1. Course Title

**NATO Voice over IP Foundation Course**
Version 2.1

2. Identification Number (ID)

095

3. Purpose of the Course

There are a number of new technologies (to NATO) that are encompassed within the voice networks, such as Voice over IP (VoIP). Also a number of new products, such as Cisco CUCME, Cisco CUCM, Cisco Unity Connection and Microsoft LYNC, and various VoIP telephones and collaboration endpoints.

The aim of this course is to address these issues, and pull together the elements of ‘unified communications’ so that each student will, through theory and practical exercises be exposed to all the current voice systems that NATO are installing and utilising, in order to be able to maintain an effective, fully operational, converged voice network.

4. Learning Objectives

To provide military and civilian personnel foundation knowledge and skills to understand, basic administration of Voice Over IP systems

Upon completion of the course, the qualified student will be able to:

1. **NATO Voice Systems**
   Outline the different Voice Solutions used within the various NATO networks.

2. **Intro to Telephony Networks**
   Describe the fundamentals of Telephony, including:
   - Switching and switch types
   - Signalling
   - Local Loops
   - PBX and PSTN
   - Difference between analog and digital circuits

3. **Data & Packet Networks**
   Describe various network protocols (TCP/UDP, RTP)
   Define network addressing and sub-netting.
   Define Edge Devices.
   Describe Packet Telephony Networks.
4. **Introduction to VoIP**
   Describe what VoIP is.

5. **Introduction to SIP**
   - Define SIP
   - Describe the main components of SIP.
   - Define a number of VoIP protocols RTP RTCP
   - Discuss issues around VoIP (jitter, delay etc.)
   - Describe the main Codecs used by NATO.
   - QoS Overview

6. **Intro LAN**
   - Introduction.
   - Power Over Ethernet Advantages.
   - How PoE works.
   - Deploying PoE.
   - Understanding VLAN.
   - Deploying VLAN.
   - Configure Inter VLAN routing.

7. **CUCM: Overview/Architecture, Deployment, Administering/ Managing Services & Implementing IP Phones, Endpoints, Gateways, Call Routing, DIGIT Manipulation & Call coverage, Bandwidth Management & CAC.**

   **Overview/Architecture**
   - Describe the components and the functionality of a CUCM.
   - Describe the architecture and role of CUCM.
   - Describe the characteristics of the CUCM.
   - Describe the licensing model CUCM/PLM.

   **Deployment**
   - CUCM deployment options.
   - Characteristics of CUCM single-site deployment.
   - Characteristics of CUCM multisite deployment with centralized call processing.
   - Characteristics of CUCM multisite deployment with distributed call processing.
   - Characteristics of CUCM multisite with clustering over the WAN.
   - Support of Virtualized servers in CUCM.
   - Call-processing redundancy is provided in a CUCM.
   - Describe type of media resources (hardware-software).
   - Prime License Manager (PLM)
Administering/ Managing Services & Implementing IP Phones
- Describe Cisco Unified Communications Manager administration and user interface.
- Describe how to access the Cisco Unified Communications Manager user web interface.
- List elements used for general, initial configuration and network configuration options for CUCM.
- NTP servers and DHCP services in CUCM.
- Difference between network service and feature service.
- Working with Features Services (Cisco Call Manager)
- Enterprise parameters and enterprise phone configuration.
- Endpoints supported by CUCM.
- Boot sequences of CISCO Phones.
- How CUCM supports H.323 endpoints.
- Describe how CUCM supports third-party SIP Phones.

Endpoints
- Identify Endpoint configuration elements.
- Auto registration.
- Describe how to manually add phones to CUCM.
- Implementing Video Calls (Desktop Video)

Gateways
- Types of gateways that can interact with CUCM.
- MGCP gateways with CUCM.
- H.323 gateways with CUCM.
- SIP gateways with CUCM.

Call Routing
- Components of Dial Plan.
- Describe the concept of call routing in CUCM.
- Describe how CUCM analyzes digits.
- Features that relate to call routing.
- Calling Privilege (CoS).
- Describe partitions and Calling Search Spaces (CSS).

DIGIT Manipulation & Call coverage
CUCM Digit Manipulation
- Flow
- Elements
- Digit Prefix and Stripping
- Transformation Mask and Patterns
- Describe call coverage.
- Describe shared lines.
- Call hunting.

**Bandwidth Management & Call Admission Control**
- Describe techniques to reduce bandwidth on CUCM deployments.
- Describe and configure CAC mechanisms.

**Media Resources**
- Media Termination Point.
- Music of Hold (MoH) Servers.
- Software Conference Bridges and Meet-Me Conferences.
- Call Manager Features (Call Pickup, DND, Call Back, Call Park, etc)

8. **Cisco Unity Connection (VOICEMAIL)**

**Technical Overview**
Introduces the Cisco Unity Connection system in NATO networks.
Describe voice-mail integration options, requirements and features.
Examines various deployment options.

**Voice Mail Integration Overview**
- Single Site Deployment.
- Centralized and Decentralized Multisite Deployment.
- Cisco Unity Connection Integrations Options.
- Cisco Unity Client Interfaces Administration and RTMT.
- Voice-Messaging Design.

