Multi-Tenant Ping

Send SIP OPTIONS from multiple realms to the same destination

May 2022, Version 1.0

Public

Purpose statement

This document provides a configuration overview of various methods for achieving a ‘multi-realm’ tenant mechanism for UCaaS/CCaaS environments.

This intended as an interim solution while Oracle develops a full solution to this challenge.

Disclaimer

This document in any form, software or printed matter, contains proprietary information that is the exclusive property of Oracle. Your access to and use of this confidential material is subject to the terms and conditions of your Oracle software license and service agreement, which has been executed and with which you agree to comply. This document and information contained herein may not be disclosed, copied, reproduced or distributed to anyone outside Oracle without prior written consent of Oracle. This document is not part of your license agreement nor can it be incorporated into any contractual agreement with Oracle or its subsidiaries or affiliates.

This document is for informational purposes only and is intended solely to assist you in planning for the implementation and upgrade of the product features described. 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 in this document remains at the sole discretion of Oracle. Due to the nature of the product architecture, it may not be possible to safely include all features described in this document without risking significant destabilization of the code.

Table of contents

List of images

List of tables

Challenge

The Oracle SBC supports the capability to designate a single ‘Session Agent’ for an endpoint or domain name that is reachable from multiple realms. These are referred to as ‘Global Session Agents’, as they can be reached from any realm with the appropriate networking.

The current SBC implementation will only send OPTIONS messages from a single realm to the Global Session Agent, as this is a more efficient method for polling availability of a Global Session Agent. However, some UCaaS/CCaaS environments use the received OPTIONS from the SBC to determine the availability of a logical endpoint (SBC SIP Interface).

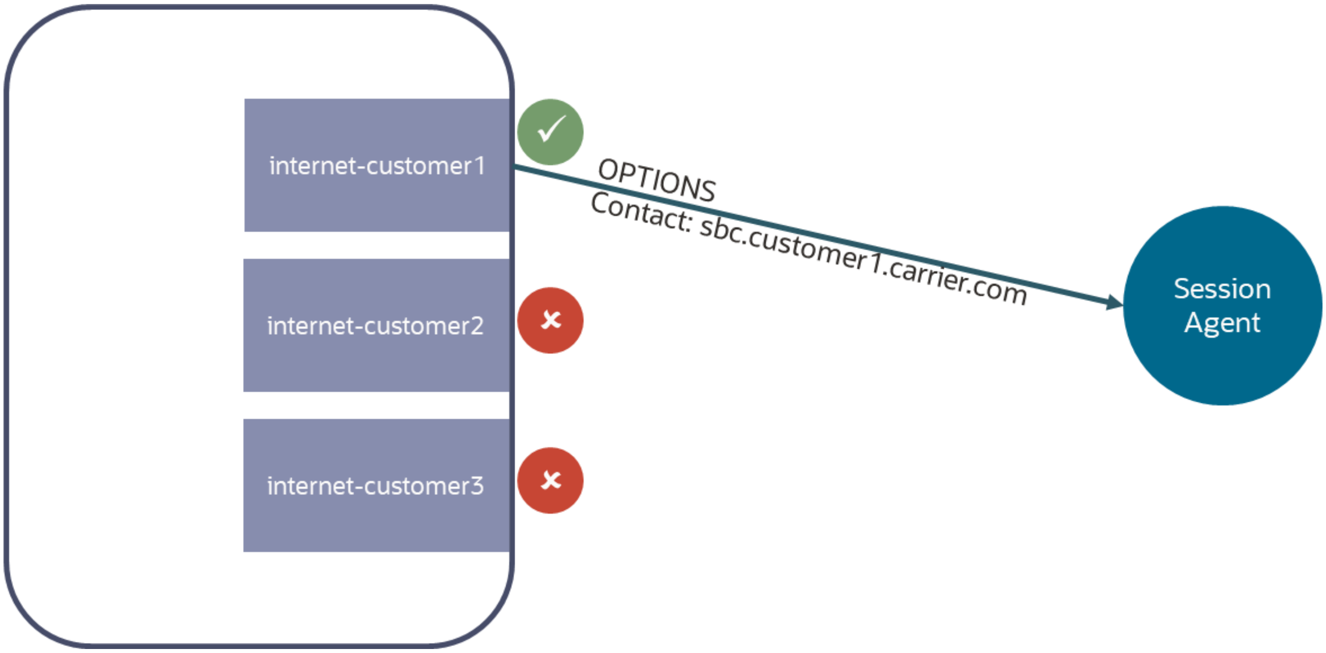


Image 1. Challenges of Multi-tenancy

This guide will outline two different methods for working around this problem so that the remote Session Agent can correctly interpret the availability of the SBC’s realms. These are intended as workarounds while we await a feature to support this capability natively.

Method #1 – Forwarding received OPTIONS

Components

This architecture uses the following components to achieve the configuration:

Oracle SBC/E-SBC:

- Local Policy
- Header Manipulation Rules (HMR)
- Realm Config

If you're unfamiliar with these component features and how they work, it's recommended to read the relevant documentation prior to this Technical Brief.

Goals

In order for the UCaaS/CCaaS platform to assess the availability of multiple realms, it needs to see OPTIONS messages sent by each. However, the SBC doesn't actually need to generate these, and instead we can simply route OPTIONS that were received on each Core/PSTN realm through to the UCaaS/CCaaS platform sourced from the corresponding Access/Internet realm.

Architectural Overview

High Level

This method requires that OPTIONS requests be sent by an external party on the corresponding, opposite realm whereby we can route these OPTIONS requests rather than terminate them. Local Policy is used to route each to the Global Session Agent from the appropriate realm.

