

## RapidIO 2 PORTFOLIO BENEFITS

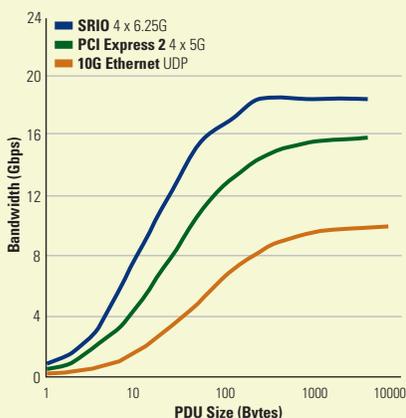
- Design highest performance backplane in industry with 20 Gbps data rate per link
- Lowest power per payload bit vs. other interconnect protocols
- RapidIO standard supports arbitrary system topology with true peer-to-peer networking
- RapidIO Messaging Support for transfers of 4-KB messages in hardware

## TARGET APPLICATIONS

- Wireless: Baseband cards and backplanes in LTE, WiMAX, WCDMA, and TD-SCDMA
- Defense and aerospace: Radar, sonar and navigations systems
- Medical imaging: CT scanners, MRIs
- Video: Teleconferencing
- Networking
- Servers

## COMPARISON WITH OTHER INTERCONNECT PROTOCOLS

- Highest performance serial interconnect with up to 6.25 Gbaud per link
- Highest protocol efficiency in embedded systems with 94% payload versus header efficiency
- Serial RapidIO standard supports arbitrary system topology with true peer-to-peer networking
- Twice the performance per link compared to 10 Gb Ethernet
- RapidIO messaging support for transfers of large blocks of data, superior to PCIe and 10 GbE in target applications



## Overview

IDT is the industry's leading supplier of RapidIO® interconnect solutions, providing a broad portfolio of switches, bridges, IP, and development platforms for defense, aerospace, video, imaging, and wireless markets. IDT has several switches supporting RapidIO 2 which are available today.

## Why RapidIO 2?

The RapidIO Interconnect Architecture, designed to be compatible with the most popular integrated communications processors, host processors, and networking digital signal processors, is a high-performance, packet-switched, interconnect technology.

Around 2001, a number of experts from the embedded systems world met to come up with a better way to connect microprocessors, FPGAs, digital signal processors, ASICs, entire boards and entire chassis. The intention was to design an interconnect that allowed these elements to speak to one another using any networking topology, with low latency, low power and an architecture that would simplify the design of application level software. For the reasons mentioned, above, it was clear back then as it

is today, that applications would very rarely be built in embedded systems with single processors only. Moore's law simply could not catch up with application needs. This led to the inception of RapidIO.

Because RapidIO was built from the ground up for multi-processor peer-to-peer networks, it inherently comes with the following attributes

- Reliable transmission
- Sub micro-second end-to-end packet delivery
- 100 ns cut through latency
- No processor overhead to terminate the protocol
- High performance messaging for transmitting large amounts of data
- Push architecture with the option for every processor in the system to have its own memory subsystem

RapidIO 2 builds on previous generations of RapidIO and supports serial link speeds of up to 6.25 Gbaud, resulting in switches with single port bandwidths of 20 Gbps with only 100 ns latency.

### RapidIO 2 For Wireless

- Carrier-grade reliable packet transport
- Gen2 performance to power ratio allows unprecedented compute density to enable 3G and 4G systems
- Switched architecture allows highly scalable system for micro and macro BTS implementations
- Carrier-grade 6.25 Gbaud SerDes enables backplane-based modular systems and system scaling by inter-chassis cabling

### RapidIO 2 for Video and Imaging

- 40 multicast masks per port provides strong support for broadcasting or multicasting a given data stream to multiple endpoints executing unique transforms, scaling, and CODECs
- IDT PCIe to S-RIO bridging to interface S-RIO DSP/FPGA cluster to a PC front end for image acquisition or data/graphics display processing

