TELUS IP Trunking: Connecting Cisco Unified Communications Manager
7.1 via the Cisco Unified Border Element 8.5 (Enterprise Edition) using SIP

11/01/2011

Table of Contents

Introduction ........................................................................................................................................... 2
Network Topology ................................................................................................................................. 3
System Components .............................................................................................................................. 4
  Hardware Components ....................................................................................................................... 4
  The following hardware is required: .................................................................................................. 4
Features ................................................................................................................................................ 5
  Features Supported ......................................................................................................................... 5
  Features Not Supported ................................................................................................................... 5
Configuration ....................................................................................................................................... 6
  Configuring Cisco Unified Border Element ..................................................................................... 6
  Configuring the Cisco Unified Communications Manager ............................................................. 18
    SIP PRACK for early-media negotiation ...................................................................................... 18
    SIP Trunks .................................................................................................................................... 20
    SIP Trunk to IOS Voice Gateway for Fax Machine ..................................................................... 22
    Regions (codec settings) ............................................................................................................. 31
    Device Pool ................................................................................................................................. 32
    Route Group (SIP Trunk) ............................................................................................................. 33
    Route List .................................................................................................................................... 34
    Route Pattern ............................................................................................................................. 35
    IP phone configuration .................................................................................................................. 39
    IP Phone DN configuration .......................................................................................................... 45
    System Version ............................................................................................................................ 50
Acronyms ............................................................................................................................................ 51
Important Information ......................................................................................................................... 52

© 2010 Cisco Systems, Inc. All rights reserved.
Important notices, privacy statements, and trademarks of Cisco Systems, Inc. can be found on cisco.com
Page 1 of 54
EDCS# 1106716 Rev # 2

Testing was conducted in TELUS lab.
Introduction

Service Providers today, such as TELUS, are offering alternative methods to connect to the PSTN via their IP network. Most of these services utilize SIP as the primary signaling method and a centralized IP to TDM gateway to provide on-net and off-net services. TELUS IP Trunking is a service provider offering that allows connection to the PSTN and may offer the end customer a viable alternative to traditional PSTN connectivity via either Analog or T1 lines. A demarcation device between these services and customer owned services is recommended. The Cisco Unified Border Element provides demarcation, security, interworking and session management services.

- This application note describes how to configure a Cisco Unified Communications Manager (Cisco UCM) 7.1 with a Cisco Unified Border Element (Cisco UBE) for connectivity to TELUS IP Trunking SIP trunk service. The deployment model covered in this application note is CPE to PSTN. This document does not address 911 emergency outbound calls. For 911 feature service details contact TELUS directly.

- Testing was performed in accordance to TELUS test plan and all features were verified. Key features verified are: Listed under features in this document

- The Cisco Unified Border Element configuration detailed in this document is based on a lab environment with a simple dial-plan used to ensure proper interoperability between the TELUS SIP network and Cisco Unified Communications. The configuration described in this document details the important commands to have enabled for interoperability to be successful and care must be taken, by the network administrator deploying Cisco UBE, to ensure these commands are set per each dial-peer requiring to interoperate to TELUS’ SIP network.

- This application note does not engage the use of calling search spaces (CSS) or partitions on Cisco Unified Communications Manager.

Testing was conducted in TELUS lab.
Testing was conducted in TELUS lab.
System Components

Hardware Components

The following hardware is required:

- Cisco 2901 (Cisco 2900 family router)
- CUCM cluster with (2) Cisco MCS 7800 Series server (Cisco Unified Communications Manager)
- 3 Cisco Unified IP Phones (3-7960)
- Cisco 2801 as voice gateway for fax
- 1 Cisco 3550 powered Ethernet switch

Software Requirements

The following software is required:

- Cisco Unified Communications Manager Release 7.1(3). This solution was tested with 7.1.3.32900-4
- Cisco Unified Border Element Release 8.5 with IOS version 15.1.2T release. This configuration was tested with C2900-universalk9-mz.
Features

Features Supported

- Basic calls (inbound and outbound)
- Calling line (number) identification presentation (CLIP)
- Calling Name
- Calling line (number) identification restriction (CLIR)
- DTMF (RFC2833)
- Call hold and Resume
- Call transfer (including blind transfer)
- Call conference
- Call forward All, Busy and No answer
- Toll-free numbers
- Long calls durations
- Fax using t.38 and G.711 pass-through.

