



The standard series IEC 61850:

Status of standardization, implementations and applications,

What's next?

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- Introduction
- Standardization in IEC TC 57 and TC 88
- Some recommendation for utilities

Introduction

- About the future
- Introduce myself



- „Shaping the future now – with concepts for tomorrow“
(Motto of EWE – 5th biggest German utility, 2007-04)
 - with people of today (you and I)
 - with the vision of a future standardized information and information exchange solutions for power generation, transmission, distribution, asset monitoring, ... (IEC 61850 and IEC 61400-25)
 - with base technologies of yesterday (protection and control devices, SCADA, EMS, DMS, Ethernet, TCP/IP, MMS, XML, ...)
 - with the experience of the past (the many solutions for remote monitoring and control, ...)
 - with old and new devices, systems and tools to come
 - **a challenging future (short, medium, long term)**

Dipl.-Ing. Karlheinz Schwarz



- Independent consultant for automation and communication systems since 1992 (owner of NettedAutomation GmbH)
- Some 20 years background in industrial automation (Siemens)
- Experience in communication, utility applications and automation systems (AS-i, Field busses, UCA, TASE.2, IEC 61850, IEC 61400-25, MMS, ...)
- Experience in testing, certification and quality assurance
- Based in Karlsruhe/Germany
- Email: schwarz@scc-online.de
- Editor of IEC 61850 (power utility automation), IEC 61400-25 (wind turbines)
- Member of IEC TC 57 WG 10 (IEC 61850 Core), WG 17 (decentralized energy resources, DER), WG 18 (Hydro power plants), WG 19 (Interoperability within TC 57 in the long term)
- Member of IEC TC 88 PT 25 (IEC 61400-25-1 to 5, wind power plants)
- Project leader of IEC TC 88 PT 25-6 (IEC 61400-25-6, condition monitoring)
- Consultant to several utility projects related to IEC 61850
- Experienced in training on IEC 61850 and related issues (1000+ people)

Standardization

- IEC TC 57 and TC 88 (Wind turbines)
- IEC 61850 and IEC 61400-25 (IEC 61850 for wind turbines)



Power systems management and associated information exchange

- Power system control equipment and systems, including
 - EMS (energy management systems)
 - SCADA
 - distribution automation
 - teleprotection
- associated information exchange, used in
 - planning
 - operation
 - maintenance

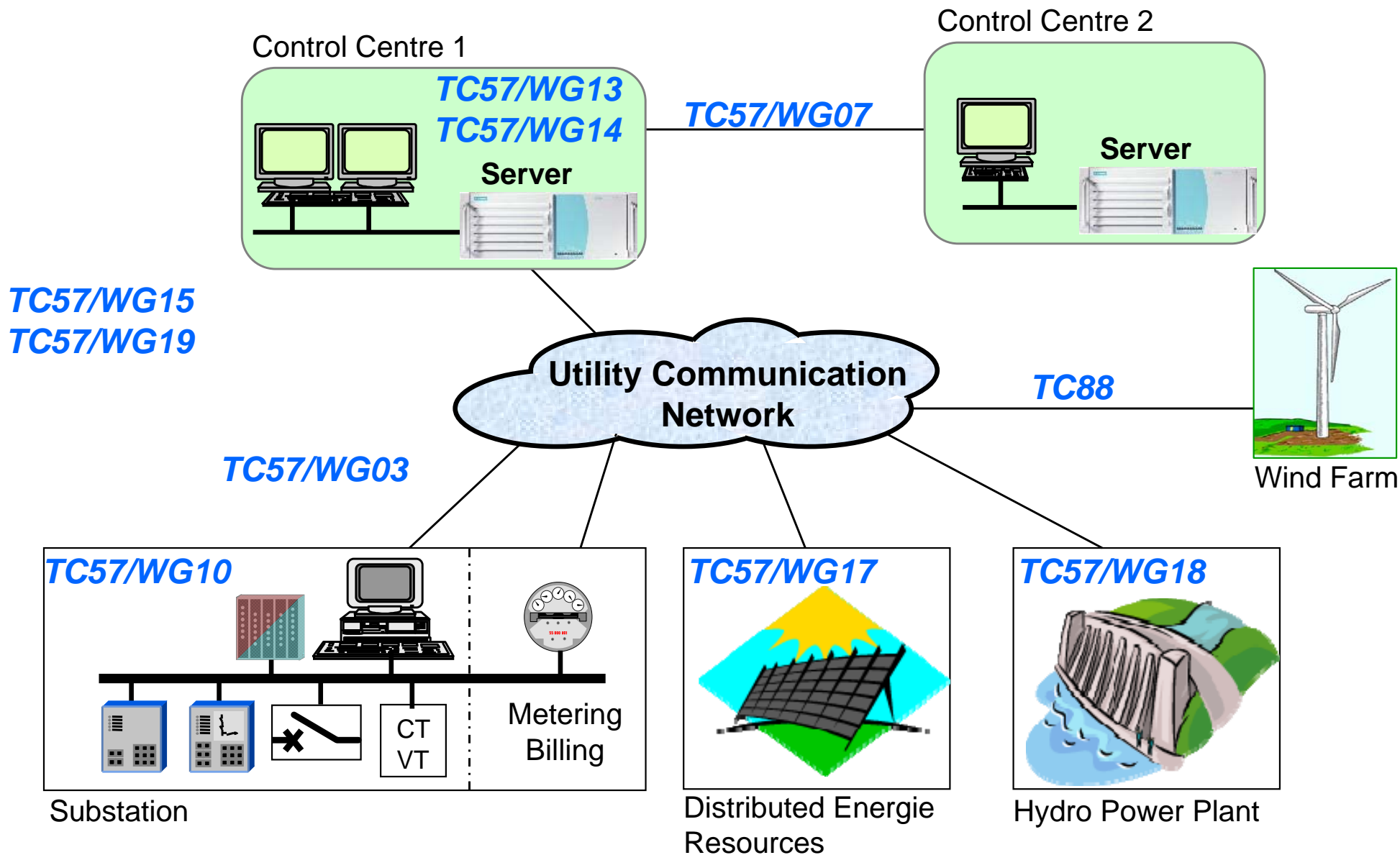
Control within

- control centers
- substations
- Individual pieces of primary equipment including
 - interfaces to equipment, systems and databases outside the scope of TC57

