

As PABX vendors implement the latest and greatest VoIP strategies in their PABX systems, an unfortunate design problem often occurs because the phone system is implemented on top of an existing data network system designed for PC and server use, but not for IP phone use.

The Designing & Implementing a Voice-Enabled IP Network course has been designed with three primary goals:

- To equip businesses with the necessary network knowledge to plan for and implement current or future VoIP deployment.
- To inform the student of the various VoIP networking standards currently used in the industry.
- To present a selection of implementation strategies suitable for VoIP implementation.

Anyone planning to upgrade or considering expansion of their PABX system in the near future should take advantage of this course.

Students will design and implement a secure network to simulate the introduction of an NEC IP PABX.

To accomplish this, they will configure Cisco routers and switches as well as NEC IP phones, ensuring IP Voice traffic is securely separated from PC IP traffic using VLAN technology and routing.

During the course students will also configure IP phones and observe the various networking standards at work, and use a PC based PABX (Asterisk) as well as the NEC PABX to place VoIP calls. They will observe the effects of delay and jitter caused by combining voice and data on an IP network, then configure Cisco routers and switches to minimise these problems. VoIP network design strategies will be discussed including different vendor offerings and implementations.

Students will receive a copy of Theodore Wallingford's popular book *Switching to VoIP* around which part of the course is based.

### Who Should Attend:

The Designing & Implementing a Voice-Enabled IP Network is ideal for anyone who is planning to replace or upgrade their PABX in the future.

### Prerequisites:

Students who attend this course should have a good understanding of the Internet Protocol (IP) and some familiarity with the Cisco command line interface would be an advantage.

### Format:

40% lecture, 60% exercises and hands-on labs with two softphones, two NEC DT700 IP phones, an Asterisk IP PABX, one Cisco switch and one Cisco router per group of two students.

### Course Content:

Voice and Data: Two Separate Worlds?

The PSTN

Key Systems and PBXs

Limits of Traditional Telephony

VoIP in the Home

VoIP in Business

VoIP's Changing Reputation

Voice over Data: Many Conversations, One Network

The Layers of a VoIP Network

Distributed Versus Centralised

Linux as a PBX

Free Telephony Software

Installing Legacy Interface Cards

Monitoring Asterisk

Circuit-Switched Telephony

Components of the PSTN

Customer Premises Equipment

Time Division Multiplexing

Point-to-Point Trunking

Legacy Endpoints

Dial-Plan and PBX Design

Enterprise Telephony Applications

Application Terminology

Basic Call

Handling

Administrative Applications

Messaging Applications

Advanced Call-Handling Applications

CTI Applications

Replacing the Voice Circuit with VoIP

The Dumb Transport

Voice Channels

Project: Set Up Custom Codec Selection and Enable an Independent Call Path

Replacing Call Signalling with VoIP

VoIP Signalling Protocols

H.323

SIP

IAX

MGCP

Cisco SCCP

Heterogeneous Signalling

VoIP Readiness

Assessing VoIP Readiness

Business Environment

Network Environment

Implementation Plan

Quality of Service

Latency, Packet Loss, and Jitter

CoS

802.1q VLAN

Quality of Service

Residential QoS

Voice QoS on Windows

Best Practices for Quality of Service

Troubleshooting Tools

VoIP Troubleshooting Tools

The Three Things You'll Troubleshoot

SIP Packet Inspection

Interoperability

Project: Trace Both Ends of a Call Setup with Log Comparison

When, Not if, You Have Problems...

Simulating Media Loads

PSTN Trunks

Dial-Tone Trunks

Routing PSTN Calls at Connect Points

Timing Trunk Transitions

Network Infrastructure for VoIP

Legacy Trunks

VoIP Trunks

Project: Build an Interactive Directory on a SIP Display Phone

Traditional Apps on the Converged Network

Fax and Modems

Fire and Burglary Systems

Surveillance Systems and Videoconferencing

Voice Mail and IVR

Emergency Dispatch

What Can Go Wrong?

Common Problem Situations

VoIP Vendors and Services

Softphones and Instant Messaging Software

Skype

Other Desktop Telephony Software

<p>◆<span style="white-space: pre;"> </span>Developer Tools and SoftPBX Systems</p>  
<p>◆<span style="white-space: pre;"> </span>VoIP Service Providers</p> <p>◆<span style="white-space: pre;"> </span>Telephony Hardware Vendors</p> <p>◆</p> <p>◆</p>