### RapidIO 2 for Defense and Aerospace

- Serial RapidIO Error Management Extension support including Time-to-Live enables fault-tolerant systems
- VITA 41, Open VPX, and ATCA fabric mappings enable rapid development of modular, standards-based systems
- True peer-to-peer networking allows scaling of arbitrary topology and simplifies hot swap software implementation
- Per-port filter feature allows blocking errant packets or malicious attack (for example, denial of service, system memory reads and writes)

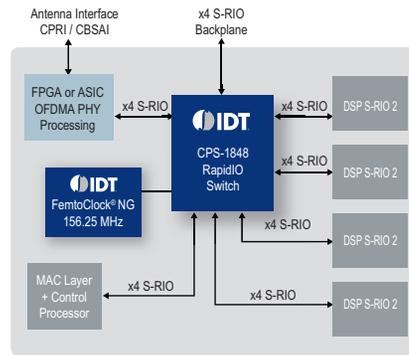
### RapidIO 2 For Networking

- High performance networking requires high throughput and reliable packet delivery with low end to end latency that is only provided with RapidIO.
- RapidIO 2 provides up to 20 Gbps per port for high performance control plane
- PCIe to RapidIO Bridging allows for use of any PCIe enabled control plane CPU while also using RapidIO 2 for control in backplane

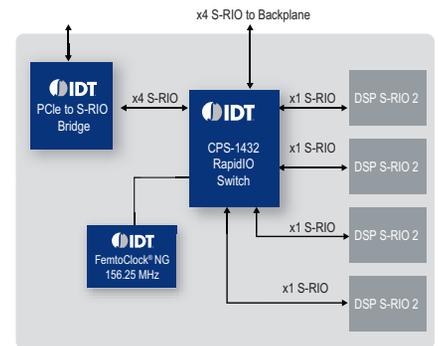
### RapidIO 2 for Servers

- Backplane switching capability of IDT RapidIO 2 exceeds anything available in 10 GigE market and offers better performance, lower power and best end to end packet termination latencies
- Network Interface cards and Processor cards benefit from IDT's PCIe to S-RIO bridging to interface to a variety of peripherals and high end processors locally, while using RapidIO to backplane/top of shelf switch hub
- Reduce overall cabling and total cost of ownership