**Requirements for Voice-Mail Integration**
- CUC SCCP Integration.
- CUC SIP Integration.

**Integration with Cisco Unified Communications Manager**
- Cisco Unity Connection Configuration with SIP integration
- SIP Trunk.
- Route Pattern and Voice-Mail Settings.
- Voice Mail Profile.
- Voice Mail Hunt Pilot.
- SIP Phone System.
- Port Groups and Ports Configuration.
- Voice Mail Verification with Real Time Monitoring Tool.

**User Creation**
- Manual Adding
- Importing users from CUCM and LDAP Server.
- Creating Voice Mail Templates from new users.
- Working with personal Voice Mail.

**User Creation**
- Cisco Personal Communications Assistant (PCA).
- Access to PCA.
- Managing the Voice Mail through PCA.

9. **CUCME: Overview, Managing Endpoints, Dial Plans, Voice ports / Call legs and Dial peer, Digit Manipulation and Selection Path, Configuring Calling Privileges (COR).**

**Overview**
Describe the role of Cisco Unified Communications Solutions.
Describe the components of a CUCME solution.
Describe the role of Cisco Communications Manager Express and Unity Express.

**Managing Endpoints**
- Working IP Phones Files, TFTP Server and DHCP.
- Managing Endpoints and End users with CUCME.
- Describe the types of directory numbers and how to implement in CUCME.
- Explain how to configure directory numbers for SCCP Phones.
- Explain how to configure directory numbers for SIP Phones.
- Explain how to configure major parameter of SIP Phones.
- Implementing Video Calls with Collaboration endpoints.

**Dial Plans**
- Basic characteristics of a typical numbering plan and list types of dial plans.
- Attributes of a scalable numbering plan.
- Overlapping numbering plans and strategies to address the overlap.
- How to integrate private and public PSTN numbering plans.
- Describe how a voice gateway route calls.
- Endpoint addressing.
- Explain PSTN dial plan requirements.
- Explain ISDN dial plan requirements.
Voice ports / Call legs and Dial peer
- Voice ports
  - Analog
  - Digital E1/T1
- Call Legs & Dial Peers.

Digit Manipulation and Selection Path
- How Gateways collect, process and consumes digits.
- Components of digit Manipulation.
- Describe digit stripping, forwarding and prefixing and its configuration.
- Describe number expansion.
- Describe CLID manipulation.
- Describe voice translation rules and profiles.
- Describe how the voice gateways select the correct path.
- Explain how a gateway matches dial peers to determine path selection.
- Path selection strategies.
- Describe site code dialing and toll bypass.
- Explain the principle and characteristics of TEHO.

Configuring Calling Privileges (COR-CoS)
- Describe Calling Privileges.
- Describe how to implement COR on Cisco IOS gateways.
- Describe how to implement COR on Cisco SRST and CUCME.
- How configure COR.
- Describe how to configure COR.

10. CUBE
- Cisco Unified Border Element (CUBE) Overview.
- Resolve VoIP Interconnect Challenges using Cisco Unified Border Element.
- Common Deployments using Cisco Unified Border Element.


Features/Architecture and Deployment
- Features of Microsoft Lync .
- What is converge Communications.
- Social Networking Additions.
- Enterprise Voice Features.
- Lync Server 2013 tools.
- Lync 2013 clients.

**Design & Deploy Voice Infrastructure Lync Telephony Server**
- Preparing for Deployment.
- Reviewing the Design Process.
- Deploying Lync Server 2013
- Planning Tool
- AD preparation
- Deploy servers roles

**Client Deployment**
- Preparing for Client Deployment.
- Deploying and Managing Lync 2013 Clients.
- Preparing for Device Deployment.
- Deploying and Managing IP Phones.

**Enterprise Voice**
- Features of Lync Server 2013 Enterprise Voice.
- Preparing for Enterprise Voice.
- Deploying Enterprise Voice.

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5. **Qualification**

Voice over IP basic Technician

6. **Student Criteria**

1. The course is designed for military and civilian staff assigned within a NCISG, or within in a technical field in NATO (such as NCIA Sectors, NCIA CLD or similar).
2. Have met the Background Knowledge Prerequisites for this course.

7. **Rank**

- Selected officer
- Enlisted
- Civilian equivalent

8. **Language Proficiency**

according to STANAG 6001: English SLP 3232

9. **Security Clearance**
10. Course Length

10 working days (two weeks)

11. Special Instructions

i. A course entrance test will be taken, to gauge the level of student knowledge prior to the course starting

ii. The student must achieve a grade of 70 % on a comprehensive final practical exercise

iii. The student must achieve a grade of 70 % on a comprehensive final written examination

After daily lessons the students need access to Internet to review the on line documentation and practise using Packet Tracer.

12. Class Size

- Maximum
- Recommended
- Minimum

12/12/5

13. Nomination Procedures

www.nciss.nato.int

14. Pre-course Study Material

15. Location

The course is conducted at the NATO Communications and Information Systems School (NCISS), Latina Italy.

16. Background Knowledge Prerequisites

Students must have completed/passed Cisco On-Line CCENT (ICND1) NCISS ID 650 or NATO Networking Infrastructure (CCNA Routing & Switching) NCISS ID 236 courses* or any commercial training at CCNA or ICND1 and ICND2 lever or above
* This course is provided by NCISS as an online course and has to be completed/passed NLT4 weeks before course start.