

Subsea Bus & DigiGRID

Joint development of open architecture control system
based on a shared vision for the subsea industry

Carlo Monteverde
Saipem



Karstein Berge Kristiansen
Siemens Subsea



Summary

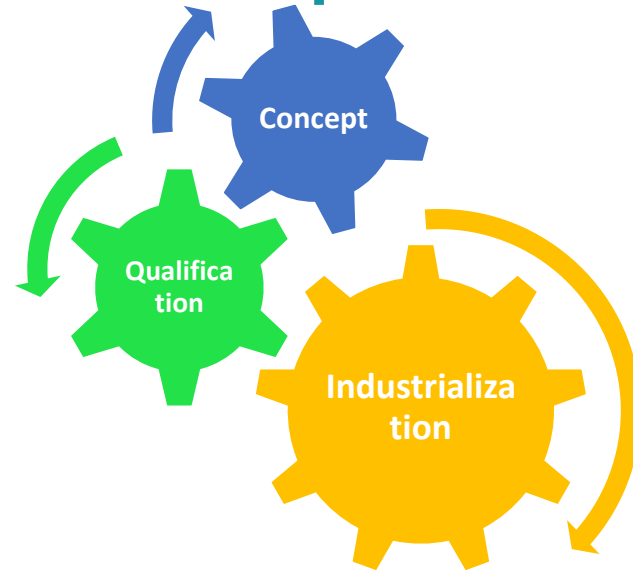
- Background of Joint Development Agreement
 - Saipem commitment in subsea processing
 - Siemens DigiGRID
 - Saipem SUBSEA BUS™
- Saipem SUBSEA BUS™ and Siemens DigiGRID
 - Saipem Open Framework Control System
- Subsea Control System Architecture
 - Subsea Infrastructure for LV Power and Control
 - Open industrial standards
- LV Power and Control System as part of subsea processing
- Status per April 2018
- Benefits for the Subsea Industry



Background for Joint Development

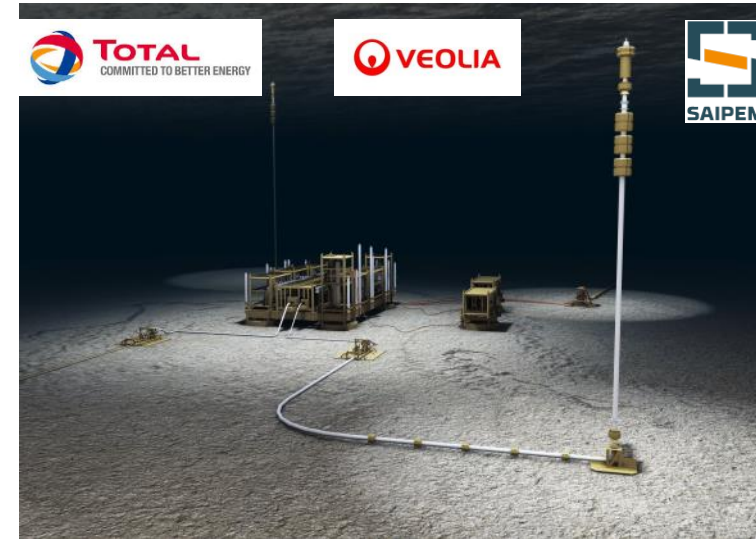
- Need for change in the subsea industry by introducing
 - Standardized components and interfaces
 - Only open and available industry standard,
 - No company specific «*standards*»
- Outcome
 - Cost saving system(s), both Capex and Opex
 - Open architecture subsea process control system
 - Ideal for subsea water treatment, separation systems, and high voltage grids eg. Next generation subsea process control system
 - Qualified and built for 3000 meter water depth

