

CHANGING DYNAMICS OF IP PEERING

Arista Solution Guide

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Summary

At a time when the internet peering landscape has undergone a major transformation, the Arista 7500R Universal Spine and 7280R Universal Leaf platforms address the challenges of new IP peering dynamics with innovations in both hardware and software, disrupting the status quo economics for the content driven internet.

Introduction

Looking back over the last two decades at the most impactful transformations in routing architectures, the internet itself has undergone one of the biggest changes. The primary driver for this has been the ever-accelerating growth of real-time content on the internet. From the 1990s to the early 2000s, internet content was primarily email, text and static web pages, so the network interconnects were symmetric or strictly hierarchical. Large Tier 1 Service providers provided transit services to everyone else through their large global backbones, and smaller networks “peered” with each other due to the symmetric traffic flow. Fast forward to today, when content from YouTube, Netflix, Facebook, Spotify and online gaming dominates the Internet traffic. This increase in high-bandwidth content has set in motion a series of changes to the interconnect requirements, altering network economics, interconnection and business relationships between the content owners, the Internet Service Provider (ISP) and the end consumers. New services are driving increased bandwidth, connectivity, uptime and latency requirements, forcing interconnection and network infrastructures to adapt.

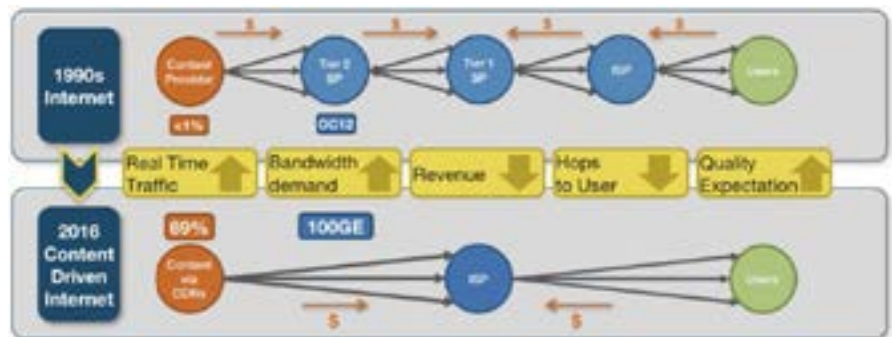


Figure 1: Evolution to Content Driven Internet

The Rise of Content Delivery Networks

According to the Global Internet Phenomena Report: North America and Latin America report in May 2015 from Sandvine, Real-Time entertainment (video and audio) grew to occupy nearly 69% of peak internet bandwidth for fixed access and 40% for mobile users.

In this world of a content-driven internet, the broadband and mobile access ISPs (cable TV, DSL, mobile phone providers) hold the access to the consumer. Consumers have also expanded their direct financial relationships with content providers and are demanding a better entertainment experience for content that rides over the top of ISP networks providing last mile access.

In the race to capture eyeballs and provide a high quality experience, most content providers are aggressively rolling out Content Delivery Networks (CDNs) that place content closer to the edges of the network to avoid transit hops through the internet and are peering directly over high bandwidth peering interconnects with the ISPs. Content providers have several choices of exit points from their CDN (settlement-free public peering, direct/paid peering, transit, private WAN) and often rely on sophisticated distributed algorithms to make the optimal routing decision and to traffic engineer their content to meet the peaks in demand. In addition to the need for a high performance peering platform, CDNs are often built in point of presence (POPs) locations that are often severely limited in the amount of available space and power. This, in turn, highlights the value of both low power and compact footprint solutions for IP peering. Finally, Ethernet is the medium of choice for these interconnects, fueling the need for high density 10/25/40/50/100 GbE ports on the peering platform.

Meanwhile the access ISPs are faced with increasing bandwidth demands on their last mile networks combined with declining per user revenues from their traditional fixed and mobile customer base. They face a set of growing competitive threats from new market entrants in the last mile access business that is further driving down end user prices. Also the largest CDN operators like Netflix and Google have offerings to house their caches in their data centers for ISPs to distribute content directly from these local caches. All these transformations are forcing ISPs to refresh their network infrastructures to meet the growing bandwidth needs and adopt the cloud efficiencies and principles that have driven the evolution of compute, switching and storage of "scale out", "simplify" and "software driven control".

The Arista Advantage

For internet peering and the last mile network infrastructures, content providers and ISPs have usually resorted to traditional "big iron" router platforms to meet their internet routing needs. These platforms usually have a multitude of features and capabilities that are not required for an IP peering role, and are historically expensive, limited in port density, and very power hungry. Cloud DCs revolutionized the way legacy DC switching networks were built and operated by adopting cloud principles of "scale out, simplify and software driven control", to reap the advantages of efficiency and cost.

