



Whitepaper



High performance
Ethernet redundancy solution
for the **Industrial and Defense markets**

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Today's defense systems are highly sophisticated and based on high-performance mission computers, servers, workstations and signal processing nodes that need to exchange large amounts of information. This critical and strategic information is transmitted via communication networks requiring high availability, reliability and robustness. In these systems, where Ethernet is ubiquitous, the network infrastructure and communication protocols must ensure that no data gets lost and that information is reliably delivered. To meet these requirements in the most critical conditions, a solution to consider is the implementation of a redundancy network.

THE CHALLENGES

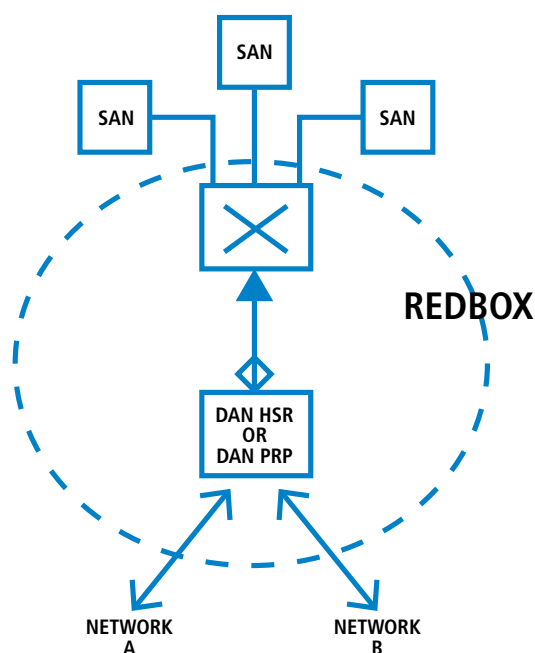
In parallel with the rapid deployment and growing popularity of Gigabit Ethernet standard, that is not deterministic by essence, network redundancy protocols such as Parallel Redundancy Protocol (PRP) and High-availability Seamless Redundancy (HSR) have been developed to overcome network failures.

However, introducing communication robustness to embedded military systems means adding a constraint to this area already subject to quite a few, the main ones being to maintain even continuously improve performance, ensure interoperability and reduce costs.

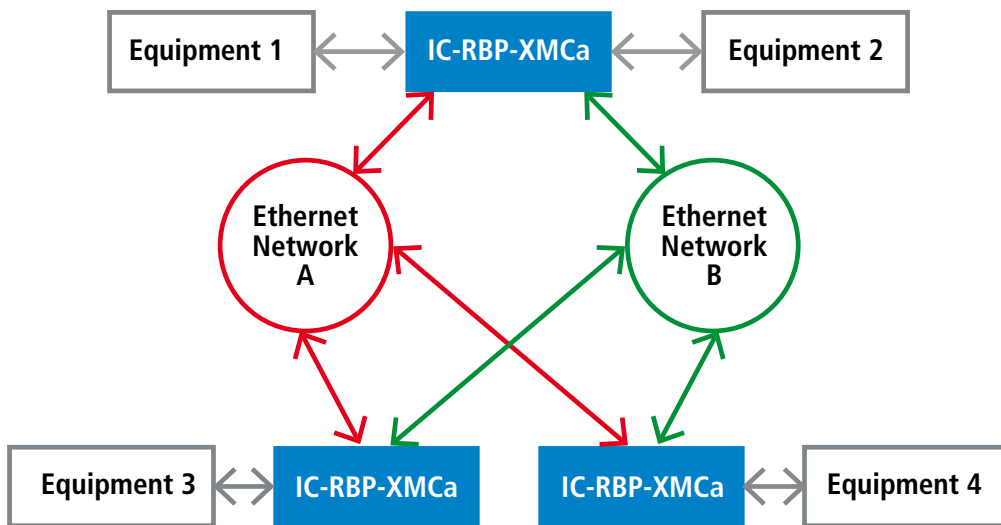
THE SOLUTION

As a result, most integrators and users in the Defense, tend to upgrade their VME and VPX systems with a high-performance redundancy module. In this respect, Interface Concept has leveraged its knowledge in the defense systems and extensive experience in Ethernet technology, to provide the market with the IC-RBP-XMCa.

