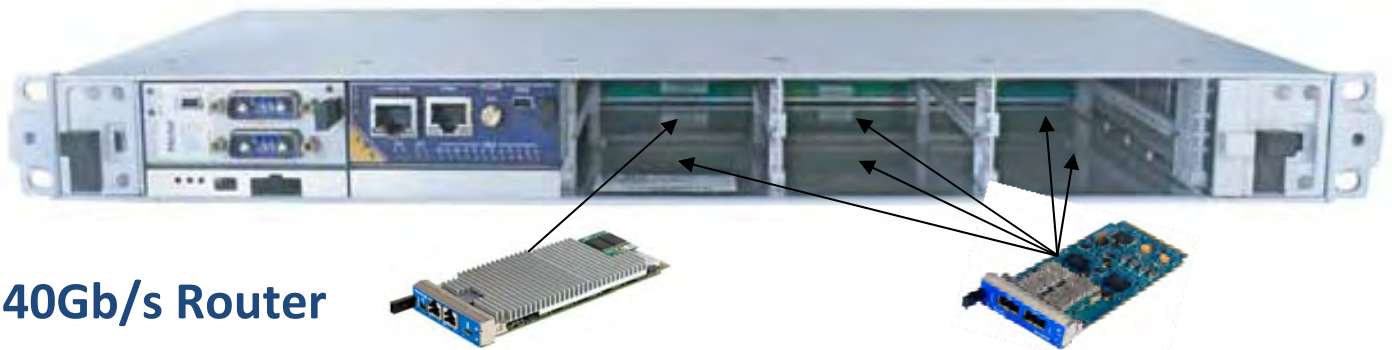


Hyperchip H40G Router

CONFIDENTIAL (Draft - for discussion purposes only)



40Gb/s Router

Ultra Performance

The Hyperchip H40G Router is a 40Gb/s 100Mpps router for systems requiring up to 40 Gb/s of full duplex communication in a single 19" rack mountable chassis, only 1U high and 210mm (8.3") deep. The H40G is powered by the Hyperchip 40Gb/s iNP Ingress Network Processor and the Hyperchip 40Gb/s eNP Egress Network Processor on the MicroTCA Hyperchip 40Gb/s 100Mpps iNP/eNP Hub with wire speed packet processing (IPv4, IPv6, MPLS LER/LSR), massive route tables, ACL space and QoS. The H40G also includes one CPU AMC and five available single-width/mid-size AMC slots for guest applications.

Ultra Low Cost

The H40G Router is over 10 times smaller and a fraction of the cost of competitors. Using a single 19" rack mountable chassis only 1U high and 210mm (8.3") deep, the H40G offers dramatic savings on footprint, power and maintenance.

Green NGI Router

The Hyperchip H40G Router is a green Next-Generation Internet router. The H40G configured as a 40 Gb/s router with four 10GigE interfaces uses over three times less power than current routers at less than 3 watts per Gb/s of interface capacity. The H40G has a dramatically reduced carbon footprint, saving over 120 tons of coal per year. The H40G uses hardware programmable Hyperchip Network Processors for ultra power efficiency and NGI versatility.

Open Modular Versatility

The H40G Router uses industry standard MicroTCA chassis and open-standard interfaces. With support for five additional AMC modules, the H40G provides equipment manufacturers with the open modular versatility to accommodate their network equipment. For example, the H40G can handle 40 Gb/s of Ethernet, InfiniBand, PoS or GPON traffic from AMC cards. The H40G supports guest AMC modules for telecom (edge, aggregation and core), computing and storage applications such as IPTV, video streaming, content caching, ad insertion, IMS, wireless, WiMAX, LTE, VPN and deep packet inspection.

Features

- Single 19" rack mountable chassis, only 1U high and 210mm (8.3") deep
- Hyperchip 40Gb/s 100Mpps iNP/eNP Network Processor Hub with QoS
- CPU AMC Module
- Mounting for 5 guest AMC modules with full Hot-Swap capabilities
- Power Module 380 watt, 48VDC input
- Superior cooling (96CFM @ 0.75" H₂O)
 - Right to left Push-Pull airflow, 4 x 20CFM @ 1.5" H₂O fans per Cooling Unit (CU)
 - Redundant, hot-swappable CUs with Speed controlled fans for noise reduction
 - J-TAG compatible with USB port
- J-TAG Switching Module
 - Advanced testing, remote upgrade and diagnostics
 - Supports face plate mounted J-TAG diagnostic input and iNP/eNP Hub interface, USB I/O
- Star Topology Backplane (20-layer stripline design), optimized via signal integrity studies