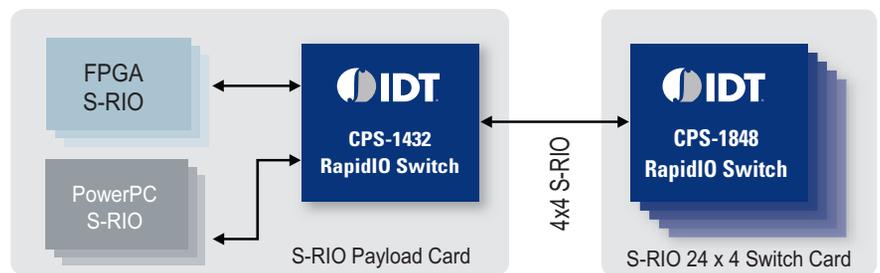
### Wireless



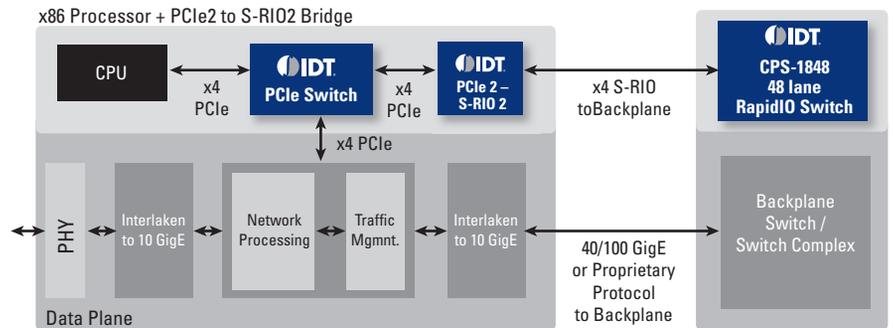
### Video



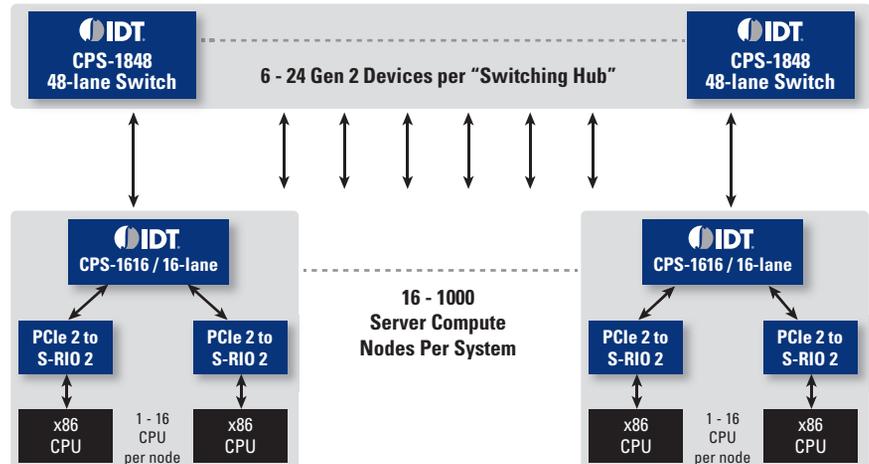
### Defense



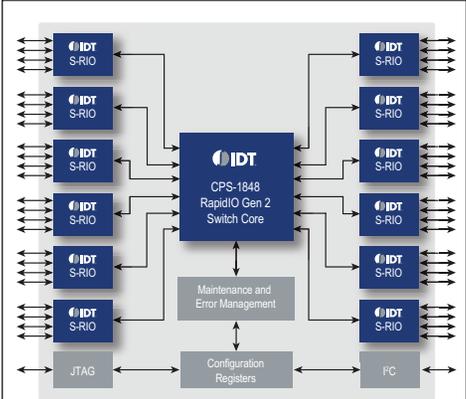
### Networking



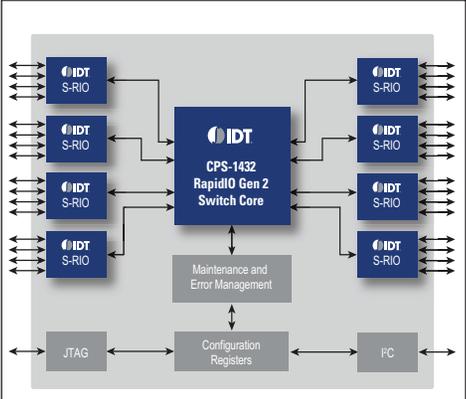
### Server



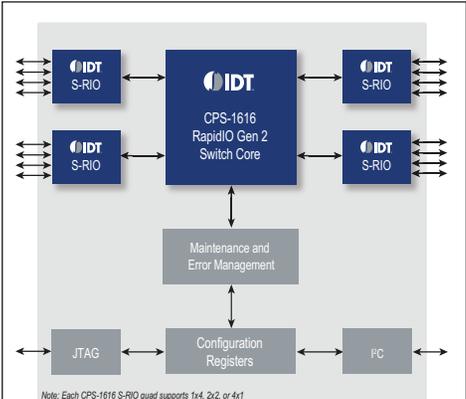
Switch Descriptions



The CPS-1848 is IDT's largest RapidIO 2 switch, ideal for backplanes in large systems or on boards that require several high bandwidth connections of up to 20 Gbps per port. The CPS-1848 is the highest performance backplane switch in the embedded market.

