AIOTI – Semantic Modelling of Digital Twins
Session 8

introduction
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Thanks to IEC Experts

International Electrotechnical Commission

IEC System Committee Smart Energy :

Grid management is a system of systems

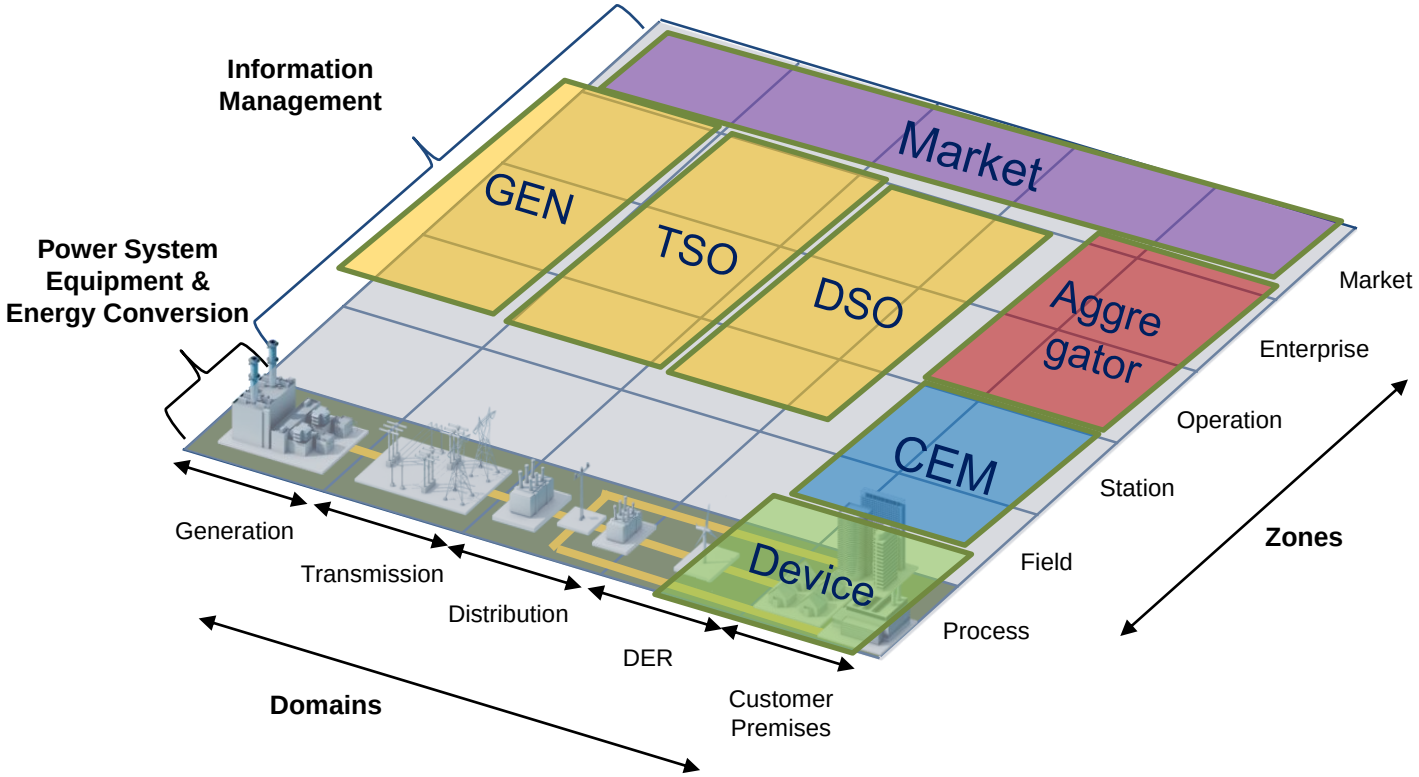
Market systems

Transmission and Distribution grid operators

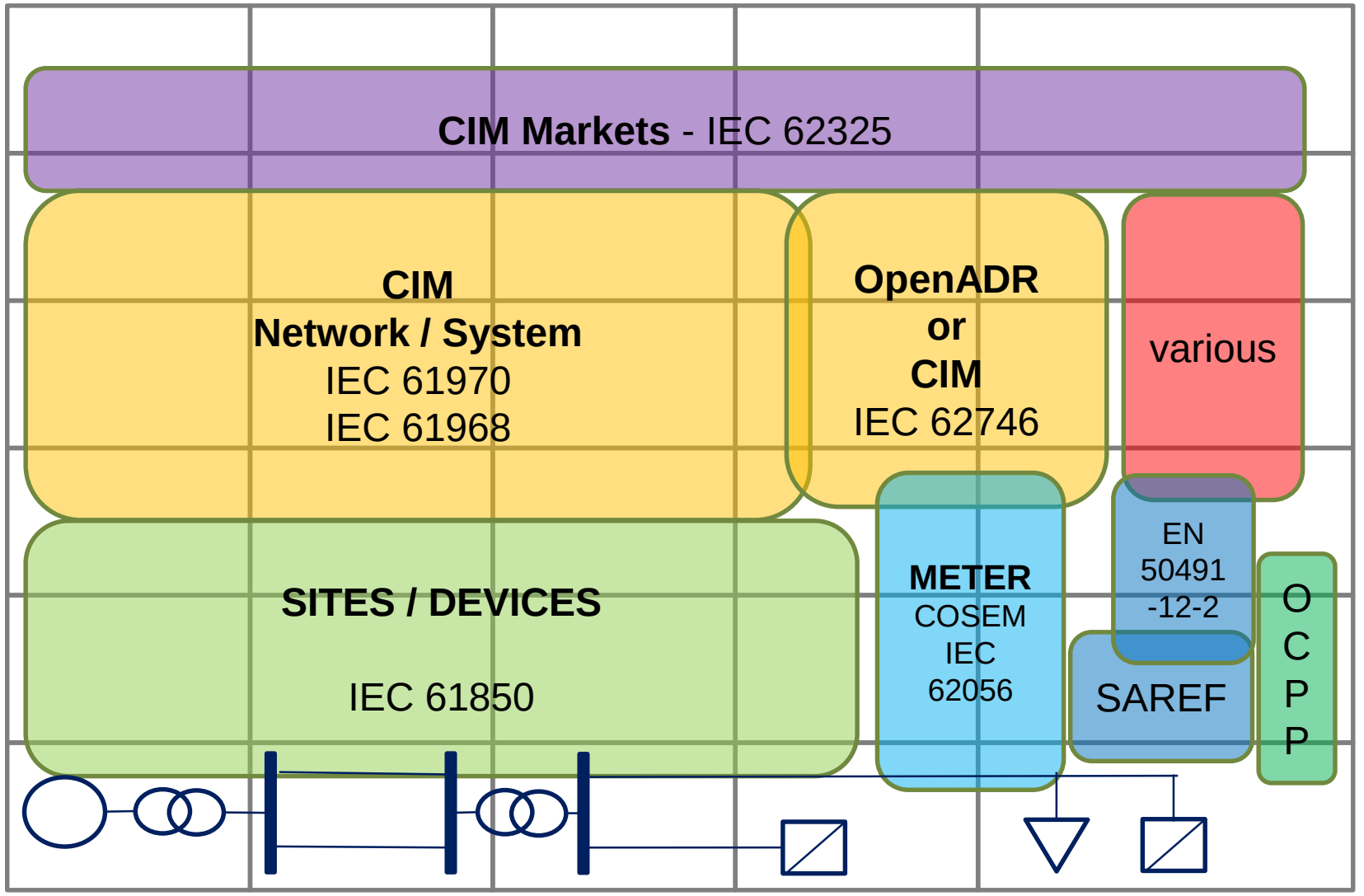
Aggregators and flexibility service providers (VPP, DERMS)

Customer site energy management systems (CEM)

Physical devices with local controllers



Smart Energy principle data models



D.Twin thematic groups in IEC Smart Energy – WG3

TG1 Data Harmonisation

Drafting the TG1 report

- Relation between Digital Twins and data models
  - Incl. communication data models vs descriptive data models
- Inventory of data models
  - Approach and categorization, incl. mapping to SGAM
  - Current version of the inventory
  - Inventory table exploitation
    - Publication and maintenance
    - Derive an ontology from the collected information
- Identified gaps: data models, mappings, alignments

N° TC	Nom TC	Publishes data models?
TC 3	Documentation, graphical symbols and representations of technical information	Yes
TC 8	System aspects of electrical energy supply	?
TC 11	Overhead lines	*Yes ?*
TC 13	Electrical energy measurement and control	Yes
TC 14	Power transformers	*No ?*
TC 20	Electric cables	*No ?*
TC 21	Secondary cells and batteries	*No*
TC 57	Power systems management and associated information exchange	Yes
TC 123	Management of network assets in power systems	Yes
ISO/IEC JTC 1/SC 41	Internet of Things and Digital Twin	No
ISO/TC 59/SC 13	Organization and digitization of information about buildings and civil engineering works, including building information modelling (BIM)	Yes
ETSI TC DATA	Data solutions and related interoperability services	Yes

TG4 Governance of Data Models

DTw workshop findings

- Several types of digital twin were identified in the workshop
  - They don't share the same foundations (data definition, data model, tools)
  - They are used in different lifecycle moments (operation, maintenance , etc..)
