Solution Overview

Highlights

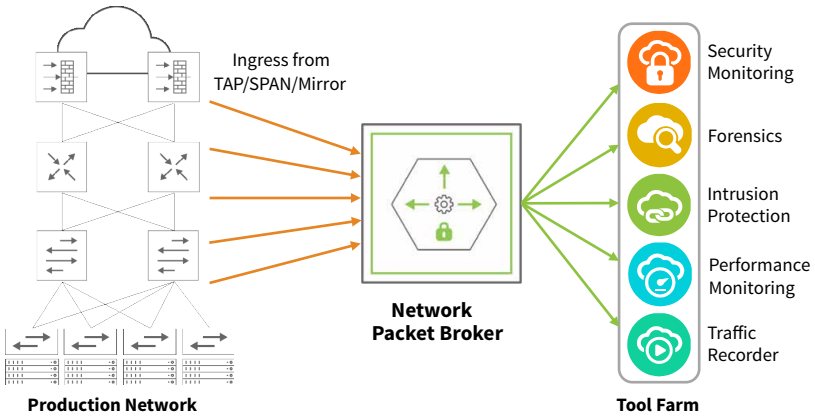
- Industry's first SDN-enabled virtualized packet broker
- Easily scale port capacity, add switches and sites to match demand and minimize operational complexity
- Simplify multi-site operations to lower opex, and enable easier tool sharing across sites to lower capex
- Ensure continuous monitoring and visibility
- Use network capacity efficiently to drive lower capex

Pluribus Network Packet Broker

Software-defined packet broker architecture for pervasive network visibility from single sites to geographically distributed data centers

Introduction

The Pluribus Network Packet Broker solution is the industry's first SDN-enabled packet broker fabric delivered as a fully virtualized service on disaggregated white box switches. This unique architecture allows for flexible deployment options, from a single packet broker switch to a scalable multi-site packet broker fabric that can be operated as a virtual chassis with a single point of management. In any deployment model, the Pluribus Network Packet Broker solution delivers highly automated, flexible, resilient and cost-effective connectivity between any test access point (TAP) or SPAN/mirror port and any tools that need traffic visibility for security and performance management.



Applications

The Pluribus Network Packet Broker solution addresses a wide range of visibility, monitoring and security applications:

- Network Operations (NetOps): network and application performance monitoring and assurance, application detection, policy and regulatory compliance
- Security Operations (SecOps): Security monitoring, firewall, intrusion detection and prevention, suspicious user and application detection

The Pluribus Network Packet Broker solution enables traffic flows to be aggregated, filtered and replicated from multiple traffic monitoring points (TAP, SPAN and mirror) to multiple tools addressing these different visibility, monitoring and security applications, with advanced traffic conditioning to optimize utilization of each tool. The solution enables visibility and sharing of tools in a single location or across distributed, multi-site networks.

Network Packet Broker Challenges

Traditional approaches to creating network packet broker (NPB) fabrics can have several challenges:

- **Hardware cost:** proprietary solutions require high-cost switching hardware
- **Operations complexity:** manual, box-by-box configuration is required to create the fabric and manage connections
- **Scaling limitations:** some NPB solutions are limited to a small number of ports in a single switch chassis or a small number of interconnected switches
- **Geographic limitations:** many NPB architectures are hard or impossible to extend across geographically separated sites for multi-site visibility and tool sharing

These challenges create complexity and increase the total cost of operations while limiting agility and flexibility. The Pluribus Network Packet Broker solution addresses all of these challenges.

Pluribus Network Packet Broker Solution

The Pluribus Network Packet Broker (NPB) is the industry's most flexible and scalable solution for network and security monitoring and visibility. The scale-out fabric architecture grows seamlessly from simple single-switch applications to multi-site, geographically distributed monitoring and visibility fabrics while preserving a virtual chassis operational model with a single point of management.

The NPB solution can be deployed in flexible topologies for high-scale, highly flexible traffic aggregation, filtering, replication and advanced packet processing. And because Pluribus NPB solutions are built on a foundation of the Pluribus Adaptive Cloud Fabric and open networking Ethernet switches, they are inherently high-performance, highly automated, resilient and cost-effective.