Features Not Supported

- Emergency 911 calls were not tested.
Configuration

Configuring Cisco Unified Border Element

TOROICCUBE1#sh version
Cisco IOS Software, C2900 Software (C2900-UNIVERSALK9-M), Version 15.1(2)T1, REL
EASE SOFTWARE (fc1)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 1986-2010 by Cisco Systems, Inc.
Compiled Wed 11-Aug-10 13:38 by prod_rel_team

ROM: System Bootstrap, Version 15.0(1r)M9, RELEASE SOFTWARE (fc1)
TOROICCUBE1 uptime is 23 weeks, 11 hours, 3 minutes
System returned to ROM by reload at 11:14:01 EST Thu Mar 24 2011
System restarted at 11:07:28 EST Thu Mar 24 2011
System image file is "flash0:c2900-universalk9-mz.SPA.151-2.T1.bin"
Last reload type: Normal Reload
Last reload reason: Reload Command

This product contains cryptographic features and is subject to United States and local country laws governing import, export, transfer and use. Delivery of Cisco cryptographic products does not imply third-party authority to import, export, distribute or use encryption. Importers, exporters, distributors and users are responsible for compliance with U.S. and local country laws. By using this product you agree to comply with applicable laws and regulations. If you are unable to comply with U.S. and local laws, return this product immediately. A summary of U.S. laws governing Cisco cryptographic products may be found at: http://www.cisco.com/wwl/export/crypto/tool/stqrg.html
If you require further assistance please contact us by sending email to export@cisco.com.
Cisco CISCO2901/K9 (revision 1.0) with 483328K/40960K bytes of memory.
Processor board ID FHK1442727M
2 Gigabit Ethernet interfaces
1 Virtual Private Network (VPN) Module
DRAM configuration is 64 bits wide with parity enabled.

© 2010 Cisco Systems, Inc. All rights reserved.
Important notices, privacy statements, and trademarks of Cisco Systems, Inc. can be found on cisco.com
Page 6 of 54
EDCS# 1106716 Rev # 2

Testing was conducted in TELUS lab.
255K bytes of non-volatile configuration memory.
254464K bytes of ATA System CompactFlash 0 (Read/Write)

License Info:
License UDI:

<table>
<thead>
<tr>
<th>Device#</th>
<th>PID</th>
<th>SN</th>
</tr>
</thead>
<tbody>
<tr>
<td>*0</td>
<td>CISCO2901/K9</td>
<td>FHK1442727M</td>
</tr>
</tbody>
</table>

Technology Package License Information for Module:'c2900'

<table>
<thead>
<tr>
<th>Technology</th>
<th>Technology-package</th>
<th>Type</th>
<th>Technology-package</th>
<th>Next reboot</th>
</tr>
</thead>
<tbody>
<tr>
<td>ipbase</td>
<td>ipbasek9</td>
<td>Permanent</td>
<td>ipbasek9</td>
<td></td>
</tr>
<tr>
<td>security</td>
<td>securityk9</td>
<td>Permanent</td>
<td>securityk9</td>
<td></td>
</tr>
<tr>
<td>uc</td>
<td>uck9</td>
<td>Permanent</td>
<td>uck9</td>
<td></td>
</tr>
<tr>
<td>data</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td></td>
</tr>
</tbody>
</table>

Configuration register is 0x2102

```
TOROICCUBE1#show run
Building configuration...

Current configuration : 10758 bytes
|
| Last configuration change at 18:15:15 EST Wed Aug 24 2011 by admin
| NVRAM config last updated at 16:54:24 EST Wed Aug 24 2011 by admin
| version 15.1
| service timestamps debug datetime msec
| service timestamps log datetime msec
| service password-encryption
```

Testing was conducted in TELUS lab.
Testing was conducted in TELUS lab.

Testing was conducted in TELUS lab.

1 This introduces the mode border-element command to distinguish between Cisco Unified Communications Manager Express and Cisco UBE configuration.
Testing was conducted in TELUS lab.

2 Enables the P-Asserted-Identity (PAI) privacy header in incoming and outgoing SIP requests or response messages.
3 Specifies that the asymmetric payload support is dual-tone multi-frequency (DTMF) only.
4 To force a Cisco Unified Border Element (Cisco UBE) to send a SIP invite with Early-Offer (EO) on the Out-Leg (OL), use the early-offer command in SIP or dial peer configuration mode.
5 Passes SIP messages that involve media-change from one IP leg to another IP leg.
6 Passes the privacy values from the received message to the next call leg.
voice translation-profile Call-Out
  translate calling 2

  license udi pid CISCO2901/K9 sn FHK1442727M
  hw-module pvdm 0/0

  username dc privilege 15 secret 5 $1$Kw2e$h4MFWEhxZH6dxY/Ufeou/
  username admin secret 5 $1$uDnF$XPmlrD0G5Lcxu6ahPPvptO
  username t807815 privilege 15 secret 5 $1$..f.$45HYmQ/uvkHuLYWQlxvXJV.

  redundancy inter-device'  
    scheme standby SB

  redundancy

  ip ssh source-interface GigabitEthernet0/0

  interface GigabitEthernet0/0
    description "Link to IC CUCM"
    ip address 10.10.1.109 255.255.255.0
    ip traffic-export apply test size 2000000
duplex auto
    speed auto
  
  interface GigabitEthernet0/1
    description "Link to TOR00XN-TCTS17 via 77 King lab pop"
    no ip address
duplex auto
    speed auto
  
  interface GigabitEthernet0/1.17

This feature allows for a redundant registrar for each SIP trunk and enables registrar redundancy across multiple service providers.

