# MAWLANA BHASHANI SCIENCE AND TECHNOLOGY UNIVERSITY

## DEPARTMENT OF ICT

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Assignment name   : Zodiac OpenFlow Switch (Configure)

**Submitted by**
Md. Faruk Hosen
ID : IT-17035
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**Submitted to**
Nazrul Islam
Assistant Professor,
Department of ICT,MBSTU
Santosh,Tangail-1902

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# Zodiac OpenFlow Switch (Configure)

## Objectives :

- Configure and interact with Zodiac FX OpenFlow Switch.
- Exploring the Zodiac FX context.

## 1.What is Zodiac FX Switch ?

**Ans :** Zodiac FX is the first OpenFlow switch designed to sit in a desk, not in a datacenter. Until now the power of Software Defined Networking (SDN) was only available to the administrators of large corporate networks. Even though there are numerous free or open source SDN controllers the one thing that was missing a small, affordable OpenFlow Switch.

## 2.Describe the structure of Zodiac FX OpenFlow Switch ?

**Ans :**  The Zodiac FX is a 4 port network development board designed for hobbyists, students, researchers, embedded developers or anyone who requires a low cost network development platform. Even though it was initially designed to allow affordable access to OpenFlow enabled hardware it's open source firmware it can be used in any number of other applications. By providing the firmware source code users are free to not only create their own versions but also use it as a basis for a completely different type of device. Some such
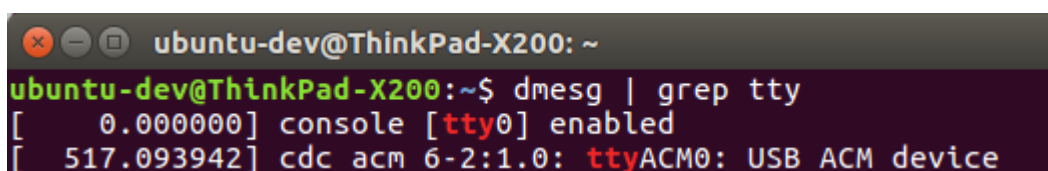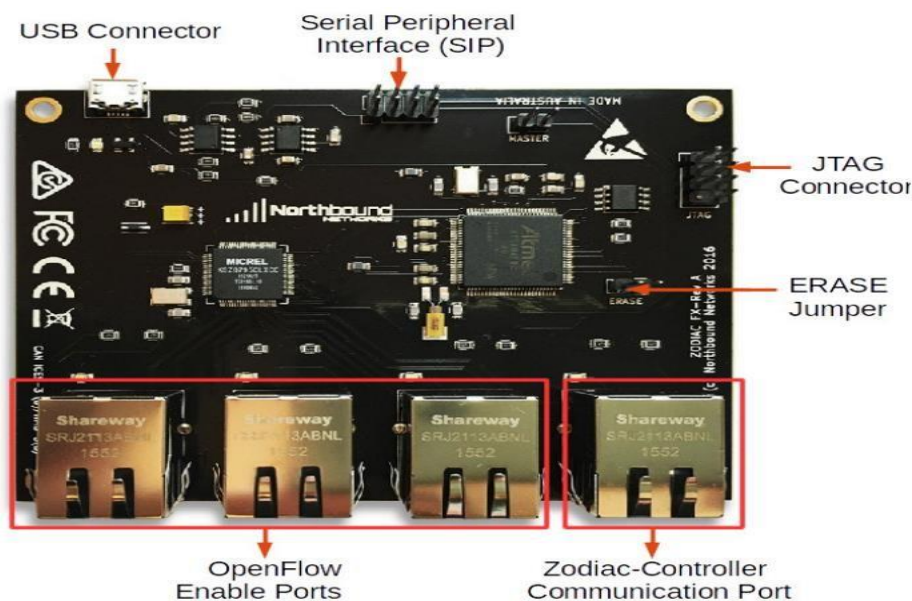
applications may include: Router, Bridge, Load Balancer, Web server, VPN concentrator and many more. The main communication peripherals of Zodiac FX are sketched in Fig.1.
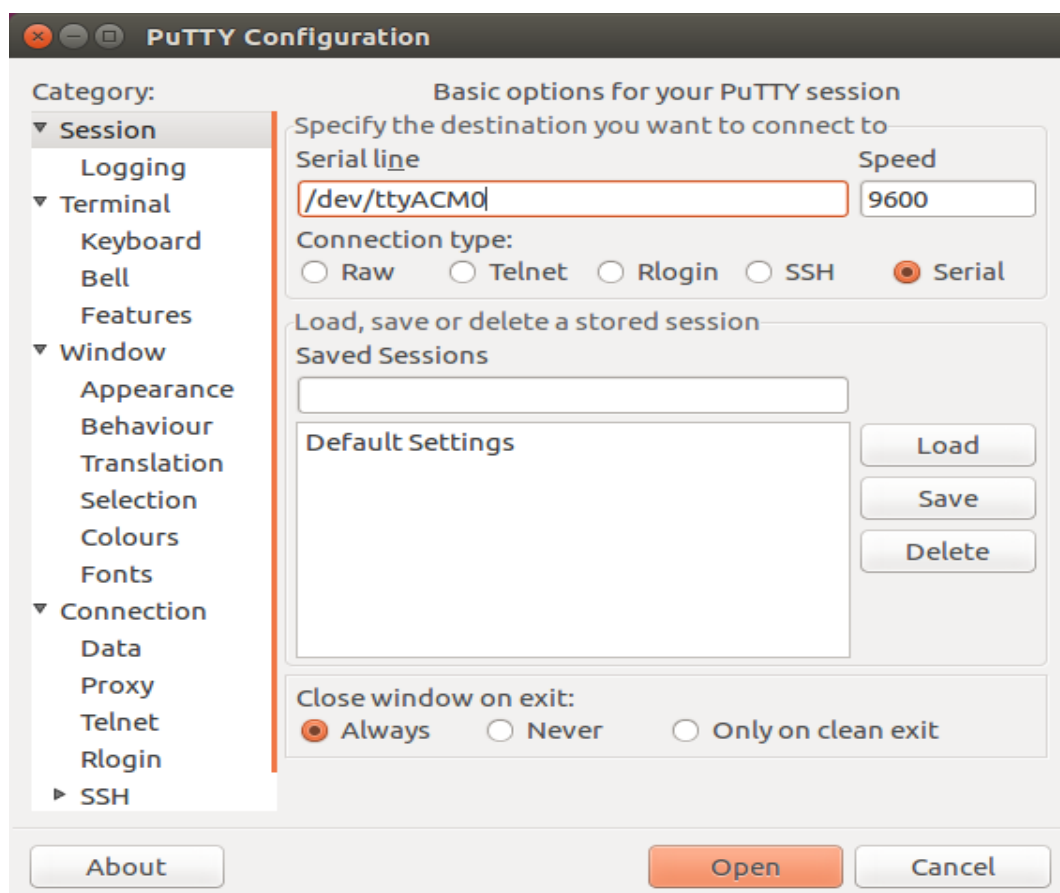
**3.How to connect the Zodiac FX to the PC ?**

