ARRCUS
NETWORK DIFFERENT™

SOLUTION BRIEF

The ArcOS: Segment Routing (SRv6)

Key Benefits

- **FLEXIBLE**
  SR eliminates path provisioning state in network transit notes, enabling greater scale and functionality
- **TRAFFIC ENGINEERING**
  Programmable traffic engineering with flexible algorithms, and customizable TE metrics and constraints
- **RESILIENT**
  Intrinsic fast re-route without transient loops, generalized for any topology (TI-LFA and microloop avoidance)

Solution Overview

Arrcus' SRv6 solution is standards-based and highly scalable to meet the needs of various types of networks (datacenters, access networks, transport backbones, or 5G networks). SRv6 combines standard IPv6 with source routing, creating a stateless and per-packet path or behavior over the network, delivering traffic engineering, SLA management, and customizable network functions. The SRv6 Network Programming model offers great flexibility in designing and deploying end-end (or edge-edge) networking objectives. TI-LFA and micro-loop avoidance (ULA) leverages SRv6 to provide protection to both Segment Routing and non-SR IP traffic, by pre-computing the post-convergence state of the network and source routing to the optimal next hop when a failure occurs, all of which is seamless to the operator and requires minimal configuration.

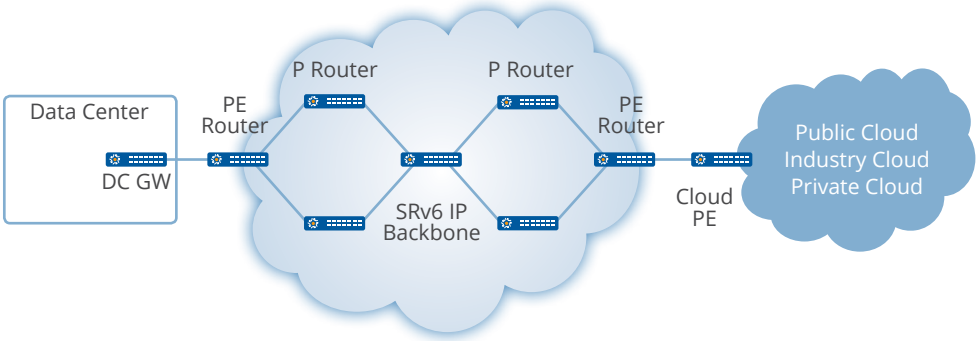

Figure 1 - SRv6 IP Backbone (PE and P routers)

SRv6 Introduction

SRv6 uses source routing to define a "program," that is deployed on a network with specific instructions (Segment IDs) available at each node. Similar to instructions in a computer program, these network programs are integrated with the data/payloads as an IPv6 extension header, the SRH. Nodes capable of SRv6 will execute the local instruction associated with the Segment ID, one packet at a time with consistent and formally-defined behaviors associated with the type of Segment ID. For example, Segment Routing can exploit ECMP routing within each segment and steer traffic along traffic-engineered paths with no per-flow state in the nodes along the path. The packet itself contains all of the information needed to select the TE path.

The Arrcus SRv6 Solution Benefits

SRv6 needs only incremental network upgrades

An SR domain is a collection of nodes or network devices that participate in SR control plane protocols and is generally in a single administrative entity. SRv6 enables the network operators to take a more discrete approach to route optimization for specific data from source to destination, such as routing hyper-scaler specific traffic to improve performance, scale, and efficiency of data plane communication. Since SRv6 does not require each intermediate node to read and process the SRH, it obviates the need to upgrade the entire network. It allows the operator to carve out a policy-driven network path that meets the network traffic needs. The headend node can classify traffic for a given destination network N that requires "low loss" and traffic for the same destination network N that requires "low latency" and choose a different policy for each traffic type.

Planned Maintenance: Source routing in SRv6 allows a network operator to route the network traffic via alternate paths during a maintenance window.

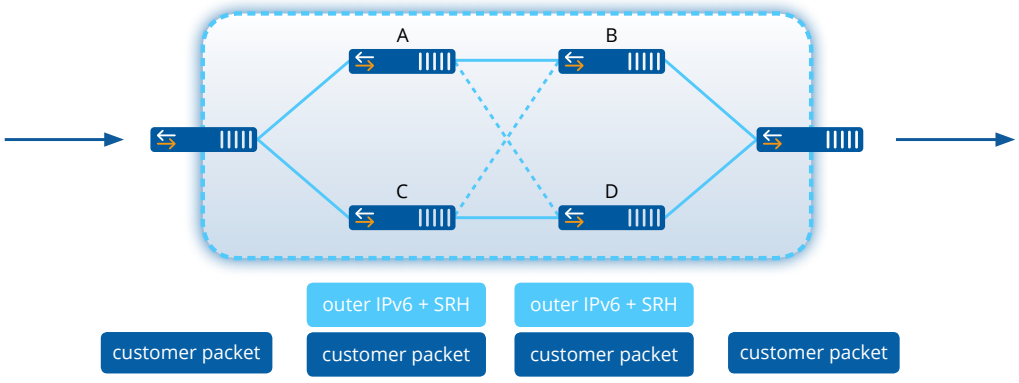

Figure 2 - SRv6 Domain

Topology Independent Loop-free Alternate Fast Re-route (TI-LFA)

With TI-LFA, the IGP pre-computes a backup path for each destination and pre-installs these backup paths in the data plane. Upon a node/link failure, the node activates the backup path (within 50 ms) restoring the network connectivity. TI-LFA guarantees 100% protection coverage in any topology. TI-LFA backup path is a post-convergence most optimal backup path. SRv6 TI-LFA is a local per-router functionality, it can be deployed incrementally obviating the need for a full network upgrade.

