Analysis on network automation using python

by

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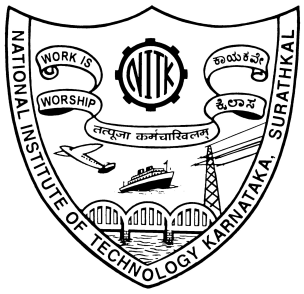

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1 Motivation

The number of devices in a network and their heterogeneous nature is steadily increasing. The traditional methods used for network equipment configuration are time consuming and because of large number of device maintenance the network is become hard. also chances of errors occur in network is high. risk is high when number of devices is very large and also performance is reduce. Networks, however, are traditionally known to be slow and unresponsive. Their complex, bulky nature combined with manual operations makes them prone to delays – deploying one configuration change can take days. With applications and changes being perform at a rapid pace, manually managed networks become a bottleneck in deploying those changes, thereby decelerating the business processes as a whole. Automating networks makes them agile and responsive to changes, dramatically supporting DevOps initiatives. It also makes networks more secure by eliminating the errors that accompany manual processes. some times fault occur in any intermediate router then it take so much time to find fault and it lead to loss.

The main reason for an organization to adopt network automation is to reduce the time that is needed to maintain and deploy changes on the network. Although time is crucial not all organizations choose to move to network automation. The network administrators had to manually configure each device through CLI and in the case of a change that had to be done in all the devices, such as an addition of a new VLAN, they had to go to its device and set it up. This was not only time consuming, but it also maximizes the possibility of an error. Moreover, it is dangerous to apply changes on a network on work hours and there are enterprises that works every day and there is a tight window, usually on holidays, for applying changes. Surveys that have been conducted showed that the most usual reason for a downtime on a network are human errors. The most common human error on networking is misconfiguration of network devices. It is common task of a network administrator to apply an update configuration file to a bunch of network devices.

2 Problem definition

Python programming language can be used to automate manual tasks by writing simple scripts. It is a convenient tool for the server and networking devices for managing tasks and configurations. Python is also used for interacting with SDN (Software Defined Networking), managing multiple networking devices and utilizing APIs. The Python interpreter helps the network engineer to make his own scripts to manage the routine tasks and easily configure networking assets within an organization.

Network programmability is trend, enhanced and inspired by software Defined Networks, that are based on scripting methods and standard programming languages used for controlling and monitoring of network elements. We will illustrating some new methods in configuring network devices by using automation, reducing time for equipment configuration and easier maintenance. It will also improves network security by recognizing and fixing security vulnerabilities and it increases the network stability. These methods represent the future of networks, allowing the management of an increased number of devices in a unitary way.

3 Literature Survey

configurations by automating deployments, simplifying the network and reducing human generated errors .All major vendors, including Cisco, started promoting the software configurability of networks (e.g. Cisco DevNet concept that promotes the creation of an open source community for network programmability). All new automation implementations are based on generic programing methods (python, java) and standard interfaces (Secure Shell SSH).

Today, many methods for network or system automation have been developed and the use of Python Programming methods has been popular. One research has presented the results from the development and testing shows that it is possible to develop the network automation program in Python that offers different kinds of automation in a multivendor environment[1] . Trends of using the automation concepts

help very much specially to reduce time and manual workers in computer network deployment. A recent mobile network such as mobile operators who are planning a transition from 4G to 5G will need to consider building a mobile network that is more standard-based and fully automated with a control on the complete network or software control[2] . The virtual network function deployment and service automation to provide end-to-end quantum encryption has been designed .[3] This is due to the nature of network services and system automation have drastically changed in recent years. New demands require new capabilities, forcing the infrastructure to dynamically adapt to new scenarios thus many automations areas required such as security automation . Novel network paradigms, such as software-defined networking (SDN) and network functions virtualization, have appeared to provide flexibility for network management and services.[4]

Managing network has been developed from time to time and it is crucial cause the demand of network is increased from time to time. Network automation on dynamic design and control also have been implemented.[5] Building a reliable communication network is a challenging task as the medium for control and data acquisition networks. There could be multiple design challenges to build such networks such as total-traffic, compact node design, bandwidth limitations, packet retransmissions, delays, and drops. A research has implemented a reliable HTTP based automation network of large, interconnected microcontroller-based nodes with a careful design of hardware, firmware components, and a new application-layer faulty-node-filter-algorithm.[6]

4 Plan Of Work

At its core, network programmability and automation has the main goal of simplifying the tasks involved in configuring, managing and operating network equipment, network topologies, network services and network connectivity. In our experimental setup we have used the GNS3 emulator which is a tool for building, designing and testing networks.

We will perform some simple task and see how network automation work. We will use python script and libraries for automated network. we will use netmiko and peramiko module(python libraries .we will check whether all router are work properly or not ,all devices(like switches ,router) are accessible or not, created vlan on multiple devices ,fetch devices list and update configuration ,use paramiko(python library) for troubleshoot and use netmiko (python library) to access devices .

For run(compile) python script we will use pycharm and vs code . Python scripting is based on Netmiko and Paramiko libraries for controlling the network devices. Both Netmiko and Paramiko are using SSH connection to get the control of devices. SSH (Secure Shell) is a cryptographic network protocol for operating network services securely over an unsecured network. Paramiko is a Python implementation of the SSHv2 protocol that provides both client and server functionality . it means Paramiko is a python library for interacting with SSH. When working on real-world networks, we will come across various device models. Thus, we need a reliable tool that can help us automate the process. In some instances, we cannot use Paramiko due to device support limitations, leading to lags and crashes we can check the supported devices on the official documentation. It is also considerably slower than Netmiko. Paramiko is more of a generic SSH module that we can use to automate specific SSH tasks. In contrast, Netmiko is broader and well optimized for managing network devices such as switches and routers

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