

Pluribus VirtualWire Software

Layer 1 physical switching feature set for the Netvisor ONE OS

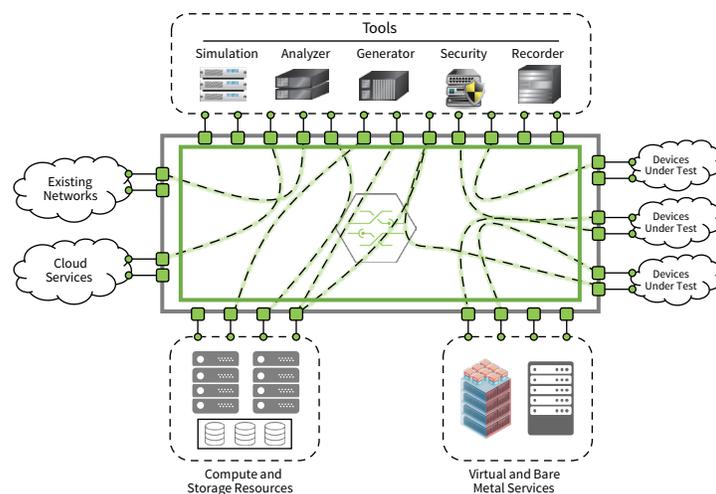
Highlights

- Comprehensive Layer 1 switching feature set for high-performance, low-latency open networking switches
- Programmable software-defined architecture enabling API-driven automation
- Intelligent Layer 1-4 filtering and distributed traffic mirroring
- High-density interface flexibility for 1, 10, 25, 40 and 100 Gigabit Ethernet connections
- Distributed architecture enabling flexible and geographically distributed deployments
- Embedded monitoring telemetry for pervasive network and application visibility
- Integrated with Quali CloudShell for end-to-end lab as a service automation

Pluribus VirtualWire™ is an integrated physical layer feature set for the Netvisor® ONE Operating System (OS) that enables native Layer 1 switching capabilities on open networking hardware switches. VirtualWire transforms a traditional electrical Ethernet connection to emulate a physical wired connection so that interconnections are mapped between two or more physical ports in single switch, or across a multi-switch topology. VirtualWire enables the creation of a virtualized, software-defined patch panel that allows modern Ethernet switching silicon to create transparent physical layer connections between devices. As a result, interconnected devices see each other as being directly connected, with all frames passed through the interconnected ports as if they are connected by a physical wire. This enables all protocols and anomalous packets, such as CRC errors, to be exchanged to allow for unmodified, native connectivity and transparent failure propagation.

SDN-Powered Automation

The VirtualWire solution leverages the power of next-generation software-defined networking (SDN) technology to transform how physical layer connectivity networks are built and operated. By leveraging the exceptional value and flexibility of open networking switches, operators can build highly scalable and dynamic environments that enable the automation of interconnections for lab operations or subscriber interconnection. The result is a data center-class environment that delivers high-performance and reliable Layer 1 connectivity that replicates production-class networks to enable real-world test scenarios. The distributed architecture simplifies interconnection within a single location, or across geographically distributed locations, to support large-scale operations. The result is dramatically simplified operations that improve equipment utilization, reduce provisioning time and lower costs.



The VirtualWire solution provides physical Layer 1 connectivity that enables interconnected devices to see each other as being directly connected, with all frames transparently passed through the interconnected ports

Cable Once and Automate

VirtualWire enables the flexible, low-latency and transparent cross-connection of any combination of switch ports across a single switch, or multiple switches across a distributed topology, enabling rapid changes without touching a cable. Each port can be configured as either a bidirectional or unidirectional connection. Multi-port interconnection allows ingress traffic to be replicated at wire speed to any number of egress switch ports. This enables multiple tools to receive a real-time copy of the targeted traffic. In addition to Layer 1 functionality, Netvisor ONE can apply advanced network services to interconnected traffic as needed without incurring latency or traffic degradation.