NOTE: This method may not be appropriate for Global Session Agents that use DNS SRV Load Balancing

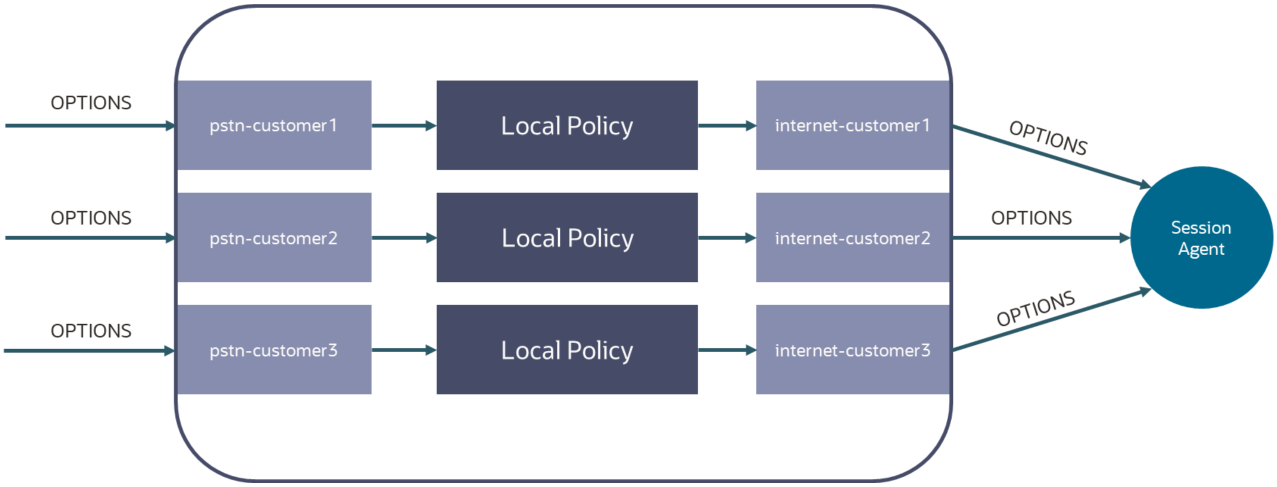


Image 2. Architectural Overview – Forwarding received OPTIONS

Low Level

This method requires a Local Policy for each realm that matches the SIP OPTION method. This can be a dedicated Local Policy, or it can be the same Local Policy that is used to route calls, amended to include the OPTIONS method.

Additionally, a Header Manipulation Rule (HMR) will be required to set the Contact Header appropriately.

Local Policy

Each Local Policy is a simple 1:1 mapping from the ingress realm to the Global Session Agent via the corresponding egress realm. The Example here outlines the configuration for 3 realm pairs.

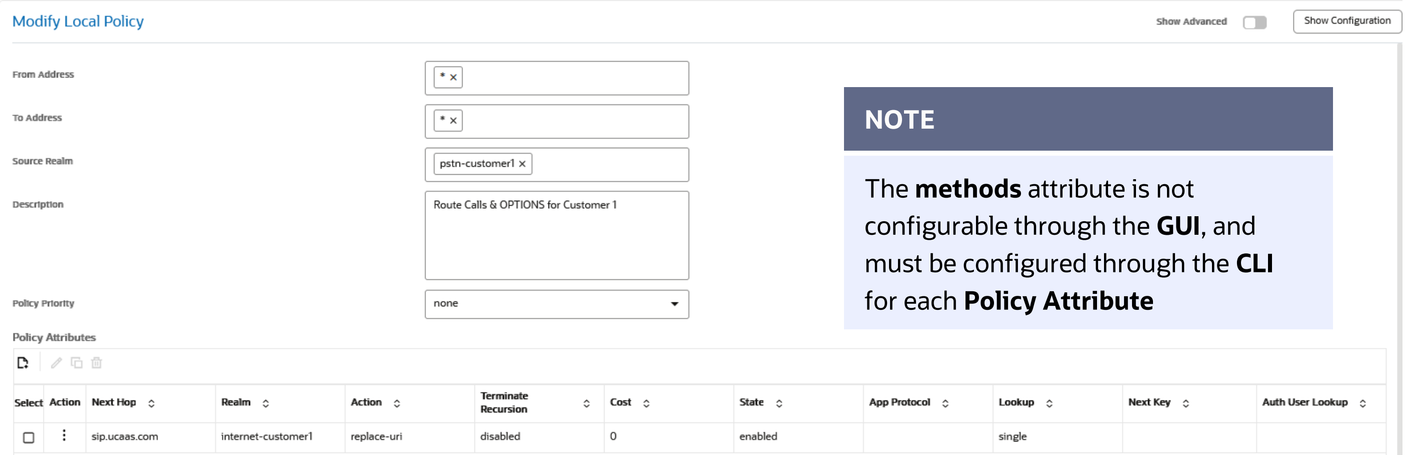
Customer 1

TO ADDRESS	FROM ADDRESS	SOURCE REALM	DESCRIPTION
*	*	pstn-customer1	Route Calls & OPTIONS for Customer 1

Table 1. Method 1 – SBC Local Policy for Customer 1

NEXT HOP	NEXT HOP REALM	ACTION	METHODS
sip.ucaas.com	internet-customer1	Replace URI	INVITE, OPTIONS

Table 2. Method 1 – SBC Local Policy – Policy Attribute for Customer 1



From Address	* ×
To Address	* ×
Source Realm	pstn-customer1 ×
Description	Route Calls & OPTIONS for Customer 1
Policy Priority	none

Policy Attributes

Select	Action	Next Hop	Realm	Action	Terminate Recursion	Cost	State	App Protocol	Lookup	Next Key	Auth User Lookup
□	⋮	sip.ucaas.com	internet-customer1	replace-uri	disabled	0	enabled		single		

NOTE

The **methods** attribute is not configurable through the **GUI**, and must be configured through the **CLI** for each **Policy Attribute**

Image 3. Method 1 – E-SBC Local Policy for Customer 1

```
local-policy
        from-address                            *
        to-address                              *
        source-realm                            pstn-customer1
        description                             Route Calls & OPTIONS for Customer 1
        state                                   enabled
        policy-attribute
                next-hop                                sip.ucaas.com
                realm                                   internet-customer1
                action                                  replace-uri
                terminate-recursion                     enabled
                state                                   enabled
                app-protocol                            SIP
                methods                                 INVITE,OPTIONS
```

