Junos Automation and Ansible for Education Networks

Meet growing demand for connectivity and content with automation for campus and data center networks

Junos Automation and Ansible Solution Overview

Digital learning tools, Internet resources, and collaboration have become an essential part of education today. In K-12, blended learning and one-to-one computing programs are reshaping the classroom and engaging today's tech-savvy children. In higher education, bring your own device (BYOD) is the norm, and students expect to use their smartphones, tablets, laptops, game consoles, and other Wi-Fi devices in classrooms, dorm rooms, and everywhere in between.

Educational institutions can meet the unprecedented demand for connectivity with high-performance, highly reliable campus network and data center network solutions from Juniper Networks. By taking advantage of Juniper's ability to integrate with modern DevOps tools like Ansible, schools can deliver the network experience students, faculty, and administrators expect, while simplifying network operations and lowering OpEx.

Challenges

An explosion of mobile devices, a growing appetite for applications and media, and rising security concerns are placing new burdens on education networks. To meet these challenges, schools are expanding their networks to meet student and faculty expectations for high-performance and highly reliable, always-on connectivity.

The school network is mission-critical, and downtime cannot be tolerated when class assignments, lectures, research projects, or even late-night gaming parties are involved. The diversity and richness of educational applications are growing as learning increasingly leverages interactive curricula, collaboration tools, streaming media, and social media. The success of the Common Core assessments depends on connectivity, too. In higher education, universities and colleges that have poor quality, non-ubiquitous network access, quickly discover that this is affecting their enrollment rates.

The number of Wi-Fi devices and the types of devices that students bring to a university or college campus are exploding. Students commonly have three or more devices—smartphone, tablet, laptop, gaming device, or streaming media player—and expect flawless connectivity. In addition, higher education is deploying wireless IP phones for better communications, IP video cameras to enhance physical security, and sensors for a more efficient environment. The projections for the Internet of Things, which will connect hundreds of billions of devices in a few short years, are nothing short of staggering.

Trends

With student, faculty, and administrator expectations for connectivity rising, the complexity and cost of networking is growing exponentially. In addition to this growth, the practice of "adding on" networking equipment to old designs is causing the network to become very fragile. IT budgets are tight, and technology requirements are expanding faster than funding.

Due to operational constraints and the need to ensure quality delivery of end-user applications, IT departments have been converging over recent years, and as of late the network has begun to follow a movement called "DevOps."

Converged IT processes are becoming increasingly important in the education market, as our users expect a seamless digital learning experience, always-on network connectivity, and a digital strategy that "keeps up with the Joneses." For this we require flexible, integrated tools for all aspects of the technology pipeline.

It's time to modernize the way educational institutions design, build, and maintain networks, taking advantage of automation and modern management tools to create scale, consistency, and efficiency.

Juniper Networks Automation Solutions for Education Networks with Ansible

Juniper Networks integration with DevOps tools such as Ansible helps educational institutions simplify network deployment, improve uptime, increase configuration consistency, add capacity more easily, and reduce overall OpEx.

Ansible, along with Juniper Networks® Junos operating system automation, can not only help you reduce the cost of network deployments, but also integrate with your existing infrastructure and begin your journey into converged IT systems.

Deployment is one of the most expensive pieces in the IT equipment life cycle and networking is no different. Older deployment models rely on manual processes that include "manual templates" based on spreadsheets, text files, and old configurations that are installed via cut and paste, a thumb drive, or some other inconsistent process. This is not only slow, but also error prone. One of the solutions to remedy this problem is integration with a modern DevOps tool like Ansible.

Figure 1 demonstrates how we have been configuring our network equipment for years. We start with unboxing the equipment.

