

# IEEE Bangalore Section Communications Society Chapter

## Workshop on Advanced Software Defined Networks (SDN)/ Network Functions Virtualization (NFV)

**Date:**

25-26 September 2015

**Time:**

09:00am to 05:00pm

**Host:**

 L&T Technology Services

Whitefield, Bangalore

**For Registration:**

<http://advancedsdn-nfv.doattend.com>

**For details, please contact:**

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For more information about SDN visit: [sdn.ieee.org](http://sdn.ieee.org)

*Limited seats available based on first come first basis!!*

The Software-Defined Network (SDN) approach decouples control and forwarding planes. Such separation introduces reliability design issues of the SDN control network, since disconnection between the control and forwarding planes may lead to severe packet loss and performance degradation. Security needs to be everywhere within a software-defined network (SDN). SDN security needs to be built into the architecture, as well as delivered as a service to protect the availability, integrity, and privacy of all connected resources and information.

This workshop dwells on the key issues such as:

- Security (How security is ensured in SDN/NFV)
- How do you enable SDN/NFV in existing infrastructure?
- IoT use cases in SDN
- Open source topics (OpenFlow, Open NFV, Open Config, ODL, Open Stack Mgmt., etc.)
- Test Bed framework
- SDN Conformance Testing
- Smart City Security solutions via SDN/NFV
- Digital India - last mile Wi-Fi based on SDN
- Performance Benchmarking of Virtualized Evolved Packet Core on General-Purpose Processors

**Distinguished Speakers from:**

- Avaya
- Ericsson
- Cisco
- Huawei
- IIT-B
- Intel
- L&T Technology Services
- NEC
- Rochester Institute of Technology
- Wipro

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## Advanced SDN/NFV Workshop Schedule

25-26<sup>th</sup> September 2015, L&T Technology Services, Whitefield, Bangalore

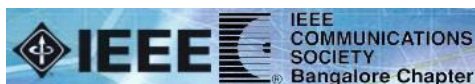
Day	Topic	Speaker	Time
Friday 25th Sep 2015	Inaugural Session by Mr. Govindarajan (Cluster Head Office, L&T) 9:00 AM – 9:30 AM		
	Software Defined Networking and Clean Slate Routing Initiatives	Dr. Nirmla Shenoy (RIT)	9:30 AM – 10:15 AM
	Tea/Coffee Break 10:15-10:45 AM		
	Service Chain Verification	Shashank & Shweta (Cisco)	10:45 AM – 11:30 AM
	Abstraction and Control of Transport Networks	Dhruv Dhody (Huawei)	11:30 AM – 12:15 PM
	Indian Cybersecurity policy & SDN	Subhas Mondal & Anand Kumar (Wipro)	12:15 PM – 1:15 PM
	Lunch Break 1:15 PM – 2:15 PM		
	SDN for Broadband Access: Indian use Case and IEEE 802.11	Dr. Abhay Karandikar (IIT-B)	2:15 PM – 3:00 PM
	ONOS Architecture Tutorial	Satish (Huawei)	3:00 PM – 3:45 PM
	Tea/Coffee Break 3:45 PM – 4:15 PM		
	NFV Security Aspects	Sivabalan Arumugam (NEC)	4:15 PM – 5:00 PM

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## Advanced SDN/NFV Workshop Schedule

25-26<sup>th</sup> September 2015, L&T Technology Services, Whitefield, Bangalore

Day	Topic	Speaker	Time
Saturday 6 <sup>th</sup> Sep 2015	Open source projects related to SDN & NFV	Daya Kamath (Ericsson)	9:30 AM – 10:15 AM
	Tea/Coffee Break 10:15-10:45 AM		
	Service Function Chaining and its enablement via OpenStack + ONOS	Suresh & Vikram (Huawei)	10:45 AM – 11:30 AM
	SDN in legacy environments	Nishant Krishna (Avaya)	11:30 AM – 12:30 PM
	Performance Benchmarking of Virtualized Evolved Packet Core on General-purpose Processors	Punit Rathod (Intel)	12:30 PM – 1:15 PM
	Lunch Break 1:15 PM – 2:15 PM		
	Thought leadership on the SDN Inspector	Partha Datta (TCS)	2:15 PM – 3:00 PM
	SDN Conformance and Demo	Maniyan Sunderasan (L&T Technology Services)	3:00 PM – 4:00 PM
	IEEE Communications Society – SIG on SDN/NFV	Munir Mohammed (IEEE)	4:00 PM – 4:30 PM
	Tea/Coffee Break & Networking 4:30 PM – 5:00 PM		