The industry has now reached an inflection point where these established cloud principles are intersecting with the expanding capabilities of best of breed merchant silicon feature sets and scale, creating a disruption in legacy routing system architectures. Leveraging standard merchant silicon capabilities with Arista EOS innovations enables a new best of breed platform. The Arista 7500R Universal Spine and 7280R Universal Leaf platforms offers content providers and ISPs a high-bandwidth, high density, greener, programmable, cost-effective option for both peering and cloud network infrastructure scale out.

Arista 7500R Universal Spine Platforms

The Arista 7500R Series delivers the industry's highest performance, with up to 150 Tbps of system throughput to meet the needs of the largest scale data centers. They combine scalable L2 and L3 resources and high port density with advanced features for network monitoring, precision timing and network virtualization to deliver scalable and deterministic network performance while simplifying designs and reducing OpEx.

Deep packet buffers and large routing tables provides complete deployment flexibility and allow the 7500R to be deployed in a wide range of open networking solutions including large scale layer 2 and layer 3 cloud designs and internet peering applications.

Available in a compact system design, as a choice of 16, 12, 8 and 4 slot, the Arista 7500R is the next generation of the 7500 Series and sets a new standard for performance, density, reliability, and power efficiency. The 7500R can support up to 576 ports of wire speed 100GbE and 40GbE and offers over 150 Tbps of total capacity with a broad choice of line cards. Every 100GbE interface supports a choice of 5 speeds including 25GbE and 50GbE providing unparalleled flexibility and the ability to seamlessly transition data centers to the next generation of Ethernet performance.

All components are hot swappable, with redundant supervisor, power, fabric and cooling modules with front-to-rear airflow. The system is purpose built for co-location and data centers, and is energy efficient with typical power consumption of under 25 watts per 100GbE port for a fully configured chassis with a choice of AC or DC power and is designed for NEBS compliance. These attributes make the Arista 7500R an ideal platform for building reliable and highly scalable data center networks.

The Arista 7500 Series uses a deep buffer virtual output queue (VOQ) architecture that eliminates head-of-line (HOL) blocking and virtually eliminates packet drops even in the most congested network scenarios. An advanced traffic scheduler fairly allocates bandwidth between all virtual output queues while accurately following queue disciplines including weighted fair queuing, fixed priority, or hybrid schemes. As a result, the Arista 7500 can handle the most demanding traffic requirements with ease, including mixed loads of real-time, multicast, and storage traffic while still delivering low latency.



Figure 2: Arista 7500R Universal Spine platforms

Highest 100G Density with Power Efficiency

The 7500R Series delivers a maximum of 576 ports of 100GbE with 150 Tbps of wire speed L3 throughput in a range of highly compact systems at breakthrough price/performance compared to traditional routers. Designed with modern titanium rated power supplies that are over 94% power efficient and combined with power-efficient merchant silicon that needs less than half the power/100G compared to similar routing platforms, the 7500R delivers the lowest power/bit ratio that is needed in the modern CDN POPs. This power advantage provides savings sufficient to power as much as two additional racks of servers in a typical installation.



Arista 7280R Universal Leaf Platforms

The Arista 7280R Series are purpose built fixed configuration 10/25/40/25/100GbE leaf systems built for the highest performance environments, and to meet the needs of the IP Peering networks. They combine scalable L2 and L3 resources and high density with advanced features to deliver scalable and deterministic network performance while simplifying designs and reducing OpEx.

The 7280R capabilities address the requirements for a highly scalable forwarding solution in a compact and energy efficient form factor. The same packet processors at the heart of the 7500R Series of products are also used in the fixed configuration family of 7280R Series switches. The broad range of interfaces and density choice provides deployment flexibility. The 7280R Series are available in a choice of models with a choice of 10GBASET, 10GbE SFP+ with 40/100GbE QSFP uplinks and a range of 1RU and 2RU 40/100GbE systems that offers up to 60 ports of wire speed 100GbE in a 2RU system with 10.24Tbps of forwarding capacity.

The 7280R Series provide industry leading power efficiency with airflow choices for back to front, or front to back.



Figure 3: 7280R Series Platforms

Arista FlexRoute™ Engine and EOS NetDB



Figure 4: Arista FlexRoute™ Engine and EOS NetDB

The Arista innovative FlexRoute™ Engine provides support for the full internet routing table, in hardware, with IP forwarding at Layer 3 and with sufficient headroom for future growth in both IPv4 and IPv6 route scale to more than 1 million routes.