Table 3. Method 1 – SBC Local Policy – Configuration for Customer 1

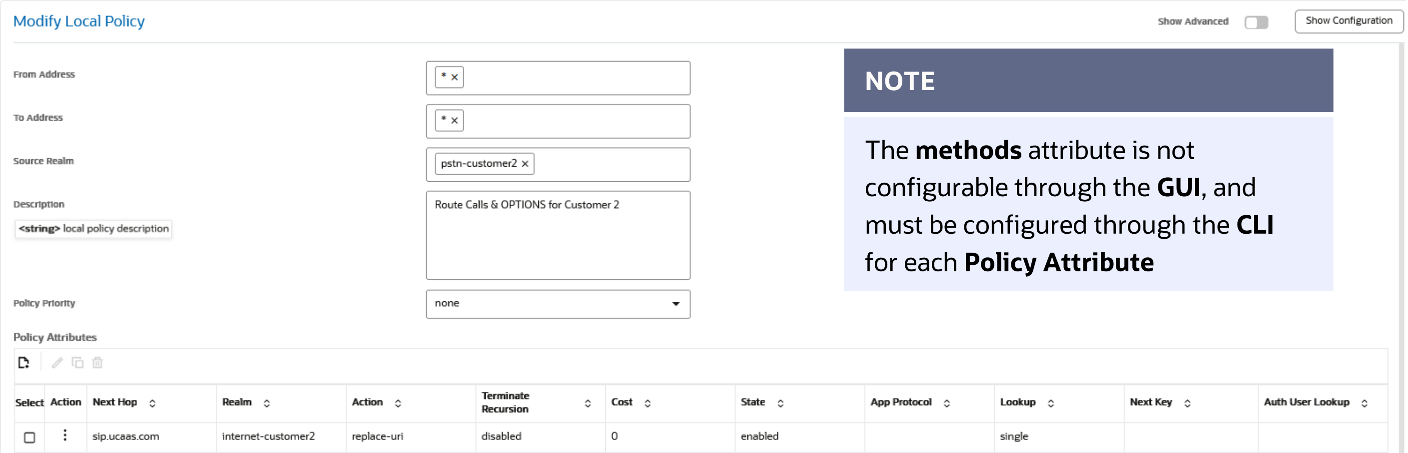
Customer 2

TO ADDRESS	FROM ADDRESS	SOURCE REALM	DESCRIPTION
*	*	pstn-customer2	Route Calls & OPTIONS for Customer 2

Table 4. Method 1 – SBC Local Policy for Customer 2

NEXT HOP	NEXT HOP REALM	ACTION	METHODS
sip.ucaas.com	internet-customer2	Replace URI	INVITE, OPTIONS

Table 5. Method 1 – SBC Local Policy – Policy Attribute for Customer 2



From Address	* ×
To Address	* ×
Source Realm	pstn-customer2 ×
Description <string> local policy description	Route Calls & OPTIONS for Customer 2
Policy Priority	none

Policy Attributes

Select	Action	Next Hop	Realm	Action	Terminate Recursion	Cost	State	App Protocol	Lookup	Next Key	Auth User Lookup
□	⋮	sip.ucaas.com	internet-customer2	replace-uri	disabled	0	enabled		single		

NOTE

The **methods** attribute is not configurable through the **GUI**, and must be configured through the **CLI** for each **Policy Attribute**

Image 4. Method 1 – E-SBC Local Policy for Customer 2

```
local-policy
        from-address                                    *
        to-address                                      *
        source-realm                                    pstn-customer2
        description                                     Route Calls & OPTIONS for Customer 2
        state                                           enabled
        policy-attribute
                next-hop                                        sip.ucaas.com
                realm                                           internet-customer2
                action                                          replace-uri
                terminate-recursion                             enabled
                state                                           enabled
                app-protocol                                    SIP
                methods                                         INVITE,OPTIONS
```

Table 6. Method 1 – SBC Local Policy – Configuration for Customer 2

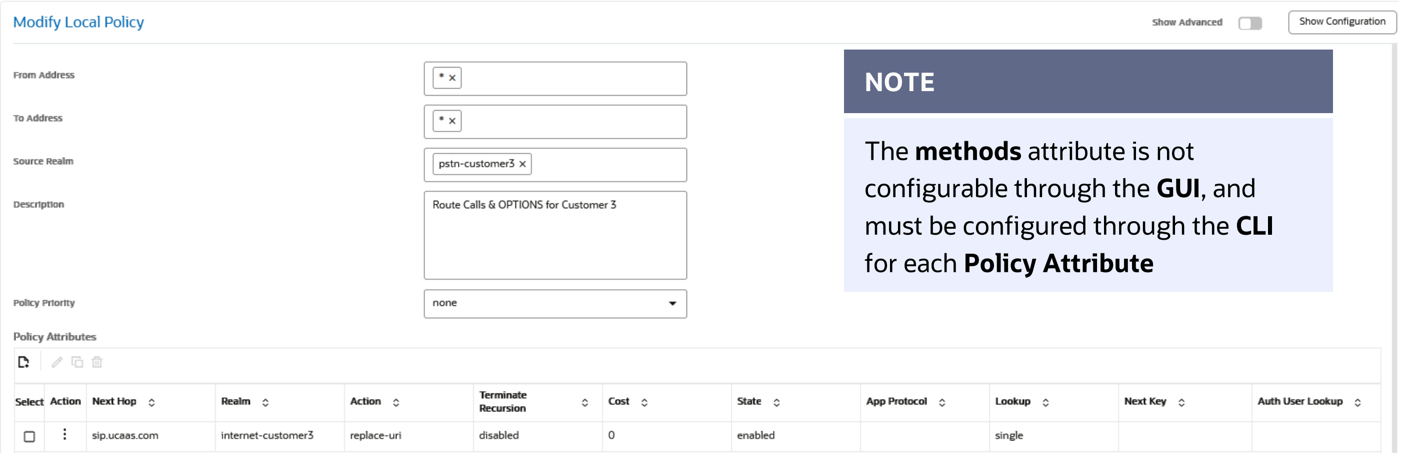
Customer 3

TO ADDRESS	FROM ADDRESS	SOURCE REALM	DESCRIPTION
*	*	pstn-customer3	Route Calls & OPTIONS for Customer 3

