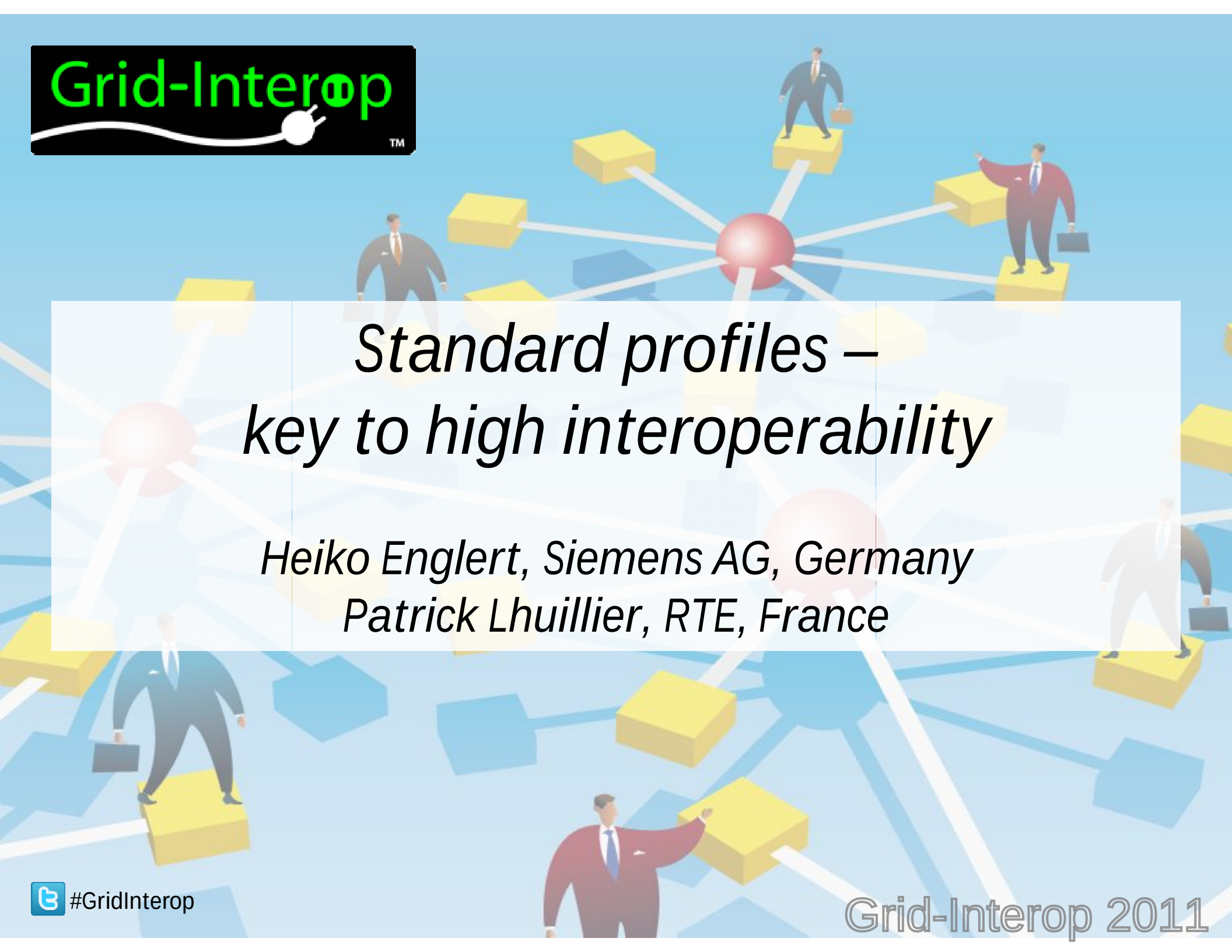


Standard profiles – key to high interoperability

Heiko Englert, Siemens AG, Germany
Patrick Lhuillier, RTE, France

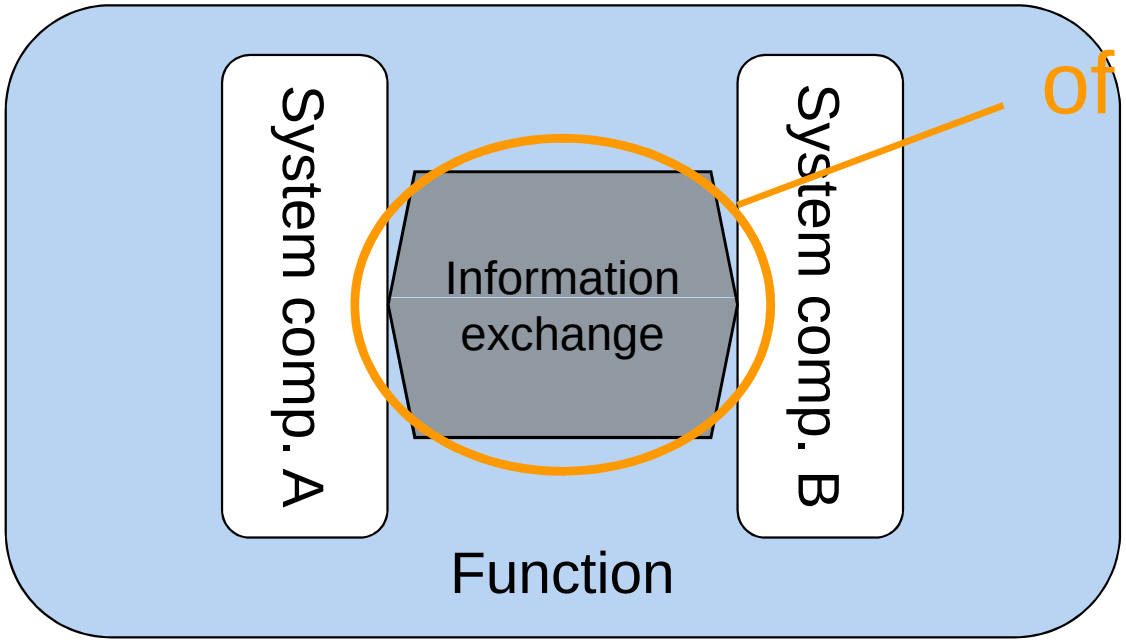
Theses to be verified

- Achieving **Interoperability** is a **matter of effort**
- There is a **“Quality”** of **Interoperability**
