U-6 (SDN)

* Juniper SDN Framework -

- uses high level data model that self generates & offers a REST API to SDN appln.
- data centre orchestration appl" → setup virtual routers on hosts in order to connect/relay instances across network overlay.
- API → coordinate entire system.
  ↳ portion of it overlaps Openstack Quantum API.
- controller → multinode system → several different subsystems.
  goal → promote high availability, scalability & extensibility
  sys → scale out server modules for analytics configuration & control by supporting theoritically sepdeables modules.

* Analytics → supports query interface & storage interface for statistics / counter reporting.

* Configuration → facilities compiler that uses high level data model to exchange API requests for network actions into low-level data model for implementation via control code distribution.

* Control → BGP speaker → horizontal scale b/w controller & implementer of low level data model.

- BGP → defined protocol enabling horizontal scalability & possibility for multivendor interoperability, used by control node to distribute network state.

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IETF SDN Framework -

Q2

- Internet Engineering Task Force.
- works on specific, tightly focussed problems with an emphasis on protocol specification.
- foremost standards body for Internet.
- SDN → centralized view of topology of network.
- Appl^n layer traffic optimization (ALTO) can implemented at controller side in this context.

Open Daylight (ODL) controller -

Q5

- JVM software.
- used with any hardware & OS that supports JAVA.

Tools utilized by controller.

* Maven → • easy build automation.
  • uses pom.xml (Project Object Model) to script dependencies among bundles & describe what bundles to load & start.
* OSGi → • framework is backend of OpenDaylight.
  • permits dynamically loading bundles & packages JAR files & binding jointly for exchanging information.
* JAVA interface → • used for event listening, specification & forming patterns.
  • main way in specific bundles implement call back functions for events & also to indicate awareness of specific state.
* REST APIs → northbound APIs → topology manages, host tracker, flow programmer, static routing, etc
  • Northbound APIs → controller exposes
  • Northbound APIs → bothbidirectional REST & OSGI framework.

Open Daylight Architecture -

- modular open platform for customizing & automating networks of any size & scale.
- arose out of SDN movement, with clear focus on network programmability
- designed from outset as foundation for commercial solutions.

ODL architecture has three layers -

1) Southbound Plugins - communicate with network devices.
2) core services - used by service Abstraction Layer (SAL) which is based on OSGi to help components going in & out of controller while controller is running.
3) Northbound interfaces - allows operators to relate high-level policies to network devices or integration of ODL with other platforms

1) Modularity & extensibility (join code modules)
2) Scalability → cluster scalability
   → scalability of architecture
3) Interfaces → southbound
   → Northbound
4) Telemetry
5) Resilience & fault tolerance.
6) Programming Language (JAVA)
7) Community.

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Floodlight Controller -

Q5 -

- open & programmable network by SDN.
- an OpenFlow controller.
- implements various capabilities to address various user demands across network.
- a set of common functionalities to control & query an OpenFlow network.
- made up of appln modules that implement self for various problems & controller modules → essential network functions.

Features →

- Developers benefit → Java → quickly adjust s/w & build distinct apps.
- REST APIs → simpler to interact with product programmatically
  - coding samples to help developers to create product.
- tested with physical & virtual OpenFlow compatible switches.
- handle standard networks, non-open flow switch consists a collection of open flow compatible switches.
- Openstack s/w toolset → cloud computing platform → public / private clouds.
- network backend for openstack using Neutron plugin exposes a networking as a service model with REST API that floodlight offers.

Flood light Platform -

1) Apache licensed
2) openFlow protocol
3) Java based
4) Enterprise class controllers.

Basic functionality

1) Topology discovery.
   - LLDP protocol.
2) Flow installation / deletion -
   - Install / modify / delete a flow on a switch
   - Flow is defined as packets same match.
3) Stats query -
   - Packet counters.
   - Flow counts
   - Port stats query - Etc.

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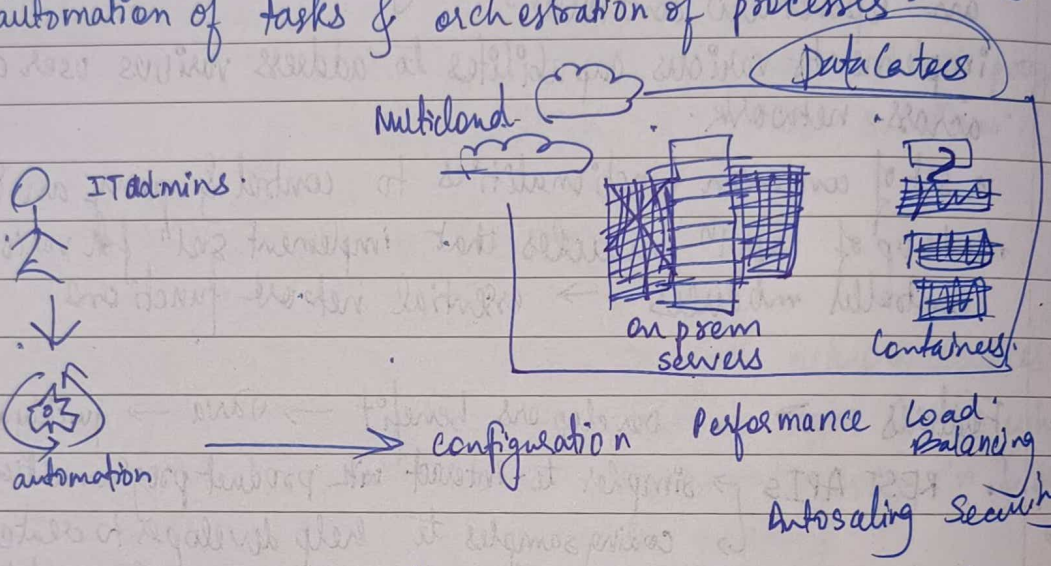
* Data Center Orchestration -

- process driven workflow will help to make data centr more well organized
- Repetitive, slow & error prone manual tasks are replaced by automation of tasks & orchestration of processes.



Adv → streamlined creation → public & private clouds.
→ shorter time lag exists b/w business demand & infrastructure
→ IT department → less time to deliver a domain specific
→ framework controlling data transffered b/w business process.

capabilities → tracking & publishing APIs for automatic updates of metadata
→ updating policy enforcement
→ Integrating data services
→ Scheduling & coordination of data services.
→ Leveraging of distributed data services.

* Data Center Orchestration Tools -

- Chef
- Docker
- Puppet
- Ansible
- Vagrant

Bandwidth Calendering (BWC)

- optimize network resource allocation.
  - Minimize Network cost.
  - Max. Resource Utilization.

Adv →
- Improved Network Efficiency
- Cost Reduction
- Better Quality of Service (QoS)
- Scalable & Agility

Disadv →
- Complexity
- Limited flexibility
- Accuracy Dependence

Features →
- Predefined demands.
- Flexible Scheduling
- Dynamic Programming
- Software Defined Control.