Oracle Enterprise Communication Broker, Enterprise Session Border Controller, Oracle Enterprise Operations Monitor and Acano Video Transcoding with Lync 2013 and Cisco CUCM

Technical Application Note
Disclaimer

The following is intended to outline our general product direction. It is intended for information purposes only, and may not be incorporated into any contract. It is not a commitment to deliver any material, code, or functionality, and should not be relied upon in making purchasing decisions. The development, release, and timing of any features or functionality described for Oracle’s products remain at the sole discretion of Oracle.
Table of Contents

INTENDED AUDIENCE .................................................................................................................. 5

DOCUMENT OVERVIEW ............................................................................................................... 5

INTRODUCTION ............................................................................................................................ 6

AUDIENCE ...................................................................................................................................... 6
REQUIREMENTS ............................................................................................................................. 6
ARCHITECTURE ............................................................................................................................ 7
  Video Transcoding .................................................................................................................. 7
  Audio Transcoding ................................................................................................................. 8
  Overall architecture ................................................................................................................. 8
LAB CONFIGURATION .................................................................................................................. 9

CONFIGURING THE ORACLE E-SBC & ECB ........................................................................... 10

IN SCOPE .................................................................................................................................... 10
OUT OF SCOPE ........................................................................................................................... 10

E-SBC CONFIGURATION .......................................................................................................... 10

AUDIO TRANSCODING ............................................................................................................. 10

ECB CONFIGURATION ............................................................................................................. 12

SIP INTERFACE ........................................................................................................................... 12
SIP PORT ...................................................................................................................................... 13
AGENTS ....................................................................................................................................... 14
CALL ROUTING .......................................................................................................................... 15
VIDEO CODEC POLICY .................................................................................................................. 16
  Policy Conditions .................................................................................................................. 17
  Policy Action ......................................................................................................................... 18
AUDIO CODEC POLICY .................................................................................................................. 19
  Policy Conditions .................................................................................................................. 20
  Policy Action ......................................................................................................................... 21
HEADER MANIPULATION RULES ............................................................................................ 21
  Outbound HMR to Acano ....................................................................................................... 21
  Inbound HMR from Acano ...................................................................................................... 22
  Outbound to CUCM .............................................................................................................. 23
  Inbound from CUCM & Lync ............................................................................................... 24
  Outbound to Lync .................................................................................................................. 24

TEST PLAN ..................................................................................................................................... 26

APPENDIX A ............................................................................................................................... 27

E-SBC CONFIGURATION .......................................................................................................... 27

APPENDIX B ................................................................................................................................ 28

FULL ECB CONFIGURATION .................................................................................................... 28

APPENDIX C ............................................................................................................................... 36
**Intended Audience**

This document is intended for use by Oracle Systems Engineers, third party Systems Integrators, and end users of the Oracle Enterprise Session Border Controller (E-SBC), Communications Broker (ECB) & Operations Monitor (EOM). It assumes that the reader is familiar with basic operations of the Oracle Enterprise Session Border Controller Oracle Communications Broker & Operations monitor.

**Document Overview**

Oracle Communications provides session based products that help internetwork SIP based communications in multivendor environments. This document discusses the configuration and implementation of Oracle’s Enterprise Communication Broker, Session Border Controller and leveraging Acano for video transcoding to provide seamless audio or video connectivity between Microsoft Lync endpoints and Cisco endpoints.
Introduction

Audience

This is a technical document intended for telecommunications engineers with the purpose of configuring the Oracle Enterprise Session Border Controller and the Oracle Communication Broker. There will be steps that require navigating the Command Line Interface (ACLI). Understanding the basic concepts of TCP/UDP, IP/Routing, and SIP/RTP are also necessary to complete the configuration and for troubleshooting, if necessary.

Requirements

- Microsoft Lync 2013
- Cisco CUCM 10.5
- Oracle Enterprise Session Border Controller ECZ730m2
- Oracle Enterprise Communication Broker PCZ200m3
- Oracle Enterprise Operations Monitor 3.3.91.2.0
- Acano 1.8.6
- Cisco Endpoint TC7.3.3.c84180a
Architecture

Video Transcoding

Video Calls from a Microsoft Lync environment to other external environments will likely require video transcoding. Because Oracle Communications E-SBCs only support audio transcoding, Oracle has partnered with Acano to provide video transcoding services. Video calls that originate from a Lync endpoint are sent to the Microsoft Lync frontend server. The Lync frontend server performs a lookup on the request-uri and determines that the request is external. The Lync frontend server then forwards the call to the Oracle Communications Enterprise Communication Broker over TLS. The Lync frontend server has the ECB configured as a trusted application server.

The ECB is configured to look at calls from Lync and perform a policy lookup on codecs. The codec policy evaluates the SDP in the initial invite to determine if one of the configured video codecs is present. If the policy matches one of the codecs, the ECB is configured to redirect the call to Acano for transcoding. If a video call is not present the ECB will forward the call to the E-SBC.

If the call is forwarded to Acano, Acano will process the signaling and will anchor media. Acano then forwards the signaling back to the ECB. The ECB does a second routing lookup based on the source from Acano and forwards the call to Cisco UCM. Routing on the ECB is determined first by the source IP in the “from” header, secondly based on the calling and called numbers, and finally based on any policy configured.

Because the ECB only performs policy lookups on the initial INVITE and does not comparing the initial offer to the 200OK, the ECB is not making a determination on transcoding. All video calls will get sent to Acano and Acano will determine if transcoding is required. Likewise, all audio calls will be forwarded to the E-SBC regardless of their transcoding requirements.
Audio Transcoding

A second ECB policy is setup on all calls from Lync that do not have video codecs. If this policy is matched the call is forwarded to the SBC as a hair pinned call. The ECB accomplishes the hairpin by including a route header requesting that the call be sent back to the EBC. The E-SBC processes the call and anchors the media by setting the SDP contact address to the IP of the SBC. The E-SBC will continue to be in the signaling path and will make a determination if audio transcoding is required. Media will be anchored to the SBC regardless of the need for transcoding.