- “**Plug-and-play**” and “**Interchangeability**” are **different qualities** of interoperability
- IEC 61850 and hamburgers have common grounds
- **Standard profiles** help **increasing quality** of interoperability
- **Standard profiles** are **essential** for **interoperability testing**

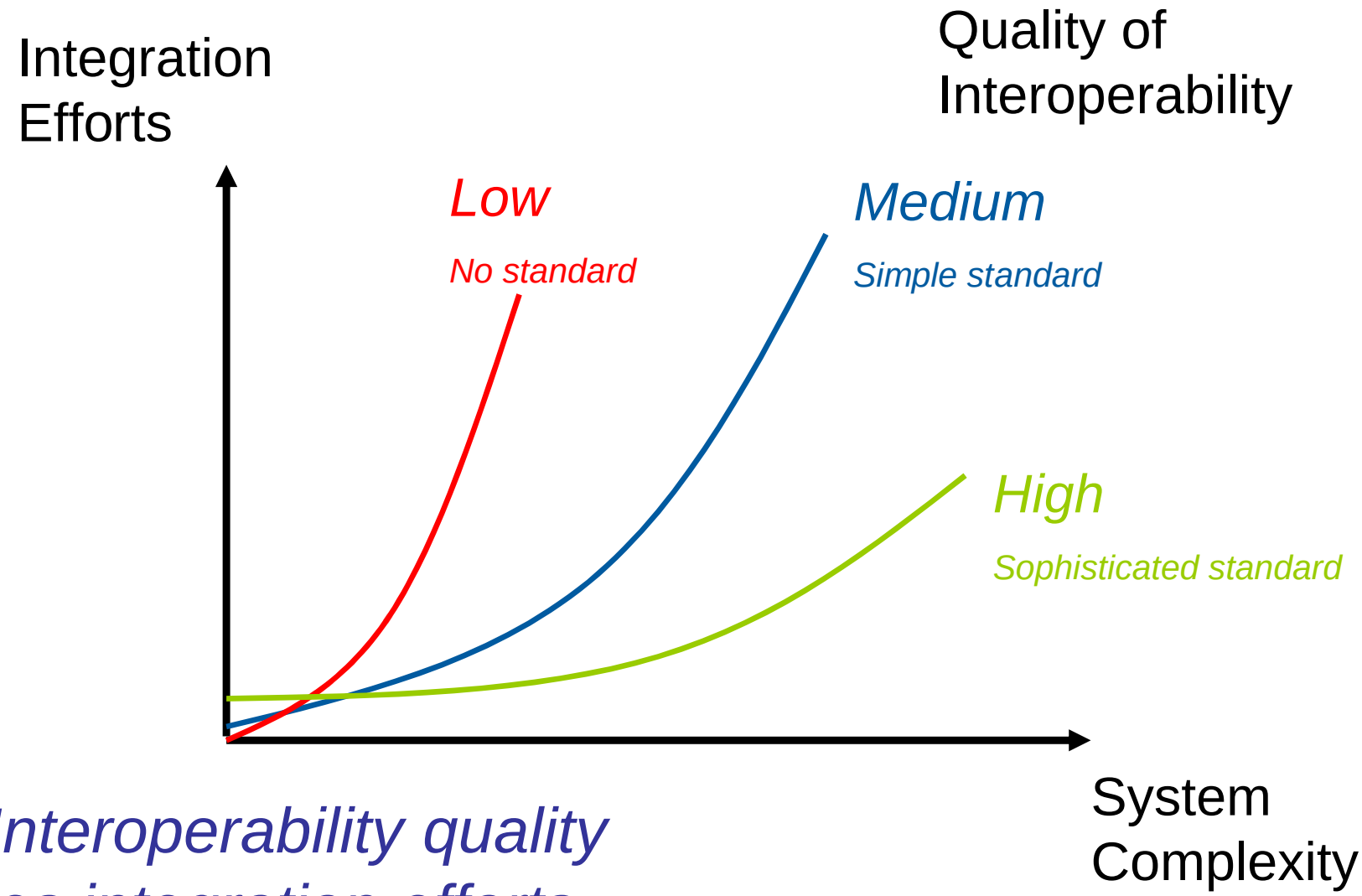
What does “Interoperability” mean?

