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COMPETITIVE BULLETIN

Cisco's Gigabit Switch Router – the "GSR"

Recent Developments

Cisco has released additional details on its Gigabit Switch Router: the GSR 12000 series.

- 4-slot and 12-slot models will ship in fall/winter 1997 - ISP deployment will not commence until the end of the year.
- A 16-slot version is promised - "later"
- Cisco provided a low-key "technology preview" at Interop, Las Vegas
- Cisco has announced that Beta testing will begin at Continental Cablevision
- Cisco is aggressively attempting to place Beta units to compete with - or in some cases knock out - GRF evaluations.
- CiscoIOS code to support the product is not ready yet
- International availability dates unknown at this time

Cisco GSR Product Description

While details are still sketchy, Cisco is making the following claims as to parameters/features for the 4- and 12-slot models.

Model	Number of slots	Capacity
GSR 12004	4	5 to 20 Gb/s
GSR 12012	12	5 to 60 Gb/s

According to reports the initial release will support:

- SONET / ATM OC-12c*
  (3 ports for 12004 model, 11 ports/12012 model)
- SONET OC-3c
  (12 ports/12004 model; 44 ports/12012 model)

There are conflicting reports regarding Gigabit Ethernet capability: one report says the Cisco GSR will have a Gigabit Ethernet interface available at release, other reports say Gigabit Ethernet will not be available until 1998.

** Availability of ATM STM-4 is unknown at this time*

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Cisco GSR 12000 Series Product Claims:

- Switch fabric: fully synchronous cross-bar switch with up to 5 Gb/s bandwidth/card
  - 4-slot switch modules can be combined to 16-slot, 80 Gb/s capacity in the future
  - Architectural limit (16-slot chassis) is 320 Gb/s
- Line cards:
  - In first release, SONET OC-3c and OC-12c ; ATM OC-12c
  - Possibly Gigabit Ethernet line cards at release, or sometime thereafter
  - In 1998, support for OC-48 and dense DS-3
- "Express Forwarding" distributed table management:
  - Each line card stores the forwarding information base (FIB) - no address caching (This capability is promised for the 7500 line as well)
  - Route table lookup will be enhanced by the line card memory capability
- Redundancy:
  - SONET automatic protection switching (required data feeds may not be available from all carriers in order to use this feature)
  - Fully redundant interface cards and processors according to configuration
- Virtual output queues (VOQs) increase switch efficiency
  - On each line card, VOQs manage fabric utilization, multicast, head-of-line blocking performance and class of service provisioning (future)
  - New algorithm supports up to 17 VOQs per card
- Routed protocols
  - IP only
- Routing Protocols
  - OSPF
  - BGP4
- Supports Tag Switching

Cisco's GSR Product Positioning

Beyond bandwidth and performance, Cisco says the GSR will deliver:

- High availability through redundancy
- Traffic management using BGP-4 for route dampening
- Cost containment through bandwidth optimization
- Large (up to 20 MB) buffers on line cards to maximize throughput
  - use random early detection software to control traffic bursts and protect buffers
- Load balancing using advanced traffic engineering to define alternate routes
- Class of Service (CoS) features

Cisco's Value Proposition to the ISP:

Cisco will "partner" with the ISP to help them reduce costs and differentiate their service offering - to profit from **value-added network services using CoS capability.**

Cisco Claims & Selling Points:	Ascend Response:
The Cisco GSR is higher speed: 5 Gb/s per card	The Ascend GRF™ 400 and 1600 have market tested/proven 1 Gb/s card speed TODAY. It is unclear when a Cisco 5 Gb/s card will ship.
GSR uses a distributed routing table on each card, to eliminate route caching.	The Ascend GRF also stores a routing table on each card, but the GRF uses a hardware-based look-up at media speeds. The GSR is simply optimizing its cache management by using multiported memory — it is still a slower software lookup.
GSR supports "several thousand routes."	Cisco's promise is not proven. The GRF's support of 150,000 routes per line card is field proven.
In initial release the GSR will support: SONET OC-3c SONET OC-12c ATM OC-12c Gigabit Ethernet (unconfirmed)	TODAY Ascend's GRF supports: SONET OC-3c SONET OC-12c ATM OC-3c/STM-1 single and multimode ATM OC-12c/STM-4 (6/97) Ethernet 10/100 FDDI HSSI HPPI
The GSR will support multi-port OC-12 and OC-48 in "future releases" (1998).	Ascend's GRF will have OC-48 support in Q1'98.
The GSR is based on CiscoIOS.	Ascend GRF is based on open standards. CiscoIOS is proprietary, and therefore harder to use and customize. The GSR will use a rewrite of the Cisco 7500-based IOS code that has not been field proven.
Efficient fabric utilization/scheduling using 17 VOQs per port	It is not yet clear what benefit this gives ISPs and Carriers, since the QoS protocols are not yet established. This sounds like a hardware feature looking for an application, or an acknowledgment of switch fabric scheduling problems. (On the surface, 17 seems like a rather small number.)
Pricing	
Cisco has announced that its GSR will be "very aggressively priced" against the Ascend GRF.	Ascend's GRF base pricing is lower than the Cisco GSR. The hype regarding price is irrelevant without information regarding what features/software is included.
Cisco GSR 12004 BASE with redundant power supply $20K $30K	**Ascend GRF 400** BASE with redundant power supply $15,650 $21,150
Cisco GSR 12012 BASE with redundant power supply $30K $55K	**Ascend GRF 1600** BASE with redundant power supply $32,000 $38,700
Cisco OC-3c Card $12K	**Ascend OC-3c/STM-1 Cards** $19-24

Key Selling points Against the Cisco GSR

- The Ascend GRF is market tested: it is in full production at major ISPs across the country today - by the time Cisco ships in 2H'97, the GRF will have been in production for over a year.
  - ⇨ Details regarding the Cisco GSR are still sketchy: it is unclear what functionality it will actually have upon release, and when it will actually be released
  - ⇨ Can an ISP afford to delay purchase decisions for an uncertain release?
- The Ascend GRF uses a hardware-based route table look-up -mapping at media speeds.
  - ⇨ The Cisco GSR will in effect optimize its cache management by using multiported memory - but it still will be performing a slower software-based route table look-up
- The Ascend GRF supports a more robust suite of high performance media including ATM OC-3c/STM-1, ATM OC-12c/STM-4, SONET OC-3c, FDDI, HPPI, HSSI, and Ethernet 10/100Base-T.
  - ⇨ The Cisco GSR's media support will be limited to SONET OC-3c/OC-12c and ATM OC-12
  - ⇨ International support/availability has not been announced
  - ⇨ The Cisco GSR will not support FDDI, HPPI or HSSI on its initial release
- The Ascend GRF's routing software is based on open standards.
  - ⇨ The Cisco GSR will be based on a significant re-write of Cisco's proprietary software - CiscoIOS. **Customers that choose Cisco will be limited to addressing their future networking needs based on Cisco's products, terms, and schedules.**

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