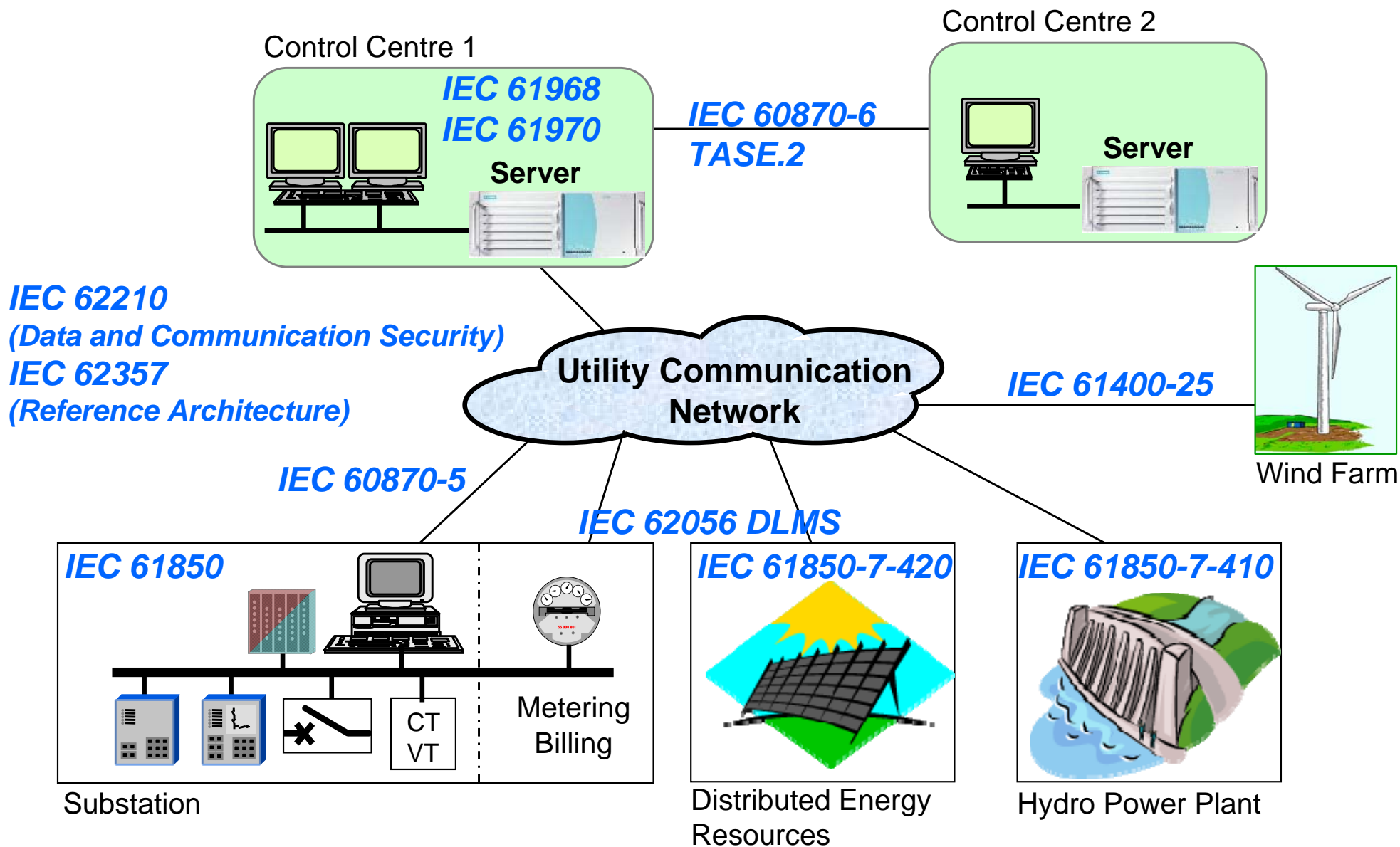
Working Groups of TC57

- WG03: Telecontrol equipment and systems – telecontrol protocols
- WG07: Telecontrol protocols compatible with ISO and ITU-T standards
- **WG10: Power system IED communication and associated data models (1995 – today)**
- WG13: Energy management system application program interface (EMS - API)
- WG14: System interfaces for distribution management (SIDM)
- WG15: Power system control and associated communications – Data and communication security
- WG16: Framework for energy market communication
- WG17: Communication systems for distributed energy resources (DER)
- WG18: Hydroelectric power plants – Communication for monitoring and control
- WG19: Interoperability within TC57 in the long term

