IP Core Routers: Competitive Landscape Assessment

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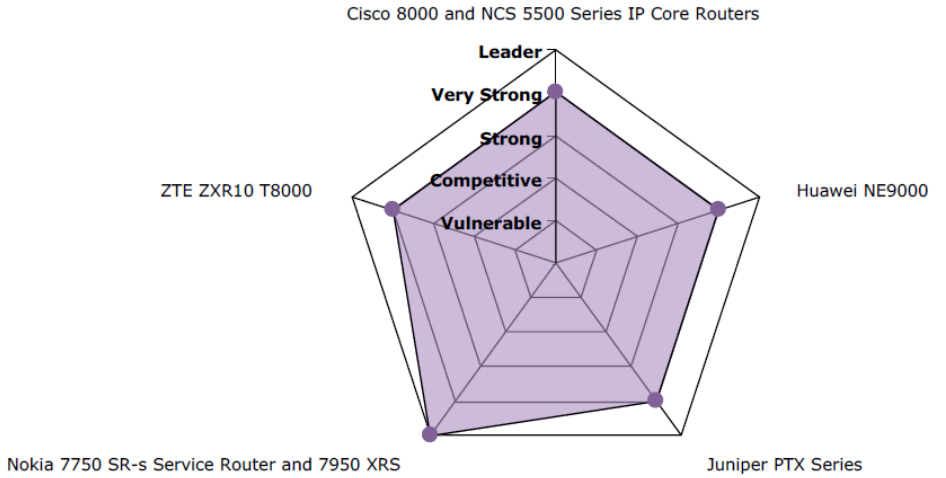
COMPETITIVE LANDSCAPE ASSESSMENT - IP CORE ROUTERS

REPORT SUMMARY:

The IP core routers fueled by new, low-power, next-generation silicon with embedded telemetry, security, and analytics help CSPs reduce complexity and prepare for a 5G world with rapidly growing capacity needs and high customer expectations.

PRODUCT CLASS SCORECARD



MARKET OVERVIEW

Product Class

IP Core Routers

Market Definition

The platforms in the core router product class support the network infrastructures of telco and webscale operators. Massive growth in IP traffic requires continual increases in bandwidth and connectivity. Bandwidth growth, however, is coupled with significant changes in traffic mix, ranging from internet access and business Ethernet services to rich video and data center interconnections (DCIs).

The transition from predominately fixed traffic profiles to a more dynamic, mobile-centric network model is forcing service providers to continually upgrade their IP and optical core infrastructures, seek solutions to reduce complexity, and significantly lower operational costs through automation.

There are currently only five vendors that actively address this market segment with a full range of telco and webscale capabilities. This is due to the high barriers to entry as well as extreme performance and reliability requirements. The covered vendors invest heavily in custom silicon to drive performance, lower power consumption, and support advanced telemetry and programmability.

Rated Competitors

Metric	Weight	Cisco	Huawei	Juniper	Nokia	ZTE
System Performance and Architecture	25%	Leader	Very Strong	Leader	Leader	Very Strong
Interfaces and Port Density	25%	Very Strong	Very Strong	Very Strong	Leader	Very Strong
Resiliency and Life Cycle Management	20%	Very Strong	Very Strong	Very Strong	Very Strong	Very Strong
Infrastructure Services	15%	Leader	Leader	Leader	Leader	Leader
Network and Service Management	15%	Very Strong	Leader	Very Strong	Leader	Leader
Overall	100%	Very Strong	Very Strong	Very Strong	Leader	Very Strong
Score		4.36	4.35	4.44	4.58	4.19

Note: Score of 1-1.49 = Vulnerable/1.50-2.49=Competitive/2.50-3.49=Strong/3.50-4.49=Very Strong/4.50-5=Leader)

- Cisco
- Huawei
- Juniper
- Nokia
- ZTE

Additional Competitors

Due to the high barrier to entry, the covered vendors noted above are the key players in this space.

Changes Since Last Update

Cisco:

October 2021: Deutsche Telekom (DT) deployed the Cisco 8000 Series routers powered with Cisco Silicon to connect more people and businesses across Europe.

Huawei:

March 2022: Huawei and China Telecom upgraded their strategic collaboration and will utilize their advantages to facilitate innovation and its application in industries and provide the digital services required by different users.

