



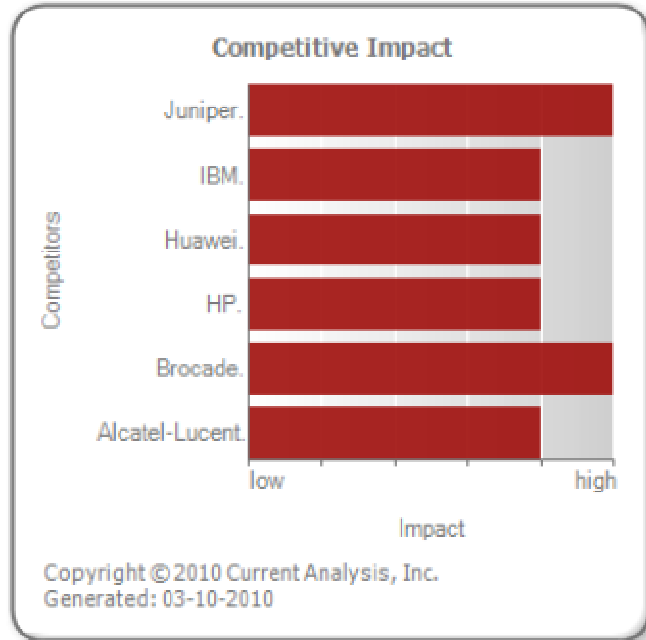
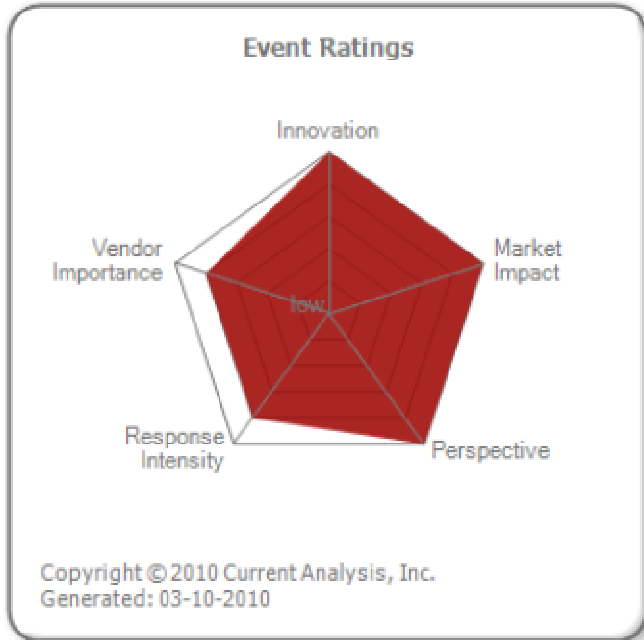
Intelligence Report: **Cisco Launches Its Solution to Tame Next-generation Internet Cravings: The 322 Tbps-capable CRS-3**

Report Date: March 10, 2010

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Market: Carrier Infrastructure , Optical Infrastructure 

## Quick Take



### Competitive Positives

- Supports higher-scale service, uses less power, and is smarter
- Delivers data center network automation via Network Positioning System (NPS)
- Supports a pay-as-you-go compute, storage, and network model for cloud services
- Provides high investment protection for CRS-1 customers
- Received an endorsement by AT&T Labs and completed 100G field trial

### Competitive Concerns

- Network and data center interconnection standards are still in progress
- Enterprise adoption of cloud computing models may lag infrastructure builds
- Cisco is not alone in its attempts to tap the next wave of cloud services

## Event Summary

March 09, 2010 -- Cisco announced its CRS-3 Carrier Routing System (CRS), designed to serve as the foundation of the next-generation Internet and set the pace for the growth of video transmission, mobile devices, and new online services. The CRS-3 delivers three times the switching capacity, a significant improvement in service scale over the CRS-1, and supports tighter data center integration to deliver secure cloud services. AT&T noted that it has completed a 100G trial over its live network.

## Analytical Summary


### Perspective

Very positive on Cisco's announcement of the CRS-3, because it provides the switching and




routing capabilities as well as service intelligence needed to support the next wave of service provider requirements, such as 100G services. The new platform is backward and forward compatible with the CRS-1, enabling carriers to leverage existing investments and move forward with a system that offers the performance and service flexibility necessary to deal with emerging network/data center integration and cloud service needs. The announcement also received a strong endorsement from AT&T Labs as a key component of its next-generation IP core network architecture, which adds a high level of market validation for the product.