Background – Saipem commitment in Subsea Processing

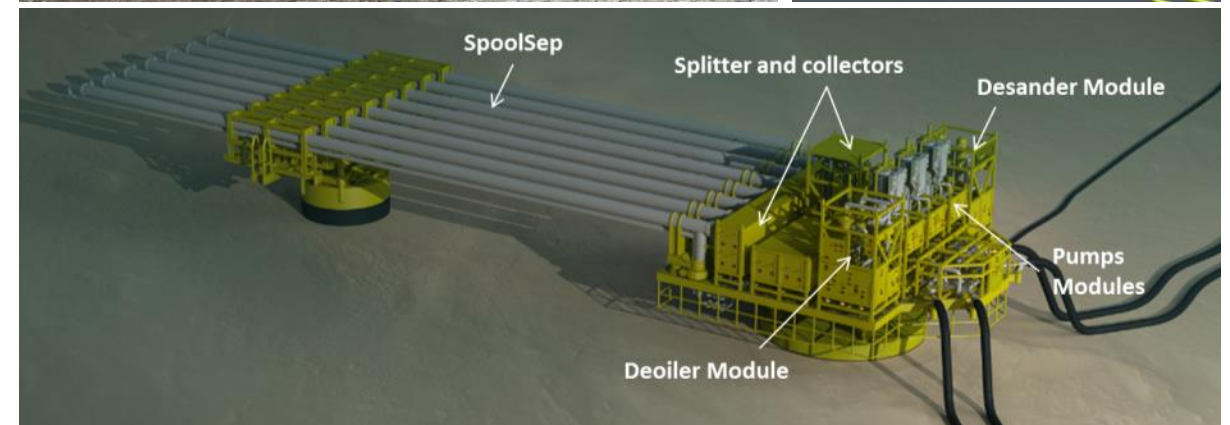


- Industrialization: Industrial platform for all Saipem Subsea factories
 - Establishing, qualifying and securing the supply chain for all key components
- ↓
- Standardisation and modularisation of interfaces = **SUBSEA BUS™**

