Solution Showcase

Arrcus: Enabling Simple, Scalable, and Secure Routing-centric Networks

Date: November 2019 **Author:** Bob Laliberte, Sr. Analyst

Abstract: Digital transformation, cloud services, 5G, and computing at the edge are rapidly changing the IT landscape and will place increasing pressure on enterprise and service provider networks. To meet these challenges, organizations will require new solutions that enable them to efficiently scale and futureproof the network. Arrcus has emerged as a company capable of delivering innovative software solutions that take advantage of the latest merchant silicon optimized for routing-centric network architectures.

Overview

Digital transformation is changing the way organizations operate and deliver value to customers. Several significant initiatives are underway (Cloud, Edge Computing, 5G, etc.), enabling organizations to take a holistic view of data from the data center, the edge, and the cloud, and to use analytics leveraging artificial intelligence, machine learning, and other tools to create new revenue streams and drive better business outcomes.

However, organizations will need to evolve their networks to support these initiatives and accommodate the demands for additional bandwidth required to connect cloud and edge computing environments. Typically, this will involve leveraging business connectivity (private IP/MPLS or public internet), and utilizing internet exchanges or co-lo facilities to ensure network performance in these highly distributed environments. Plus, communication service providers are starting to educate enterprises about how emerging high-bandwidth, low-latency 5G connections can open up new revenue-generating, value-added services.

The shift to the cloud, 5G, and edge computing will place significantly more reliance on the network to ensure a positive customer experience and to enable business. This surge in traffic will not only require corporate networks to change but could also impact internet backbones, service provider networks, and peering points to accommodate rapid growth in network traffic.

Legacy Environments Present Challenges

In scaling to meet demand and accommodate these initiatives, all of these organizations will face challenges, including:

- **Constraining existing architectures**: Typical data center switching environments have relied on layer 2 proprietary, siloed solutions or on open-source routing solutions that are brittle, limited in scale, and that have interoperability issues. This makes it very difficult to seamlessly operationalize network environments across the data center, the backbone, and the edge, resulting in higher capital and operating expenditures.

- **Strong reliance on custom silicon**: Some network vendors are still leveraging custom silicon for their networking solutions to provide a differentiated solution. However, this creates vendor lock-in and typically requires hardware upgrades on a regular basis to take advantage of new enhancements. For organizations looking to emulate cloud hyperscalers, the use of proprietary silicon may prove to be problematic.

- **Difficulty adopting new innovations**: While much has changed in software architectures and development, many legacy network OSs and management software may still be based on monolithic architectures that leverage traditional waterfall or perhaps agile development methodologies and require extensive time gaps between new releases (2x per year) and bug fixes (quarterly). This would also include the lack of a common OS across the data center, cloud, and edge, resulting in a lack of uniform capabilities across an end-to-end environment.

- **High costs**: All organizations struggle to work within a budget, but in times of transformation, it is even more difficult, as organizations need to purchase innovative technologies while maintaining existing operational environments. This can be more challenging when purchasing solutions that include custom silicon and proprietary hardware, and not commercial off the shelf (COTS) hardware leveraging merchant silicon.

Organizations need new network architectures to transform the environment at the rate the business and markets require. Arrcus has designed a solution it believes provides the requisite scale up, scale out, and secure routing-centric network capabilities to meet all performance requirements.
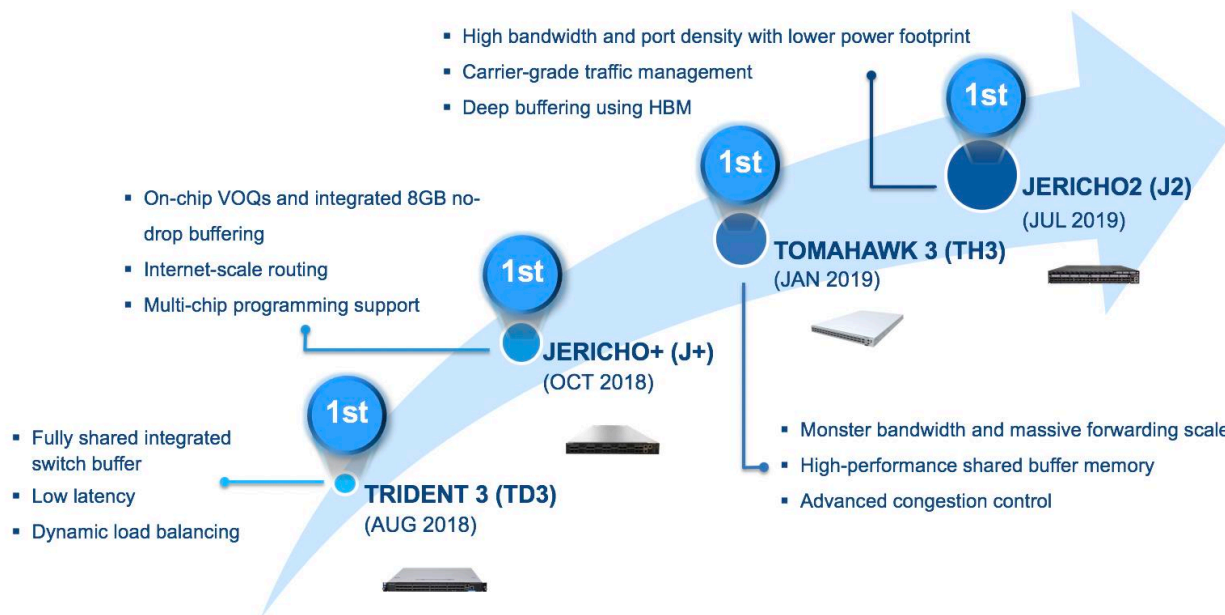
Arrcus Is Taking an Innovative Approach