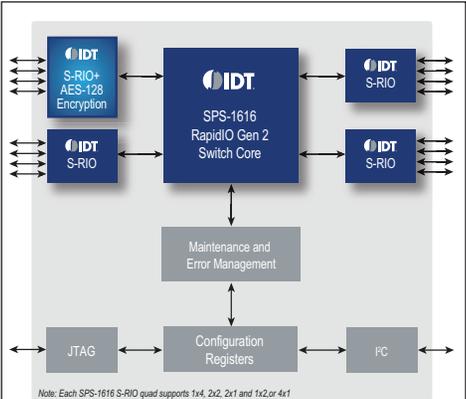


The CPS-1432 is IDT's RapidIO 2 switch that is ideal for boards that require several high bandwidth connections of up to 20 Gbps per port. The CPS-1432 can also be used in space constrained applications such as AMC or 6U/3U VPX where a large number of x4 links are used.



Note: Each CPS-1616 S-RIO quad supports 1x4, 2x2, or 4x1

The CPS-1616 is IDT's RapidIO 2 switch that is targeted for applications that require several x1 links that can support up to 6.25 Gbaud per serial link. It has up to 16 x1 ports.



Note: Each SPS-1616 S-RIO quad supports 1x4, 2x2, 2x1 and 1x2 or 4x1

The SPS-1616 is IDT's RapidIO 2 switch that is targeted for applications that require several x1 links and also has one quad which support AES-128 encryption and can be used to scramble RapidIO packets for out of the box links

IDT RapidIO 2 SWITCH FEATURES

- Designed to Serial RapidIO 2.1 Specification
- Up to 48 lanes, with up to 12x4, 18x2, 18x1 port configurations
- Up to 240 Gbps non-blocking bandwidth
- Carrier-grade, high performance SerDes
- 1.25, 2.5, 3.125, 5.0, or 6.25 Gbaud
- Long reach 100 cm with 2 connectors
- Transmit drive strength and Pre-emphasis
- Receive equalization with DFE
- Up to 40% power-per-gigabit savings vs. RapidIO 1.3 Switches
- Dynamic ingress and egress buffer management improves performance over RapidIO 1.3 switches
  - Better per-port throughput
  - Better system-level traffic engineering
- 40 multicast groups per port
- Cut-through and Store-and-Forward modes
- Cut-through latency of 100 ns
- RapidIO Error Management Extension Support
- Error log captures sequence of errors
- Packet mirror, trace, filter per port
- Receiver- and Transmitter-based flow control
- Per-port reset provides robust hot swap support
- Multicast Event Control Symbol generation input pin
- Industrial and commercial temperature grades



## IDT CPS/SPS RapidIO 2 Switch Comparison Matrix

Part Number*	Serial RapidIO specifications	Aggregate peak throughput (Gbps)	S-Full mesh non-blocking fabric	Maximum of number of x4 ports	Maximum of number of x2 ports	Maximum of number of x1 port	Cut-through latency (ns)	Store and forward mode	Configurable by speed	Power per 10 Gbps link (typical, mW)	Per port power down	Programmable transmit drive strength and pre-emphasis	Programmable receive equalization	Per port multicast architecture	Per port multicast masks/groups	8- and 16-bit addressing	Programmable watermark on ingress buffers	Packet/trace/mirror/filter for debug	Traffic management through user selectable scheduling algorithms	Receiver controlled flow control	Transmitter controlled flow control	Performance counters/monitors	Dedicated maintenance path for "5th priority"	Error Management features exceeding S-RIO specification	Error log (history) and broad error detection coverage	Link-layer AES-128 encryption	Clocking options (MHz)	EDebug packet generator	Debug packet capture	Package (mm)									
CPS-1848	2.1	240	•	12	18	18	100	•	each quad	<300	•	•	•	•	40	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	156	•	•	29x29				
CPS-1432	2.1	160	•	8	14	14	100	•	each quad	<385	•	•	•	•	40	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	156	•	•	25x25		
CPS-1616	2.1	80	•	4	8	16	100	•	each lane	<440	•	•	•	•	40	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	156	•	•	21x21	
SPS-1616	2.1	80	•	4	8	16	100	•	each lane	<440	•	•	•	•	40	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	156	•	•	21x21