Nokia:

- **March 2022:** Nokia showcased its Coherent Routing IP-Optical solution at the Optical Communications Conference (OFC). The solution currently supports managed IP-optical integration for 400G Ethernet (GE) IP networks and will support future 800GE.
- **January 2022:** Nokia was selected by Capital Online to upgrade its IP backbone network with the 7750 Service Router (7750 SR) and the 7250 Interconnect Router (7250 IXR) platforms to deploy Capital Online's network 2.0 plan.
- **September 2021:** Nokia launched its fifth generation IP (FP5) routing platform to address the requirement of network capacity, IP network security and energy efficiency. FP5 can deliver integrated line rate encryption for Layer 2 and Layer 3 network services with speeds up to 1.6 Tbps.
- **June 2021:** Nokia and Vodafone Turkey have completed a trial connecting Asia and Europe with intercontinental 1 Tbps (Terabit) IP link. Nokia's 7950 XRS routers with terabit interfaces powered by FP4 chipset can support next-generation applications and access technologies.

Changes Since Last Update	**Juniper:** • **February 2022:** Juniper announced that Italian international service provider Sparkle has deployed its 400G solutions to fulfil the increasing bandwidth demands. • **January 2022:** Juniper announced new networking silicon to bolster the scale and capacity for its MX Series edge and PTX Series core routers. The Express 5 ASIC delivers higher throughput and bandwidth for the PTX Series routers. • **November 2021:** Juniper announced the extension of AI-driven support for its entire Junos Portfolio to maximize end user experience. Juniper AI-based support connects Junos-based customer platforms, including ACX series, EX series, PTX series, MX series, PTX series, QFX series, and SRX series to the Juniper cloud. **ZTE:** • **March 2022:** ZTE announced that its router portfolio achieved MEF 3.0 Carrier Ethernet (CE) certifications. • **January 2022:** ZTE helped Ningxia Cable TV Network upgrade its IP transport network with the ZXR10 T8000 core router. • **December 2021:** China Telecom selected ZTE's ZXR10 T8000 for its next core router centralized procurement. • **December 2021:** ZTE extended its partnership with Ooredoo Group for the next five years to supply its Radio, Cloud Core, Transport, and 4G/5G CPE terminals. The deal also included implementation and integration services. • N**ovember 2021:** ZTE is to deploy the cloud-based Operations and Maintenance Centre (OMC) system for China Mobile. ZTE's ZENIC ONE product was able to control the operators special propagation network (SPN)/packet transport network (PTN) in 13 cities, involving 180,000 NEs. • **July 2021:** ZTE announced that its Bit Index Explicit Replication IPv6 Network (BIERin6) multicast solution has been approved by Internet Engineering Task Force (IETF). BIER provides simple deployment, high service scalability, and allows operators to provide flexible and controllable multicast services.

MARKET ASSESSMENT

Global IP traffic projections continue on a steep trajectory at 26% CAGR (2017 to 2022) and will reach traffic levels of 396 exabytes per month flowing through networks globally. The IP core router market segment has responded in kind by providing support for high-density 100G, 400G, 800G (emerging), and 1+ Tbps (in trials) interfaces. Current designs have been influenced by webscale requirements, which stress disaggregation, speed, and simplicity. The rapid growth in traffic- and associated increase in network complexity- is driving vendors and operators to adopt software-defined networking (SDN)-based control and automation.

Separately, the management of IP and optical core networks has changed to support on-demand provisioning and coordination of resources with the services layer. Operators must consider architecture and implementation models that can dynamically allocate IP and optical core assets to meet the growing requirements of cloud services and distributed data centers. SDN has become an integral part of all vendor offerings as operators plot their next equipment refresh cycle- and corresponding high-dollar equipment purchases. SDN control will increasingly be subsumed into more ambitious automation solutions, requiring streaming telemetry and elements of machine learning.

Key Takeaways:

Increased Port Speeds:

- 400G ports are generally available with per-rack densities ranging from 144-648 ports, with an average of 420 ports.
- 800G ports are emerging with several vendors planning and one vendor announcing support by end-2022.
- 100G ports have per-rack 100G port densities between 720-2,304 with an average of 1,225 ports.

Power Consumption per Gigabyte:

- Current IP routers consume between 0.1 watts and 0.5 watts per gig of traffic transported with the average reported by vendors being 0.23 watts. Power consumption and switching capacity continue to improve with each generation.

High-Performance Silicon:

All IP core routers covered in this report are powered by vendor-specific, custom-designed chipsets. Next generation versions have emerged that increase performance and reduce power consumption, the latest chipsets include embedded security (i.e., MACsec and IPsec), increased capacity, and expanded telemetry to drive AI engine to improve operations, administration, and management (OAM) and provide network insights. The high cost and multi-year time to market have restricted the market to all but the largest vendors.