Once unboxed, the network engineer then begins to build a configuration from scratch or utilize a previous configuration from a similar device, replacing configuration variables (by hand) to create the new configuration. This configuration is then installed onto the new device, which in turn is then repackaged and shipped or installed in its permanent location.
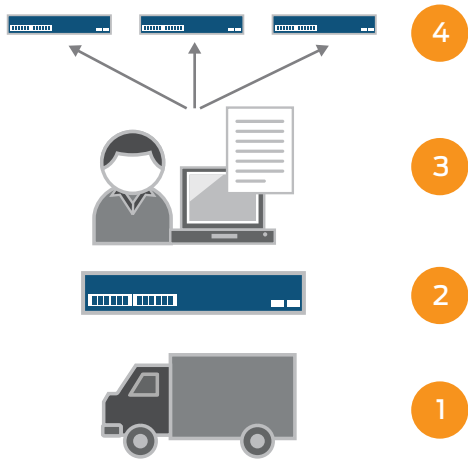

Figure 1: The old way requires someone to manually install a configuration on each device either during staging or during deployment.
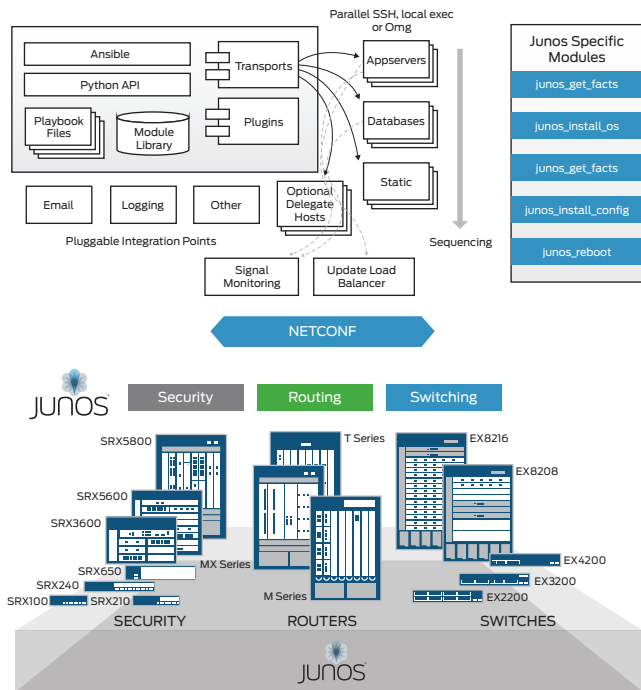

Figure 2: Integration with automation tools can not only significantly speed up your equipment deployment, but also create consistent configurations.

Figure 2 depicts the integration of Ansible and Juniper Networks® Junos® operating system. One benefit of using Ansible is the ability to configure all Junos OS devices without the requirement of a client residing on the device. Whether you are deploying one box or many, Ansible creates operational efficiencies and consistency using playbooks. Playbooks are a defined set of steps or workflow to perform a specific set of actions. These playbooks can be run against a list of hosts (which are stored in an .ini file type format) that integrate configuration snippets (JinJa2 Templates) to build configurations based on predefined roles for each device or a grouping of devices. The device-specific variables can come from a number of sources and in the above use case are stored in various files.

Just as with your initial deployment, changes in your network can be both time-consuming and error prone, tying up your limited resources as well as causing the potential for outages due to misconfigurations. Perhaps you use a network management tool that only addresses one aspect of your compute stack. With Junos automation and Ansible, you can automate anything from a single device change in a branch, to multilayer campus configurations, to full data center software stack integration.

What is Ansible?

Ansible is a radically simple IT automation engine that automates cloud provisioning, configuration management, application deployment, intra-service orchestration, and many other IT needs.

Being designed for multitier deployments since day one, Ansible models your IT infrastructure by describing how all of your systems interrelate, rather than just managing one system at a time.

It uses no agents and no additional custom security infrastructure, so it's easy to deploy—and most importantly, it uses a very simple language (YAML, in the form of Ansible Playbooks) that allows you to describe your automation jobs in a way that approaches plain English.

