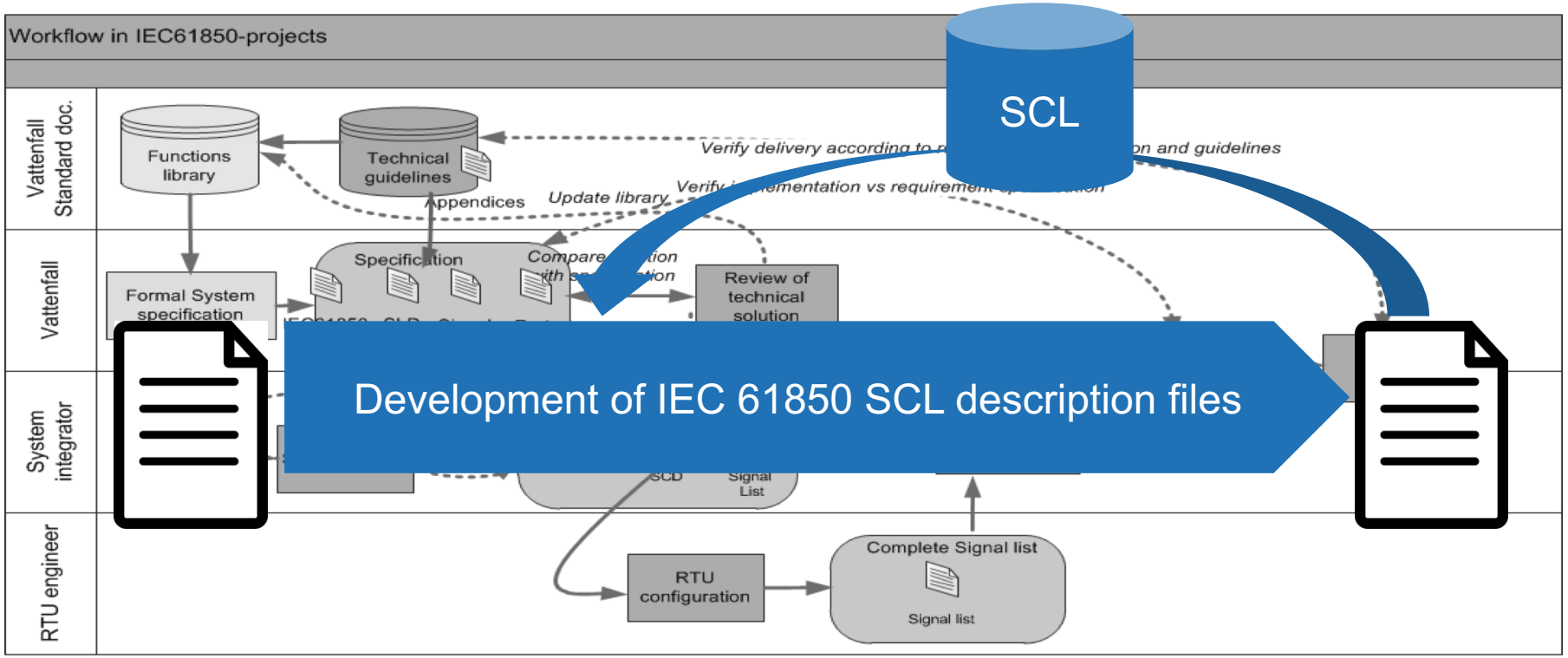
Asset Lifecycle



Simplified information asset lifecycle in reality



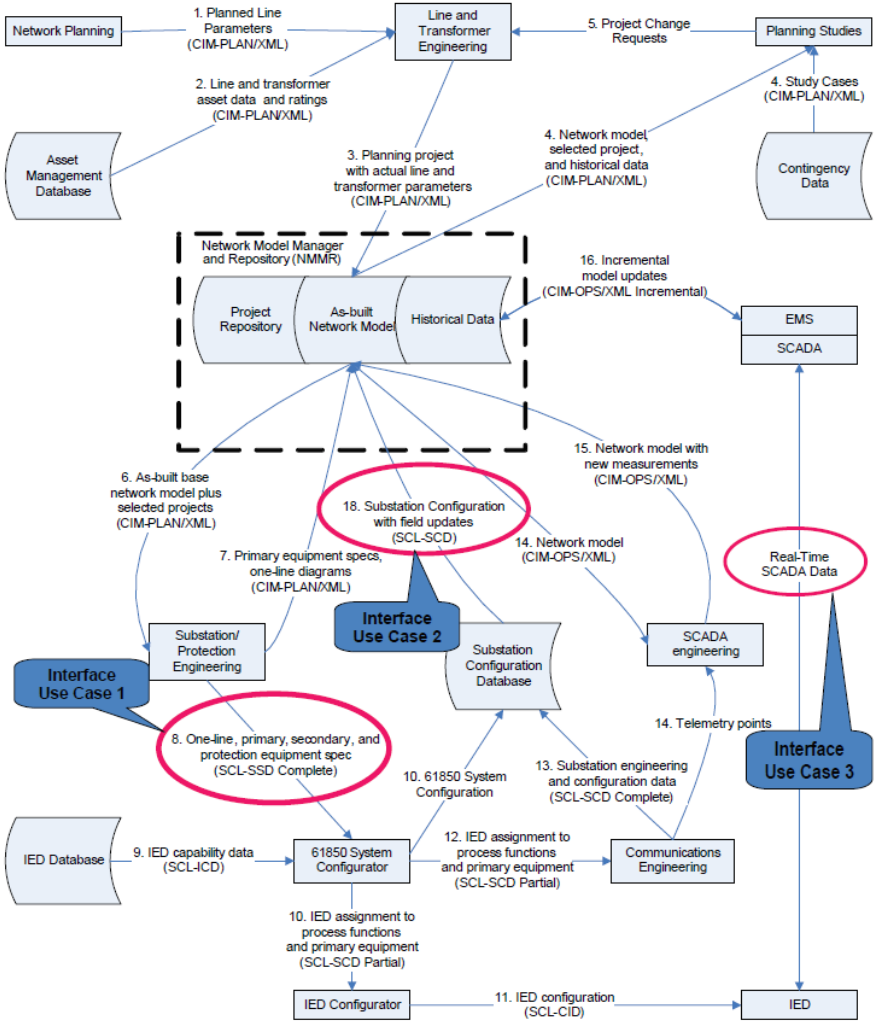
Existing process – the starting point



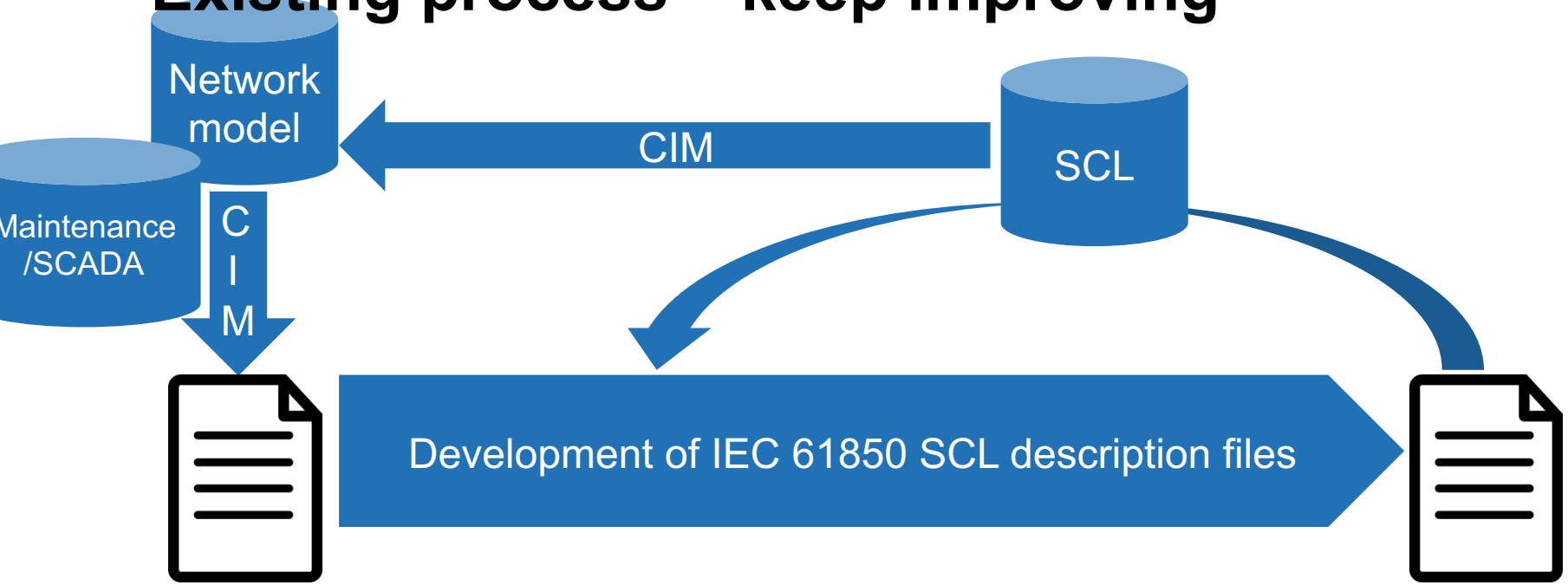
Recommendation from the pilot

- Take a step back and look at the broader perspective, where we capture the lifecycle of
  - Asset
  - Equipment
  - Measurement

- Understand where the information is created, updated and used in our systems and processes
- Take inspiration of the 61850/CIM harmonisation document