### Vendor Importance

High to Cisco, as it has invested nearly \$1.6 billion in the CRS family since its inception in 2004, and the announcement helps to insure its leadership role in the delivery of the next generation of Internet services. Although the announcement focused on CRS-3's scale and services ability, the overall significance of the platform is closely tied to previous Cisco initiatives, such as its combined data center/IP NGN to optimize managed services designed to establish a cloud services foundation, its carrier-grade IPv6 transition strategy, and its cloud security services portfolio obtained via the ScanSafe acquisition. In that respect, the introduction of the CRS-3 is a logical next step for Cisco in both scale and services ability. 

### Market Impact

Very high on the IP core router market, as well as the overall telecommunication infrastructure market, because in addition to raising the bar on total aggregate router capacity to 322 Tbps, Cisco has brought together a set of capabilities that will enable carriers to continue to support rapid increases in network scale, service virtualization, and security. The CRS family provides an enhanced network infrastructure to support continued network traffic growth and a meshing of data center and storage networking which network performance by itself cannot fulfill. 

## Competitive Strengths

### Competitive Positives

- The CRS-3 scales up to 4.88 Tbps per chassis or 322 Tbps for a fully loaded cluster system, and it provides the service intelligence (IPv6, data center, cloud services) through Cisco's QuantumFlow Array chipset. The CRS-3 offers reduced power consumption (down to 2.75 watts per gigabit of traffic) and a modular power system which can optimize the number of power supplies based on system load. Service providers are faced with scale, service, and power challenges which are all addressed by the new system.
- Scale and performance aside, Cisco's Data Center Services System (DCSS), which includes the Network Positioning System (NPS) and automated CRS+Nexus inter-data center connectivity (via UCS), provides the requisite tools to help simplify and automate network/data center operations. The NPS uses Layer 3 – Layer 7 network information to establish an optimal linkage to content/resources while improving the end user experience and security.
- Tight integration between the CRS in the network and Nexus in the data center supports a pay-as-you-go compute, storage, and network model which carriers can leverage to offer their enterprise customers cloud services. By leveraging the infrastructure as a service (IaaS), enterprises can obtain virtual services to assist them in offloading peak workloads by providing additional storage or compute resources, as well as maintaining a high level of security. As enterprises adopt outsourced models, service providers will be well positioned to find new revenue opportunities.
- The CRS-3 provides a high level of investment protection since the CRS-3 uses the same chassis and common equipment, line cards, and power system as the current CRS-1. An existing system can be upgraded, in service, by adding a new switch fabric which enables the new 140 Gbps/slot performance. Three new line cards have been announced that will fully utilize this new performance and includes a 14x10 GigE, a 20x10 GigE, and a 1x100 GigE line card module.
- The CRS-3 received an endorsement by AT&T Labs, which has completed a 100G backbone field trial using its live network. The service provider highlighted the need to deliver a new set of communication and entertainment services and applications, which will need 100G interfaces to handle the growing bandwidth demand that it is experiencing in its network. Currently, AT&T noted that it is using 40G link aggregation groups (LAGs) to satisfy the need to supply greater than 40G traffic flows.

## Competitive Weaknesses

### Competitive Concerns

- Network and data center interconnection standards are still in progress, leaving early adopters somewhat exposed if the eventual standards that are adopted have undergone significant change prior to ratification. Although Cisco is an active participant in many of the relevant standards groups, there is a certain level of exposure and single-vendor dependence.
- Service providers run the risk that enterprise adoption of cloud computing models will lag the implementation of network/cloud-based infrastructure builds. Other issues include the fact that many enterprises may not be ready to adopt a cloud model despite the potential cost savings until the models are well proven. Consulting services will often be needed to help enterprise customers consider incorporating the cloud as part of their broader IT strategy, which may again take time to materialize.
- Cisco is not alone in its attempts to tap the next wave of cloud services. Traditional IT services vendors such as IBM, HP, CA, Microsoft, VMware, and EMC as well as service providers such as AT&T, Verizon Business, Vodafone, SingTel, Global Crossing, KPN, and others are focused on this next wave of opportunity. The result will likely be a delicate mix between competitor and collaborator/partner.

