Advanced Automation and Visibility with Arista EOS

The Era of Automation

The Pandemic has challenged IT teams across the globe to rethink their strategy as the workforce became highly distributed requiring access to business applications and the ability to deploy new applications and service delivery models for competitive differentiation. This new strategy began to take shape similar to the cloud model of application delivery, however, posed challenges on the operational front. How to operate at scale and ensure new deployment, visibility, analytics, compliance etc are enabled without manual intervention? As Netops transitioned to this new model of application delivery, they needed to adopt cloud principles for agile service delivery and operational efficiency. Network automation and observability became key to this transition. These are no longer just features but are now minimum required functions to rapidly spin up new applications, ensure optimum performance and enable troubleshooting /isolating issues quickly.

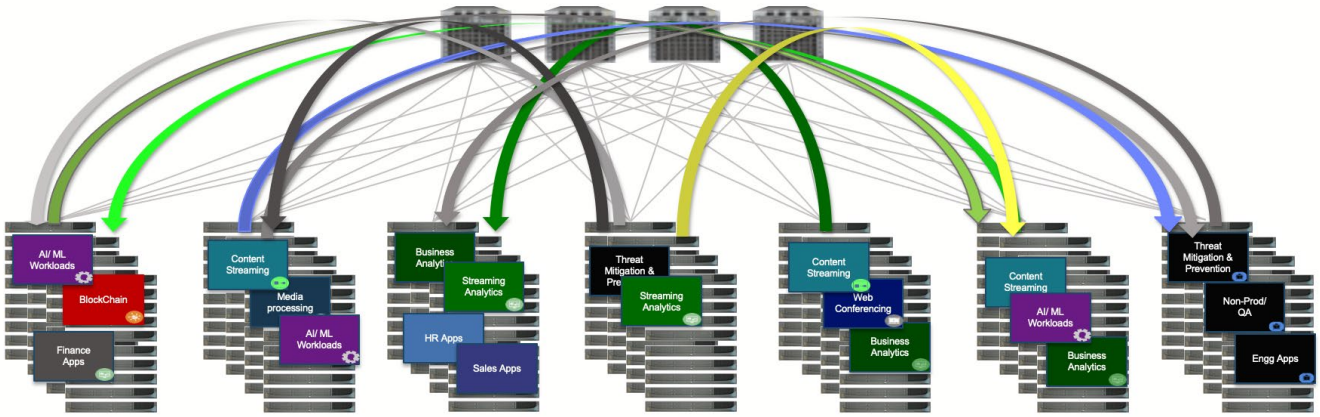

Figure 1: Modern Network Centric Application Deployments

Modern networks need to be cloud class i.e always working and available, always watching and monitoring for security events, performance bottlenecks/optimizations, integrated health checks, predictive analysis and always evolving by integrating into the CI/CD DevOps workflows of modern application deployments.

Network operations teams are counted upon to manage availability, security, agility, costs, and risks. To do so, they need processes and tools that enable them to employ efficient and repeatable workflows with continuous visibility and observability. The approach that they take to do their daily jobs has to allow them to control and monitor their networks, make changes without disruption, and deploy new sites quickly and reliably. Network automation is the key to the successful outcome of this journey.

Challenges with Legacy Network Operating Systems(NOS)

Traditional NOS have long been susceptible to software crashes and unplanned outages. Combined with error-prone manual configuration and lack of programmability, it is difficult for the networks running legacy NOS to keep up with the dynamic nature of the modern application deployment models. Businesses can no longer afford to wait for maintenance windows to roll out changes and updates to the networks.

For basic visibility into all network traffic for identifying security events, performance monitoring like real-time path latency and identify congestion points, capacity planning, compliance and reporting, troubleshooting, businesses would need to deploy additional, often expensive, Network Packet Brokers (NPB) as legacy NOS, which relies on SNMP based polling, simply does not have enough capabilities to provide these services.

Arista Extensible Operating System (EOS®)

Arista EOS is a fully programmable and highly modular, Linux-based NOS and is at the core of Arista's Universal Cloud Network (UCN) deployments powering hyper-scale data centers, large campuses, multi-cloud connectivity, and carrier networks.

