Understand CUSP Terminology and Routing Logic

Contents

Introduction

This document explains how Cisco Unified SIP Proxy (CUSP) call routing logic.

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Prerequisites

Requirements

Cisco recommends that you have the knowledge of these topics:

- General knowledge of Session Initiation Protocol (SIP)
- Conceptual Understanding of CUSP in voice network deployments

Terminology

Definitions

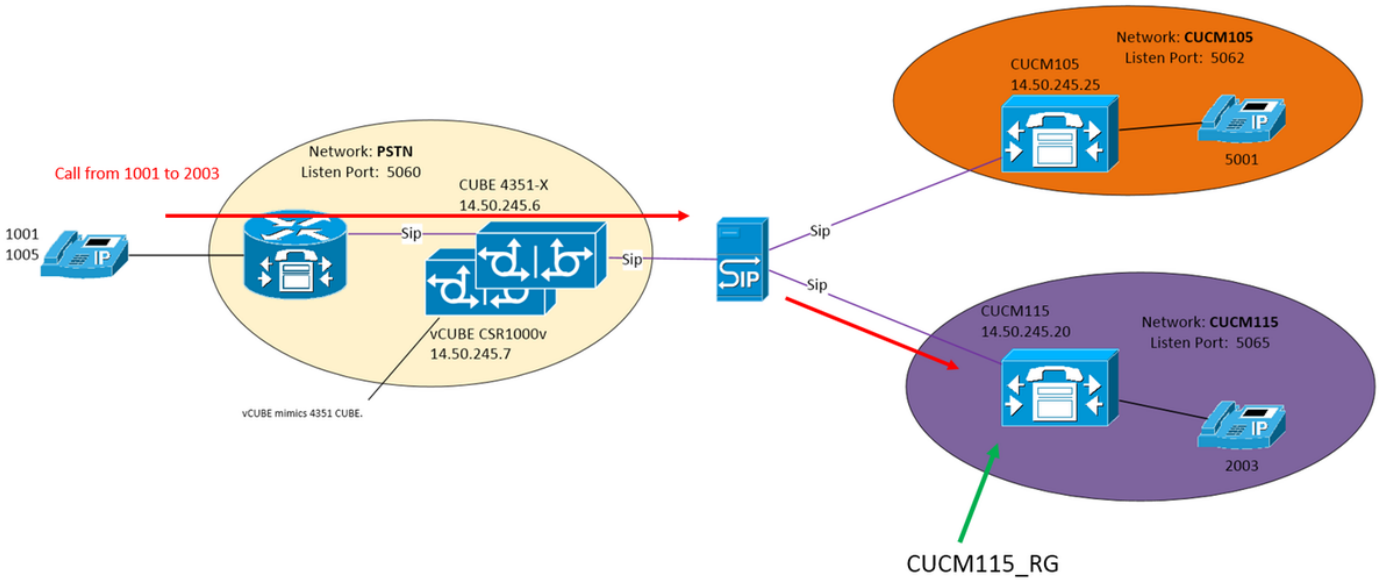
Term	**Definition**
Network	A SIP network is a logical collection of local interfaces that can be treated the same for general From <http://www.cisco.com/c/en/us/td/docs/voice_ip_comm/cusp/rel9_1/gui_configuration/en_US/co The Network logically defines areas of the network. The network can be defined using interface specific ports can be used to provide segmentation. To achieve this logical segmentation, sepa configured. (Example: Listen Ports 14.50.245.9:**5060**, 14.50.245.9:**5062**, 14.50.245.9:**5065** can define thre single CUSP layer 3 interface) Once the Networks are defined logically, they can be used to configured Triggers based on the **Note**: If you set up a listen port, ensure devices sending traffic to the CUSP use the correc port 14.50.245.9:**5065** for CUCM traffic, you must ensure CUCM sends traffic to port 5065,
Triggers	Triggers can be set to identify incoming messages. Triggers can identify Inbound Network, Local Port, Remote Network, etc.
Server Group	Server groups define the elements with which the Cisco Unified SIP Proxy system interacts for e From <http://www.cisco.com/c/en/us/td/docs/voice_ip_comm/cusp/rel9_1/gui_configuration/en_US/co ml> Both Server Group and Route Group can be used as destinations in the Route Table. A server used for redundant devices of the same type. A CUBE stack would be a good example of a Ser
Route Group	A route group allows you to designate the order in which gateways and trunks are selected. It al of gateways and ports for outgoing trunk selection. From <http://www.cisco.com/c/en/us/td/docs/voice_ip_comm/cusp/rel9_1/gui_configuration/en_US/co l> Both Server Group and Route Group can be used as destinations in the Route Table. A route g weighted group destinations to reach the same device. A direct SIP trunk to a CUCM and a SIP trunk to a PSTN gateway to reach the CUCM would be Group. The direct SIP trunk to the CUCM would be the prefered method, and the PSTN route w
Route Table	You configure route tables to direct SIP requests to their appropriate destinations. Each route ta **keys** that are matched based on the lookup policy. From <http://www.cisco.com/c/en/us/td/docs/voice_ip_comm/cusp/rel9_1/gui_configuration/en_US/co > Route Tables in CUSP are similar to Layer 3 routing tables. CUSP Route Tables consist of **Key** layer 3 routing tables. Route Tables link **Keys** to destinations. In the CUSP Route Table **Keys** can be mapped to the following route types to route SIP messa **destination**: a specific host or a locally configured server group can be configured as a destinat **route-group**: a locally configured route-group with one or more elements **route-policy**: route policies can be used to move between Route Tables similar to translation p **reponse**: rather than routing a SIP message, CUSP can send a specific response to terminate t **default-sip**: Simple routing following RFC 3263. **Note**: If mapping a **Key** to a route-policy, be cognizant of logical loops.
Route Policy	A Route Policy points to a a Route Table and defines how to use the **Key** in that route table. **Example**: Route Table Name: "FromCUCM105-RT" Lookup Key matches: "Prefix-Longest-Match" Lookup Key: "SIP Header: 'To' Phone" By separating the definition of the **Key** from the configured value of the **Key** the same Route Ta

ways. For example, one Route Policy could define the Route Table's **Key** as the prefix for a **TO**
Route Policy could define the Route Table's **Key** as the prefix for a **FROM:** header.

Routing Triggers Routing Triggers link a Trigger to a Route Policy.
Logically it states if a SIP message matches the Trigger, then use the configured Route Policy.