Table 7. Method 1 – SBC Local Policy for Customer 3

NEXT HOP	NEXT HOP REALM	ACTION	METHODS
sip.ucaas.com	internet-customer3	Replace URI	INVITE, OPTIONS

Table 8. Method 1 – SBC Local Policy – Policy Attribute for Customer 3



From Address	* ×
To Address	* ×
Source Realm	pstn-customer3 ×
Description	Route Calls & OPTIONS for Customer 3
Policy Priority	none

Policy Attributes

Select	Action	Next Hop	Realm	Action	Terminate Recursion	Cost	State	App Protocol	Lookup	Next Key	Auth User Lookup
□	⋮	sip.ucaas.com	internet-customer3	replace-uri	disabled	0	enabled		single		

NOTE

The **methods** attribute is not configurable through the **GUI**, and must be configured through the **CLI** for each **Policy Attribute**

Image 5. Method 1 – E-SBC Local Policy for Customer 3

```
local-policy
        from-address                            *
        to-address                              *
        source-realm                            pstn-customer3
        description                             Route Calls & OPTIONS for Customer 3
        state                                   enabled
        policy-attribute
                next-hop                                sip.ucaas.com
                realm                                   internet-customer3
                action                                  replace-uri
                terminate-recursion                     enabled
                state                                   enabled
                app-protocol                            SIP
                methods                                 INVITE,OPTIONS
                media-profiles
```

Table 9. Method 1 – SBC Local Policy – Configuration for Customer 3

SIP Manipulation

We have a single SIP Manipulation (HMR) applied to all of the ‘Internet’ Realms as an ‘Outbound’ SIP Manipulation (to modify messages on egress). This SIP Manipulation is only applied to OPTIONS requests.

The first Manipulation will alter any already present Contact header to set the host to the value specified in the egress realms Trunk Context field. The second will add a Contact header with the appropriate value, but only if one is not already present.

SIP MANIPULATION

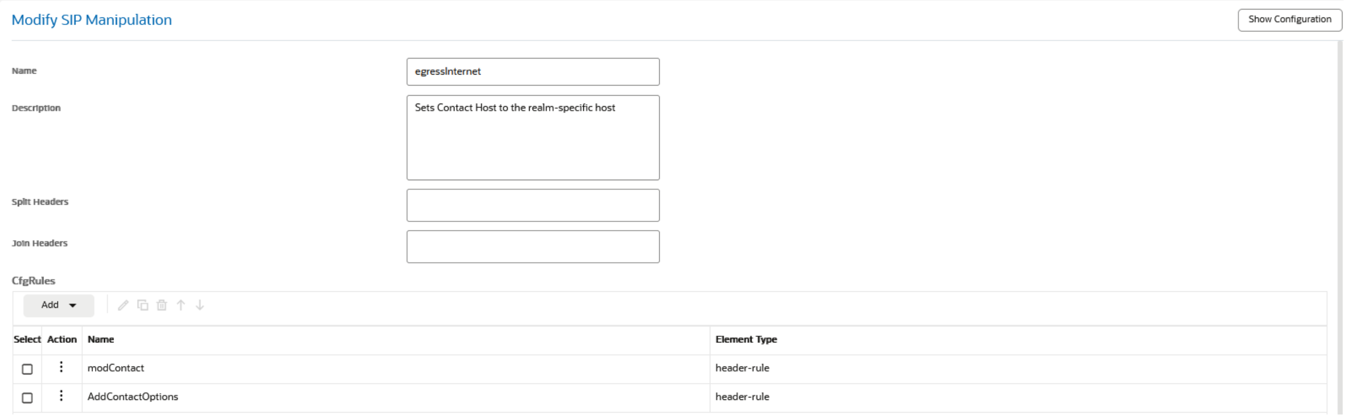
HEADER RULE NAME	HEADER NAME	ACTION	MSG TYPE	METHODS
modContact	Contact	Manipulate	Out of Dialog	OPTIONS

ELEMENT RULE NAME	TYPE	ACTION	PARAMETER NAME	COMPARISON TYPE	MATCH VALUE	NEW VALUE
modContactHost	uri-host	replace		case-sensitive		$TRUNK_GROUP_CONTEXT

HEADER RULE NAME	HEADER NAME	ACTION	MSG TYPE	METHODS	COMPARISON TYPE
AddContactOptions	Contact	add	Out of Dialog	OPTIONS	boolean

MATCH VALUE	NEW VALUE
!$modContact.$modContactHost	"<sip:ping@"+$TRUNK_GROUP_CONTEXT+":"+$LOCAL_PORT+";transport=tls>"