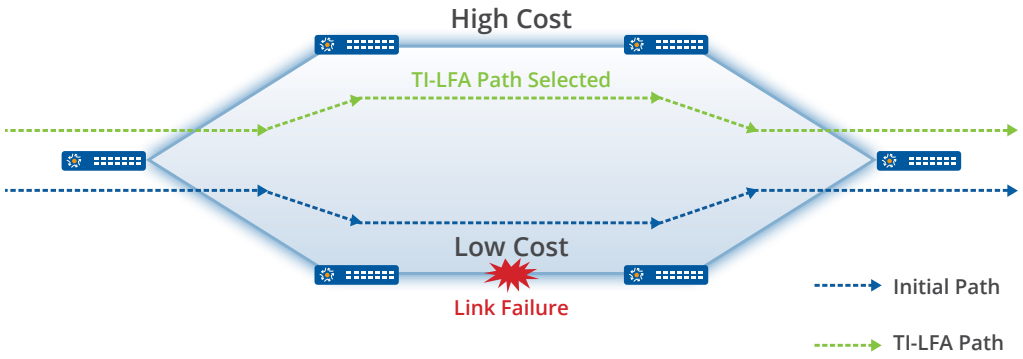

Figure 3 - SRv6-TI-LFA

Deployment ease and flexibility with the use of non-proprietary and standards-based technologies

The Arrcus L3VPN solution over SRv6 allows a seamless deployment in a core IPv6 network without using MPLS VPNs. IPv4/IPv6 packets can be transported across an SRv6 ingress node even if the transit routers are not SRv6-capable, alleviating the need to deploy SRv6 across all nodes in an IPv6 network. Dual-stack L3VPN is supported as an overlay along with TI-LFA and ULA to optimize convergence. As nodes become SRv6-aware, TI-LFA and ULA coverage improves, and additional policies and behaviors can be applied to the VPN traffic in the core.

Hyper-Scalable with uSID support allowing greater control of traffic as it transits

Without any change to the SRv6 control plane, micro-instructions allow for traffic to be controlled with minimum overhead, enabling higher throughput and larger SID lists for more complex SR TE policies. ArcOS supports uSIDs enabling the best MTU efficiency by supporting 6 uSIDs without an SRH or, for larger-scale environments, up to 18 uSIDs can be supported with an SRH. The simplicity and low overhead of SRv6 micro-instructions allow for line-rate forwarding implementations across several merchant silicon platforms. uSIDs can be combined with full SRv6 SIDs as well.

BGP-PIC support reduces convergence time after a failure

BGP Prefix Independent Convergence (PIC) improves convergence after a network failure in both the core and the edge cases. BGP-PIC creates and stores an alternate path as a backup. When the failure is detected, the backup path immediately takes over thus reducing the convergence time.

Operational simplicity and consistency through automation

As the SRv6 network scales, the simplicity of the network protocols allow the operator to focus more on automation of provisioning, policy, and process. For Day-0, ArcOS supports Zero Touch Provisioning (ZTP), which provides the ability to run a boot script on the first boot of the device. For Day-1 and Day-2, ArcOS provides NETCONF, RESTCONF, ArcAPI (python APIs), SNMP, and Ansible support. The software is OpenConfig compliant allowing operators to use vendor-neutral YANG data models to program devices. Based on Debian Linux, ArcOS is an open system allowing operators the flexibility of installing third-party applications using Debian packages. To learn more about automation with ArcOS, refer here. SRv6 policies can be computed by centralized controllers, and programmed into the network ingress nodes with BGP.

Simplified architecture yielding improved network resource efficiency

SRv6 eliminates many protocols:

- No LDP - In an SRv6 network, the transit nodes no longer need to maintain per-path information. Thus there is no need for an extra protocol to distribute per-path information such as LDP. The same IGP that communicates the IP topology also distributes the Segment IDs available in the core. This allows the network to restore more quickly after a link failure, and obviates the need for complex IGP and LDP synchronization approaches.
- No RSVP-TE - SRv6 supports traffic engineering natively through the use of instructions and SR-TE policies.
- No MPLS Entropy Labels or VxLAN UDP - Load balancing is supported by SRv6 using the IPv6 flow label field.

Solution Requirements

REQUIREMENTS	DESCRIPTION
ArcOS	v4.3.1 or later
Platforms	Broadcom DNX-based

Learn more

Visit www.arrcus.com to find out how Arrcus can enable your organization to build massively scalable multi-tenant networks using Arrcus's L3VPN over SRv6 solution.

About Arrcus

Arrcus was founded to enrich human experiences by interconnecting people, machines, and data. Our mission is to democratize the networking industry by providing the best-in-class software, the most flexible consumption model, and the lowest total cost of ownership (TCO). The Arrcus team consists of world-class technologists who have an unparalleled record in shipping industry-leading networking products, complemented by industry thought leaders, operating executives, and strategic company builders. The company is headquartered in San Jose, California.

For more information, go to www.arrcus.com or follow @arrcusinc.

www.arrcus.com 2077 Gateway Place, Suite 400, San Jose, CA