



**Presentation of IEC 61400-25 work:
"A generic communication solution for Wind Power Plants"**

**PT26 Seminar for JWPA – Oct 27th, 2009
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Why a standard for wind power?

Objectives for the IEC 61400-25:

- Provide a uniform communication platform for monitoring and control of wind power plants
- Perform a way to minimize the communication barriers arising from the wide variety of proprietary protocols, data labels, data semantics etc.
- Offering the possibility to manage different wind power plants independently of the vendor specific SCADA systems
- Enable components from various vendors to easily communicate with other subsystems, at any location, at any time
- Applying modern software object-oriented software technology, data structures, enabling more efficient handling and presentation of information from wind power plants
- Maximize scalability, connectivity, and interoperability in order to **reduce total cost of owner ship or cost of energy**





Project Team – PT25

Companies behind the IEC61400-25 standard series:

- **DONG (Energi E2), Denmark**
- **EnerNex Corporation, USA**
- **General Electric Energy, USA**
- **Hydro Tasmania, Australia**
- **Ingeteam, Spain**
- **KC Associates, USA**
- **n@tcon7 – rep. ENERCON, NORDEX, REpower Systems AG, Germany**
- **Schwarz Consulting Company, Germany**
- **Siemens Wind Power A/S, Denmark**
- **Statkraft, Norway**
- **Vattenfall, Sweden**
- **Vestas Wind Systems A/S, Denmark**
- **Q-Technology, Denmark – rep. Gamesa, Spain**





IEC 61400-25 Scope

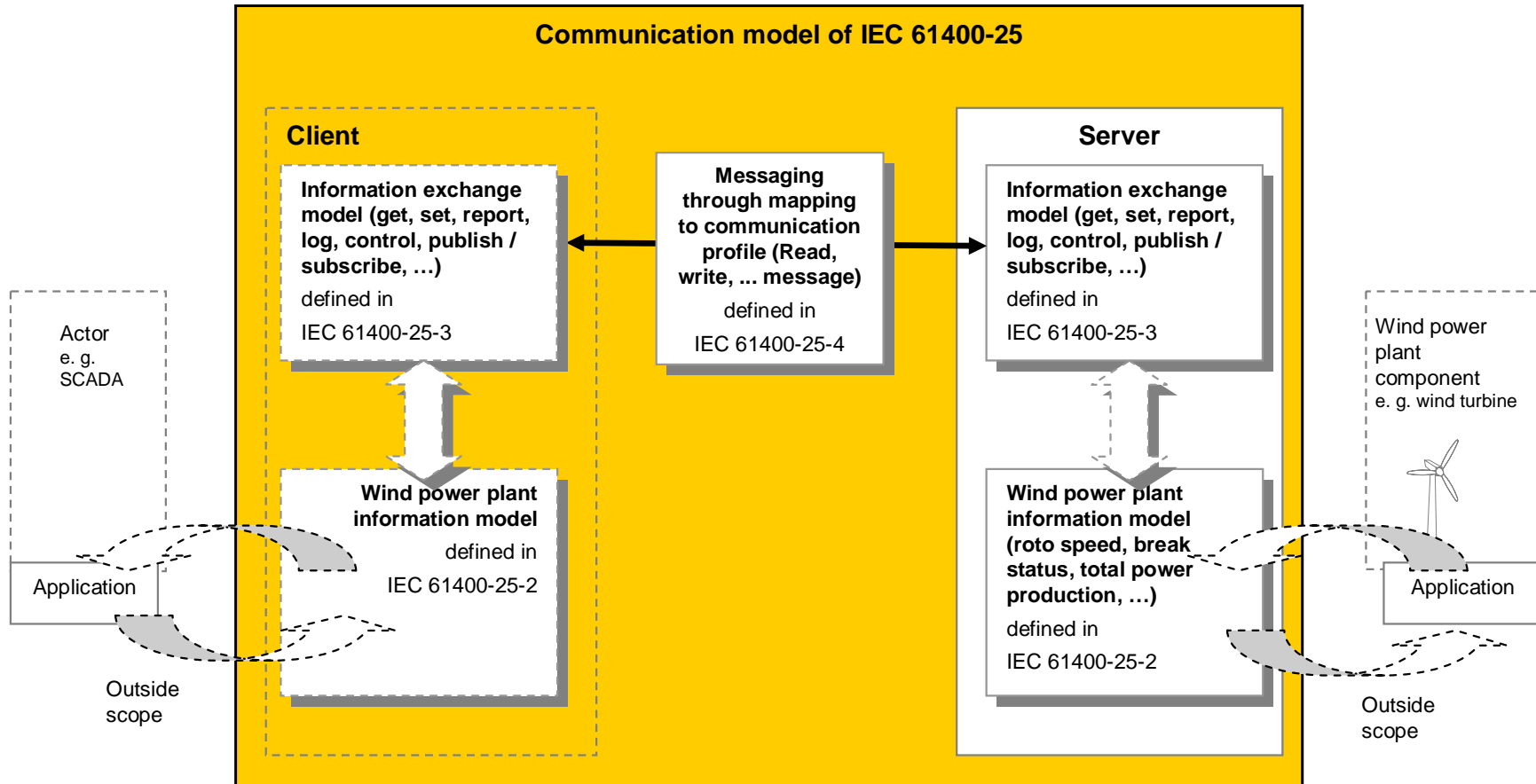
The scope of the IEC 61400-25 standard are as follows:

- Addressing all communication means between **wind power plant components** such as wind turbines and **actors** such as SCADA systems and dispatch centres
- Applies to any wind power plant operational concept, i.e., both in individual and integrated operations
- The application area of IEC 61400-25 covers all components required for the operation of wind power plants including the meteorological subsystem, the electrical subsystem and the wind power plant management system
- IEC 61400-25 defines how to
 - model the information
 - perform information exchange
 - map to specific communication protocols stacks
 - perform conformance testing
- The wind power plant specific information given in IEC 61400-25 is build on the common data classes specified in thee IEC 61850 series of standards
- The standard excludes a definition of how and where to implement the communication interface and thereby enable any topology to be applied





