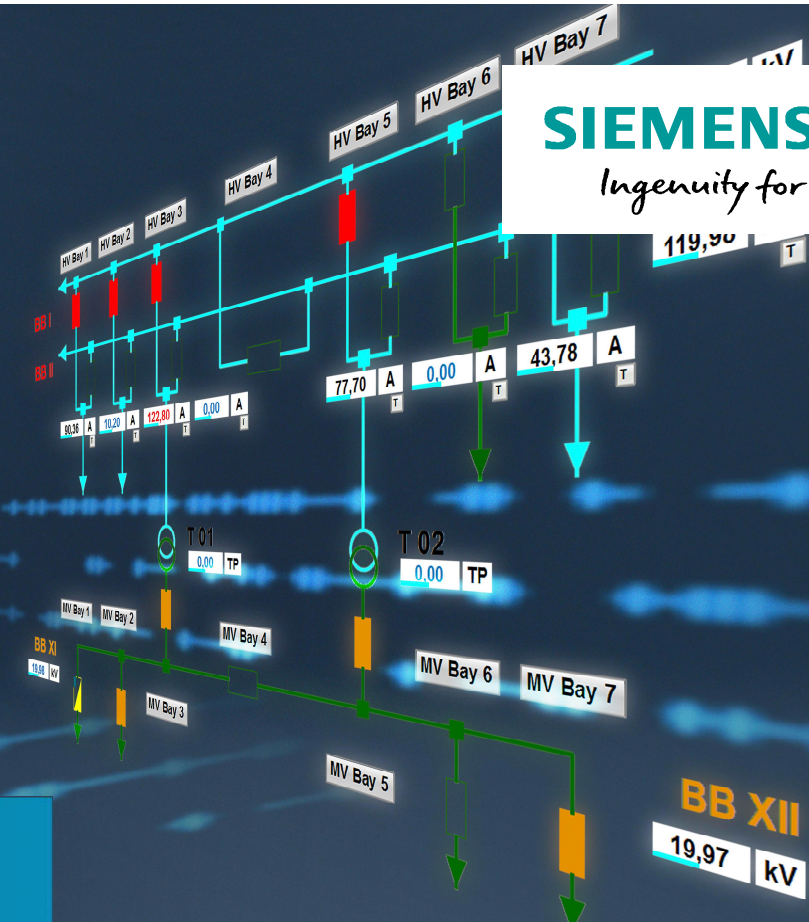


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KOMUNIKACIJE U TS

Tipične šeme

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Digital Grid Products

Broadest portfolio – strong brands for IEC 61850

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Substation Automation,
RTU's

Power Quality
Feeder Automation

Protection



SICAM

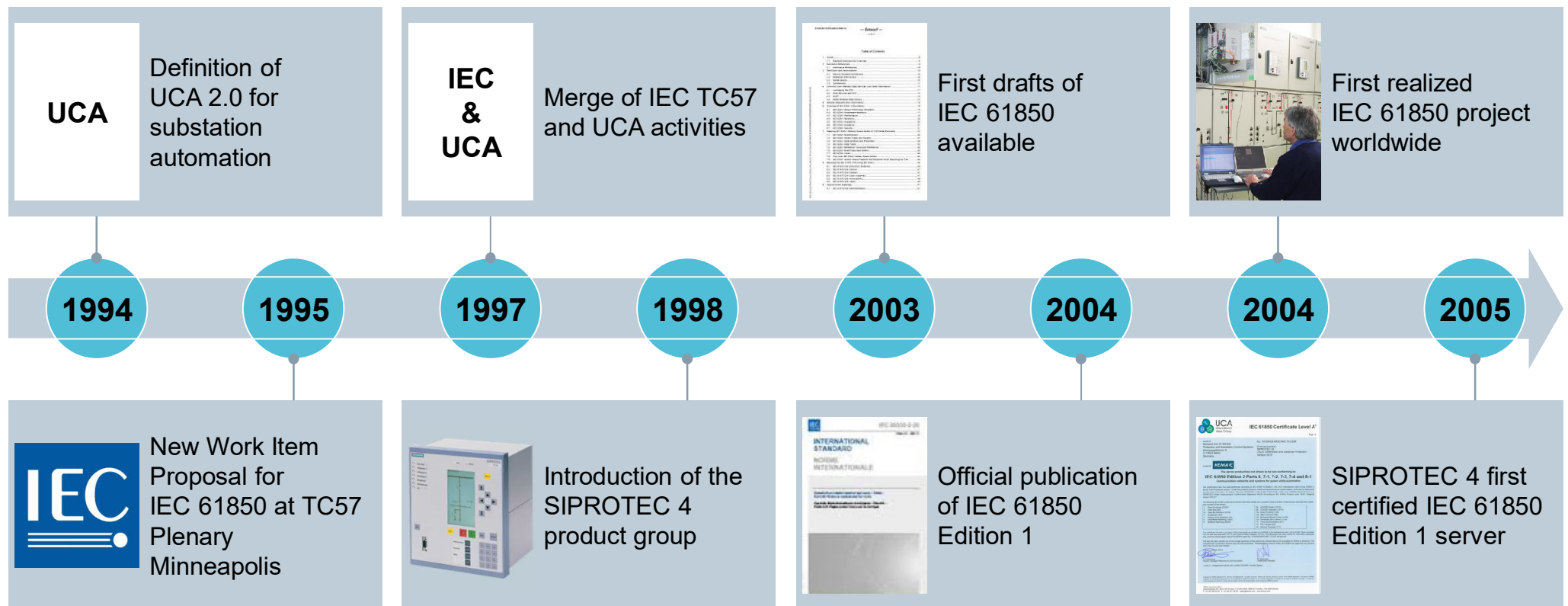
SICAM, SIPROTEC

SIPROTEC, Reyrolle

Milestones of the IEC 61850 evolution, 1994 – 2005 the pioneering phase



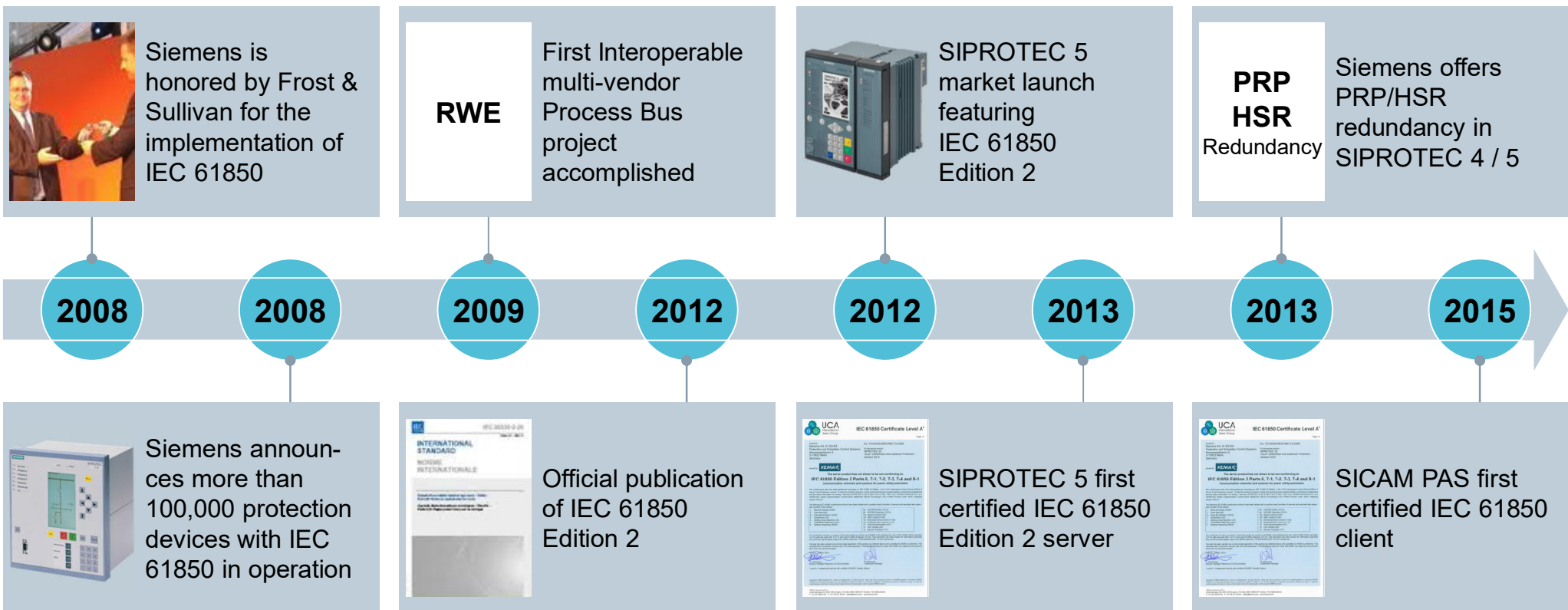
The histories of IEC 61850 and SIPROTEC are strongly interconnected