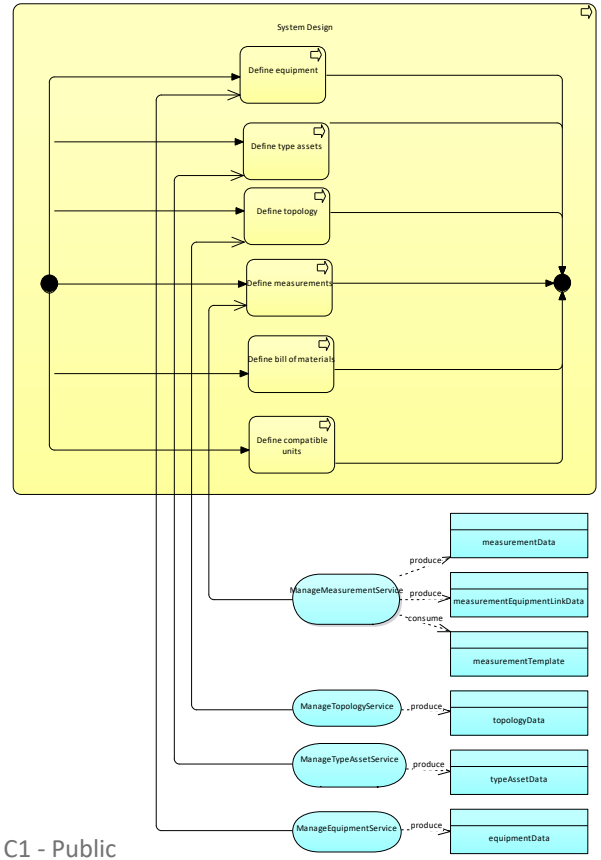
Existing process – keep improving

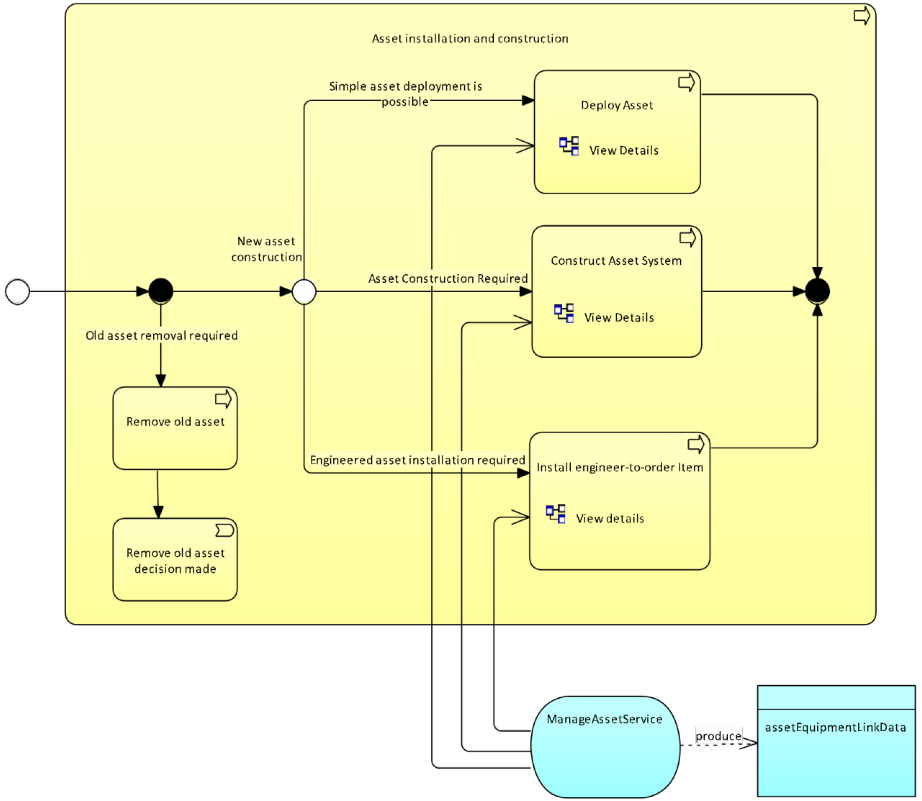


Closing the loop from planning to as-is!

Presented at IEC61850 Global 2018

Connecting processes with services to keep information up to date





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Preparing the business case for ESBs-CIM integration in terms of its impact on lifecycle management

Current Challenges

- Ongoing digitalization and automation affect Vattenfall Eldistribution
- Administrative and technical IT are gradually, and over time increasingly, merged and interlinked.
- At present Vattenfall Eldistribution has approx. 170 integration flows. This is expected to increase with another 25-50 in the near future
- The development portfolio contains more than 25 small and large projects that include extensive exchange of information and system integrations
- Risk of substantially higher integration costs and increased complexity
- Demand for improved information management and increased ability to integrate technical IT systems

Benefits of CIM across Projects and Programs

- Standardized flows make it **easier to establish and change** technical systems and IT systems. **Reduces complexity**, both in projects and in the organization.
- Supports **easier integration** between systems and creates a **platform for big data analytics**. Establishes common data language across applications and systems.
- **Improved efficiency for information exchange** and interfaces between technical IT systems and central IT systems.
- Facilitates **increased exchange** of information between technical systems and IT systems.
- Supports **easier access** to information/data for decision support and tracing.
- **Improved reliability. Reduced maintenance** costs.
- **Long term management** of value creating information.
- **Reduced costs for growth**. **Simplifies the addition** of more applications and/or systems. Standards (reference models) speed up and increases the long term improvement and development work.

Use of CIM: 3 Avenues for Improvement

ESB

CIM supports and simplifies ESB development and implementation.

Lowers costs

Reduces personnel

Increased system availability due to lower complexity and faster problem resolution.

MESSAGING

Standards based messaging simplifies interface creation between entities, reducing development and testing time for both sides of the interface.