Springs™



Multipipe



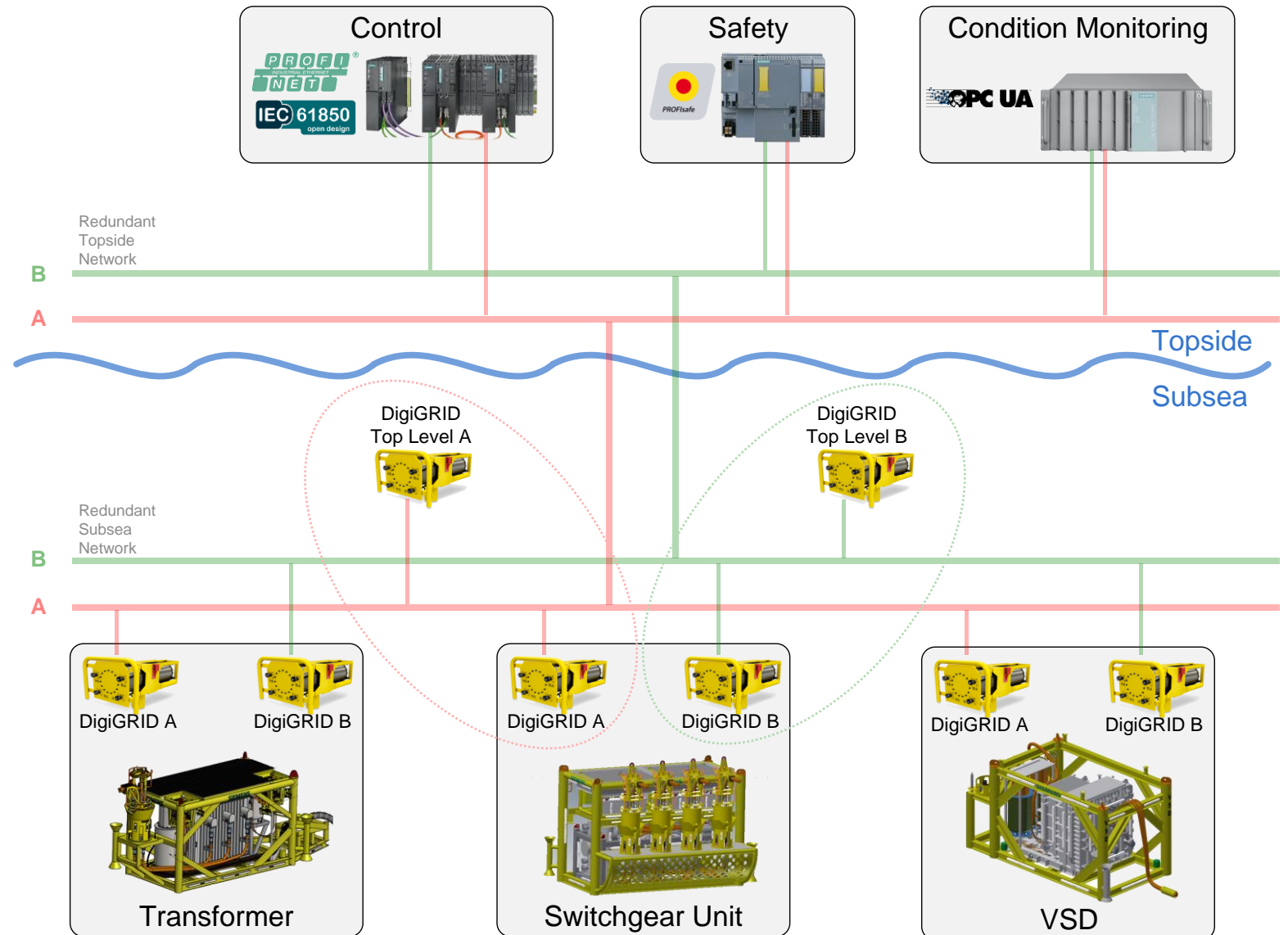
Spoolsep

Background – Siemens Subsea PowerGRID

Multiple
Functional interfaces

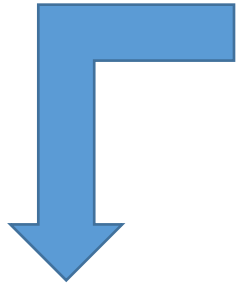
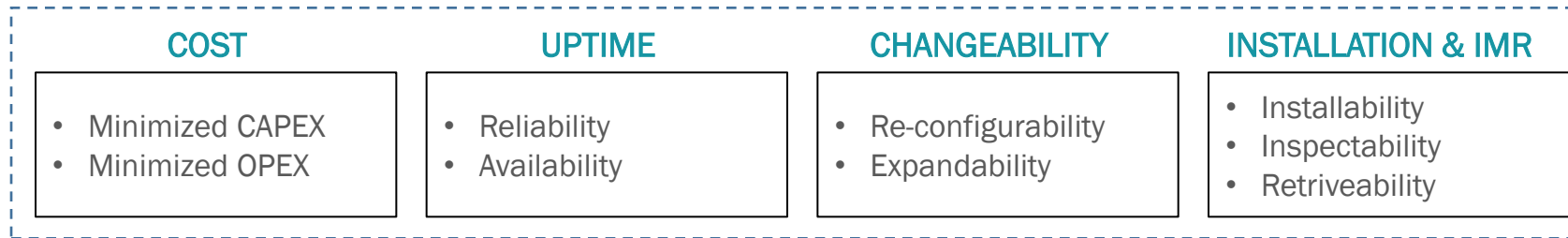
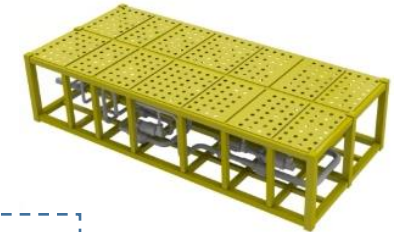
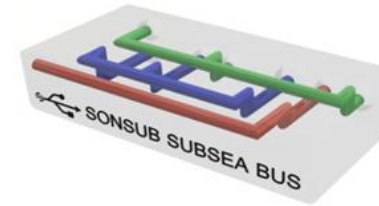


One physical interface
(Ethernet)

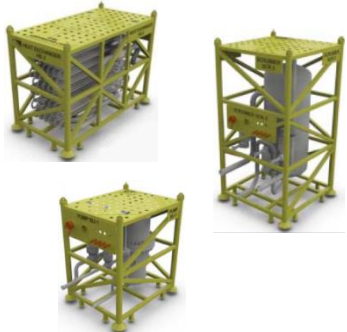


Background – Saipem SUBSEA BUS™

The SUBSEA BUS™ (patent pending) assures the modules connections allowing distribution of process, chemicals, control and power