## Response & Recommendations

- Cisco should obviously leverage its presence and apparently strong strategic relationship with AT&T to move the CRS-3 from trial to full deployment status. AT&T appears to have the network scale requirements that can stress the capabilities of the system's high-density 10GigE and 100GigE capabilities in addition to leveraging the CRS and Nexus solutions to support an IaaS service model.
- Cisco should insure that the base technologies that it is using for network/data center interconnect are also being promoted within the standards groups such as ITU and IEEE. First-mover advantage aside, carriers will want to have multi-vendor participation in their next generation networks.
- Cisco should show uptake on significant multi-chassis CRS family systems (CRS-1 and CRS-3) with respect to scaling. Although it has noted that there are over 500 multi-chassis systems shipped/deployed, there are few reference points to show that the 92 Tbps capacity limit is being stressed by current network applications and when 322 Tbps will be needed in a single router. Cisco should leverage its VNI statistics and projections to identify inflection points that will quantify the utilization levels of current and future multi-chassis solutions.
- Force10 and Brocade should have a ready answer to Cisco's new CRS-3 and its corresponding push into the cloud services market. They should show how they provide similar functionality for both data center and network-side solutions, as well as support for effective IPv6 transformation. Force10's ExaScale E-Series and Brocades XMR series deliver 3.5 Tbps/3.2 Tbps per chassis and provide 120 Gbps/100 Gbps per slot, respectively. Both vendors should downplay the need to provide larger router capacities (i.e., multi-chassis), but they should also update their 100G product roadmaps.
- Juniper should go head-to-head with Cisco's claims regarding having 12 times the capacity of its nearest competitor by showing the upgrade path currently available to its T Series customers; it should also note that the system has the architecture to move beyond the 25 Tbps level when needed. Juniper should stress that the capabilities of its 3.2 Tbps T1600 router, with its new 100G chipset and announced support for 100GigE and high-density 10 GigE line cards, meets service provider needs for now and into the future.
- Juniper should continue messaging around products designed to deliver secure cloud-enabled services based on the Junos software platform and further position the T Series as smoothly interworking with all aspects of the solution to support inter-data center network services. Juniper should also show how the recently announced Junos Pulse, Junos Space, and its expanded partner-driven ecosystem can be leveraged by service providers to offer cloud services. Juniper should highlight its Stratus project, which it chartered to support for a fully converged and virtualized data center environment.
- Huawei should note that its 2.56 Tbps NE5000E router supports IPv6 and 100GigE interfaces. The NE5000E

leverages an optical backplane interconnection and currently scales up to 10 Tbps. Huawei should provide a roadmap that outlines expansion beyond the current levels up to 200 Tbps, reinforcing the fact that it is not constrained by its system architecture. Huawei should also point out that it has deployed over 50 cluster router solutions to its service provider customers.

- ZTE should provide an updated status report on its ZXR10 T8000 IP core router (T8000), which is based on its in-house-designed ZXRIC chipset and also supports a multi-chassis model. Although the T8000 was just recently released for general availability (September 2009), it should highlight that a single chassis can deliver 3.2 Tbps and, when clustered, it can currently support 12.5 Tbps (up to 204.8 Tbps in the future when fully configured as a 16+64 node cluster). ZTE should also provide an update to its 100G roadmap for the T8000.
- Alcatel-Lucent should begin to elevate its messaging around using its 2 Tbps 7750 SR for IP core applications that require the new port densities provided by its new FP2-based line cards and its high-scale service capabilities. With its newly announced 10GigE and 100GigE line cards, it can begin to challenge the traditional IP core router platforms. The company should also continue massaging around its “High Leverage Network” vision and the tools, partnerships, and capabilities it is using to assist service providers in successfully tackling new high-value service delivery models.
- Other competitors to Cisco in the data center and enterprise networking market need to push their data center vision out to customers and channel partners in order to blunt Cisco’s overall momentum. Competitors should emphasize standards and openness as well as their own prowess when it comes to supporting carrier-grade cloud services.

## Buyer Actions

- Existing Cisco CRS-1 customers (of which Cisco notes there are over 5,000 systems installed) should consider upgrading to the CRS-3 when they need to scale beyond the capabilities currently delivered. Since a CRS-1 can be upgraded (in-service), carriers can selectively add capacity and higher-speed interfaces (100G) as needed. The CRS-3 can also support existing line cards and offer higher-density 10GigE and new 100GigE support to relieve density/capacity constraints.
- Service providers that need higher-speed connectivity and are currently using technologies such as link aggregation group (LAG) should evaluate the merits of leveraging a single 100GigE interface in lieu of configuring multiple 10GigE interfaces to achieve the necessary bandwidth. Service providers should consider the merits of deploying 40 GigE (even if on a limited basis) to ease capacity barriers while waiting for the general availability of standards-based commercially available 100 GigE, which is expected in the mid-2010 timeframe.
- Service providers that are using IP core routers from other vendors, and are projecting the need for greater 10G interface density and ultimately 40G/100G, should press their suppliers for a delivery roadmap for their 40G/100G solutions and evaluate the new CRS-3 router from Cisco. Service providers should also look to their suppliers for offers of seamless integration between their IP core router-based network, their edge network, and their optical transport networks to gain additional network simplicity, visibility, and resiliency.
- Service providers should evaluate the cloud services foundation put forth by Cisco with the recent CRS-3 and related capabilities such as IPv4-IPv6 interworking, data center + networking, and security to determine how they can tap into new revenue streams that leverage their network infrastructure assets. Service providers launching cloud services will need to ensure that the expected quality of experience is met in order to attract enterprises to their services.