Accelerates and simplifies changes

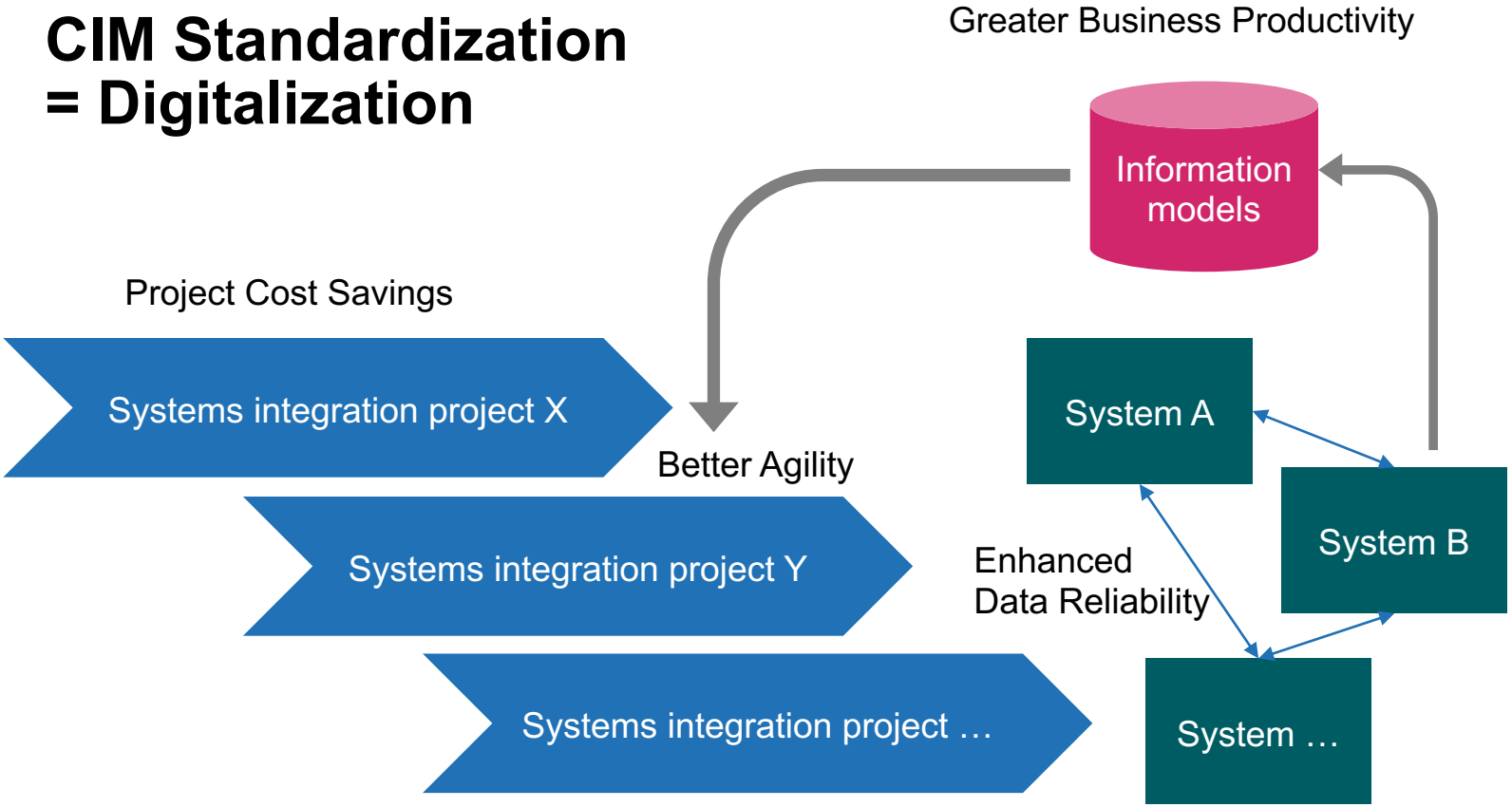
Makes interfacing with new partners/vendors more cost effective.

INFORMATION MODELING

CIM could be used to satisfy company information modeling effort. It would:

- Greatly simplify development of the information model.
- Significantly improve understanding and comprehension of the model: Partners and vendors already familiar with CIM will be speaking the same language.
- Improve usage of the model: Stakeholders throughout the enterprise will be more likely to accept and employ a model based on an industry standard.

CIM Standardization = Digitalization



Estimated* benefits of CIM during project life cycle

Makes requirements elicitation easier. Lists functions and commonly mapped data to choose from.
Could save 1-2 months.