The Pluribus Network Packet Broker solution provides a comprehensive feature set for a wide range of use cases:

- High-scale, non-blocking, wire-speed filtering, replication, conditioning and grooming
- Support for diverse hardware platforms with varying port capacities and interface speeds, enabling high- to low-speed traffic delivery
- Any feature, any service, any port: Configure any port as ingress or egress
- Any TAP, any tool, any location: Flexible aggregation and replication, 1-to-1, 1-to-many, many-to-1, many-to-many
- Granular multi-stage filtering on ingress and egress
- Pluribus UNUM GUI-based management and virtual chassis operations model to simplify and automate packet broker policy configuration
- REST API for integration with any external orchestration system

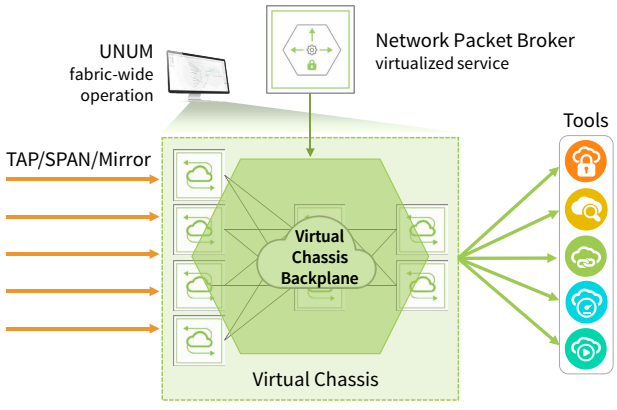
The solution also offers several advantages and benefits for network and security operations teams when compared to many traditional packet brokers:

Pluribus Network Packet Broker Advantages	Benefits
✓ Fully modular, scale-out architecture with a virtual chassis operations model and no per port licensing	Easily scale port capacity, add switches and sites to match demand and minimize operational complexity
✓ End to end visibility and management of geographically distributed, multi-site packet broker fabric, including integrated telemetry	Simplify multi-site operations to lower opex, and enable easier tool sharing across sites to lower capex
✓ High resilience and sub-second failover on link or node failures	Ensure continuous monitoring and visibility
✓ Automated load balancing and path optimization	Use network capacity efficiently to drive lower capex

Solution Architecture

The Pluribus Network Packet Broker solution builds on the Adaptive Cloud Fabric distributed, controllerless SDN architecture. The Adaptive Cloud Fabric creates a unified operational domain across one or more physical switches in any topology, allowing the monitoring network to behave like a distributed virtual chassis. Network Packet Broker functionality (such as aggregation, filtering and replication) is implemented as a fully virtualized and automated service of the fabric, which enables simplified deployment and scaling from a single switch to thousands of ports across multiple geographically distributed sites.

Built-in automation allows configuration of connections and filtering rules across a large distributed fabric as simply as configuring a single switch. For example, an administrator can create a single global declarative policy to establish a common filtering rule from a group of ports aggregating TAP traffic towards a group of destination ports connected to tools. The Adaptive Cloud Fabric then automates programming of the policy across those ports. The fabric also fully automates path computation, traffic replication and load balancing across the fabric, and dynamic failover and path re-computation in the event of a network change.



Deployment Models

The Pluribus Network Packet Broker solution enables more flexible deployment options than traditional packet brokers and efficient scaling from simple, single-switch deployments to large-scale, geographically distributed multi-site fabrics.

Out-of-band Deployment Models

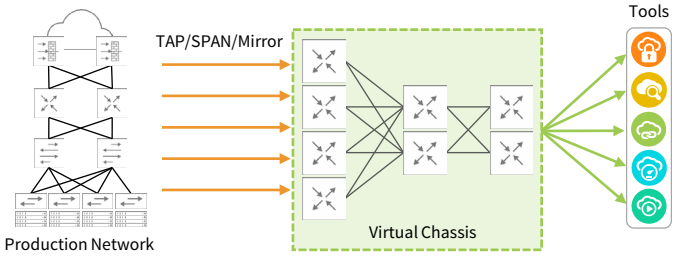
Like traditional network packet brokers, the Pluribus NPB can be deployed out-of-band, meaning that the packet broker fabric runs on network hardware that is separate from the production network being monitored.