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# Workshop on Advanced Software Defined Networks (SDN)/ Network Functions Virtualization (NFV)

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## Abstracts



➤ **Software Defined Networking and Clean Slate Routing Initiatives (Speaker: Nirmala Shenoy, Rochester Institute of Technology)**

Software Defined Networks (SDN) offer an essential and novel approach to modularize control plane operations. While the data plane has a well-defined and modular structure in the form of protocol layers, control plane has evolved in an ad-hoc manner and on needs basis. Operations in the control plane include determining routing states, implementing VLANs, ACLs and firewalls. SDN offers a modularity well-defined in terms of control programs, network virtualization and Network Operating system. However, the complexity is moved to preferably software edge nodes, while maintaining the core simple and hardware based. Connectivity and link-failure recovery in the core continue to be challenges. A tiered structure and tiered routing algorithm, which decouples routing complexity and dependency on network sizes, will be discussed in the light of an SDN implementation. MPLS-like approach is convenient to deploy with SDN because it also allows simple interior routers and moves the complexity to the edge. The tiered routing scheme deployed adopting an MPLS-like approach will be described. While MPLS has the shortcomings of establishing a path, and link failure recovery, the proposed tiered-based label switched approach overcomes these limitations of MPLS and could be an ideal candidate to address the core connectivity needs in an SDN controlled network.

➤ **Service Chain Verification (Speaker: Shashank & Shwetha – Cisco)**

"How do you prove that all traffic that is supposed to go through the service chain you specified actually made it through the service chain?"  
We will talk about our experiences how we have went about solving it (and a possible working demo on ODL)

➤ **ACTN - Abstraction and Control of Transport Networks (Speaker: Dhruv Dhody, Huawei)**

More and more network operators are building and operating on multi-domain transport networks. These domains (collections of links and nodes) may be each of a different technology, administrative zones, or vendor-specific islands. Establishment of end-to-end connections spanning multiple domains is a perpetual problem for operators. Due to these issues, new services that require connections that traverse multiple domains need significant planning and often manual operations to interface different vendor equipment and technology. Also in the realm of SDN, each domain controller is responsible for its domain and there is a need for interactions between these controllers and the end customers. The aim of Abstraction and Control of Transport Networks (ACTN) is to facilitate a centralized virtual network operation through coordination between multiple controllers.

➤ **Indian Cybersecurity policy and opportunities to enforce network securities better with SDN (Speaker – Anand & Subhas Mondal, Wipro)**

In today's interconnected world, Information Technology (IT) is the sub stratum that binds national critical infrastructure and the vehicle of economic progress globally. This information infrastructure has also become an attractive soft target for attacks both from within the nation and inimical forces outside. A successful attack on the nation's critical information infrastructure can bring it to a grinding halt. In the physical world there is a clear demarcation of roles and responsibility and the government with its defense forces are the primary protectors of the nation's boundaries and the police forces ensure internal security. When it comes to protecting the national critical information infrastructure however, it needs the coordination of multiple agencies and participation of the private industry to drive security making it more onerous task. The National Cybersecurity Policy is the apex document that spells out the priorities and strategic objectives of the country and how it proposes to address the cyber threat. In this session, we look at India's National cyber security policy, its construct and challenges. We look at the role of SDN/NFV in realizing the policy with specific use cases. SDN/NFV brings opportunities to address the existing threats yet introduces new threats that are actively being addressed by SDOs (Standards Development Organizations like ETSI, ONF, ONF, IEEE, ITU, ATIS, BBF, 3GPP). We will touch upon some of the key aspects like supply chain vulnerability and multi departmental enforcement orchestration with Software Defined Networking approach.

➤ **SDN for Broadband Access: Indian use Case and IEEE 802.11 (Speaker: Dr. Abhay Karandikar, IIT-B)**

India has witnessed a significant growth in cellular mobile communications in the last two decades. Despite this spectacular growth, broadband penetration continues to be marginal. Rural tele density is also much lower than that of urban India. India needs primary broadband connectivity to its 250 million homes. Even at a modest data rate of 2 Mbps, this has a potential of generating tremendous mobile data traffic. In this talk, we will outline our vision of connecting billions with broadband through some innovative technological interventions based on Software Defined Networking (SDN). We will review the role of SDN enabled ultra-dense IEEE 802.11 Wifi network deployment. One of the major challenges in deploying dense network such as WiFi hotspots is lack of affordable backhaul. We show how the problem of fixed primary wireless connectivity can be addressed through shared spectrum access.