Table 10. Method 1 – SBC SIP Manipulation



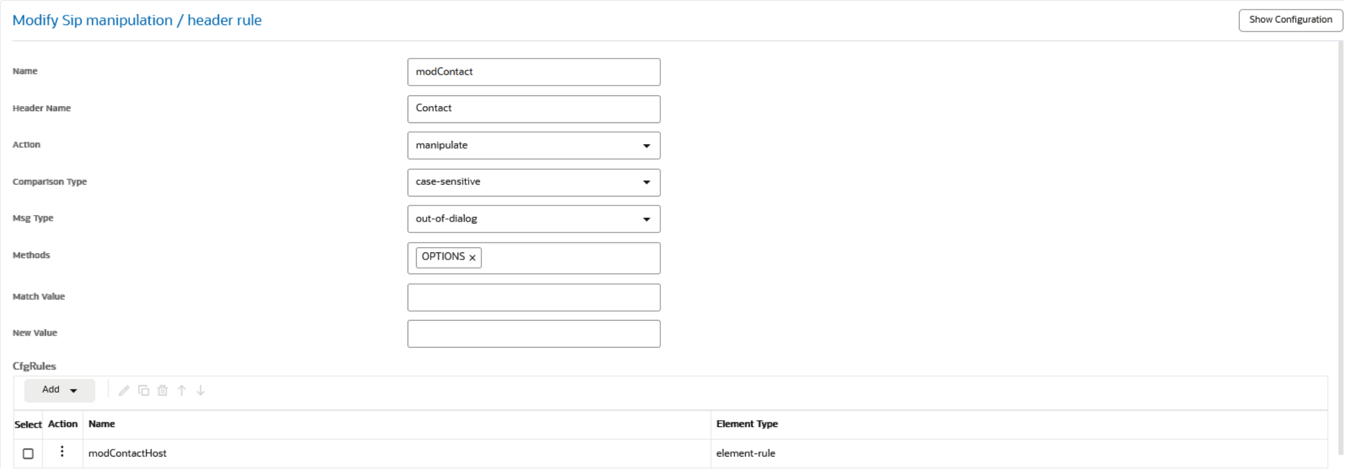
Modify SIP Manipulation

Name	egressInternet
Description	Sets Contact Host to the realm-specific host
Split Headers	
Join Headers	

CfgRules

Select	Action	Name	Element Type
□	⋮	modContact	header-rule
□	⋮	AddContactOptions	header-rule

Image 6. Method 1 – E-SBC SIP Manipulation



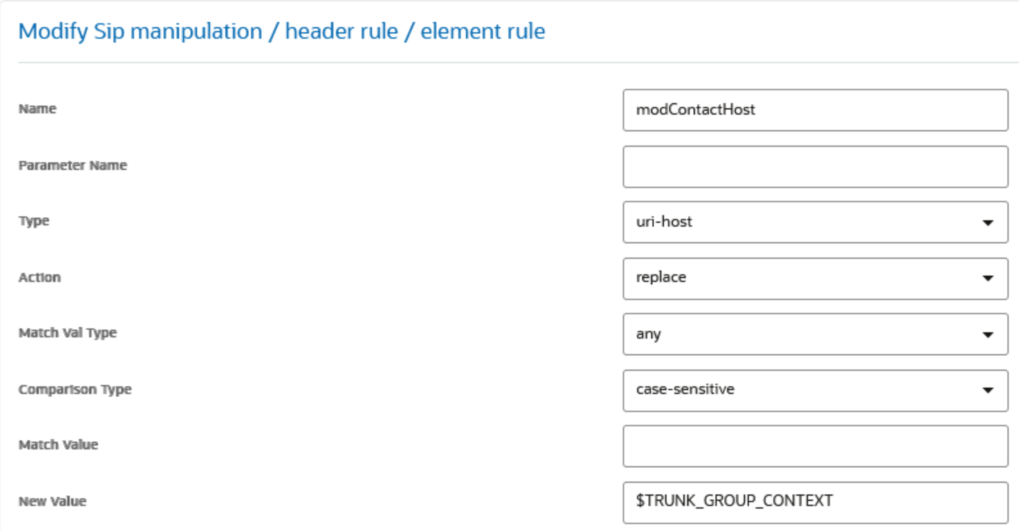
Modify Sip manipulation / header rule

Name	modContact
Header Name	Contact
Action	manipulate
Comparison Type	case-sensitive
Msg Type	out-of-dialog
Methods	OPTIONS ×
Match Value	
New Value	

CfgRules

Select	Action	Name	Element Type
☐	⋮	modContactHost	element-rule

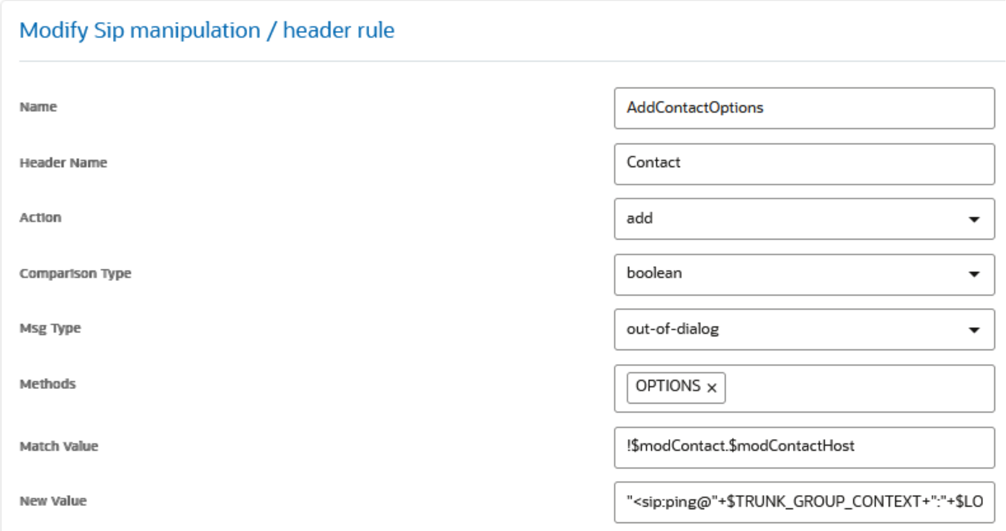
Image 7. Method 1 – E-SBC Header Rule



Modify Sip manipulation / header rule / element rule

Name	modContactHost
Parameter Name	
Type	uri-host
Action	replace
Match Val Type	any
Comparison Type	case-sensitive
Match Value	
New Value	$TRUNK_GROUP_CONTEXT

Image 8. Method 1 – E-SBC Element Rule



Modify Sip manipulation / header rule

Name	AddContactOptions
Header Name	Contact
Action	add
Comparison Type	boolean
Msg Type	out-of-dialog
Methods	OPTIONS ×
Match Value	!$modContact.$modContactHost
New Value	"<sip:ping@"+$TRUNK_GROUP_CONTEXT+":"+$LO