## ECOSYSTEM AND TOOLS

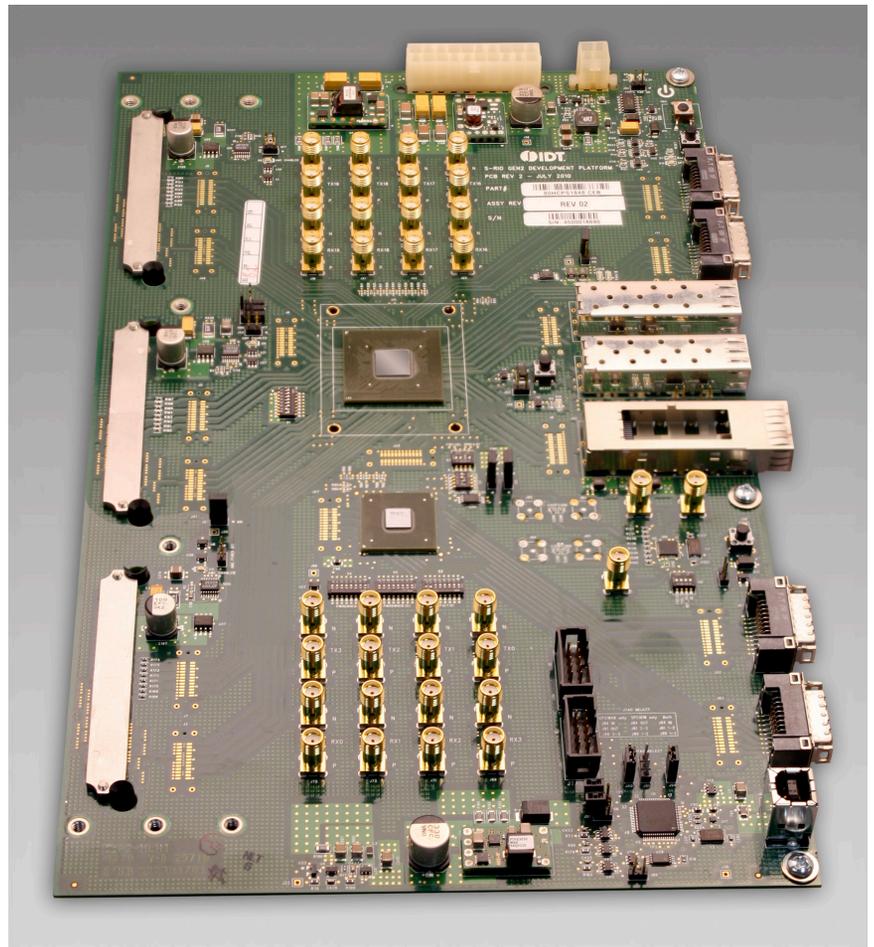
A variety of software tools, and hardware platforms are available from third party companies which support IDT RapidIO Switches.

### SOFTWARE AND HARDWARE ECOSYSTEM

- Serial RapidIO Development Platform Gen2 (SRDP2)
- RapidFET JTAG edition software support
- Serial RapidIO 2 Endpoint Intellectual Property for ASIC, CPU, DSP, and FPGAs
- RapidIO Linux support 
- Power Calculator tool
- HSPICE and IBIS models
- System Modeling Tool

The Serial RapidIO Development Platform 2 is ideal for RapidIO prototyping RapidIO systems. It has a CPS-1848 and CPS-1616 which can be connected to a variety of development platforms for DSPs, FPGA and microprocessors Connectors

- 3 AMC B+ Connectors: 2 with two 4x S-RIO links, 1 with three 4x S-RIO links, AMC.0 and AMC.4 Specification (NO support on IPMC and JTAG)
- 2 SFP+ Connectors: 1 ports with 1x S-RIO link, INF-8341 Specification
- 1 QSFP Connectors: 1 port with 4x S-RIO link, SFF-8438i Specification
- 2 InfiniBand/CX4 Connectors: 1 port with 4x S-RIO link or 2 ports with 2x S-RIO links, SFF-8470 Specification
- 1 SMA Array: 1 port with 4x S-RIO links



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