MAWLANA BHASHANI SCIENCE AND TECHNOLOGY UNIVERSITY,

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Assignment No	:	03
Assignment Name	:	Controller Rest API
Course Name	:	Introduction to Telecommunication Systems

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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. This behavior was tested on previous lab.
- 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. This behavior will be tested on this lab.
- 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.

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. Page | 62 SDN-Labs
- 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 :

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 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:

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 Page | 63 SDN-Labs
- 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
   - Description of Actions 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
   - HTT 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.

Conclusion :

REST APIs play a vital role in SDN controllers and applications. This will be new territory for many network engineers, but it doesn't have to be overwhelming. For this experiment, we have to need USB and Ethernet connetion between PC and Zodiac FX.