Image 9. Method 1 – E-SBC Header Rule

```
sip-manipulation
        name                                    egressInternet
        description                             Sets Contact Host to the realm-
specific host
        split-headers
        join-headers
        header-rule
                name                                    modContact
                header-name                             Contact
                action                                  manipulate
                comparison-type                         case-sensitive
                msg-type                                out-of-dialog
                methods                                 OPTIONS
                match-value
                new-value
                element-rule
                        name                                    modContactHost
                        parameter-name
                        type                                    uri-host
                        action                                  replace
                        match-val-type                          any
                        comparison-type                         case-sensitive
                        match-value
                        new-value                               $TRUNK_GROUP_CONTEXT
        header-rule
                name                                    AddContactOptions
                header-name                             Contact
                action                                  add
                comparison-type                         boolean
                msg-type                                out-of-dialog
                methods                                 OPTIONS
                match-value                             !$modContact.$modContactHost
                new-value
"<sip:ping@"+$TRUNK_GROUP_CONTEXT+":"+$LOCAL_PORT+";transport=tls>"
```

Table 11. Method 1 – SBC HMR – Configuration

Realm Config

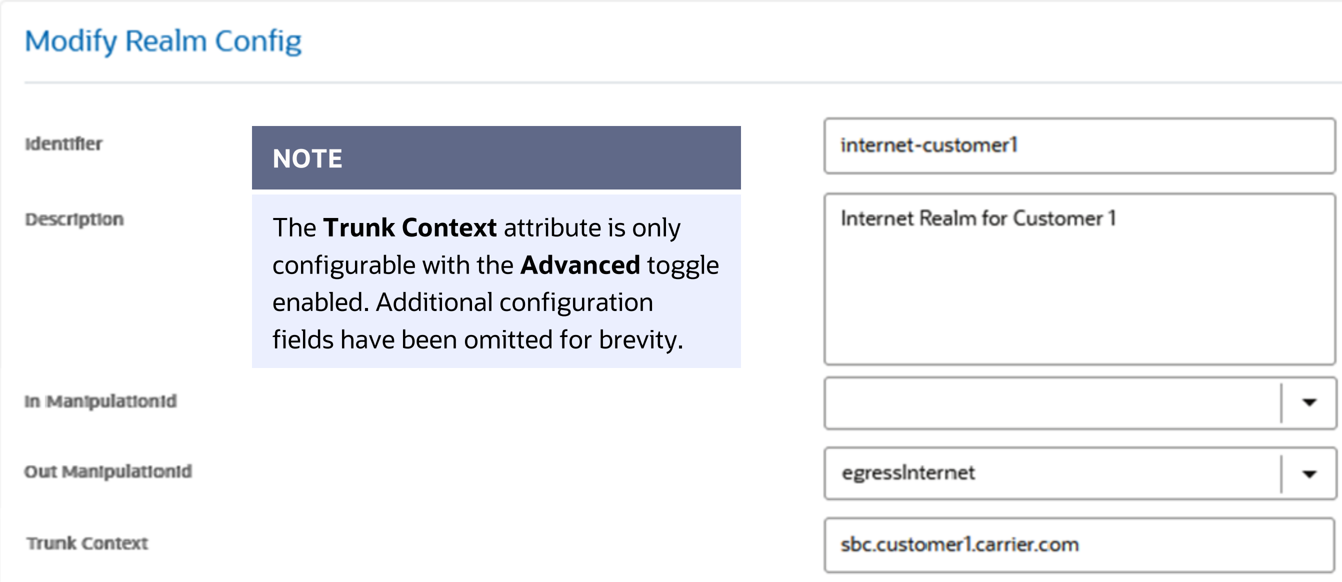
In order to apply the previous Header Manipulation Rule, the following configuration must be applied to the 'Internet' realms facing the Global Session Agent. The Trunk Context must be set to the appropriate FQDN or IP that represents the SBC's realm, and must be reachable from the Global Session Agent.

NOTE: For brevity, the 'PSTN' realms are not outlined here, as they require no special configuration for this method.

Customer 1

IDENTIFER	OUT-MANIPUALTION	TRUNK CONTEXT	DESCRIPTION
internet-customer1	egressInternet	sbc.customer1.carrier.com	Internet Realm for Customer 1

Table 12. Method 1 – SBC Realm Config for Customer 1



Modify Realm Config

Identifier	internet-customer1
Description	Internet Realm for Customer 1
In ManipulationId	
Out ManipulationId	egressInternet
Trunk Context	sbc.customer1.carrier.com

NOTE

The **Trunk Context** attribute is only configurable with the **Advanced** toggle enabled. Additional configuration fields have been omitted for brevity.