Overall architecture
**Lab Configuration**

Following are the IP addresses used for the Interoperability tests. The IPs below are specific to lab setup at Telus, the IPs in production will be vastly different from one's listed below.

<table>
<thead>
<tr>
<th>description</th>
<th>network-interface</th>
<th>realm</th>
<th>interface IP</th>
<th>sip-port</th>
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<tr>
<td>ECB interfaces</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>management</td>
<td>wancom0</td>
<td></td>
<td>192.168.10.224</td>
<td></td>
</tr>
<tr>
<td>signaling</td>
<td>M00</td>
<td></td>
<td>192.168.10.232</td>
<td>5060</td>
</tr>
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<td>192.168.10.232</td>
<td>5067</td>
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<tr>
<td>Agents</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Acano</td>
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<td>192.168.10.205</td>
<td>5060</td>
</tr>
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<td>Lync 2013</td>
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<td>E-SBC</td>
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<td>TCP</td>
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<td>192.168.10.231</td>
<td></td>
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<tr>
<td>SBC interfaces</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
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<td>wancom0</td>
<td></td>
<td>10.10.10.200</td>
<td></td>
</tr>
<tr>
<td>media/signalling</td>
<td>s1p0:0</td>
<td>core</td>
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<td>5060</td>
</tr>
<tr>
<td>Session-Agents</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ECB</td>
<td>core</td>
<td></td>
<td>192.168.10.232</td>
<td>5060</td>
</tr>
</tbody>
</table>
Configuring the Oracle E-SBC & ECB

In this section we describe the steps for configuring an Oracle Enterprise Session Border Controller, formally known as an Acme Packet Net-Net Enterprise Session Director, for use with CM Server in a SIP trunking scenario.

In Scope

The following guide configuring the Oracle E-SBC assumes that this is a newly deployed device dedicated to a single customer. If a service provider currently has the E-SBC deployed then please see the ACLI Configuration Guide on [http://docs.oracle.com/cd/E61581_01/index.htm](http://docs.oracle.com/cd/E61581_01/index.htm) for a better understanding of the Command Line Interface (CLI).

Note that Oracle offers several models of E-SBC. This document covers the setup for the E-SBC platform running ECZ7.3.0 or later. If instructions are needed for other Oracle E-SBC models, please contact your Oracle representative.

Out of Scope

- Configuration of Network management including SNMP and RADIUS
- setting up a hypervisor environment
- ECB Context, Dial-Plan, user registrar, or LDAP integration

E-SBC Configuration

The following section walks through configuring the Oracle E-SBC. It is outside the scope of this document to include all of the configuration elements as it will differ in every deployment. Physical-interface, Network-interface, sip-interfaces are completely standard. Microsoft Lync uses SRTP for media encryption by default. If SRTP is left as the default on Lync, SRTP IWF configuration maybe required to complete audio calls between Lync and Cisco endpoints. More information on SRTP E-SBC configuration can be found at: [http://docs.oracle.com/cd/E61547_01/doc/esbc_ecz730_configuration.pdf](http://docs.oracle.com/cd/E61547_01/doc/esbc_ecz730_configuration.pdf).

Audio Transcoding

For additional information on voice transcoding please see the enterprise SBC documentation for more information [http://docs.oracle.com/cd/E61547_01/doc/esbc_ecz730_configuration.pdf](http://docs.oracle.com/cd/E61547_01/doc/esbc_ecz730_configuration.pdf)

In this specific deployment the only purpose of the SBC is to transcode audio calls. The SBC only interfaces with ECB. Because of this only 1 network/realm/sip-interface is required. All calls that are forwarded to the SBC will have media anchored which can include non-transcoded audio calls.

The codec-policy has multiple purposes. The E-SBC media based policy will view the ingress methods SDP to ensure there are no video codecs and that PCMU and G729 are the only inbound audio codecs. When the message egresses the SBC it will add PCUM, G729, and RFC 2833 codecs if they aren't present. Finally, the policy orders the codecs so that G729 is preferred. When the 200OK is received the SBC will determine if there is a mismatch between the offer and what was received in the reply. If there is a conflict and PCMU is offered on one side and G729 is offered on the other side of the call, the SBC will transcode the audio. In this specific configuration we have forced G729 because we know that Microsoft Lync doesn't support G729 and this will force the SBC to transcode all audio call to and from Lync clients. Please note that transcoding support for G729 requires a license.
In the realm configuration 2 key attributes need to be set. First the mm-in-realm configuration attribute on the core realm that interfaces with the ECB needs to be set to “enabled”. This setting is disabled by default. Setting mm-in-realm to “enabled” will force the SBC to anchor all media. This is required because calls are hair pinned to/from the EBC on the same realm.

```
codec-policy
  name                                    InterRealm
  allow-codecs                            G729 PCMU video:no H264:no H263:no
  telephone-event
    add-codecs-on-egress                  PCMU G729 telephone-event
  order-codecs                            G729 *
  packetization-time                      20
  force-ptime                             disabled
  dtmf-in-audio                           disabled

realm-config
  identifier                              core
  description                            Core realm to ECB
  addr-prefix                             0.0.0.0
  network-interfaces                      s1p0:0
  mm-in-realm                             enabled
  mm-in-network                           enabled
  mm-same-ip                              enabled
  mm-in-system                            enabled
  bw-cac-non-mm                           disabled
  msm-release                             disabled
  qos-enable                              disabled
  max-bandwidth                           0
  fallback-bandwidth                      0

  codec-policy                            InterRealm
  codec-manip-in-realm                    enabled

sip-config
  state                                    enabled
  operation-mode                           dialog
  dialog-transparency                       disabled
```

