CIM for Condition Based Maintenance (CBM)

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CBM Business Case

Majority of utilities still rely on time-based maintenance.

- Maintenance tasks are scheduled in advance at predetermined time intervals.
- Augmented by some CBM tools – oil sampling & DGA, infrared survey, etc.
- Concerning results may trigger preventive intervention.
- Notwithstanding this, the prevailing paradigm is predominantly time-based.

Utilities need to do more.

- Growing demand.
- The Smart Grid demands more information, and not just from the AMI world.
- Lower tolerance for outages.
- Higher demands from regulators.
- Fleets are getting very old.
- Media is watching more than ever.
- Operational demands require knowing the systems limits.

The *New* CBM / Asset Management

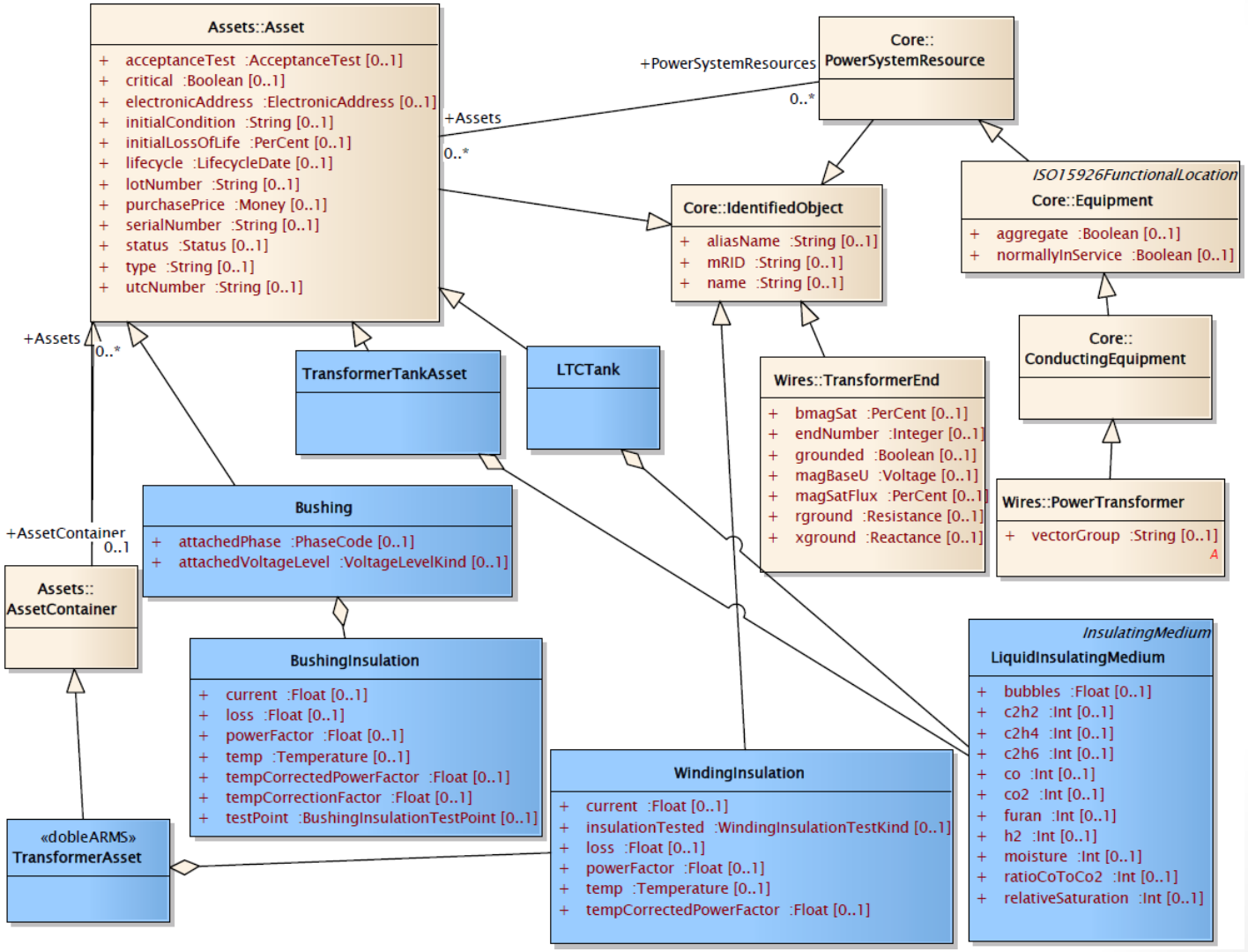
- A new Condition Based Maintenance (CBM) paradigm has emerged from these concerns, one that leverages modern sensing, communication, data systems, and computing technologies to:
  - Perform continuous field monitoring of equipment health indicators.
  - Integrate operational, maintenance, and health data from various sources
  - Use all the data available pertaining to asset health – operational, online monitoring, lab, inspections, test...
  - Process the integrated data to assess the condition of the equipment and its components.
  - Utilize the conclusions of assessment for predictive maintenance & strategic management of assets.

- ISO 55000, in-development standard on “Asset Management” pertinent from a conceptual standpoint.