Functional Building Blocks FAMILIES



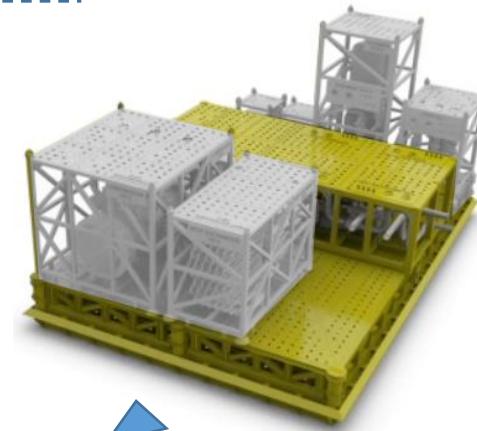
INTERFACES are standard



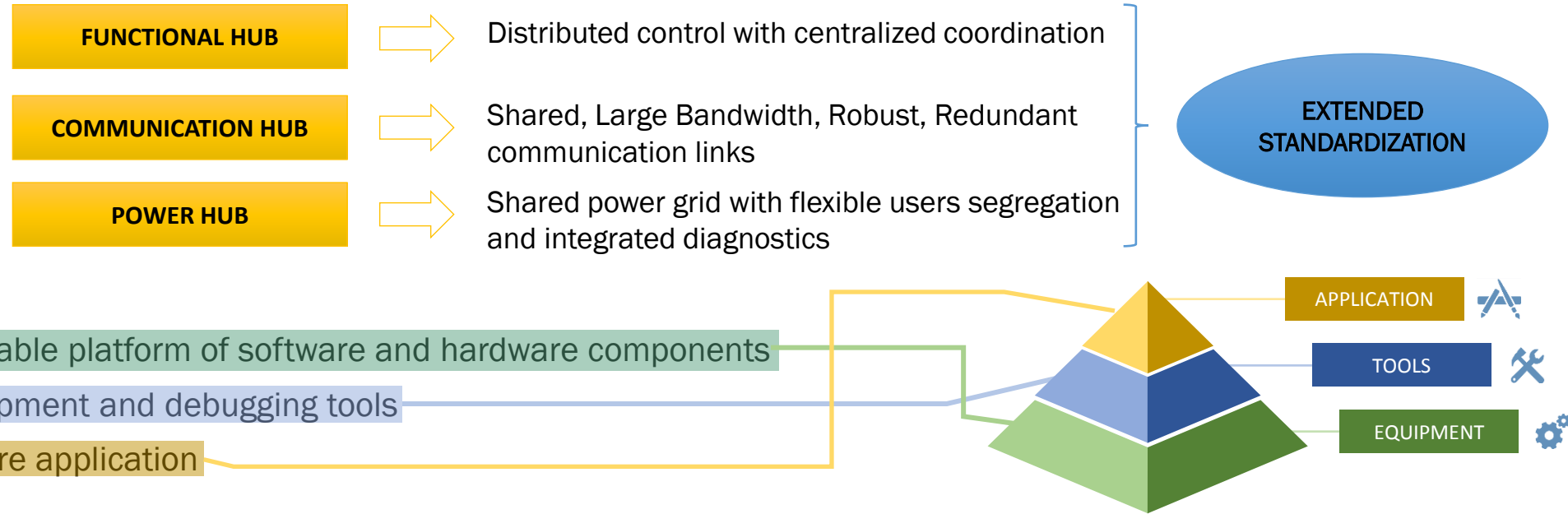
TOMORROW



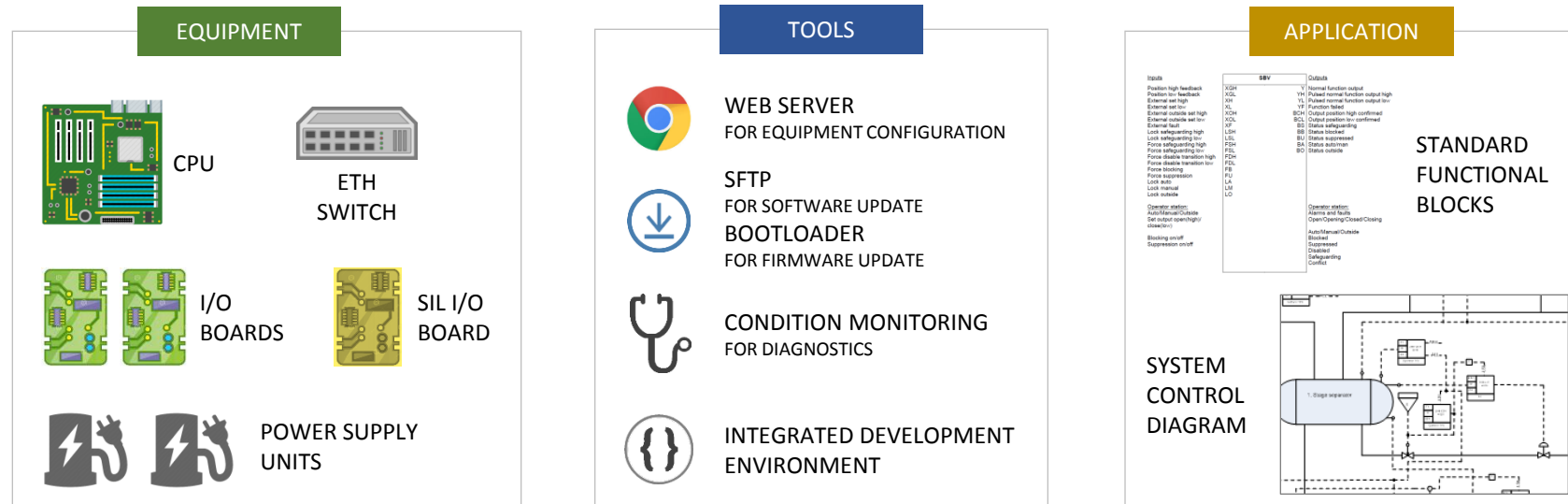
Families become a CATALOGUE



