Pluribus UNUM Platform
Unified Management, Automation and Analytics for the Adaptive Cloud Fabric

**Highlights**

- Advanced management platform that enhances the intrinsic automation of the Adaptive Cloud Fabric
- Simplifies provisioning and operating a complex network, or groups of networks
- Workflow automation with pre-built templates for zero-touch provisioning
- Dynamic topology mapping with multi-vendor network visualization
- Advanced diagnostics and analytics
- Intuitive and consistent user interface for seamless navigation across management and analysis modules
- Optional Insight Analytics supports extensive performance management and analytics

**New!**

- Fabric Dashboard – view fabric health and utilization at a glance
- Virtual Link Extension Wizard – create port-to-port VXLAN tunnels across switch clusters
- Zero-Touch Switch Provisioning – automatically provision Netvisor OS on bare metal switches, with or without internet connectivity
- vPort Analytics Dashboard – graphically view VMs, hosts and network devices connected to your fabric

Pluribus UNUM™ is a unified management platform that integrates a comprehensive range of advanced management capabilities. It enhances the intrinsic automation of the Adaptive Cloud Fabric™ architecture with workflow automation, topology visualization, network diagnostics and integrated performance analytics. Pluribus UNUM liberates network operators from the complexity of provisioning and operating a complex network, or groups of networks, by automating the complete network lifecycle from implementation to operation and optimization, enabling intent-based network operations with vastly reduced deployment times. It simplifies management interactions, eliminates the command line interface (CLI) learning curve and allows a broader range of users to operate the network while minimizing the potential for errors by minimizing direct human interactions with individual devices.

Pluribus UNUM is an agile, multi-functional web management portal that front-ends the distributed peer-to-peer Adaptive Cloud Fabric architecture. It combines an elastic big data database and intelligent analytics engine with an intuitive and consistent user interface that allows seamless navigation across fully integrated management and analysis modules. The UNUM platform combines deep intelligence with powerful real-time and historical visualization to provide a unified toolset to provision, manage, troubleshoot and proactively manage the fabric environment. Key capabilities include:

- Device and fabric management and provisioning
- Workflow automation with zero-touch provisioning
- Dynamic multi-vendor topology mapping
- Real-time network-wide monitoring with diagnostics and advanced analytics

The UNUM architecture consists of a multi-function web portal with a big data database and intelligent analytics engine that unifies automation, management and analytics.
Unified Big Data Engine

The Pluribus UNUM architecture is built on a fast, scalable and elastic big data engine capable of ingesting, aggregating and analyzing large volumes of diverse network diagnostic and performance data from across distributed network deployments in real time at scale. Collected data is analyzed and indexed as it is ingested, and UNUM maintains historical data including network state, device diagnostic data and network performance-related metadata. Common data is shared across UNUM modules to enable contextual cross-linkage with multi-dimensional analysis workflows. The real-time analytics engine generates alarms and delivers proactive insights as well as queried data on demand to support specific diagnostic and analytics activities. Granular performance management can also be performed with the optional Insight Analytics module activated.

Automation Speeds Time to Deployment

Pluribus UNUM permits operators to automate common deployment and configuration tasks from a single visual touch-point so one click can equal 1000 actions. The combination of fabric and workflow automation dramatically reduces operational complexity and significantly speeds deployments for large-scale networks by up to 95 percent faster over box-by-box manual configurations. UNUM leverages the fabric APIs to distribute configurations across the topology, enabling rapid execution with accuracy and consistency.

Workflow Automation

Pluribus UNUM workflow automation simplifies the process of building and provisioning next-generation software-defined networks. Pre-built customizable playbooks leverage deployment-proven best practice designs, allowing network operators to quickly define, provision and deploy network configurations for an entire fabric topology at scale in minutes. This significantly speeds time to deployment and helps to prevent inconsistencies and misconfigurations.

UNUM workflow automation enables precise zero-touch provisioning for any sized network – scaling from single-switch and two-switch clusters to more advanced leaf and spine topologies. The UNUM platform automatically discovers eligible devices and allows the network operator to select which devices to include in the fabric configuration. Once the devices are selected, UNUM automates the topology build-out in minutes with only a few clicks without touching a single device.

15 pre-defined automated playbooks are available for multi-vendor brownfield environments where Netvisor® ONE-powered switches are only deployed in either a leaf or spine placement, or greenfield environments where the Adaptive Cloud Fabric will be used in both the leaf and spine placements.