IEC 61400-25 Scope





IEC 61400-25-1 Objectives

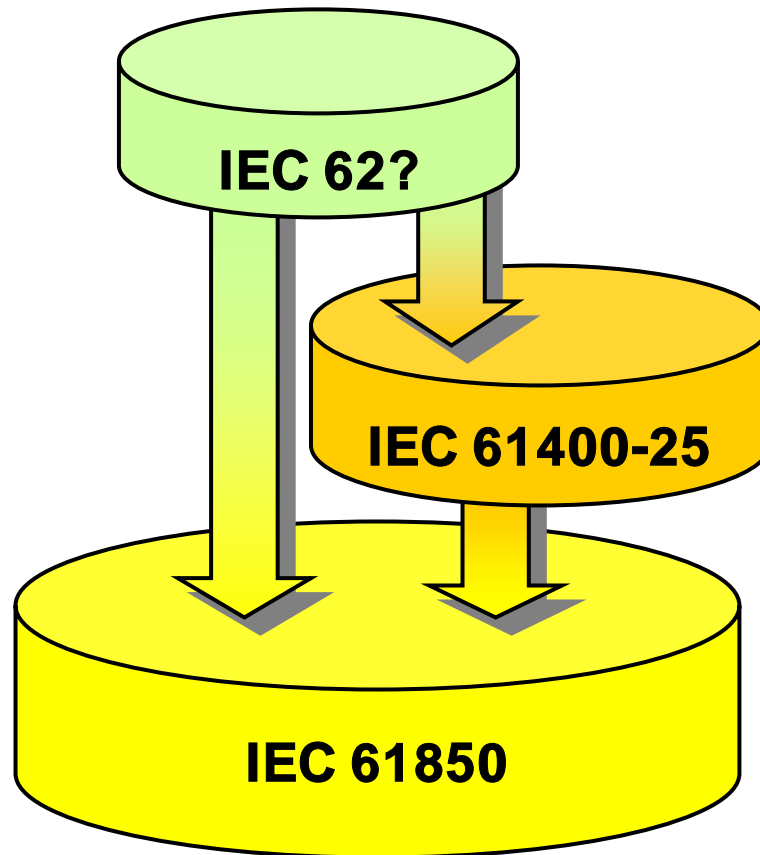
Part 25-1: Overall description of principles and models

- An introductory orientation - standard document complex in brief
- Customer requirements – what to implement for the wind power domain
- A modelling guide – how to make extensions