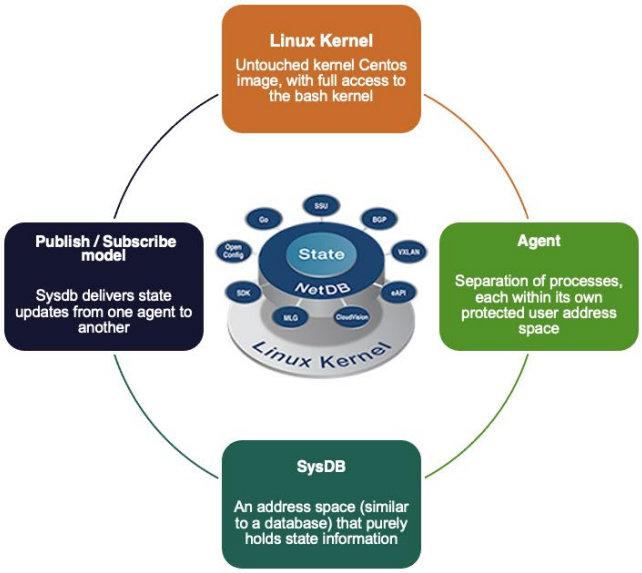

Figure 2: Arista EOS - Providing Foundation for Software Defined Networking

EOS is programmable across all layers – Linux kernel, hardware forwarding tables, switch configuration and CLI, switch control plane as well as management layer.

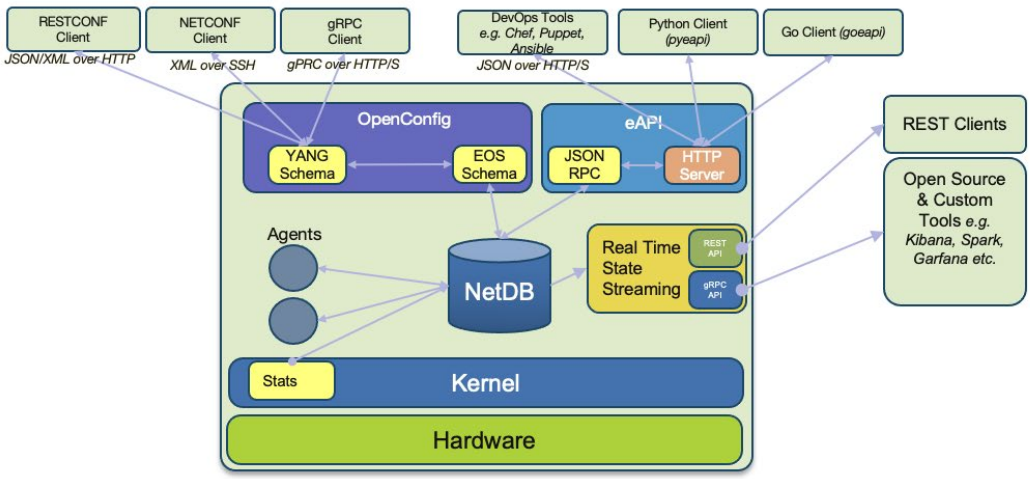

Figure 3: Broadest API Toolset

Lets see how EOS is able to provide a cloud class network perfectly suited to enable network automation and service the modern day application and business needs.

Day 0

As businesses scale up and new applications and services are deployed, additional PODs or even data centers need to be rapidly added. Gone are the days where the network is deployed once and not touched for long periods of time. Manual approach is time consuming, error-prone and does not scale.

EOS supports tools that greatly reduce network operational costs. For example **Zero Touch Provisioning (ZTP)** automates the provisioning of network infrastructure and speeds up the time to production for new services while eliminating the risk of human error. **Zero Touch Replacement (ZTR)** provides automated provisioning of replacement switches, significantly reducing mean-time-to-replacement of a failed switch. These features ensure repeatable, successful recipes for adding capacity in a short period of time.

