Python Libraries and Packages for Networking-A Survey

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***Abstract*- Python is the scripting language that is scalable, reliable, platform independent. Using python packages for networking makes it more secure, automated and ease of use. It helps network engineers to a greater extent as it can create an environment that is more flexible, easily tested, troubleshooted and virtualized.**

In this paper, the survey of different papers that used python modules and libraries for networking are taken and analyzed with metrics like performance, reliability and stability because of using python packages and libraries.

Index Terms- scripting, platform independent, flexible, troubleshooted, performance, reliability, stability, secure, ease of use.

I. INTRODUCTION

This survey paper depicts the various python packages that are been used in networking which drastically increases the performance of networking objects.

II. SIGNIFICANCE OF PYTHON

The significance of python is described as follows,

a. Python is a High -level language
b. Python is an Interpreter level language.
c. Python is an Object-oriented scripting language
d. Python is a portable language
e. Python is scalable in nature.
f. Python is an extendable language
g. Python is an interactive language
h. Python supports GUI Programming language
i. Python supports a broad standard library that can run on Windows, Macintosh, Linux

III. SIGNIFICANCE OF NETWORKING

The significance of networking is described as follows,

a. Ease of access from anywhere, anytime.
b. More Flexible approach.
c. Includes sharing of resources.
d. Secures information
e. Utilization of common resources
f. Cost effective
g. Greater flexibility
h. Connects geographic boundaries.

IV. PYTHON LIBRARIES AND PACKAGES FOR NETWORKING

a. asyncoro

It is abbreviated as Asynchronous, concurrent programming framework with coroutines with thread-like interface. It is used to create threads for processing, coding coroutines, running network clients and servers, running hosts and clients, socket connectivity for I/O processes. It enables debugging in case of any bugs in the coroutines.

b. Gevent

It is a Coroutine-based network library. It can be used combining with asyncoro library for creating coroutines.

c. TwistedMatrix

It is an event driven networking framework that is used in twisted pair cables.

d. RPyC

This library provides Transparent Remote Procedure Calls and promotes distributed computing framework.

e. PyRO

This is more powerful Object-Oriented type of Remote Procedure Calls.

f. HTTPLib2

This is a HTTP client library that supports HTTP libraries.

e. Celery

This library is used for queuing the task in distributed manner. It also uses the Remote Procedure Calls.

f. Diesel
This library supports TCP and UDP. The clients are HTTP, DNS, Redis, Riak and MongoDB.
g. Pulsar
This library is used to generate scalable network programs. It has a dependency named "multidict". In order to run in multi-processing mode, it can be combined with asyncoro.
h. NAPALM
It is abbreviated as Network Automation and Programmability Abstraction Layer with Multivendor support. It uses an API to interact with various router vendors.
i. Pyzmq
This library is light weight and it supports messaging framework and delivers the messages at a faster rate.

V. RELATED RESEARCH WORKS

A. Intruder Monitoring System for Local Networks Using Python

[1] has proposed a security solution that can be used for intrusion detection with LANs.
This is built to run on ad hoc networks or scanning across the network and it generates an alarm in case of any intrusions.
It has two modes of operation namely,
a. Learning mode: This was the initial set up mode wherein the system learns about the issues in network connectivity.
b. Alerting mode: This learns the system, if any intrusion is detected which was not found in learning mode.
Python language is used to code the software since python is scalable and portable. It uses network mapper package as a plugin.
Hence the solution for SOHO (Small Office - Home Office) networks threat detection was obtained and analysed the trends on OSINT (Open Source Intelligence), SOCMINT (Social Media Intelligence) and HUMINT (Human Intelligence).

B. Design and Implementation of a Python-Based Active Network Platform for Network Management and Control

[2] presents an active network approach that is light weighted and can easily solve critical network issues. The environment is flexible and can add new networking functions that improves the efficiency.
It used two approaches for deployment namely,
a. an approach to deploy a multicast algorithm
b. an approach to automatically set up network tunnels.
In this work Network, an active network driver is built to keep the packet active from damages and threads and it can be used to write short scripts to send via network.
It can access all the networking components and uses native code for processing that gives high performance for this real network.
PyBAR architecture for built to run active networks which runs on Linux and virtual routers (uses the IP router emulator to work with real networks)

C. Intrusion Detection System in Python

[3] represents way to detect intrusion in external modules like,
a.Scalpy.
b.Designing two raw sockets.
In this approach, the intrusion is been detected for the whole system or the network or the mainframe or host based on their architectural design. The intrusion detection techniques followed are: signature based, anomaly based and stateful protocol analysis.
It deals with four different classes of attacks namely, Denial of service, probe, user to root and root to local. Various intrusion detection tools were used.
It uses python libraries such as inbuilt and external modules. It extracts the potential dangers by running the algorithm and it is then analyzed.

D. Network Automation and Abstraction using python programming methods

[4] illustrates configuring the network devices using Software Defined Networking, an automated tool that makes the configuration, maintenance easier and reducing the chances of attacks and making more stable.
It is programmed with python scripting languages such as,
a. Netmiko
b. Paramiko
It is implemented on the Ubuntu Docker Container. Secure Shell (SSH) is used for enhancing the security.
Abstraction of network equipment is achieved via the driver concept by using open fire and spark in the XMPP client.