Helps to direct product owners to proven integration methods. With CIM, decisions on functions, messages to be communicated, data elements, transmission period and security are already made.
Could typically save up to 1 month per interface.

Standards based messaging simplifies interface creation, reducing development for both sides of the interface. Already developed CIM classes could be employed instead of starting from scratch. Customer interface development requires development of WDSLs and xsd's which are often already available in CIM.
Could save up to 40 man hours.

With a CIM based interface, test cases are often available, and sometimes even test harnesses. If not, they can be created once and reused with minor updates.
Could save 1-2 months.

Training testers on new interfaces could take 16-40 man hours (per person) depending on the complexity. This time is saved with CIM standard interfaces

* Estimates are still to be verified

Estimated benefits of CIM during project life cycle

3rd parties often require significant training and support to understand the interface(s) and integrate them with their systems(s). CIM standardized interfaces reduces these costs.

Standardized integration means readily available documentation that requires fewer updates and less time to manage.

Network Status

- Reduced Support Costs
- Lower complexity and faster problem resolution
- Higher System availability
- Less time and resources spent on root cause analysis
- Proven and tested solution results in faster performance

Reduced training and support costs.

Interface specific training and support needed should be reduced over time by about 30%.

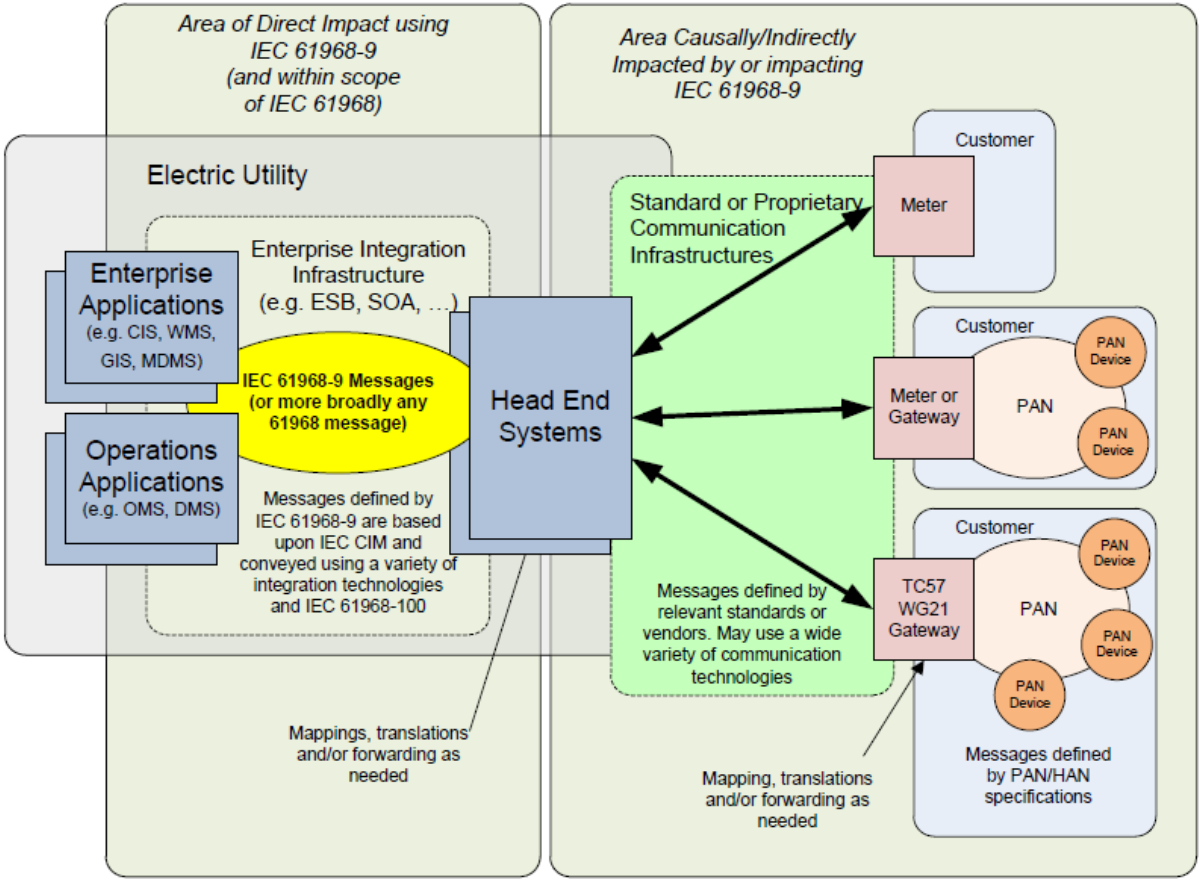
Accelerates and simplifies change management