IEC Committees – Power System

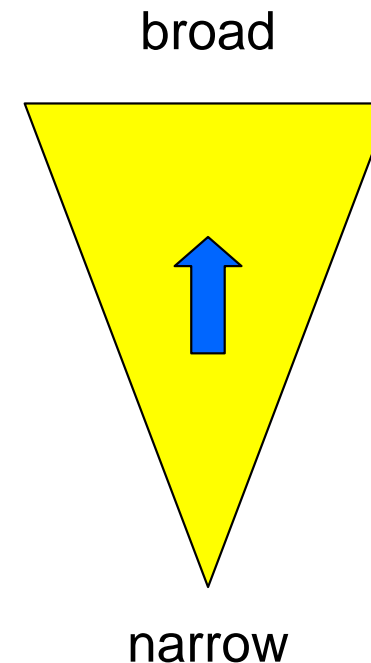


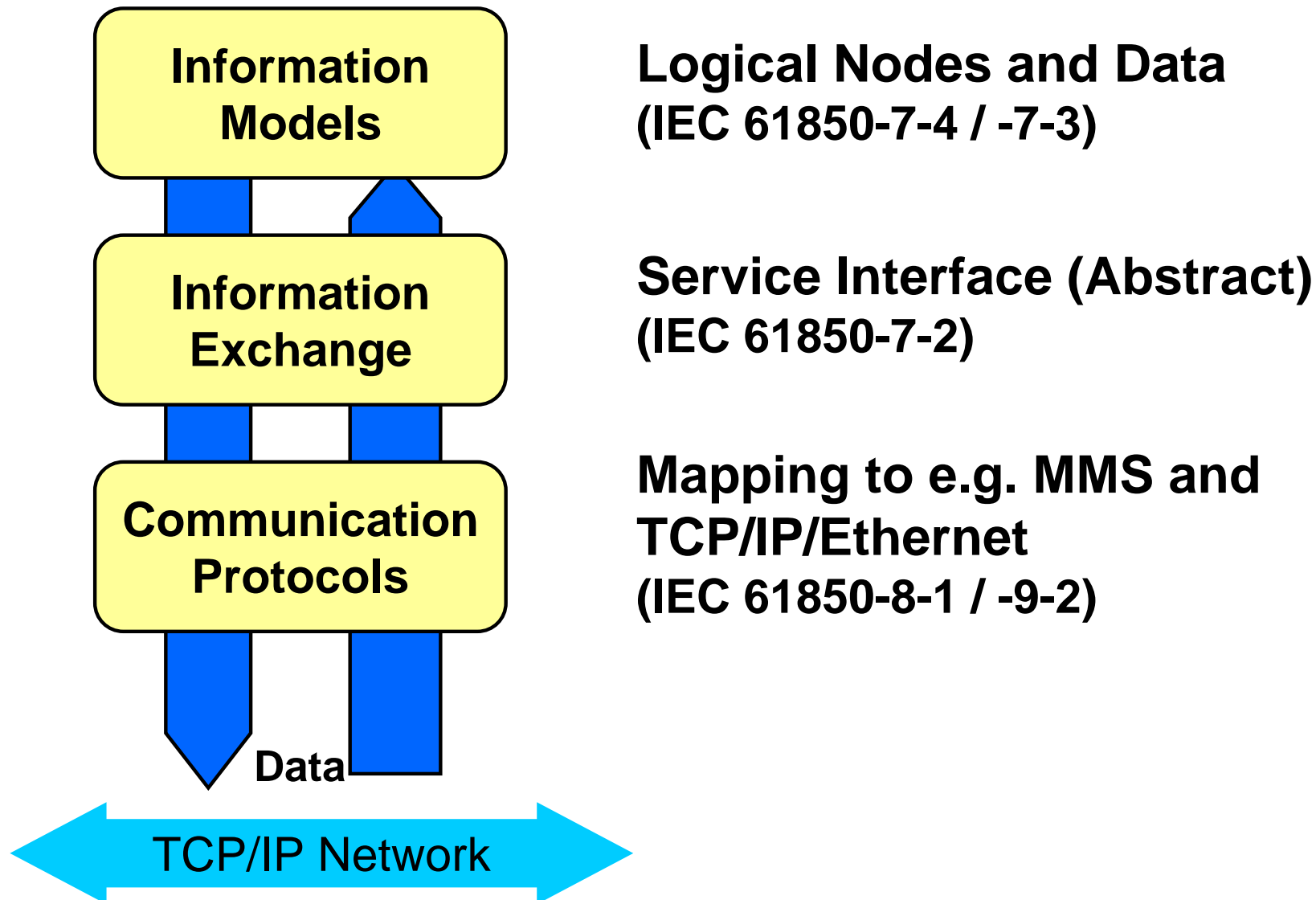
IEC Committees – Power System



New title and scope of IEC 61850

- New title:
 - Communication networks and systems **for power utility automation**
- Old title:
 - Communication networks and systems **in substations**





The parts of IEC 61850

System Aspects Part 1: Introduction and Overview Part 2: Glossary Part 3: General Requirements Part 4: System and Project Management Part 5: Comm Requirements for Functions and Device Models	Data Models Basic Communication Structure for Substations and Feeder Equipment Part 7-4: Compatible Logical Node Classes and Data Classes part 7-410 hydro Part 7-3: Common Data Classes
Configuration Part 6: Configuration Language for electrical Substation IED's	Abstract Comm. Services Basic Communication Structure for Substations and Feeder Equipment Part 7-2: Abstract Communication Services (ACSI) Part 7-1: Principles and Models
Testing Part 10: Conform. Testing	Mapping to real Comm. Networks (SCSM) Part 8-1: Mapping to MMS and ISO/IEC 8802-3 Part 9-1: Sampled Values over Serial Unidirectional Multidrop Point-to-Point link Part 9-2: Sampled Values over ISO/IEC 8802-3