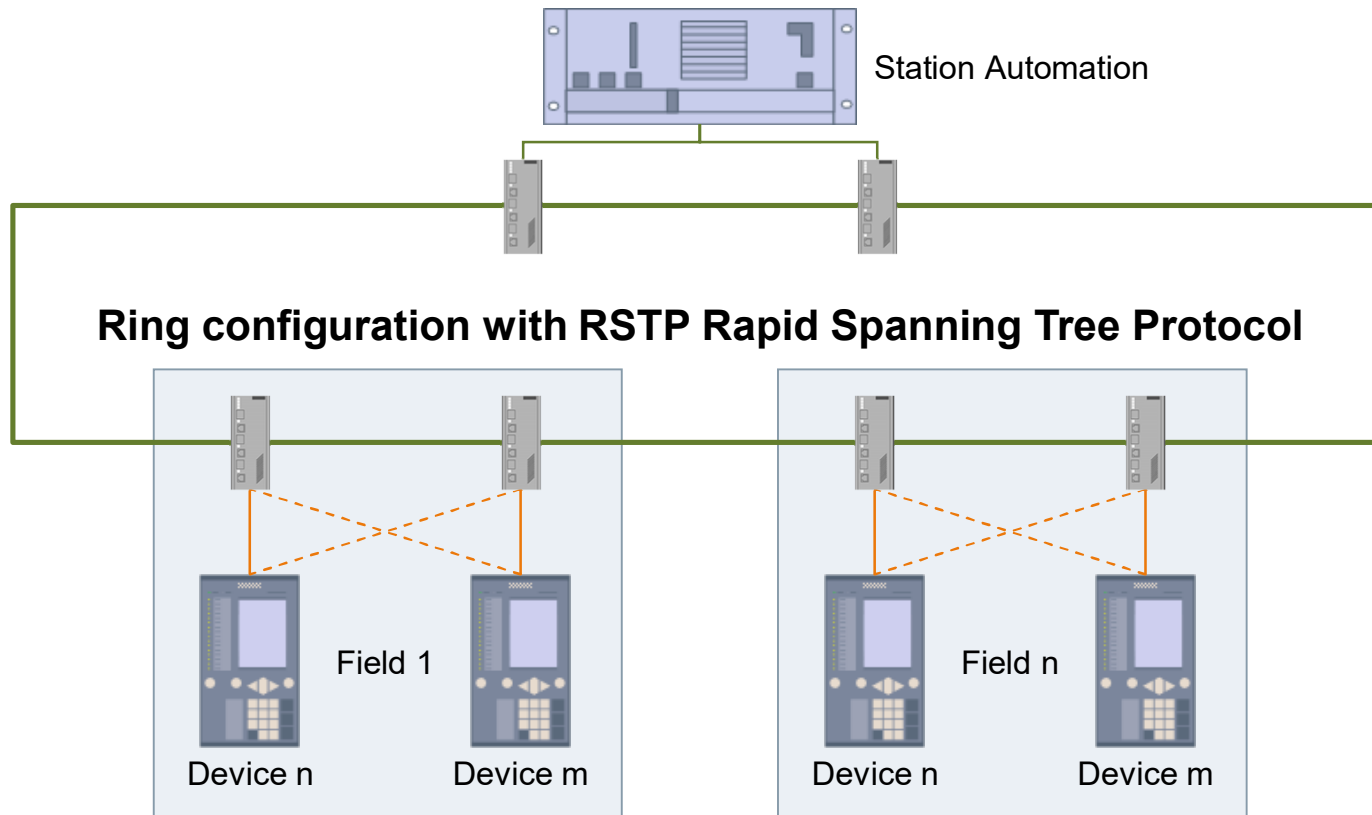
Milestones of the IEC 61850 evolution, 2006 – 2015 the global rollout phase



The histories of IEC 61850 and SIPROTEC are strongly interconnected



Communication Topologies – Ring and star with external switch

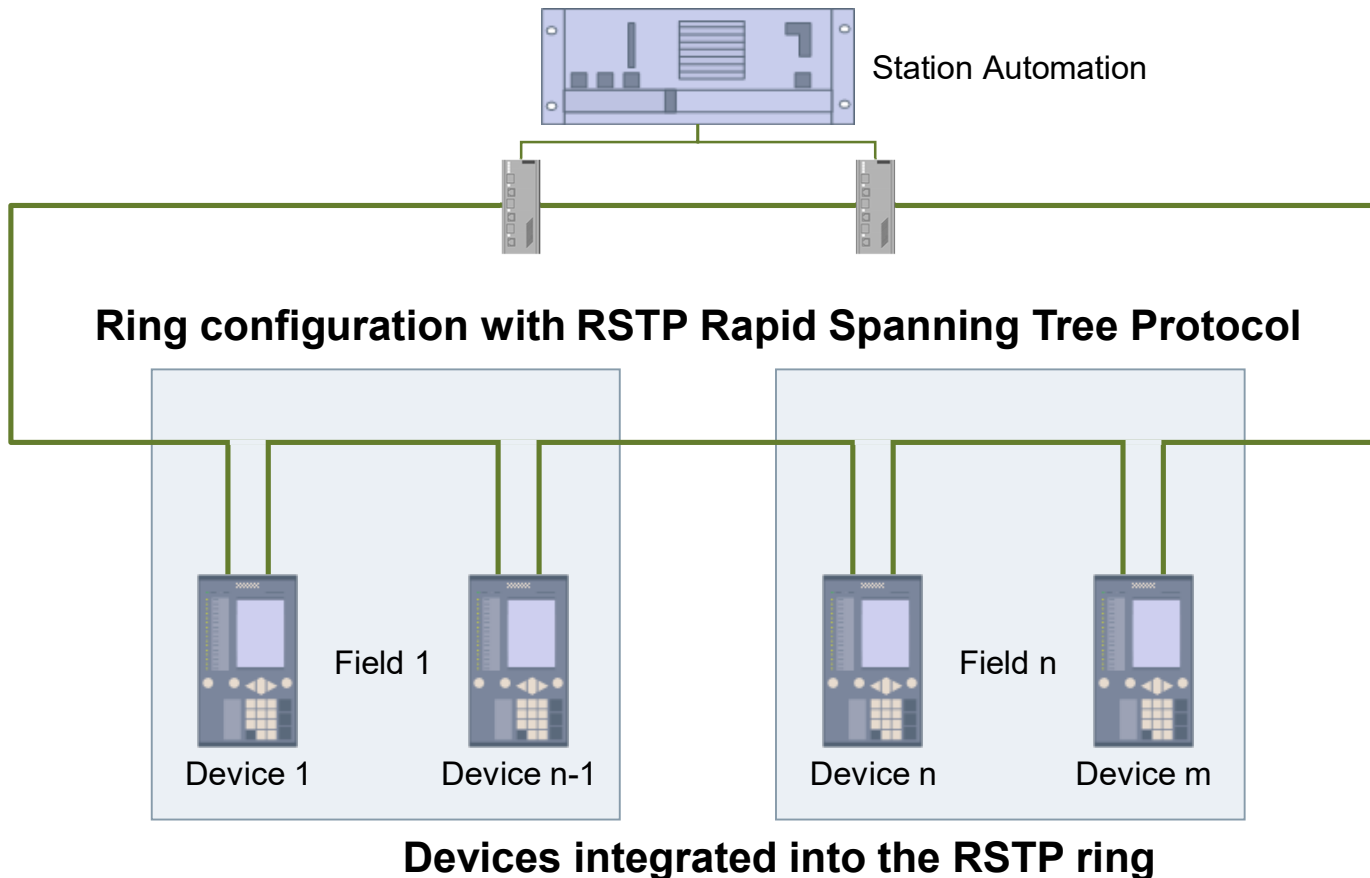


Dual Homing Link Redundancy

- 2 external Switches – directly connected
 - SIPROTEC devices connected in star structure to switches
 - SIPROTEC devices with two Ethernet ports
 - Port 1 is sending
 - Port 2 is standby
 - Switch over time <5 ms
- Established since 2004

Devices connected in star configuration and Dual Homing Link Redundancy

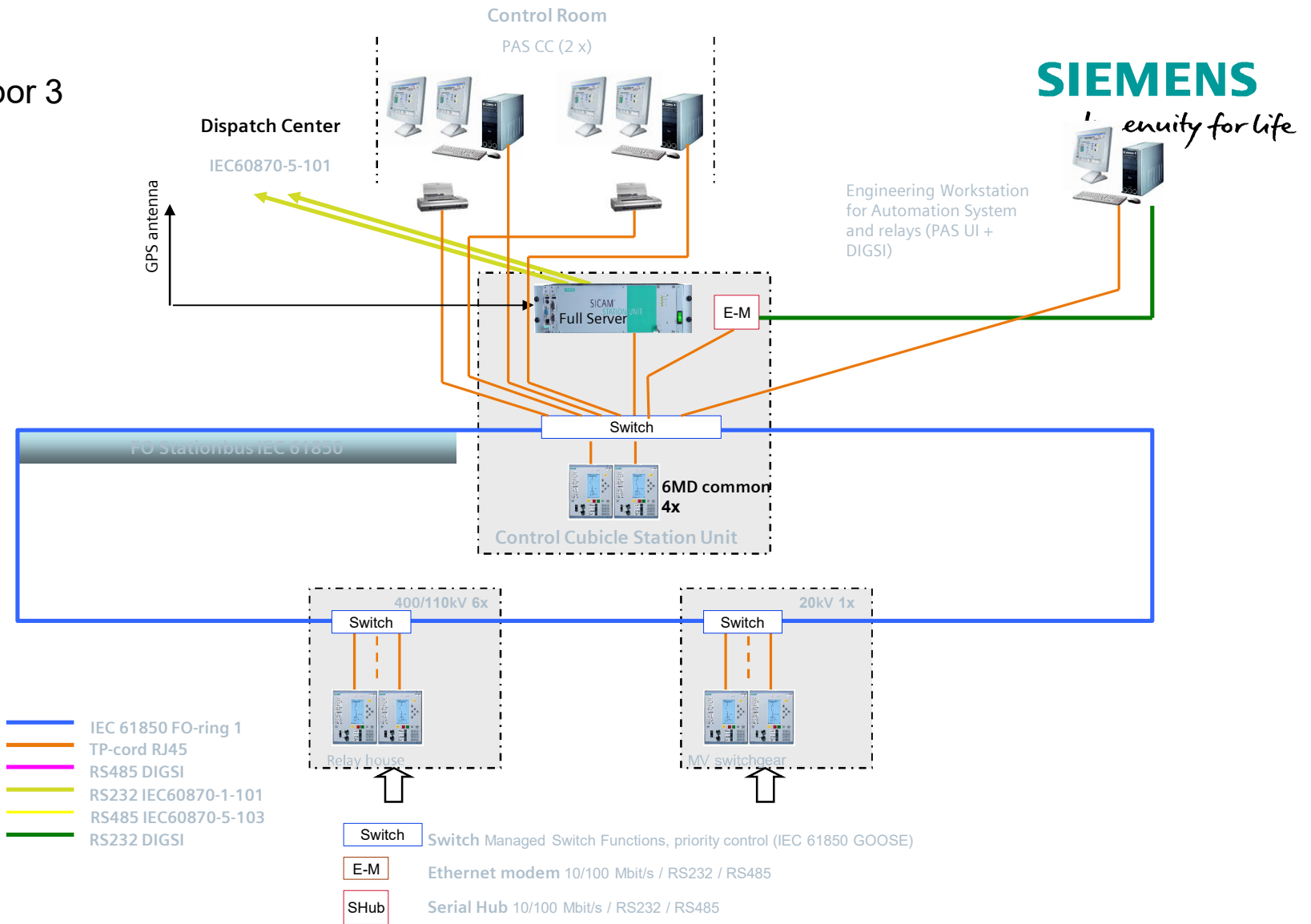
Communication Topologies – Ring with integrated switches