In summation, a SIP message is tagged with a **Network** based on the SIP listen port. The **Network** can be used to match a **Trigger**. The **Route Policy** then identifies which **Route Table** to use based on the **Trigger** and defines where to look for the **Key**. The **Route Table** will then use the **Key** to find out where to route the SIP message (Route Type). The Route Type (Host, **Server Group**, **Route Group**, etc) will be used to send the SIP message to the configured destination (**element**).

Network Topology



Call Example

Call from PSTN 1001 to 2003 on CUCM115

Basic Call Routing

Incoming Network: “PSTN”

Trigger: “From-PSTN-Trigger”

Triggers if incoming message matched Network “PSTN”

Routing Trigger: “FromPSTN-RPolicy” “From-PSTN-Trigger”

Links “From-PSTN-Trigger” to “FromPSTN-RPolicy”

Route Policy: “FromPSTN-RPolicy”

Specifies Routing table “PSTN-RT”

Specifies Lookup Key Matches “Prefix-Longest-Match”

Specifies Lookup Key is “SIP Header: 'To' Phone”

Route Table: “PSTN-RT”

Contains Key “2” to go to Route Group “CUCM115_RG”

Route Group (or Server Group): “CUCM115_RG”

Contains Element 14.50.245.20:5065

These configurations combine to make the logical statement:

For a call from the PSTN, where phone number prefix is 2, route to 14.50.245.20:5065

Configurations

PSTN - 2XXX and 5XXX calls are sent to CUSP via the CUBE and vCUBE

CUCM 10.5 - 1XXX and 2XXX are sent to CUSP via SIP trunk

CUCM 11.5 - 1XXX and 5XXX are sent to CUSP via SIP trunk

> **Note**: When using the GUI, some configurations must be committed before they are available in other configuration sections. These are marked with **###Commit Configuration**

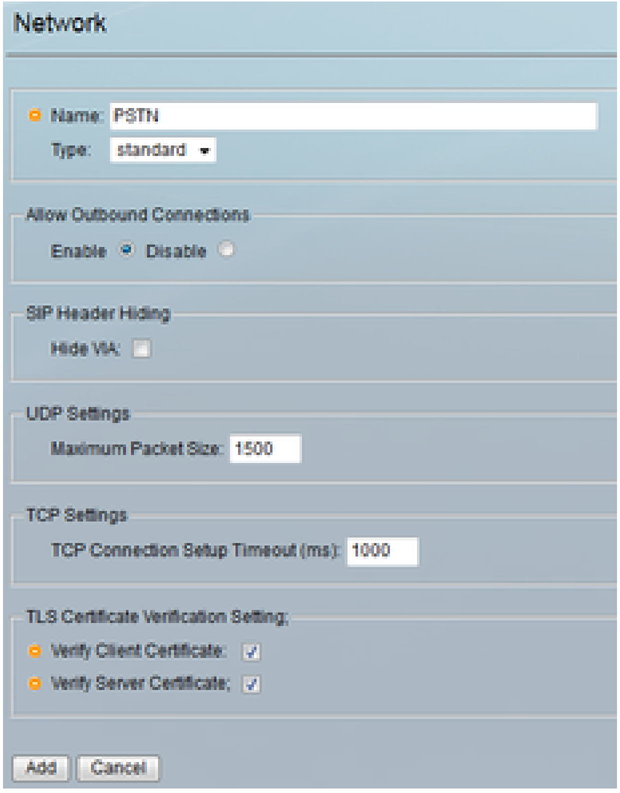
Key Configuration Elements

CLI Configuration	GUI Configuration

Create a Network

Configure >> Networks >> Add

```
sip network PSTN standard
```



Network

Name: PSTN

Type: standard

Allow Outbound Connections

Enable ● Disable ○

SIP Header Hiding

Hide VIA: □

UDP Settings

Maximum Packet Size: 1500

TCP Settings

TCP Connection Setup Timeout (ms): 1000

TLS Certificate Verification Setting:

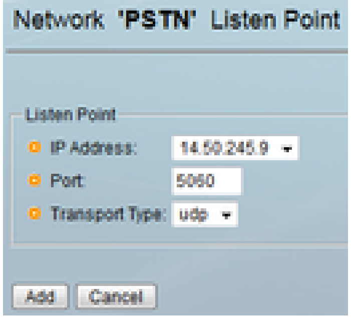
Verify Client Certificate: ☑

Verify Server Certificate: ☑

Define listening port to identify network 'PSTN'

Configure >> Networks >> [Network Name] >> S

Listen Points >> Add



Network **'PSTN'** Listen Point

Listen Point

IP Address: 14.50.245.9

Port: 5060

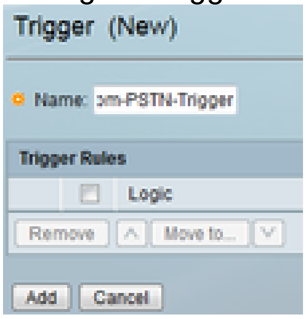
Transport Type: udp

```
sip listen PSTN udp 14.50.245.9 5060
```

Trigger for Inbound Network 'PSTN'

Configure >> Triggers >> Add

Configure Trigger Name



Trigger (New)

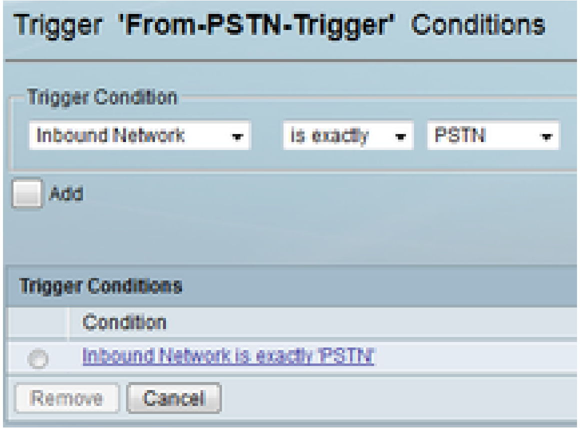
Name: om-PSTN-Trigger

Trigger Rules

□	Logic

Configure Trigger Condition and click add

```
trigger condition From-PSTN-Trigger
  sequence 1
   in-network ^\QPSTN\E$
   end sequence
  end trigger condition
```



