

# Network Automation

- Has many key benefits:
- 1- Human error as typos is reduced.
  - 2- networks become much more scalable, new deployments, network-wide changes and troubleshooting can be implemented in a fraction of time.
  - 3- network- wide policy compliance can be assured as standard configurations and software versions, ... etc.
  - 4- the improved efficiency of network operations reduce the opex (operating expenses) of the network.
- The various functions of network devices can be logically divided up into:
- 1- Data/forwarding plane: all tasks involved in forwarding user/data traffic from one interface to another as NAT, ACLs, port security, VLAN tags, .. etc.
  - 2- Control plane: as routing table, MAC address table, ARP table , STP,... Etc, functions that build tables and control what data plane does, it performs overhead work.
  - 3- Management plane: performs overhead work, doesn't directly affect the forwarding of messages in data plane, as SSH, telnet, SYSLOG, SNMP, NTP.
- When a device receives control management traffic destined for itself, it will be processed in CPU.
- When it receives data traffic that should pass through the device a specialized hardware called ASIC (Application-Specific Integrated Circuit) is used for maximum speed.
- Some important tables can be stored in TCAM (Ternary Content-Addressable Memory) as MAC address / CAM table.
- Software-Defined Networking (SDN): an approach to networking that centralizes the control plane into an application called a controller. (SDA or Controller-Based Networking), interact with network devices via APIs, the control plane can be partially centralized.
- SBI (Southbound Interface): a software interface used to allow the controller and network devices to communicate, consist of a communication protocol and API that facilitates data exchange between programs as allowing controller to control the network devices data plane tables. As OpenFlow, Cisco OpFlex, Cisco onePK, NETCONF.
- SBI's controller gather info as devices in network, topology, available interfaces on each device, their configurations.
- NBI (Northbound interface): allows users to interact with the controller, access data it gathers about the network, program it and make changes in the network via SBI, a REST API is used on the controller as an interface for app to interact with.
- Networking tasks can be automated in traditional networks as python scripts to push commands to many devices at once or regex.
- Centralized data collected by SDN: collects info about all devices in the network, NBIs allow apps to access information in a format that is easy for programs to understand, facilitate network-wide analytics.
- SDN tools can be used without the requirement of third party scripts or apps, yet APIs allow third party apps to interact with the controller.