Re-use

Power
Quality
Monitoring

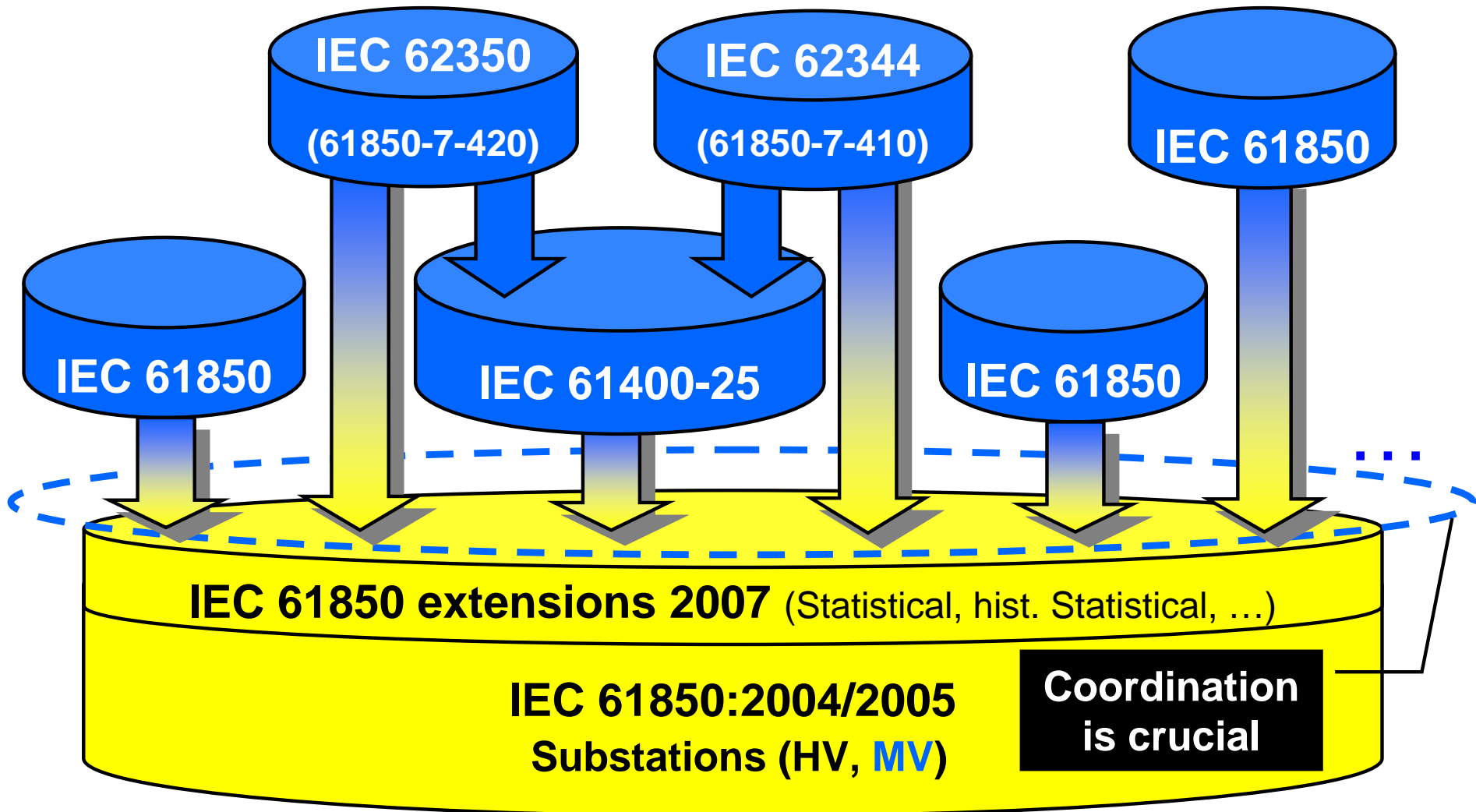
Decentralized
Energy
Resources

Wind
Power
Plants

Hydro
Power
Plants

Control
Center to
Substation

Substation to
Substation



- Part 25-1: Overall description of principles & models
- Part 25-2: Information models
- Part 25-3: Information exchange models
- Part 25-4: Mapping to communication profile
- Part 25-5: Conformance testing

