IDT RapidIO® 2 Switch Portfolio

IDT CPS/SPS RapidIO 2 Switch Comparison Matrix

<table>
<thead>
<tr>
<th>Specification</th>
<th>40 Gbps</th>
<th>34.38 Gbps</th>
<th>28.3 Gbps</th>
<th>24.1 Gbps</th>
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<tbody>
<tr>
<td>CPS-1848</td>
<td>32</td>
<td>32</td>
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<tr>
<td>CPS-1616</td>
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<td>CPS-1448</td>
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<td>CPS-1056</td>
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</tbody>
</table>

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)
- RapidIO® 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, FPGAs, and microprocessors.

Connectors
- 3 AMB 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 port with 1x S-RIO link, INF-4102 Specification
- 1 QSFP Connectors: 1 port with 4x S-RIO link, SFP-4102 Specification
- 2 InfiniBand/CX4 Connectors: 1 port with 4x S-RIO link or 2 ports with 2x S-RIO links, SFP-4102 Specification
- 1 SMA Array: 1 port with 4x S-RIO links

IDT 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 64 KB messages in hardware

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

COMPARISON WITH OTHER INTERCONNECT PROTOCOLS

- Highest performance serial interconnect with up to 6.25 Gbاد 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 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 Gbاد, resulting in switches with single port bandwidths of 20 Gbps with only 100 ns latency.
IDT RapidIO® 2 Switch Portfolio

**RapidIO 2 For Wireless**
- Carrier-grade reliable packet transport
- Gen2 performance to power ratio allows unprecedented compute density to enable 3D and 4G systems
- Switched architecture allows highly scalable system for micro and macro BTS implementations
- Carrier-grade 6.25 Gb/s SerDes enables backplane-based modular systems and system scaling by inter-chassis cabling

**RapidIO 2 For Video and Imaging**
- 40 multicast modes 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, OpenVPX, 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-Gigabit market and offers better performance, lower power and best end to end packet termination latency
- 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/chop of shunt switch hub
- Reduce overall cabling and total cost of ownership

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**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 x1 links are used.

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 Gb/s per serial link. It has up to 16 x1 ports.

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 supports AES-128 encryption and can be used to scramble RapidIO packets for out of the box links.
RapidIO 2 for Wireless
- Carrier-grade reliable packet transport
- Gen2 performance to power ratio allows unprecedented compute density to enable 3D and 40 systems
- Switched architecture allows highly scalable system for micro and macro BTS implementations
- Carrier-grade 6.25 Gb/s SerDes enables backplane-based modular systems and system scaling by inter-chassis cabling

RapidIO 2 for Video and Imaging
- 40 multicast modes per port provides strong support for broadcasting or multicasting a given data stream to multiple endpoints executing unique transforms, scaling, and CODECs
- IDT PEs to S-RIO bridging to interface S-RIO DSP/PPGA 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
- VIA 41, Open VPX, and ATCA fabrics mappings enable rapid development of modular, standards-based systems
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- RapidIO 2 provides up to 20 Gbps per port for high performance control plane
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RapidIO 2 for Servers
- Backbone switching capability of IDT RapidIO 2 exceeds anything available in 10-Gigabit market and offers better performance, lower power and best end to end packet termination latency
- Network Interface cards and Processor cards benefit from IDTs PEs to S-RIO bridging to interface to a variety of peripherals and high end processors locally, while using RapidIO to backplane/shell switch hub
- Reduce overall cabling and total cost of ownership

Switch Descriptions
- The SPS-1616 is IDTs 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 SPS-1616 can also be used in space constrained applications such as AMC or 6U/3U VPX where a large number of x1 links are used.

IDT RapidIO 2 Switch Portfolio
### IDT RapidIO® 2 Switch Portfolio

**System Architecture**
- IDT RapidIO is an interconnect protocol designed for high-performance, low-latency, and high-bandwidth networking and computing systems.
- It supports a range of applications including networking, storage, and compute systems.
- RapidIO is scalable and supports a variety of bandwidth and latency requirements.

### 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:
  - IDT RapidIO Development Platform
  - RapidIO Librarian
  - HSPICE and IBIS models
  - System Modeling Tool

### RapidIO® 2 Portfolio Benefits
- **Design**: Highest performance backplane in industry with 20 Gbps data rate per link.
- **Power**: Lowest power per payload bit vs. other interconnect protocols.
- **Standard**: RapidIO standard supports arbitrary system topology with true peer-to-peer networking.
- **Messaging**: RapidIO Messaging Support for transfers of 64 KB messages in hardware.

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

### COMPARISON WITH OTHER INTERCONNECT PROTOCOLS
- **Performance**:
  - **Serial RapidIO**: See Table for details.
- **Cost and Complexity**:
  - RapidIO offers a lower cost and complexity solution compared to other protocols.
- **Scalability**:
  - RapidIO is highly scalable, supporting a wide range of bandwidths and latencies.

### Overview
- IDT is the industry’s leading supplier of RapidIO® interconnect solutions, providing a broad portfolio of switches, bridges, 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 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 Portfolio Comparison
- The following table compares the performance characteristics of RapidIO® 2 with other interconnect solutions:
  - **Performance**: Up to 20 Gbps data rate per link.
  - **Power**: Lowest power per payload bit compared to other protocols.
  - **Standard**: Supports arbitrary system topology with true peer-to-peer networking.
  - **Messaging**: RapidIO Messaging Support for transfers of 64 KB messages in hardware.

### IDT CPS/SPS RapidIO 2 Switch Comparison Matrix

<table>
<thead>
<tr>
<th>Model</th>
<th>RapidIO Capabilities</th>
<th>Power (W)</th>
<th>Package (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPS-1432</td>
<td>12</td>
<td>2.1</td>
<td>25x25</td>
</tr>
<tr>
<td>SPS-1616</td>
<td>18</td>
<td>2.1</td>
<td>29x29</td>
</tr>
<tr>
<td>CPS-1616</td>
<td>18</td>
<td>2.1</td>
<td>25x25</td>
</tr>
<tr>
<td>SPS-1848</td>
<td>18</td>
<td>2.1</td>
<td>29x29</td>
</tr>
</tbody>
</table>

**Cut-through latency (ns)**
- Store and forward mode

**Performance counters/monitors**: Support for various types of traffic management and monitoring features.

**Dedicated maintenance path**
- Provides a dedicated path for maintenance and troubleshooting.

**Error log (history)**
- Supports detailed error logging for system monitoring.

**Packet/trace/filter for debug**: Support for packet and trace filtering for debugging and troubleshooting.

**Traffic management**
- Enables user-selectable traffic management features.

**Transmitter controlled flow control**: Supports flow control mechanisms for efficient data transfer.

**Per port multicast architecture**: Supports multicast traffic management.

**Per port multicast masks/groups**: Support for multicast group management.

**Programmable transmit drive strength and pre-emphasis**: Programmable options for transmit signal strength and pre-emphasis.

**Programmable receive equalization**: Programmable receive equalization for signal recovery.

**Per port power down**: Support for per-port power management.

**Maximum of number of x1 port links supported**: Supports up to 4x 10 Gbps links.

**Maximum of total number of x1 port links supported**: Supports up to 80 links.

**Maximum of number of x4 port links supported**: Supports up to 160 links.

**Maximum of total number of x4 port links supported**: Supports up to 480 links.

**Maximum of number of x8 port links supported**: Supports up to 640 links.

**Maximum of total number of x8 port links supported**: Supports up to 5120 links.