

HSR-PRP Switch IP Core

Low-latency switch in your equipment using a single FPGA

General description

HSR-PRP Switch is an IP Core for the implementation of High-availability Seamless Redundancy and Parallel Redundancy Protocol (HSR and PRP, IEC 62439-3-Clause 5 and 4 respectively) protocols for Reliable Ethernet communications.

HSR-PRP Switch is a full hardware solution that can be implemented on a low-cost FPGA. It is a flexible solution for the Energy Market Equipments that will be connected to HSR rings, PRP Lans or will work as Network bridges.



HSR-PRP Switch IP key features

- It supports Fast and Gigabit Ethernet
- It switches frames by hardware. This feature offers high switching speeds, needed to fulfill the Maximum Allowed Age and Data Integrity set for Process Bus and Inter-bay Bus in Electric Substation Automation
- The processing architecture has been designed specifically for HSR/PRP. Thanks to **SoCe** proprietary duplicate/circulate discard table analysis mechanism this IP offers very reduced latency times.
- It is an all-hardware. There is no need for on-chip microprocessor nor software stack
- It has been optimized to require few logic resources in order to allow the implementation on low-cost FPGA devices
- It can be used to implement End-Node DAN, RedBox or QuadBox functionalities
- It is provided with Forwarding Queues size customizable and independent for each port
- It can be used to implement End-Node DAN, RedBox or QuadBox functionalities
- It has been provided with a single flag that switches between PRP and HSR modes
- It includes complete statistics and error registers for each port integrated (Network Supervision)
- It supports:
 - H,N,T,U HSR modes
 - Duplicates Discard, Duplicates Accept PRP modes
 - VLAN support and HSR Rings
 - 1588 Transparent Clock in Redundant and Interlink Port
 - 1588 Hybrid Clock
 - VLAN Priority support
 - RedBox mode with integrated SAN proxy

Applications

HSR-PRP Switch may be used in a wide range of products and applications. It offers a simple way to introduce redundancy capabilities zero-delay switch-over.



- Equipments for Energy Market
- Electric Substations (IEC 61850)

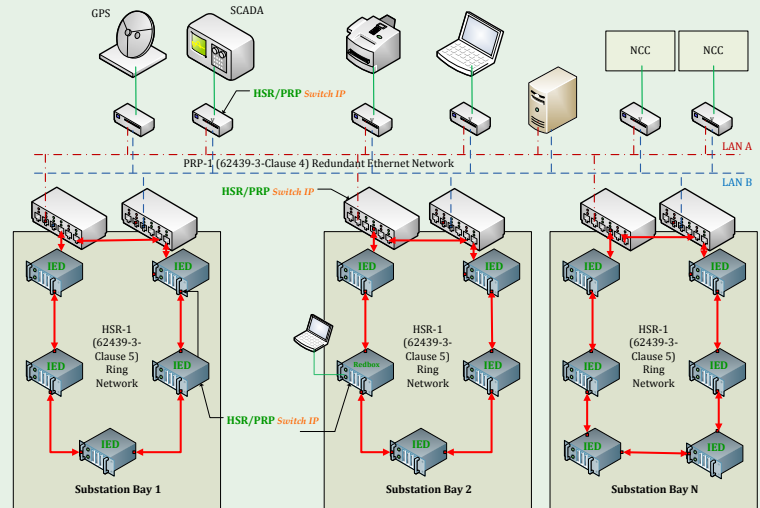


- Industrial Networking
- Transport
- Defence and Aerospace

Application example

A simple HSR network consists of doubly attached bridging nodes, each having two ring ports, so nodes are restricted to be HSR-capable bridging nodes.

The network topology used in HSR does not allow singly attached nodes directly attached to the ring due to they are provided only with one port. To overcome this limitation, they can be attached through a Redundancy Box. This module acts as a proxy for the singly attached nodes connected to it.



PRP implements redundancy functions in the end nodes rather than in network elements (Dual Attached Nodes- DANs). These nodes allow high availability connection between critical equipments and critical applications.

The two Ethernet networks (LAN A and LAN B) are independent. DAN nodes connect to both LANs and send the same frames over both networks. Destination nodes consume the first received frame and discard the duplicates.

Reference and Evaluation Designs

Features implemented on the Reference Designs:

- Standard version of **HSR-PRP Switch** implements RedBox topology
- Two ports (Port A and Port B) implement Dual Attached Node (DAN) capability
- The remaining port (Port C) offers a conventional Ethernet link to any on-board or external CPU with integrated SAN proxy
- Forwarding time for HSR $\approx 3 \mu s$ (Fast Ethernet) and 600 ns for Gigabit Ethernet
- As reference, less than the 50% of the logic resources of the Spartan-6 LX45 device for RedBox/DAN implementation
- Zynq Reference Design implements a full DAN using Internal Link to ARM9 Processor and Linux

Reference Designs and Evaluation boards:

- Fast Ethernet: Xilinx SP605 Evaluation Board and ISM Networking FMC Module
- Gigabit Ethernet: Xilinx SP605 Evaluation Board and 1000 Base-T Ethernet FMC Card By Inrevium FMC module
- Avnet Industrial Ethernet Kit
- **SoCe NEToem** and **NETbox**
- Xilinx Zynq ZC702 Evaluation Board

Ordering information and contact

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