Trigger 'From-PSTN-Trigger' Conditions

Trigger Condition

Inbound Network ▾ | is exactly ▾ | PSTN ▾

□ Add

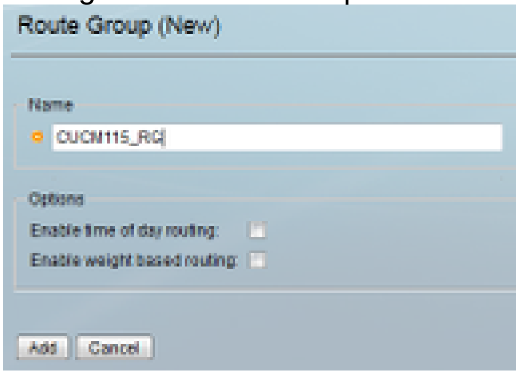
Trigger Conditions

	Condition
○	Inbound Network is exactly 'PSTN'

Specify a destination for 'CUCM115_RG'

Configure >> Route Groups >> Add (###Comm Configuration)

Configure a Route Group Name



Route Group (New)

Name: CUCM115_RG

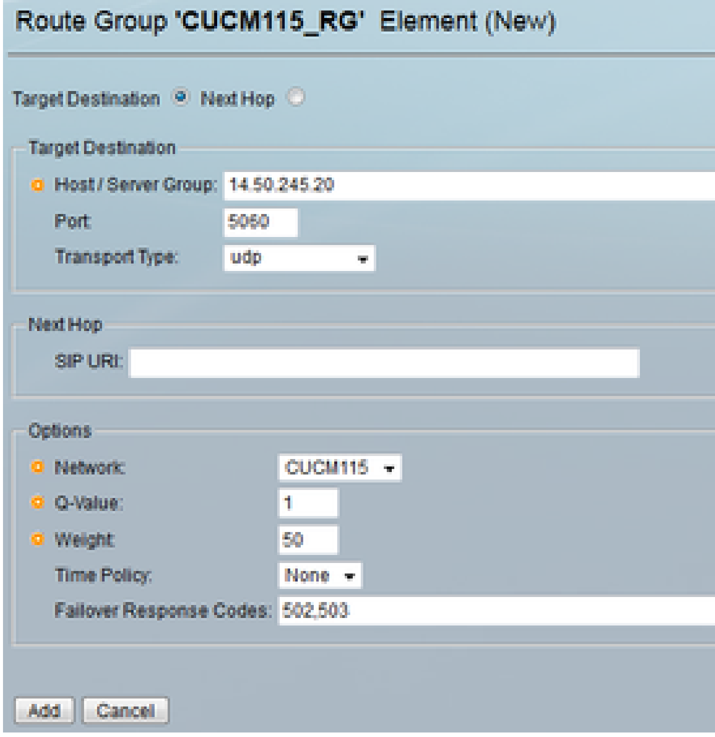
Options

Enable time of day routing: □

Enable weight based routing: □

Click "Click Here" under Elements Column, then C Add

Enter the Element Destination



Route Group 'CUCM115_RG' Element (New)

Target Destination ● Next Hop ○

Target Destination

Host / Server Group: 14.50.245.20

Port: 5060

Transport Type: udp ▾

Next Hop

SIP URI:

Options

Network: CUCM115 ▾

Q-Value: 1

Weight: 50

Time Policy: None ▾

Failover Response Codes: 502,503

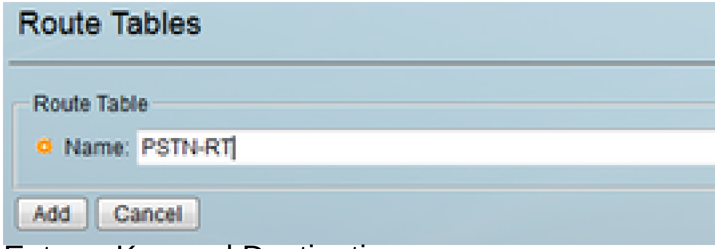
```
route group CUCM115_RG
  element target-destination 14.50.245.20:5065:udp
CUCM115 q-value 0.0
   failover-codes 502 - 503
   weight 50
   end element
  end route
```

Define Route Table and associate a key to a destination

Configure >> Route Tables >> Add (###Commit Configuration)

Configure a Route Table name

```
route table PSTN-RT
  key 2 group CUCM115_RG
  key 5 group CUCM105_RG
  end route table
```

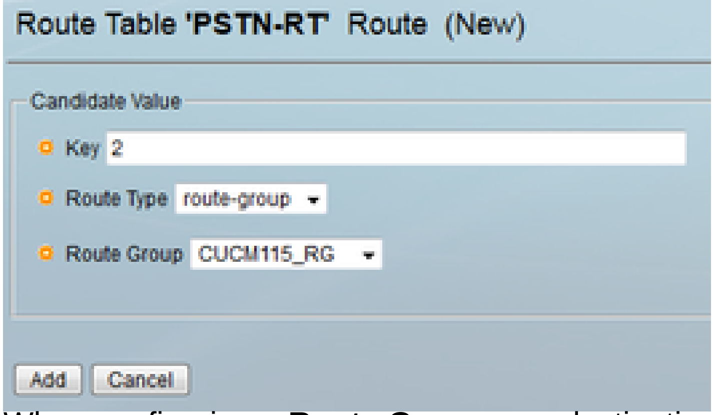


Route Tables

Route Table

Name: PSTN-RT

Enter a Kev and Destination



Route Table 'PSTN-RT' Route (New)

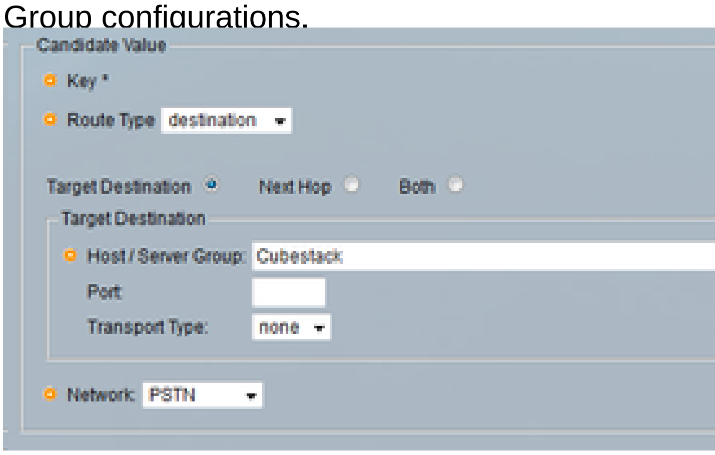
Candidate Value

Key 2

Route Type route-group

Route Group CUCM115_RG

When configuring a **Route Group** as a destination **Route Table**, do NOT add a port and transport typ adding a Port and/or Transport type, you are tellinc CUSP to look for DNS Host entry Cubestack:5060 rather than looking in the locally significant Server Group confiqurations.