In the realm configuration 2 key attributes need to be set. First the mm-in-realm configuration attribute on the core realm that interfaces with the ECB needs to be set to “enabled”. This setting is disabled by default. Setting mm-in-realm to “enabled” will force the SBC to anchor all media. This is required because calls are hair pinned to/from the EBC on the same realm.
ECB Configuration
The following section walks through configuring the Oracle E-SBC. It is outside the scope of this document to include all of the configuration elements as it will differ in every deployment. Lync by default use TLS for signaling. Two certificates are needed on the ECB. The first certificate is a CSR that will need to be signed by the Lync AD CA and imported back in to the ECB. The second certificate is the root certificate from the Microsoft AD CA. The certificate record will need to be created with the same CN and then import the root cert. More information on TLS configuration can be found online: (http://docs.oracle.com/cd/E55725_01/doc/ecb_pcz200_usersguide.pdf).

SIP Interface
The only adjustment to the sip interface configuration is the “Maximum SIP message length”. The message length needs to be adjusted for video calls because the length of INVITEs and 200OKs for video exceed the default value 4095. For simplicity, the following configuration has been set to the maximum value 65535.
SIP Port

Multiple sip ports are required to accommodate TLS to and from Lync and TCP to and from Acano. The topology has been simplified by also using TCP to the SBC.
Agents

The Oracle Communications Enterprise Communications Broker resides in the core of the network and signals to all SIP endpoints. To simplify the agent configuration we have disabled all context and dial-plans. Agent configurations only provide a SIP connection address and provide the appropriate inbound and outbound manipulations to route the call properly. Please note that using IP addresses in place of host names is critical for successful source based routing. Each agent header manipulations will be address later in the document.
Call Routing

For the purposes of this lab, all sip users with the uri-user contact of 9991001-9991009 reside as Cisco endpoint connected to Cisco UCM or CVP. Lync endpoint users have text based uri-users for their sip contact information. Environments with number based Lync sip contacts are recommended and should provide greater granularity and control within ECB.

Source based routing is the primary call routing method. Source routes have been set from UCM to Acano and from Acano to Lync for both voice and video calls. The primary purpose in this is that Cisco by default uses delayed offer which prevents the ECB from being able to make a codec policy decision until later in the call setup. Further testing is needed to ensure proper outbound routing from UCM.

Call routing from Lync default to sending all traffic to the SBC unless the codec policy is met and the call is redirected to Acano. Routing should be very straight forward with a combination of calling/called numbers and source agent and a single codec policy with hairpin redirection. The stop recurse policy is used to prevent call routing loops. All new routes should be thoroughly tested to prevent routing loops.
Video Codec Policy

ECB Policy features were introduced in PCZ2.0.0 MR-2. Policy configuration require version PC2.0.0m2 or later. The Policy configuration can be found in the main configuration menu under “Policy”. The video codec policy is a policy that must be configured. The policy has 4 primary parts: Name, Description, Conditions and Actions.
Policy Conditions

Conditions are a set of codec conditions that might invoke an "Action". If a specific codec is not listed, the Oracle ECB will allow new codecs to be added. If any of the codecs in the "contains" list the policy will invoke the action listed in action. In this specific testing most of the common video codecs are listed.
Policy Action

Policy Action allows one or more actions to be applied when a policy condition is met. For the testing performed, the policy action is set to redirect the call to the Acano agent from the agent configuration. The hairpin signaling is set to enabled so that the ECB will insert a route header forcing the signaling get sent back to the ECB. The hairpin is required because ECB is the only external device that signals directly to UCM.
Audio Codec Policy

ECB Policy features were introduced in PCZ2.0.0 MR-2. Policy configuration require version PC2.0.0m2 or later. The Policy configuration can be found in the main configuration menu under “Policy”. The video codec policy is a policy that must be configured. The policy has 4 primary parts: Name, Description, Conditions and Actions.
Policy Conditions

Modify Policy / codec condition

<table>
<thead>
<tr>
<th>Contains codecs:</th>
<th>Name: AudioWithNoVideo</th>
</tr>
</thead>
<tbody>
<tr>
<td>Add</td>
<td>Edit</td>
</tr>
<tr>
<td>PCMU</td>
<td>PCMA</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Missing codecs:</th>
<th>Add</th>
<th>Edit</th>
<th>Delete</th>
</tr>
</thead>
<tbody>
<tr>
<td>X-H264UC</td>
<td>x-ulpfiecuc</td>
<td>X-Trc1</td>
<td>H264</td>
</tr>
</tbody>
</table>
Policy Action

![Image of Oracle GUI](image)

Header Manipulation Rules

For purposes of simplifying documentation and readability the HMRs are documented in text form. All configuration changes for ECB need to be done from the GUI. Please refer to ECB config guide for additional actual screen shots on how to configure a header manipulation rule.

Outbound HMR to Acano

The purpose of this HMR is to replace the request-uri host URI with the host URI from the To header. Acano need the to & RURI URI’s to match to route requests properly.