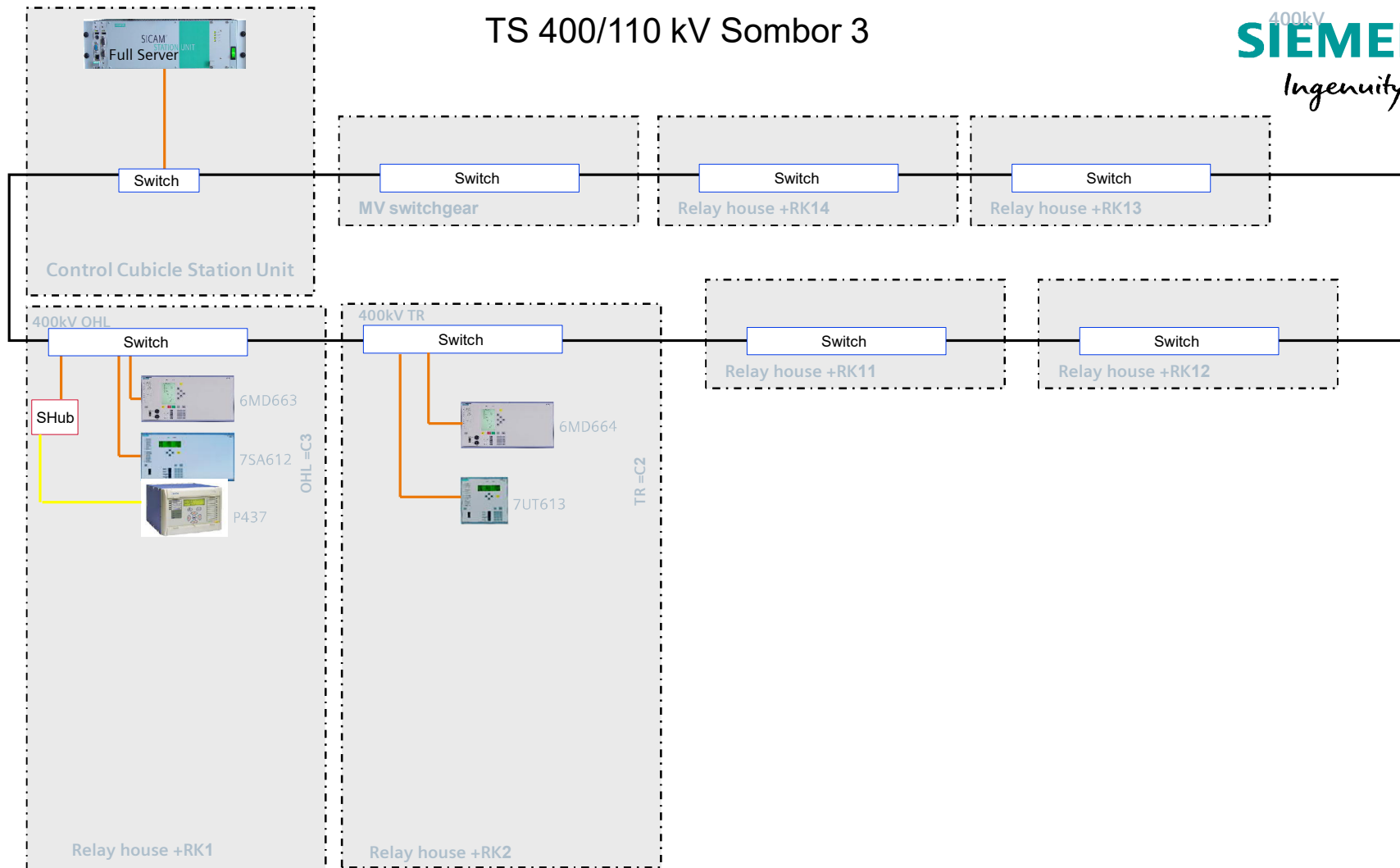
RSTP Rapid Spanning Tree Protocol

- 2 external RSTP-Switches
 - SIPROTEC devices with integrated RSTP switch
 - Rings with up to 30 devices
 - Several rings can be connected to external switches
 - Setting of RSTP parameters necessary
- Well established technology (>400.000 devices)
- Field proven interoperability