Programmability:

SDN management, based on open-source software and augmented with vendor extensions, is provided by all vendors. SDN provides centralized management and orchestration of services as well as support for multi-vendor and multi-layer networks.

Simplified Routing Protocols:

SDN has enabled vendors and operators to simplify traffic paths by leveraging technologies such as centralized path computation, segment routing (SR), and end-to-end Ethernet VPNs (EVPNs).

Increased Use of Coherent Optics:

The availability of pluggable coherent optics, scalable silicon, and open standards among others is driving a trend toward reducing the number of layers and simplifying the IP-transport network architecture.

The following provides a snapshot of the drivers and key buying criteria for the IP core router market.

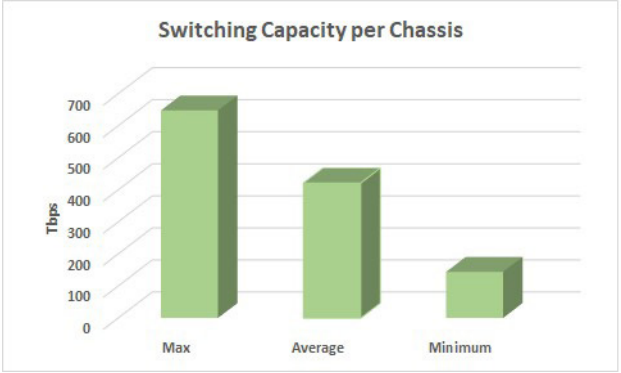
MARKET DRIVERS

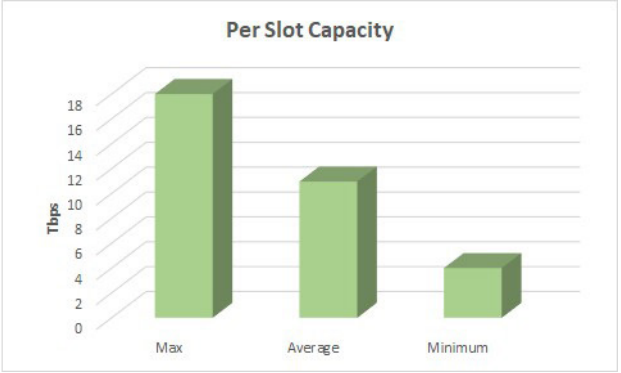
- **Increased Video Traffic:** Increased bandwidth demand is being driven by residential services that are increasingly leveraging broadband infrastructure to deliver high-quality video services. Video is also contributing to the increase in bandwidth, with the added requirement to provide a high quality of experience per user. The IP core must enable the transfer of large quantities of video traffic from the source (e.g., servers/data centers) to the service edge for regional/local distribution to subscribers.
- **Increased Mobile Data:** Mobile networks continue to push capacity expansion driven by LTE, LTE advanced, 5G, and IoT services. Massive increases in bandwidth per subscriber, as well as a flood of signaling from connected devices, have placed the backhaul network (i.e., access and aggregation) under siege- and correspondingly adds traffic in the IP core. For example, according to Ericsson's 2022 Mobility report, "by the end of 2022, the average monthly usage per smartphone is expected to surpass 15GB, and then grow to 40GB by the end of 2027."

- **IP-Optical Convergence:** Vendors must deliver solutions that provide increased utilization of all network resources; this requires the optical transport network to participate in automated reconfiguration of transport resources not only to improve utilization, but also to reduce the time to deliver new services. Nokia's Network Service Platform (NSP), Cisco's Crosswork, Huawei's iMaster Network Cloud Engine (NCE), Juniper's Paragon Automation Suite, and ZTE's ZENIC ONE are representative of integrated solutions. These solutions leverage SDN domain controllers and service orchestration to improve efficiency. Suppliers are also integrating coherent optics into routers by leveraging advances in optical pluggable interfaces (with smaller footprint and lower power consumption).
- **SDN Deployment:** SDN is prevalent in operator network architectures, including the IP and optical layers. With the ever-increasing complexity to support on-demand services, varied service types, and the need to adapt quickly to new revenue-generating opportunities, SDN promises to deliver. The understanding of how to leverage existing infrastructure investments and plan for a future SDN-based network architecture has become top-of-mind.
- **Silicon Innovation:** Greater performance and higher energy efficiency innovations will come from next-generation silicon breakthroughs. Current platforms are driven by each vendor's respective chipsets that enable routers to continue to increase per-slot capacities as well as port density and speed. However, since the silicon innovation cycle is normally three to five years, development and deployment cycles will often give one vendor an advantage with respect to switching capacity and port speeds and density. The most recent examples are Cisco's Silicon One for the Cisco 8000 Series, Juniper's Express 5 silicon for the PTX Series, and Nokia's FP5 for the 7750 SRs series.
- **Network Automation:** Network virtualization delivers the flexibility to support on-demand services; however, along with flexibility comes a much higher level of complexity. When surveyed, operators cited complexity and lack of staff skills as significant barriers to adoption. Vendors are addressing complexity by adding analytics and silicon-based telemetry to increase visibility and provide the basis to automate manual and error-prone processes. Cisco's Crosswork, Juniper's Paragon Automation Suite, Huawei's NCE-IP, ZTE's ZENIC ONE, and Nokia's NSP are a few examples. Professional services also play a key role in facilitating adoption.