Low maintenance as changes to CIM are infrequent and backward compatible.

Reduced documentation costs

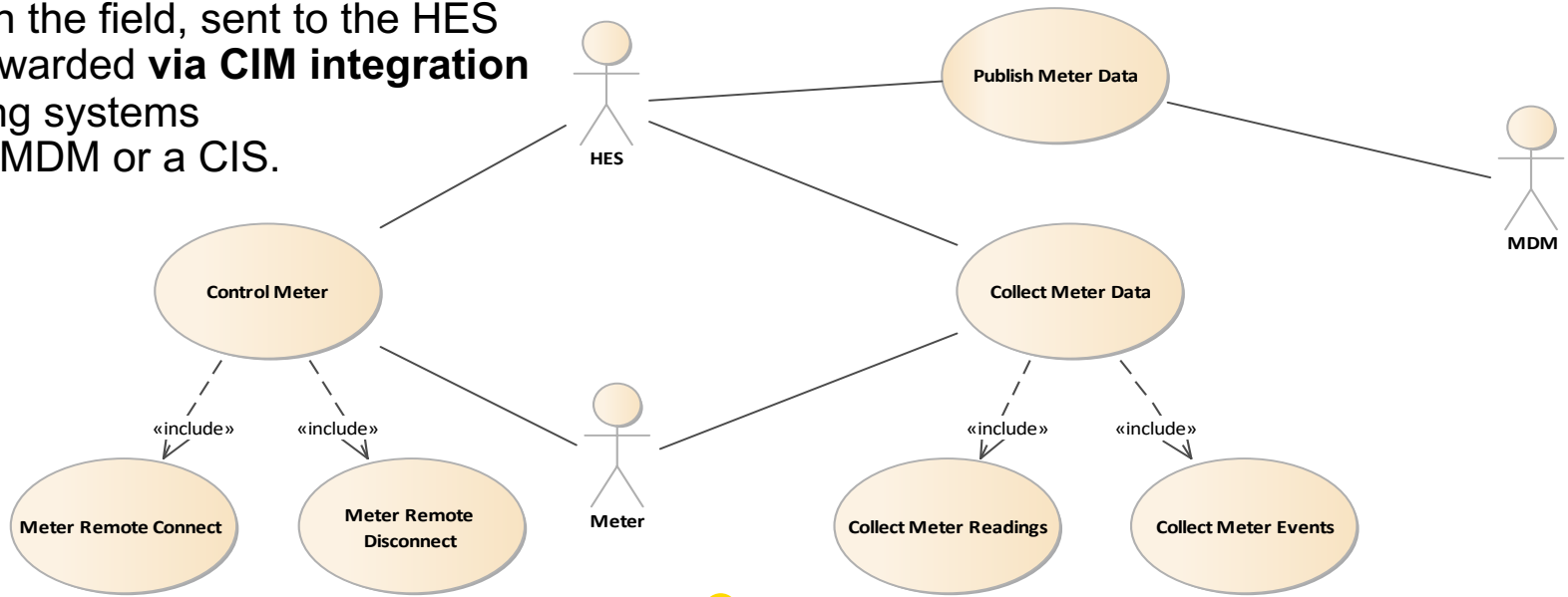
Example: Overview of planned CIM AMR Integration

CIM is identified in Yellow



Impacted AMR Information Flows

- As **Events** occur on the meters in the field, the data is gathered by the HES and forwarded to other systems **via CIM** which have subscribed to these events, such as the MDM.
- **Power Connect/Disconnect controls** are initiated from CIS or MDM that **uses CIM to interface** to the HES, which sends controls to the meters and forwards the responses back.
- **Meter Readings** are gathered from the meters in the field, sent to the HES and then forwarded **via CIM integration** to subscribing systems such as the MDM or a CIS.



