

Joyent SmartDataCenter Switch Management

Joyent and Arista will deliver the first cloud computing infrastructure with dynamically controlled network switches

A Joyent Solution Brief

Overview

Joyent, a pioneer in cloud computing, and [Arista Networks](#), the pioneer of 10 GbE cloud networking, are working together to build technology that will enable the automated management of network resources using Joyent cloud computing infrastructure. Independently, both Arista and Joyent have introduced technical advancements around a core vision of enabling centralized, software-based control of all assets in the modern data center. Arista has developed an open switch architecture that allows third party developers to add functionality directly to switches running the Extensible Operating System (EOS), while Joyent has developed SmartDataCenter, which provides an extensible, centralized command and control functionality for managing resources within a data center to provide public or private cloud infrastructure. The two companies are now working together to provide users of Joyent infrastructure built using Arista switches with centralized switch management that will significantly improve the manageability, scalability and security of cloud infrastructure. This solution will enable a new set of cloud computing use cases that require greater flexibility in network topology and access to network infrastructure.

Arista EOS Architecture

The Extensible Operating System (EOS) in Arista's [Datacenter Ethernet Switches](#) was designed specifically to allow third-party developers to extend the capabilities of the switch by adding software agents. Built on the Linux operating system, EOS has a modular architecture that separates software

based agents which do all of the processing, SYSDB which stores the state elements of the switch, and the hardware based switch ASIC. This separation of capabilities allows the switch hardware to be self-healing – if there is a software flaw in one of the agents it is terminated without harming the operation of the hardware switch ASIC. At the same time, software agents can access SYSDB to introspect and interact with network data that is flowing through the switch. This combination of modularity, high-availability, and extensibility is unique among switch architectures. Furthermore, all three characteristics are necessary preconditions for allowing third party developers to have open access to developing software that can run on the switch.

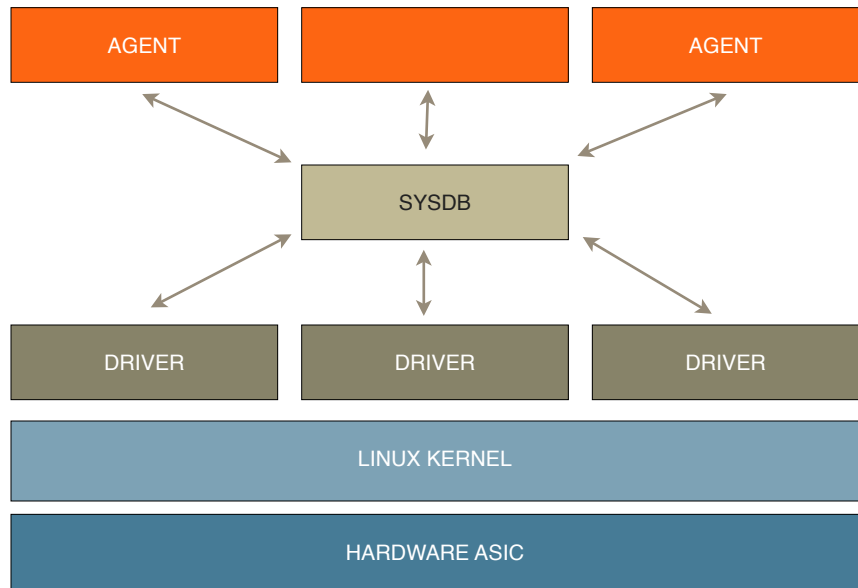


Figure 1: Architecture of the Arista Extensible Operating System (EOS)

The operating system is based on a standard Linux distribution running on X86 architecture, so common development languages such as C/C++, Python, and Java can be used to develop agents. Similarly, many existing libraries and tools such as tcpdump, PTP, or MRTG can be used within third party agents. EOS provides an event-based architecture, so agents can be designed with little to no performance impact on the switch. Finally, software updates can be delivered to the switch without rebooting the switch or affecting the flow of network traffic, which is critical when attempting to deliver software into an operational environment. Ease of software development and deployment is critical for Joyent given that software updates will be delivered into a large-scale

production environment serving millions of users every day where no downtime is acceptable.

SmartDataCenter Architecture

Joyent's SmartDataCenter software uses a collection of software-based agents throughout the data center to monitor resource usage and provide centralized command and control of those resources. The agents communicate with one another and a centralized software manger using an extensible message bus. On this architecture SmartDataCenter provides a set of application programming interfaces (APIs) for use by applications running in the data center, as well as a graphical user interface (GUI) for managing the agents. Currently, the API and GUI can be used to manage numerous types of resources including persistent storage, RAM memory, compute, and hardware.