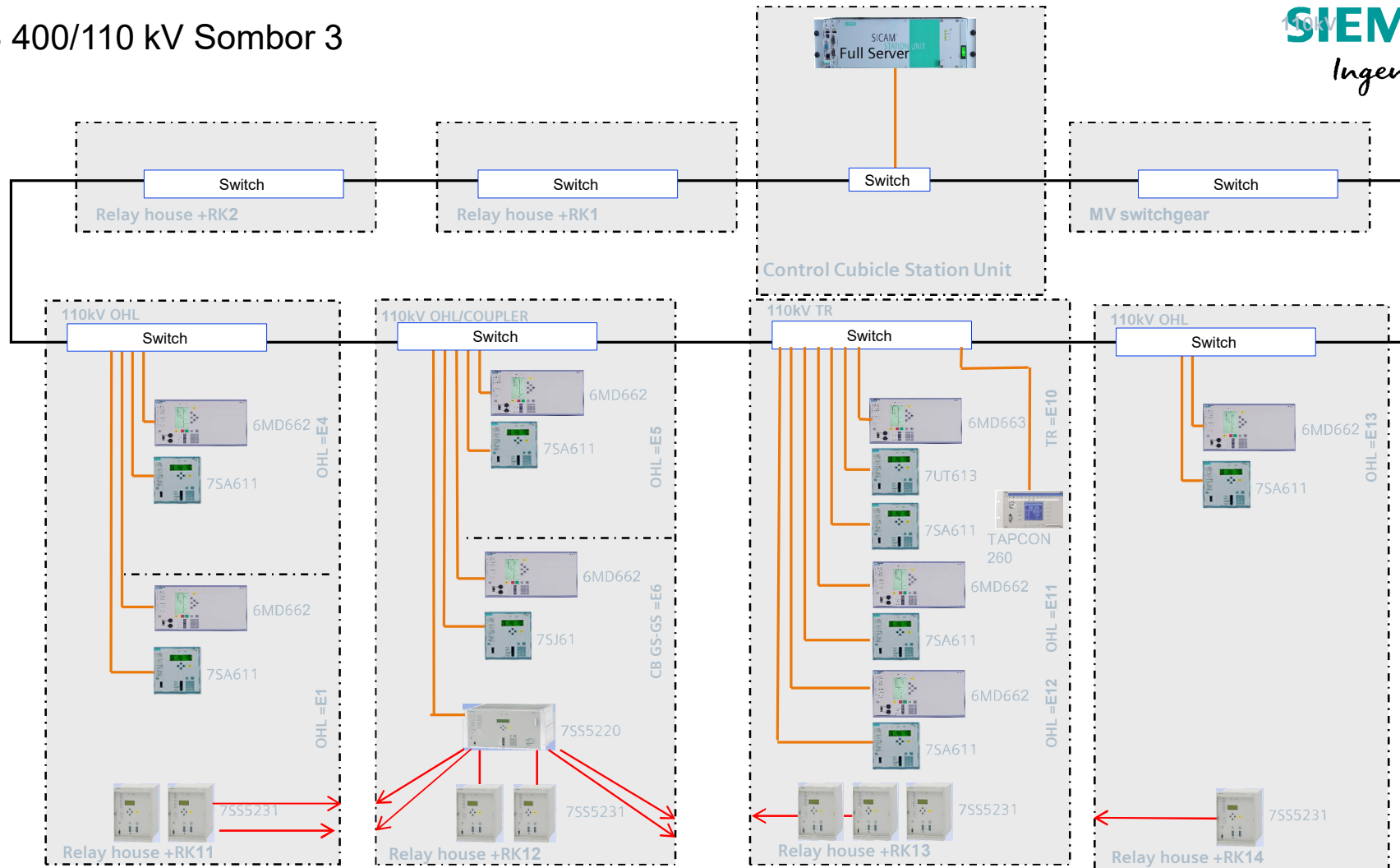
TS 400/110 kV Sombor 3



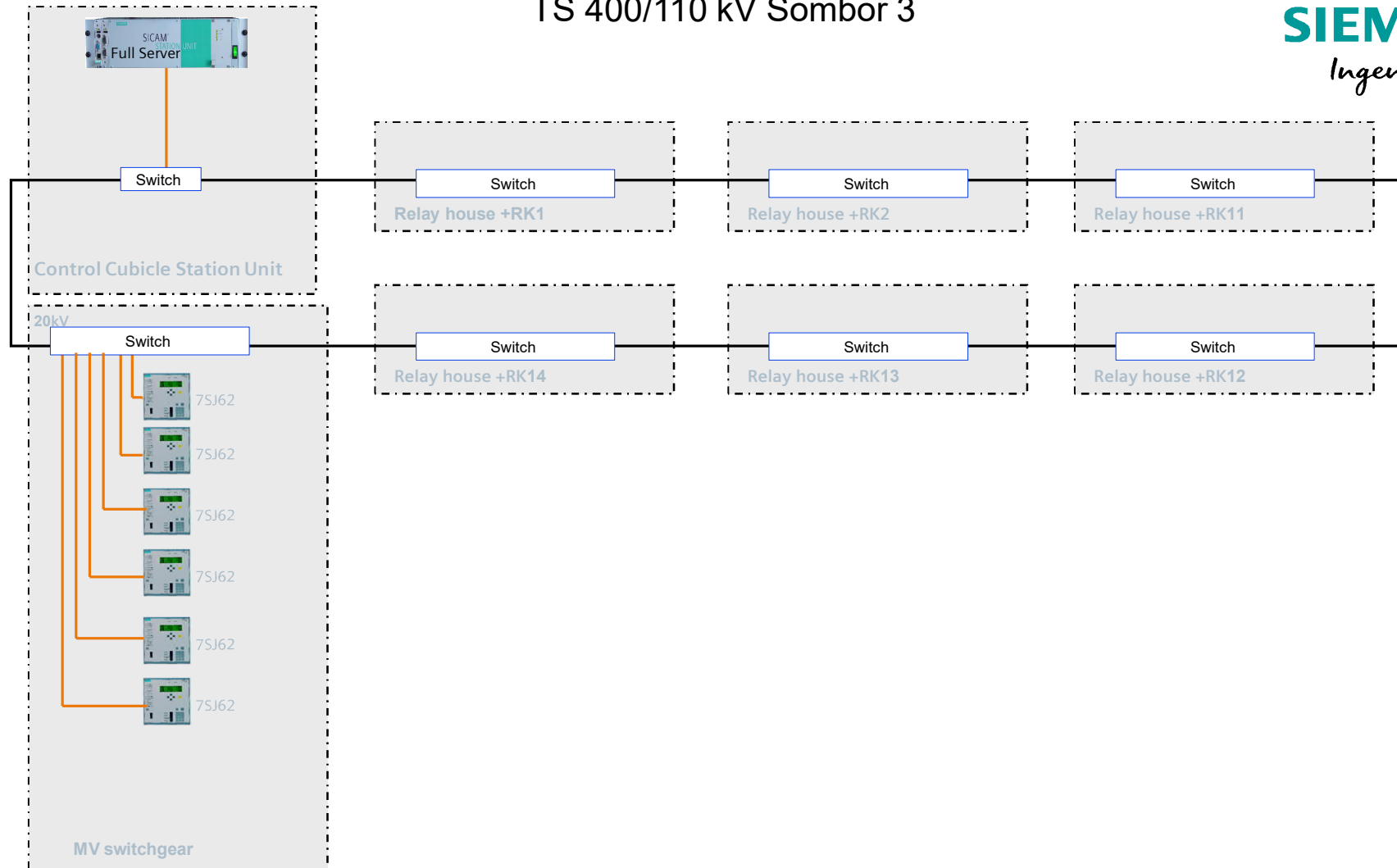
TS 400/110 kV Sombor 3



TS 400/110 kV Sombor 3

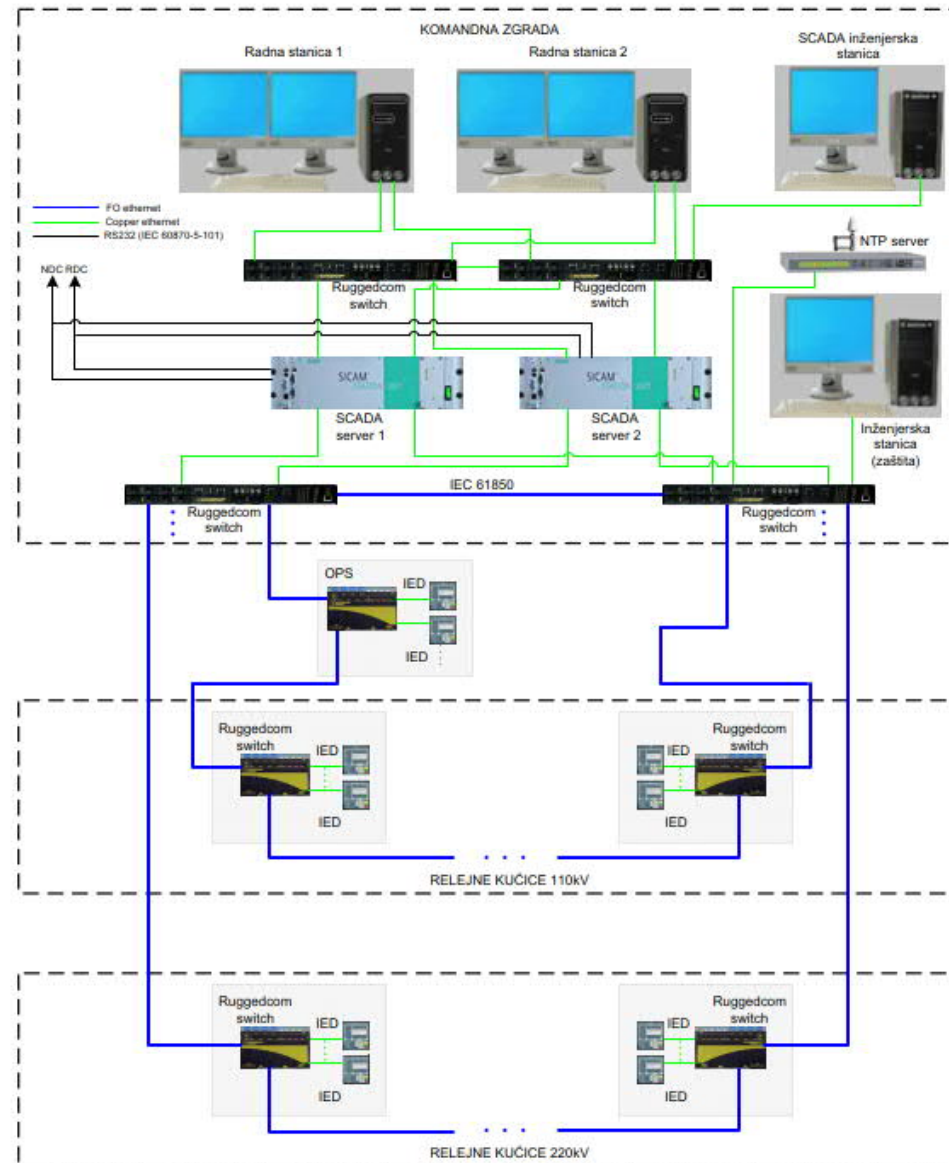


TS 400/110 kV Sombor 3