Interoperability *is the ability of two or more devices from the same vendor, or different vendors, to exchange information* ***and*** *use that information for correct co-operation*

(definition acc . IEC 61850, IEEE defines it similar)



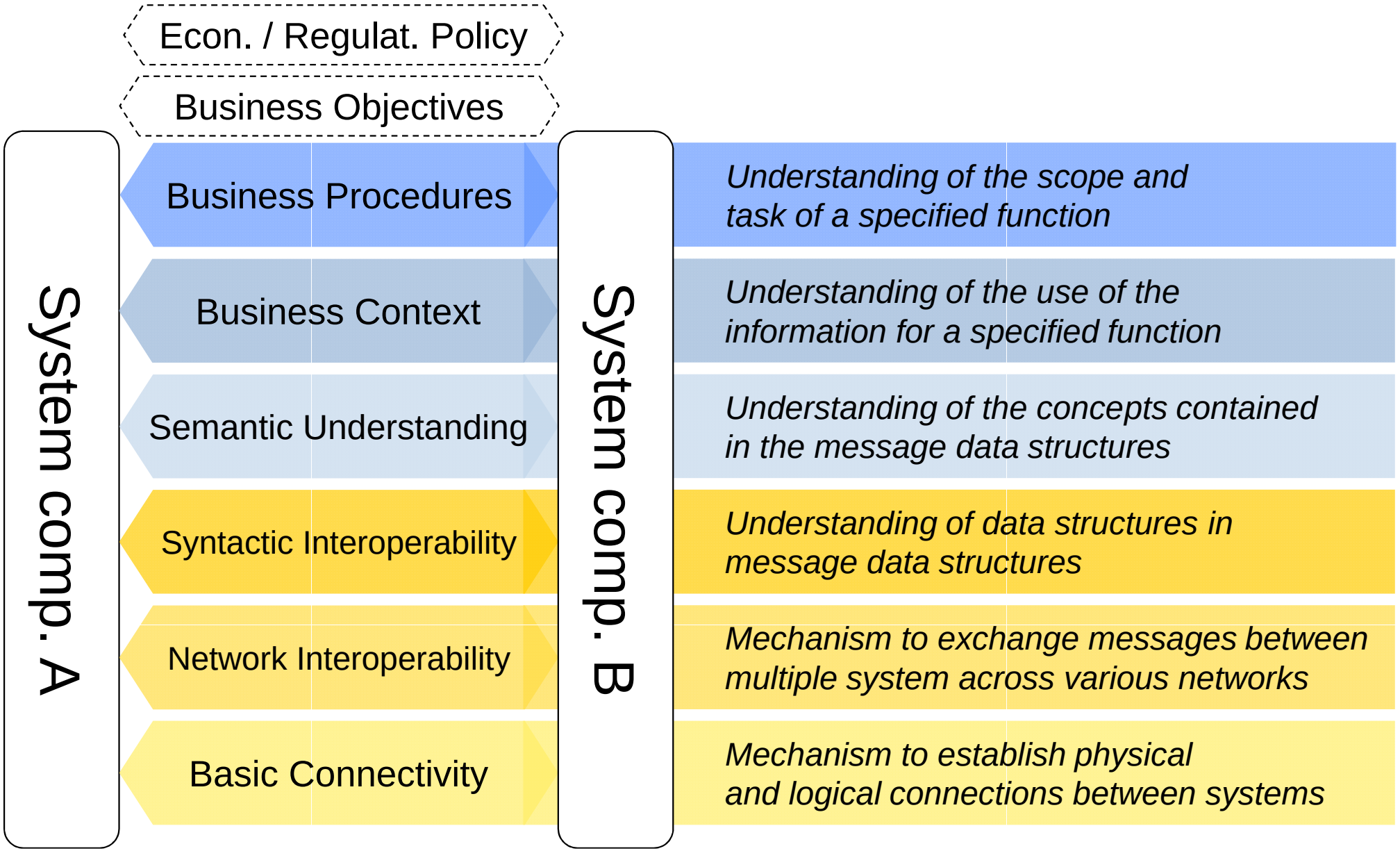
Integration efforts are determined by system complexity and quality of interoperability