Candidate Value

Key *

Route Type destination

Target Destination ● Next Hop ○ Both ○

Target Destination

Host / Server Group: Cubestack

Port:

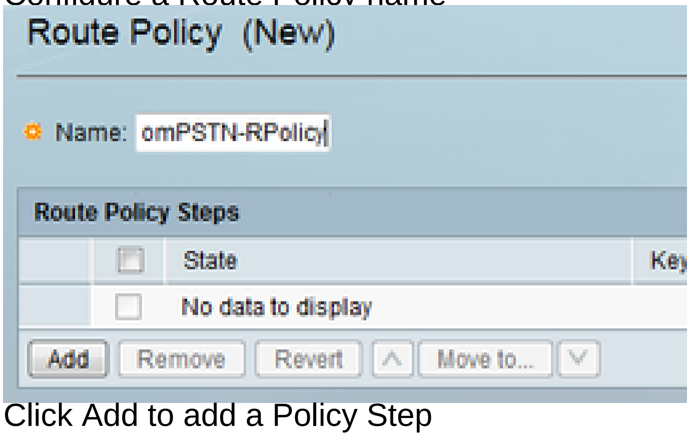
Transport Type: none

Network: PSTN

Define the Key for 'FromPSTN-RPolicy'

Configure >> Route Policies >> Add (###Comm Configuration)

Confiqure a Route Policv name



Route Policy (New)

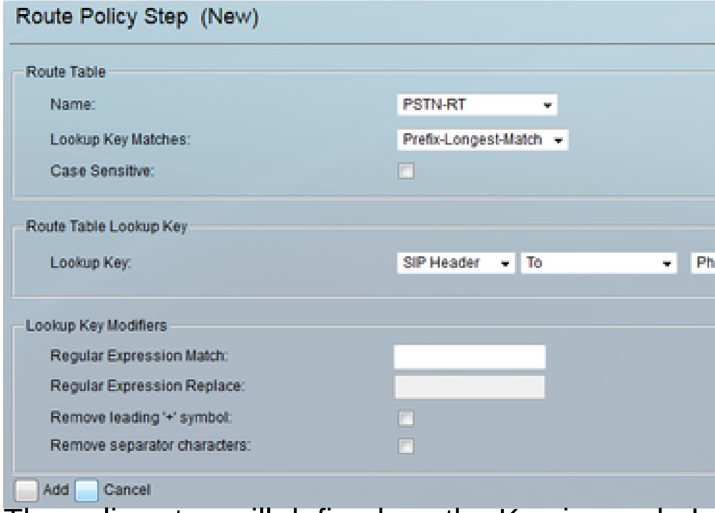
Name: omPSTN-RPolicy

Route Policy Steps

□	State	Key
□	No data to display	

Click Add to add a Policy Step

```
policy lookup FromPSTN-RPolicy
  sequence 100 PSTN-RT header to uri-component phone
   rule prefix
   end sequence
  end policy
```



Route Policy Step (New)

Route Table

Name: PSTN-RT

Lookup Key Matches: Prefix-Longest-Match

Case Sensitive: □

Route Table Lookup Key

Lookup Key: SIP Header To Ph

Lookup Key Modifiers

Regular Expression Match:

Regular Expression Replace:

Remove leading '+' symbol: □

Remove separator characters: □

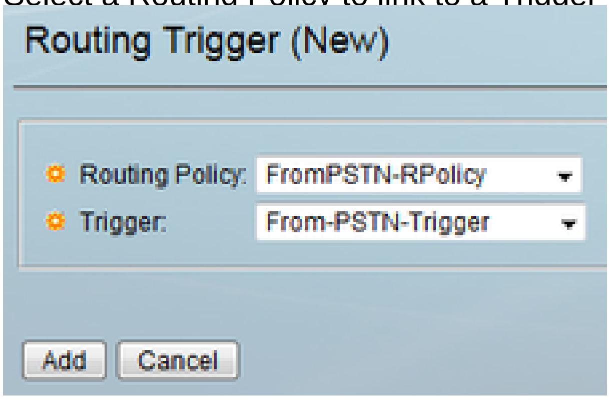
The policy step will define how the Key is used. In case, the policy looks for the longest **Phone** numb match on the **To:** field in the **SIP header**

Link the 'From-PSTN-Trigger' to 'FromPSTN-RPolicy'

Configure >> Routing Triggers >> Add

Select a Routing Policy to link to a Trigger

trigger routing sequence 2 policy FromPSTN-RPolicy condition From-PSTN-Trigger



Routing Trigger (New)