Day 1/Day 2

Once a network fabric with EOS is deployed via ZTP, the next step is to configure the leaf-spine topology so that business applications and workloads can be deployed. EOS enables automation/NetDevOps with its programmable stack to speed up the fabric configuration and onboard applications in minutes vs. the legacy model of days.

EOS APIs (eAPI) provide an easy way to interact with any Arista EOS switch remotely. All features supported by the switch can be configured via eAPI. eAPI returns the output in a programmable friendly format (JSON) in key value pairs, which is automation friendly and avoids the laborious screen scraping. eAPI allows easy web-based integration with tools commonly used to manage compute and storage resources as well as orchestration systems. Even the CLI written in Python is customizable. Scripts based on Python, go, etc., can also be developed as third party or native integration with applications, controllers & layer 4-7 services. EOS

Request:

```
{
  "jsonrpc": "2.0",
  "method": "runCli",
  "params": {
    "cmds": [
        "enable"
        "configure terminal",
        "interface ethernet1",
        "switchport access vlan
3"
    ],
  "format": "json" },
  "id": 100
}
```

Response:

```
{
  "jsonrpc": "2.0",
  "result": [
    {
      {},  // configure
terminal
      {},  // interface
ethernet1
      {"warnings": [
        "Access VLAN does not
exist,
         creating VLAN 3" ] },
    }
  ],
  "id": 100
}
```

Figure 4: eAPI for configuring EOS

natively supports **Ansible**, Chef, Puppet etc, which enables network configuration in the same manner as servers and storage within data center environments. This enables a set of software applications that deliver workflow automation, high availability, unprecedented network visibility and analytics and rapid integration with a wide range of third-party applications for virtualization, management, automation and orchestration services.

Arista Validated Design (AVD) is an Ansible collection that includes the necessary Ansible roles and modules that leverages the eAPIs to generate the configuration for the entire fabric. This enables automation of entire Day 0, 1, and 2 workflow from Zero touch bringup of the network platforms to configuring the entire fabric ready to service production workloads.

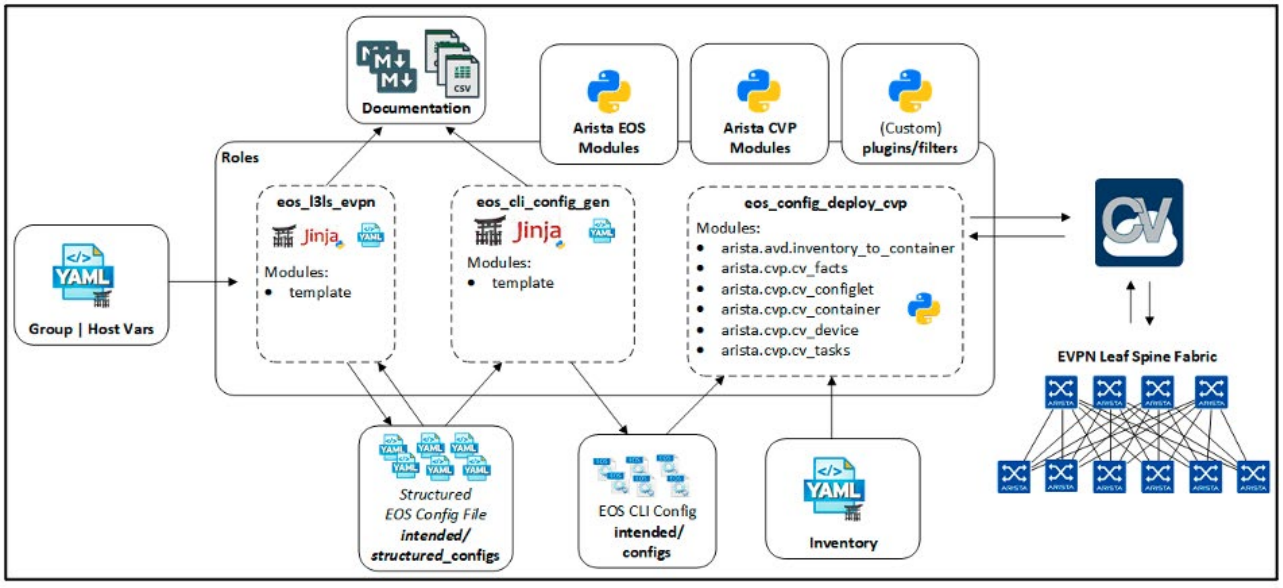

Figure 5: Deploying EVPN Fabric with eAPI

AVD enables the network infrastructure to work as a code enabling prescriptive architecture with declarative provisioning without touching the CLI.