Playbooks include automated designs for Layer 2 or Layer 3 implementations, such as BGP and OSPF, as well as various high-availability options. Operators can quickly modify the pre-built playbooks to meet unique operational needs and can create customized playbooks to automate and consistently replicate configurations.

Fabric Commit Process

To help eliminate the risk of inconsistent network configurations, Pluribus UNUM leverages the advanced transactional model of the Adaptive Cloud Fabric to validate that all provisioning and policy has been consistently implemented across every member network device. As UNUM begins to implement the desired configuration, the Netvisor ONE OS validates that all targeted switch devices have the capacity to physically support the requested configuration. To assure operational consistency, Netvisor ONE OS verifies that all devices have received the configuration and simultaneously executes the configuration across all devices.

Network Diagnostics and Fault Management

The UNUM platform continuously monitors the fabric and collects extensive physical link layer and device-level data from Netvisor embedded telemetry. Metrics are stored in the common database and leveraged across the UNUM platform to proactively identify emerging anomalies that can affect network availability and performance.

Real-time and historical diagnostic views enable contextual analysis, with event-driven insights into network and device health enabling operators to rapidly identify, troubleshoot and resolve network fault, availability and performance issues. Device statistics provide a picture of device health with CPU, memory and table utilization statistics, and link-level metrics identify congestion, traffic errors, interface flapping, and packet drops. Flexible filtering allows operators to fine-tune an investigation to focus on specific time periods, devices or activities to speed root cause isolation. Historical diagnostic data is maintained for a rolling seven-day window, allowing the network operator to analyze previous performance levels with five-second granularity.

Flexible Alerting

The optional alerting module enables flexible, user-defined alerting notifications to quickly identify emerging operational issues based upon network status changes, error state or individual device issues. The UNUM big data engine continuously monitors key performance indicators (KPI) to identify anomalies and generates real-time alert notifications when measured data crosses specific thresholds. Operators can leverage predefined KPIs or build customize alerting for user-definable KPI triggers and thresholds.
Real-time alert notifications can be delivered to any number of people or defined groups. Different classes of alerts can be targeted to specific IT staff based upon a specific incident type or affected portion of the network. Alerting can be delivered via email; through popular collaboration platforms, such as Slack; through third-party IT Service Management platforms, such as ServiceNow; or through IT alerting platforms such as xMatters using Webhooks APIs. UNUM alert notifications can contain a unique link with one-click access to alert detail and the analysis workflow, permitting operators to quickly drill down for rapid triage, targeted troubleshooting and remediation.

**Real-Time Topology Visualization**

Pluribus UNUM provides an interactive live network topology map to visualize an Adaptive Cloud Fabric network. UNUM automatically discovers all connected devices and builds a dynamic view of the network topology, including compatible adjacent third-party networked devices and end-points that support the Link Layer Discovery Protocol (LLDP). Netvisor vPort intelligence allows the visualization of servers and services correlated to end-points.

The topology view delivers an accurate representation of the fabric topology, with real-time traffic and state information overlaid on the topology. A single instance of Pluribus UNUM can seamlessly scale to visualize very large distributed fabrics and multiple interconnected fabrics in a single unified topology view.

**Device Auto Discovery**

Leveraging the automated intelligence of the Adaptive Cloud Fabric, UNUM performs autonomous multi-level network discovery to scan the network and auto-detect changes to network topology and state as devices or end-points are moved, added or removed. The discovery process is an automated background task that is non-disruptive to network operations and does not create an unnecessary load on the network. The topology view is automatically updated in real time, notifications are indicated on the live topology dashboard and alerts can be generated based upon user-defined criteria.

**Interactive Real-time Visualization**

The interactive topology map provides a real-time holistic view of the active network topology and is an ideal primary dashboard for managing network operations. Operators easily and quickly create customized physical network topology views for a specific fabric, or multiple fabrics, with simple drag-and-click operation to meet diverse operational needs.

The topology dashboard provides a comprehensive at-a-glance view of the current state and health of network operations. Granular flow-on-flow traffic path visualization superimposes traffic flows across the topology to expose traffic volume and applications traversing the network.
Unified cross-platform workflows speed analysis and simplify troubleshooting, allowing operators to quickly isolate flows between any two end-points and drill down to launch debugging tools or Insight Analytics for deeper analysis and troubleshooting.

Device-level diagnostics and configuration updates can also be initiated from the interactive topology view with a single click from any connected Netvisor device icon. Operators can view a device health snapshot or health over time for metrics such as CPU, memory and table utilization, link layer utilization and device state.

