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SIPROTEC with HSR and PRP
Ethernet Redundancy Protocols for Highest Availability

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Description

Secure and fast communication within the substation automation environment is essential to guaranteeing a secure and reliable electrical energy system in today's challenging complex electrical networks.
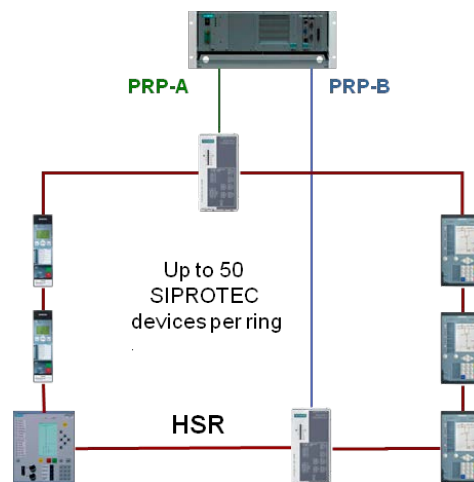
To fulfill the requirements of critical and time sensitive applications, the new Ethernet redundancy systems "High Availability Seamless Redundancy" (HSR) and "Parallel Redundancy Protocol" (PRP) have been designed according the latest IEC 62439-3 Standard.

PRP and HSR Seamless Redundancy solutions are available in the full Siemens portfolio of SIPROTEC 5, SIPROTEC 4, SIPROTEC Compact and Reyrolle 7SR2x.

These solutions utilize the familiar Ethernet IEC 61850 module which provides two Ethernet ports and built-in switch technology for Siemens field devices.

The new redundancy protocols can be used not only in new systems but in the more than 150,000 SIPROTEC devices already installed worldwide. All that is necessary is a firmware update of the existing Ethernet module In addition, the HSR & PRP solutions can be combined with the Substation Automation System SICAM PAS, which along with the protection devices provides customers and clients with a fully integrated Siemens solution.

Preferred network structure with PRP and HSR

Additionally Siemens offers Redundancy Boxes (RedBoxes) for the connection of non-PRP and non-HSR devices and as gateway between PRP and HSR.

Applications

PRP and HSR enable a large variety of demanding applications. Since they are redundancy protocols designed for Ethernet they are not limited to IEC 61850 telegrams. All Ethernet telegrams including Profinet and IEC 60870-5-104 benefit from usage of PRP or HSR.

Critical and time sensitive applications should be combined with advanced redundancy mechanisms to ensure functionality in every situation.

Typical critical applications are:

- Reverse interlocking with GOOSE

- Sending of Trip Messages (Transfer Trip)

- Phasor Measurement Unit (PMU)

- Future process bus applications

	RSTP	PRP	HSR
SIPROTEC devices in operation capable for	300.000 devices	150.000	150.000
Network configuration	ring	parallel	ring
Max. devices per layer 2 network	Unlimited (max. 30 / ring)	512	512 (max. 50 / ring)
Seamless (no recovery time)	-	✓	✓
Parameter free	-	✓	✓
Budget-saving network	✓	-	✓

Reliable and efficient

Preferred Configuration

- Combine PRP and HSR to get joined advantages without accepting the disadvantages

- Redundancy information is passed through protocol borders to ensure holistic redundancy mechanism

- Loop back prevention is included even through protocol borders

- Higher bandwidth of PRP available where needed

- Cut through switching in HSR to ensure low Latency

- Use Redundant Substation Controller

- Symmetrical and fully separated PRP-A and PRP-B networks

- Max. 50 device per HSR ring saves costs

- Equally distributed devices in both HSR ring-strings for maximum performance

Benefits

- Maximum network reliability, seamless reconfiguration

- Easy to configure, setting free mechanism

- Minimize wiring using effective ring structures

- Cost effective structures, up to 50 devices in each ring

- Easy expandable by integrating additional HSR rings

- Interoperability ensured, standardized in IEC 62439

- Full compatibility with IEC 61850 Edition 1 and 2 as well as any other Ethernet protocol