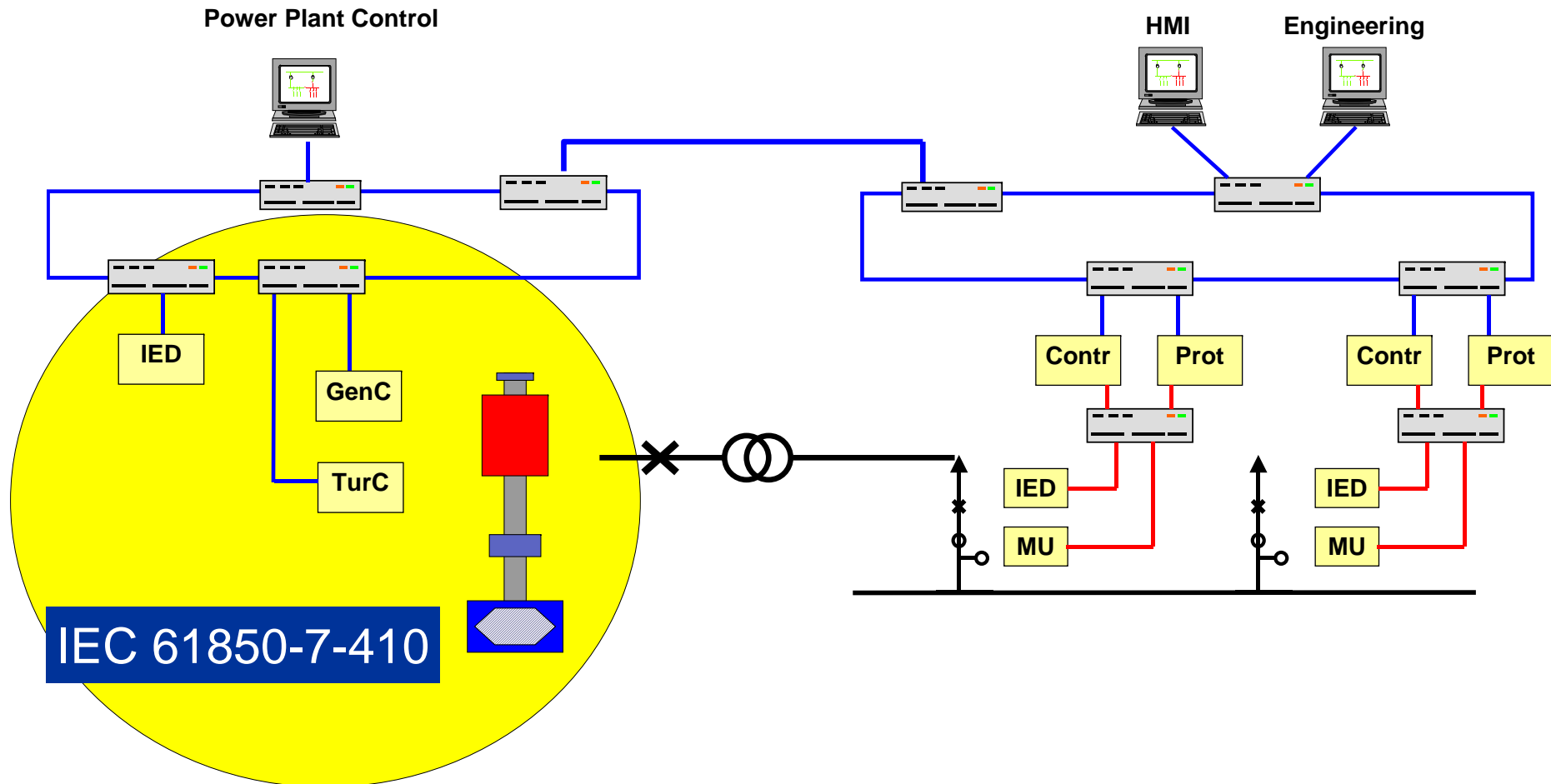
- Part 25-6: LN and Data for Condition Monitoring (New)

- Part 25-1 IS (published 2007-01)
 - Part 25-2 IS (published 2007-01)
 - Part 25-3 IS (published 2007-01)
 - *Part 25-4 NP/CDV published 01 Dec. 2006
NP approved (2007-02)
CDV approved (2007-05)*
 - Part 25-5 IS (published 2007-01)
-
- Part 25-6 CDV under preparation (2007-11)

Why IEC 61850 based standard for hydro?

Power Plant

Substation



- Hydroelectric power plants – Communication for monitoring and control
 - Develop object models for hydroelectric power plants
 - Information with regard to electrical, mechanical and hydrological functions and sensors
- 2004-01 to 2007-07 (quite fast process)
- Standard approved
- 19 Members from 8 countries (utility driven standard: Vattenfall (SE), Hydro Quebec (CA), EDF (FR), ...)
- Project leader: Claes Malcom (Vattenfall)

The standards are ready, implemented and used

- The core standards are available for some years
- All major vendors of SAS have compliant products
- Many SAS projects with IEC 61850 compliant devices and tools are in operation
- Almost all tenders for SAS require IEC 61850 – one or the other way