Single Switch

Single Switch Deployment, from 12 ports to 128 x 10G/25G

In a single-switch deployment, any port can be configured as an ingress or egress port. A wide variety of open network switches may be used, providing flexibility to match the number of ports and traffic capacity required at any given site. If port or capacity requirements grow beyond the initial switch deployment, additional switches can be added to create a fabric, as outlined below, while maintaining the same simplicity of operations.

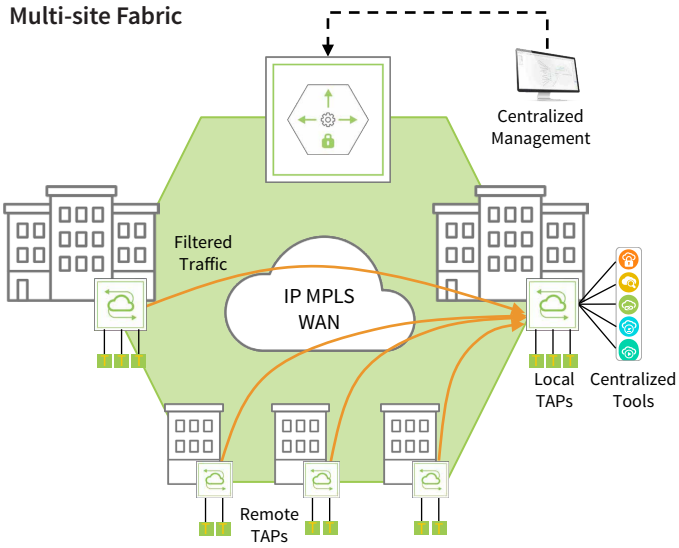
Single-site Fabric



Single-site Fabric with virtual chassis operations, scalable to thousands of ports

For deployments that require higher port capacity or diversity of port speeds and media, multiple switches may be required. In this case, all switches are connected together as a fabric. The Pluribus Adaptive Cloud Fabric provides the software foundation to integrate diverse switches into a unified fabric that can be operated as a virtual chassis, making the entire fabric as simple to manage as a single switch. Switches can be connected in any topology, including the three-tier topology shown above, a two-tier leaf-spine topology, a simple two-switch cluster, or any other topology. Switches can be added to the fabric incrementally in order to scale capacity or add new devices (e.g. new 400G TAPs or new tools) without affecting the existing switches or connected devices.

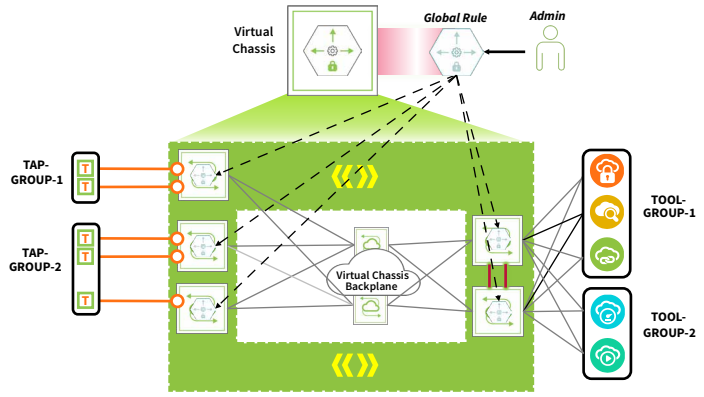
Multi-site Fabric



Multi-site Fabric with virtual chassis operations, scalable to dozens of sites, thousands of ports

Many network operators need visibility across multiple sites, including multi-site data centers, edge computing sites and other enterprise network locations. Deploying separate NPB systems and duplicate monitoring tools to each site can be complex and cost-prohibitive. The Pluribus Network Packet Broker solution can be deployed as a multi-site fabric to eliminate these challenges. Each site can be equipped with an ingress switch sized to match the port and traffic requirements of that site. These switches can then be connected to a central aggregation site (or sites) via any available IP network, such as an existing IP/MPLS wide area network (WAN) backbone, creating a multi-site Adaptive Cloud Fabric. Switches and sites can be connected in any topology, such as the logical hub-and-spoke topology shown above, or a mesh or ring. All of the Network Packet Broker traffic is encapsulated across the WAN using VXLAN tunnels, so any WAN providing basic IP connectivity can be used. Ingress filtering at each site can be used to reduce the traffic flows over the WAN and control capacity costs. The centralized "virtual chassis" management model makes operation of a multi-site NPB fabric as simple as the single-switch NPB or single-site NPB fabric.