IEC 61400-25 Introduction – platform



**Hydro, Solar,
Fuel Cell, ...**

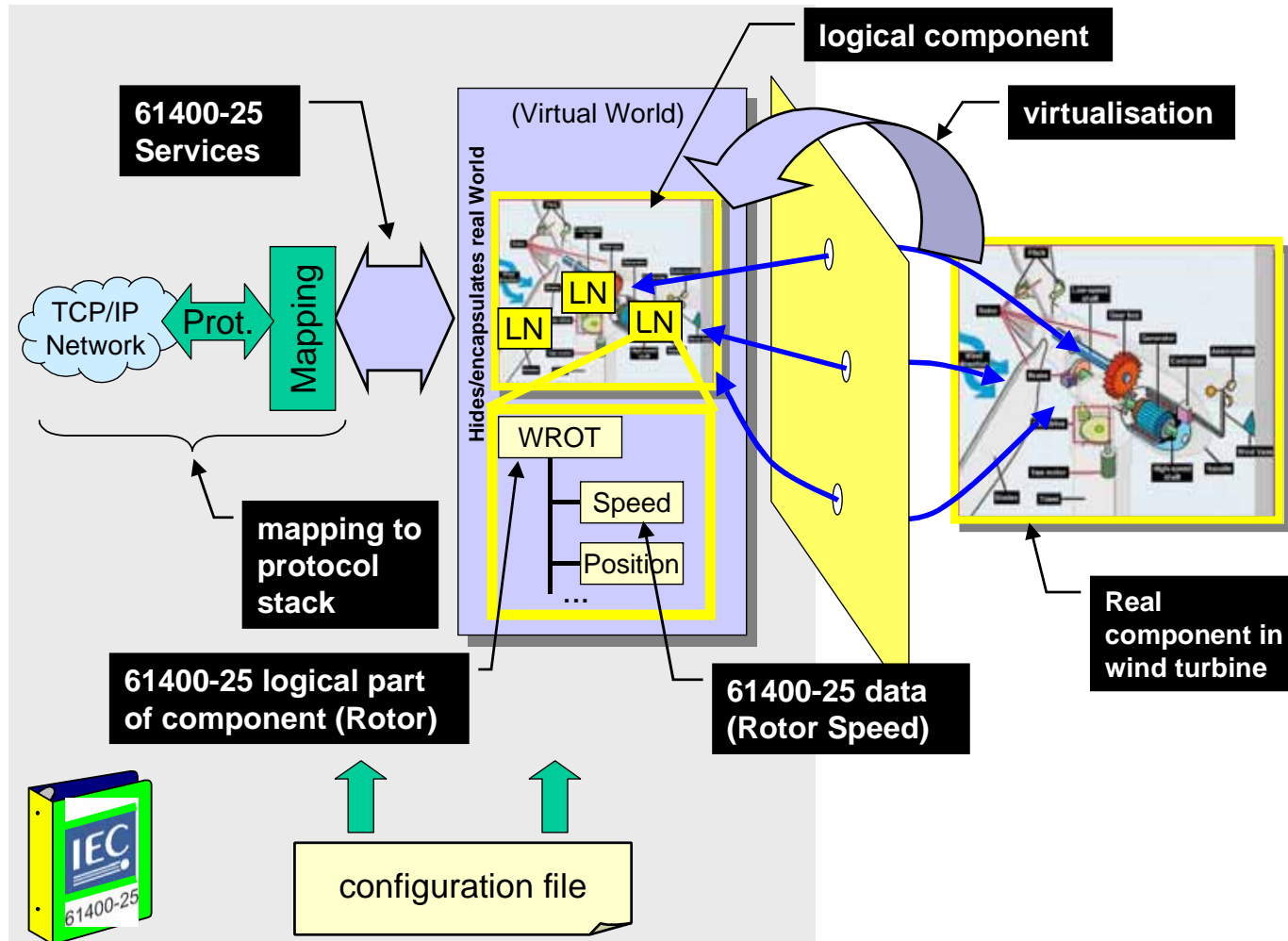
**Wind Power
2006 - ...**

**Substations (HV, MV),
SCADA, 1995 - 2003
Power Quality, 2006**



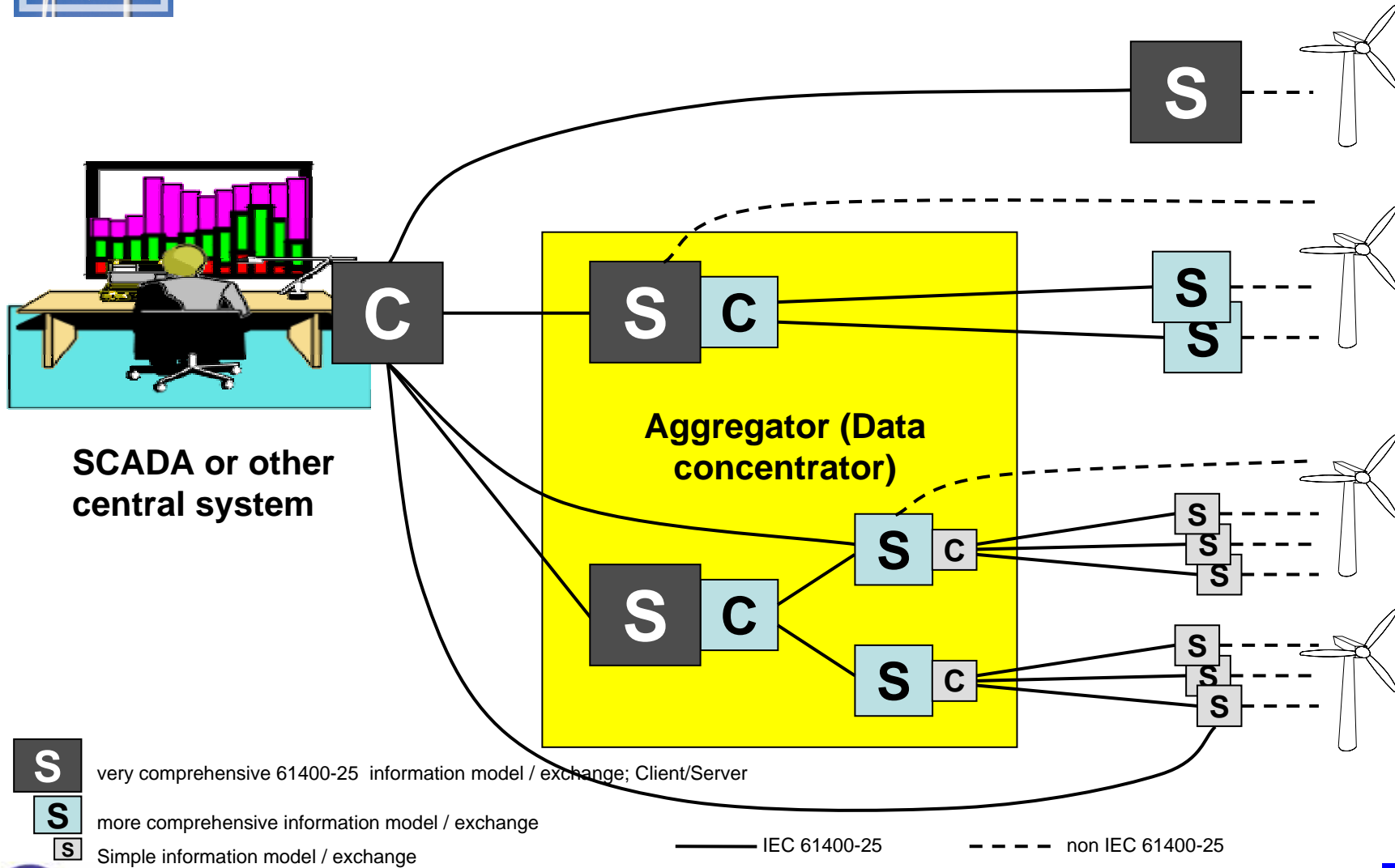


IEC 61400-25-1 Introduction - overview





IEC 61400-25-1 Introduction - topology

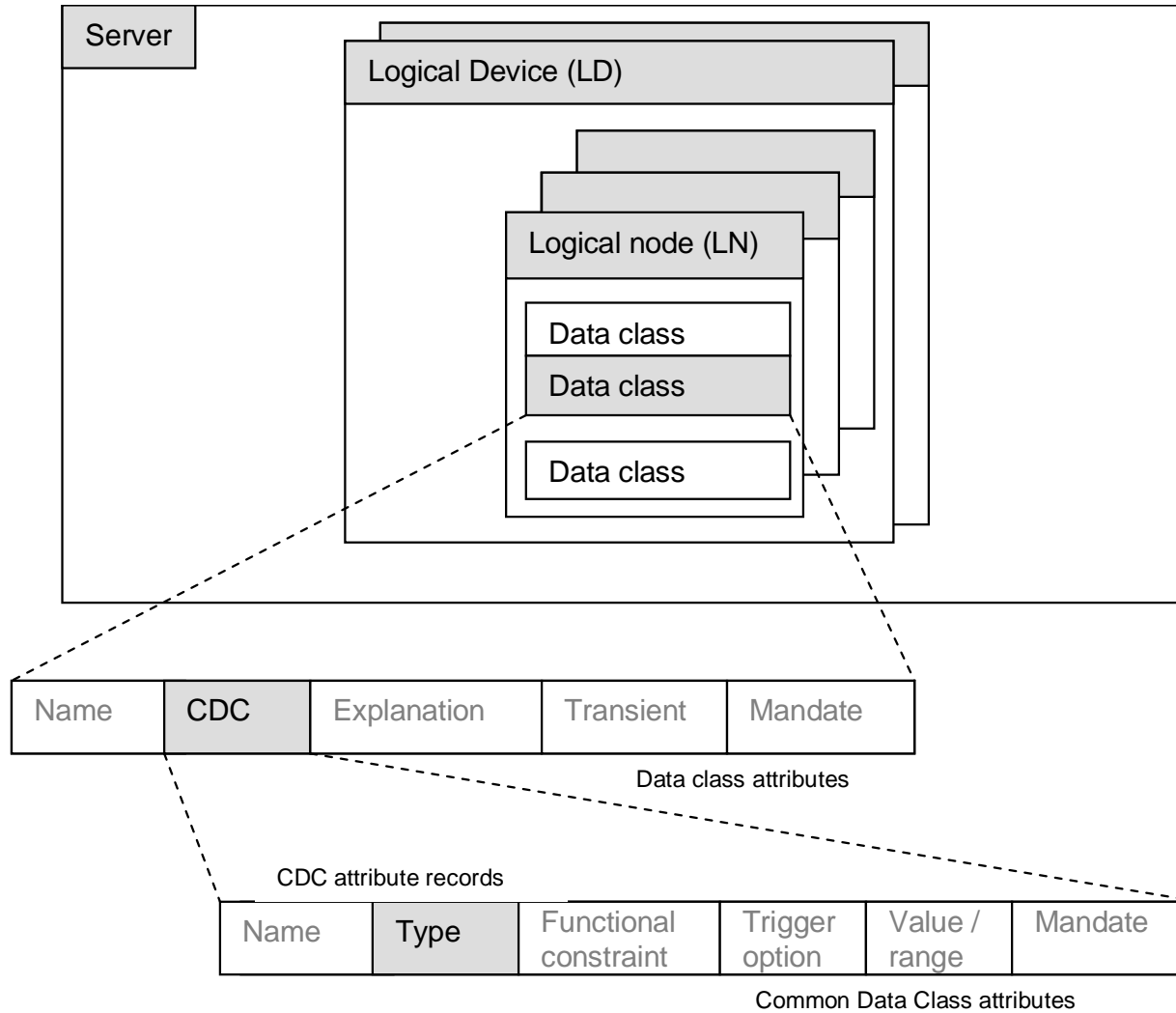


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IEC 61400-25-1 Introduction – modelling





IEC 61400-25-2 Objectives

Part 25-2: Information Models

- The wind power plant specific information, describes the common process data, meta-data (data about data, e. g. scale factor or engineering unit), and configuration data of a wind power plant
