The IPv6 Program
Institute for Professional Development

The goal of this program will be to provide students with an overview of IPv6 technologies and an understanding of the key decisions and processes required to transition their organizations from IPv4-only networks to dual IPv4/IPv6 network infrastructures. Targeted student populations are network managers, technology managers, IT officers and others who must manage or participate in the transitioning of a corporate network to IPv6.

Need for the Program

With the allocation of the last free IPv4 address block by the Internet Assigned Numbers Authority (IANA) in February, 2011\(^1\), as well as the Obama administration mandate to update all federal clients to IPv6 compatibility by September, 2012\(^2\), there is a historic need for IPv6 training as thousands of corporate networks must be transitioned to IPv6 over the next few years. Job opportunities for those with IPv6 expertise are skyrocketing\(^3\).

Course Organization and Delivery

This will be a fully-online program. Course content will consist of approximately 20 hours of online video, reading materials, homework assignments, hands-on labs and a final case study project. Course content will be released to students in content modules, which will be made available online at specific dates throughout the course. Materials for each content module include:

- Online Videos
- Readings and Notes
- Live group meetings and Demos using Wimba (or other web meeting software)
- Homework
- Lab exercises using remotely accessible servers and CDM DLPod facilities

Tentative Module Topics

Module 1: Introduction to IPv6

- History of IPv6
- Motivations for IPv6 deployments
  - Federal government mandate

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• International adoption
  • Depletion of IPv4 address space

• IPv6 Myth and Realities
  • Business case for IPv6
  • IPv4 depletion
  • NAT vs. No NAT (include privacy issues)
  • IPv6 and security
  • IPv6 and QoS
  • IPv6 and Mobility
  • Renumbering in IPv6

• IPv4 addressing and routing review

Module 2: IPv6 Technical Fundamentals I

• Overview of IPv6 addressing
• IPv6 Address Types and Scopes
  • Overview of Scope concept
    ▪ Link-local
    ▪ Unique Local
    ▪ Global
  • Unicast
    ▪ Overview of global allocation
  • Anycast
  • Multicast
  • IPv6 and Layer2 addressing
  • IPv6 addresses required on a host

• IPv6 Packet Format
  • Basic header format
  • Extension headers

• ICMPv6
  • ICMPv6 Error Messages
  • ICMPv6 Information Messages
  • Source Address Selection

Module 3: IPv6 Technical Fundamentals II

• Neighbor Discovery Protocol
  • Overview
  • Comparison with v4
  • NS/ND
  • RA/RS
  • Default router selection
IPv6 services
- Obtaining IPv6 addresses
- Connecting to IPv6 services on the Internet
- Changes to Web, E-mail, etc. services
- DNS – changes for IPv6
- DHCPv6

IPv6 Multicasting
IPv6 Mobility
IPv6 QOS

Module 4: IPv6 Routing

- IPv6 packet processing and forwarding by routers
  - Coverage of routing option header
- Configuring Static routing
- Configuring routing protocols
  - RIPng
  - EIGRPv6
  - OSPFv6
  - IS-IS for IPv6
  - MP-BGP
- Multihoming
- Deployment considerations
  - Core
  - Distribution
  - Access

Module 5: Deployment and Transition

- The Migration Process
- Typical configurations
- Native support
- Dual Stack
- IPv6 Tunneling
  - 6to4
  - ISATAP
  - 6over4
Module 6: IPv6 Security and the Future

- IPv6 Threat Analysis
- IPSec Authentication and encryption
- IPv6 Firewalls
- IPv6 VPNs
- IPv6 IDS/IPS
  (much more to be added)
- IPv6 Network Management
- Optimizing IPv6 Performance
  o Include v4 – v6 coexistence
- Future of IPv6