Arrcus is on a mission is to democratize networking by providing best-in-class software, the most flexible consumption model, and the lowest total cost of ownership (TCO) (measured as a combination of CapEx and OpEx savings and supply chain diversification). Arrcus has built a network OS solution, ArcOS that provides a single, unified (switching and routing) architecture across physical, virtual, and cloud network environments while delivering operational flexibility, superior performance, and security. As a result, Arrcus claims its customers are cost-effectively designing, deploying, and managing their infrastructure today while seamlessly scaling to the needs of hyperscale cloud, edge, 5G networks, and beyond.

ArcOS is designed from first principles to deliver a simple, scalable, and secure networking solution that provides superior bandwidth, low latency, fast convergence, and high availability at the lowest cost per terabit.

The key characteristics of the Arrcus ArcOS include:

- **A modular, composable, microservices-based architecture:** This common architecture leverages a 64-bit user space process on a 64-bit OS that is multi-threaded with minimal locking. This enables components to be replaced with minimal impact. ArcOS can be deployed on multiple form factors including physical (fixed, high-density fixed), virtual (VM, container), or cloud-based (AWS, Azure). Only one OS is required to provide support for a full range of 1GbE to 400GbE switch and routing platforms, and it can be deployed anywhere, from top of rack (TOR) through super spine or data center to edge environments.

- **Massive scale and performance:** Arrcus has demonstrated in a Route Reflector environment the ability to converge 2M routes and over 100M paths in under 3 minutes from a BGP configuration push. It has also demonstrated sub-30-sec route convergence when ingesting a full internet routing table (830K+ routes as of publish date, and growing) in internet peering applications.

- **Rapid portability to new technology:** ArcOS leverages a data plane adaptation layer (DPAL) that provides the ability to quickly port the OS software to emerging architectures, as evidenced by its ability to rapidly incorporate numerous merchant silicon families such as Broadcom's Trident 3, Jericho+, Tomahawk 3, and now Jericho2.

Figure 1. Rapid Portability & Scalability

- High bandwidth and port density with lower power footprint
- Carrier-grade traffic management
- Deep buffering using HBM

- On-chip VOQs and integrated 8GB no-drop buffering
- Internet-scale routing
- Multi-chip programming support

JERICHO2 (J2)
(JUL 2019)

TOMAHAWK 3 (TH3)
(JAN 2019)

JERICHO+ (J+)
(OCT 2018)

- Fully shared integrated switch buffer
- Low latency
- Dynamic load balancing

TRIDENT 3 (TD3)
(AUG 2018)

- Monster bandwidth and massive forwarding scale
- High-performance shared buffer memory
- Advanced congestion control

Source: Arrcus

- **Enhanced availability and ease of use:** ArcOS has built-in resiliency that ensures an easy and efficient upgrade path that requires minimal downtime leveraging fast reboot on switches. It also supports the ability to scale out in terms of threads per process and per process "restartability" for routing information bases (RIB) and forwarding information bases (FIB). In addition, it includes open and standards-based solutions for debugging and logging to monitor both software and any COTS-based hardware, including the ability to stream component-specific state information using real-time telemetry.

- **Security:** The solution leverages time series stamps and provides full visibility into all entry points, enabling organizations to monitor traffic for abnormalities and take corrective actions to maximize network uptime.

- **Cost-efficiency:** Arrcus claims its customers are able to achieve at least 25% reduction in TCO when compared with traditional incumbent vendors after factoring in CapEx and OpEx savings and supply chain diversification.

Organizations have found ArcOS effective in several use cases, including the deep buffer, high density 100/400G IP Clos environments found in data center spine and leaf configurations, 5G PoPs, and edge or cloud PoPs. In internet peering sites, organizations have also taken advantage of the deep buffer, high density 100/400G internet routing capabilities and RPKI-based route origin validation (ROV) as well as BGP Flowspec-based DDoS mitigation.

The Bigger Truth

The simple fact is that change is occurring quickly today. As the pendulum swings from consolidated back to distributed environments, more traffic will run through the network than ever before. Increasing adoption of cloud-based services, distributed computing at the edge to support real-time decisions, and innovative 5G technologies from communication services providers will all require the ability to rapidly scale network environments. Organizations need to become more operationally efficient, drive better customer experiences, and deliver new and innovative products and services.

To overcome these challenges, innovative new solutions are needed to accommodate the growth and accelerate the transition. Unfortunately, many legacy environments will struggle to keep up, as physical dependencies and monolithic software architectures hinder progress.

Arrcus is taking a first-principles approach to creating its ArcOS to deliver a simple, scalable, and secure routing-centric networking solution. With a single OS to scale from 1GbE to 400GbE, deploy in the data center, cloud, or edge in a number of different form factors, and rapidly port to adapt to new merchant silicon, ArcOS has been designed to not only handle the current networking needs but also seamlessly enable future growth.

Enterprise Strategy Group is an IT analyst, research, validation, and strategy firm that provides market intelligence and actionable insight to the global IT community.

© 2019 by The Enterprise Strategy Group, Inc. All Rights Reserved.