Neighbor	V	AS	Weight	Next Hop	S/I	Adm	In/Down	State	Physical	Prefix
18.215.243.1	*	65000	65000	0	0	0	0	0	0	18.215.243.1
18.215.243.2	*	65000	65000	0	0	0	0	0	0	18.215.243.2
18.215.243.3	*	65000	65000	0	0	0	0	0	0	18.215.243.3
18.215.243.4	*	65000	65000	0	0	0	0	0	0	18.215.243.4
18.215.243.5	*	65000	65000	0	0	0	0	0	0	18.215.243.5
18.215.243.6	*	65000	65000	0	0	0	0	0	0	18.215.243.6
18.215.243.7	*	65000	65000	0	0	0	0	0	0	18.215.243.7
18.215.243.8	*	65000	65000	0	0	0	0	0	0	18.215.243.8
18.215.243.9	*	65000	65000	0	0	0	0	0	0	18.215.243.9
18.215.243.10	*	65000	65000	0	0	0	0	0	0	18.215.243.10
18.215.243.11	*	65000	65000	0	0	0	0	0	0	18.215.243.11
18.215.243.12	*	65000	65000	0	0	0	0	0	0	18.215.243.12
18.215.243.13	*	65000	65000	0	0	0	0	0	0	18.215.243.13
18.215.243.14	*	65000	65000	0	0	0	0	0	0	18.215.243.14
18.215.243.15	*	65000	65000	0	0	0	0	0	0	18.215.243.15
18.215.243.16	*	65000	65000	0	0	0	0	0	0	18.215.243.16
18.215.243.17	*	65000	65000	0	0	0	0	0	0	18.215.243.17
18.215.243.18	*	65000	65000	0	0	0	0	0	0	18.215.243.18
18.215.243.19	*	65000	65000	0	0	0	0	0	0	18.215.243.19
18.215.243.20	*	65000	65000	0	0	0	0	0	0	18.215.243.20
18.215.243.21	*	65000	65000	0	0	0	0	0	0	18.215.243.21
18.215.243.22	*	65000	65000	0	0	0	0	0	0	18.215.243.22
18.215.243.23	*	65000	65000	0	0	0	0	0	0	18.215.243.23
18.215.243.24	*	65000	65000	0	0	0	0	0	0	18.215.243.24
18.215.243.25	*	65000	65000	0	0	0	0	0	0	18.215.243.25
18.215.243.26	*	65000	65000	0	0	0	0	0	0	18.215.243.26
18.215.243.27	*	65000	65000	0	0	0	0	0	0	18.215.243.27
18.215.243.28	*	65000	65000	0	0	0	0	0	0	18.215.243.28
18.215.243.29	*	65000	65000	0	0	0	0	0	0	18.215.243.29
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18.215.243.31	*	65000	65000	0	0	0	0	0	0	18.215.243.31
18.215.243.32	*	65000	65000	0	0	0	0	0	0	18.215.243.32
18.215.243.33	*	65000	65000	0	0	0	0	0	0	18.215.243.33
18.215.243.34	*	65000	65000	0	0	0	0	0	0	18.215.243.34
18.215.243.35	*	65000	65000	0	0	0	0	0	0	18.215.243.35
18.215.243.36	*	65000	65000	0	0	0	0	0	0	18.215.243.36
18.215.243.37	*	65000	65000	0	0	0	0	0	0	18.215.243.37
18.215.243.38	*	65000	65000	0	0	0	0	0	0	18.215.243.38
18.215.243.39	*	65000	65000	0	0	0	0	0	0	18.215.243.39
18.215.243.40	*	65000	65000	0	0	0	0	0	0	18.215.243.40
18.215.243.41	*	65000	65000	0	0	0	0	0	0	18.215.243.41
18.215.243.42	*	65000	65000	0	0	0	0	0	0	18.215.243.42
18.215.243.43	*	65000	65000	0	0	0	0	0	0	18.215.243.43
18.215.243.44	*	65000	65000	0	0	0	0	0	0	18.215.243.44
18.215.243.45	*	65000	65000	0	0	0	0	0	0	18.215.243.45
18.215.243.46	*	65000	65000	0	0	0	0	0	0	18.215.243.46
18.215.243.47	*	65000	65000	0	0	0	0	0	0	18.215.243.47
18.215.243.48	*	65000	65000	0	0	0	0	0	0	18.215.243.48
18.215.243.49	*	65000	65000	0	0	0	0	0	0	18.215.243.49
18.215.243.50	*	65000	65000	0	0	0	0	0	0	18.215.243.50
18.215.244.0	*	65000	65000	0	0	0	0	0	0	18.215.244.0
18.215.244.1	*	65000	65000	0	0	0	0	0	0	18.215.244.1
18.215.244.2	*	65000	65000	0	0	0	0	0	0	18.215.244.2
18.215.244.3	*	65000	65000	0	0	0	0	0	0	18.215.244.3
18.215.244.4	*	65000	65000	0	0	0	0	0	0	18.215.244.4

Figure 5: Arista BGP routing table outputs

Coupled with Arista EOS NetDB evolution, the Arista 7500R and 7280R series platforms support hundreds of BGP peers and more than 2 million routes, with large scale ECMP and proven best-in-class routing convergence. In addition to route scale, security at the edge is equally important and Arista AlgoMatch™ delivers industry leading scale for security access control policies on 7500R and 7280R series platforms with uncompromised scale for IPv6 ACLs.