- Hierarchically structured information covering e.g. process information found in the rotor subsystem, generator, converter, grid connection etc. The data may be simple (value, timestamp, and quality) or more comprehensive incl. scale, description, short hand reference, statistical and historical information of processed values.
- All information of a wind power plant defined in the standard is name tagged – it defines a comprehensive name space. A concise meaning of each signal is given. The standardised wind power plant information can be easily extended by means of a name space extension rule

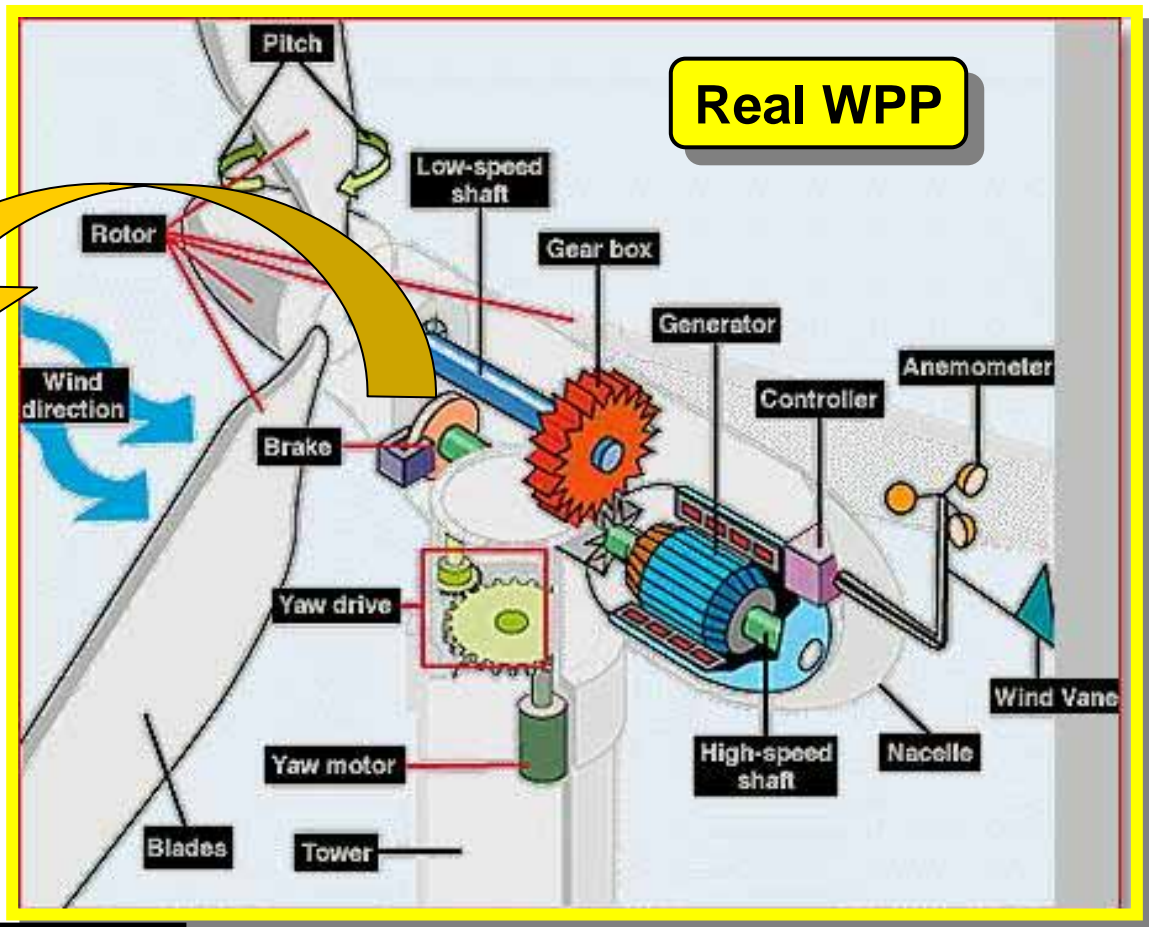




IEC 61400-25-2 Information Models

Data of wind power plant components

- Wind turbine
- Wind generator
- Nacelle
- Rotor
- Converter
- Yaw
- ...