➤ **ONOS Architecture Tutorial (Speaker: Satish, Huawei)**

The open source project ONOS (Open Network Operating System) is an SDN network operating system specifically targeted at the Service Provider and Mission Critical Networks. ONOS is built to offer carrier grade features (high scale, availability and performance) to the SDN control plane. ONOS has created useful NBI abstractions and APIs for easier application development and SBI abstraction and interfaces to allow control of Open flow and legacy devices. This tutorial will discuss the status of ONOS project, its detailed architecture and some demo applications.

➤ **NFV security aspects (Speaker: Sivabalan Arumugam, NEC)**

NFV provides many advantages for service provider like rapid scaling, resiliency, migration of resources, and anything as a service (XaaS) which are complex and time consuming nature in case of traditional networks. NFV bundles the virtualization and cloud computing technologies to construct the virtualized infrastructure and on top it virtualized network functions are placed to provide services. This new combination creating multiple new security issues in addition to the existing security problems. This talk will give an overview of NFV security and followed by specific security issue that arise due the virtualization. Further the current state of NFV security study in different SDOs will be addressed.

➤ **Open source projects related to SDN & NFV (Speaker: Daya Kamath, Ericsson)**

'Openness' is at the very core of SDN and NFV. These paradigms strive to enable open interfaces between different network components, as well as standardize control operations within the network components to increase interoperability, achieve programmability and reduce costs and complexity. The opensource community has taken up this challenge and come up with a host of open source standards and projects in response. This talk will take a closer look at some of these, including Openstack Neutron, OpenDaylight, ONOS, Openconfig, Openflow and OPNFV. We will discuss what they are about, and how they come together for the solutions.

➤ **Service Function Chaining and its enablement via OpenStack + ONOS (Speakers: Suresh and Vikram, Huawei)**

Network operators frequently utilize service functions such as packet filtering at firewalls, load-balancing and transactional proxies (for example spam filters) in the delivery of services to end users. Today, common deployment models have service functions inserted on the data-forwarding path between communicating peers. Going forward, however, there is a need to move to a different model, where service functions, whether physical or virtualized, are not required to reside on the direct data path and traffic is instead steered through required service functions, wherever they are deployed. Deploying service functions to support service delivery is currently both a technical and an organizational challenge that involves significant modification to the network configuration, impacting the speed at which services can be deployed and increasing operational costs. Service Function Chaining (SFC) aims to solve these issues and efforts are ongoing to enable SFC in OpenStack and ONOS.

➤ **SDN in Legacy Environments (Speaker: Nishant Krishna, Varun M Tayur, Avaya)**

Co-existence of old and new networking technologies is required as migrating to SDN network by "rip-and-replace" method may not be practical. While moving to SDN sounds exciting, old and new networks need to co-exist for a prolonged period of time. Moreover, the incremental migration should be transparent to the users of the network. A Hybrid SDN is a network where the legacy network and the next-gen SDN integrate and interwork. Network Virtualization can play an important role in this migration -- IEEE SPB (802.1aq) and OpenFlow can act as supplementary technologies. A blueprint for making the network more programmable and open while maintaining the ability to customize the hybrid environment is discussed.

➤ **Performance Benchmarking of Virtualized Evolved Packet Core on General-Purpose Processors (Speaker: Punit Rathod, Intel)**

Network Function Virtualization (NFV) is revolutionizing how the design, deployment and management of networks. From a service provider point of view, NFV provides an attractive proposition for significant cost savings, flexibility in service rollout and ease of deployment. While providing these advantages, understanding the challenges and performance implications while migrating the network function software from specialized hardware to general purpose processor become important. This talk will highlight the gaps in existing standards for performance benchmarking of packet wireless core as a Virtualized Network Function (VNF). This talk will also build a case for a standardization of Work Load Design for NFV performance evaluation.

➤ **Thought leadership on the SDN Inspector (Test Harness framework (Speaker: Partha Datta, TCS)**

- Requirements for SDN Test framework (Key challenges for testing SDN of different flavors)
- State of the Art in the industry/open source advances in SDN testbed/test framework
- Architecture for the SDN Test framework (Cloud based or Distributed)
- What tools/languages are used in the test framework (open sources, scripts)
- Example of few important SDN test cases.
- Summary (With hint of future work)

➤ **SDN Conformance and Demo (Speaker: Maniyan Sunderasan, L&T Technology Services)**

SDN Conformance with a code walkthrough /demo session (OpenFlow 1.3 onwards). OpenFlow1.3+ client spec includes new categories like Auxiliary Connection, Multiple controllers, Controller to Switch etc are defined. This will help in creating awareness on recent development in OpenFlow client spec among the audience.