High Interoperability quality reduces integration efforts

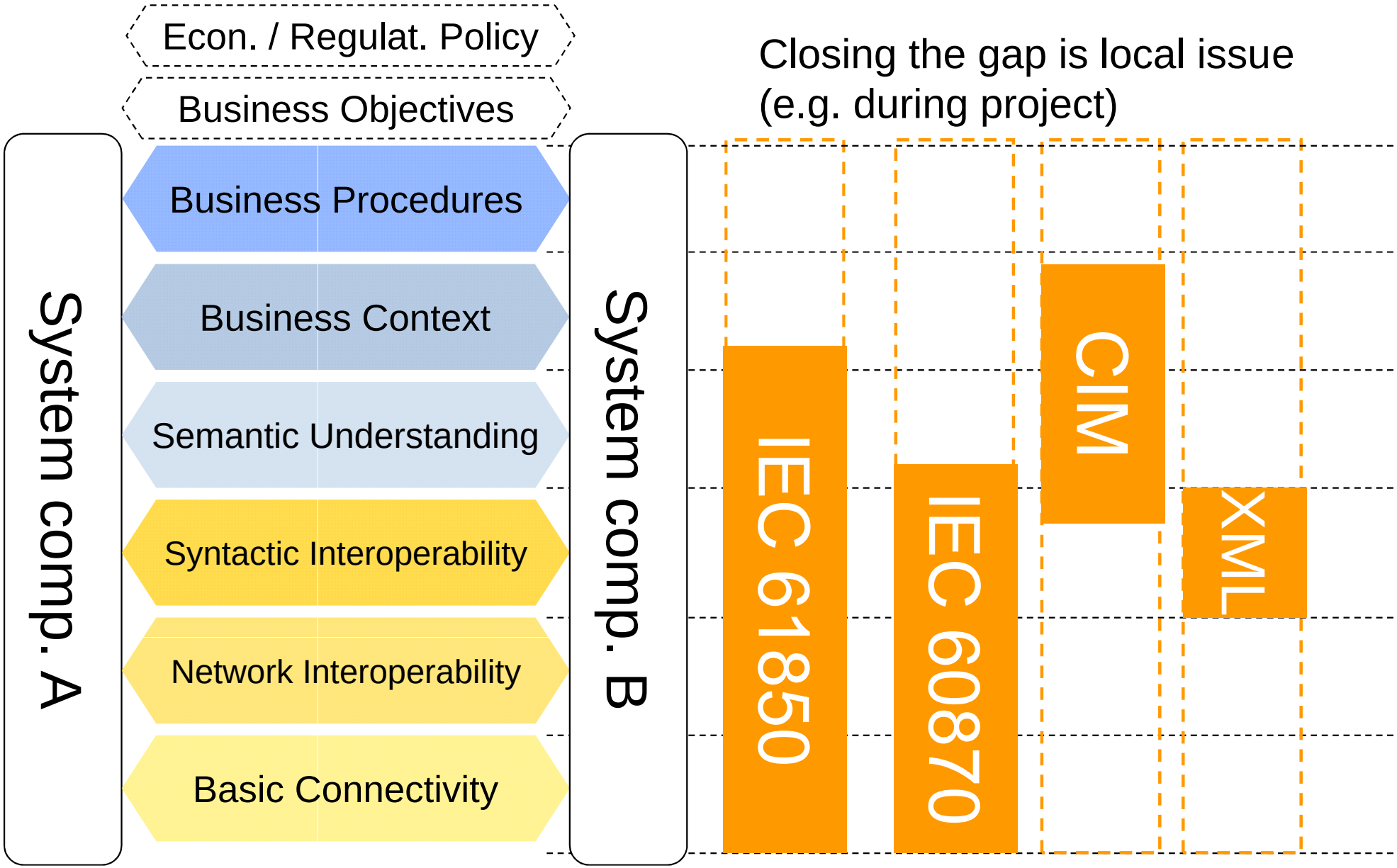
Standards increase interoperability quality significantly