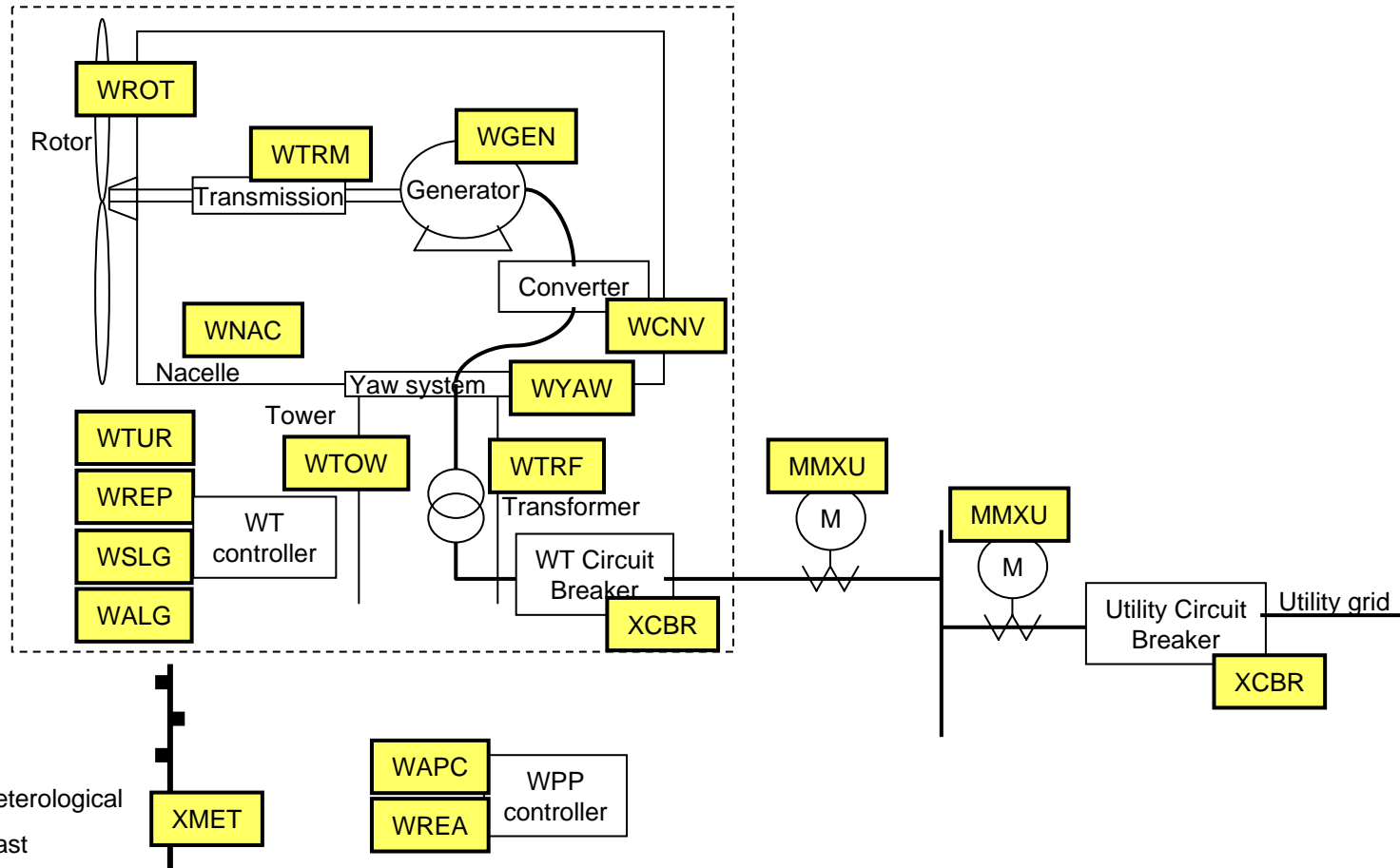


Information Models





IEC 61400-25-2 Information Models



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IEC 61400-25-2 Information Models

Table 2 – Wind Power Plant specific logical nodes

LN classes	Description	M/O
WTUR	Wind turbine general information	M
WMET	Wind power plant meteorological information	O
WAPC	Wind power plant active power control information	O
WRPC	Wind power plant reactive power control information	O

Table 3 – Wind Turbine specific logical nodes

LN classes	Description	M/O
WROT	Wind turbine rotor information	M
WTRM	Wind turbine transmission information	O
WGEN	Wind turbine generator information	M
WCNV	Wind turbine converter information	O
WTRF	Wind turbine transformer information	O
WNAC	Wind turbine nacelle information	M
WYAW	Wind turbine yawing information	M
WTOW	Wind turbine tower information	O
WALM	Wind turbine alarm information	M
WSLG	Wind turbine state log information	O
WALG	Wind turbine analogue log information	O
WREP	Wind turbine report information	O