SAIPEM
OPEN FRAMEWORK
For
SUBSEA BUS™

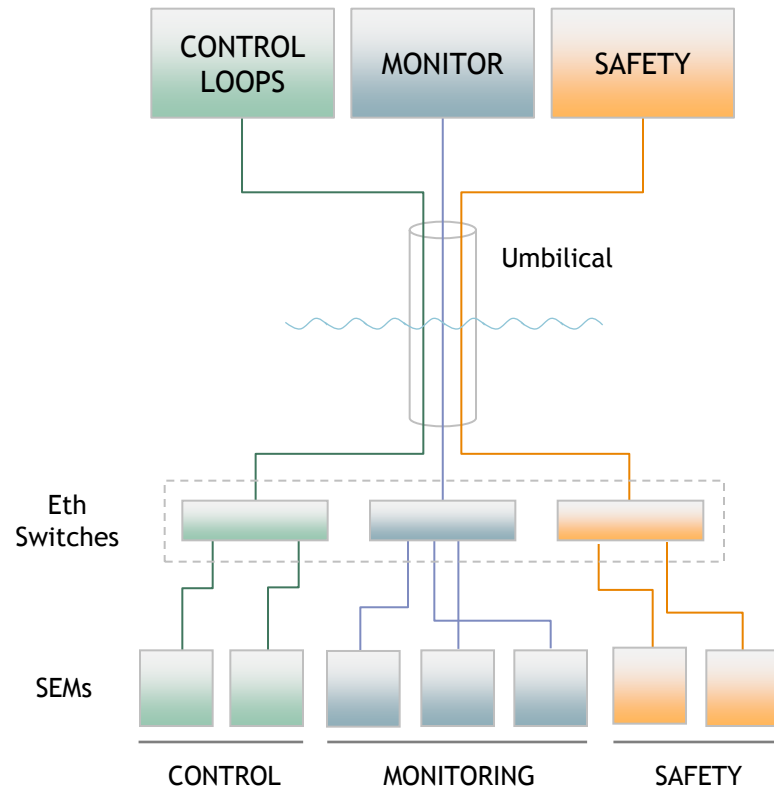


SIEMENS DigiGrid
Fitting
Saipem SUBSEA BUS™

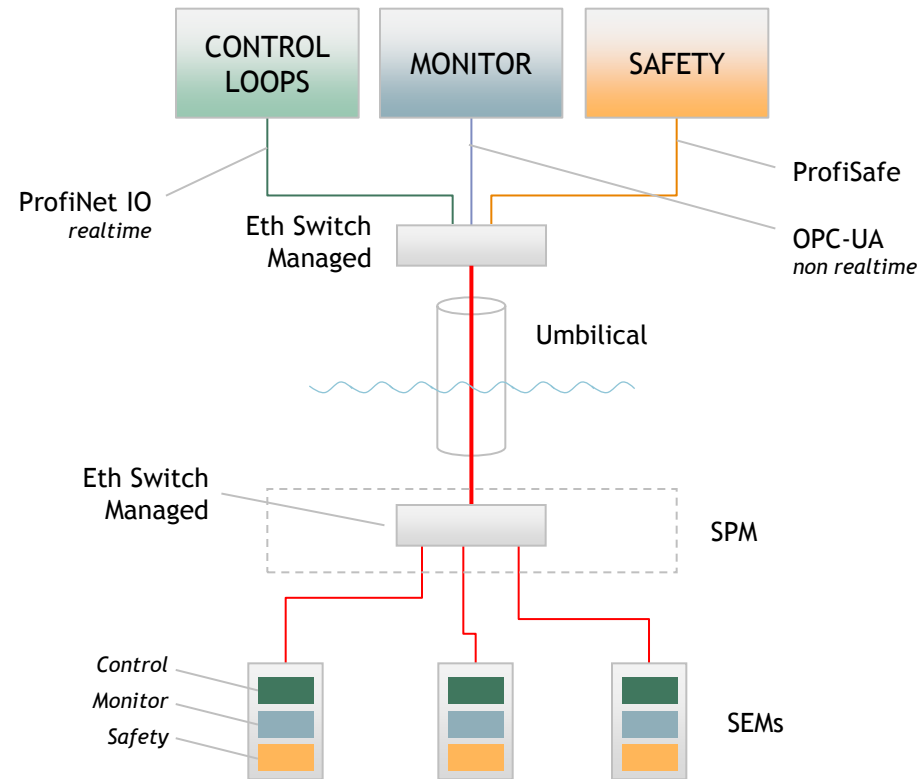


Saipem SUBSEA BUS™ and Siemens DigiGRID