Testing was conducted in TELUS lab.
Testing was conducted in TELUS lab.
Testing was conducted in TELUS lab.

max Sessions 2
associate application SCCP
shutdown

dial-peer voice 2000 voip
description "TELUS SIP Trunk - NA calls"
translation-profile outgoing Call-Out
preference 1
destination-pattern 1........
signaling forward unconditional
session protocol sipv2
session target ipv4:172.27.48.7
voice-class codec 1
voice-class sip g729 annexb-all
voice-class sip early-offer forced
voice-class sip profiles 1
dtmf-relay rtp-nre
fax-relay sg3-to-g3
fax protocol pass-through g711ulaw
no vad

dial-peer voice 2001 voip
description "TELUS SIP Trunk - local calls"
translation-profile outgoing Call-Out
preference 1
destination-pattern ..........
signaling forward unconditional
session protocol sipv2
session target ipv4:172.27.48.7
voice-class codec 1
voice-class sip g729 annexb-all
voice-class sip early-offer forced
voice-class sip profiles 1
dtmf-relay rtp-nre
fax-relay sg3-to-g3
fax protocol pass-through g711ulaw
no vad

dial-peer voice 2002 voip
description "Production SBCs - International LD"
translation-profile outgoing Call-Out
preference 1
destination-pattern 011T
signaling forward unconditional
session protocol sipv2
session target ipv4:172.27.48.7
Testing was conducted in TELUS lab.
Testing was conducted in TELUS lab.
Testing was conducted in TELUS lab.
Testing was conducted in TELUS lab.

```plaintext
! telephony-service
  max-ephones 20
  max-dn 100
  ip source-address 10.10.1.109 port 2000
  max-conferences 8 gain -6
  moh music-on-hold.au
  transfer-system full-consult
  create cnf-files version-stamp Jan 01 2002 00:00:00

! line con 0
  login local
line aux 0
line vty 0 4
  access-class 23 in
  exec-timeout 30 0
  privilege level 15
  login local
  transport input telnet ssh
  transport output none
line vty 5 15
  access-class 23 in
  privilege level 15
  login local
  transport input telnet ssh
  transport output telnet ssh

! scheduler allocate 20000 1000
ntp server 10.10.1.1
ntp server 10.10.1.10
end
```
Configuring the Cisco Unified Communications Manager

SIP PRACK for early-media negotiation

---

8 Default condition is used during test calls for Disable Provisional Reliable Acknowledgements (PRACK).

Testing was conducted in TELUS lab.
Testing was conducted in TELUS lab.
Testing was conducted in TELUS lab.
Testing was conducted in TELUS lab.
SIP Trunk to IOS Voice Gateway for Fax Machine

Testing was conducted in TELUS lab.
Testing was conducted in TELUS lab.
Testing was conducted in TELUS lab.
Testing was conducted in TELUS lab.
Testing was conducted in TELUS lab.
Testing was conducted in TELUS lab.
Innovation-Fax#sh run
Building configuration...

Current configuration : 2041 bytes
!
version 12.4
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname Innovation-Fax
!
boot-start-marker
boot-end-marker
!
enable secret xxxxxxxxxxxxxxxx
!

Testing was conducted in TELUS lab.
no aaa new-model
memory-size iomem 25
ip cef
!
multilink bundle-name authenticated
!
voice-card 0
!
voice service voip
  fax protocol pass-through g711ulaw
  sip
  !
  archive
  log config
  hidekeys
!
interface FastEthernet0/0
  ip address 10.10.1.155 255.255.255.0
duplex auto
speed auto
!
ip http server
  no ip http secure-server
!
control-plane
!
voice-port 0/0/0
  description Innovation>FAX
  station-id name Innovation_FAX
  station-id number 2034
caller-id enable
!
voice-port 0/0/1
!
dial-peer voice 92 voip
destination-pattern 9T
session protocol sipv2

Testing was conducted in TELUS lab.
Testing was conducted in TELUS lab.

```
session target ipv4:10.10.1.250
dtmf-relay rtp-npe
codec g711ulaw
fax-relay sg3-to-g3
fax rate disable
fax protocol pass-through g711alaw
!
dial-peer voice 2000 voip
destination-pattern 2...
session protocol sipv2
session target ipv4:10.10.1.250
dtmf-relay rtp-npe
codec g711ulaw
fax-relay sg3-to-g3
fax rate disable
fax protocol pass-through g711alaw
!
dial-peer voice 2034 pots
destination-pattern 2034
incoming called-number 2034
port 0/0/0
!
dial-peer voice 1003 voip
destination-pattern 1...
session protocol sipv2
session target ipv4:10.10.1.250
dtmf-relay rtp-npe
codec g711ulaw
fax-relay sg3-to-g3
fax rate disable
fax protocol pass-through g711alaw
!
sip-ua
```
Testing was conducted in TELUS lab.
Testing was conducted in TELUS lab.
Testing was conducted in TELUS lab.
Testing was conducted in TELUS lab.
**Testing was conducted in TELUS lab.**
Please note that Digits 9. Predot will be discarded on all patterns on the outgoing SIP trunk. 9 was used only for route selection.