VirtualWire capabilities include:

- Transparency to Ethernet frames and protocols
- Policy-based wire-speed filtering
- Low-latency media and speed conversion
- Link state tracking
- Port mirroring and traffic replication
- Network segmentation and multi-tenant services
- Production-class network resiliency and high availability
- Integrated telemetry for network visibility
- Integrated packet capture (on compatible switches)

Use Cases

VirtualWire provides consistent and reliable physical layer connectivity to support virtually any environment that requires continuous transparent Layer 1 interconnection. Some example use cases for VirtualWire connectivity include:

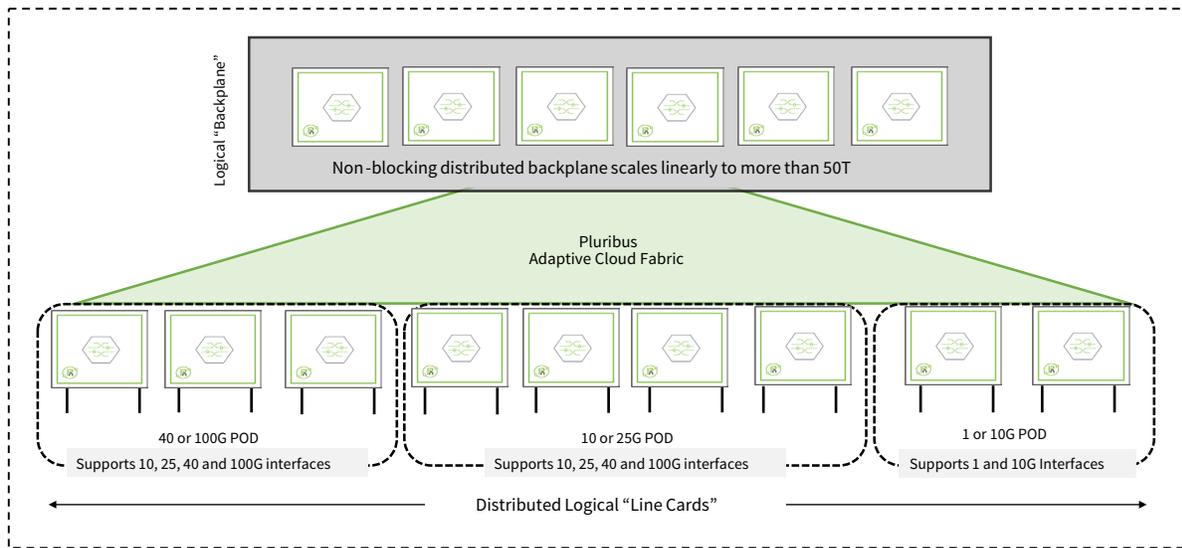
- Test lab interconnection and automation
- Validation and interoperability testbeds
- Lab as a service (LaaS)
- Cybersecurity testing and validation
- Colocation and MSP cross-connect
- Automated subscriber interconnection

Runs on Dell Open Networking Hardware

The Netvisor ONE OS runs on many Open Compute Project (OCP) and Open Network Install Environment (ONIE) hardware-compliant switches, including Dell's ON series open networking switches. Open networking hardware delivers high-performance switching and exceptional operational flexibility, along with significant cost savings. Capacity is elastic, so additional switches and interfaces can be added as additional ports or bandwidth are needed. This enables seamless expansion to build multi-terabit scale-out designs capable of supporting thousands of end ports and millions of connections to meet the most demanding operational requirements. This provides operators with a more flexible choice of hardware options to build scale-out networks with any combination of 1, 10, 25, 40 or 100 Gigabit Ethernet interfaces. To save space and reduce the cost per connection, these switches deliver up to 10 times the port density per rack unit (RU) over traditional Layer 1 switches, with support for up to 128 x 10G ports and 32 x 100G ports in 1RU.

Scale Out Deployments with VirtualChassis Architecture

Leveraging the distributed, scale-out architecture of the Adaptive Cloud Fabric, the Pluribus VirtualChassis™ architecture is built using high-performance, cost-effective 1RU fixed-configuration switches that collectively operate and behave as a single logical switch. The VirtualChassis is managed as one entity and seamlessly scales to support more than 4,000 ports. This provides the operational and manageability benefits of a chassis without the associated high cost and technical limitations, and with a greater degree of operational flexibility.



Scale out Pluribus VirtualChassis located in a single rack, distributed across top of rack or deployed in geographically distributed locations

Intrinsic Automation Simplifies Operations

Extensive programmability and automation enable the building of new VirtualWire topologies in software in a matter of minutes. All configurations are software defined, enabling provisioning to be rolled out quickly with minimal effort. Operators can provision and initiate configuration changes for all switches with a single command through command-line interface (CLI) or RESTful APIs, reducing configuration time by up to 90% over traditional box-by-box provisioning. Operators can define and store multiple test configurations for later use or reuse. Orchestration can be seamlessly integrated into many popular automation and orchestration platforms. Quali CloudShell integration allows end-to-end automation and orchestration across a global test lab or interconnect environment to orchestrate and automate the provisioning of virtually all test lab resources.