Openconfig brings a common operational framework using declarative configuration and model-driven management for multivendor networks. It provides vendor neutral data models and streaming telemetry for network management. In addition to supporting NETCONF/ YANG, EOS supports gNMI - gRPC Network Management Interface - an IETF draft for retrieval and manipulation of state from network elements. The gNMI service defines operations for configuration, management, operational state retrieval, and bulk data collection via streaming telemetry.

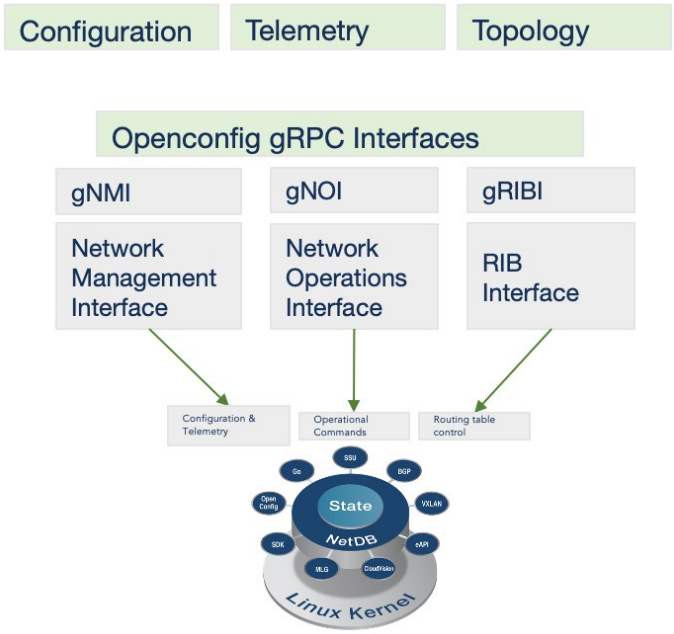

Figure 6: EOS Services - Simplified RPC Service Model

EOS helps the businesses to perform always on real-time monitoring by performing tasks like proactive threat hunting, predictive network/application monitoring, recording data for forensic analysis to name a few.

Network TAP Aggregation and Data Analysis (DANZ) allows for services like traffic mirroring and monitoring, packet replication, packet truncation, deep packet inspection of the network traffic without any impact to user-traffic. DANZ delivers an order of magnitude improvement in the economics of cloud-scale non-blocking 10/25/40/50/100GbE visibility, delivering scalable TAP aggregation and advanced mirroring with exceptional density, flexibility and precision. With DANZ, customers can transform opaque datacenter traffic into visibility for better application and network performance management, traffic recording and analysis, security threat detection and mitigation, compliance and troubleshooting.DANZ is powered by Arista's programmable datacenter switches and EOS that leverage advanced mirroring capabilities with integrated packet processing, filtering and time-stamping functionality to allow direct integration with third party analysis tools like Splunk, Corvil, Extrahop, eliminating the need for a dedicated TAP aggregation network entirely.