The OT Divide

- We've heard about the IT-OT divide (CIM helps).
- But there is a gulf within OT – there is a ton of operations data with bearing on asset health that Asset Engineers don't have access to.
  - For instance dynamic loading data is used in IEEE C57.91 to calculate loss of life.
  - Transformer loss of life is a foundation for CBM.
  - But much of the data in operations data systems & not accessible from maintenance data systems.
- Furthermore, many objects essential to maintenance aren't well represented – e.g., insulation.
  - Insulation failure is the leading cause of transformer failure.
- Need CIM support to bridge the OT divide and enable integration of operations and maintenance data for a more comprehensive picture of asset health.

Transformers



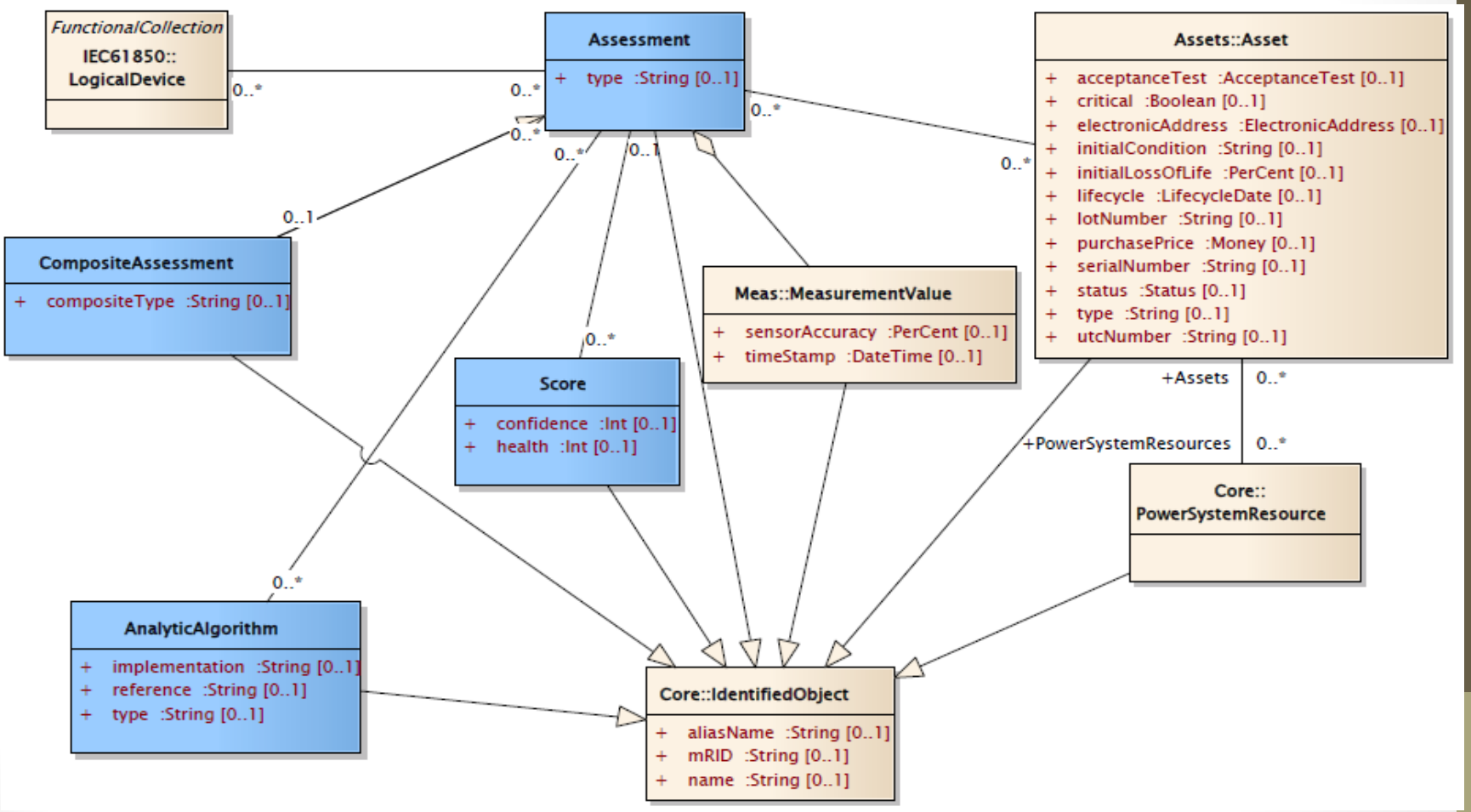
CBM Best Practices

- Utilities want to determine CBM best practices.
  - What asset attributes should be measured?
  - What assessments should be made?
  - What actions should be taken and when?

- Utilities want to share CBM best practices.

- Need models that describe assessments and actions.
  - For instance, transformers @ Utility A run “wet” and they are worried about bubble formation risk.
  - Utility B has figured out an effective regime for tracking, assessing, and preventing bubble formation.
  - Need a standardized way of exchanging such CBM best practices.

Assessments and Algorithms



CIM for CBM

- Identification of systems that would want to exchange data.
  - Asset loading information from operations systems to asset management system.
  - Asset health information from asset management system to operations systems.
  - Test and inspection results from relevant systems.

- Better description of high value assets from asset management perspective.
  - Transformers & breakers.
  - Other assets?

- Means of describing assessments and actions.

Conclusions

- CBM must evolve.
  - Great interest from utilities across the world.
  - Well-established need for standards support.

- Affects WG13 and WG14 models.
  - Many of the concepts extend the WG14 asset models.
  - Others extend the WG13 models.
  - Use 61850-harmonized models for IEDs and measurements.

- Need collaborative work across the CIM working groups (WG13-WG14) and with the user community at large.