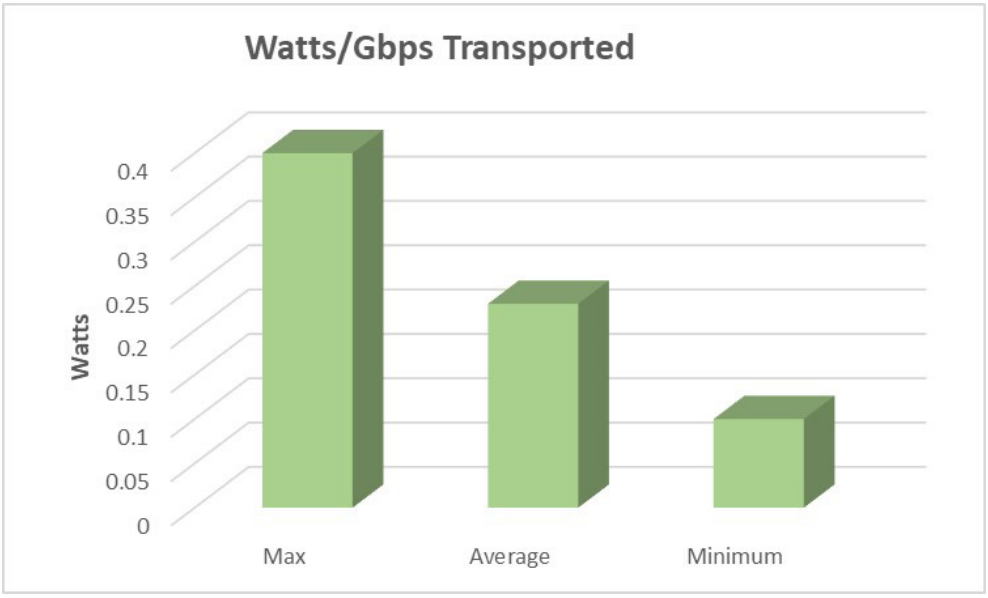
BUYING CRITERIA

System Performance and Architecture: Vendors have defined the upper limits of their IP core router platforms, and some have now reached that level while others have launched their next-generation platforms. IP core platforms are expected to support traffic growth for at least five years. The criteria looks at total per rack and per slot switching capacity, watts per gig of traffic (vendor supplied at the chip-level), and overall Tbps/RU efficiency. Reported power efficiency has improved significantly due to new silicon and advanced thermal designs; the lowest consumption reported with current products is on Juniper's PTX and Cisco's 8000 at 1.4W/Gbps, Nokia projects approximately 0.1 watts per gigabit with its FP5 at the chip level. ZTE's future liquid cooling could reduce heat dissipation by 250%, noise by six decibels, and lower energy consumption by 30%.



