



## **AFRICAN ADVANCED LEVEL TELECOMMUNICATIONS INSTITUTE (AFRALTI)**

### **TRAINING WORKSHOP OUTLINE**

<b>Title:</b>	<b>INTERNET PROTOCOL VERSION 6 (IPv6).</b>
<b>Duration:</b>	<b>1-5<sup>th</sup> Dec 2014 (5 Days)</b>
<b>Venue:</b>	<b>Arusha, Tanzania.</b>

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#### **OVERVIEW:**

IPv6, or Internet Protocol Version 6, is the "Next Generation" protocol designed by the Internet Engineering Task Force (IETF) to replace IPv4, the version that has been in use for nearly two decades. With the pervasive IP enable smart phones and other appliances the IPv4 addresses are getting exhausted at an alarming rate.

IPv6 overcomes some of the limitations of IPv4, such as the limited address space, while introducing a number of enhancements in areas such as routing, network device autoconfiguration, mobility, security and quality of service. With the momentum for migration to IPv6 growing worldwide, it has become an important area of study for all involved in internetworking.

This course deals with all of the key issues of implementing and configuring IPv6 networks.

- Quick review of the IPv4 addressing, configuration, subnetting and routing functionality.
- Study the basics of IPv6 addressing and continue into the comprehensive discussion of implementation and routing functions.
- Finish up with a study of the mechanisms that facilitate the co-existence of IPv4 and IPv6.

#### **TARGET AUDIENCE:**

This course is aimed at the IT and Telecommunications professionals and managers who are charged with implementing IPv6 or who wish to keep up with the evolving next generation networks.

#### **PRE-REQUISITE:**

The participants should have good knowledge of TCP/IP version 4, networking principles and configuration of routing protocols.

#### **WORKSHOP OBJECTIVES**

- Identify the limitations of IPv4 and how they are overcome in IPv6
- Describe the major enhancements offered by IPv6 over IPv4
- Implement addressing and name resolution
- Manage and monitor IPv6 traffic
- Provide for coexistence between IPv4 and IPv6

## **TRAINING TOPICS:**

### **Motivations for IPv6**

- Current status of IPv4
- Limitations of IPv4
- IP address depletion
- Route expansion
- CIDR, NAT
- Security, Class of Service
- The IPng project
- IPv6 standards

### **The IPv6 Protocol**

- IPv6 header format
- IPv6 option headers
- Address format and notation
- "Special" and reserved addresses
- The Datagram service
- Datagram hopcount
- Eliminating checksums
- IPv6 Plug-and-Play configuration
- Obtaining IPv6 addresses

### **Configuring IPv6**

- Stateless & stateful autoconfiguration
- Link local addressing
- Duplicate Address Detection
- Address resolution
- Neighbour discovery & solicitation
- Router discovery
- ICMPv6 redirection

### **Working with IPv6**

- IPv6 on Cisco routers
- IPv6 on Windows
- IPv6 on UNIX, Linux

### **IPv6 Operation over Networks**

- Ethernet, FDDI
- IEEE 802 networks
- PPP
- NBMA networks
- ATM, Frame relay, SMDS

## **Internetworking with IPv6**

- Global addressing
- Address assignment and management
- IPv6 routing protocols
- OSPFv3
- RIPng
- BGP, IDRP
- IPv6 Fragmentation and Reassembly
- Discovering path MTU
- Fragmentation option header

## **IPv6 Security**

- Host Authentication
- Using MD5 hashing
- AH header
- Generating keys
- Encryption services and algorithms
- ESH header
- Distributing and authenticating keys
- Employing IPv6 security

## **Implementing DNS for IPv6**

- AAAA resource records
- Coexistence with IPv4
- Dynamic DNS
- DNS support for mobile computing

## **Migrating from IPv4 to IPv6**

- Dual Stacking IPv6 & IPv4
- Tunnelling IPv6 over IPv4
  - - "6 over 4" tunnels
  - - "6to4" tunneling
- Tunnelling IPv4 over IPv6
- Limitations of tunnelling
- Network address translation
- NAT-PT
- Coexisting addressing schemes
- Migrating addressing schemes

## **Advanced usage of IPv6**

- Basic IPv6 Configuration
- IPv6 Router Configuration
- Security Configuration
- IPv4 to IPv6 Transition

Troubleshooting IPv6 implementation

## **Lab Activities**

All lab activities will be completed using the latest routing equipment from Cisco. The following labs will be done during the training session.

- Configuring the end station (PC, laptop, Smart Phones) LAN interface with IPv6.
- Bring up minimal IPv6 network
- Using ICMPv6 diagnostic commands
- Monitoring IPv6 Neighbor discovery process
- Router interfaces configuration
- Routing protocols configuration
- Bringing up IPv6 network with three provider routers
- Monitoring IPv6 routing protocols
- Installing and configuring DNS
- Configuring QoS on routers
- IPv6 Firewall basic configuration
- Monitoring network with mixture of IPv4 and IPv6
- Tunnels configuration
  - IPv6 over IPv4
  - IPv4 over IPv6

**FACILITATORS' BRIEF:**

**Mr. Stephen Gachogu**

*Mr. Stephen Gachogu holds a Master of Science degree in Information Systems from the University of Nairobi, Bachelor of Science degree in Computing and Information Systems from the University of Portsmouth, United Kingdom and a Diploma in Education and has over 15 years experience in the ICT industry.*

*Stephen has undergone extensive ICT training and undertaken a lot of research work on the design and implementation of enterprise IP networks. He holds certificates on Backbone Routing, Multilayer Switching, Network Security, Wireless LANs and Security, WIMAX, VoIP, Internet Development Tools awarded by various institutions including USTTI-USA, IIT-Canada. He has attended other ICT courses in Kenya, South Africa, United Kingdom and the USA.*

*Stephen also holds an active certification in Cisco Certified Network Professional (CCNP), Cisco Certified Network Associate (CCNA), CCNA Security, and Cisco Quality of Service Certified and is Cisco Certified Academy Instructor (CCAI) for CCNA and CCNP Courses. He is a qualified Information Systems Auditor (CISA-ISACA).*

*His area of specialization is in the design, implementation and security of local and wide area enterprise & service provider IP networks utilizing advanced routing technologies and multilayer switching. He has expert knowledge of Ethernet technology, Wireless LANs technologies and TCP/IP protocol suite. Mr. Gachogu also specializes in deployment of enterprise MPLS, IPv6, Network Security and VOIP technologies.*

**For more information, please contact us on**

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