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 (SRDPU)
• RapidDET 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-1816 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, AMB-1 and AMB-4 Specification (NO support on IPMC and JTAG)
• 2 SFP Connectors: 1 ports with 1x S-RIO link, INF-4311 Specification
• 1 QSFP Connectors: 1 port with 4 S-RIO link, SFF-8438 Specification
• 2 InfiniBand/CSI4 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

IDT RapidIO® 2 Switch Portfolio

IDT RapidIO® 2 Switch Portfolio

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 than 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 in embedded systems with simple 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
- Gig2 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 multicasts/ports 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/graphic 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 ARINC 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 traffic (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 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/hub or shelf switch hub.
- Reduce overall cabling and total cost of ownership.

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**IDT RAPIDIO 2 SWITCH PORTFOLIO**

**IDT**

**Integrated Device Technology**

**IDT RapidIO® 2 Switch Portfolio**

**Wireless**

- Network Interface cards and Processor cards benefit.
- PCIe to RapidIO Bridging allows for use of any PCIe enabled control plane CPU while also using RapidIO 2 for control in backplane.

**Video**

- Receiver - and Transmitter-based flow control.
- Multicast Event Control Symbol generation.
- Multicast Event Control Symbol generation.

**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.

**Networking**

- 40 multicast groups per port.
- 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.
- Switch core.
- Industrial and commercial temperature grades.

**Server**

- Designed for Serial RapidIO 2.1 Specification.
- Up to 48 lanes, with up to 12x4, 18x2, 18x1 ports configurations.
- Up to 240 Gbps non-blocking bandwidth.
- Carrier-grade, high performance SerDes.
- 1.25, 2.5, 3.125, 5.0, 6.25 Gbaud.
- Long reach 100 cm with 2 connectors.
- Transmit drive strength and Pre-emphasis.
- Receive equalization with OPE.
- 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 multicasts groups per port.
- Switch hub.
- 16 - 1000 Mbit/s clients.
- 16 - 3Gbps servers.
- 16 - 5.0Gbps servers.
- 16 - 10Gbps servers.

**Mercer Analog & Digital Company**
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
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RapidIO 2 For Video and Imaging
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RapidIO 2 for Defense and Aerospace
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RapidIO 2 For Networking
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RapidIO 2 for Servers
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- 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 chip of shelf switch hub
- Reduce overall cabling and total cost of ownership

Wireless
- Antenna to Interface (CPM/SDM)
- at S-RO Switch (Backplane)

Video
- 40/100 GigE or Proprietary Protocol to Backplane
- 4x4 Switch Complex

Defence
- FPGA S-RIO

Networking
- a Processor + PCIe to S-RIO Bridge

Server
- 6 - 24 Gen 2 Devices per “Switching Hub”

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  - Better per port throughput
  - Better system level traffic engineering
- 40 multicast groups per port
- Cut-through and Store-and-Foward modes
- Cut-through latency of 100 ns
- RapidIO Error Management Extension Support
- Error log captures sequence of errors
- Packet mirrors, 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

THE ANALOG + DIGITAL COMPANY
Integrated Device Technology
IDT Portfolio
IDT RapidIO® 2 Switch Portfolio

IDT CPS/SPS RapidIO 2 Switch Comparison Matrix

<table>
<thead>
<tr>
<th>Model</th>
<th>Package</th>
<th>Pinout</th>
<th>Links</th>
<th>Bandwidth (Gbps)</th>
<th>Power Dissipation (W)</th>
<th>Fabric Throughput (Gbps)</th>
<th>Fabric Latency (ns)</th>
<th>Port Latency (ns)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPS-1432</td>
<td>SFF-8438</td>
<td>8x8</td>
<td>4x</td>
<td>20</td>
<td>10</td>
<td>10</td>
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</table>

SOURCE: Integrated Device Technology

IDT RapidIO® 2 PORTFOLIO BENEFITS

• Highest performance serial interface with up to 10 x 10 Gbps per link
• Highest protocol efficiency in embedded systems with 94% payload versus header efficiency
• Supports 10 Gigabit Ethernet
• Supports point-to-point networking
• Fast 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

TARGET APPLICATIONS

• Commercial: servers, switches, blade systems, storage systems, medical, imaging, displays, and video systems
• Defense: ocean, airborne, space, and ground vehicles
• Industrial: manufacturing, factory automation, and control systems
• Communications: cellular base stations, wireless infrastructure, SONET/SDH transport, high-speed data links, and distributed networking

OTHER RapidIO INTERCONNECT SOLUTIONS

• RapidIO 2 and RapidIO 1 port solutions for switch and router backplanes
• RapidIO 2 and RapidIO 1 port solutions for backplane switches
• RapidIO 2 and RapidIO 1 port solutions for blade systems

REFERENCES

1. SFF-8470 Pinout
2. Access the latest RapidIO specifications and other resources at IDT’s website: www.idt.com/rapidio

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IDT RapidIO® 2 Switch Portfolio

ECOSYSTEM AND TOOLS

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

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• HSPICE and IBIS models
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Connectors

• 3 AMCs: Connectors: 2 with two 4x S-RIO links, 1 with three 4x S-RIO links, AMC2 and AMC4 Specification (Direct support on IPMC and JTAG)
• 2 SFP+ Connectors: 1 port with 1x S-RIO link, INF-4331 Specification
• 1 QSFP Connectors: 1 port with 4x S-RIO link, SFF-8436 Specification
• 2 InfiniBand®/CXL 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

2001, the intent was to design a platform which 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.

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