Routing Policy: FromPSTN-RPolicy

Trigger: From-PSTN-Trigger

Full Configuration

Note: show configuration active verbose will show the entire configuration including the Route Tables.

```
josmeado-CUSP(cusp)# show configuration active verbose
Building CUSP configuration...
!
server-group sip global-load-balance weight
server-group sip retry-after 250
server-group sip element-retries udp 2
server-group sip element-retries tls 1
server-group sip element-retries tcp 1
sip dns-srv
 enable
 no naptr
 end dns
!
no sip header-compaction
no sip logging
!
sip max-forwards 70
sip network CUCM105 standard
 no non-invite-provisional
 allow-connections
 no tls verify
 retransmit-count invite-client-transaction 3
 retransmit-count invite-server-transaction 5
 retransmit-count non-invite-client-transaction 3
 retransmit-timer T1 500
 retransmit-timer T2 4000
 retransmit-timer T4 5000
 retransmit-timer TU1 5000
 retransmit-timer TU2 32000
 retransmit-timer clientTn 64000
 retransmit-timer serverTn 64000
 tcp connection-setup-timeout 1000
 tls handshake-timeout 3000
 udp max-datagram-size 1500
 end network
!
sip network CUCM115 standard
 no non-invite-provisional
 allow-connections
 no tls verify
 retransmit-count invite-client-transaction 3
 retransmit-count invite-server-transaction 5
 retransmit-count non-invite-client-transaction 3
 retransmit-timer T1 500
 retransmit-timer T2 4000
 retransmit-timer T4 5000
 retransmit-timer TU1 5000
 retransmit-timer TU2 32000
 retransmit-timer clientTn 64000
 retransmit-timer serverTn 64000
 tcp connection-setup-timeout 1000
 tls handshake-timeout 3000
 udp max-datagram-size 1500
 end network
!
sip network PSTN standard
 no non-invite-provisional
 allow-connections
 no tls verify
 retransmit-count invite-client-transaction 3
 retransmit-count invite-server-transaction 5
 retransmit-count non-invite-client-transaction 3
 retransmit-timer T1 500
 retransmit-timer T2 4000
 retransmit-timer T4 5000
 retransmit-timer TU1 5000
 retransmit-timer TU2 32000
 retransmit-timer clientTn 64000
 retransmit-timer serverTn 64000
 tcp connection-setup-timeout 1000
 tls handshake-timeout 3000
 udp max-datagram-size 1500
 end network
!
sip overload reject retry-after 0
!
no sip peg-counting
!
sip privacy service
sip queue message
 drop-policy head
 low-threshold 80
 size 2000
 thread-count 20
 end queue
!
sip queue radius
 drop-policy head
 low-threshold 80
 size 2000
 thread-count 20
 end queue
!
sip queue request
 drop-policy head
 low-threshold 80
 size 2000
 thread-count 20
 end queue
!
sip queue response
 drop-policy head
 low-threshold 80
 size 2000
 thread-count 20
 end queue
!
sip queue st-callback
 drop-policy head
 low-threshold 80
 size 2000
 thread-count 10
 end queue
!
sip queue timer
 drop-policy none
 low-threshold 80
 size 2500
 thread-count 8
 end queue
!
sip queue xcl
 drop-policy head
 low-threshold 80
 size 2000
 thread-count 2
 end queue
!
route recursion
!
sip tcp connection-timeout 30
sip tcp max-connections 256
!
no sip tls
!
sip tls connection-setup-timeout 1
!
trigger condition From-CUCM105-Trigger
 sequence 1
  in-network ^\QCUCM105\E$
  end sequence
 end trigger condition
!
trigger condition From-CUCM115-Trigger
 sequence 1
  in-network ^\QCUCM115\E$
  end sequence
 end trigger condition
!
trigger condition From-PSTN-Trigger
 sequence 1
  in-network ^\QPSTN\E$
  end sequence
 end trigger condition
!
trigger condition mid-dialog
 sequence 1
  mid-dialog
  end sequence
 end trigger condition
!
accounting
 no enable
 no client-side
 no server-side
 end accounting
!
server-group sip group Cubestack PSTN
 element ip-address 14.50.245.6 5060 udp q-value 0.0 weight 1
 element ip-address 14.50.245.7 5060 udp q-value 0.0 weight 1
 failover-resp-codes 503
 lbtype weight
 ping
 end server-group
!
route group CUCM105_RG
 element target-destination 14.50.245.25:5062:udp CUCM105 q-value 0.0
  failover-codes 510
  weight 50
  end element
 end route
!
route group CUCM115_RG
 element target-destination 14.50.245.20:5065:udp CUCM115 q-value 0.0
  failover-codes 502 - 503
  weight 50
  end element
 end route
!
route table FromCUCM105-RT
 key * target-destination Cubestack PSTN
 key 2 group CUCM115_RG
 end route table
!
route table FromCUCM115-RT
 key 1 target-destination Cubestack PSTN
 key 5 group CUCM105_RG
 end route table
!
route table PSTN-RT
 key 2 group CUCM115_RG
 key 5 group CUCM105_RG
 end route table
!
policy lookup FromCUCM105-RPolicy
 sequence 100 FromCUCM105-RT header to uri-component phone
  rule prefix
  end sequence
 end policy
!
policy lookup FromCUCM115-RPolicy
```

```
 sequence 100 FromCUCM115-RT header to uri-component phone
  rule prefix
  end sequence
 end policy
!
policy lookup FromPSTN-RPolicy
 sequence 100 PSTN-RT header to uri-component phone
  rule prefix
  end sequence
 end policy
!
trigger routing sequence 1 by-pass condition mid-dialog
trigger routing sequence 2 policy FromPSTN-RPolicy condition From-PSTN-Trigger
trigger routing sequence 3 policy FromCUCM115-RPolicy condition From-CUCM115-Trigger
trigger routing sequence 4 policy FromCUCM105-RPolicy condition From-CUCM105-Trigger
!
server-group sip global-ping
!
no server-group sip ping-503
!
sip cac session-timeout 720
sip cac PSTN 14.50.245.6 5060 udp limit -1
sip cac PSTN 14.50.245.7 5060 udp limit -1
!
no sip cac
!
sip listen CUCM105 udp 14.50.245.9 5062
sip listen CUCM115 udp 14.50.245.9 5065
sip listen PSTN udp 14.50.245.9 5060
!
call-rate-limit 100
!
end
```

Troubleshoot

Trace Levels Configuration

In the CUSP GUI, navigate to **Troubleshoot >> Cisco Unified SIP Proxy >> Traces**

Trigger-Conditions - Level:debug: This will show which triggers were match to initate call routing.

Routing - Level:debug: This will show what was done during call routing. Which Key's were matched, what destination was chosen, etc.

SIP-Wire-Log - Level:debug: This will show the SIP messages received and sent.