Interoperability categories
All levels are required for correct cooperation



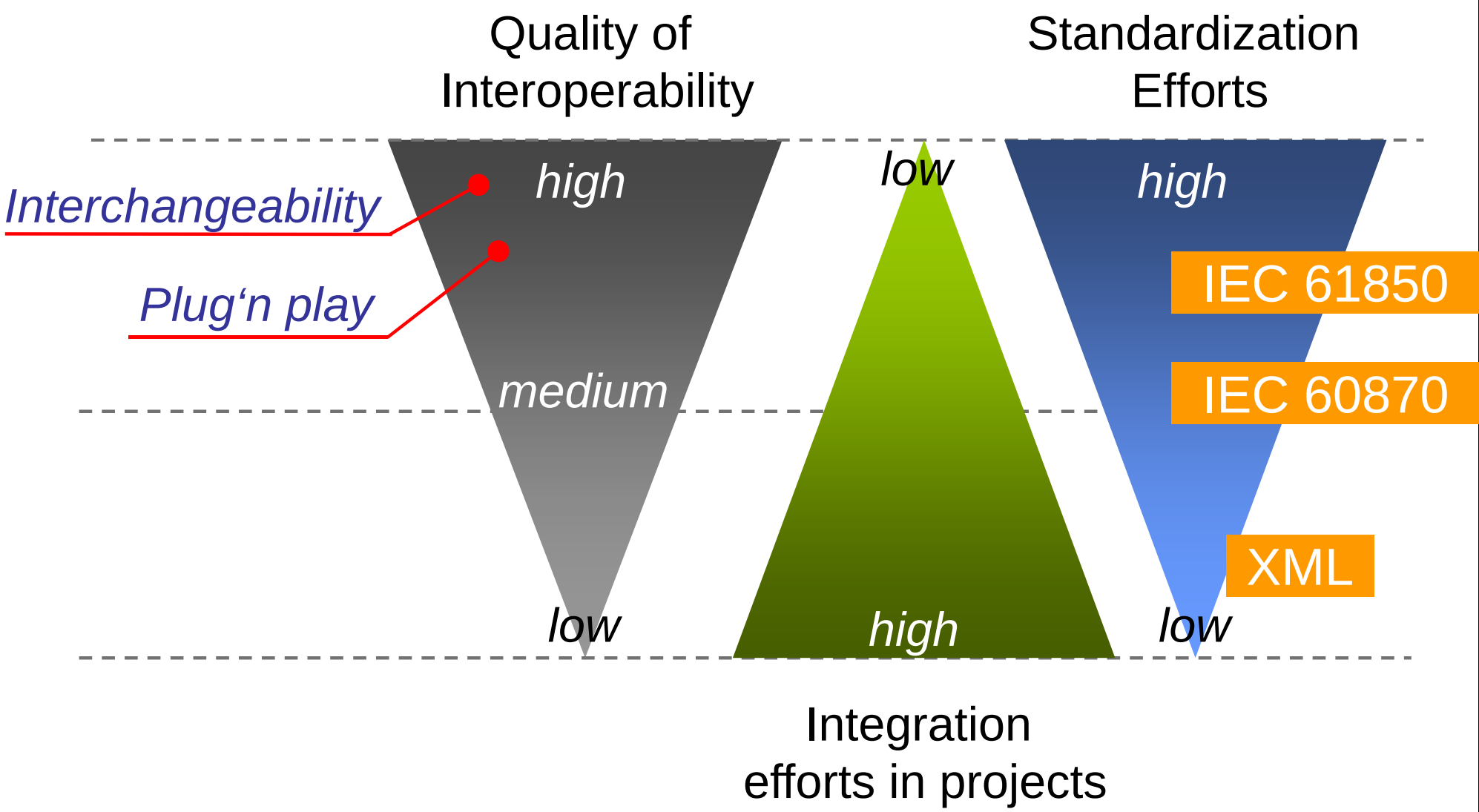
(Adopted from GWAC Stack)

Coverage by standards - Examples



(Adopted from GWAC Stack)

Quality of Interoperability - Sophisticated standards require high standardization efforts



Plug'n play

- Definition of PnP
  - „The ability to add a new component to a system and have it work automatically without having to do any technical analysis or manual configuration.“
  - It is more or less „Auto-configuration“
- Required Ingredients
  - Specific Communication standard (“device driver”)
  - Auxiliary Services (Addressing, Discovery, Self-description)
  - Location information
- PnP may require post-configuration for user specific adaption of application

