

## SIPTO 1.0 - SIP Trunk Operations (SIPTO)

### **COURSE OVERVIEW:**

SIP Trunk Operations (SIPTO) is a 5-day instructor led course that is intended for Cisco collaboration administrators who need to understand the features and functionality of the SIP protocol, as implemented in Cisco's Collaboration deployments.

The course begins with an examination SIP Request and Response messages, their purpose, their meanings. We examine Session Description protocol (SDP) offers and answers. We explain SIP early offer and SIP early media. We also cover the purpose and configuration of Media Termination Points (MTP) and transcoders in our SIP deployments. We examine the headers that makeup all SIP messages.

Next, we examine the features and capabilities of CUCM SIP trunks. We cover the purpose of options available on the CUCM SIP Profiles that are used for trunks, and line-side endpoint configurations. We will configure SIP URI dialing on CUCM. We will use ILS, GDPR, and an SME server to dynamically distribute the dial plan among multiple CUCM clusters. We configure the Cisco SIP Proxy to route enterprise calls.

We will configure Session Border Controllers (CUBES) for a variety of connective purposes. We will demonstrate how the use of E.164 Pattern Maps and Server-Groups will significantly improve and simplify the CUBE configuration. We examine the call routing logic of both inbound and outbound dial peers. We configure Voice Translation Profiles and Dial Peer Groups. We configure URI Call Routing on the CUBE and demonstrate how Provisioning Policies allow administrators to select outbound dial peers based on inbound dial peer matching. We show you how to configure SIP Normalization on both the CUBE and CUCM, as well as how to configure the SIP OPTIONS ping keepalive feature.

In this course, we will spend an extensive amount of time Troubleshooting SIP calls. We will demonstrate many ways to collect SIP Traces and Debugs and show you how to use diagnostic programs that are available to examine and understand the various SIP debug and trace output.

Finally, you will configure a summary lab that will challenge you to use the knowledge and skills you will have learned throughout the course. You will configure an end-to-end SIP solution using multiple CUCM clusters and CUBEs. You will fulfill a list of SIP configuration requirements like what you will encounter in your real-world collaboration deployment.

### **WHO WILL BENEFIT FROM THIS COURSE?**

This course is intended for students who have general knowledge about:

- Cisco Unified Communications Manager
- Professionals with CCNA Voice and/or CCNP Voice Certification
- Customers that need to better understand the SIP protocol

### **PREREQUISITES:**

To fully benefit from this course, students should have the following prerequisite skills and knowledge:

- CCNA Voice or equivalent knowledge or,
- Knowledge gained from attending prerequisite courses: VFCC or ACUCM w/AUC

**COURSE OBJECTIVES:**

After this course, students will be able to...

- Examine and understand the purpose of SIP requests, responses, and SDP
- Configure SIP trunks and SIP Profiles on Cisco Unified Communication Manager (CUCM)
- Configure SIP call routing on Cisco SIP Proxy (CUSP)
- Configure URI Call routing on both CUCM and Session Border Controllers (CUBEs)
- Configure SIP CUBEs using a variety of features, including translation-profiles, patterns-maps, server groups, provision policies
- Gather SIP traces from servers, CUBEs, routers, phones, endpoints
- Diagnose and resolve SIP call routing issues, including one-way audio, misconfiguration, and many other commonly encountered “real world” issues
- Configure and troubleshoot SIP throughout their collaboration enterprise

**COURSE OUTLINE:****Module 1: Examining What is SIP**

- User Agents
- SIP Request and Responses
- Session Description Protocol (SDP)
- Early Offer
- Early Media
- Configuring Media Termination Points and Transcoders

**Module 2: Examining How to Read SIP Requests and Responses Headers**

- Examining the headers that comprise all SIP requests and responses
- Examining headers in INVITE
- Examining headers in 1xx responses
- Examining headers on 2xx Success response
- Examining headers in SIP error responses

**Module 3: Configuring SIP Trunks**

- Configuring SIP trunks to provide call routing
- Examining CUCM SIP trunk settings and understanding their purpose
- Examining CUCM SIP Profile settings and understanding their purpose

**Module 4: Configuring URI Dialing on CUCM**

- Configuring ILS
- Configuring GDPR
- Using SME to aggregate an ILS deployment
- Examining numerical URI call routing vs non-numerical URI call routing
- Configuring SIP Route Patterns
- Modifying SIP URI Enterprise Parameters

**Module 5: Configuring Cisco SIP Proxy**

- Examining SIP Proxy Call Processing
- Configuring SIP Proxy to manage enterprise calls

**Module 6: Configuring Session Border Controllers (CUBE) Call Routing**

- Examining PSTN connectivity: past and present
- Understanding inbound and outbound dial peer call logic
- Simplifying CUBE Configuration with E.164 Pattern Maps
- Simplifying CUBE Configuration with Server Groups
- Configuring CUBE Translation Profiles
- Configuring Dial Peer Groups

**Module 7: Configuring CUBE based URI Call Routing**

- Configuring inbound URL dial peer matching
- Configuring outbound URL dial peer matching
- Configuring SIP Calling and Connected Party Info
- Configuring Provisioning Policies
- Matching inbound dial peers for outbound dial peer selection

**Module 8: Troubleshooting SIP using Traces and Debug**

- Configuring SIP Traces using RTMT
- Using Wireshark AND TranslatorX to read SIP debugs and traces
- Configuring Traffic Export to capture SIP traffic on any IOS router
- Using Cisco Support Tools like CUBE DNA and Collaboration Analyzer to troubleshoot SIP calls

**Module 9: Configuring Additional SIP Settings**

- Configuring SIP Early offer on the CUBE
- Configuring MTP on SIP Trunk to support early offer
- Configuring SIP OPTIONS keepalives on CUBE
- Configuring Call Admission Control
- Configuring SIP Error Codes

**Module 10: Configuring SIP Normalization**

- Configuring SIP Normalization script using LUA on CUCM
- Modifying, Adding, Removing SIP Request and Responses using SIP profiles on CUBE

**Module 11: Configuring the Summary Lab**

- Configuring SIP trunks, CUBE, dial plan, and a variety of other settings students learned during the class. There is a list of requirements that students will fulfill, and SIP related problems that students will solve. This lab helps students solidify concepts and demonstrates their proficiency with building SIP deployments.

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