Trace Collection

Via GUI

In the CUSP GUI, navigate to **Troubleshoot >> Cisco Unified SIP Proxy >> Traces**

Select Download Log File

You can also Clear Logs

Via FTP Client

By default there is no account with FTP privilages. To enable an account with FTP privilages add the user to a PFS group.

```
josmeado-CUSP# user platformadmin group ?
  Administrators    System administrators group
  pfs-privusers     PFS privileged users group
  pfs-readonly      PFS read only group
josmeado-CUSP# user platformadmin group pfs
```

Via FTP Client, connect to CUSP. **File Path:** cusp >> log >> trace >> trace.log

Trace Order

1. **SIP-Wire-Log** - Incoming SIP Invite
2. **SIP-Wire-Log** - Return 100 Trying
3. **Trigger-Condition** - Identify Network and Trigger Route Policy
4. **Routing** - See Routing Trace section below for details
5. **SIP-Wire-Log** - Send Invite toward destination
6. **SIP-Wire-Log** - Continue normal SIP transactions until there is a 200 Ok message for each call leg

Trigger-Condition Trace Sample

```
13:24:36:987 08:17:2017 vCUSP,9.1.5,josmeado-CUSP,14.50.245.9,trace.log
[REQUESTI.7] DEBUG 2017.08.17 13:25:03:006 conditions.RegexCondition - inNetwork='PSTN'
[REQUESTI.7] DEBUG 2017.08.17 13:25:03:006 conditions.RegexCondition - IN_NETWORK: PSTN
[REQUESTI.7] DEBUG 2017.08.17 13:25:03:006 conditions.AbstractRegexCondition -
pattern(^\QPSTN\E$), toMatch(PSTN) returning true
[REQUESTI.7] DEBUG 2017.08.17 13:25:03:006 triggers.ModuleTrigger - ModuleTrigger.eval()
action<FromPSTN-RPolicy> actionParameter<>
[REQUESTI.7] DEBUG 2017.08.17 13:25:03:006 triggers.ModuleTrigger - ModuleTrigger.eval() got the
policy, executing it ...
```

In the above sample, we see the network is matched as PSTN, which is used in Route Policy "FromPSTN-RPolicy".

Routing Trace Sample

```
13:29:13:453 08:17:2017 vCUSP,9.1.5,josmeado-CUSP,14.50.245.9,trace.log
[REQUESTI.7] DEBUG 2017.08.17 13:29:33:987 nrs.XCLNRSShiftRoutes - Entering
ShiftAlgorithms.execute()
[REQUESTI.7] DEBUG 2017.08.17 13:29:33:987 nrs.XCLNRSShiftRoutes - Leaving
ShiftAlgorithms.execute()
[REQUESTI.7] DEBUG 2017.08.17 13:29:33:987 modules.XCLLookup - Entering execute()
[REQUESTI.7] DEBUG 2017.08.17 13:29:33:987 nrs.XCLPrefix - Entering getKeyValue()
[REQUESTI.7] DEBUG 2017.08.17 13:29:33:987 nrs.FieldSelector - getToUri: To header obtained -
To: <sip:2003@14.50.245.9>

[REQUESTI.7] DEBUG 2017.08.17 13:29:33:987 nrs.FieldSelector - getUriPart: URI -
sip:2003@14.50.245.9 part 1
[REQUESTI.7] DEBUG 2017.08.17 13:29:33:987 nrs.FieldSelector - Requested field 52
```

```
[REQUESTI.7] DEBUG 2017.08.17 13:29:33:987 nrs.FieldSelector - Returning key 2003
[REQUESTI.7] DEBUG 2017.08.17 13:29:33:987 nrs.XCLPrefix - Leaving getKeyValue()
[REQUESTI.7] DEBUG 2017.08.17 13:29:33:987 modules.XCLLookup - table=PSTN-RT, key=2003
[REQUESTI.7] INFO  2017.08.17 13:29:33:987 modules.XCLLookup - table is PSTN-RT
[REQUESTI.7] DEBUG 2017.08.17 13:29:33:987 routingtables.RoutingTable - Entering lookup()
[REQUESTI.7] DEBUG 2017.08.17 13:29:33:987 routingtables.RoutingTable - Looking up 2003 in table
PSTN-RT with rule prefix and modifiers=none
[REQUESTI.7] DEBUG 2017.08.17 13:29:33:987 routingtables.RoutingTable - Entering
applyModifiers()
[REQUESTI.7] DEBUG 2017.08.17 13:29:33:987 routingtables.RoutingTable - Leaving
applyModifiers(), returning 2003
[REQUESTI.7] DEBUG 2017.08.17 13:29:33:988 routingtables.RoutingTable - Leaving lookup()
[REQUESTI.7] INFO  2017.08.17 13:29:33:988 nrs.XCLPrefix - NRS Routing decision is:
RouteTable:PSTN-RT, RouteKey:2, RouteGroup:CUCM115_RG
[REQUESTI.7] DEBUG 2017.08.17 13:29:33:988 loadbalancer.LBFactory - Entering
createLoadBalancer()
[REQUESTI.7] INFO  2017.08.17 13:29:33:988 loadbalancer.LBFactory - lbtype is 3(call-id)
[REQUESTI.7] DEBUG 2017.08.17 13:29:33:988 loadbalancer.LBFactory - Leaving createLoadBalancer()
[REQUESTI.7] DEBUG 2017.08.17 13:29:33:988 nrs.XCLPrefix - Stored NRSAlgResult=isFound=true,
isFailure=false, Response=-1, Routes=[Ruri: 14.50.245.20:5065:udp, Route: null, Network:
CUCM115, q-value=0.0radvance=[502, 503]], PolicyAdvance=null [REQUESTI.7] DEBUG 2017.08.17
13:29:33:988 nrs.NRSAlgResult - set policyAdvance as specified in route=RouteTable:PSTN-RT,
RouteKey:2, RouteGroup:CUCM115_RG
[REQUESTI.7] DEBUG 2017.08.17 13:29:33:988 nrs.NRSAlgResult - no policyAdvance specified in
route
[REQUESTI.7] DEBUG 2017.08.17 13:29:33:988 nrs.NRSAlgResult - set policyAdvance as specified in
algorithm={lookuprule=1, lookupfield=52, lookuplenght=-1, lookuptable=PSTN-RT, sequence=100,
algorithm=1}
[REQUESTI.7] DEBUG 2017.08.17 13:29:33:988 nrs.NRSAlgResult - no policyAdvance specified in
algorithm
[REQUESTI.7] DEBUG 2017.08.17 13:29:33:988 modules.XCLLookup - Leaving execute()
[REQUESTI.7] DEBUG 2017.08.17 13:29:33:988 nrs.XCLNRSShiftRoutes - Entering
ShiftRoutes.execute()
[REQUESTI.7] DEBUG 2017.08.17 13:29:33:988 loadbalancer.LBBase - Entering getServer()
[REQUESTI.7] DEBUG 2017.08.17 13:29:33:988 loadbalancer.LBBase - Entering initializeDomains()
[REQUESTI.7] DEBUG 2017.08.17 13:29:33:988 nrs.NRSRoutes - routes before applying time policies:
[Ruri: 14.50.245.20:5065:udp, Route: null, Network: CUCM115, q-value=0.0radvance=[502, 503]]
[REQUESTI.7] DEBUG 2017.08.17 13:29:33:988 nrs.NRSRoutes -routes after applying time policies:
[Ruri: 14.50.245.20:5065:udp, Route: null, Network: CUCM115, q-value=0.0radvance=[502, 503]]
[REQUESTI.7] DEBUG 2017.08.17 13:29:33:988 loadbalancer.LBBase - Leaving initializeDomains()
[REQUESTI.7] INFO  2017.08.17 13:29:33:988 loadbalancer.LBHashBased - list of elements in order
on which load balancing is done : Ruri: 14.50.245.20:5065:udp, Route: null, Network: CUCM115, q-
value=0.0radvance=[502, 503],
[REQUESTI.7] DEBUG 2017.08.17 13:29:33:988 loadbalancer.LBBase - Server group route-sg selected
Ruri: 14.50.245.20:5065:udp, Route: null, Network: CUCM115, q-value=0.0radvance=[502, 503]
[REQUESTI.7] DEBUG 2017.08.17 13:29:33:988 loadbalancer.LBBase - Leaving getServer()
[REQUESTI.7] DEBUG 2017.08.17 13:29:33:988 nrs.XCLNRSShiftRoutes - Leaving ShiftRoutes.execute()
```