  - Their construction methods and data are ad-hoc
  - In product-related TCs, data are mainly related to equipment (physical elements) while the need can be functional (user view)
  - Data models are different and not necessarily compliant with ISO/IEC Directive 1 annex SK
  - Data models are different and not necessarily aligned between SDBs' or between TCs (IEC 61850, CIM, BIM, IEC CDD, AAS, etc..)
  - There is almost no data re-use from one TC to another - awareness of what's available and leading to data incompatibility
- TCs are not producing systematically the data needed for DTw applications
  - There is no common process or approach to deal with DTw applications
  - There is not systematic data production by the product TCs for later reuse in DTw
  - Tools to manage data are different in the TCs and not interoperable
- There is no formal shared governance on the data lifecycle for TCs producing data (early adopters)
- New DTw challenges related to horizontal matters such as environment / CO2 / SF6

Thematic group	Challenge	Rationale
Data harmonization	• Terminology • Definitions and concepts • Semantic • lifecycle data & function alignment (design / operation / maintenance / end-of-life / recovery ...) • Horizontal data definition (environment / insulation/ dependability) • Alignment of properties between product TC and TC 57 digital representation	• Avoid model translations • Reach same comprehension of information • Model reuse and flow of information during lifecycle phases
Tools	• Not homogeneous choice among TCs • Not compatible to each other • Too long learning curve	• Reduce complexity of use • Avoid in-house developments
Education & awareness (de-silo)	• Available models / tools • Data model education for TCs • Missing templates • Guidance on methodologies and roles	• Make it broadly available and easy to use by our TCs • Point the right path to those starting their journey
Governance	• Governance of available data models (IEV, CDD, etc.) • Missing objectives to produce basic data from product TCs to be re-used by others TC • Scattered and not communicated governance	Identify and recommend a governance model to create stability