End-Point Intelligence
UNUM leverages Netvisor ONE OS vPort intelligence to identify fabric-connected end-points. Operators can click and view all active end-points connected to each switch directly from the network topology dashboard. When the Insight Analytics module is activated, operators can drill down to view real-time and historical end-point performance metrics for an entire switch, a specific switch port or a specific end-point.

Latest Features*
The latest iteration of Pluribus UNUM incorporates several new features:

- **Fabric Dashboard** – The new fabric dashboard feature enables network administrators and engineers to quickly view node health, alarms and global fabric resources. Additional widgets identify top 10 interfaces by traffic, interface errors and a variety of hardware utilization data points such as IPv4 routes, host routes, vFlow and MAC tables.

- **Virtual Link Extension Wizard** – Now included is a wizard for creating virtual links over VXLAN tunnels for cross-cluster point-to-point connectivity. This feature is only for fabrics built with UNUM 5.0 and later.

- **Zero-Touch Open Network Install Environment (ONIE) switch provisioning** – A new, streamlined process allows administrators to automatically provision Netvisor OS onto bare metal, either via an internet connection or by downloading the appropriate ONIE installer and license key files.

- **vPort Analytics Dashboard** – Display graphical summaries of fabric end-points by state and type, as well as widgets displaying top 10 switches, VLANs and VXLANs by active end-points.

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*The UNUM Fabric Dashboard*
Insight Analytics

Insight Analytics is a powerful integrated analytics module within the Pluribus UNUM platform that provides the IT operations team with proactive insight into network and application performance to assure peak operating performance and meet user experience expectations. Insight Analytics leverages embedded Netvisor monitoring telemetry, sFlow and packet flow data sources to enable pervasive visibility across the network – eliminating the need for expensive probes or complex monitoring overlay networks.

Integrated Netvisor telemetry monitors every TCP connection, including traffic within a VXLAN tunnel, across the entire fabric at the speed of the network to track east/west and north/south traffic flows, and virtualized workloads to expose important network and application performance characteristics.

Insight Analytics leverages the collected network intelligence from the UNUM database to build knowledge of the network operating environment and enables contextual drilldown from dashboards and analysis views. The UNUM analytics engine constantly monitors and analyzes all traffic and transactions to identify network and application performance characteristics, allowing IT operations to quickly identify performance trends and interrelationships in real time.

User-defined alert notifications can be generated when anomalies are discovered, such as volumetric changes, performance deviations or threshold-based violations, enabling rapid triage to precisely pinpoint root cause and speed resolution. Insight Analytics provides extensive operational intelligence that supports many performance management use cases, allowing operators to quickly pinpoint performance issues, accelerate troubleshooting, improve operational intelligence, identify security risks and speed remediation.

Network Intelligence in a White Box Environment

Insight Analytics tracks network and end-point service state and performance across the Adaptive Cloud Fabric to understand how users and services are consuming the infrastructure, and conversely, how the infrastructure is supporting users and services.

The intelligence garnered from across the fabric enables operators to analyze and compare actual versus desired performance and implement corrective actions such as changes to policy, rerouting traffic to implement on-demand changes to the infrastructure. Since all visualization is done within the same platform, changes can be implemented from a single pane of glass, simplifying operations and speeding change implementation.
UNUM Insight Analytics (IA) provides a suite of tools designed to analyze data with search capabilities on information collected from UNUM collectors (a designated switch UNUM uses to collect fabric information), packet capture analytics and monitoring capabilities.

**Flow Analytics**

IA - Flow Analytics collects fabric and network flow data over time, and graphically displays the information via a variety of tools.

- The **Connections** dashboard allows network admins to measure, sort and analyze TCP connection states (SYN, SYN-ACK, EST, FIN, etc.) by service, client, domains and many other options over time.
- The **Traffic** dashboard breaks flows down into busiest services, servers, domains and switches.

- The **Dynamic Flow Mapping** (DFM) dashboard illustrates the total connections based on server, state and end-points.
- **Custom Tagging** - customers can choose up to 100 different options to tag IP addresses, VLANs, MAC addresses and switch ports with metadata/contextual tags, and then aggregate or filter their flows based on their custom tags.
- **Report** dashboard – displays a standardized view of high-level flow statistics over the past seven days.
- **VMware vSphere integration** - The Netvisor vCenter Connection Service provides UNUM Insight Analytics with virtual machine and virtual network configuration data, allowing any recorded communication to be identified and indexed. This enables insight into the virtualization layer.