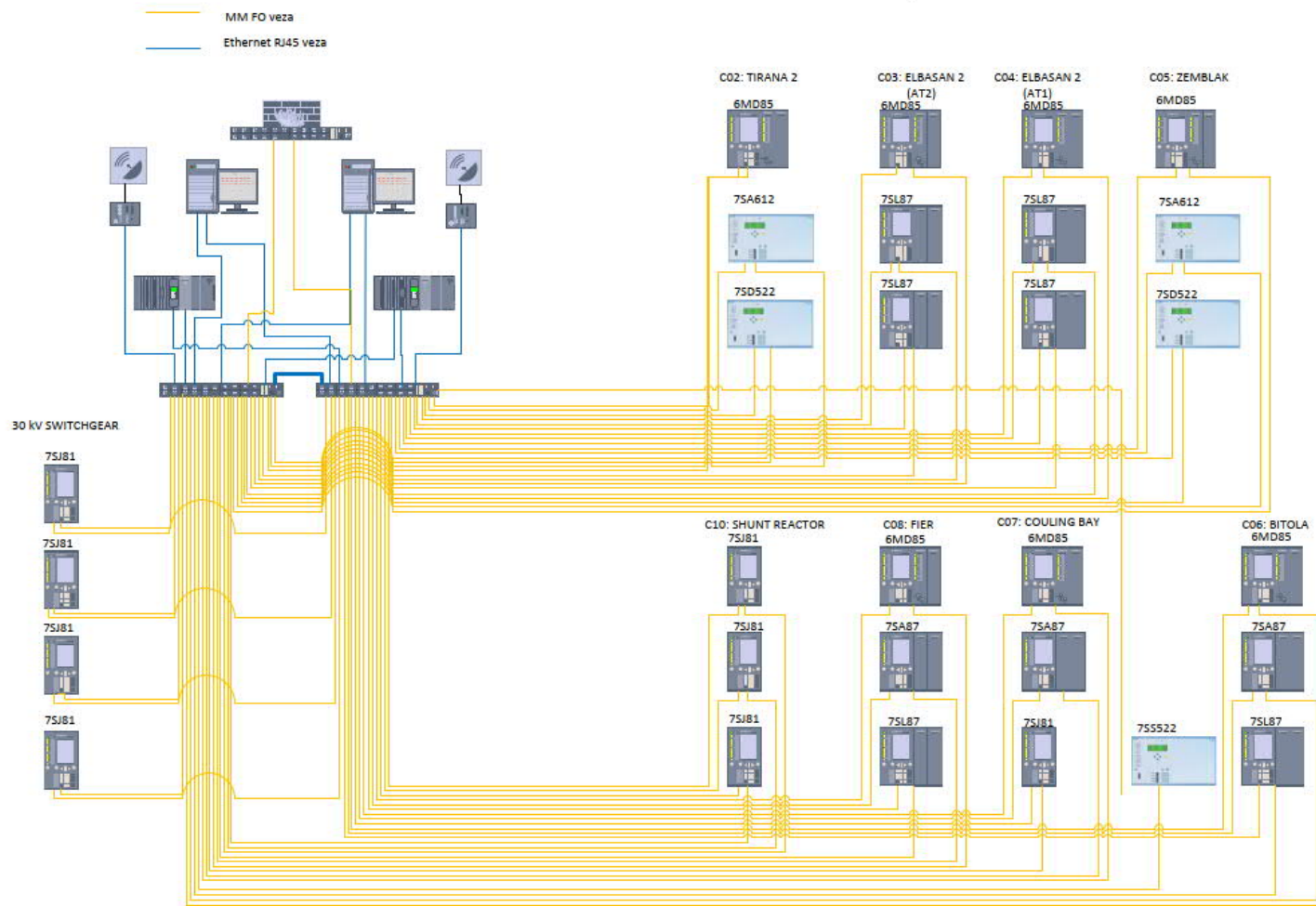


TS 220/110kV BISTRICA

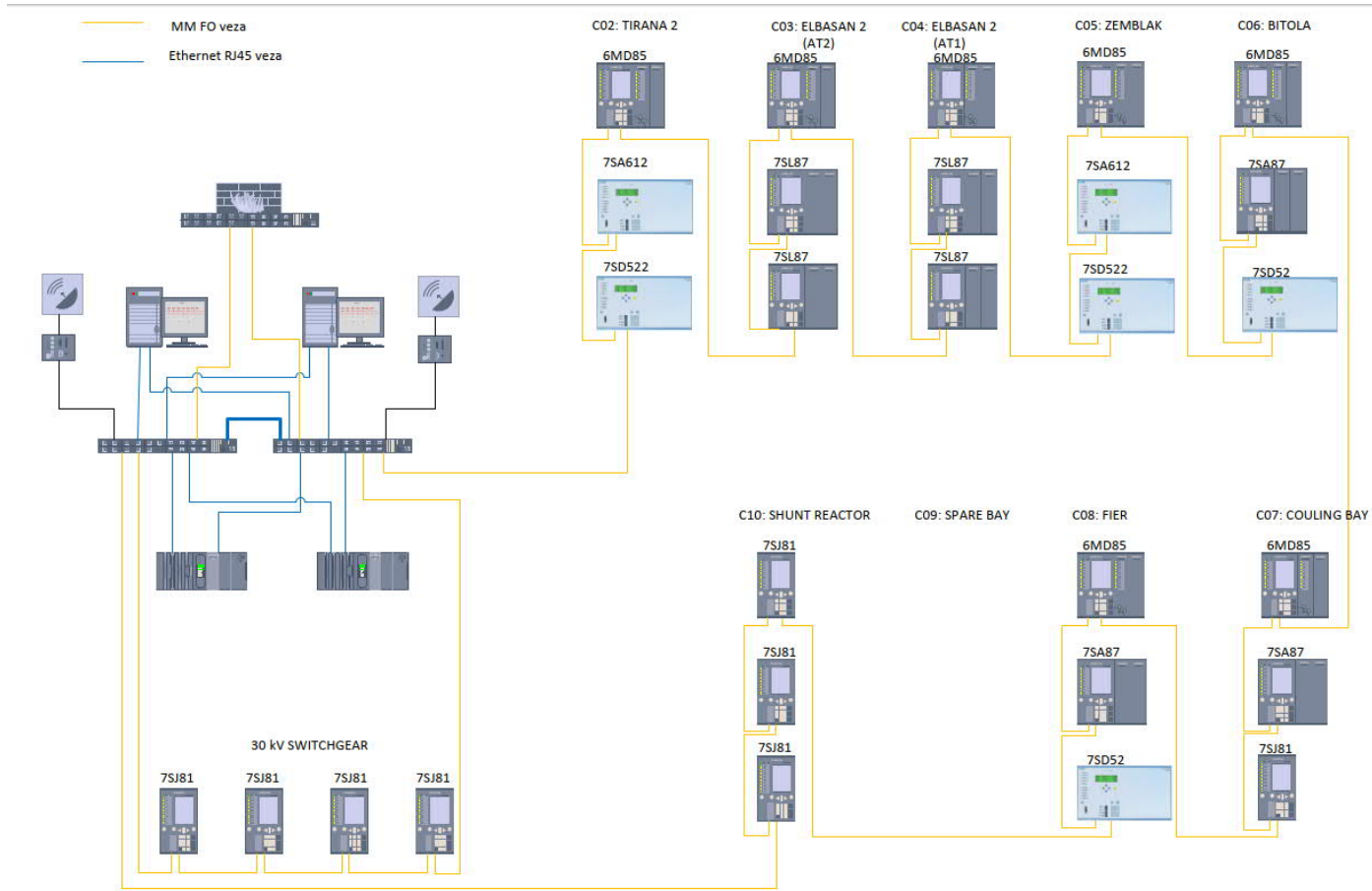
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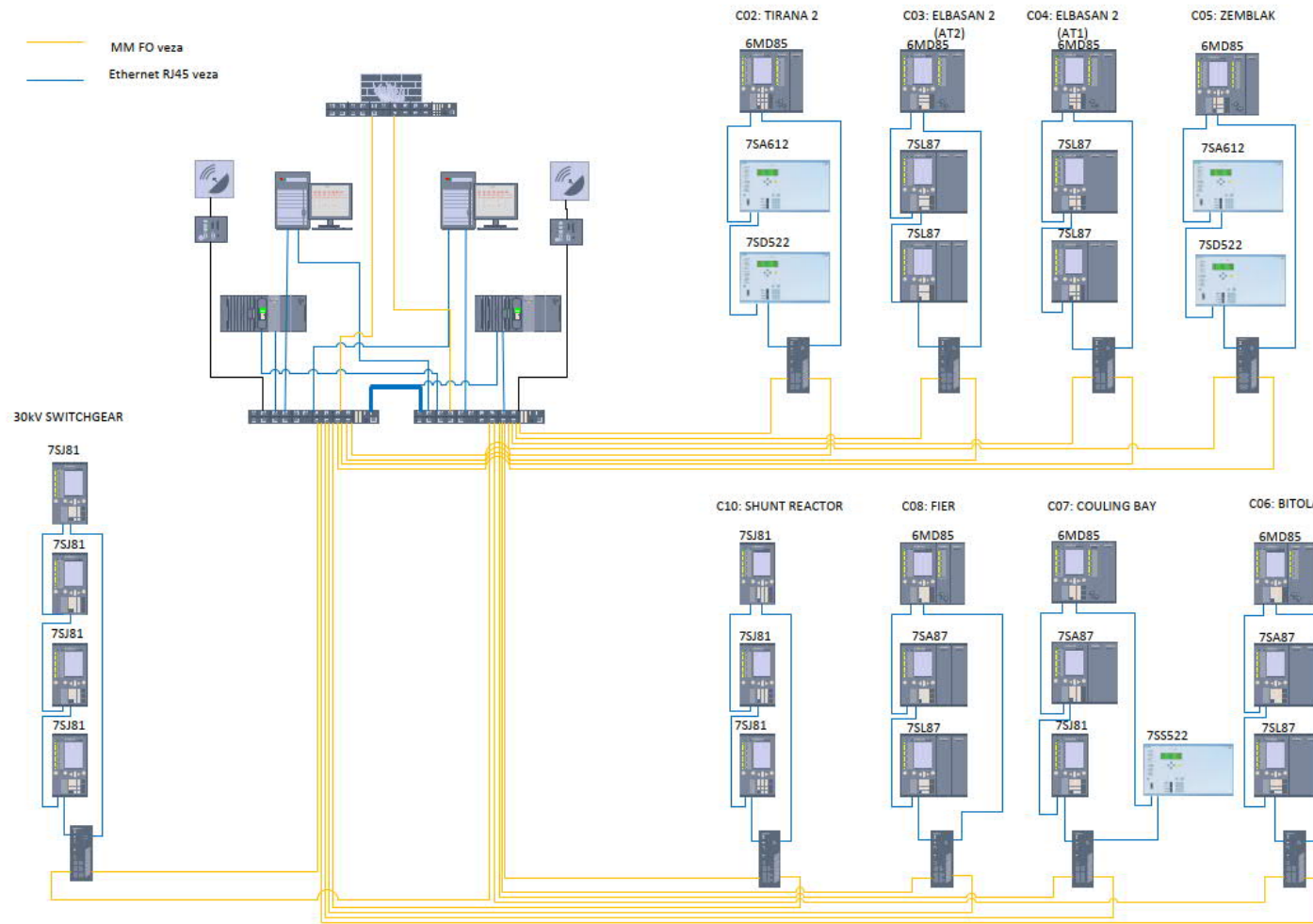
TS 400kV ELBASAN 3