Some recommendations for utilities

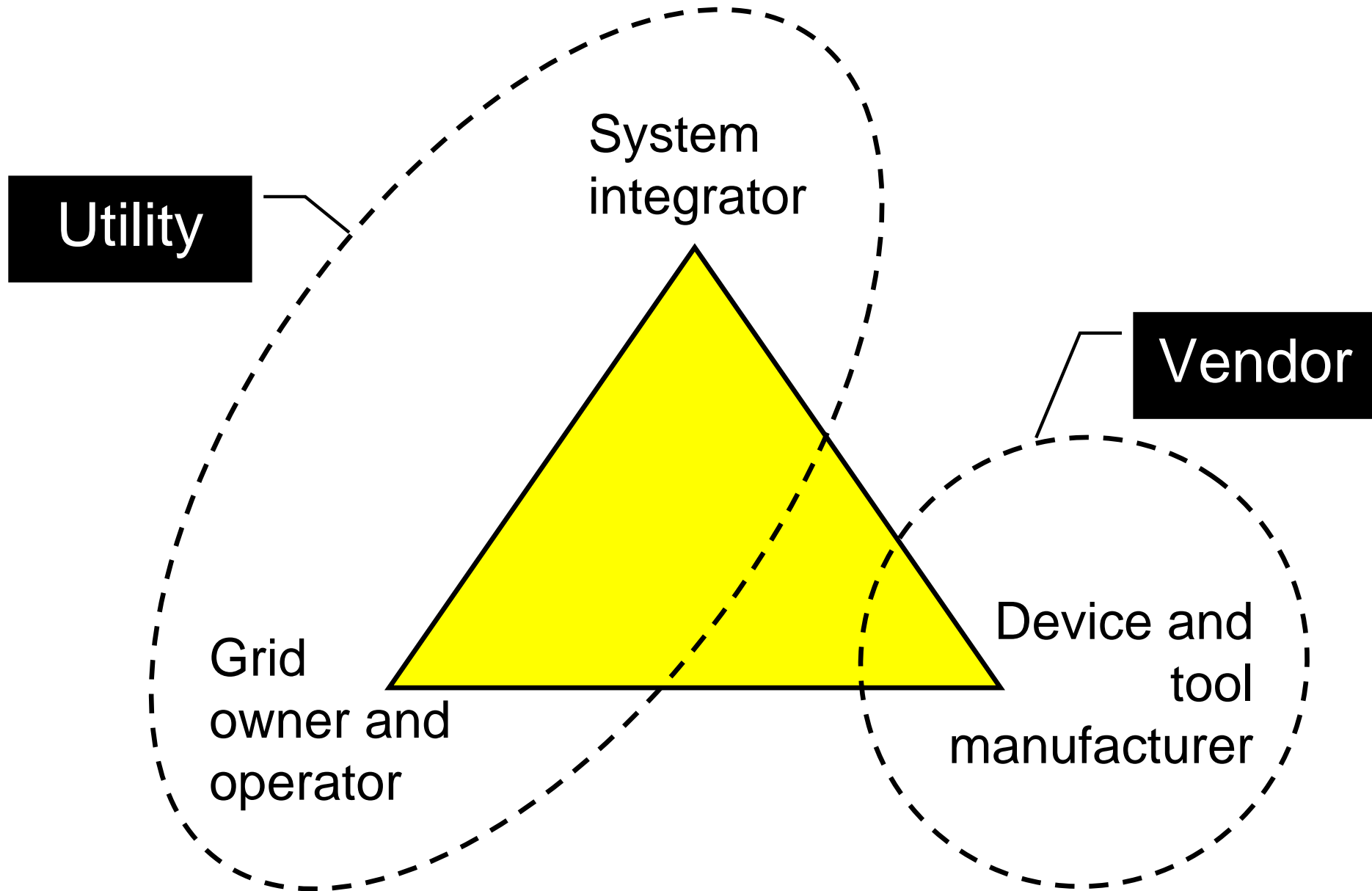


- Roles of utilities with regard to IEC 61850
- System integration
- Involvement of utility in SAS
- Standards, implementation, application
- Where are we?
- What you order is what you will get!
- Actions recommended

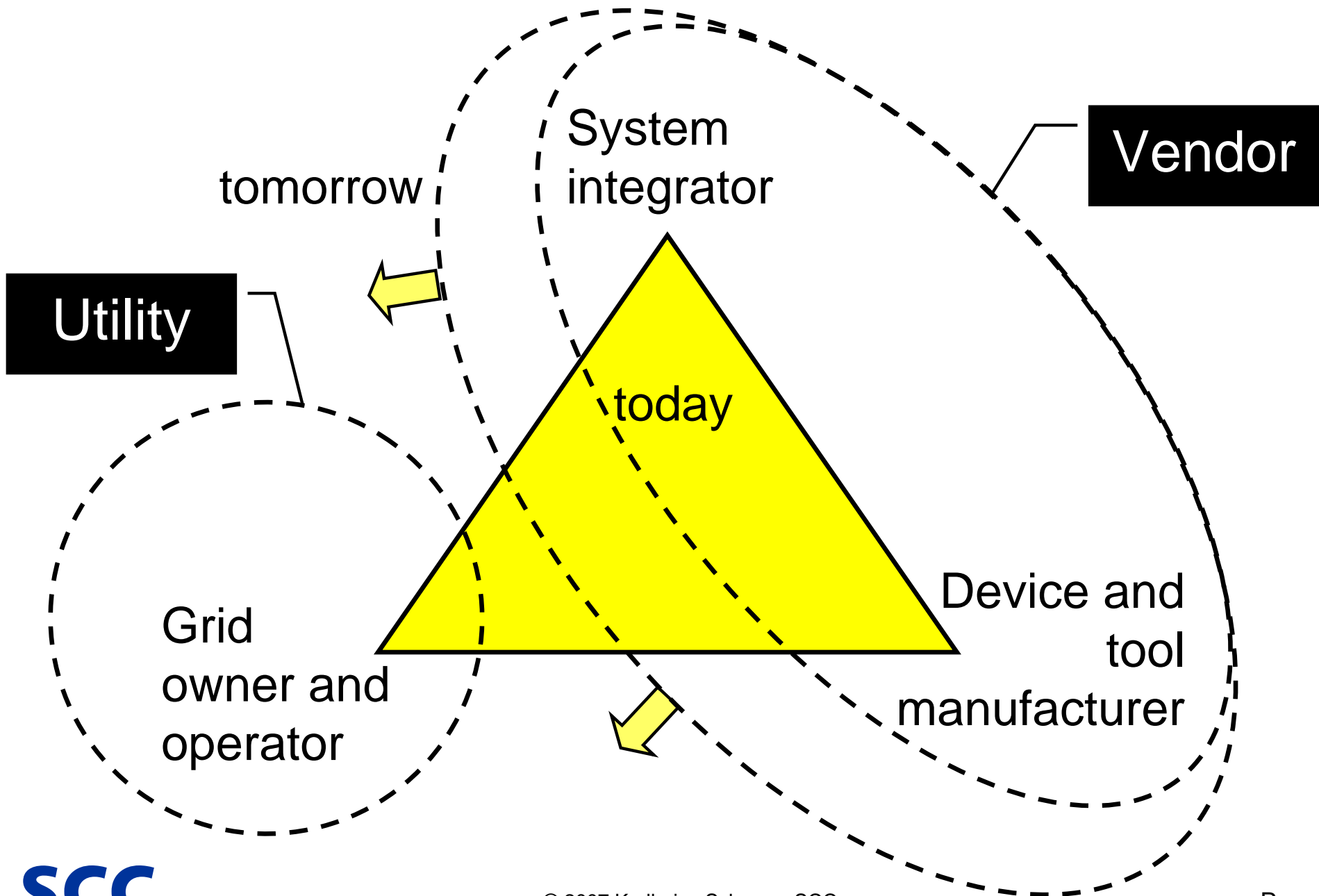
Roles of utilities with regard to IEC 61850