AMR CIM Integration drives Lower Costs Across the Board

- **Expected to lower the Average cost per interface throughout the entire development life cycle – to 1/5 the cost of custom interfaces**
  - Savings from Optimized Information
    - Reduced development and operational costs
  - Fewer Resources Required
  - Productivity Gains
- **Simplifies and accelerates future integrations – Estimated to save up to 12 Man Months**
  - Provides a common model and language
  - Provides readily available integration solutions

Impacts on Future Integrations

Future systems or other stakeholders – how can CIM help?

- CIM as a Reference Model
  - Better support future integrations for AMR
  - Easier to link information in AMR-project to other systems or export data
- If more integration flows needed – how does CIM help?
  - Stakeholders throughout the enterprise will be more likely to accept and employ a model based on an industry standard.
  - Integration flows and data exchanges are already developed and can be readily implemented.

For Enterprise Service Bus (ESB) projects, having a common model and readily available integration solutions are critical to reducing complexity, and reducing development and implementation costs.

Benefits to be verified

- Develop and implement an evaluation process for CIM's effectiveness within Vattenfall Eldistribution AMR-project
- Evaluation will focus on proving out assertions from the Business Case
- Each component of the development life cycle will be reviewed against the expected benefits as outlined in this presentation.
- Evaluation will consist of a qualitative and quantitative analysis of data gathered for each phase of the development cycle.

The way forward

Implementation Plan

- Developing Implementation Plans for CIM standardization on current key projects
- Implementation Guide in development.

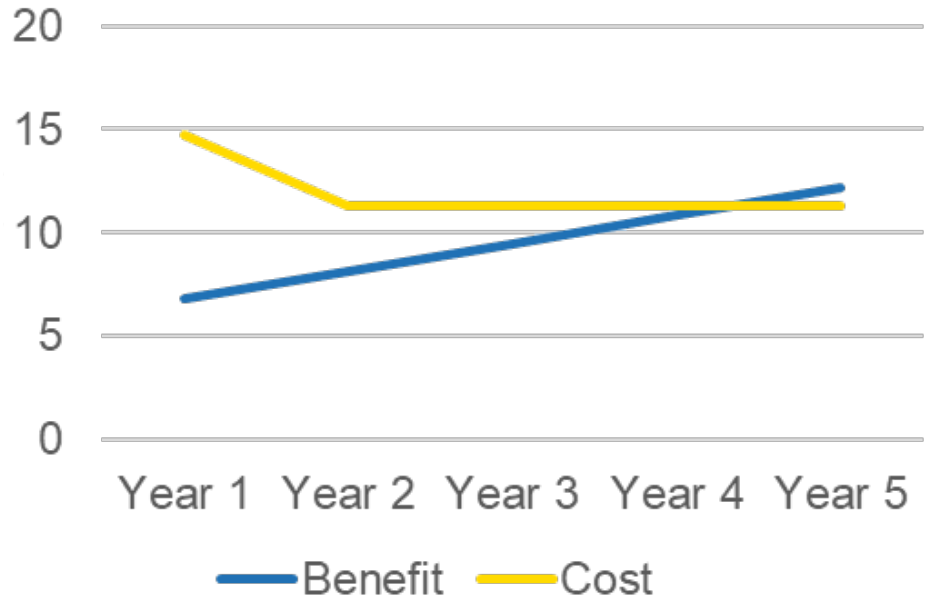
Roadmap

- Develop Roadmap for long term CIM standards expansion and usage.

Management (Part of Roadmap)

- Create instrumentation for monitoring value added benefits, cost savings, and performance.

Benefits accumulated project by project vs Implementation costs



Thank You