MAWLANA BHASHANI SCIENCE AND TECHNOLOGY UNIVERSITY

DEPARTMENT OF ICT

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Controller Rest API

Objectives :

- Understand the working principles of Controller Rest API.
- Understand the difference between proactive and reactive installation flows.

1. What is REST API ?

Ans : Application program interface (API) is an interface presented by software (such as a network operating system) that provides the capability to collect information from or make a change to an underlying set of resources.

2. Why are open APIs needed in a software-defined network?

Ans : Open APIs are architectural components of a software-defined network (SDN) that push configurations or information to routers and switches or other apps.

3.Describe REST APIs in Software-Defined Network (SDN) ?

Ans : In an open SDN model, The northbound interface(NBI) is the interface between software applications, such as operational support systems, and a centralized SDN controller. One of the common API technologies used at the northbound interface is the Representational State Transfer (REST) API. REST APIs use the HTTP/HTTPS protocol to execute common operations on resources represented by Uniform Resource Identifier (URI) strings. An application may use REST APIs to send an HTTP/HTTPS GET message via an SDN controller's IP address. That message would contain a URI string referencing the relevant network device and comprising an HTTP payload with a JSON header that has the proper parameters for a particular interface and statistic.

4. How to create flows using the Controller REST API ?

Ans : Using REST APIs: REST API can be used in different ways:

i. A tool to generate REST API calls:
   - The Chrome browser, for example, has multiple plug-ins to generate REST API messages. These include Postman and the Advanced REST Client.
   - Firefox has the RESTClient add-on for the same functionality.

ii. Command-line interface, the curl utility may also be used.

Although the formatting of the REST API varies form one controller to another, the following items are common: URI string for the requested, HTTP method (e.g., GET, POST, PUT, and DELETE) and JSON/XML payload and/or parameters. The Ryu documentation provides examples illustrating how to send a valid REST API message.

RYU.APP.OFCTL_REST :

ryu.app.ofctl_rest provides REST APIs for retrieving the switch stats and updating the switch stats. This application helps to debug application and get various statistics. Valid actions are:

i. Retrieve the switch stats
   - Get all switches
   - Get the desc stats
   - Get all flows stats
   - Get flows stats filtered by fields
   - Get aggregate flow stats
   - Get aggregate flow stats filtered by fields
   - Get table stats
   - Get table features
   - Get ports stats
   - Get ports description
   - Get queues stats
   - Get queues config
   - Get queues description
   - Get groups stats

- Get group description stats
- Get group features stats
- Get meters stats
- Get meter config stats
- Get meter description stats
- Get meter features stats

ii. Update the switch stats
- Add a flow entry
- Modify all matching flow entries
- Modify flow entry strictly
- Delete all matching flow entries
- Delete flow entry strictly
- Delete all flow entries
- Add a group entry
- Modify a group entry
- Delete a group entry
- Modify the behavior of the port
- Add a meter entry
- Modify a meter entry
- Delete a meter entry
- Modify role

iii. Support for experimenter multipart
- Send a experimenter message

iv. Reference: Description of Match and Actions
- Description of Match on request messages
- Description of Actions on request messages

5.What is the use of curl in Ubuntu ?

Ans : Use of curl : curl command is a tool to download or transfer files/data from or to a server using FTP, HTTP, HTTPS, SCP, SFTP, SMB and other supported protocols on Linux or Unix-like system.

6.How to install curl on Ubuntu ?

Ans : **Installing curl :**

i. Open the Synaptic Package Manager (Navigator ->System-> Synaptic Package Manager)
ii. Setup the proxy:
    - Click on settings-> Preference -> Network
    - Click on manual proxy configuration
    - HTT and FTP Proxy: proxy.rmit.edu.au Port: 8080
iii. Search for Quick filter `curl`
iv. Click on Mark for installation
v. Then click on Apply and wait until the package is installed .

7.What is the difference between proactive and reactive instantiation flows ?

Ans : **OpenFlow: Reactive versus Proactive**

OpenFlow is still the only one wire protocol that has a reasonably good chance at becoming the de-facto open SDN southbound messaging standard. When using OpenFlow to populate tables in switches there are essentially three modes of operation:

- Reactive Flow Instantiation: When a new flow comes into the switch, the OpenFlow agent software on the switch does a lookup in the flow tables. If no match for the flow is found, the switch creates an OFP packet-in packet and sends it off to the controller for instructions. Reactive mode reacts to traffic, consults the OpenFlow controller and creates a rule in the flow table based on the instruction.

- Proactive Flow Instantiation: Rather than reacting to a packet, an OpenFlow controller could populate the flow tables ahead of time for all traffic matches that could come into the switch. By pre-defining all of the flows and actions ahead of time in the switches flow tables, the packet-in event never occurs. The result is all packets are forwarded at line rate. Proactive OpenFlow flow tables eliminate any latency induced by consulting a controller on every flow.

- Hybrid flow instantiation: A combination of both would allow for flexibility of reactive for particular sets a granular traffic control that while still preserving low-latency forwarding for the rest of the traffic.

Conclusion : From this assignment, we know the working principle of controller REST API . We also know the proactive and reactive instantiation flows. The APIs can be used to facilitate efficient orchestration and automation of the network to align with the needs of different applications via SDN network. Therefore, we say that REST APIs play a vital role in SDN controllers and applications.