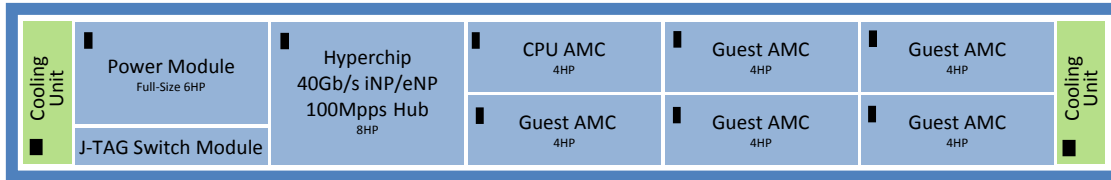
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Module Configuration



H40G Router includes:

- 1 x Hyperchip 40Gb/s 100Mpps iNP/eNP Hub with Hyperchip Shelf Management
- 1 x CPU AMC
- 1 x Power Module (PM)
- 1 x J-TAG Switch Module (JSM)
- 2 x Cooling Units (CU)
- 5 x Guest AMC Slots for applications
One slot can be used for 2nd CPU AMC

I/O Guest AMC examples:

- 10GigE, Dual 10GigE
- Quad SFP+ for GigE or OC-48
- PCIe Cable, up to 16 lanes
- Quad Fibre-channel 4, 2 and 1 Gb/s
- Octal 3Gb/s Serial Attached SCSI
- Dual 4x Infiniband 20 or 10 Gb/s
- Quad GPON

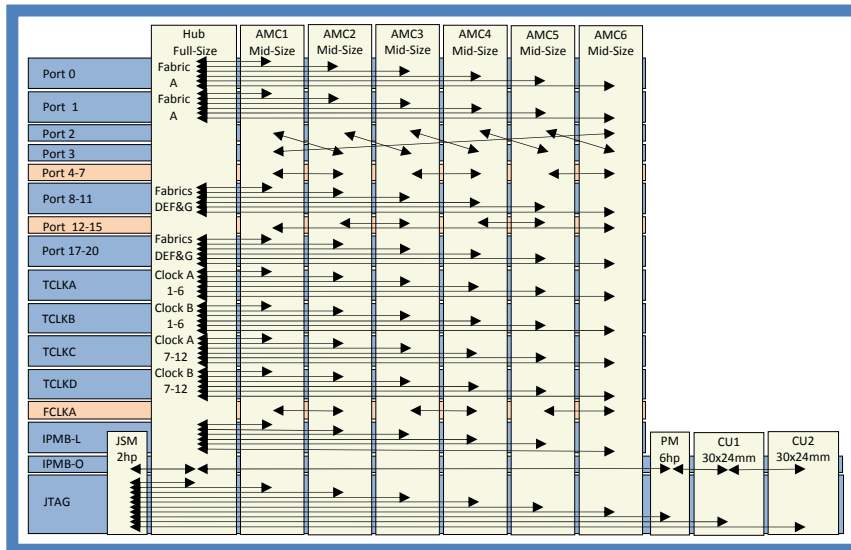
Other Guest AMC examples:

- Video Services
- Redundant CPU for non-stop routing
- CPUs for Guest Control Planes, Logical Routers
- Deep packet inspection
- Cryptography and Compression
- Third party in-skin monitoring
- Multi-chassis link

I/O Guest AMC Configuration examples:

- Five 10GigE AMCs = provisioning 50 Gb/s to a peak of 40 Gb/s
- Four 10GigE AMCs & 2nd CPU AMC = provisioning 40 Gb/s and resilient routing protocols or deep packet inspection engines
- Three 10GigE AMCs & two quad-GigE AMCs = provisioning 38 Gb/s
- Four Dual 10GigE AMCs = provisioning 80 Gb/s to a peak of 40 Gb/s

Backplane Mapping



Compression-mount connectors are used in the backplane for reliability and easier, more flexible routing. If a connector is damaged in the field, it has two screws securing it in place that can be easily removed for replacing the connector. The backplane features Star routing, a 20-layer stripline design and has undergone signal integrity studies to optimize performance.

Cooling Unit



Redundant plug-in Cooling Units in a side-to-side airflow (push/pull) configuration. The airflow layout includes 2 sets of 4 fans providing a total of 96 CFM @ .75" H₂O of cooling capacity. To ensure proper performance, the unit has a separately removable and manageable air filter. The result is tremendous thermal performance, cooling even the densest AMC modules with a heat dissipation of 36W each. The 380W Power Module converts the 48V DC input to voltages of 3.3V (signal) and 12V (power).