By implementing this work, the network can be deployed faster and automatically considering the legacy networks. The troubleshooting is made easier in this network setup.

E: Serialization and Deserialization of Python Objects using Pickle and cPickle Modules and their Performance Comparison [5] discusses a way to implement serialization and deserialization of network objects using pickle module.

Here, python is used to sequence the binary object that is produced as a result of serialization and sequenced via the TCP connection. For storing the objects, mongo dB or MySQL is used.

Python objects are used to convert the dictionary keys into string via serialization and that can be converted to any type like numeric, Boolean, collections or the user defined classes.

Pickle is implemented in Windows 7 and Linux distribution. C pickle is identical to pickle but implemented in C language.

Hence on comparing the serialization and deserialization, cpickle is faster compared to the pickle module.

Summary of the Research Related Works – Table 1

S. no	Title	Author Name	Description	Python packages used	Merits	Demerits
A	Intruder Monitoring System for Local Networks Using Python	Barbu, I. D et al.,	Intruder monitoring system in LANs with python coding.	Network Mappers	Scalable, portable, runs on all Operating systems since python interpreter is available on all Operating systems.	Limited only for local networks.
B	Design and Implementation of a Python-Based Active Network Platform for Network Management and Control	Baumgartner.F, et al.,	PyBAR architecture is developed that consists of active real networks that can solve the critical networking tasks easily.	PyBAR framework and all networking packages	Scalable, runs on all platforms, easy to write short scripts, more compatible than java	It runs only on emulator environment.
C	Intrusion Detection System in Python	Wahal, M., et al.,	A basic intrusion detection system that uses IDS tools for finding the potential risks in the networks	Scalpy, sniff	Uses python modules and tools for finding intrusion, Runs on TCP/IP layer	Fundamental method, consumes more power, Runs only on transport layer
D	Network Automation and Abstraction using python programming methods	Mihaila, P., et.al,	Deploying networking automatically and abstraction of legacy networks using openfire and spark running over XMPP clients under TCP layer	Net Miko,Para Miko,cryptography	Faster deployment, secure, troubleshooting is easier	Implemented only on Ubuntu Containers.
E	Serialization and Deserialization of Python Objects using Pickle and cPickle Modules and their Performance Comparison	Rakshith C A., et al.,	Comparing the serialization and deserialization of the network objects via pickle and cpickle module using python objects and found that cpickle module has higher efficiency than pickle module.	Pickle, Cpickle, Caml, Yaml.	Implemented om Windows and Linux containers, provides automated way by loading and dumping the codes associated with network objects.	Restricted only for two modules such as pickle and cpickle.

VI. CONCLUSION

This survey paper comprises of various python libraries and modules that are been used in networking. With the usage of python, it has eliminated various issues such as lack of stability, lack of reliability. The code size has been relatively reduced such that it enhances the throughput and reduces the memory usage.

Importing the various python networking libraries have made the automated and flexible environment for network engineers to work in.

Since python has inbuilt libraries and also provides a provision to include external modules, it is easier to code the project.

Using the python libraries, it is easy to detect the intrusions in the network and it is easy to detect and remove the intruders from the network [1][3].

It can also be used to create the automated, virtual environment [4]to virtually create the network devices and monitor their functionality and networks can be easily monitored, abstractions can be included in the network that provides the reliable, faster and very ease way of deploying, monitoring, configuring changes in the networking environment.

Since python can be used to convert string objects to another return type [5], it can be used in many instances that needs a conversion. As python interpreter is been supported by many operating systems, it can be deployed in all types of platforms.

Moreover, it also can be deployed in the virtual environment.

Thus, python provides various libraries and modules that can be used in networking which helps the networking programmers to easily code, deploy and monitor the network from intrusions and building an efficient networking platform with python [2].

REFERENCES

[1] Barbu, I. D., Pascariu, C., Bacivarov, I. C., Axinte, S. D., & Firoiu, M. (2017, June). Intruder monitoring system for local networks using Python. In 2017 9th International Conference on Electronics, Computers and Artificial Intelligence (ECAI)(pp. 1-4). IEEE.

[2] Baumgartner, F., Braun, T., & Bhargava, B. (2002, December). Design and implementation of a python-based active network platform for network management and control. In IFIP International Working Conference on Active Networks (pp. 177-190). Springer, Berlin, Heidelberg.

[3] Wahal, M., Choudhury, T., & Arora, M. (2018, January). Intrusion Detection System in Python. In 2018 8th International Conference on Cloud Computing, Data Science & Engineering (Confluence) (pp. 348-353). IEEE.

[4] Mihaila, P., Balan, T., Curpen, R., & Sandu, F. (2017). Network Automation and Abstraction using Python Programming Methods. MACRo 2015, 2(1), 95-103.

[5] Rakshith C A.,Varun Sharma N., Serialization and Deserialization of Python Objects using Pickle and cPickle Modules and their Performance Comparison International Journal of Computer Science and Mobile Computing, Vol.5 Issue.4, April- 2016, pg. 444-448