IEC 61400-25-3 Objectives

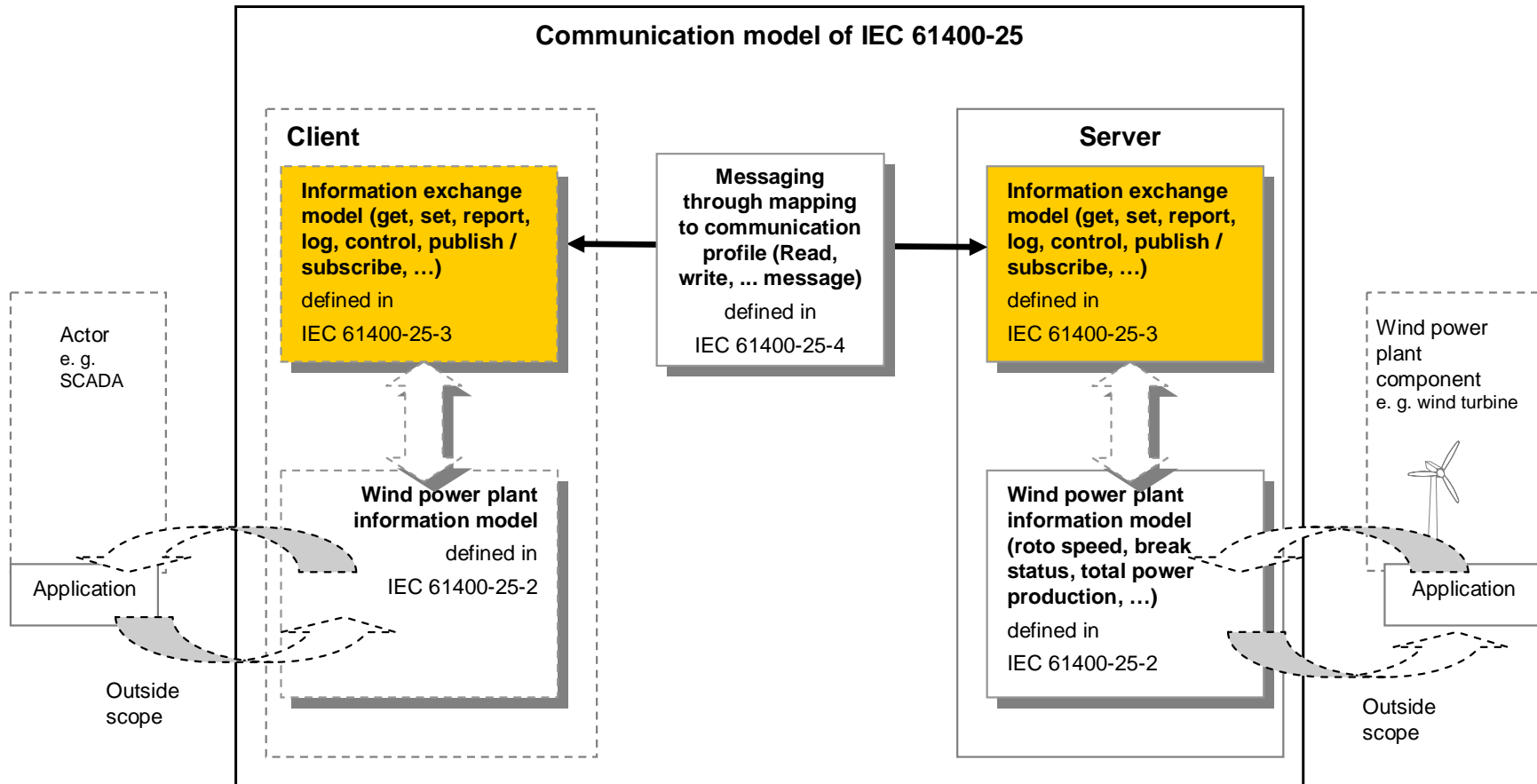
Part 25-3: Information Exchange Models

- All modelled and tagged data and meta-data can be exchanged by corresponding services
- Access to the meta-data (including configuration information with regard to the wind power plant information model and services and communication stacks) provides the so-called self-description of a device





IEC 61400-25-3 Information Exch. Models





IEC 61400-25-3 Information Exch. Models

Table 1 – Information exchange models

Functional Group	Information Exchange Model	Short Description	Information categories	Transfer Principles	ACSI Service models
Operational (see 7)	Authorisation (see 7.1)	Authentication and restriction of access to operational and management functions.	Short text messages	Data transfer on demand Command transfer	ASSOCIATION
	Control (see 7.2)	Control of operational devices.	Setpoints Commands	Command transfer Set point transfer	CONTROL
	Monitoring (see 7.3)	Monitoring of current data and change of data of operational devices.	Measured Data Processed data (Average Values, Min/Max) Status Alarms Events Timer Counter Setpoints Parameters Commands Time Series Data (i.e. Alarm/Event Log, Command Log, Setpoint Log) (Analogue Values, Binary Values)	Periodic data transfer (all data or only data that has changed since last transfer) Data transfer on demand Event driven data transfer (spontaneous)	LOGICAL-DEVICE LOGICAL-NODE DATA DATA-SET BUFFERED-REPORT-CONTROL UNBUFFERED-REPORT-CONTROL
	Reporting and logging (see 7.3)	Trigger controlled continuous scanning and recording of values and events.	Histories (Logs) Reports Statistics Curves Trends Events		LOG LOG-CONTROL (see 9 for de-





IEC 61400-25-4 Objectives

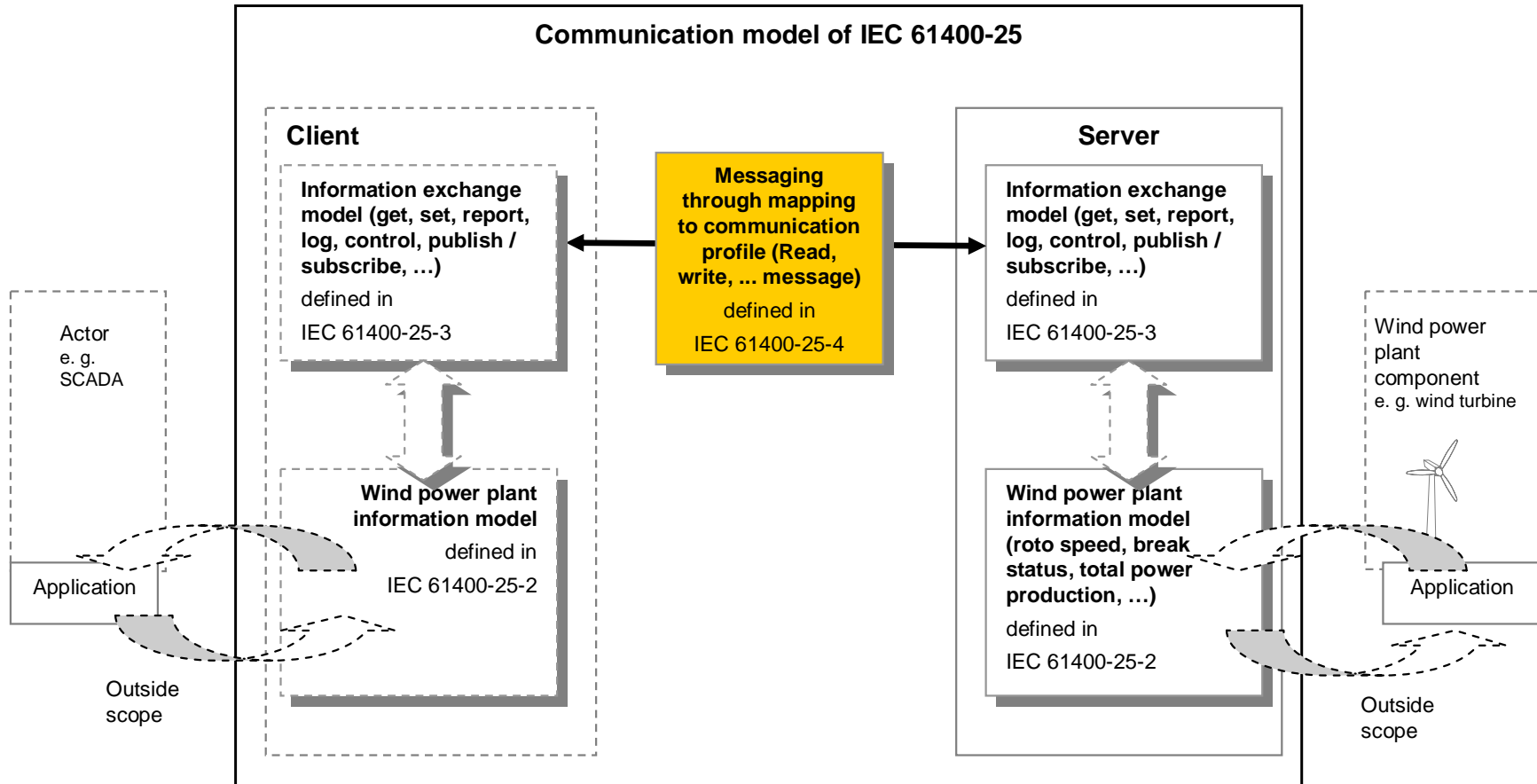
Part 25-4: Mapping to communication profiles