<table>
<thead>
<tr>
<th>name</th>
<th>FixAcanoURI</th>
</tr>
</thead>
<tbody>
<tr>
<td>description</td>
<td></td>
</tr>
<tr>
<td>split-headers</td>
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</tr>
<tr>
<td>join-headers</td>
<td></td>
</tr>
<tr>
<td>header-rule</td>
<td></td>
</tr>
<tr>
<td>name</td>
<td></td>
</tr>
<tr>
<td>header-name</td>
<td>StrTo</td>
</tr>
<tr>
<td>action</td>
<td>To</td>
</tr>
<tr>
<td>comparison-type</td>
<td>case-sensitive</td>
</tr>
<tr>
<td>msg-type</td>
<td>any</td>
</tr>
<tr>
<td>methods</td>
<td></td>
</tr>
<tr>
<td>match-value</td>
<td></td>
</tr>
<tr>
<td>new-value</td>
<td></td>
</tr>
<tr>
<td>element-rule</td>
<td></td>
</tr>
<tr>
<td>name</td>
<td>UpdtRURIHost</td>
</tr>
<tr>
<td>parameter-name</td>
<td></td>
</tr>
<tr>
<td>type</td>
<td>uri-host</td>
</tr>
<tr>
<td>action</td>
<td>store</td>
</tr>
<tr>
<td>match-val-type</td>
<td>any</td>
</tr>
<tr>
<td>comparison-type</td>
<td>case-sensitive</td>
</tr>
<tr>
<td>match-value</td>
<td></td>
</tr>
</tbody>
</table>
new-value

header-rule
  name
  header-name request-uri
  action manipulate
  comparison-type case-sensitive
  msg-type any
  methods
  match-value
  new-value
  element-rule
    name
    parameter-name UpdtURIHost
    type uri-host
    action replace
    match-val-type any
    comparison-type case-sensitive
    match-value
    new-value $StrTo.$UpdtRURIHost.$0

Inbound HMR from Acano
This HMR sets the request-uri host to local IP and the from host to remote IP to ensure proper source routing on the ECB

name InFrmAcano
description split-headers
join-headers
header-rule
  name
  header-name request-uri
  action manipulate
  comparison-type case-sensitive
  msg-type any
  methods
  match-value
  new-value
  element-rule
    name
    parameter-name UpdtURIHost
    type uri-host
    action replace
    match-val-type any
    comparison-type case-sensitive
    match-value
    new-value $LOCAL_IP

header-rule
  name
  header-name From
  action manipulate
  comparison-type case-sensitive
  msg-type any
  methods
  match-value
  new-value
  element-rule
    name
    parameter-name UpdtFrom
    type uri-host
    action replace
    match-val-type any
    comparison-type case-sensitive
    match-value
    new-value $REMOTE_IP
Outbound to CUCM

UCM during this testing was setup where all the cisco users have a URI of ucm.acano.show. Because of the contact URI expectations, the request uri host and to uri host both need to be set to ucm.acano.show. Furthermore, UCM also has the expectation that all call will be from acano.show. Because the ECB is routing using source routes via IP in the headers, the from must also be set to the host acano.show.

<table>
<thead>
<tr>
<th>name</th>
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<tbody>
<tr>
<td>description</td>
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</table>
Inbound from CUCM & Lync

A generic HMR has been configured for inbound call from CUCM and Lync. The purpose of this HMR is to update the From URI host to the remote IP. Both CUCM and Lync use FQDNs for the host portion of the from URI. ECB uses the from URI host to determine source routes. Additionally Lync inserts a host name in record-route. This HMR also sets the record-route to the remote IP.

<table>
<thead>
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<tbody>
<tr>
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</tr>
<tr>
<td>join-headers</td>
<td>header-rule</td>
</tr>
<tr>
<td>name</td>
<td>UpdtFrm</td>
</tr>
<tr>
<td>header-name</td>
<td>From</td>
</tr>
<tr>
<td>action</td>
<td>manipulate</td>
</tr>
<tr>
<td>comparison-type</td>
<td>case-sensitive</td>
</tr>
<tr>
<td>msg-type</td>
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</tr>
<tr>
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</tr>
<tr>
<td>new-value</td>
<td>element-rule</td>
</tr>
<tr>
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<td>UpdtRUIHost</td>
</tr>
<tr>
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<td>uri-host</td>
</tr>
<tr>
<td>type</td>
<td>replace</td>
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<tr>
<td>action</td>
<td>any</td>
</tr>
<tr>
<td>comparison-type</td>
<td>case-sensitive</td>
</tr>
<tr>
<td>match-value</td>
<td>new-value</td>
</tr>
<tr>
<td>$REMOTE_IP</td>
<td></td>
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</table>

Outbound to Lync

Lync requires FQDN in most of the header URIs. The HMR to Lync sets the request URI and TO host URIs to acano.show. The contact header URI host is also updated to local IP. Finally, the route header inserted by ECB needs to be removed for the Lync frontend server to accept calls from a “trusted application server”. Otherwise, the Lync server tries to forward the call as a proxy.

<table>
<thead>
<tr>
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<td>request-uri</td>
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<td>action</td>
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<tr>
<td>comparison-type</td>
<td>case-sensitive</td>
</tr>
<tr>
<td>msg-type</td>
<td>any</td>
</tr>
<tr>
<td>methods</td>
<td>match-value</td>
</tr>
<tr>
<td>new-value</td>
<td>element-rule</td>
</tr>
<tr>
<td>name</td>
<td>UpdtRURIHost</td>
</tr>
<tr>
<td>parameter-name</td>
<td>uri-host</td>
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<tr>
<td>type</td>
<td>replace</td>
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<tr>
<td>action</td>
<td>any</td>
</tr>
<tr>
<td>comparison-type</td>
<td>case-sensitive</td>
</tr>
<tr>
<td>match-value</td>
<td>new-value</td>
</tr>
</tbody>
</table>
new-value: acano.show

header-rule
name: UpdtContact
header-name: Contact
action: manipulate
comparision-type: case-sensitive
msg-type: any
methods
match-value
new-value

element-rule
name: updtURIHost
parameter-name
type: uri
action: replace
match-val-type: any
comparison-type: case-sensitive
match-value
new-value

header-rule
name: UpdtTo
header-name: To
action: manipulate
comparision-type: case-sensitive
msg-type: request
methods
match-value
new-value

element-rule
name: UpdtURIHost
parameter-name
type: uri
action: replace
match-val-type: any
comparison-type: case-sensitive
match-value
new-value

header-rule
name: UpdtRoute
header-name: Route
action: delete
comparision-type: case-sensitive
msg-type: any
methods
match-value
new-value
## Test Plan

Testing was limited to proof of concept only. Testing was limited to very basic calls.