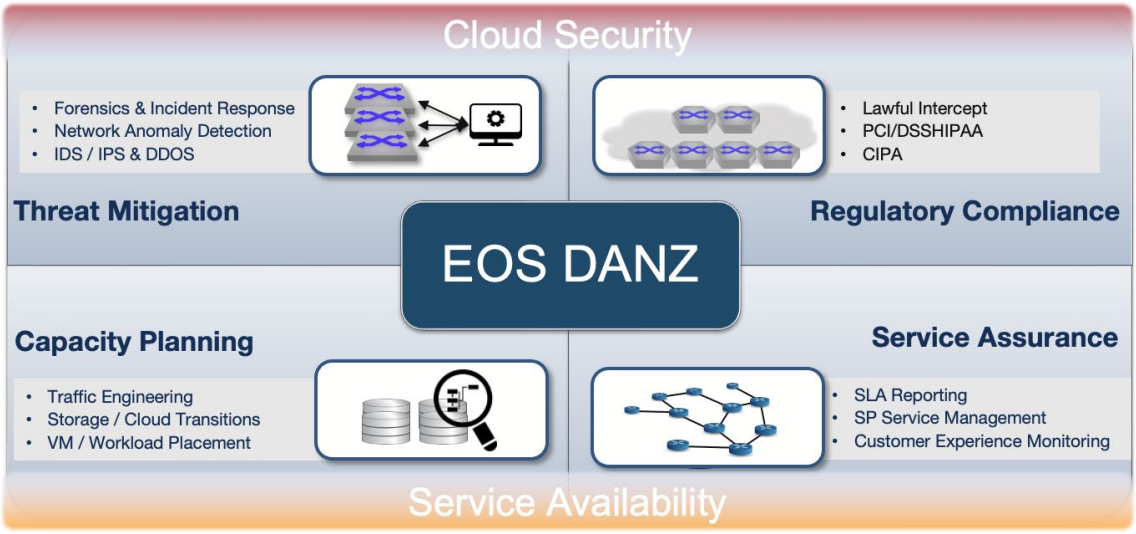

Figure 7: EOS Data Center Analyzer

Latency Analyzer (LANZ) provides integrated network visibility performance monitoring allowing the administrators and applications to gain near real-time visibility into congestion conditions as experienced by the network itself.

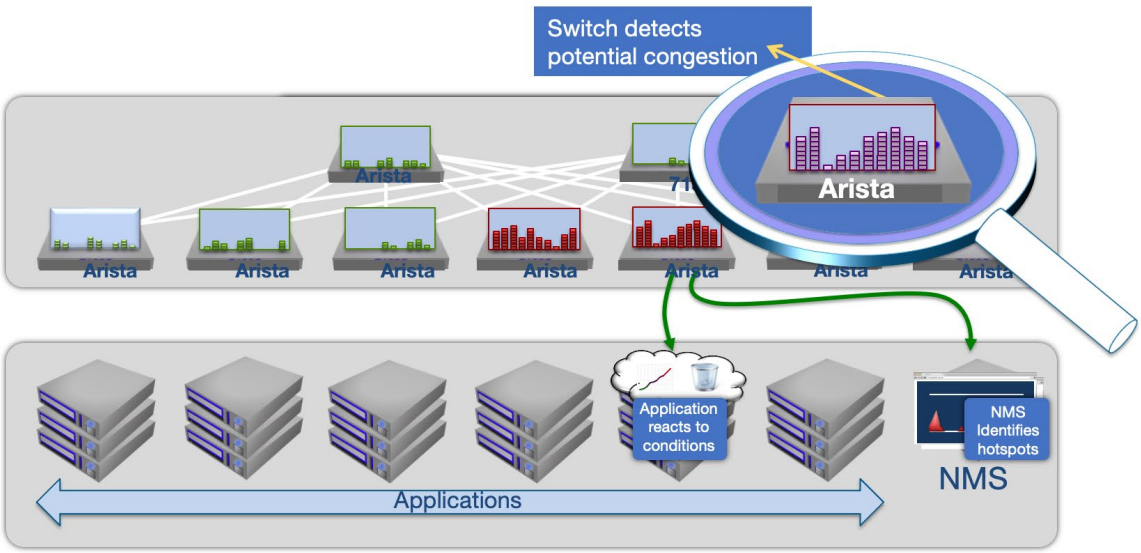

Figure 8: Precision analysis of queues, ports and buffers + congestion capture!

Rather than simply waiting for congestion to occur, LANZ provides granular proactive notification of impending congestion events detected at the network layer directly to the application layer resulting in avoidance of congestion, enabling applications to react rapidly to changing network conditions before packets are dropped thus preserving application performance and competitive advantage while minimizing risk.

