

Pluribus Open Netvisor® Linux Fabric Extender Edition

Operating System for White Box OCP Switches

Affordable, Powerful Network Switching to Simplify your Environment

Traditional data center networking is complex to manage and troubleshoot: too many boxes, too many protocols with too many approaches. When it comes to application performance monitoring and telemetry, traditional solutions are based on expensive taps and packet brokers making it cost prohibitive and impractical for most organization to deploy monitoring solutions to achieve 100% East-West visibility inside the fabric.

Networking infrastructure is lacking when compared to storage and compute from an agility, control and visibility standpoint. Depending on your role, you are wanting something more out of your network - but not just for your network's sake. Rather, you want networking to be a key enabler for better IT. You want it to be easier, you want more out of it, and you don't want it to merely be a cost center.

At the same time, you are looking for solutions that don't require "rip and replace" of your existing network infrastructure and don't promote vendor lock-in while offering best-in-class features and performance

Pluribus Open Netvisor® Linux (ONVL)

To address the needs of a large virtualized workloads presented by today's modern applications, Pluribus has developed Open Netvisor® Linux (ONVL) to run on white box Open Compute Project (OCP) switches. Without the need for an external controller, OCP Switches powered by Pluribus ONVL federate into a single fabric, offering unprecedented insight, agility and security. Together, Pluribus ONVL and OCP white box switches not only work together to enhance the operation and deployment of your existing networking infrastructure, but meet or exceed the performance of all other switches available on the market.

Pluribus Networks advances software-defined networking (SDN) through Open Netvisor Linux (ONVL), the industry's most programmable, open source-based network operating system. ONVL is based upon the Pluribus Virtualization-Centric Fabric™ (VCF™) architecture, a proven approach to understanding flow, rapidly responding to business needs and securing your data.

Pluribus ONVL combines the benefits of Linux with a distributed controller fabric. A traditional CLI (Command Line Interface) is

paired with fabric-wide programmability (C, Java, RESTful API), OpenStack integration and DevOps tools (e.g. Ansible and Puppet) for agility and automation via a single point of management. Granular visibility and control is through a fabric-wide directory that contains endpoint information (vPorts) as well as allows for granular flow filtering and control (vFlow).

White Box OCP Switches, based on the latest generation chipsets from Broadcom, are designed to implement extremely cost effective, non-blocking, pay-as-you-grow leaf-spine architecture with predictable low-latency, thus dramatically improving workload management and network agility.

In combination with White Box Open Compute Project switches portfolio, Pluribus ONVL provides best-in-class switching economics. The deployment flexibility is guaranteed by Pluribus ONVL full L2/L3 stack providing complete interoperability with legacy networking infrastructure, allowing for easy insertion into brownfield deployments.

Benefits

- Faster, more secure application roll-out to reap financial benefits more quickly.
- Unparalleled visibility of network demand, data usage for capacity planning and application performance monitoring.
- Best in-class hardware economics with Open Networking hardware platforms.
- Lower CapEx by avoiding a separate monitoring network.
- Enhance network security and auditing by being able to monitor and control for any application flow.

Advanced Features

- Feature-rich L2/L3 and multicast enable flexible deployment options.
- Switches running ONVL can join into a distributed controller fabric and be managed as a single switch via CLI and/or API.
- Support for Ansible and Puppet automation:
 - Zero Touch Provisioning
 - Zero Touch L2/L3 fabric provisioning
- Integrated tap-less visibility for data capture and post.
- vPort table, a fabric-wide endpoint "directory" accessible from any node for comprehensive endpoint and VM lifecycle tracking across the fabric.
- vFlow for service insertion and stateless security policies.

