

Proposal for Tutorial

Software Defined Networking (SDN) – Architecture for programmable networks

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Jothirlatha Jaganathan is Technical Lead in Freescale and has 14+ years of experience in building L2/L3 and security products that include Firewall, Intrusion Detection/Prevention System (IDS/IPS) for different segments. She holds Bachelor of Engineering in Computer Science from College of Engineering, Guindy, Anna University and Master of Science in Software Systems from BITS, Pilani. She is member of IEEE.

Abstract: Traditional network architectures suffer from the inability to scale as today's networks have become more complex with addition of thousands of networks that must be configured and managed. Abstraction is not evolved to the extent of growing networks which throws service disruption challenges. With the advent of server virtualization, there is a need to have connectivity of multiple hosts and applications which run across multiple virtual machines (VMs) may demand the dynamic nature of the networking environment. Software Defined Networking (SDN) is evolved to cater to the demands of vendor independent and dynamic nature of networking environment. In SDN, the network control is decoupled from forwarding, the intelligence and state are logically centralized in software-based SDN controllers and the underlying network infrastructure is abstracted from the applications, which provides the programmability.

Scope of the tutorial:

1. The limitations of traditional networking architectures, SDN architecture and benefits
2. Trends in SDN and various technologies in Northbound, Southbound and East/West bound APIs
3. OpenFlow protocol, architectures and components
4. OpenFlow implementations- OVS, Floodlight, NOX, OpenDayLight, FSL controller and Switch etc
5. Cloud orchestration and management for SDN and VXLAN
6. Usecase of SDN and OpenFlow
7. SDN implementation challenges and approaches for solutions
8. Performance and Security considerations of Open Networking
9. L3/ L4-L7 Apps–OpenFlow Northbound and Southbound considerations- Case Study
10. Test infrastructure for SDN and simulation of multiple logical datapaths
11. Network Function Virtualizations – NFV vs. SDN

Intended Audience:

1. IEEE,ACM student members and other students as well
2. Teaching professionals of academia and Researchers
3. Software Developers ,Architects and Product Managers

Outline of the Topic:

1. The limitations of traditional Networking Architectures
 - Inability to Scale and Service Disruptions
 - Static networks
 - Vendor dependencies
 - Complex management
2. SDN architecture & Benefits
 - Hardware and software advancements in the arena of virtualization
 - Server virtualization, cloud and Network Virtualization
 - Need for new architecture and exploit the new paradigms of virtualization
 - SDN Architecture: Control layer, application layer and network infrastructure layers
 - Benefits
3. Trends in SDN, various technologies in Northbound, Southbound and East/West bound interfaces
 - Northbound interface - Frenetics, RESTful, FML and Procera
 - Southbound interface - OpenFlow, Netconf, IRS, etc
 - East/West Interface- ALTO, Hyper flow etc
4. OpenFlow protocol, architectures and components
 - OpenFlow protocol – Pipeline, Group, Meter, Instructions, Actions, Experimental and messages
 - Architecture & Components – controller and Switch, Multiple controllers and multiple Datapaths
 - OF config
 - Why and how OpenFlow dominant as Southbound interface?
5. OpenFlow implementations-
 - Insight of OpenvSwitch and FSL Switch
 - NOX, POX, Open daylight, beacon and FSL controllers
 - Comparison of Performance - survey
6. Use cases of SDN and OpenFlow
 - Enterprise, Datacenter and Carrier
 - Multiple controllers and datapaths in Cloud environments
 - Multiple VMs with controller and Datapaths
7. SDN implementation challenges and approaches for solutions
 - Scalability, Security and performance issues
 - Practical implementation challenges
8. Performance and Security considerations of Open Networking
 - Connection rate improvements
 - Datapath performance – fast path implementations
 - Security applications
9. L3/ L4-L7 Apps–OpenFlow Northbound and Southbound considerations- Case study
 - How the L2 switch can be extended to L3+ switch
 - Software Framework to run the L3-L7 applications on OpenFlow
10. Cloud orchestration and management for SDN
 - Management challenges in SDN
 - What are Cloud orchestration tools – VMware and OpenStack?
 - How to pull SDN and OpenStack together?

- What are the Architectural considerations?
 - How Quantum plug-ins help to bring up the network services?
 - VxLAN
11. Test infrastructure for SDN and simulation of multiple logical DPs
 - Test infrastructure and open source tools for multiple for simulation of multiple DPs
 - OpenFlow conformance tests
 12. Network Function Virtualization (NFV)
 - NFV vs SDN
 - Do NFV and SDN co-exist? or complimentary technologies?
 13. Open Issues – Road Map

What will the participants learn?

1. Step-by-Step approach of understanding of different technologies in SDN, architecture, challenges and suggested approaches to meet the future needs of the networks
2. Practical implementation issues of SDN and OpenFlow ?
3. What is OpenFlow and why it is dominant of other peer technologies?
4. Deep dive of OpenFlow protocol and different OF implementations
5. Management challenges of SDN and possible approaches
6. Performance, Security, Scaling issues and solution approaches
7. OpenFlow Switch with L3-L7 applications – Case study
8. Future work and open issues