Furthermore, for troubleshooting flow related issues, it is desirable to know the path, latency, queue and congestion information for flows at different times. The **Inband Telemetry feature(INT)**, based on Inband Flow Analyzer RFC draft -IFA 2.0,is used to gather per flow telemetry information like path, per hop latency and congestion. Inband telemetry samples flow at ingress edge port and appends INT header and INT metadata. Every switch in path adds INT metadata to the packet containing telemetry information like path, latency, egress queue id, congestion information. At the egress node, this telemetry information is stored in a flow table which is exported to the Collector using

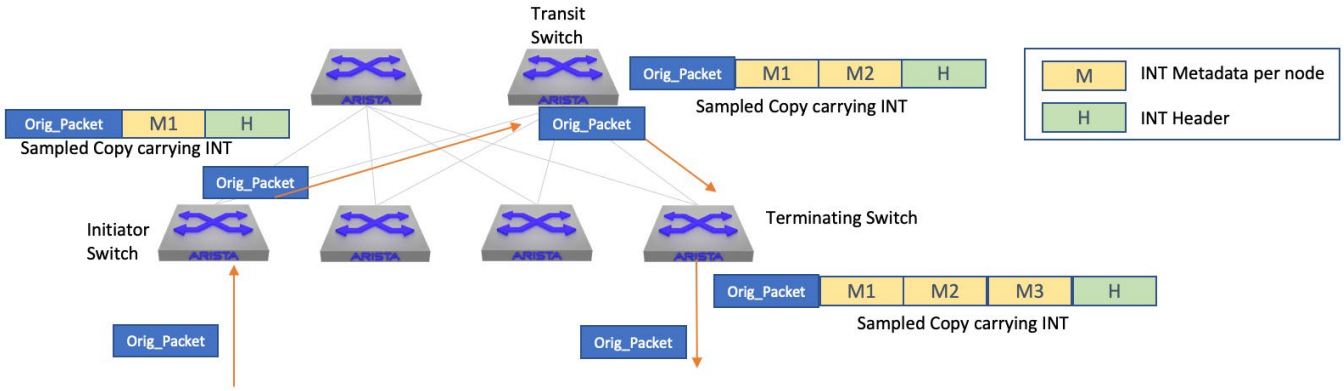

Figure 9: Inband Network Telemetry

IPFIX. One of the most powerful tools EOS offers is State Streaming. **State streaming** can instantaneously export the entire raw state of the switch state that includes Sysdb, Large tables (FIB, ARP, MAC, BGP etc), Linux Kernel stats, Interface counters, system logs etc to any repository for analytics. This information is provided real time from EOS and customers can get instantaneous visibility into their whole network.

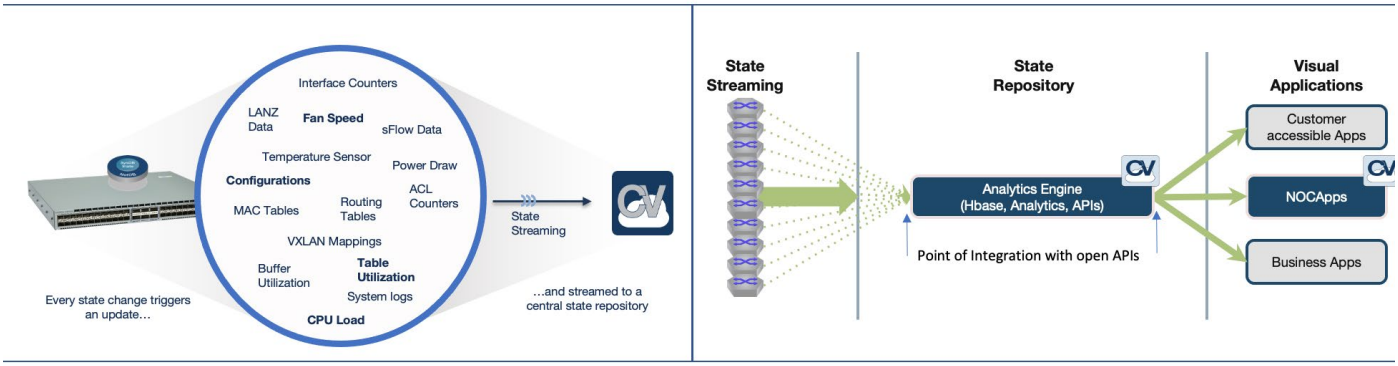

Figure 10: State Streaming - Real time updates of network state

Customers will have access to both real-time and historic telemetry views of the network in one place and at a level of granularity never before achievable.