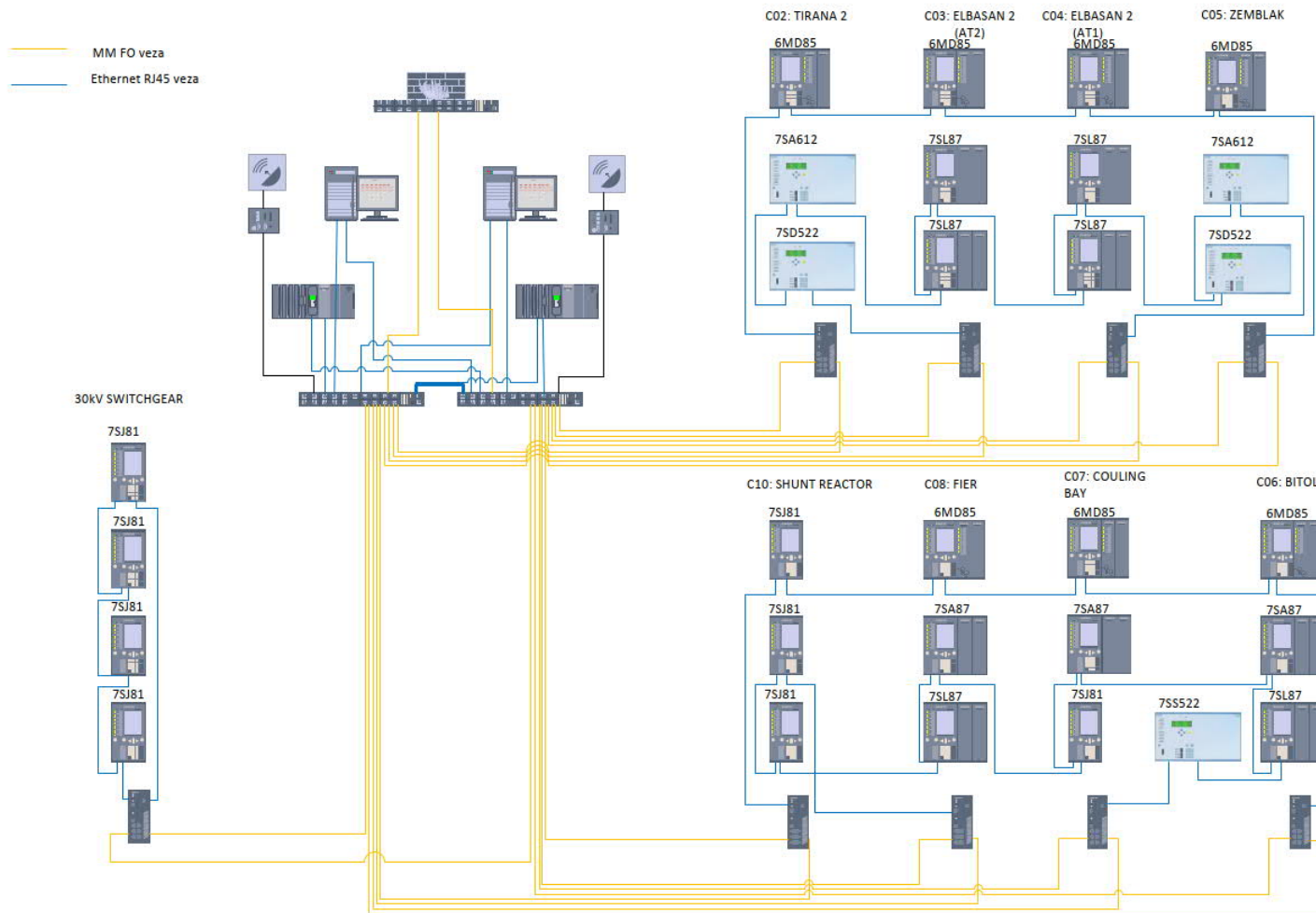
TS 400kV ELBASAN 3



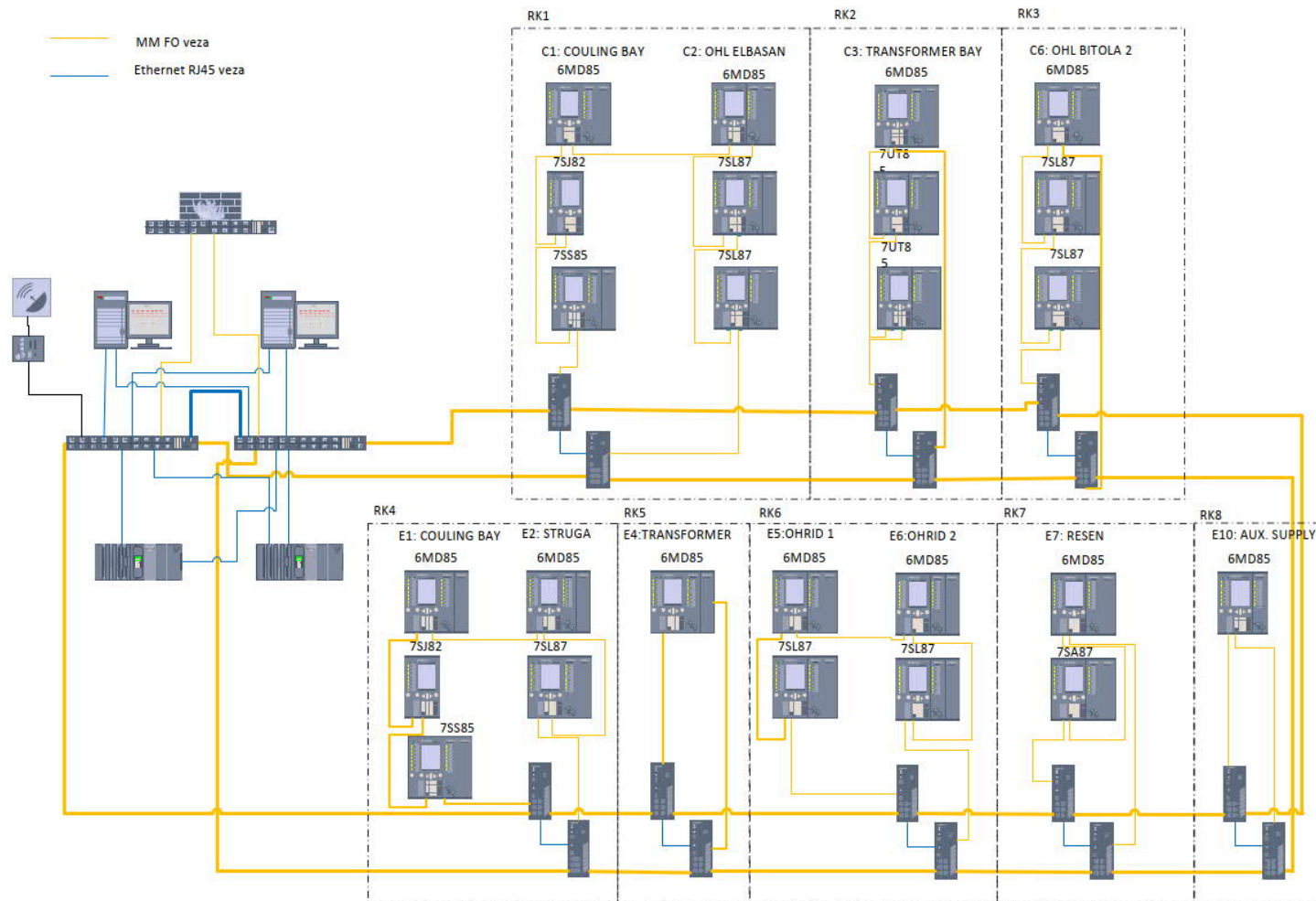
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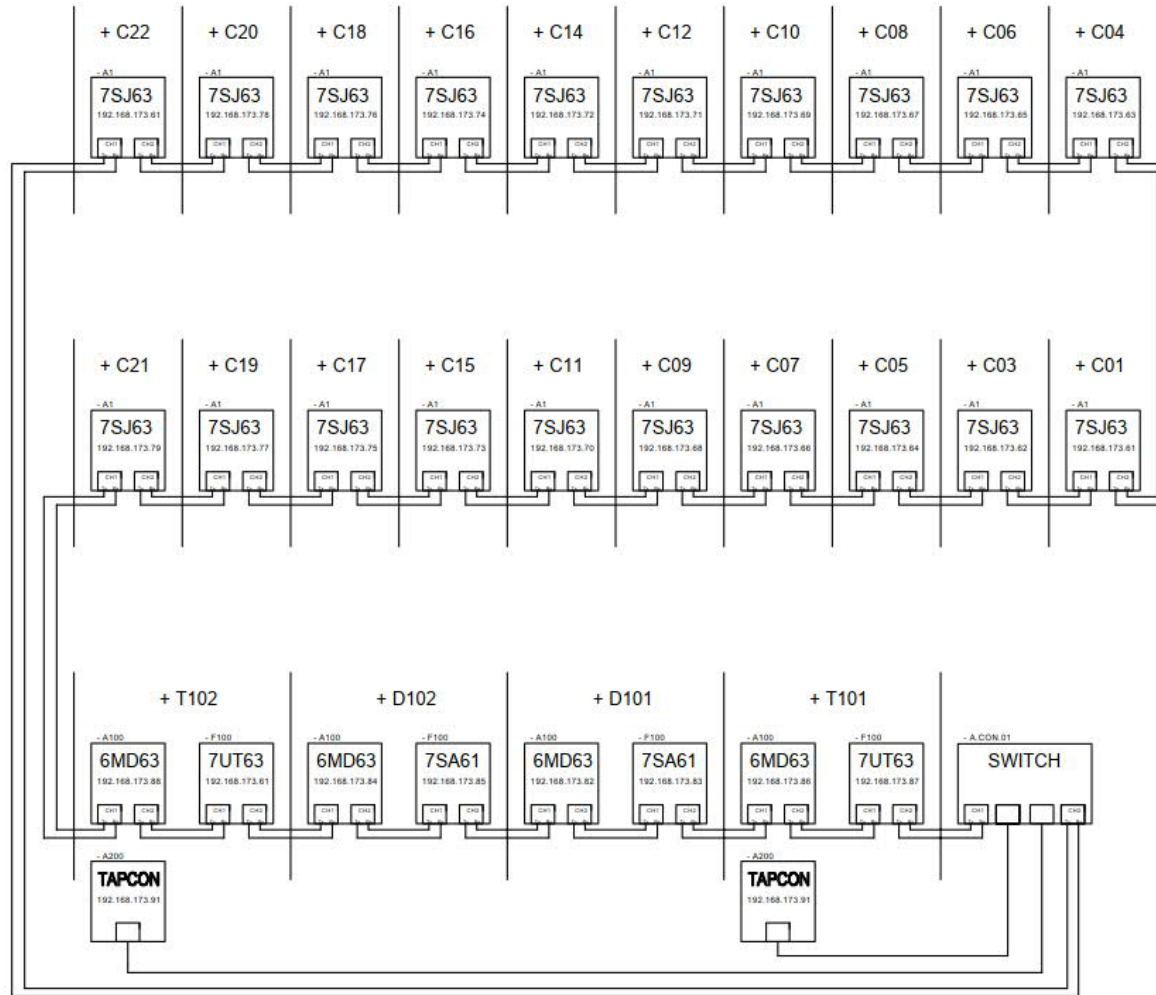
TS 400kV ELBASAN 3