Image 10. Method 1 – E-SBC Realm Config for Customer 1

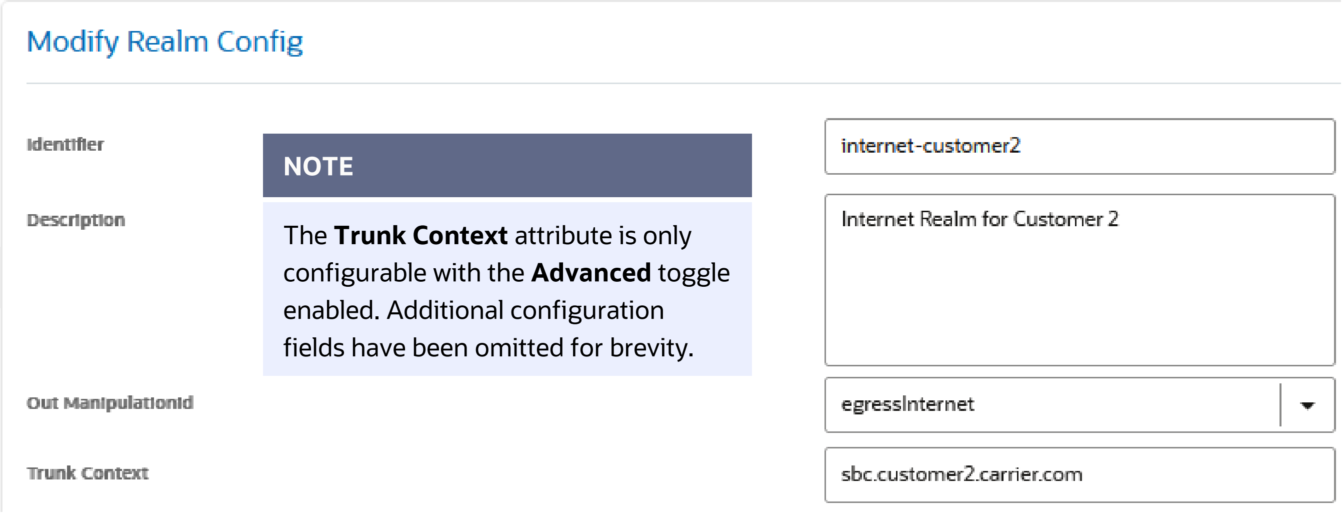
```
realm-config
        identifier                              internet-customer1
        description                             Internet Realm for Customer 1
        network-interfaces                      s0p0:0.4
        out-manipulationid                      egressInternet
        trunk-context                           sbc.customer1.carrier.com
```

Table 13. Method 1 – SBC Realm Config – Configuration for Customer 1

Customer 2

IDENTIFER	OUT-MANIPUALTION	TRUNK CONTEXT	DESCRIPTION
internet-customer2	egressInternet	sbc.customer2.carrier.com	Internet Realm for Customer 2

Table 14. Method 1 – SBC Realm Config for Customer 2



Modify Realm Config

Identifier: internet-customer2

Description: Internet Realm for Customer 2

Out ManipulationId: egressInternet

Trunk Context: sbc.customer2.carrier.com

NOTE

The **Trunk Context** attribute is only configurable with the **Advanced** toggle enabled. Additional configuration fields have been omitted for brevity.

Image 11. Method 1 – E-SBC Realm Config for Customer 2

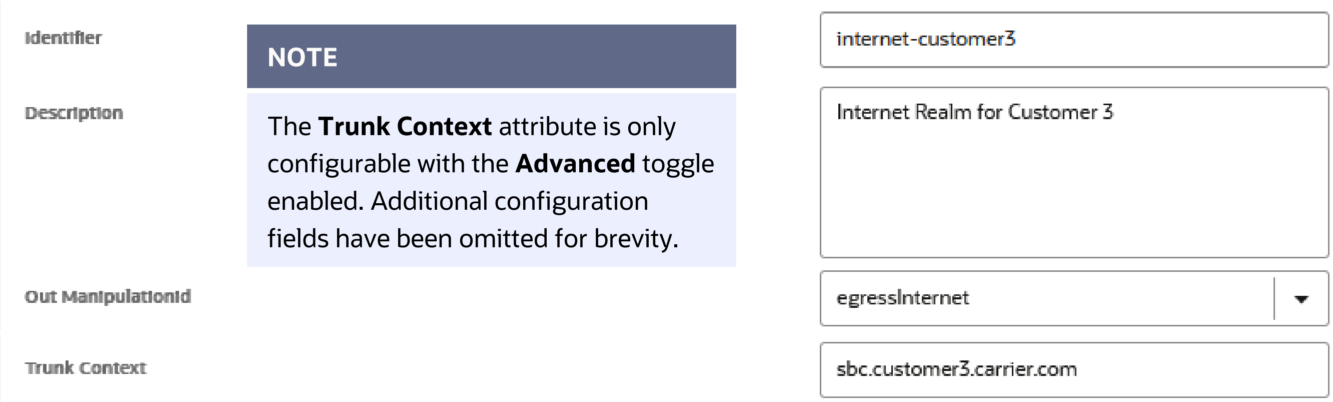
```
realm-config
        identifier                              internet-customer2
        description                             Internet Realm for Customer 2
        network-interfaces                      s0p0:0.4
        out-manipulationid                      egressInternet
        trunk-context                           sbc.customer2.carrier.com
```

Table 15. Method 1 – SBC Realm Config – Configuration for Customer 2

Customer 3

IDENTIFER	OUT-MANIPUALTION	TRUNK CONTEXT	DESCRIPTION
internet-customer3	egressInternet	sbc.customer3.carrier.com	Internet Realm for Customer 3

Table 16. Method 1 – SBC Realm Config for Customer 3



Identifier: internet-customer3

Description: Internet Realm for Customer 3

Out ManipulationId: egressInternet

Trunk Context: sbc.customer3.carrier.com

NOTE

The **Trunk Context** attribute is only configurable with the **Advanced** toggle enabled. Additional configuration fields have been omitted for brevity.

Image 12. Method 1 – E-SBC Realm Config for Customer 3

```
realm-config
        identifier                              internet-customer3
        description                             Internet Realm for Customer 3
        network-interfaces                      s0p0:0.4
        out-manipulationid                      egressInternet
        trunk-context                           sbc.customer3.carrier.com
```

Table 17. Method 1 – SBC Realm Config – Configuration for Customer 3

Method #2 – Time-based alternating

Components

This architecture uses the following components to achieve the configuration:

Oracle SBC/E-SBC:

- Header Manipulation Rules (HMR)
- Session Agent

If you're unfamiliar with these component features and how they work, it's recommended to read the relevant documentation prior to this Technical Brief.

Goals

Although the SBC does generate SIP OPTIONS messages towards Global Session Agent, as previously outlined, it will only generate them from a single realm (designated by the Egress Realm in the Session Agent). In order for the UCaaS/CCaaS platform to see all of the SBC's realms as In Service, they generally rely on the received Contact Header information.