STANDARD ARCHITECTURE

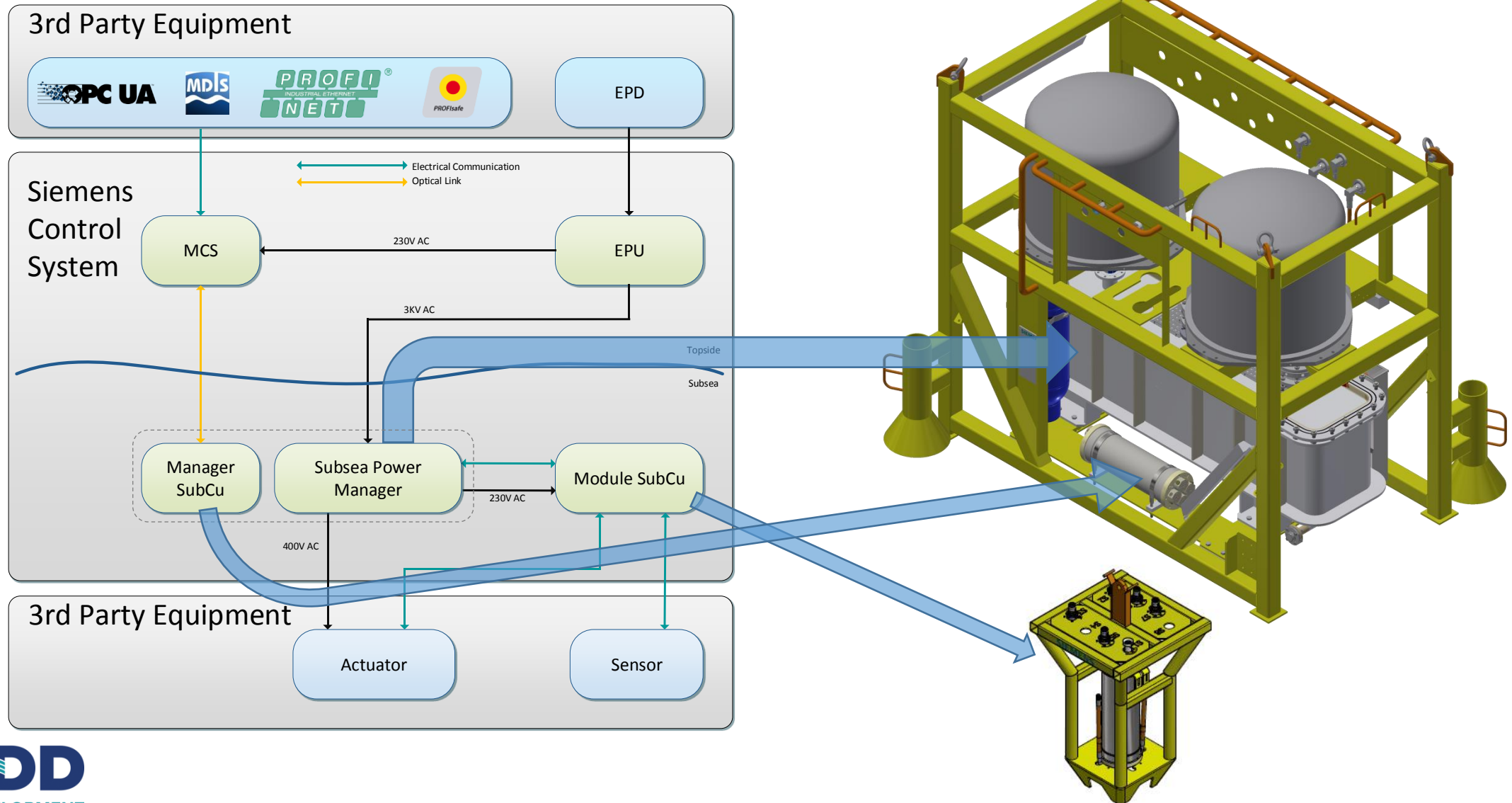


SAIPEM SIEMENS CONCEPT

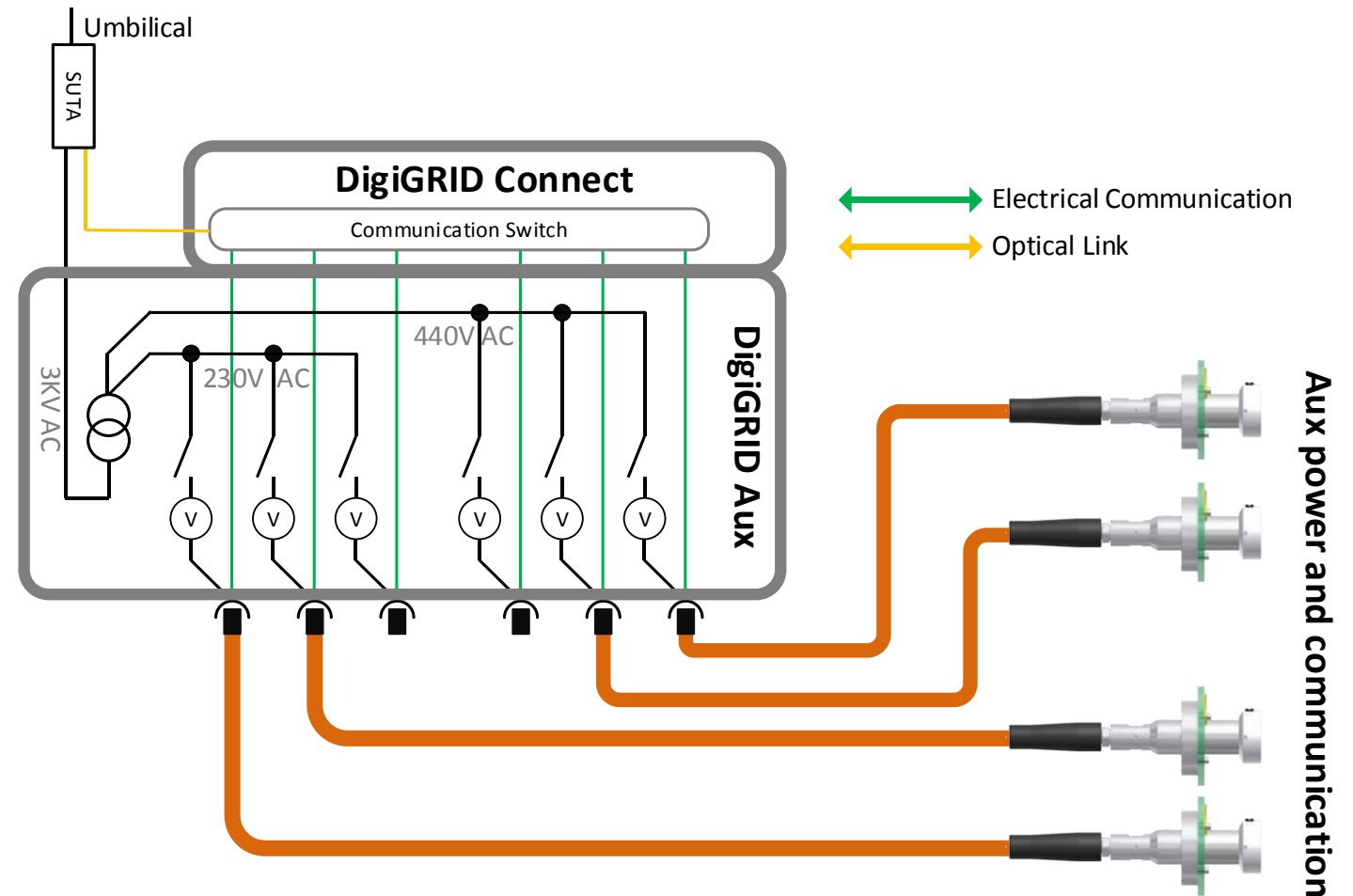
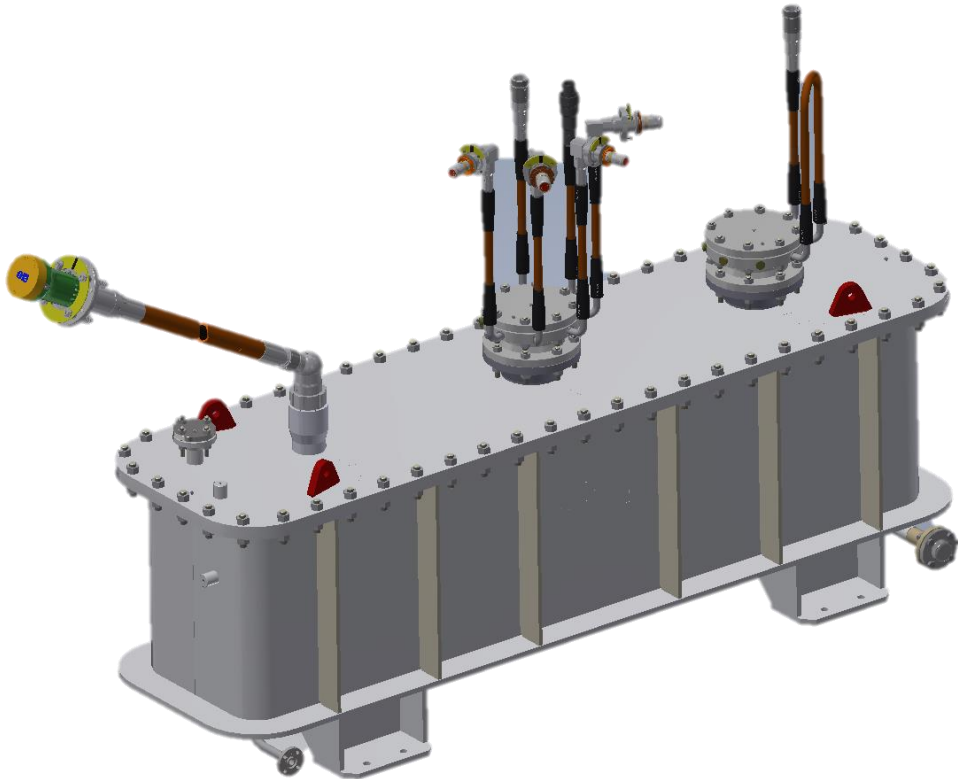


- Standard protocols integrated (and segregated) into the same physical communication lines
- SEMs integrate all necessary functions and hardware
- Simpler umbilical, simpler hardware and less connections
- No need of full SIL certified control chain (standard communication network)