- There are several groups of utilities with regard to their involvement in IEC 61850:
 1. Utilities that **build the substation automation system**: using off-the-shelf IEC 61850-compliant devices from different vendors and available tools
 2. Utilities that buy turnkey substations - But **specify the details**: models, services, conformance details, tools, and network infrastructure to meet their requirements
 3. Utilities that buy turnkey substations - But specify their requirements in the way as they do today (signal list and text) and request just **“IEC 61850.”**
 4. Utilities that **do not care** about IEC 61850

System integration (utility driven)



System integration (vendor driven)



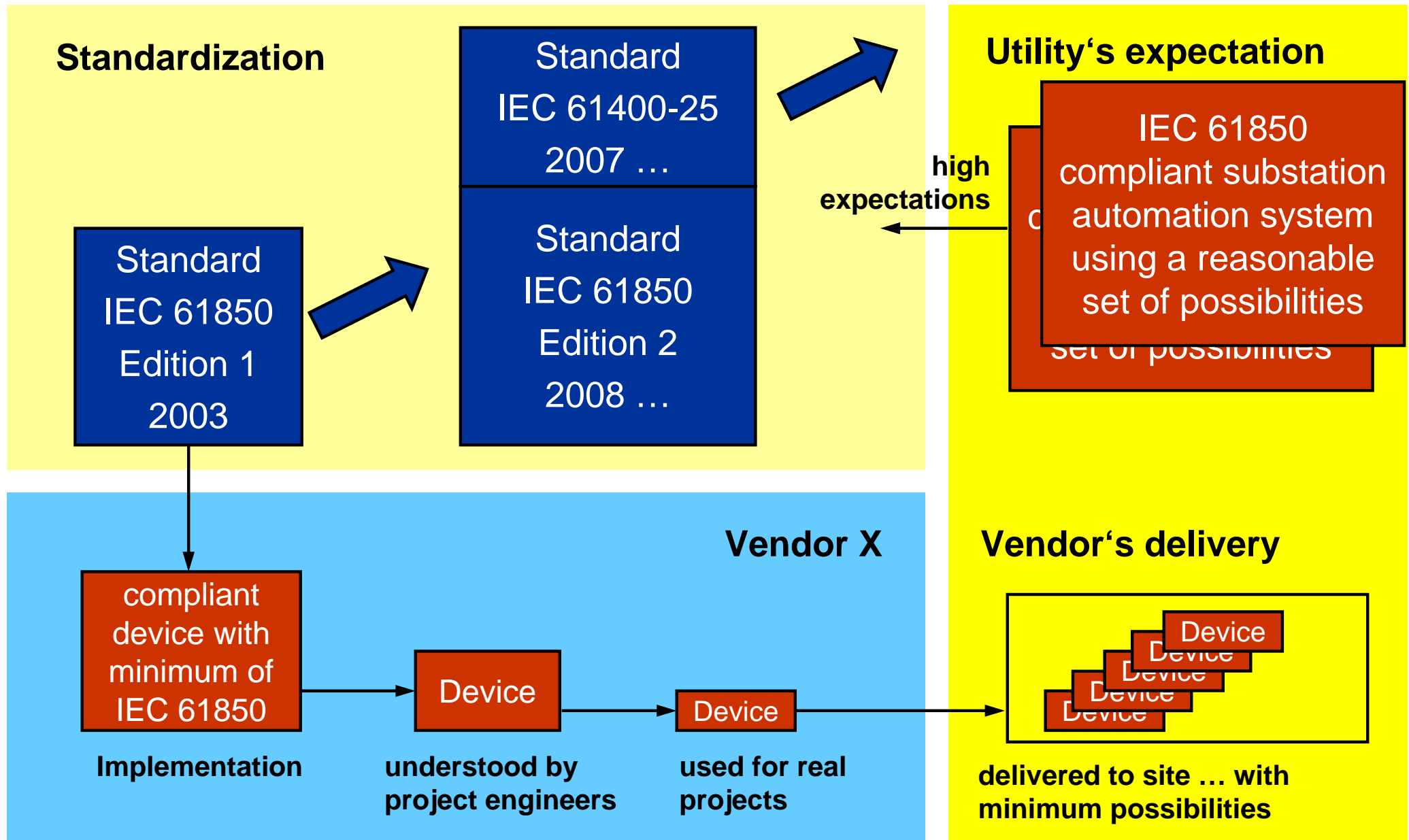
Bright future of utility engineers



Where are we and what to do next?

- The big vendors are speeding up quite fast – they are not waiting for other people to share the benefit of the use of IEC 61850
- **Think about YOUR role in the future of SAS!**
- **What are the areas where you can benefit most from the standard?**
- Make sure that all your needs and wishes are reflected in SPECIFICATION documents and in future CONTRACTS
- Make sure that you do not get more than what is required (no over-engineering)
- Make sure that your people really understand what IEC 61850 is all about!

Standards, implementation, application



What you order is what you will get!