The IC-RBP-XMCa, an FPGA XMC (Switched Mezzanine Card) board offers an outstanding solution to the above requirements. The on-board FPGA makes the board versatile, supporting both PRP and HSR redundancy protocols, as a redbox:

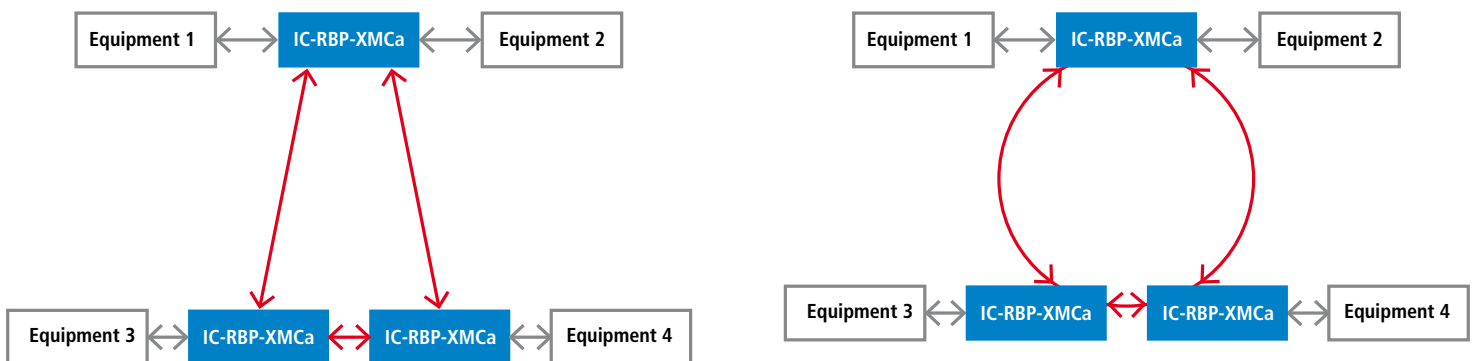


PRP: Parallel Redundancy protocol network



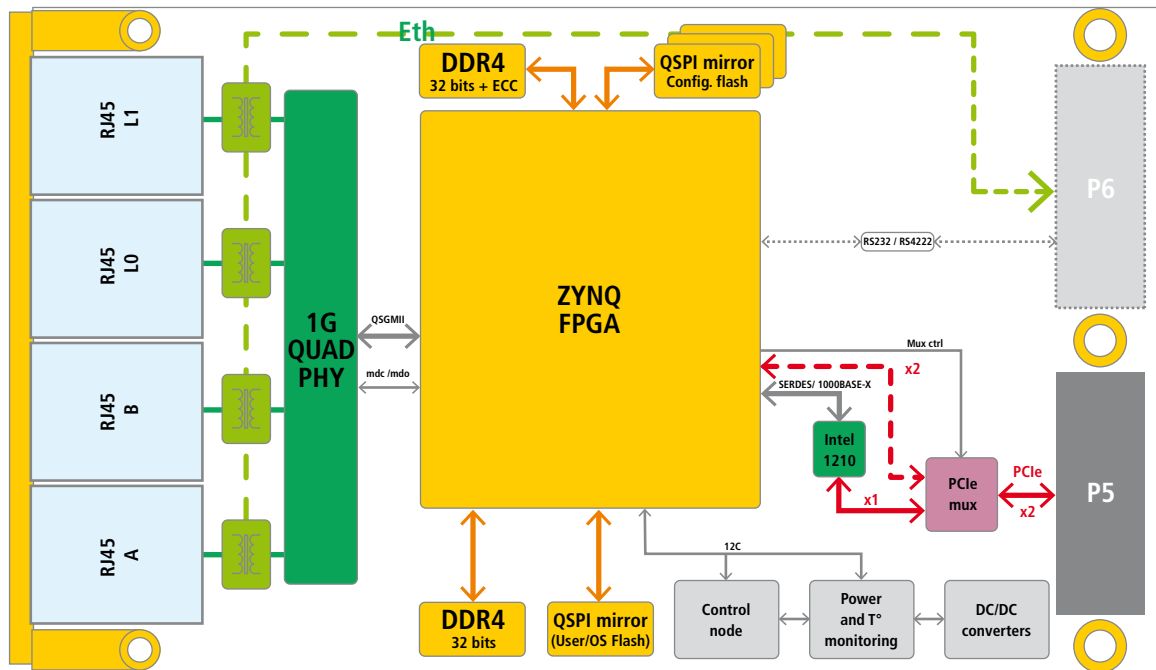
When operating in PRP mode, several IC-RBP-XMCa cards are attached to two separate networks via two distinct Ethernet interfaces. Each IC-RBP-XMCa card is also connected to a Single Attach Node (SAN) or equipment which receives/transmits normal (non-duplicated) traffic. When transmitting frames towards the network, the IC-RBP-XMCa card forwards the frames coming from the SAN on each network. When receiving frames from the redundant network, the IC-RBP-XMCa forwards the frames arriving first to the SAN and discards the duplicate frames. In case of a failure in one of the network links, the redundant network allows the remaining operating network to continue to seamlessly provide traffic to the attached equipment.

HSR: High-availability Seamless Redundancy



When operating in HSR mode, several IC-RBP-XMCa cards operate in a similar way but with a ring topology network. In this case, each IC-RBP-XMCa board stands at each node of the ring and is capable of duplicating traffic towards both directions of the ring when transmitting frames and discards duplicates when receiving frames.

WHY USING THE IC-RBP-XMCA?