Enterprise Networking - Detailed Functionality

Functionality	Description
Operating System Install & Upgrade	ONIE boot using DHCP & USB Offline Software Upgrade Online Software Upgrade
Extensibility	CLI RESTful, C, and Java API API and CLI install on any Linux server for centralized management and automation Ansible & Puppet automation
Layer 3 Features	Quagga IPv4 routing suite including OSPFv2, BGPv4, and RIP Equal-Cost Multi-Path (ECMP) VRRP Bidirectional Forwarding Detection (BFD) for BGPv4 Static Routes Loopback Interface DHCP Relay Quagga Direct Access via Shell
Layer 2 Features	Bridge management with RSTP (IEEE 802.1w) and RSTP PortFast MSTP (IEEE 802.1s) STP Cluster Awareness BPDU Guard, BPDU Filter VLANs, VLAN Trunks (IEEE 802.1q), LACP (IEEE 802.3ad) LLDP (IEEE 802.1ab) Link Aggregation Group (LAG) Multi-chassis LAG (vLAG) Storm control for Multicast and Broadcast IGMPv2/v3 snooping MLD Snooping Jumbo Frames
Management	Linux Management Tools – Perl, Python, etc SSHv2 TLS 1.2 Banner & MOTD IPv6 for Management
Monitoring & Troubleshooting	Traditional monitoring with SNMP v1, v2, and v3 Network specific MIB, ACL-based counters Port Mirroring Port Mirroring to Remote Host (PMRH) Encapsulated Port Mirroring to Remote Host (EPMRH) Troubleshooting with syslog, hardware inventory, and log files sFlow – based on sFlow standard (data sampling) Traceroute
Security Features	MAC Security (vFlow based) Control Plane Traffic Protection (CPTP) Flow level security (vFlow ACL with drop, log, mirror actions) L2 and L3 ACL TACACS+ MD5 (BGPv4)
QoS Features	Layer 2 Class of Service (CoS) (IEEE 802.1p) Differentiated Services Code Point (DSCP) DSCP to CoS mapping CoS to DSCP Mapping QoS Strict Priority Queue Egress per port rate limiting Cos-toToS/ToS-to-CoS Mapping

Fabric Networking - Detailed Functionality

Functionality	Description
Fabric Automation	Distributed Controller Fabric with single CLI/API for automation and operational simplification Fabric interoperability with third party Spine and/or Leaf Networks Fabric control plane over In-band and Out-of-band management network Fabric Over Layer 3 Zero Touch Replacement (ZTR) for nodes in an HA cluster Automatic Port Channeling (trunking) VXLAN VXLAN vTEP HA VXLAN DCI Virtual Link Extension VXLAN Egress Load Balancing
Fabric Visibility	vPort - End-point/VM level visibility VMware vCenter integration with vPort for VM/host visibility Connection flow visibility IPFIX Connection Export sFlow VXLAN Connection Visibility Fabric-wide network traffic telemetry (packets, congestion, errors, etc.) FlowTrace to trace the path of any flow across the fabric

ONVL Scalability – Tested & Verified

Performance	Edge-Core AS5712-54X	Edge-Core AS5812-54T	Edge-Core AS6712-32X
MAC Addresses	24,000	24,000	16,000
IPv4 Routes	8,000	8,000	8,000
RSTP Instances	256	256	256
VLANs	256	256	256
VLANs (with MST)	256	256	256
MST Instances	20	20	20
Link Aggregation Group (LAG)	4	4	10
Member ports per LAG	16	2	2
Multi-chassis LAG (vLAG)	4	2	8
Member ports per vLAG	32	4	4
IGMP Groups	1,000	1,000	1,000
MLD Groups	1,000	1,000	1,000
Traffic Mirroring	2 ports	2 ports	2 ports
Jumbo Frames	9612 bytes	9612 bytes	9612 bytes
ACL Entries	2000	2000	2000
vNIC (SVI)	64	64	64
VRRP	64	64	64
ECMP	6-way	6-way	6-way
IPv4 host table size	16,000	16,000	16,000
QoS Queues	8	8	8
Number of Nodes in a Fabric	22	22	22
Number of Clusters in a Fabric	11	11	11
Total vFlows in a Fabric	2,000	2,000	2,000
Open TCP Connections by ONVL	16,000	16,000	16,000
Total TCP Connections by ONVL	64,000	64,000	64,000
TCP Connection Track Rate	5,000/sec	5,000/sec	5,000/sec
Total vPorts in a Fabric	16,000	16,000	16,000
vPorts Learning Rate	5,000/sec	5,000/sec	5,000/sec

ONVL Supported IEEE standards

IEEE Standards	Description
IEEE 802.1ab	LLDP
IEEE 802.1Qbb	Priority-based Flow Control
IEEE 802.1D	Spanning Tree Protocol
IEEE 802.3ad	Link Aggregation Control Protocol (LACP)
IEEE 802.3ae	10 Gigabit Ethernet
IEEE 802.3ba	40 Gigabit Ethernet
IEEE 802.1p	CoS Prioritization
IEEE 802.1W	Rapid Spanning Tree Protocol
IEEE 802.1Q	VLAN Tagging
IEEE 802.1s	MSTP
IEEE 802.3z	Gigabit Ethernet