- “Protection And Control Retrofitting Works At XXX 132/33/11kV Substation **Complying To IEC 61850 Standards With Ethernet Bus System**”

→ **You may get Ethernet and simple GOOSE only**

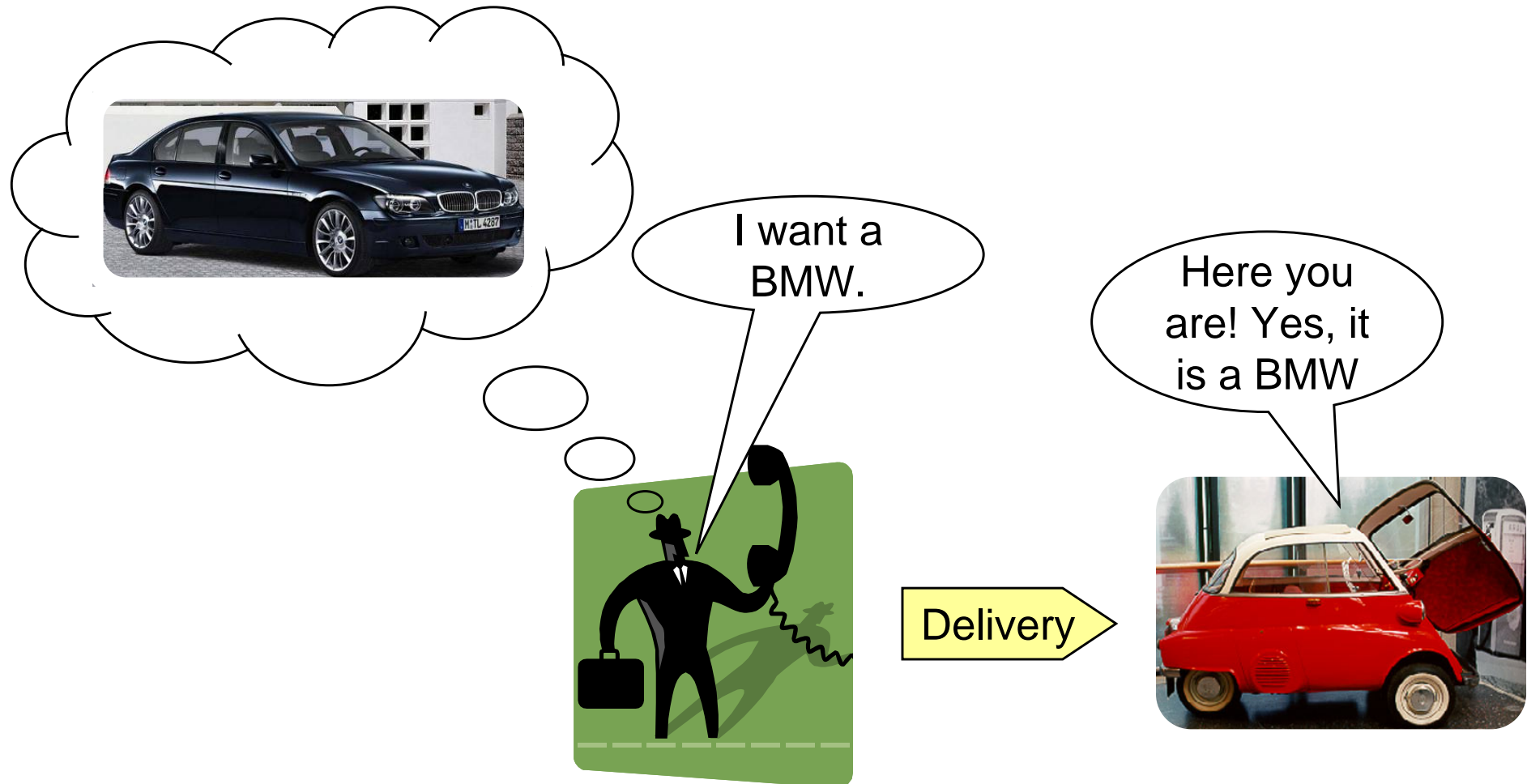
- TECHNICAL SPECIFICATIONS FOR NUMERICAL DISTANCE PROTECTION RELAY: The Relay shall have the following minimum functions:

- i) The relay should be suitable for 1 A
- ii) At least 4 Binary inputs and 8 output relays
- iii) Front RS 232 port for relay parameterization, ...
- **iv) The relays should conform to IEC 61850**

→ **You may get Ethernet and simple GOOSE only**

What you order is what you will get!

If you don't **specify exactly** what you want ...
... you may get **much less** than what you expect



What is your role in the future?

- What are **YOUR** short, medium and long term **requirements** and your **roles with regard to implementing IEC 61850?** (No, some, more or full involvement?)
 - Specification (using formal SCL tools, ...) of functions, devices, systems, tools, multi-vendor interoperability, ... questionnaires for pre-qualification?
 - Engineering for first commissioning and future replacements and extensions?
 - Commissioning in long term?
 - Maintenance (extensions, ...)?
 - Testing IEDs (stress, performance, ...), diagnosis and error debugging?
 - System diagnosis and repair
 - Add information models and exchange for new applications?

Actions recommended

- Depending on the decisions on YOUR future involvements
 - plan how to implement your role
 - develop and document use cases of the most crucial areas in which you want/expect to benefit from IEC 61850
 - contact the vendors and discuss the cooperation with them in all areas of interest (complete life cycle)
 - start teamwork with vendors, ... to figure out what their system (tools) could provide
 - negotiate your involvement in the contracts under way and to come
 - run pilot tests if you want to gain experience
 - revise the plan based on regular audits
 - **train your most important asset: YOUR PEOPLE**



Wishes for the future

- I wish you a smooth and successful start into the new standard based automation solutions for:
 - substations
 - the whole power system

- Thank you for your attention!

- I will be available for questions and answers for the rest of the day

- Need help?
 - <http://www.nettedautomation.com/seminars/uca/index.html>

Questions?