<table>
<thead>
<tr>
<th>Call Type</th>
<th>Call Ringback</th>
<th>Voice Cut Through on Connect</th>
<th>Video Cut Through on Connect</th>
<th>2-Way Voice</th>
<th>2-Way Video</th>
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</thead>
<tbody>
<tr>
<td>Video Call from Lync Client to Cisco Video Endpoint using Acano for Video transcoding</td>
<td>pass</td>
<td>pass</td>
<td>pass</td>
<td>pass</td>
<td>pass</td>
</tr>
<tr>
<td>Voice Call from Lync Client to Cisco Audio endpoint using E-SCB for transcoding</td>
<td>pass</td>
<td>pass</td>
<td>pass</td>
<td>pass</td>
<td>pass</td>
</tr>
<tr>
<td>Acano initiated call to Lync endpoint through ECB</td>
<td>pass</td>
<td>pass</td>
<td>pass</td>
<td>pass</td>
<td>pass</td>
</tr>
<tr>
<td>Acano initiated call to UCM endpoint through ECB</td>
<td>pass</td>
<td>pass</td>
<td>pass</td>
<td>pass</td>
<td>pass</td>
</tr>
<tr>
<td>Video Call from UCM endpoint to Lync Video Endpoint using Acano for Video transcoding</td>
<td>pass</td>
<td>pass</td>
<td>pass</td>
<td>pass</td>
<td>pass</td>
</tr>
<tr>
<td>Audio Call from UCM endpoint to Lync Video Endpoint using Acano for Video transcoding</td>
<td>pass</td>
<td>pass</td>
<td>pass</td>
<td>pass</td>
<td>pass</td>
</tr>
</tbody>
</table>
## Appendix A

### E-SBC Configuration

```bash
sho running-config short
codec-policy
    name InterRealm
    allow-codecs G729 PCMU video:no H264:no H263:no
telephone-event
    add-codecs-on-egress PCMU G729 telephone-event
    order-codecs G729 *
media-manager
network-interface
    name s1p0
    description Core
    hostname ESBC-Core
    ip-address 192.168.10.230
    netmask 255.255.255.0
    gateway 192.168.10.1
    icmp-address 192.168.10.230
ntp-config
    server 172.16.0.101
phy-interface
    name s1p0
    operation-type Media
    slot 1
realm-config
    identifier core
    description core
    network-interfaces s1p0:0
    mm-in-realm enabled
    codec-policy InterRealm
    codec-manip-in-realm enabled
redundancy-config
    state disabled
session-agent
    hostname 192.168.10.232
    ip-address 192.168.10.232
    transport-method StaticTCP
    realm-id core
sip-config
    dialog-transparency disabled
    home-realm-id core
    options max-udp-length=0
    sip-message-len 65535
sip-interface
    realm-id core
    description core sip interface
    sip-port
        address 192.168.10.230
        transport-protocol TCP
    redirect-action Recurse
sip-monitoring
spl-config
steering-pool
    ip-address 192.168.10.230
```
Appendix B

Full ECB Configuration

```
start-port                      32768
end-port                       65535
realm-id                       core

system-config
    hostname                    esbc
    description                 Acano Lab ESBC
    location                    Acano Lab
    process-log-level           DEBUG
    comm-monitor
        state                   enabled
        monitor-collector
    default-gateway
        address                  192.168.10.227

web-server-config

ESBC#
```

```
show running-config short
certificate-record
    name                       AcanoDC
    common-name                acano-SHOWAD-CA
    key-size                   2048

certificate-record
    name                       ECB-Cert2
    common-name                ecb.acano.show
    key-size                   2048

policy
    name                       AudioCall
    description                Audio calls should get anchored to the

Oracle SBC,
    codec-condition
        name                       AudioCodecCondition
        contains-codecs
        missing-codecs
        redirect-action
            name
            redirect-to-agent

policy
    name
    description                Deny
    session
        routing-action
            name
            routing-mode

policy
    name
    description                Emergency
    emergency or priority calls
        constraints-action
            name
            ignore-constraints

policy
    name
    description                FixRURIToAcano

policy
    name
    description                StopRecurse

route attempts
```

Routing

Policy

Name: VideoCall
Description: Policy to send Video Calls to Acano for Transcoding

Codec-Condition
Name: VideoCodecs
Contains-Codes
- X-H264UC
- x-ulpfecuc
- x-rtvcl
- H263
- H261
- H264

Redirect-Action
Name: AcanoVideoTranscoding
Redirect-To-Agent: 192.168.10.205

Profile

Profile-Name: acctProfile
Template-Name: ESM-5-Acct
Generate-Start: OK
State: disabled
File-Path: /opt/logs
File-Output: disabled
File-Rotate-Time: 0
Max-File-Size: 10000000
Ftp-Push: disabled
Ftp-Port: 21

Profile

Profile-Name: acctsrvProfile
Template-Name: ESM-6-Acct-Srv
Port: 1813

Profile

Profile-Name: agentGroupProfile
Template-Name: ESM-D-Agent-Group
Strategy: Hunt
Recursion: disabled
Agents:

Profile

Profile-Name: agentProfile
Template-Name: ESM-4-Agent
Port: 5060
Transport: UDP
Agent-State: enabled
Translate-Mode: E164
Number-Digits: 4
Constraints: disabled
Max-Sessions: 0
Max-Inbound-Sessions: 0
Max-Outbound-Sessions: 0
Max-Burst-Rate: 0
Max-Inbound-Burst-Rate: 0
Max-Outbound-Burst-Rate: 0
Max-Sustain-Rate: 0
Max-Inbound-Sustain-Rate: 0
Max-Outbound-Sustain-Rate: 0
Burst-Rate-Window: 0
Sustain-Rate-Window: 0
Options-Ping: disabled
Ping-Interval: 0

Profile

Profile-Name: enumProfile
Template-Name: ESM-9-Enum
Servers:
Translate-Mode: E164
Number-Digits: 0
Query-Method: hunt
timeout: 11
lookup-length: 0
max-response-size: 512
health-query-interval: 0

profile

profile-name: intfProfile
template-name: ESM-25-Interface
sipMessageLen: 4095
parallelForking: disabled
earlyMediaInhibit: disabled
terminateRefer: disabled
forkGroupTimeout: 0
referNotifyProvisional: none
default-context: E164
min-reg-expire: (unresolvable) (target not set)
enable-tos-marking: disabled
tos-value-signaling: 0x00
proxyRegistration: disabled

profile

profile-name: networkProfile
template-name: ESM-2-Network
VLAN: 0
gateway: 0.0.0.0
enable-icmp: disabled
virtual-mac: 00:08:25:dd:dd:dd
high-availability: (unresolvable) (target not set)
gwHeartbeat: enabled
hostname: (unresolvable) (target not set)
terminateRefer: (unresolvable) (target not set)
referNotifyProvisional: (unresolvable) (target not set)

profile

profile-name: portProfile
template-name: ESM-3-Port
port: 5060
transport: UDP
registered-and-session-agents: disabled

profile

profile-name: regProfile
template-name: ESM-A-Registrar
reg-state: disabled
domains: min-reg-expire: 300
credential-retrieval-method: None
fork-group: 1

profile

profile-name: snmpProfile
template-name: ESM-7-SNMP
snmp-community: public
snmp-addresses:

profile

profile-name: syncAgentProfile
template-name: ESM-C-Sync-Agent

profile

profile-name: syncConfigProfile
template-name: ESM-B-Sync-Config
state: configuration: enabled
registration: disabled

profile

profile-name: systemProfile
template-name: ESM-1-System
hostname: ECB
process-log-level: NOTICE
restart: enabled
telnet-tmo: 0
console-tmo: 0
syslog-server-address: 0.0.0.0
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<td>169.254.1.2</td>
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<td>commMonitorCollectorAddress</td>
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<td>commMonitorCollectorNetIf</td>
<td>wancom0:0</td>
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<td>maxArpPacketRate</td>
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</tr>
<tr>
<td>enableSipMonAndTrc</td>
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</tr>
<tr>
<td>ntpServers</td>
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<tr>
<td>route</td>
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<tr>
<td>route</td>
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<tr>
<td>policy</td>
<td>StopRecurse</td>
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<td>route</td>
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<td>cost</td>
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<td>VideoCall,AudioCall,StopRecurse</td>
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<td>cost</td>
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<td>policy</td>
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<td>terminateRefer</td>
<td>disabled</td>
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<td>forkGroupTimeout</td>
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</table>
enable-tos-marking: disabled
tos-value-signaling: 0x00
proxyRegistration: disabled
esm-registrar: reg1

service
  service-name: network1
  profile-name: networkProfile
  VLAN: 0
  ip-address: 192.168.10.224
  netmask: 255.255.255.0
  gateway: 192.168.10.1
  enable-icmp: enabled
  virtual-mac: 02:0c:29:7b:90:e9
  high-availability: disabled
gwHeartbeat: enabled
  hostname: ECB
  terminateRefer: disabled
  referNotifyProvisional: none
  esm-system: system1
  esm-sip-int: intf1

service
  service-name: port_192.168.10.232_5060_TCP
  profile-name: portProfile
  address: 192.168.10.232
  port: 5060
  transport: TCP
  registered-and-session-agents: disabled

service
  service-name: port_192.168.10.232_5061_TLS
  profile-name: portProfile
  address: 192.168.10.232
  port: 5061
  transport: TLS
tls-profile: LyncCert
  registered-and-session-agents: disabled

service
  service-name: port_192.168.10.232_5061_UDP
  profile-name: portProfile
  address: 192.168.10.232
  port: 5061
  transport: UDP
  registered-and-session-agents: disabled

service
  service-name: port_192.168.10.232_5067_TLS
  profile-name: portProfile
  address: 192.168.10.232
  port: 5067
  transport: TLS
tls-profile: LyncCert
  registered-and-session-agents: disabled

service
  service-name: reg1
  profile-name: regProfile
  reg-state: enabled
domains
  snr.acano.com, hong.acano.com, oracle.acano.com
  min-reg-expire: 300
  credential-retrieval-method: None
  fork-group: 1

service
  service-name: sync1
  profile-name: syncConfigProfile
  state: disabled
  configuration: enabled
  registration: disabled

service
  service-name: system1
<table>
<thead>
<tr>
<th>profile-name</th>
<th>systemProfile</th>
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<td>location</td>
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<td>default-gateway</td>
<td>192.168.10.1</td>
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<td>restart</td>
<td>enabled</td>
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<td>telnet-tmo</td>
<td>0</td>
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<tr>
<td>console-tmo</td>
<td>0</td>
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<td>syslog-server-address</td>
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<td>primary-peer</td>
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<td>ecb02</td>
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<td>secondary-addr</td>
<td>169.254.1.2</td>
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<td>enableMiscSnmpTraps</td>
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<tr>
<td>enableSipMonAndTrc</td>
<td>enabled</td>
</tr>
<tr>
<td>ntpServers</td>
<td></td>
</tr>
</tbody>
</table>