## Analytical Perspective

We are taking a very positive stance on Cisco’s announcement for the CRS-3, because it provides a logical next step in the evolution of Cisco’s IP core solutions by addressing multiple service provider pain points. The system provides the added switching capacity to address growing bandwidth requirements driven by video and demanding data applications. The system also adds support for line-rate 100GigE interfaces which, given the growth in traffic between routers and data centers, helps to simplify interconnections as well as support higher per-flow rates. The CRS-3 also delivers higher-density 10GigE line rate interfaces to support higher connectivity requirements. The new system also provides investment protection for service providers that have deployed the

CRS-1 by reusing many of the system components and enabling an in-service upgrade. Aside from the performance and new higher-capacity interfaces, the CRS-3 also supports a carrier-grade cloud services model. As cloud services mature, service providers will be able to offer highly efficient services to their enterprise customers with the expected quality of service and experience.

The CRS-3 provides a significant performance enhancement over its predecessor, which was introduced in 2004. At the time of introduction, the CRS-1 was often viewed as overkill for the market, especially with respect to its multi-chassis support model, which could ultimately grow to support 92 Tbps of switching capacity as a single router. For details on the initial launch of the CRS-1, see "[Cisco Finally Announces the Worst Kept Secret in Silicon Valley, the CRS-1](#)," June 01, 2004). Cisco has deployed over 5,000 CRS-1 systems to date and notes that 500 of these systems are multi-chassis configurations. From a performance perspective, the CRS-3 supports up to 4.48 Tbps per chassis and 140 Gbps/slot, as compared to the 1.2 Tbps and 40 Gbps/slot delivered by the CRS-1. In order to take full advantage of the increased per-slot capacity, Cisco announced three new line card modules; this includes a line-rate 14x10 GigE, a line-rate 1x100 GigE, and an oversubscribed 20x10 GigE line card. The new line cards can be mixed with existing CRS-1 line cards to provide investment protection and support additional interface types which are available for the CRS-1.

Aside from the performance aspects, Cisco has also established a foundation to support most aspects of a carrier-grade cloud services model. With the introduction of the CRS-3, Cisco announced that the system uses its QuantumFlow Array chipset, which delivers a significant increase in service intelligence. The new chipset includes support for core data center/cloud services attributes as well as support for full 100G flows to remove forwarding bottlenecks. As part of its Data Center Services System, Cisco announced its Network Positioning System (NPS) and support for cloud VPNs to deliver infrastructure as a service (IaaS). This includes a tighter coupling between the XR-based CRS family and Nexus in the data center.

The ability to support the next wave of Internet services relies heavily on the capabilities noted above as well as on capabilities announced earlier, such as the company's data center and IP NGN managed services and cloud services foundation (see "[Cisco Combines Data Center and IP NGN](#)," March 14, 2009). In order for the Internet to continue to scale to meet the demands brought on by massive increases in IP addressing, Cisco announced its IPv6 migration strategy (please see "[Cisco Launches Carrier Grade IPv6 Transition Strategy](#)," October 13, 2009). To insure the security of cloud services, Cisco expanded its capabilities with a cloud security portfolio (see "[Cisco Extends Its Cloud Security Services Portfolio with ScanSafe Acquisition](#)," November 02, 2009).

Although the move to provide additional capacity and performance was a logical next step for Cisco in support of the generally accepted growth patterns being projected for the IP core, it also needed to retain its leadership in the IP core market. Competitors such as Juniper, Huawei, and ZTE have all introduced per-chassis/slot performance increases for their respective core routers; all three support a multi-chassis model to provide greater per-router capacity; and Juniper has announced new 10GigE and 100GigE line card availability for mid-2010. Alcatel-Lucent, which has not discussed its plans to address the super-core market, has announced 2 Tbps/chassis performance and support for 100GigE interfaces for its 7750 Service Router; plus, it is developing service enablement tools and support for its service provider customers. With IP core planning cycles extending for multiple years, the CRS-3 will be well positioned to maintain a leadership position moving forward.

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