1. **CUSP gets the Key value in the TO: header**

2. **CUSP identifies the Key as 2003**

3. **CUSP Looks up the Key in the Routing Table**

4. **CUSP matches an entry in the Routing Table and identifies destination RouteGroup:CUCM115_RG**

5. **CUSP applies loadbalancing within teh RouteGroup**

6. **CUSP identifies the specific Element in the RouteGroup to which it will send the SIP message**

7. **CUSP applies Time Policies if applicable**

8. **CUSP finalizes the Element to which it will send a SIP Message**

SIP-Wire-Log Trace Sample

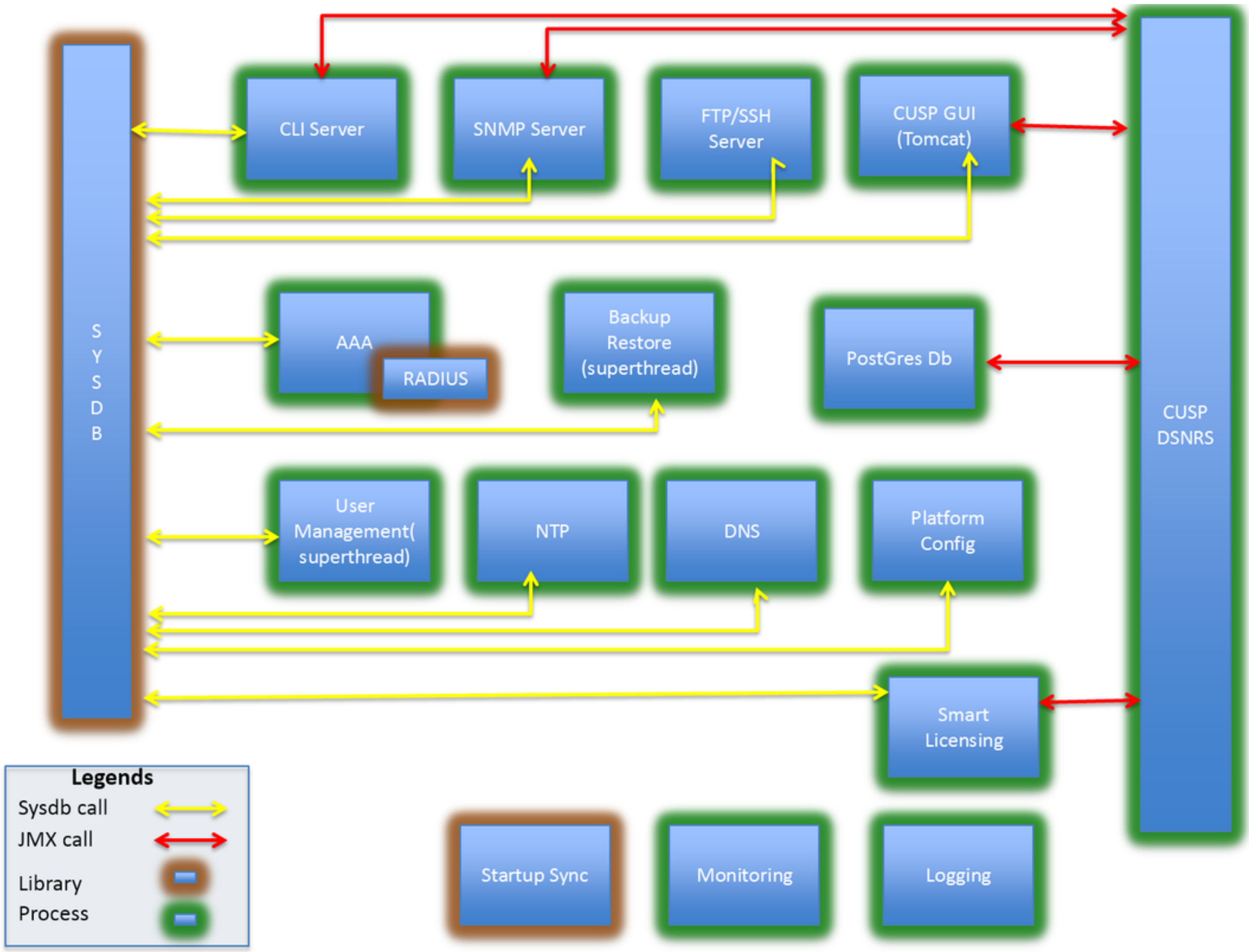
```
13:29:13:453 08:17:2017 vCUSP,9.1.5,josmeado-CUSP,14.50.245.9,trace.log
[REQUESTI.7] DEBUG 2017.08.17 13:29:33:987 nrs.XCLNRSShiftRoutes - Entering
ShiftAlgorithms.execute()
[REQUESTI.7] DEBUG 2017.08.17 13:29:33:987 nrs.XCLNRSShiftRoutes - Leaving
ShiftAlgorithms.execute()
[REQUESTI.7] DEBUG 2017.08.17 13:29:33:987 modules.XCLLookup - Entering execute()
[REQUESTI.7] DEBUG 2017.08.17 13:29:33:987 nrs.XCLPrefix - Entering getKeyValue()
[REQUESTI.7] DEBUG 2017.08.17 13:29:33:987 nrs.FieldSelector - getToUri: To header obtained -
To: <sip:2003@14.50.245.9>

[REQUESTI.7] DEBUG 2017.08.17 13:29:33:987 nrs.FieldSelector - getUriPart: URI -
sip:2003@14.50.245.9 part 1
[REQUESTI.7] DEBUG 2017.08.17 13:29:33:987 nrs.FieldSelector - Requested field 52
[REQUESTI.7] DEBUG 2017.08.17 13:29:33:987 nrs.FieldSelector - Returning key 2003
[REQUESTI.7] DEBUG 2017.08.17 13:29:33:987 nrs.XCLPrefix - Leaving getKeyValue()
[REQUESTI.7] DEBUG 2017.08.17 13:29:33:987 modules.XCLLookup - table=PSTN-RT, key=2003
[REQUESTI.7] INFO  2017.08.17 13:29:33:987 modules.XCLLookup - table is PSTN-RT
[REQUESTI.7] DEBUG 2017.08.17 13:29:33:987 routingtables.RoutingTable - Entering lookup()
[REQUESTI.7] DEBUG 2017.08.17 13:29:33:987 routingtables.RoutingTable - Looking up 2003 in table
PSTN-RT with rule prefix and modifiers=none
[REQUESTI.7] DEBUG 2017.08.17 13:29:33:987 routingtables.RoutingTable - Entering
applyModifiers()
[REQUESTI.7] DEBUG 2017.08.17 13:29:33:987 routingtables.RoutingTable - Leaving
applyModifiers(), returning 2003
[REQUESTI.7] DEBUG 2017.08.17 13:29:33:988 routingtables.RoutingTable - Leaving lookup()
[REQUESTI.7] INFO  2017.08.17 13:29:33:988 nrs.XCLPrefix - NRS Routing decision is:
RouteTable:PSTN-RT, RouteKey:2, RouteGroup:CUCM115_RG
[REQUESTI.7] DEBUG 2017.08.17 13:29:33:988 loadbalancer.LBFactory - Entering
createLoadBalancer()
[REQUESTI.7] INFO  2017.08.17 13:29:33:988 loadbalancer.LBFactory - lbtype is 3(call-id)
[REQUESTI.7] DEBUG 2017.08.17 13:29:33:988 loadbalancer.LBFactory - Leaving createLoadBalancer()