**session-agent**

| hostname              | 192.168.10.205 |
| IP-address            | 192.168.10.205 |
| transport-protocol    | StaticTCP     |
| description            | Acano Transcoding/Call Bridge on Virtual Machine |

**egress-number-translation-mode** pattern-only

**inbound-header-manipulation** InFrmAcano

**outbound-header-manipulation** FixAcanoURI

**enable-OPTIONS-ping** enabled

**OPTIONS-ping-interval** 90

**session-agent**

| hostname              | 192.168.10.207 |
| IP-address            | 192.168.10.207 |
| port                  | 5061          |
| transport-protocol    | StaticTLS     |
| TLS-profile           | LyncCert      |
| description            | Lync 2013 Front end Server with ECB setup as a Trusted AS |

**egress-number-translation-mode** pattern-only

**inbound-header-manipulation** GenericIn

**outbound-header-manipulation** ToLync

**OPTIONS-ping-interval** 20

**session-agent**

| hostname              | 192.168.10.210 |
| IP-address            | 192.168.10.210 |
| transport-protocol    | StaticTCP     |
| description            | Cisco Unified Communication Manager |

**egress-number-translation-mode** pattern-only

**inbound-header-manipulation** GenericIn

**outbound-header-manipulation** ToCUCM

**OPTIONS-ping-interval** 30

**session-agent**

| hostname              | 192.168.10.230 |
| IP-address            | 192.168.10.230 |
| transport-protocol    | StaticTCP     |
| description            | E-SCB Between ECB and CUCM |

**egress-number-translation-mode** pattern-only

**sip-manipulation**

| name                  | FixAcanoURI   |
| header-rule           |               |
name                                    StrTo
header-name                             To
action                                  store
element-rule
name                                    UpdtRURIHost
  type                                    uri-host
  action                                  store
header-rule
name                                    UpdtRURI
  header-name                             request-uri
  action                                  manipulate
element-rule
name                                    UpdtURHost
  type                                    uri-host
  action                                  replace
  new-value                               $StrTo.$UpdtRURIHost.$0

sip-manipulation
name                                    GenericIn
header-rule
name                                    UpdtFr
  header-name                             From
  action                                  manipulate
element-rule
name                                    UpdtURHost
  type                                    uri-host
  action                                  replace
  new-value                               $REMOTE_IP
header-rule
name                                    FixRecordRoute
  header-name                             Record-Route
  action                                  manipulate
element-rule
name                                    UpdtURHost
  type                                    uri-host
  action                                  replace
  new-value                               $REMOTE_IP

sip-manipulation
name                                    InFrMAno
header-rule
name                                    UpdtRURI
  header-name                             request-uri
  action                                  manipulate
element-rule
name                                    UpdtURHost
  type                                    uri-host
  action                                  replace
  new-value                               $LOCAL_IP
header-rule
name                                    UpdtFr
  header-name                             From
  action                                  manipulate
element-rule
name                                    UpdtFrom
  type                                    uri-host
  action                                  replace
  new-value                               $REMOTE_IP

sip-manipulation
name                                    ToCUCM
header-rule
name                                    UpdtRURI
  header-name                             request-uri
  action                                  manipulate
element-rule
name                                    UpdtURHost
  type                                    uri-host
  action                                  replace
  new-value                               ucm.acano.show
header-rule
  name
  header-name
  action
  element-rule
    name
    type
    action
    new-value
    UpdtTo
    To
    manipulate
    UpdtURIHost
    uri-host
    replace
    ucm.acano.show
header-rule
  name
  header-name
  action
  element-rule
    name
    type
    action
    new-value
    UpdtURIHost
    uri-host
    replace
    acano.show
sip-manipulation
  name
  ToLync
  UpdtRURI
  request-uri
  manipulate
  UpdtRURIHost
  uri-host
  replace
  acano.show
header-rule
  name
  header-name
  action
  element-rule
    name
    type
    action
    new-value
    UpdtURIHost
    uri-host
    replace
    $LOCAL_IP
header-rule
  name
  header-name
  action
  msg-type
  methods
  element-rule
    name
    type
    action
    new-value
    UpdtURIHost
    uri-host
    replace
    acano.show
header-rule
  name
  header-name
  action
  trusted-ca-certificates
  mutual-authenticate
  enabled
tls-profile
  name
  end-entity-certificate
  trusted-ca-certificates
  AcanoDC
  mutual-authenticate
  enabled
tls-profile
  name
  end-entity-certificate
  trusted-ca-certificates
  AcanoDC
web-server-config
  inactivity-timeout
  10
  https-state
  enabled
tls-profile
  name
  LyncCert
  task done
Appendix C

Setting up ECB as Trusted Application Server in Lync Frontend Server

For purposes of simplifying documentation and readability the HMRs are documented in text form. All configuration changes for ECB need to be done from the GUI.

1) You will need to upload a certificate signed by the trusted CA to the ECB. Note, when you create the CSR the certificate’s CN will need to match the FQDN of the ECB.