Interchangeability

- Definition
  - *„is the ability to replace a device supplied by one manufacturer with a device supplied by another manufacturer, without making changes to the other elements in the system."*
  - It is more-or-less "hot plug" capability
- Requires „Profiling"
- „Plug'n play" capability is not necessary (since pre-configuration is sufficient)

Imagine there is a standard for hamburgers, it specifies

Ingredients

Cooking instruments

Serving methods

Ingredients for French style hamburgers
= **regional profile**

Big Mac recipe
= **product profile**

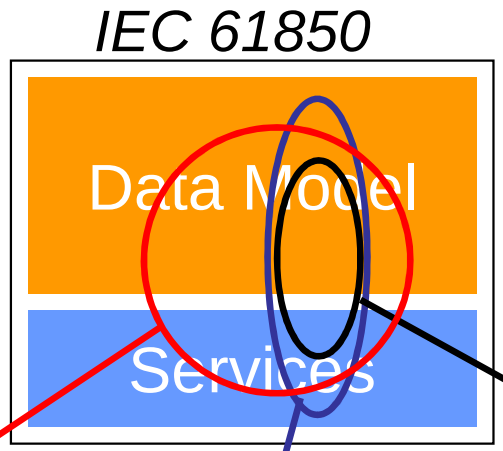
rough Profile specification degree *detailed*

Role of profiles – definition & objective

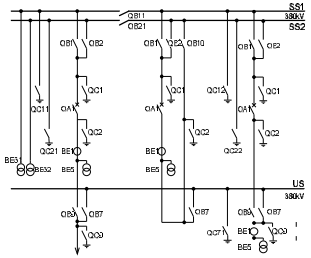
- A **profile defines a subset** of a entity (e.g. standard)
  - It may contain a **selection** of
    - Data models
    - Services
  - Furthermore a profile may define
    - **Instances** (e.g. specific device types)
    - **Procedures** (e.g. programmable logics, message sequences)
- **Objective of profiles**:
  - profiles are used to **reduce complexity** (data model, integration effort)

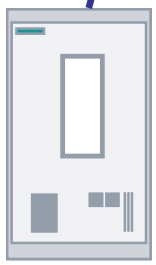
Example of IEC 61850 profiles

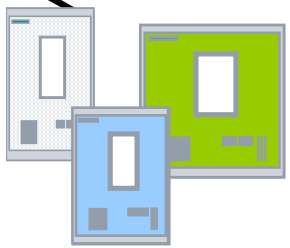
Note:
In multi vendor projects profiles should overlap for high interoperability



Instances
Procedures







Domain profile
domain specific
(E.g. Substation Automation)

Device profile
Vendor / function specific

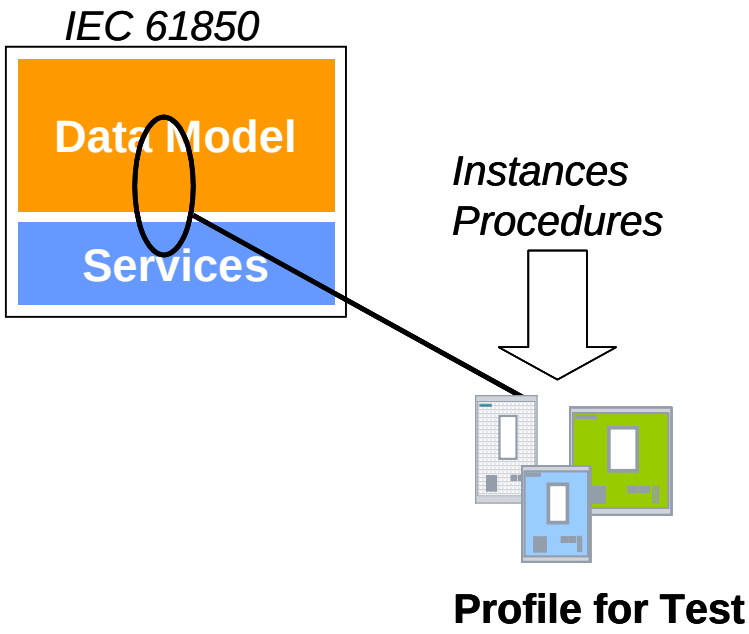
Application profile
User / regional specific

rough *medium* *detailed*

Profile specification degree

Profiles are crucial for real projects and interoperability tests

- Each InterOp test requires a **specification** of **„What“** will be tested
- **„What“ = Profile**
- The outcome of a test verifies that a product is interoperable in respect to the **test-specific profile** (and not more)