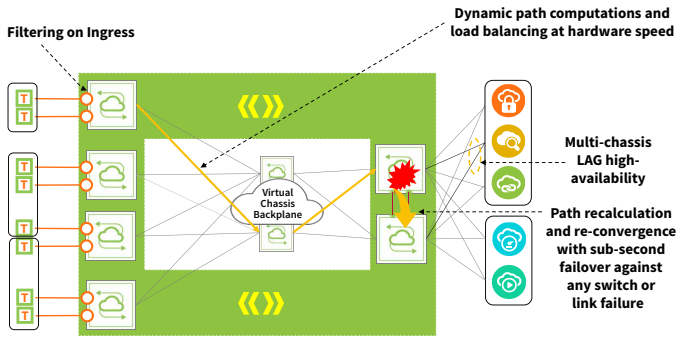
Simple Global Policy Automation



Automated configuration of global policies and across the fabric

In a traditional NPB fabric, configuration complexity increases as the fabric grows because policies must be manually configured in multiple switches to ensure traffic is directed to the right tools. By contrast the Pluribus NPB solution uses the built-in automation of the Adaptive Cloud Fabric to eliminate this configuration complexity. As shown above, the administrator can specify a single global policy or rule in the form of a single command (for example to filter traffic from TAP-GROUP-1 to TOOL-GROUP-2) and the fabric automatically configures all switches to implement the policy.

Scalability and Resilience



Resilience features of the Pluribus NPB based on the Adaptive Cloud Fabric

The Pluribus NPB solution has several advantages in scalability and resilience. Paths are automatically computed in hardware for each flow of each policy, ensuring optimized capacity utilization as well as rapid, dynamic adaptation to network changes, including link and node failures. The Adaptive Cloud Fabric dynamically load-balances traffic across multiple links for efficient resource utilization and resilient connectivity between ingress TAP/SPAN sources and outbound tools. Re-convergence in the event of link or node failures is completely automated and typically sub-second.

Specific features that contribute to the Pluribus NPB solution's resilience and high availability include:

- TAP and tool ports can be aggregated on a single switch using a Link Aggregation Group (LAG), or across two switches using Multichassis LAG (M-LAG) for non-stop operation even when a switch needs to be upgraded or repaired.
- Traffic flows within the fabric are automatically load balanced via Equal-Cost Multi-Path (ECMP) routing and maintain session-awareness. ECMP is also supplemented by Bidirectional Forwarding Detection (BFD) to detect almost instantaneously any link or switch failure and dynamically re-route traffic flows on the remaining links. No manual action is required to trigger path re-discovery across the fabric. As a result, fabrics designed with redundancy in mind can ensure that traffic continues to flow uninterrupted despite one or more link or node failures.
- Redundant fabric designs also enable software upgrades with virtually no interruption as traffic is re-routed almost instantaneously around any switch during its upgrade process.

Summary of Pluribus Network Packet Broker Solution Benefits

The Pluribus NPB solutions address several challenges found in traditional NPBs:

- **Hardware cost:** the Pluribus NPB is based on disaggregated commodity switching hardware that enables lower cost and greater choice to precisely match port and capacity requirements
- **Operations complexity:** the Pluribus NPB leverages built-in automation to enable a "virtual chassis" operating model with simple, global policy configuration across a network of any size, dramatically reducing operational costs
- **Scalability:** the Pluribus NPB solution scales seamlessly from a single switch to geographically distributed multi-site fabrics, enabling efficient sharing of expensive tools across sites and eliminating costly rip-and-replace upgrades as capacity demands grow
- **Resilience:** the Pluribus NPB solution delivers high resilience and high availability to ensure continuous monitoring and visibility with minimal downtime or packet loss