Testing was conducted in TELUS lab.
Testing was conducted in TELUS lab.
Testing was conducted in TELUS lab.
IP phone configuration

<table>
<thead>
<tr>
<th>Association Information</th>
<th>Phone Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Line 1: 1.2.3.4 in gttemplates.cisco.com</td>
<td>Product Type: Cisco 7965</td>
</tr>
<tr>
<td>Line 2: 2.3.4.5 in gttemplates.cisco.com</td>
<td>Device Protocol: SCCP</td>
</tr>
<tr>
<td></td>
<td>Registration</td>
</tr>
<tr>
<td></td>
<td>Registered with Cisco Unified Communications Manager 10.9.1.280</td>
</tr>
<tr>
<td></td>
<td>IPv4 Address</td>
</tr>
<tr>
<td></td>
<td>Active User ID</td>
</tr>
<tr>
<td></td>
<td>Device Pool</td>
</tr>
<tr>
<td></td>
<td>Common Device Configuration</td>
</tr>
<tr>
<td></td>
<td>Phone button Template</td>
</tr>
<tr>
<td></td>
<td>Secret Template</td>
</tr>
<tr>
<td></td>
<td>Common Phone Profile</td>
</tr>
<tr>
<td></td>
<td>Calling Search Space</td>
</tr>
<tr>
<td></td>
<td>AAR Calling Search Space</td>
</tr>
<tr>
<td></td>
<td>Media Resource Group List</td>
</tr>
<tr>
<td></td>
<td>User HOLD MOH Audio Source</td>
</tr>
<tr>
<td></td>
<td>Network Held MOH Audio Source</td>
</tr>
<tr>
<td></td>
<td>Location</td>
</tr>
<tr>
<td></td>
<td>AAR Group</td>
</tr>
<tr>
<td></td>
<td>User Locale</td>
</tr>
<tr>
<td></td>
<td>Network Locale</td>
</tr>
</tbody>
</table>

Testing was conducted in TELUS lab.
Testing was conducted in TELUS lab.
Testing was conducted in TELUS lab.
Testing was conducted in TELUS lab.
Testing was conducted in TELUS lab.
Testing was conducted in TELUS lab.
Testing was conducted in TELUS lab.
Testing was conducted in TELUS lab.
Testing was conducted in TELUS lab.
Testing was conducted in TELUS lab.
Testing was conducted in TELUS lab.
Testing was conducted in TELUS lab.
<table>
<thead>
<tr>
<th>Acronym</th>
<th>Definitions</th>
</tr>
</thead>
<tbody>
<tr>
<td>SIP</td>
<td>Session Initiation Protocol</td>
</tr>
<tr>
<td>MGCP</td>
<td>Media Gateway Control Protocol</td>
</tr>
<tr>
<td>SCCP</td>
<td>Skinny Client Control Protocol</td>
</tr>
<tr>
<td>Cisco UCM</td>
<td>Cisco Unified Communications Manager</td>
</tr>
<tr>
<td>Cisco UBE</td>
<td>Cisco Unified Border Element</td>
</tr>
</tbody>
</table>
Important Information

THE SPECIFICATIONS AND INFORMATION REGARDING THE PRODUCTS IN THIS MANUAL ARE SUBJECT TO CHANGE WITHOUT NOTICE. ALL STATEMENTS, INFORMATION, AND RECOMMENDATIONS IN THIS MANUAL ARE BELIEVED TO BE ACCURATE BUT ARE PRESENTED WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED. USERS MUST TAKE FULL RESPONSIBILITY FOR THEIR APPLICATION OF ANY PRODUCTS. IN NO EVENT SHALL CISCO OR ITS SUPPLIERS BE LIABLE FOR ANY INDIRECT, SPECIAL, CONSEQUENTIAL, OR INCIDENTAL DAMAGES, INCLUDING, WITHOUT LIMITATION, LOST PROFITS OR LOSS OR DAMAGE TO DATA ARISING OUT OF THE USE OR INABILITY TO USE THIS MANUAL, EVEN IF CISCO OR ITS SUPPLIERS HAVE BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

Testing was conducted in TELUS lab.
Testing was conducted in TELUS lab.