**Ans :** On Linux,
i.    Connect the Zodiac FX to the PC via the micro-USB port. This powers the Zodiac FX and also provides a serial connection to the PC.
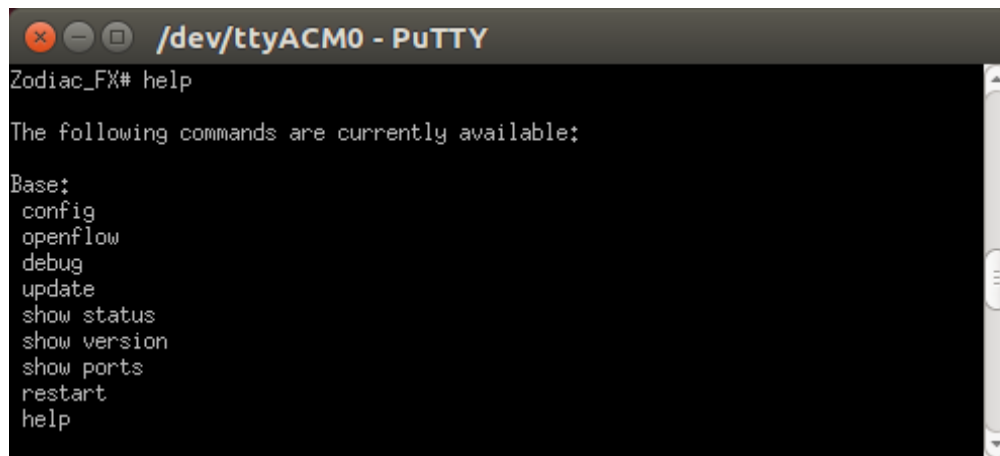ii.    Use the command below to find the serial device identifier.



iii.    Open PuTTY and select the Serial option, connecting to the serial line from the previous step.

iv. Open the connection and hit any key to show the CLI. If nothing shows in the CLI, try the 'help' command to verify that it's connected.



## 4.Describe Static IP Addressing ?

**Ans : Static IP Addressing :** With static IP addressing, addresses are assigned manually, and have to be provisioned carefully so that each device has its own address—with no overlap. When you connect a new device, you would have to select the "manual" configuration option and enter in the IP address, the subnet mask, the default gateway and the DNS server(s).

## 5. Describe the DHCP process ?

**Ans : Dynamic Host Configuration Protocol (DHCP):** DHCP takes all of the manual work out of IP addressing. Generally, the device that's at the "top" of your home network—whether it's a standalone firewall or a router/gateway device or your Control home controller—will provide DHCP by default as a service on the network. When DHCP is enabled, a new device connected to the network asks the DHCP server for an address, and the server assigns one from its pool of unused locations. The server itself tracks which addresses are used and which addresses are available, and keeps a record of which addresses have been assigned to the various devices. This ensures that addresses don't conflict with each other. However, it also means that, if a device goes offline, when it reconnects it may not have the same IP address it had before.

