451 Research

Impact Report

Arista CloudVision: managing switches as software

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CloudVision is a server application that manages a set of up to 1,000 Arista switches by synchronizing and consolidating switch state and maintaining a log of changes, as well as providing a consolidated point for orchestrating Arista's 'zero touch' provisioning, configuration management including network-wide upgrades and rollback. Systems such as CloudVision have been used to manage server software for many years, but the use in networking is innovative and builds on a fundamental Arista differentiation – the Arista switch software architecture, Arista Extensible Operating System (EOS).

The 451 Take

Arista CloudVision substantiates Arista's long-standing claim that the objectives of software-defined networking (SDN) can be achieved without any disruptive changes, such as OpenFlow, by having a clean internal software architecture and then adapting existing distributed system technology for use in networking, which is exactly what CloudVision does, creating a single repository for provisioning and managing the base software and configurations of a substantial datacenter network. Underneath the rhetoric of SDN, the basic issues are network management automation and agility, both of which CloudVision provides admirably.

Context

The Arista founders have always believed that the company's core differentiation is the software architecture of EOS. Within a single switch, the value of EOS is nuanced, perhaps best seen as the basis for Arista believing it can create new product versions in about half of the time it takes competitors. With the new offering – CloudVision – the value of the architecture is more apparent.

Modern networking is software traditionally packaged within appliances, but more importantly, managed by network administrators who are not generally deeply knowledgeable about software and who manage the network through command line interfaces and scripting of those interfaces. That notwithstanding, managing the software in the switches and routers is predictably important. John Stewart, Cisco's CISO, has repeatedly made public statements that the best way to improve network security at large would be to ensure that switch and router software was kept patched and up to date (just like servers). In its recently disclosed Altoona, Iowa datacenter network, Facebook manages its network very much like it manages its servers through the software images of the switches.

Product

CloudVision is a server application that is packaged as a VM workload. CloudVision is based on EOS – the LINUX-based Arista switch software

platform – and provides the same APIs by which an element of the switch software can access and share state, except in the case of CloudVision, an application can interact with the state of all the switches. In addition, Cloud Vision understands and manages the software elements that constitute the switch software and provides a mechanism for the coordinated update of that software (the switches can be configured to boot from the CloudVision server). In addition to providing a platform for management and instrument applications, CloudVision maintains a log of switch-configuration changes that can be used for compliance purposes (for example), as well as providing a means of rolling back network state to an earlier configuration.

The automation provided by CloudVision provides direct opex benefits (because it enables a network admin to accomplish more) and improves network management agility, and by doing so, improves datacenter infrastructure management agility. More importantly, automation improves operational quality and network availability, and system and application availability as well (network operators often say that 80% of the problems they have to fix are self-inflicted admin errors – 'fat fingering').

CloudVision is licensed based on the number of devices managed; the base price is $295 per device per month. A single CloudVision instance can manage up to 1,000 devices.

Technology

The key underpinning technology is Arista's Extensible Operating System. EOS combines aspects of conventional LINUX (the various elements of switch software are programmed as conventional LINUX tasks) and an object-component operating system. The individual tasks are isolated from one another and from the switching kernel, and all elements share state through a high-speed, in-memory pub/sub mechanism – Sysdb. The software that drives a switch is packaged as about 100 Linux tasks and the switching kernel. Additional agents or switch applications can be added as LINUX tasks. Sysdb-mediated state sharing and the isolation of the switching kernel ensure that the various switch tasks cannot disrupt core switching functions or damage the operation of another task.

The EOS instance running as the centralized virtual appliance is referred to as CloudVision eXchange (or CVX). CVX holds the centralized Sysdb and associated state. The CVX infrastructure aggregates all states from every switch's Sysdb into a network-wide database depending on what services are enabled at CVX. When state changes in Sysdb on a switch, the mechanism for that change getting pushed to CVX is the same as the mechanism for state changes getting propagated to another agent running on that switch. The change is serialized to the central database, which then updates its copy, and in turn notifies agents running on CVX of the change. The synchronization architecture is built around eventual state consistency, not transactional semantics, which is necessary for any distributed system to truly scale. The state synchronization happens over TCP with a binary serialization encoding enabling updates to be pipelined very efficiently for state mounted from Sysdb into the network-wide database, and vice versa.

Partners

The CloudVision API provides a control and network-wide visibility and analytics integration point for virtual overlay networks such as VMware NSX and Microsoft CloudPlatform, both of which were supporting partners in the CloudVision launch. HP announced CloudVision integration with its OneView management framework. Layer 4-7 services companies were also well represented with Palo Alto Networks and F5 pledging integration of the CloudVision functions with their products.

Competition

Arista competes directly with Cisco and increasingly with various forms of white-box switching. Cisco provides generally comparable functionality, but through a more complex set of tools and without anything directly comparable to the application platform provided by Arista that customers or third parties can easily build on. Cumulus Networks and Big Switch – the commercial leaders in open networking software – both can and do exploit server tools for switch image management, but run on a set of switch offerings that don't really compare to the breadth of what Arista provides.

General management tools are available from vendors such as SolarWinds that can do some of the functions provided by CloudVision. Open source server administration tools exist that could be adapted to do some of the functions.

SWOT Analysis

Strengths

Arista CloudVision unquestionably provides important management and automation functions that were identified as SDN objectives. Use of CloudVision can decrease a network operator's opex and improve network reliability and availability.

Weaknesses

Understanding the potential benefits of CloudVision requires an explicit consideration of a switch as a software system, a notion quite foreign to many network administrators.

Opportunities

With the addition of CloudVision, the differentiated benefits of the Arista software architecture are increased and the attractiveness of Arista as a cloud platform improved as well. As more datacenters move toward automated and virtualized operation, the automation and state management provided by CloudVision will be a more important factor in datacenter network selection.

Threats

Despite its remarkable success to date, Arista is still a small vendor compared to industry leader Cisco, and is now clearly in Cisco's competitive crosshairs.

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