Ansible and Junos OS Integration

Juniper Networks provides support for the use of Ansible to deploy devices running the Junos operating system. The Juniper Networks Ansible library, which is hosted on the Ansible Galaxy website under the role "Junos," enables you to use Ansible to
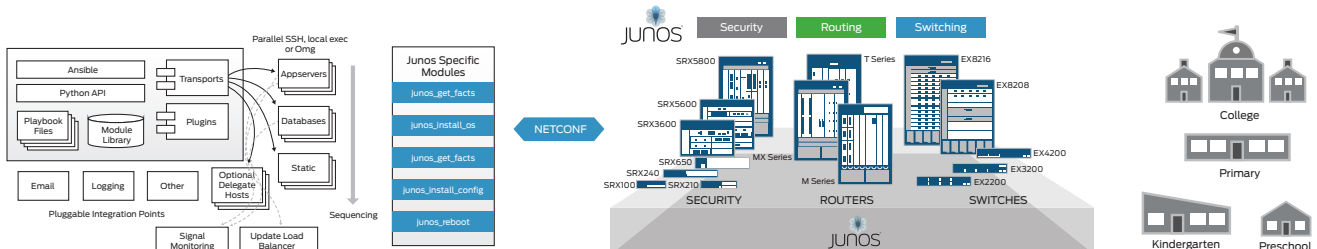

Figure 3. Ansible and Junos automation across one building, many buildings, or many different types of institutions

perform specific operational and configuration tasks on devices running Junos OS, including installing and upgrading Junos OS, deploying specific devices in the network, loading configuration changes, retrieving information, and resetting, rebooting, or shutting down managed devices.

Junos OS Modules for Ansible

- junos_get_facts: Retrieve device-specific information from the host

- junos_install_config: Modify the configuration of a device running Junos OS

- junos_install_os: Install a Junos OS software package

- junos_shutdown: Shut down or reboot a device running Junos OS

- junos_zeroize: Remove all configuration information on the Routing Engines and reset all key values on a device

Devices running Junos OS do not require Python, because the Ansible for Junos OS modules use the NETCONF and Junos XML APIs, which all Junos OS devices have standard.

Table 1. Key Benefits of Juniper Networks Ansible Integration for Education

Solution	Benefit
Deployment	Integration reduces time and operational cost of the deployment of your data center or campus network.
Scale	Ansible and Junos automation help drive scale and efficiency by creating template solutions that can be configured at the scale of your IT process.
Extensible	Ansible can be quickly adapted to many workflows and supports a large number of device types and device manufacturers. Ansible modules are also easily created to support custom solutions in your networks.
Rollback	Just like Junos OS, Ansible can roll back any number of steps, which allows you to quickly undo undesirable changes in your IT system.
Clientless	Ansible does not require a client and can be run against any Junos OS platform.

Summary—Save Time with Junos Automation and Ansible

Free your IT staff from time-consuming network configuration steps and integrate higher level processes with Junos automation and Ansible. By taking advantage of Juniper's automated network configuration and integration, schools can deliver the network experience students, faculty, and administrators expect, while simplifying network operations as well as lowering operational expenses.

It's time to modernize the way educational institutions design, build, and maintain networks, taking advantage of automation and modern management tools to simplify the job. Junos automation makes it easier to deliver the always-on, ultra-reliable connectivity that is both flexible and meets the demand of your end customers—your students.

References and Resources

Ansible: http://www.ansible.com/how-ansible-works

Juniper Technical Documentation: http://www.juniper.net/techpubs/en_US/junos-ansible1.0/topics/concept/junos-ansible-overview.html

Junos OS Modules: https://github.com/Juniper/ansible-junos-stdlib

Module Development: http://docs.ansible.com/developing_modules.html

About Juniper Networks

Juniper Networks is in the business of network innovation. From devices to data centers, from consumers to cloud providers, Juniper Networks delivers the software, silicon and systems that transform the experience and economics of networking. The company serves customers and partners worldwide. Additional information can be found at www.juniper.net.

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