- **Flow Analytics** collects fabric and network flow data over time, and graphically displays the information via a variety of tools.

**Switch Analytics**

UNUM IA Switch Analytics enables port telemetry and device diagnostics via a selection of searchable options such as fabric node, switch port, vport (virtual port) and state, including a dashboard of all ports in the fabric.

- **Switch Analytics Notifications** allow users to sort and analyze syslog and SNMP data, as well as schedule reports and configure alerts.

- The **Schedule Reports module** provides a method of creating customized reports, which are then sent by email to the user. Schedule Reports notifies the user of useful monitoring information, such as the information in the standardized view reporting high-level flow statistics over the past seven days. Use of the scheduler is an option that requires an additional license.
- **The Alerts module** provides a method of creating alerts notifying the user of critical monitored events. Alert Details, Alert Conditions, Schedule Details and Alert Action parameters can all be adjusted depending on the monitoring and alerting requirements. Use of the Alerts module is an option that requires an additional license.
Potential use cases for Pluribus Insight Analytics Alerts and programmable tagging include the detection of unauthorized access attempts, DDOS attacks or fabric node failure.

Pluribus UNUM Insight Analytics is deployed in one of two scenarios. The first is with Pluribus Netvisor switches in-line to maximize the capture of switch telemetry for analysis, providing a comprehensive view of the fabric, including syslog and SNMP. Netvisor Flow, or nvFlow, is the technology used by Netvisor ONE to collect metadata and telemetry for the Insight Analytics database.

**Search**

UNUM Insight Analytics utilizes a powerful, distributed engine to store, filter, correlate and visualize vast amounts of data in real time, while isolating and filtering specific flows from millions, all in a fraction of a second.

Features of the search engine include:

- Powerful query syntax to filter flow metadata information based on: field-based exact matches, regular expressions, ranges, Boolean operators.
- Selected views from the Connection Dashboard.
- Aggregated flow statistics: duration, latency, total bytes per connection.
- Extensive “time machine” functionality with absolute or relative year-month-day-hour-minute-second granularity.
- IP geolocation for client and servers.
- Detailed flow table consisting of over 30 metadata fields associated with each flow.

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**Deployment Options**

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The second scenario is when a customer has an already-deployed network and would like to use IA as a collection and analysis tool for SNMP traps and syslog data.

Insight Analytics is available in two versions depending on the monitoring capacity required. The standard version supports up to 100 million flows, and the high-capacity version supports up to 2 billion flows.

**Support and Professional Services**

Pluribus Networks offers a wide range of advanced services spanning the entire network lifecycle to protect investments and help accelerate success from initial deployment to ongoing optimization. Multiple extended support options are available, including on-demand global support, on-site support, advanced hardware replacements and customized technical training.

Professional implementation services can help design, deploy and optimize the operating environment tailored to your organization’s specific requirements. 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.

**Pluribus UNUM and Netvisor OS Compatibility**

Pluribus UNUM supports the equivalent release of Netvisor OS, plus the prior version. For example, UNUM 3.1.x supports NVOS versions 3.1.x and 3.0.x. For other combinations, please contact Pluribus Networks customer service before deploying.

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**Ordering Information**

Pluribus UNUM software can be deployed as an OVA/virtual appliance on customer-provided hardware or can be delivered pre-configured on a server appliance for turnkey deployment. Ordering information below for Pluribus UNUM, Insight Analytics, server appliances and add-on reports/alerts. Support ordered separately. Subscription options available.

**Pluribus UNUM Software**


**Insight Analytics Module License**

Insight Analytics is optionally licensed in addition to the Pluribus UNUM software.

- **IA-MOD-LIC** — Pluribus Insight Analytics module license. Supports up to 100 million flows and first 10 monitored Netvisor devices.
- **IA-HC-MOD-LIC** — Pluribus Insight Analytics High-Capacity (HC) module license. Supports 100 million+ flows and first 10 monitored Netvisor devices. Cannot be deployed on customer hardware – HC server appliance required.

**Pluribus UNUM Server Appliance**

- **AP-BASE-HW** — Standard hardware server appliance for UNUM software or UNUM + Insight Analytics, supporting up to 100M flows. Hardware only – requires software licenses.
- **AP-HC-HW** — HC hardware server appliance for UNUM + Insight Analytics, supporting 100M+ flows. Hardware only – requires software licenses.