ONVL Supported RFCs

Supported RFCs	Description
RFC 768	User Datagram Protocol (UDP)
RFC 791	IP
RFC 792	Internet Control Message Protocol (ICMP)
RFC 793	TCP
RFC 826	ARP
RFC 854	Telnet
RFC 959	FTP
RFC 1305	Network Time Protocol (NTP) Version 3
RFC 1519	Classless Interdomain Routing (CIDR)
RFC 1591	Domain Name System (DNS) Client
RFC 1724	RIPv2 MIB Extension
RFC 1812	IPv4 Routers
RFC 2236	Internet Group Management Protocol
RFC 2328	OSPF Version 2
RFC 2453	RIP Version 2
RFC 2519	A Framework for Inter-Domain Route Aggregation
RFC 3101	OSPF Not-So-Stubby-Area (NSSA) Option
RFC 3137	OSPF Stub Router Advertisement
RFC 3376	Internet Group Management Protocol
RFC 3509	Alternative Implementations of OSPF Area Border Routers
RFC 4271	BGPv4
RFC 4456	BGP Route Reflection
RFC 4486	Subcodes for BGP Cease Notification Message
RFC 4893	BGP Support For Four-Octet AS Number Space
RFC 7011	IP Flow Information Export (IPFIX)

ONVL supported MIBs

Supported MIBs	Description
RFC 1155	SMI
RFC 1157	SNMPv1
RFC 1212, 1213, 1215	MIB-II, Ethernet-like MIB and TRAPs
RFC 1901	Introduction to Community-based SNMPv2
RFC 2011	SNMPv2 for Internet Protocol using SMIv2
RFC 2012	SNMPv2 for Transmission Control Protocol using SMIv2
RFC 2013	SNMPv2 for User Datagram Protocol using SMIv2
RFC 2233	The Interfaces Group MIB using SMIv2
RFC 2287	System Application Packages MIB
RFC 2570	Introduction to Version 3 of the Internet standard Network Management Framework
RFC 2571	An Architecture For Describing SNMP Management Frame works (read-only access)
RFC 2572	Message Processing and Dispatching for the SNMP (read only access)
RFC 2576	Coexistence between SNMP v1, v2, and v3
RFC 2578	SNMP Structure of Management Information MIB
RFC 2579	SNMP Textual Conventions for SMIv2
RFC 2580	Conformance Statements for SMIv2
RFC 2665	Ethernet like Interface MIB

Hardware Platforms Supported:

- Edge-Core AS5712-54X 10GbE switch
- Edge-Core AS5812-54T 10GbE switch
- Edge-Core AS6712-32X 40GbE switch

Part Number	Description
ONVL-10G-PLEX-LIC	Pluribus Open Netvisor Linux Fabric Extender Perpetual License for 10 Gig switches - requires ONVL-10G-PLEX-SVC-XYR license
SVC-ONVL-10G-PLEX-1YR	Pluribus 24/7 1 Year Support for ONVL-10G-PLEX-LIC
SVC-ONVL-10G-PLEX-3YR	Pluribus 24/7 3 Year Support for ONVL-10G-PLEX-LIC
ONVL-40G-PLEX-LIC	Pluribus Open Netvisor Linux Fabric Extender Perpetual License for 40 Gig switches - requires ONVL-40G-PLEX-SVC-XYR license
SVC-ONVL-40G-PLEX-1YR	Pluribus 24/7 1 Year Support for ONVL-40G-PLEX-LIC
SVC-ONVL-40G-PLEX-3YR	Pluribus 24/7 3 Year Support for ONVL-40G-PLEX-LIC

About Pluribus Networks

Pluribus Networks provides fabric networking and analytics solutions that transform existing network infrastructures from being rigid, costly and complex, into a foundation for modern digital-centric businesses. Our Virtualization-Centric Fabric (VCF™) provides unprecedented insight, agility and security to create the industry's only combined SDN and Network Performance Monitoring (NPM) offering.

Learn more at www.pluribusnetworks.com and [@pluribusnet](https://twitter.com/pluribusnet).

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