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Technical Information

Standards Compliance

The H40G Router is compatible to the following standards:

- MTCA.0 PICMG MicroTCA Base Specification
- AMC.0 rev 2 PICMG AMC Base Specification
- AMC.1 PCIe direct connect between paired AMCs
- AMC.2 GbE common port and 10GbE FAT pipe region
- AMC.3 SATA/SAS common port interface
- AMC.4 sRIO
- IPMI v1.5

Building Blocks

- Hyperchip 40Gb/s 100Mpps iNP/eNP Network Processor Hub
- CPU AMC Module
- Power Module including Holdup Circuit
- 5 AMC mid-size slots for guest applications
 - One slot can be used for 2nd CPU AMC
- Synchronous Clock Distribution

Routing Capacity

- 40Gb/s 100Mpps iNP and eNP Hyperchip Network Processors
- 20Gb/s from any AMC slot to the Backplane
- 40Gb/s from any AMC slot if Interlaken or RXAUI are used
- 40Gb/s from any AMC slot if 10GBASE-KR is used

Synchronous Clock and PCI Express Clock Distribution

- Telco Clock for all AMC slots
- Multi-service Line Card PLL
- MLVDS Buffer
- CPLD for clock distribution and control
- PCI Express compliant clock source with optional Spread Spectrum Clock

Mechanical

- 19" rack mountable, only 1U high and 210mm (8") deep

Services/Applications

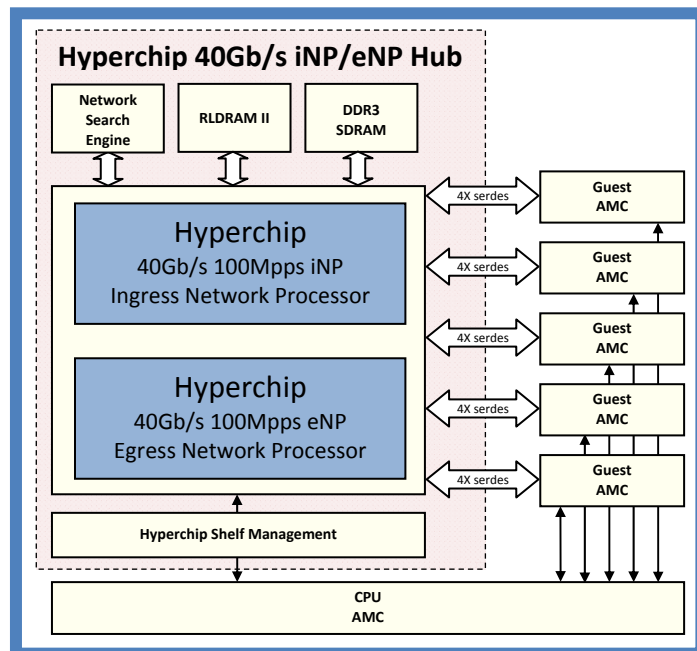
- NTP client for retrieving accurate time and date information
- Onboard event management
- Test and trace facilities
- POST (power on self tests) diagnostics
- Monitoring and management via SNMP v1, v2 and v3, TELNET, CLI, either in-band or out of band via 10/100 Base-T Ethernet or RS232 for field upgrades, rollbacks and watchdog functions
- PICMG 3.0 / IPMI 1.5 based management of the AMC modules, including firmware update manager
- Persistent storage of configuration across restarts
- Support for retrieving and installing multiple configurations
- Support for hot-plugging of AMCs
- Two alternative firmware versions stored allowing for rollback after updates

Environmental

Meet or exceed Temperature:	Operating 0 °C to +55 °C	Storage and Transit -40 to +70°C / -10 to 158°F*
Humidity*:	15%-90% (non-condensing) at 55°C (131°F)	15%-90% (non-condensing) at 55°C (131°F)
Altitude*:	4000 m (13,123 ft)	15,000m / (49,212 ft)
Shock*:	30G/11 ms half sine	50G, 170 inches/second trapezoidal
Vibration*:	5 to 100Hz: 1G @ 0.25 Octave/minute	5 to 50Hz: 0.5G @ 0.1 Octave/minute

Chassis Targeted MTBF is 150,000h @ 30°C, calculations based on Bellcore/Telcordia SR-332 Issue 1

Topology of a Typical Application



Hyperchip Network Processors

40Gb/s iNP and eNP Network Processors

- Fully hardware-programmable Network Processors
- Full wire speed at 40Gb/s 100Mpps Ethernet/Sonet/SDH
 - Even at minimum packet sizes with all features turned on
- IPv4, IPv6, MPLS LER/LSR
- Optional L2 forwarding
- ACLs with classification including layer 4 & 5 fields
 - 160-bit ACLs for IPv4, 320-bit ACLs for IPv6
 - Optional TCAM for large ACL tables
- Optional Traffic Regulation, Sampling, Filtering, Marking
- 8 Service Classes for QoS, 4 Drop Precedences
- Per-port, per-sub-port (e.g. VLAN), per-ACL statistics

40Gb/s iNP Ingress Network Processor

- Multi-million-route forwarding tables
- ECMP, Link Aggregation, Fast Re-Route
- trTCM
- Optional per-route statistics
- Supports unlimited control-plane CPUs
- Protects Control Plane CPUs from attacks

40Gb/s eNP Egress Network Processor

- 100 milliseconds buffering for all packet sizes
- Traffic Shaping, WRED



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