**Pluribus UNUM Reporting and Alerts**

Add-on reporting and alerts are optionally licensed in addition to the Pluribus UNUM software.

- **UNUM-RPRT-LIC** — Pluribus UNUM add-on reporting license.
- **UNUM-ALRT-LIC** — Pluribus UNUM add-on alert license.

*Please Note* - early field trial (EFT) features are not fully tested and are annotated in the Pluribus UNUM release notes. Before implementing an EFT feature in production, please consult your local partner or Pluribus Networks account team.
Pluribus UNUM Virtual Appliance Operational Requirements

The Pluribus UNUM application is deployed as an OVA on customer-provided hardware. The installation of Pluribus UNUM and Insight Analytics should be on a dedicated system with the following requirements for each VM:

- **Hardware requirements**: Eight (8) vCPUs, 64 GB RAM, 300 GB HD
- **Hypervisor requirements**: VMware ESXi version 6.5 or 6.7. Versions earlier than 6.x have not been tested.
- **Client requirements**: Google Chrome (Version 44+), Mozilla Firefox (version 39+)

Pluribus Hardware Server Appliance Specifications

**Standard Server Appliance Hardware Specifications**
The UNUM standard hardware appliance is a 1RU server with UNUM pre-installed. For complete details, refer to the Pluribus UNUM data sheet. Server specifications are:

- Single server with 4 CPU cores (8 vCPU), 128 GB RAM, 480 GB SSD
- Dual 1G Base-T NIC, dual 10G Base-T NIC
- iPMI 2.0 + KVM with dedicated LAN
- Dual power supplies

**High-Capacity Server Appliance Hardware Specifications**
The UNUM High-Capacity Server Appliance is optimized to support medium to large Insight Analytics deployments where higher flow volume and storage capacity are required. Requires the High-Capacity Insight Analytics software. Available only with a Pluribus-provided hardware appliance. For complete details, refer to the Pluribus UNUM data sheet.

- Quad server chassis
- Dual power supply
  - Each server provides:
    - 16 CPU cores (32 vCPU), 64 GB RAM, dual 1.2 TB SSD
    - Dual 10G Base-T NIC
    - iPMI 2.0 + KVM with Dedicated LAN

Platform Scalability

**OVA or Standard Server Appliance Scalability**

Fabric Management

- Up to 100 Netvisor ONE Devices
- Up to six Adaptive Cloud Fabrics

Insight Analytics

- Ingestion rate of up to 1,000 nvFlow or sFlow connection records per second combined
- Long-term retention of up to 100 million nvFlow and sFlow records
- 30-day rolling window (FIFO) of up to 100M nvFlow and sFlow records combined
- Seven-day rolling window (FIFO) of syslog and SNMP records

High-Capacity Server Appliance Hardware Scalability

Fabric Management

- Up to 200 Netvisor ONE Devices
- Up to 12 Adaptive Cloud Fabrics

Insight Analytics

- Ingestion rate of up to 10,000 nvFlow or sFlow connection records per second combined
- Long-term retention of up to 2.5 billion nvFlow and sFlow records
- 30-day rolling window (FIFO) of up to 3 billion nvFlow and sFlow records combined
- Seven-day rolling window (FIFO) of syslog and SNMP records

Specifications

The following are highlights of features provided by the Pluribus UNUM platform. Many automation capabilities are integrated as part of the Netvisor ONE OS and are not included in this summary.

**Operational**

- Runs in a VM as a virtual appliance
- Single node deployment
- High-performance cluster supported for analytics
- Device inventory
- Manual device discovery
- Automatic device discovery via LLDP
- Zero-touch provisioning (ZTP)
- Per-device logs of all actions taken by the portal
- Device connectivity status (up/down)
- Network provisioning - configuration
- Switch configuration management
- Change history tracking
- Device configuration validation
- View devices through network provisioning
- Filter view of network provisioning based on devices
- Topology mapping for Netvisor-enabled devices
- Third-party device topology mapping and visualization requires LLDP

**Task Management**

- Task scheduling
- Task panel identifying completed and pending tasks
- Automated task creation
- Log files for all tasks and commands issued to the fabric

**Configuration**

- Automated ongoing device configuration change management
- Automated detection and rollback of invalid configuration changes
- Network-wide rollback supported from Netvisor OS

**Telemetry Supported**

- nvFlow for real-time analytics stream from Netvisor devices
- sFlow
- SNMP
- Syslog