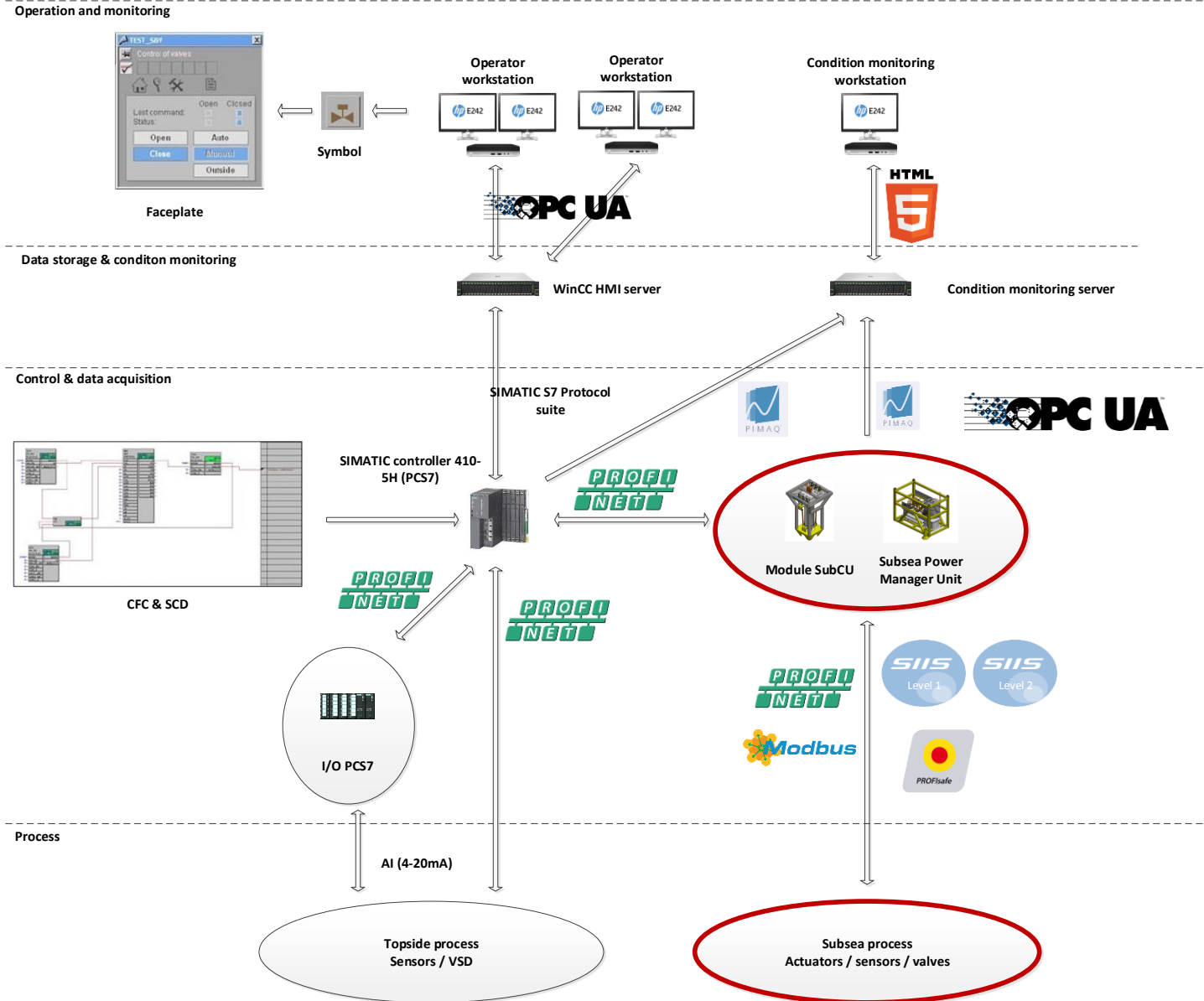
System architecture with main subsea building blocks



Subsea Infrastructure for LV Power and Control



Open industrial standards – Functionality & Implementation



LV Power and Control System as part of subsea processing

Main requirements for Subsea Processing

- Necessity to run logics such as sequences and closed control loops.
- Fast closed control loops.
- Continuous control valves vs. stepping control.
- Simultaneous valve actuations and System promptness (faster actuation of valves): hence higher power consumption.
- Higher frequency of valves actuation.

- Condition Monitoring.
- Safety functions (even SIL certified).

Siemens Subsea Control System features

- Possibility to run logics such as sequences and closed control loops, even subsea.
- Real time protocol (Profinet IO), also between topside and subsea.
- Subsea CPU with real time OS (QNX).
- All electric control system.
- Subsea Power Manager (SPM).
- Advanced Condition Monitoring System integrated with PCS and with Safety system: everything in the same control pod.

Status per April 2018

- Siemens Subsea Power Grid
 - Factory floor SIT concluded. Shallow water SIT and TRL 4 in 2018.
- Joint Development Agreement
 - Detailed design completed
 - Testing and API17F-Q1 qualification of internals finished
 - Started assembly of main units for prototypes
 - Testing of main units 2018/2019
 - Integration test all units together, extended test with third party vendors
 - TRL 4 by Q1 2019

Benefits for the Subsea Industry

- New approach to subsea low voltage power & control infrastructure based on proven onshore architecture and philosophies
- Use of open standards is supported by large service providers and gaining momentum with operators
- Control infrastructure with deterministic behaviour
- Supports safety certified functions (SIL 3)
- Supports electrical power budget > 40kW
- Subsea system could become integrated part of topside/onshore plant control
- Fit for Long Subsea Tie-back

References and contact information



Carlo Monteverde
Saipem
carlo.monteverde@saipem.com



Karstein Berge Kristiansen
Siemens Subsea
karstein.kristiansen@siemens.com

