

# **Mawlana Bhashani Science and Technology University**

## **Assignment**

Assignment No:03

Assignment name: Controller Rest API

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## **Assignment name:** Controller Rest API

### **Objectives:**

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

### **Theory:**

**Network Controller:** The Network Controller Northbound API allows you to configure, monitor, troubleshoot, and deploy new devices on the network by using Windows PowerShell, the Representational State Transfer (REST) API, or a management application with a graphical user interface, such as System Center Virtual Machine Manager.

Using Windows PowerShell, the REST API, or a management application, you can use Network Controller to manage the following physical and virtual network infrastructure:

- Hyper-V VMs and virtual switches
- Datacenter Firewall
- Remote Access Service (RAS) Multitenant Gateways, Virtual Gateways, and gateway pools
- Software Load Balancers

### **Controller: REST API**

- **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.
- **APIs in the context of SDN:** In an open SDN model, a common interface discussed is the northbound interface (NBI). The 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.

- **Datapath Identifier of Openflow Switch:** Each OpenFlow instance on a switch is identified by a Datapath Identifier. This is a 64 bit number determined as follows according to the OpenFlow specification: “The datapath id field uniquely identifies a datapath. The lower 48 bits are intended for the switch MAC address, while the top 16 bits are up to the implementer. An example use of the top 16 bits would be a VLAN ID to distinguish multiple virtual switch instances on a single physical switch.”

## **Methodology**

In this activity students will learn how to create flows using the Controller REST API.

Using REST APIs:

REST API can be used in different ways:

1. 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.

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

Although the formatting of the REST API varies from 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:

1. 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

## 2. 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

## 3. Support for experimenter multipart

- Send a experimenter message

#### 4. Reference: Description of Match and Actions

- Description of Match on request messages

#### **Installing curl:**

1. Open the Synaptic Package Manager (Navigator ->System-> Synaptic Package Manager)

2. Setup the proxy:

- Click on settings-> Preference -> Network
- Click on manual proxy configuration
- HTTP and FTP Proxy: proxy.rmit.edu.au Port: 8080

3. Search for Quick filter `curl`

4. Click on Mark for installation

5. Then click on Apply and wait until the package is installed Description of Actions on request messages

#### **Exercises**

Section 4.1: Using Rest API of RYU controller, perform the following exercises.

Exercise 4.1.2: Run ryu controller including the two applications i) simple switch and 2)

RYU.APP.OFCTL\_REST using the following command line:

```
sudo ryu-manager ryu.app.simple_switch_13 ryu.app.ofctl_rest
```

Using ZODIAC\_CLI check if there is any flow?

Yes, the default flow sending all the packets to the controller.

Exercise 4.1.3: Get the list of all switches which connected to the controller using the following command line:

```
sudo curl -X GET http://0.0.0.0:8080/stats/switches
```

The output is the ZODIAC\_ dpid\_number, provide the output.

Each Zodiac has a different number

Exercise 4.1.4: Get all flows stats of the switch which specified with Datapath ID in URI using the following command line:

```
sudo curl -X GET http:// 0.0.0.0:8080/stats/flow/ ZODIAC_ dpid_number
```

Provide and explain the output.

Output is the statistics about the flows

**Conclusion:** In this assignment, we learn network controller and REST API. We know that different function of rest API and work methodology.