[REQUESTI.7] DEBUG 2017.08.17 13:29:33:988 nrs.XCLPrefix - Stored NRSAlgResult=isFound=true,
isFailure=false, Response=-1, Routes=[Ruri: 14.50.245.20:5065:udp, Route: null, Network:
CUCM115, q-value=0.0radvance=[502, 503]], PolicyAdvance=null [REQUESTI.7] DEBUG 2017.08.17
13:29:33:988 nrs.NRSAlgResult - set policyAdvance as specified in route=RouteTable:PSTN-RT,
RouteKey:2, RouteGroup:CUCM115_RG
[REQUESTI.7] DEBUG 2017.08.17 13:29:33:988 nrs.NRSAlgResult - no policyAdvance specified in
route
[REQUESTI.7] DEBUG 2017.08.17 13:29:33:988 nrs.NRSAlgResult - set policyAdvance as specified in
algorithm={lookuprule=1, lookupfield=52, lookuplenght=-1, lookuptable=PSTN-RT, sequence=100,
algorithm=1}
[REQUESTI.7] DEBUG 2017.08.17 13:29:33:988 nrs.NRSAlgResult - no policyAdvance specified in
algorithm
[REQUESTI.7] DEBUG 2017.08.17 13:29:33:988 modules.XCLLookup - Leaving execute()
[REQUESTI.7] DEBUG 2017.08.17 13:29:33:988 nrs.XCLNRSShiftRoutes - Entering
ShiftRoutes.execute()
[REQUESTI.7] DEBUG 2017.08.17 13:29:33:988 loadbalancer.LBBase - Entering getServer()
[REQUESTI.7] DEBUG 2017.08.17 13:29:33:988 loadbalancer.LBBase - Entering initializeDomains()
[REQUESTI.7] DEBUG 2017.08.17 13:29:33:988 nrs.NRSRoutes - routes before applying time policies:
[Ruri: 14.50.245.20:5065:udp, Route: null, Network: CUCM115, q-value=0.0radvance=[502, 503]]
[REQUESTI.7] DEBUG 2017.08.17 13:29:33:988 nrs.NRSRoutes -routes after applying time policies:
[Ruri: 14.50.245.20:5065:udp, Route: null, Network: CUCM115, q-value=0.0radvance=[502, 503]]
[REQUESTI.7] DEBUG 2017.08.17 13:29:33:988 loadbalancer.LBBase - Leaving initializeDomains()
[REQUESTI.7] INFO  2017.08.17 13:29:33:988 loadbalancer.LBHashBased - list of elements in order
on which load balancing is done : Ruri: 14.50.245.20:5065:udp, Route: null, Network: CUCM115, q-
```

```
value=0.0radvance=[502, 503],
[REQUESTI.7] DEBUG 2017.08.17 13:29:33:988 loadbalancer.LBBase - Server group route-sg selected
Ruri: 14.50.245.20:5065:udp, Route: null, Network: CUCM115, q-value=0.0radvance=[502, 503]
[REQUESTI.7] DEBUG 2017.08.17 13:29:33:988 loadbalancer.LBBase - Leaving getServer()
[REQUESTI.7] DEBUG 2017.08.17 13:29:33:988 nrs.XCLNRSShiftRoutes - Leaving ShiftRoutes.execute()
```

SIP-Wire-Log shows the normal SIP messaging up to the 200 Okay for both call legs.

Architectural Reference



SYSDB
CLI Server
SNMP Server
FTP/SSH Server
CUSP GUI (Tomcat)
AAA
RADIUS
Backup Restore (superthread)
PostGres Db
User Management(superthread)
NTP
DNS
Platform Config
Smart Licensing
CUSP DSNRS
Startup Sync
Monitoring
Logging
Legends
Sysdb call
JMX call
Library
Process