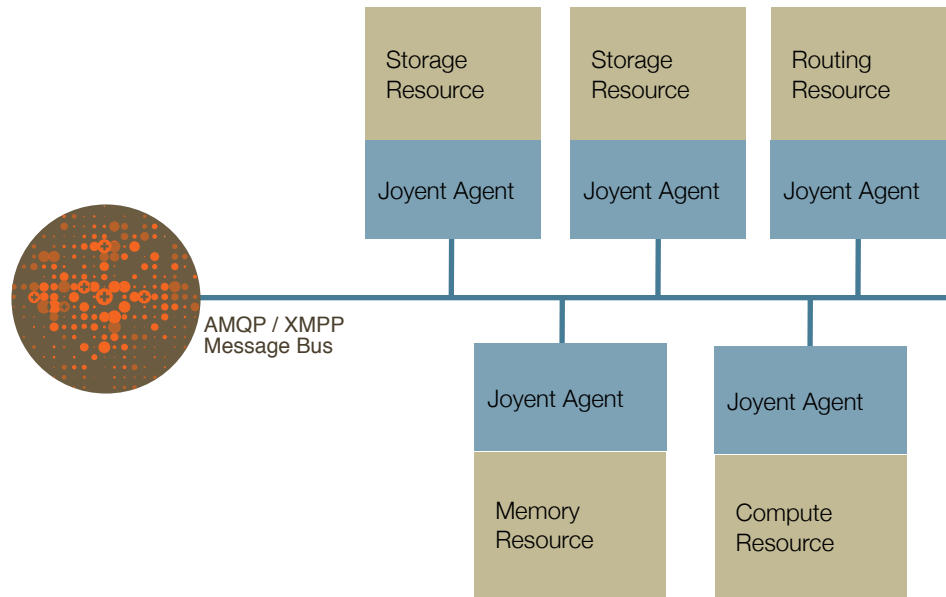


Figure 2: Architecture of SmartDataCenter depicting two storage resources, a routing resource, a

The message bus in SmartDataCenter uses AMQP and XMPP protocols. AMQP and XMPP have been proven on Joyent's architecture and in other technology implementations such as instant messaging networks and financial services solutions to scale to support millions of agents generating large volumes of real-time transactions. As implemented in Joyent's architecture, messages that are not recognized by an agent are simply ignored by the agent.

This behavior makes possible to introduce new message types (and hence new types software agents) into an existing network without disrupting any of the existing functionality of the network. Any new agent that is added to SmartDataCenter can be controlled centrally from the management interface and control can be delegated through APIs to other agents within the data center.

SmartDataCenter is available in a variety of deployment configurations, supporting public clouds as well as private cloud implementations. Across these configurations, Joyent uses Arista switches because they deliver the required performance in a compact, efficient form factor. Joyent is therefore able to maximize the density and hardware utilization of its Cloud infrastructure to provide applications with a high-performance environment while remaining cost effective.

At this time, network infrastructure manipulation within a Joyent cloud requires console access to each of the switches. In both private and public configurations, Joyent provides customers with greater flexibility in network configuration than many cloud providers, but it has not been possible to automate switch management. The largest implementation of SmartDataCenter has thousands of companies in a multi-tenant environment, so in addition to a strategic desire to automate the network infrastructure management, it is also becoming administratively inefficient to manually control the network infrastructure.

Joyent SmartDataCenter Switch Management

Joyent and Arista are working together to develop a software agent that will run on EOS and communicate with the Joyent SmartDataCenter message bus. Joyent is also developing extensions to SmartDataCenter to expose switch management directly to users of the GUI and APIs. This joint solution will provide complete network management capabilities, making Joyent the only cloud computing infrastructure provider to allow for centralized, software-based management of all of the resources in the data center.

Initially, this collaboration will enable Joyent's multi-tenant public cloud solution to provide highly customized security configurations with improved network

segmentation, including VLANs and dynamic address reconfiguration. This technology will be available in both public and private cloud solutions built using Joyent and Arista technology, providing the widest and richest range of configurations for application development and delivery.