- Providing a protocol stack to carry the exchanged values from the modelled information in a server – client based communication
- Mapping to five optional communication profiles:
 - SOAP-based Web Services (primary Western Europe + North America)
 - OPC/XML-DA (primary Western Europe)
 - IEC 61850-8-1 MMS (primary US, Sweden and Germany)
 - IEC 60870-5-104 (primary Norway)
 - DNP3 (primary North America, Australia and Asia)





IEC 61400-25-4 Mapping to Com. Profiles





IEC 61400-25-4 Mapping to Com. Profiles

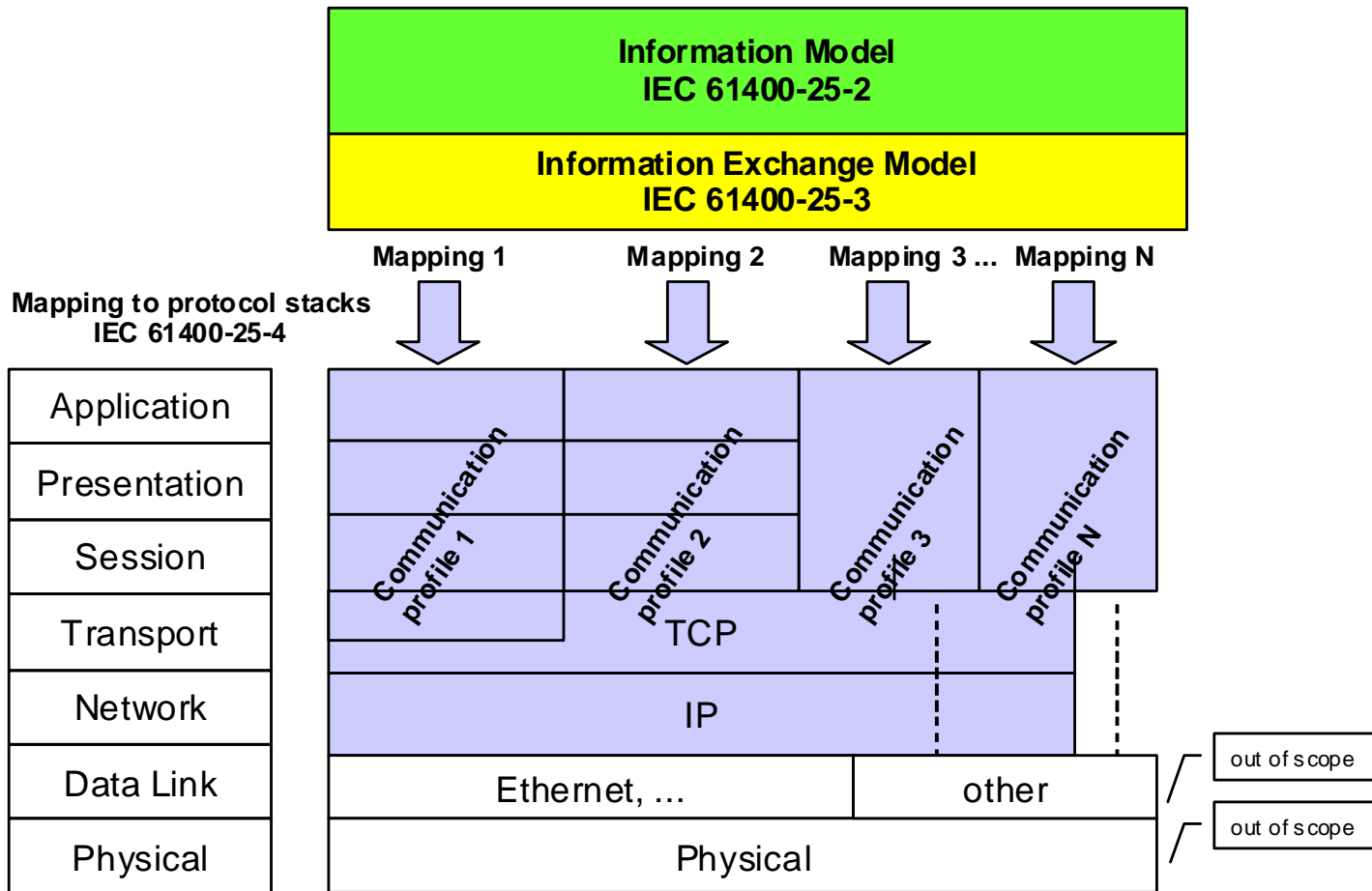
Table 1 – Mapping overview of IEC 61400-25-3 services