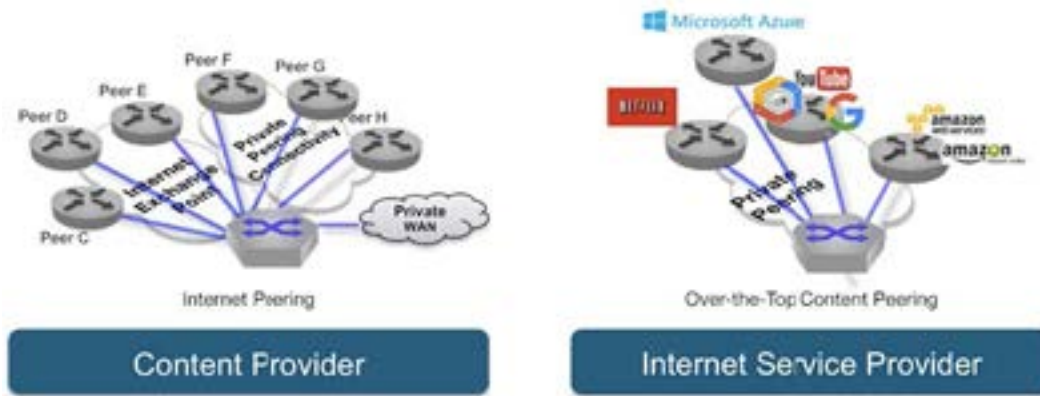


Figure 6: IP Peering Platform for Content Provider and ISP

These innovations make the Arista 7500R Universal Spine and 7280R Universal Leaf ideal peering platforms for both the content provider as well as the internet service provider in power demanding and space constrained environments.



Arista AlgoMatch

AlgoMatch is a unique Arista innovation for modern cloud networks, combining both software and hardware to enable more flexible and scalable solutions for access control, policy based forwarding and network telemetry. By combining general purpose memory with advanced software algorithms AlgoMatch delivers higher scale, performance and efficiency with lower power and is more cost effective than traditional TCAM-based solutions. AlgoMatch provides a more efficient packet matching algorithm that enables flow matching for access control, policy and visibility. The net benefits are a high performance policy engine with both increased functionality and scale in a cost and power efficient solution. AlgoMatch is available on the 7500R and 7280R Series of products.

- AlgoMatch enables IPv4 and IPv6 access control at the same scale
- L4 rule ranges are programmed efficiently without expansion or reduced capacity
- Multiple actions can be performed on a single packet or flow
- User defined filters allow flexible packet classification based on offsets for custom actions
- Supports rich policy with consistent semantics that would exhaust classical resources

Programmable Traffic Steering with Arista EOS

Arista EOS offers a variety of programmable traffic steering options for content providers to manage traffic across all available exit points from the CDN to optimally deliver content to the consumers.

- Common tunneling technologies: including MPLS, VXLAN, GRE, MPLSoGRE or IPinIP for customers to enable software driven exit point selection.
- Support for traffic engineering and path selection for CDN deployments: ISIS Segment Routing (ISIS-SR), BGP-LU (RFC 3170), BGP ADD_PATH, UCMP and sFlow analytics with BGP extended gateway support.
- EOS NetDB provides network telemetry to stream the real-time state of the network - a superior alternative to traditional polling mechanisms.
- Arista AlgoMatch technology provides rich visibility with accelerated sFlow at dense 100G that can be used for various applications from optimal traffic steering to DDOS monitoring to trending analysis at the peering edge. AlgoMatch in conjunction with EOS NetDB, DANZ, Tracers and CloudVision Telemetry provide the needed high visibility for customers.
- EOS offers rich capabilities for advanced traffic management, monitoring, automation and provisioning.

Summary

The internet peering landscape has undergone a major transformation in the past decade, driving the growth of CDNs, new business opportunities and the refresh of access ISP network infrastructures. The content driven internet of today demands a high bandwidth, cost-effective, programmable 100G peering platform with low power and space requirements. The Arista 7500R Universal Spine and the Arista 7280R Universal Leaf platforms address the challenges of the new IP peering dynamics with innovations in both hardware and software, disrupting the status quo economics for the content driven internet.

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