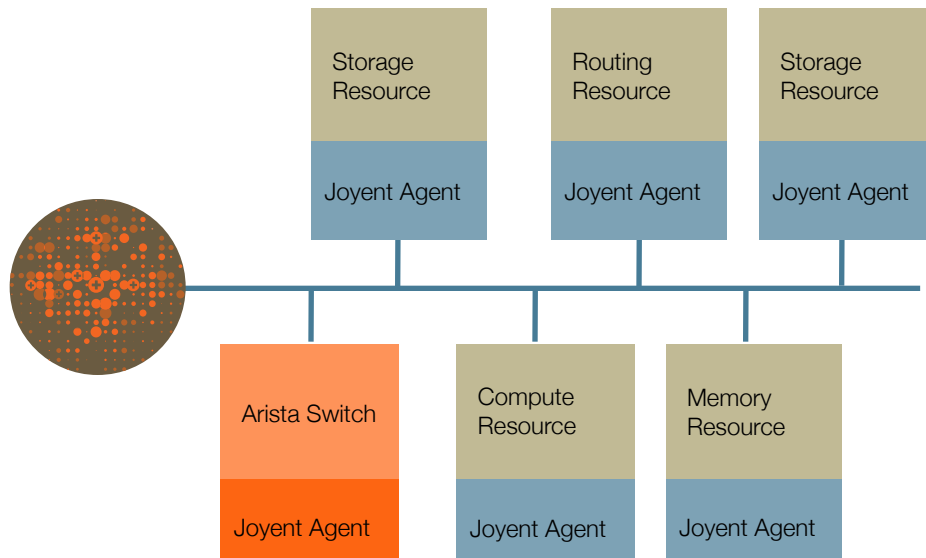


Figure 3. Architecture of the Joint Solution including Joyent Agent running on the Arista EOS Switch and connected to the SmartDataCenter message bus

Benefits

So far, the range of use cases supported by cloud computing has been limited by a lack of flexibility in network topology and low-level access to network configuration and data. The Joyent / Arista solution will eliminate this obstacle, significantly broadening the use cases that can be serviced by cloud computing. Initially, the Joyent / Arista solution will allow a user of Joyent infrastructure to create VLAN tags and assign SmartMachines to a specific VLAN. This will provide customers with improved scalability, security, and flexibility. They will be able to dynamically reconfigure the network topology to respond to network traffic, including refactoring cloud resources across different physical and geographic locations.

Beyond this initial development, the range of capabilities that can be enabled in this architecture is extensive and it is foreseeable that other capabilities will be provided on Arista EOS switches within Joyent’s cloud computing

infrastructure. For example, Joyent is also exploring the ability to deliver enhanced, high-performance security functionality in the form of IDS/IPS directly on the switch, which would significantly enhance network security while maintaining networking performance.

Conclusion

Joyent and Arista share a common vision of innovating in the data center by creating modular, extensible, high-availability architectures that allow for third party development. Arista EOS provides a powerful new way to create and deploy software based agents to switches that are already operational within a network. Joyent's SmartDataCenter allows the introduction of new software agents without disruption of existing cloud computing resources. The creation of a new software agent for managing Arista switches on Joyent infrastructure will provide users with unprecedented control of the underlying network resources and topology. This joint solution also demonstrates a clear path to creating innovative new solutions in the future based on Arista and Joyent technology.

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About Joyent

Joyent has been building the software to deliver Infrastructure as a Service since 2004, long before it was ever called cloud computing. With thousands of customers worldwide, from rapidly growing startups to Fortune 500 companies, Joyent's high-performance software has been proven to be extremely stable, flexible and secure. Today, Joyent is the only true on-demand cloud computing solution, providing enterprise customers the convenience, efficiency and scalability of cloud computing with the reliability, security and performance of fully managed, dedicated data centers. Our virtual data center solutions enable customers to deploy and scale computing resources in minutes with a pay-per-use model, buying only the necessary capacity desired. Joyent is a leading infrastructure provider for some of the fastest-growing businesses on the Web. More information about Joyent can be found at www.joyent.com.

About Arista

Arista Networks was founded to deliver cloud networking solutions for large data center and computing environments. Arista Networks ignited the low-latency 10GbE Ethernet revolution with the Arista 7100 and reinvented the modular data center Ethernet switch with the Arista 7500. Arista leads the data center Ethernet switching industry with innovation in switching hardware, silicon based performance, and the EOS platform, a pioneering new software architecture with self-healing and live in-service software upgrade capabilities. Arista markets its products worldwide through distribution partners, systems integrators and resellers with a strong dedication to partner and customer success. Information about Arista Networks can be found at www.aristanetworks.com.

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