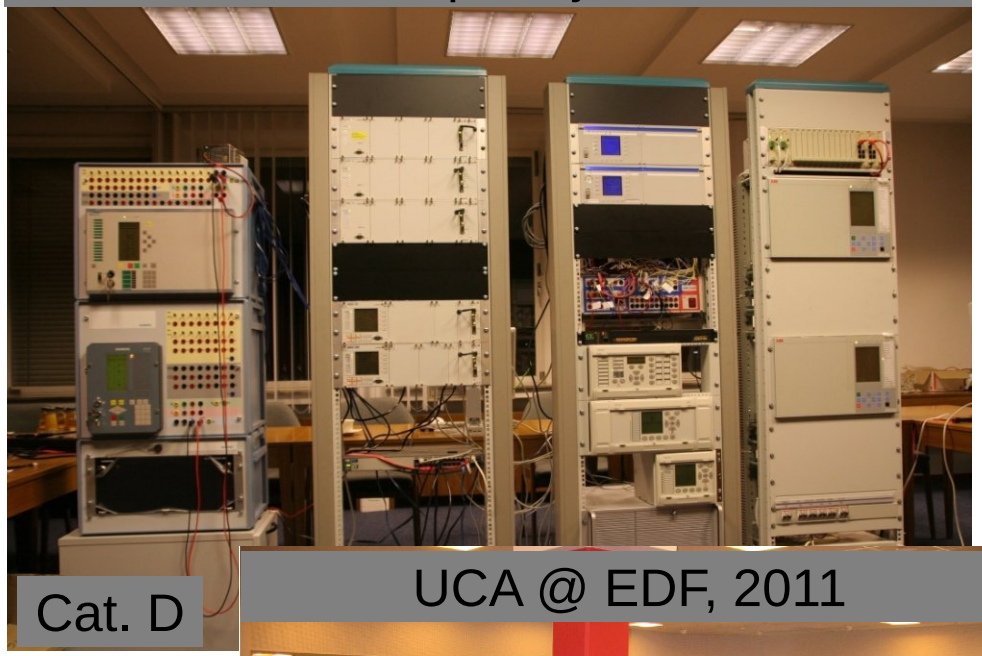


Past IEC 61850 Interoperability Tests

TVA Bradley Substation, 2005

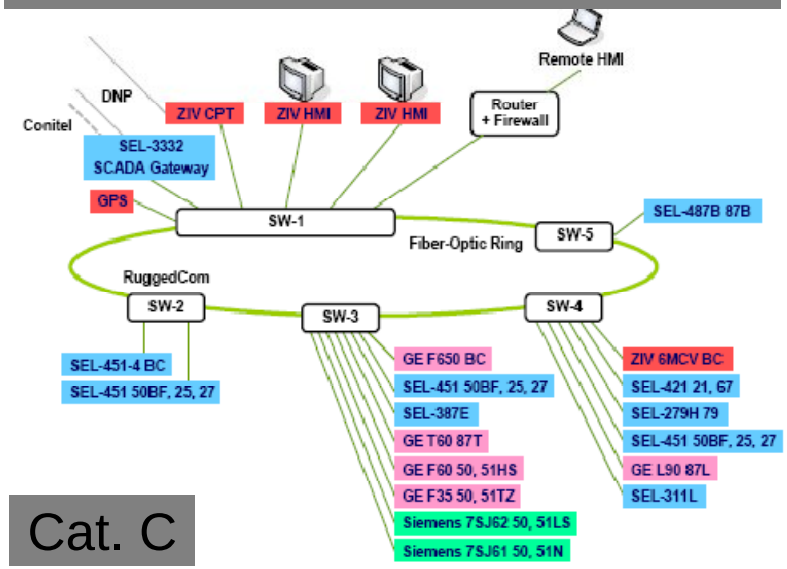
Cat. C

FGH InterOp Project, 2009



Cat. D

CFE La Venta, 2006

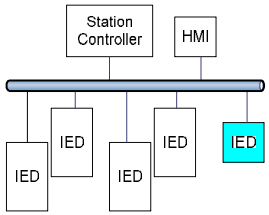
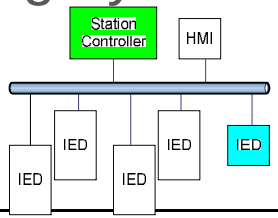
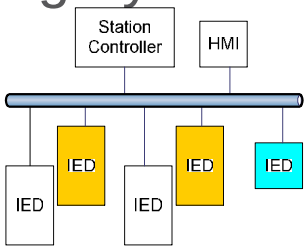
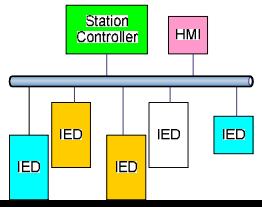