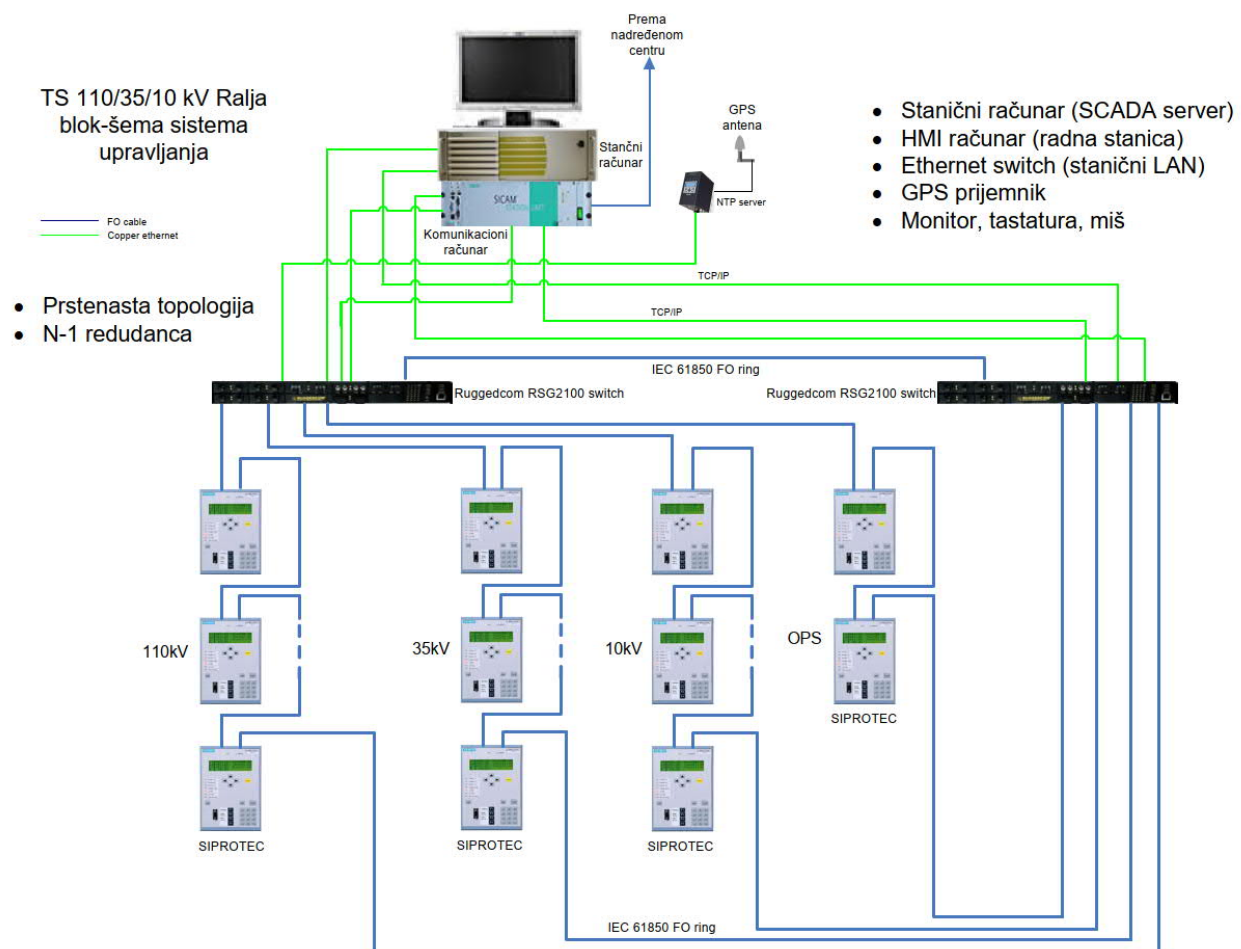
SS 400/110kV OHRID



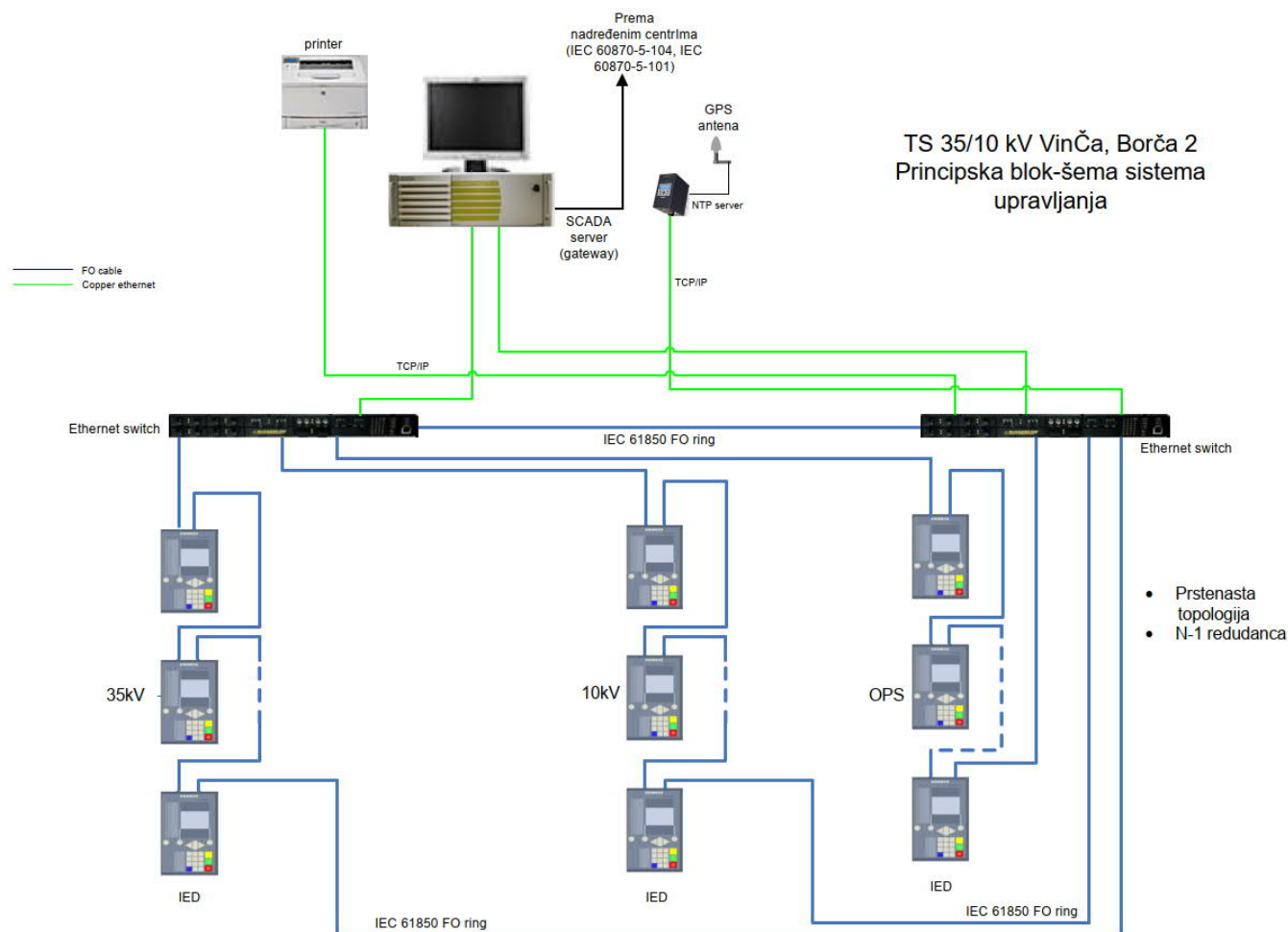
TS 110/20kV RUMA 1



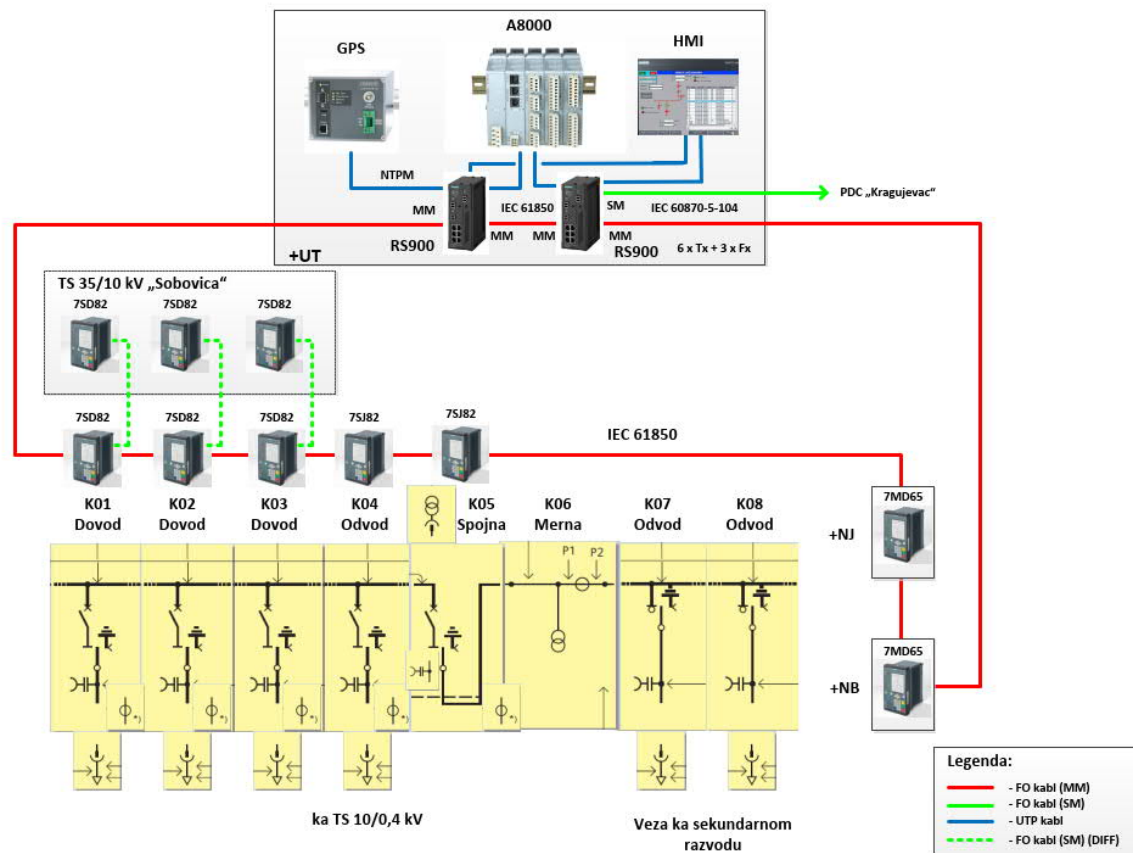
TS 110/35/10kV RALJA



TS 35/10kV VINČA, BORČA 2



PRP 10kV SOBOVICA



Communication Requirements for Process Bus



Redundancy with recovery time

- *Dual Homing Link Redundancy*
Two active links, one is sending, sending link changes if one link is down
- *RSTP Rapid Spanning Tree Protocol*
Redundancy IEEE 802.1D-2004

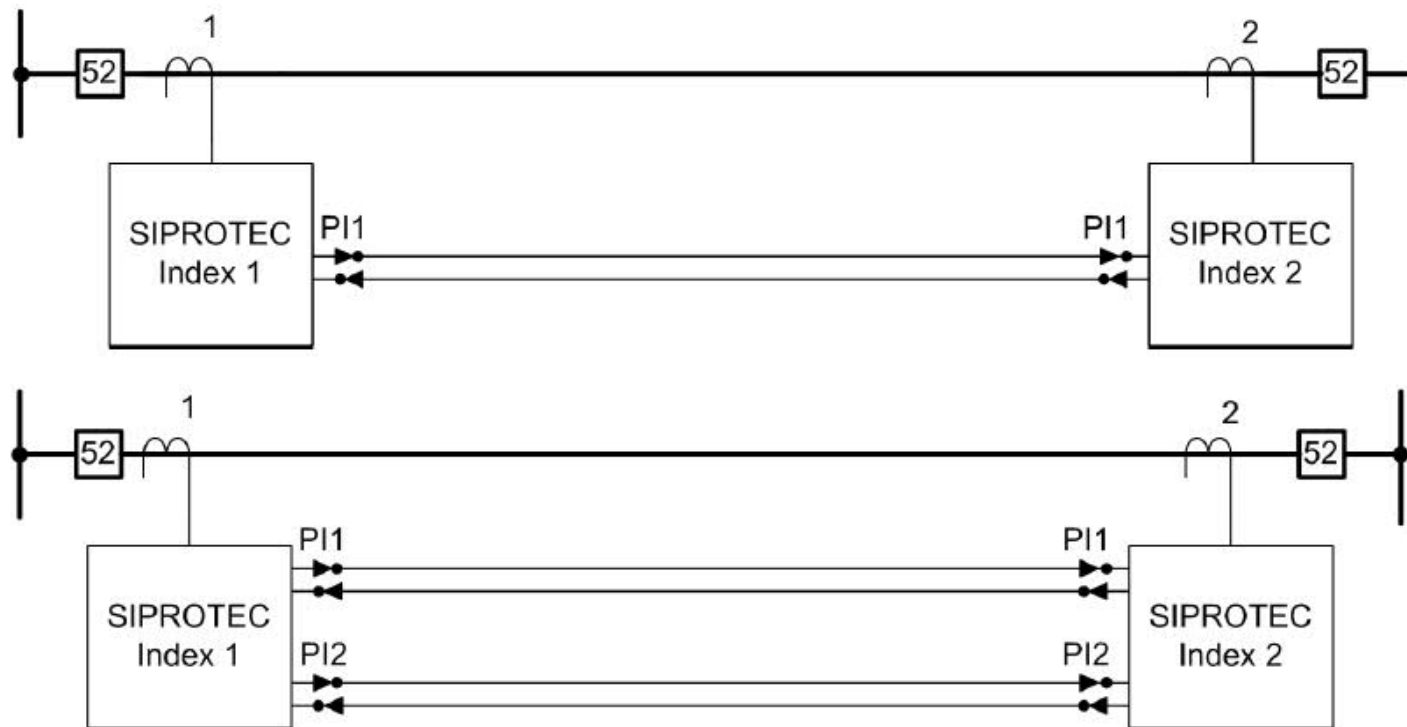
Insufficient for
Process bus

Seamless Redundancy Systems:

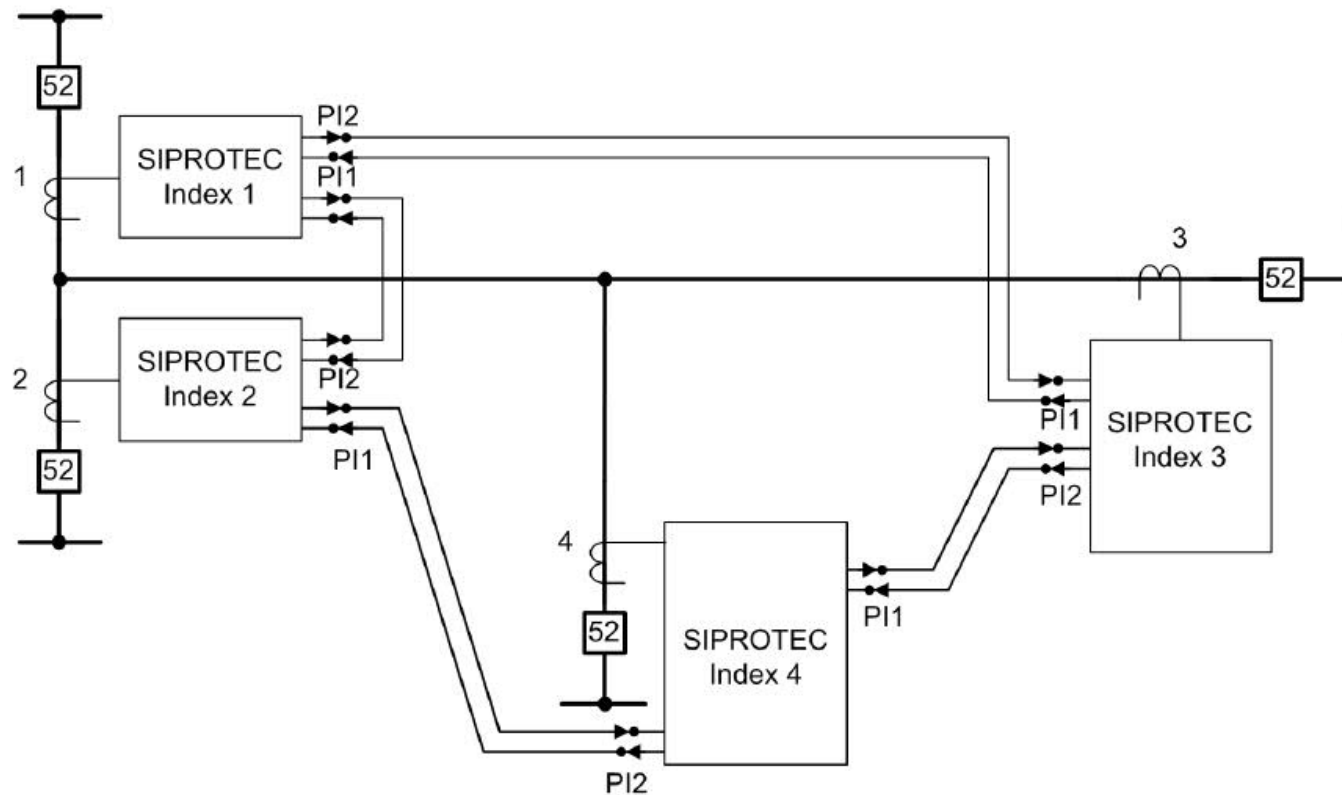
- *PRP – Parallel Redundancy Protocol IEC 62439-3.4*
Two active links, both sending, parallel configuration
- *HSR – High Availability Seamless Redundancy IEC 62439-3.5*
Two active links, both sending, ring configuration

Field proven
in SIPROTEC

Protection communication



Protection communication



Line differential protection SIPROTEC 5 Multimedia protection interfaces



Customer requirement

- Communication via optical fiber FO, existing 2-wire connections (pilot wire, telephone cable) and digital communication networks (SDH, IP-MPLS)

Siemens solution

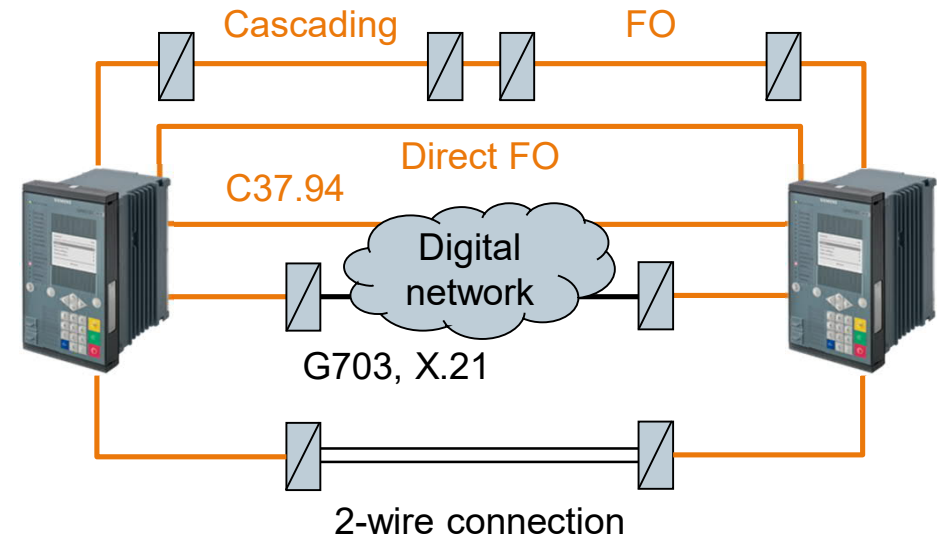
- Integrated modules for FO up to 100 km and digital networks according C37.94
- External converters for pilot wires up to 20 km and digital networks according X.21 and G703
- Ext. FO-repeaters up to 170 km

Device functions

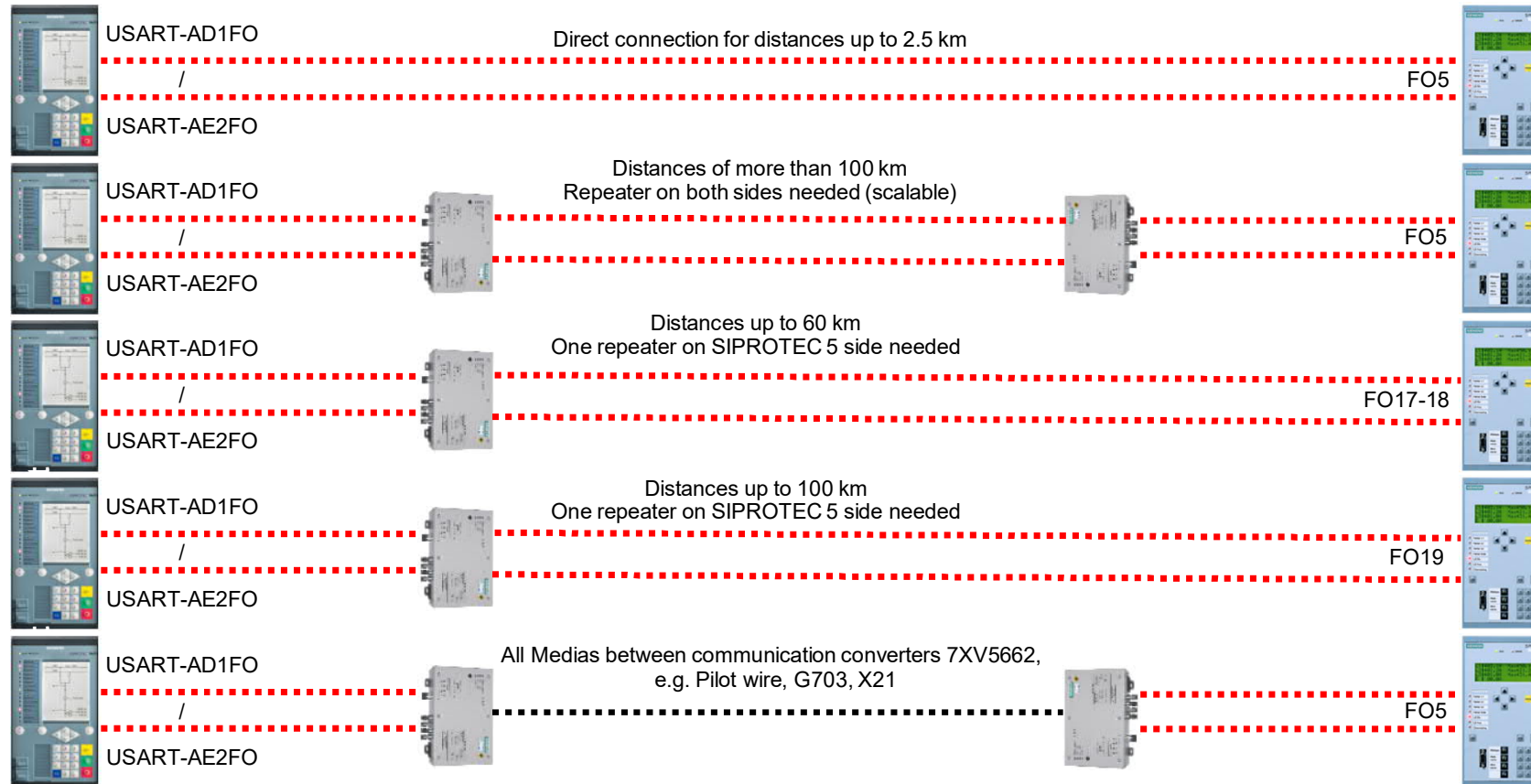
- Modules changeable and upgradeable
- Modules with two interfaces
- Automatic time synchronization
- Monitoring of PI transfer quality
- Automatic restraint against disturbances and network re-routings

Benefits

- Use of present infrastructure
- Future save investment in protection and communication
- Increased system availability (application of differential protection for longer lines)



Line differential protection SIPROTEC 5 and SIPROTEC 4 Protection Data Communication



Kontakt

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