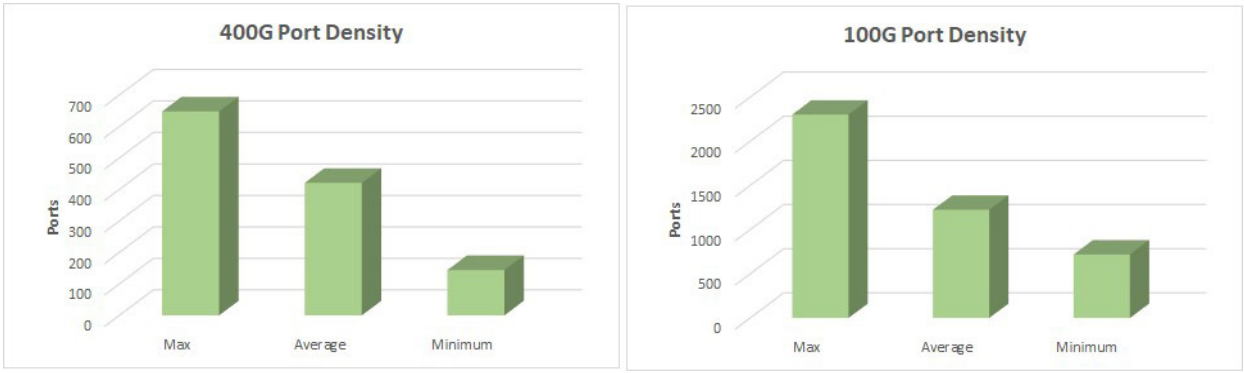


Source: GlobalData, IP Core product assessment



Source: GlobalData, IP Core product assessments, vendor supplied

- **Interface Densities and Speeds:** All evaluated platforms support 100G and 400G (most also support 10G and 40G interfaces). One vendor notes a 1.6T clear-channel interface, and 800G with its new silicon. Furthermore, 400G interface availability on routers will mirror that of the core optical transport platforms. Increased port density creates a challenging physical problem, regarding how to package and terminate large numbers of ports in a chassis.



Source: GlobalData, IP Core product assessment

- **Resiliency and Life Cycle Management:** All vendors have hardened their routers to deal with multiple failures, this includes enabling hot-swappable components, redundancy of key components (e.g., route processors and switch fabric), non-stop protocols, and in-service software upgrade capabilities. All vendors support high availability and provide non-service impacting upgrade paths for software and for maintenance to minimize disruptions in traffic flow.
- **Infrastructure Services:** All vendors covered offer extensive support for IP services which includes Layer 2, Layer 3, MPLS, peering, DCI, EVPN, virtual extensible LAN, and SR (SRv6). With the increased emphasis on security, most also support embedded MACsec, and with the latest silicon IPsec is supported at line rate up to 400G. Additional capabilities include IP-optical integration to improve multi-layer efficiency and agility.
- **Network and Service Management:** All vendors covered have a viable SDN strategy and well-formed ecosystems to participate in the next IP core router refresh cycle. End-to-end suppliers command more elements of an ecosystem than those with limited portfolios. Infrastructure optimization can contribute to a reduction in OpEx as well as improved service agility. Automation and analytics have risen to become top-of-mind operator concerns as vehicles to help conquer complexity and address gaps in staff expertise and improve operational efficiency.

VENDOR RECOMMENDATIONS

- **Capacity/Feature Roadmaps:** Capacity will continue to drive IP core requirements, as evidenced by the uptake in 100G and 400G interfaces; however, all vendors need to telegraph their ability to support continued growth (e.g., >400G), OpEx reduction through automation, simplified routing (e.g., SR and EVPN), and network visibility (via analytics and telemetry) to help operators to reduce their overall total cost of ownership.
- **Webscale Architectures:** Webscale operators have been instrumental in defining agile infrastructures that exploit IT-oriented development and implementation principles. Vendors need to highlight their support for cloud-based infrastructure solutions, but also find creative methods to help operators transition their existing infrastructures to preserve legacy (and profitable) revenues.
- **SDN and Telemetry:** Vendors must combine the central control and visibility promised by SDN to simplify and optimize an operator's multi-layer network. Vendors should leverage telemetry data, which is collected at each network layer (via capabilities embedded in silicon) to provide operators with guidance and insight into network issues, traffic trends, and resource utilization.

BUYER RECOMMENDATIONS

- **SDN Plans and Roadmap:** Service providers can accelerate the move to SDN by performing joint demonstrations and participating in interoperability testing. Service providers should leverage SDN capabilities that support multi-layer (IP-optical) capabilities to improve network element resource utilization. Service providers also need to address the evolution of their organizations, which may be necessary to realize the full benefits of advances in automation and analytics to help fine-tune both infrastructures and business models.
- **Continued Power/Space Efficiency:** Service providers should keep pressing suppliers to continue their efforts to reduce overall space and power consumption; since the IP core represents higher power consumption per device, potential savings in this area can significantly impact OpEx. Operators should press for a standardized metric process for power consumption, which currently ranges from 0.1 watts to 0.4 watts per gigabit transmitted. For very high port densities, operators should consider the impact on rack space when using breakout panels. Buyers should also press vendors for a clear roadmap addressing the general availability of new line cards and networking features.
- **Dynamic IP/Optical Layers:** Service providers should continue to work with vendors to refine dynamic control of the IP and optical domains to improve network resource utilization. Solutions utilize technology such as path computation element (PCE), analytics, and inter-domain control and orchestration; however, organizational issues also need to be identified and resolved. Vendors should be encouraged to provide solutions that can be leveraged by an integrated network management model, as well as disaggregated if needed due to organization/regulatory requirements.