Netvisor ONE VirtualWire Technologies

Pluribus Netvisor ONE supports two different VirtualWire implementations or modes, each based on different Layer 1 forwarding characteristics.

When a switch is configured in VirtualWire cross-connect mode, Netvisor ONE allows the creation of end-to-end native Layer 1 emulated circuits across a leaf-spine fabric. Ethernet frames are forwarded across pre-defined end-to-end circuits “carved” across the fabric switches. This mode is currently supported on the following Dell ON switches: S4048-ON, Z9100-ON, S5048-F-ON.

When a switch is configured in traditional IP switching mode, Netvisor ONE supports IP VirtualWires. An IP VirtualWire is an end-to-end IP-based pseudo-wire across a leaf-spine fabric. Ethernet frames are transparently encapsulated over VXLAN and are dynamically load-balanced across the links of the leaf-spine fabric using standard Ethernet/IP hashing. IP VirtualWires are supported on all the Dell ON switches compatible with Netvisor ONE.

Warranty and Support

Pluribus Networks offers a wide range of advanced services spanning the entire test lab network lifecycle to protect investments and help accelerate success when deploying and optimizing VirtualWire and the Netvisor ONE operating system for next-generation lab network architectures. Multiple extended support options are available, including on-demand global support, on-site support, advanced hardware replacements and professional implementation services. Maintenance options include direct access to a team of expert network engineers with deep networking experience, and our self-service online Customer Portal. For more information about Pluribus support options, visit <http://www.pluribusnetworks.com/support> or contact a Pluribus Networks authorized reseller.

Ordering Information

Software licenses and switches do not include support – order desired support separately.

Dell ON Series Open Networking Switches with VirtualWire

Dell's ON series switches are fully integrated, turnkey open networking solutions that are available pre-configured with the Pluribus Netvisor ONE Operating System enterprise license. Dell's ON series switches are best-in-class, programmable open networking platforms built on deployment-proven Broadcom StrataXGS® switching ASICs to provide high-capacity, standards-based networking. The following are the Dell VirtualWire part numbers for software and services:

Dell SKU Number	Product Description	Dell SKU Number	Product Description
AA657271	Pluribus VirtualWire fabric license for 100G switch Includes VirtualWire and fabric One per switch Perpetual license; support not included	AA657277	Pluribus VirtualWire fabric 100G license Five-year software support per switch
AA657272	Pluribus VirtualWire fabric license for 10G switch Includes VirtualWire and fabric One per switch Perpetual license; support not included	AA657278	Pluribus VirtualWire fabric 10G license One-year software support per switch
AA657273	Pluribus VirtualWire fabric license for 25G switch Includes VirtualWire and fabric One per switch Perpetual license; support not included	AA657279	Pluribus VirtualWire fabric 10G license Three-year software support per switch
AA657274	Pluribus VirtualWire fabric license for 40G switch Includes VirtualWire and fabric One per switch Perpetual license; support not included	AA657280	Pluribus VirtualWire fabric 10G license Five-year software support per switch
AA657275	Pluribus VirtualWire fabric 100G license One-year software support per switch	AA657281	Pluribus VirtualWire fabric 25G license One-year software support per switch
AA657276	Pluribus VirtualWire fabric 100G license Three-year software support per switch	AA657282	Pluribus VirtualWire fabric 25G license Three-year software support per switch
		AA657283	Pluribus VirtualWire fabric 25G license Five-year software support per switch
		AA657284	Pluribus VirtualWire fabric 40G license One-year software support per switch
		AA657285	Pluribus VirtualWire fabric 40G license Three-year software support per switch
		AA657286	Pluribus VirtualWire fabric 40G license Five-year software support per switch

Specifications

For a complete list of features and specifications, please see the Netvisor ONE and relevant Pluribus Freedom™ 9000 Series switch data sheets. In addition to the base capabilities provided by the Netvisor ONE OS and included fabric license, VirtualWire capabilities include:

- One:many TAP/mirror aggregation
- Many:many TAP/mirror aggregation
- Many:one TAP/mirror aggregation
- Bypass switch for inline tool deployment
- Bypass switch heartbeat packet to detect inline tool failure
- Layer 2/3/4 traffic filtering
- Layer 1 cut-through mode
- Error pass-through
- RFC 3176 sFlow
- nvFlow for TCP connection visibility
- IPFIX export for nvFlow