## 6.What is VLAN ? Why VLAN is used in the network ?

**Ans : Virtual Local Area Network (VLAN):** A VLAN is a group of devices on one or more LANs that are configured to communicate as if they were attached to the same wire, when in fact they are located on a number of different LAN segments.

**Why VLAN is used :**
There are two main reasons for the development of VLANs:
  i.    the amount of broadcast traffic
  ii.   increased security

Broadcast traffic increases in direct proportion to the number of stations in the LAN. The goal of the virtual LAN (VLAN) is the isolation of groups of users so that one group is not interrupted by the broadcast traffic of another. By segregating a group of devices to a particular VLAN, a switch will block broadcasts from devices in that VLAN to devices that are not in that VLAN instead of flooding it out every port. VLANs also have the benefit of added security by separating the network into distinct logical networks. Traffic in one VLAN is separated from another VLAN as if they were physically separate networks. If traffic is to pass from one VLAN to another, it must be routed.

Each VLAN is identified by a VLAN ID (VID), which is usually a number. They can reside on only a single switch, or they can be distributed throughout the entire network on each switch. Each VLAN is a broadcast domain. Each device in a VLAN, regardless of its physical location, can communicate directly with every other device in the same VLAN. However, they cannot communicate outside of the VLAN except through a router. A VLAN is usually created using physical ports.

**7.Describe about Zodiac FX Command Line Interface (Z-CLI) ?**

**Ans : Zodiac FX Command Line Interface (Z-CLI)** : The Zodiac CLI provides the ability to configure setting and monitor the operation of the Zodiac FX. To simplify operations the CLI uses the concept of a context's, this limits the available commands to only those available in the currently selected context. There are currently four available contexts: Base, Config, OpenFlow and Debug. To enter the required context simply type the name of the context on the command line while at the base level. The return to the base level type exit. The current context is shown in bracket between the device name and the prompt.

**8.Describe the functionalities of Zodiac FX Command Line Interface (Z-CLI) ?**

**Ans :** The following sections describe the commands available within each context; please note that all commands are lower-case only.

   i.   <u>Base functionalities</u> : The following commands are available in this context:
   - **config** Enter the config's context.
   - **openflow** Enter the OpenFlow's context.
   - **debug** Enter the debug's context.
   - **show status** Displays the current device status.
   - **show ports** Displays information about each Ethernet port including state, VLAN membership and traffic statistics .
   - **show version** Display the firmware version.
   - **help** Display a list of available commands.

   ii.   <u>Config Functionalities:</u> The following commands are available in this context:
   - **save** Saves the current configuration to non-volatile memory.
   - **show config** Display the current device configuration.
   - **show vlans** Displays a list of the currently configured VLANS.
   - **set name < name >** Sets the device name. Maximum of 16 characters, entries will be truncated.
   - **set mac-address < mac address >** Sets the MAC address of the device. The MAC address assigned to the device is located on a label on the underside of the device.
   - **set ip-address < ip address >** Sets the device IP address.
   - **set netmask < netmask >** Set the device netmask
   - **set gateway < ip address >** Sets the default gateway of the device
   - **set of-controller < ip address >** Sets the IP address the OpenFlow controller
   - **set of-port < tcp port >** Sets the TCP port of the OpenFlow Controller
   - **set of-version < version >** Sets the device to only connect to an controller using the OpenFlow version specified. A value of 0 disables this function and allows the device to negotiate the version.
   - **add vlan < vlan id > < vlan name >** Creates a new vlan. Valid IDs are 1-4096 and names must be less than 16 characters.

- **delete vlan < vlan id >** Deletes an existing vlan.
- **set vlan-type < vlan id > < type >** Set the vlan to either openflow or native.
- **add vlan-port < vlan id > < port >** Assigns a ethernet port to the designated vlan. A port can only be a member of one vlan.
- **delete vlan-port < port >** Remove the named Ethernet port from a vlan.
- **factory reset** Configures and saves the configuration back to the factory test configuration.
- **exit** Return the context back the base level.

iii. <u>OpenFlow Functionalities:</u> The following commands are available in this context:
- **show status** Displays the OpenFlow status.
- **show flows** Displays a list of the currently installed flows.
- **enable** Enables the OpenFlow functionality.
- **disable** Disables the OpenFlow functionality.
- **clean flows** Disabling OpenFlow will clear the flow tables and
- **exit** Return the context back the base level.

iv. <u>Debug Functionalities :</u> The following commands are available in this context:
- **read register** Display the value of the KSZ8795 register.
- **write register < value>** Writes the value into the defined KSZ8795 register.
- **exit** Return the context back the base level

**Conclusion :** From this assignment, we know that how to Configure and interact with Zodiac FX OpenFlow Switch. All possible configurations are provided based on SDN standard OpenFlow protocol and Ryu SDN open source controller. Hence, it can say that SDN is more flexible than traditional network and main advantage of SDN is a cost efficient and programmable. Zodiac FX can be used to perform more experiments and examine the performance via Rya OpenFlow controller and other SDN controllers. It is observed that the major limitation of SDN controllers that if any active controller fails it can rapidly break down the entire network.