Mapping capability overview						
IEC 61400-25-3 Services	M/O	Web-services	OPC XML-DA	IEC 61850-8-1 (MMS)	IEC 60870-5-104	DNP3
Associate	M	Y	Y	Y	Y	Y
Release	O	Y	Y	Y	Y	N
Abort	O	Y	Y	Y	N	N
GetServerDirectory	O	Y	Y	Y	N	Y
GetLogicalDeviceDirectory	O	Y	Y	Y	N	Y
GetLogicalNodeDirectory	O	Y	Y	Y	N	N
GetDataValues	M	Y	Y	Y	Y	Y
SetDataValues	M	Y	Y	Y	Y	Y
GetDataDirectory	O	Y	Y	Y	N	N
GetDataDefinition	O	Y	Y	Y	N	N
GetDataSetValues	M	Y	P ^a	Y	N	Y
DataSetValues	O	Y	N	Y	N	Y
CreateDataSet	O	Y	N	Y	N	N
DeleteDataSet	O	Y	N	Y	N	N
GetDataSetDirectory	O	Y	N	Y	N	N
Report	O	Y	Y	Y	Y	N
GetRRCAValues	O	Y	N	Y	N	N





IEC 61400-25-4 Mapping - overview





IEC 61400-25-5 Objectives

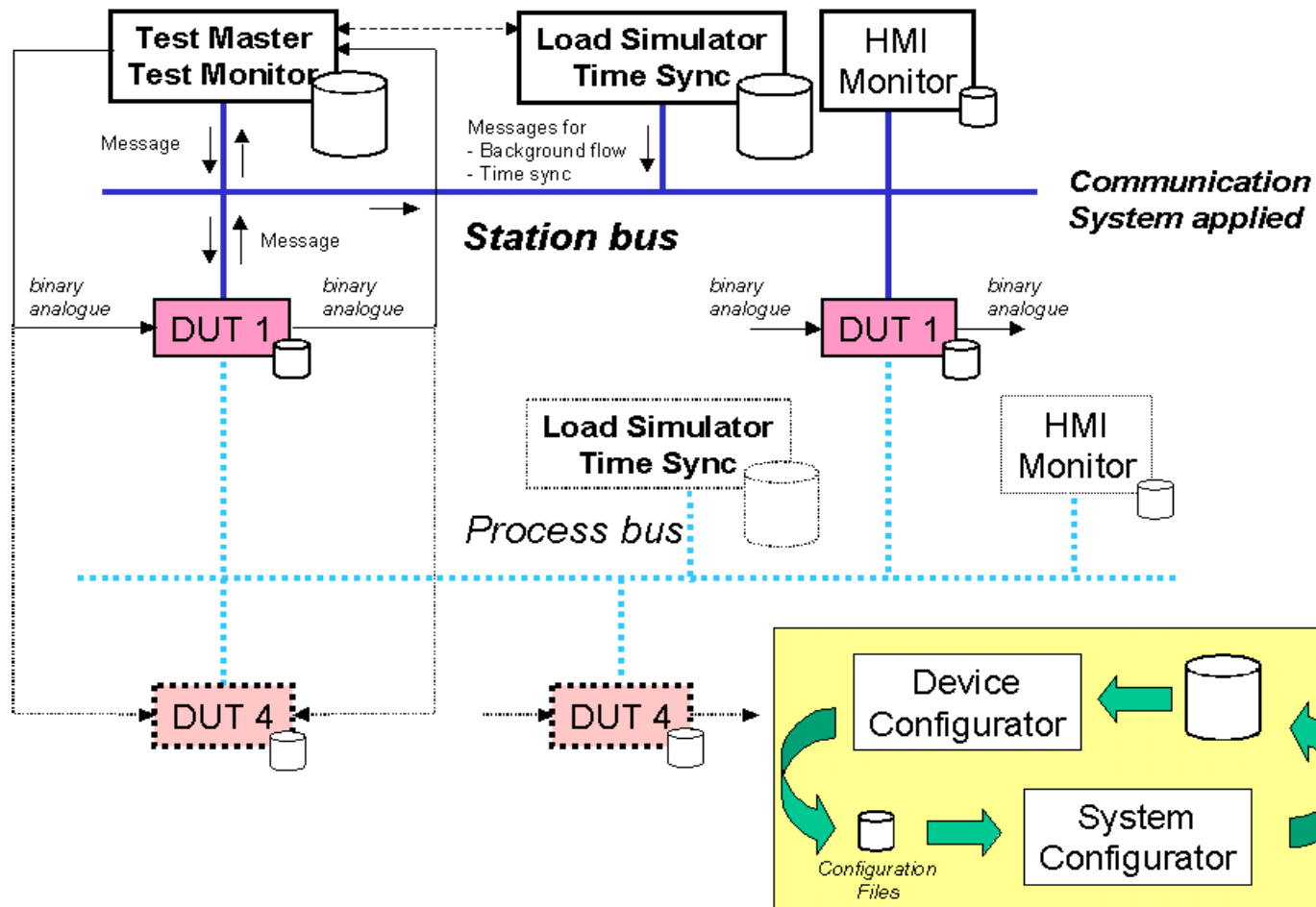
Part 25-5: Conformance testing

- Specifies standard techniques for testing of conformance of implementations
- Specifies measurement techniques to be applied when declaring performance parameters.
- Application of standard test techniques will enhance the ability of customers to purchase systems that integrate easily, operate correctly, and support the applications as intended by the standard





IEC 61400-25-5 Conformance Testing





IEC 61400-25 User Group

USE61400-25 User Group

Mission

- To support use of the IEC 61400-25 standard series

Vision

- Add value for the users of IEC 61400-25
- Share information of relevance for use of IEC 61400-25
- Share documents of relevance for use of IEC 61400-25
- Discussion forum for resolution of technical issues / data base
- Feedback to IEC 61400-25 maintenance team
- Coordinate activities with related user groups and organizations
- Validate member devices spending the least effort, money and time “*This means efficient and with expected interoperability*”

More info

- On web site: WWW.USE61400-25.COM
- Knud Johansen, Q-Technology: e-mail: KJ@QTECHNOLOGY.DK





A generic com. solution IS available for wind power:
IEC61400-25 standard series



Thanks for your attention