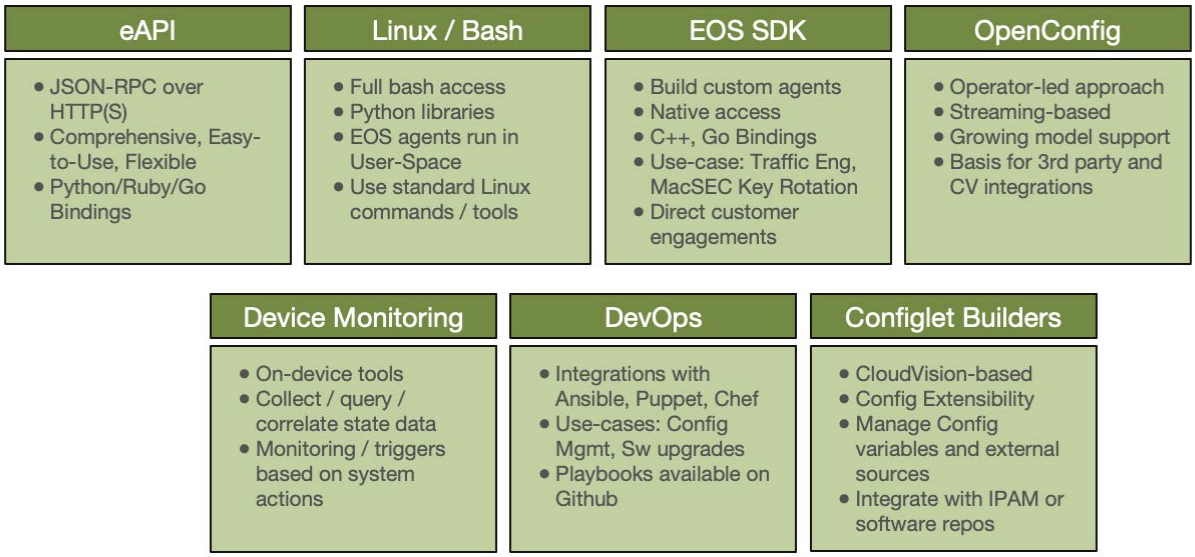

Figure 11: Arista Programmability Framework

With these automation and visibility capabilities, Arista EOS switches are Always Working, Always Monitoring and Always Evolving. These capabilities are offered as part of the EOS 'Z' license for easy consumption.

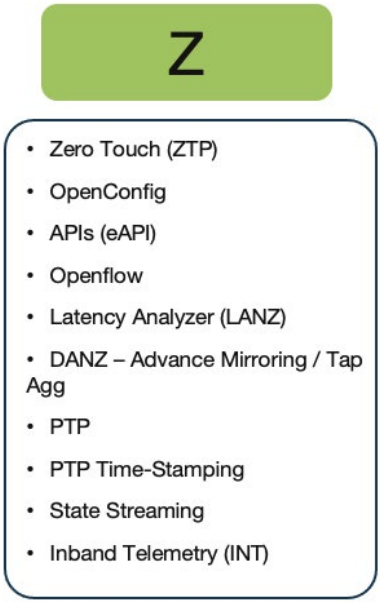

Figure 12: Arista EOS Software "Z" license features

The Arista Networks Advantage

As networks linearly scale and new revenue generating services are enabled, continuing to deliver an industry leading return on investment creates a need for a more programmable software-driven operational model that is both agile and cost efficient to ensure operating costs remain constant as the infrastructure grows. This evolution to a software driven operational model places greater focus than ever before on the architectural design, resilience and programmability of the software running within the infrastructure. Arista EOS provides a new software-driven operational model that is resilient, agile, programmable and cost-efficient and is deployed in some of the most highly demanding network environments.

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