2) Setup DNS records

SRV : _sipintnegtl._tcp.fe.lync.acano.show
A : fe.lync.acano.show

3) Set up a trust pool

New-CsTrustedApplicationPool -Identity acano-trust -ComputerFqdn ecb.acano.show -Registrar fe.lync15.acano.com -site 1 -RequiresReplication $false -ThrottleAsServer $true -TreatAsAuthenticated $true
New-CsTrustedApplication -ApplicationId ecb-application -TrustedApplicationPoolFqdn ecb-trust -Port 5061
$x=New-CsStaticRoute -TLSRoute -Destination "server.acano.com" -MatchUri "ecb.acano.show" -Port 5061 -UseDefaultCertificate $true
Set-CsStaticRoutingConfiguration -Identity global -Route @{$Add=$x}
Enable-CsTopology

4) Set up a static route towards the ECB

<RouteSfserver01=New-CsStaticRoute -TLSRoute -Destination "ecb.acano.show" -MatchUri "ecb.acano.show" -Port 5061 -UseDefaultCertificate $true>
Set-CsStaticRoutingConfiguration -Identity global -Route @{$Add=$RouteSfserver01}
To show the routes "Get-CsStaticRoutingConfiguration"

Appendix D

Acano Configuration

Network Configuration on IPv4

In the Acano solution virtual deployment, there is only one network interface initially but up to 4 are supported (see the next section). The initial interface is “a”, equivalent to interface A in the Acano Server deployment. (The MMP runs on this interface in the virtual deployment.)

Configuration

1. Configure the Network Interface speed using the following MMP commands.

To set network interface speed, duplex and auto-negotiation parameters use the iface command e.g. to display the current configuration on the Admin interface, in the MMP type:

iface a

To set the interface to 1GE, full duplex type:

iface a 1000 full

and to switch auto negotiation on or off, type:

iface a autoneg <on|off>

We recommend that the network interface is set to auto negotiation unless you have a specific reason not to.
The “a” interface is initially configured to use DHCP. To view or reconfigure the IP settings: a. Go on to step b if you are using static IP addresses.

To find out the dhcp configured settings, type:

```
ipv4 a
```


Go on to step 3. b. Configure to use static IP addresses (skip this step if you are using DHCP)

Use the ipv4 add command to add a static IP address to the interface with a specified subnet mask and default gateway. For example, to add address 10.1.2.4 with prefix length 16 (netmask 255.255.0.0) with gateway 10.1.1.1 to the interface, type:

```
ipv4 a add 10.1.2.4/16 10.1.1.1
```

To remove the IPv4 address, type:

```
ipv4 a del
```

3. Set DNS Configuration

To output the dns configuration, type:  

```
dns
```

To set the application DNS server type:  

```
dns add forwardzone <domain name> <server IP>
```

Note: A forward zone is a pair consisting of a domain name and a server address: if a name is below the given domain name in the DNS hierarchy, then the DNS resolver can query the given server. Multiple servers can be given for any particular domain name to provide load balancing and fail over. A common usage will be to specify "." as the domain name i.e. the root of the DNS hierarchy which matches every domain name, i.e. is the server is on IP 10.1.1.1  

```
dns add forwardzone . 10.1.1.33
```

If you need to delete a DNS entry use:  

```
dns del forwardzone <domain name> <server IP>
```

for example:  

```
dns del forwardzone . 10.1.1.33
```

### Configuring the Call Bridge

The Call Bridge needs a key and certificate pair that is used to establish TLS connections with SIP Call Control devices and with the Lync Front End (FE) server. If you are using Lync, this certificate will need to be trusted by the Lync FE server.  

The command `callbridge listen <interface>` allows you to configure a listening interface (chosen from A, B, C or D). By default the Call Bridge listens on no interfaces.

1. Create and upload the certificate as described in the Certificate guidelines document (available at www.acano.com).

2. Sign into the MMP and configure the CallBridge to listen on interface A.

```
callbridge listen a
```

Note: Call Bridge must be listening on a network interface that is not NAT’d to another IP address, because Call Bridge is required to convey the same IP that is configured on the interface in SIP messages when talking to a remote site.

Configure the CallBridge to use the certificates by using the following command so that a TLS connection can be established between the Lync FE server and the Call Bridge, for example:  

```
callbridge certs callbridge.key callbridge.crt
```

The full
command and using a certificate bundle as provided by your CA, is described in the Certificate guidelines document. Restart the CallBridge interface to apply the changes. **callbridge restart**

**Connecting Link/Skype for Business:**

**Lync Front End Server configuration**

To route calls originating from Lync clients to the Acano server: 1. Add a Lync static route pointing to the Acano server matching domain acano.example.com.

**Adding a dial plan rule on the Acano server**

1. Sign into the WebAdmin Interface and go to Configuration>OutboundCalls
2. Set up a dial plan rule with:

   Domain=*example.com*

   SIP Proxy = the IP address or FQDN of your Lync FE pool or server

   Local contact domain = **callbridge.acano.example.com**

   Note: The local contact domain field should contain the Fully Qualified Domain Name (FQDN) for the Acano server. It should only be set if setting up a trunk to Lync.

   TrunkType=Lync

   LocalFromDomain=**acano.example.com**

   SIP Proxy to Use = the IP address or FQDN of your Lync FE pool or server bank, or leave this field blank.

Lync clients can now dial into a call 88001 hosted on the Acano server by dialing 88001@example.com.

**Acano Routing Rules:**

The following Acano Dial plan rules were added to configuration to allow for the correct flow of the call media.

**Acano Configuration**

**Forwarding rule**

Domain matching pattern: *

Priority: 0

Forward: forward

Caller ID: pass through

Rewrite domain: no

Forwarding domain: -

**Outbound rule**

Domain: Acano.show (lync domain)
SIP Proxy to use: ecb.acano.show
Local contact domain: -
Local from domain: -
Trunk type: Lync
Behaviour: Stop
Priority: 0
Encryption: Unencrypted
Tenant: no

Acano Documentation
The following information was based on:

Acano-server-single-combined-1.8-Deployment-Guide.pdf (Available at Acano.com)
Acano-solution-Virtual-Deployment-R1.8-Installation-Guide.pdf (Available at Acano.com)