Cat. C

UCA @ EDF, 2011

Plug-Fest

Categories of multi-vendor projects

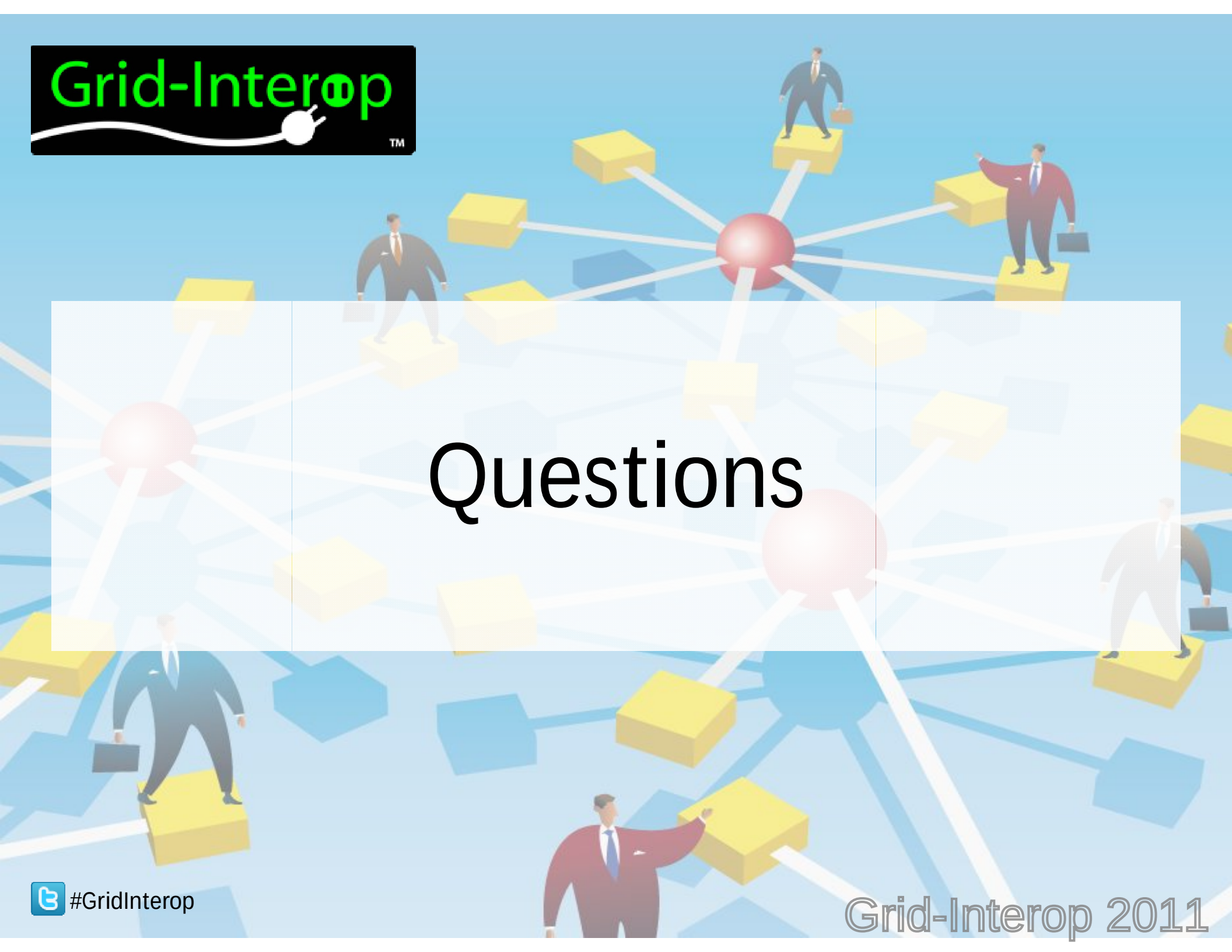
Category A 	**station controller, bay controllers and protection devices are from a single vendor. IEDs for special purposes like voltage controllers, power quality meters or equipments monitoring are provided by different vendors**
Category B 	**bay controllers and protection devices are from the same vendor, the station controllers and special purpose IEDs are from different vendors**
Category C 	**station controller, bay controllers, “main 1” protection, “main 2” or backup protection device are from different vendors, respectively, as well a special purpose IEDs**
Category D 	**devices from different vendors are mixes with no distinct preference.**

Conclusion

- **Interoperability**
  - **is a matter of effort** (integration vs. standardization efforts)
  - **has a certain quality**
- **“Plug’n play”** capability **requires** use of **auxiliary services** in addition to information exchange standards

Conclusion

- **Profiles** are **essential** to achieve **interchangeability**
- **Interoperability** can only be **verified** on the basis of **standard profiles**
- But: who will define IEC 61850 profiles?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