IC-RBP-XMCA block diagram - Active network redundancy XMC Switch Mezzanine Card

The FPGA turns out to be very efficient in applications requiring low latency, which offers an outstanding solution to the redundant communication systems performance requirements.

Besides, whether it be redundancy with PRP or HSR protocol, it is essential to be able to manage the redundant networks, and from a software standpoint, a monitoring application accessible via the IC-RBPXMCA's Ethernet ports provides the user with network statistics and status and can be used to generate real-time events such as the loss of a network link.

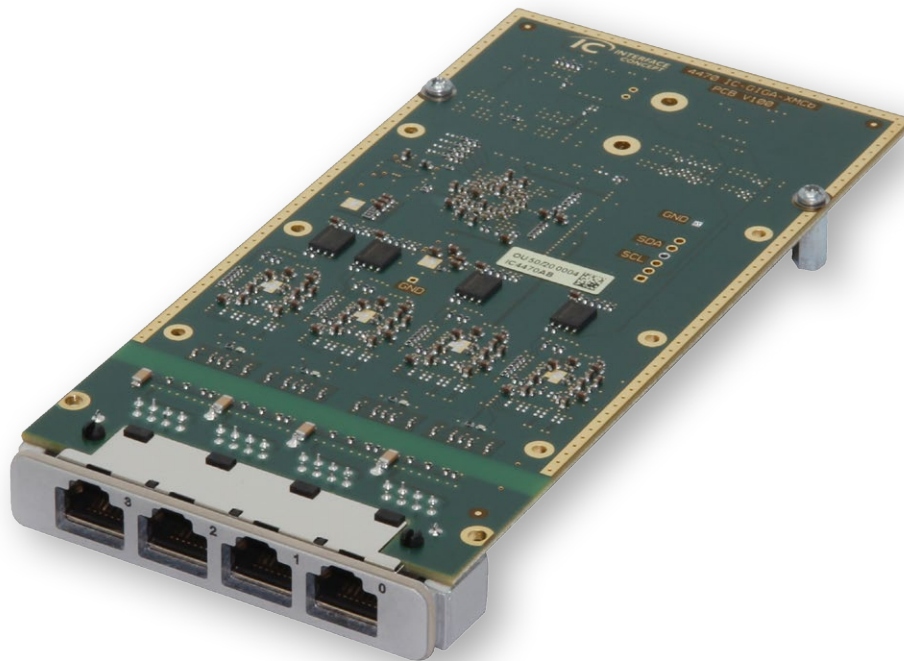
In light of this, hybrid chips, like Xilinx Zynq® architectures, which integrate ARM processors as well as programmable logic in a single System-On-a-Chip (SoC), find all its meaning and allow to deal with both the required determinism by the function and to provide an answer to the microprocessor need with regard to the control.

The IC-RBP-XMCA supports an internal Ethernet switch for several SAN ports to allow easy systems connection to redundant networks. The IC-RBP-XMCA has been developed to meet all redundant communication network requirements.

This mezzanine card, equipped with a Xilinx MPSoC, namely a Zynq® UltraScale+, may prove to be the ideal DAN for embedded communication systems:

- the FPGA allows it to be optimal in terms of performance and latency delay. It also allows the board to support independently PRP and HSR protocols on Giga Ethernet networks.
- the ARM processor integrated to the MPSoC, enables the user to access monitoring and control functions, while the board is being turned on.
- Its XMC (Switched Mezzanine Card) mezzanine form-factor (VITA 42.0) makes the board a versatile DAN, as it is pluggable in any type of system and on any type of carrier or Single Board Computer.
- this board has been qualified to meet environment requirements in the embedded market, and is available for air-cooled systems and conduction-cooled systems.

In light of the above characteristics, the IC-RBP-XMCA is definitively a high-performance, reliable, versatile and cost-effective solution.



IC-RBP-XMCa

Active network redundancy XMC Switch Mezzanine Card

About Interface Concept

INTERFACE CONCEPT develops and manufactures high-performance embedded boards and systems for high-computing industrial and mil-aero applications. Products include Commercial-Off-The-Shelf (COTS) Single Board Computers, Gigabit Ethernet switches and Xilinx-based FPGA processing boards. These open platforms are available in 3U and 6U VPX, cPCI, VME, FMC, XMC form-factors, dedicated for use in all types of environments (ruggedized and harsh operating conditions). The company leverages its leading edge technology expertise and knowledge to provide all the building

blocks for High Performance Embedded Computing (HPEC). In addition, Interface Concept backs its products with an internal support team, customises its product ranges and provides custom-designed products. Headquartered in Quimper (France), Interface Concept products are supported worldwide through reliable sales partners. Being in business for over 30 years, Interface Concept proves to be a major leader in the embedded market.

More information at www.interfaceconcept.com

Headquarters:



3, rue Félix Le Dantec
29000 QUIMPER
FRANCE

Phone: +33 (0)2 98 57 30 30
Email: info@interfaceconcept.com

www.interfaceconcept.com