This method will change the Contact header set on the OPTIONS message based on the Timestamp value of the SBC, thereby giving us an option to cycle through different Hosts within the Contact header. By then setting the Session Agent's Ping Interval to an odd number, we can effectively cycle through these Hosts periodically.

Architectural Overview

High Level

This method will change the Contact header set on the OPTIONS message based on the Timestamp value of the SBC, thereby giving us an option to cycle through different Hosts within the Contact header. By then setting the Session Agent's Ping Interval to an odd number, we can effectively cycle through these Hosts periodically.

NOTE: This method will only alter the Contact header Host, and not alter the Layer 3 IP address sent in the packet.

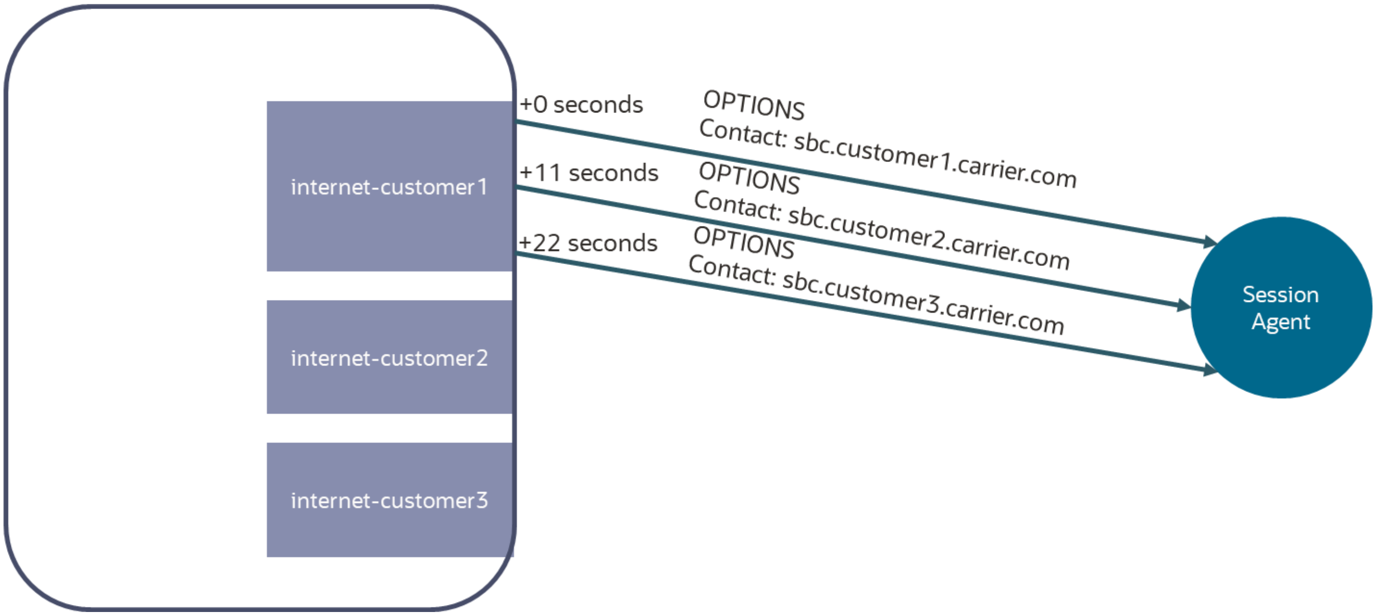


Image 13. Architectural Overview – Time-based alternating

Low Level

This method uses an HMR to check the timestamp, stored in the $TIMESTAMP_UTC variable for the last digit of the 'seconds'. Depending on how it ends, we can invoke different header-rules to add the appropriate Contact host.

The $TIMESTAMP_UTC variable stores the date and time in the format: YYYY-MM-DDTHH:MM:**SS**.PPPZ

We can use the following Regular Expression, altering only the highlighted part to match the specific 'second' digit:

$$.* T\backslash d\{2\}:\backslash d\{2\}:\backslash d(\boldsymbol{\backslash d}).*$$

For example, to service 2 realms, we can choose alternating digits to alternate between the two results, with the following 2 Regular Expressions:

$$.* T\backslash d\{2\}:\backslash d\{2\}:\backslash d(\mathbf{0|2|4|6|8}).*$$

$$.* T\backslash d\{2\}:\backslash d\{2\}:\backslash d(\mathbf{1|3|5|7|9}).*$$

For the 3 Realms in this example, we will use 3 Regular Expressions, again only changing the digits to match in the last 'second':

$$.* T\backslash d\{2\}:\backslash d\{2\}:\backslash d(\mathbf{0|3|6|9}).*$$

$$.* T\backslash d\{2\}:\backslash d\{2\}:\backslash d(\mathbf{1|4|7}).*$$

$$.* T\backslash d\{2\}:\backslash d\{2\}:\backslash d(\mathbf{2|5|8}).*$$

If we need to facilitate more than 10 realms we can encompass both digits of the ‘seconds’ field to give us a total of 60 possible permutations, by altering the Regular Expression as outlined below:

$.* T\backslash d\{2\}:\backslash d\{2\}: (\boldsymbol{\backslash d\{2\}}).*$

This would give us the facility to match against both digits, like the below which would match against the timestamp every 30 seconds on the 15th and 45th second:

$.* T\backslash d\{2\}:\backslash d\{2\}: (\mathbf{15|45}).*$

With this capability to match against specific seconds, we just need to stagger the OPTIONS messages so that they don’t always fall on the same second. If we were to set the ping-interval on the Session Agent to an even number, then the OPTIONS would skip some of the seconds that we’re matching against.

By Setting the ping-interval to an odd number however, for example 11 seconds, this ensures that the interval always increments by 1 effectively cycling through the alternating match-values with each new OPTIONS generated.

If the Global Session Agent is using SRV-based load-balancing with multiple endpoints behind a single FQDN, the SBC will attempt to ping these simultaneously, ensuring that all endpoints match against the same Regular Expression for the time interval on which they are generated.

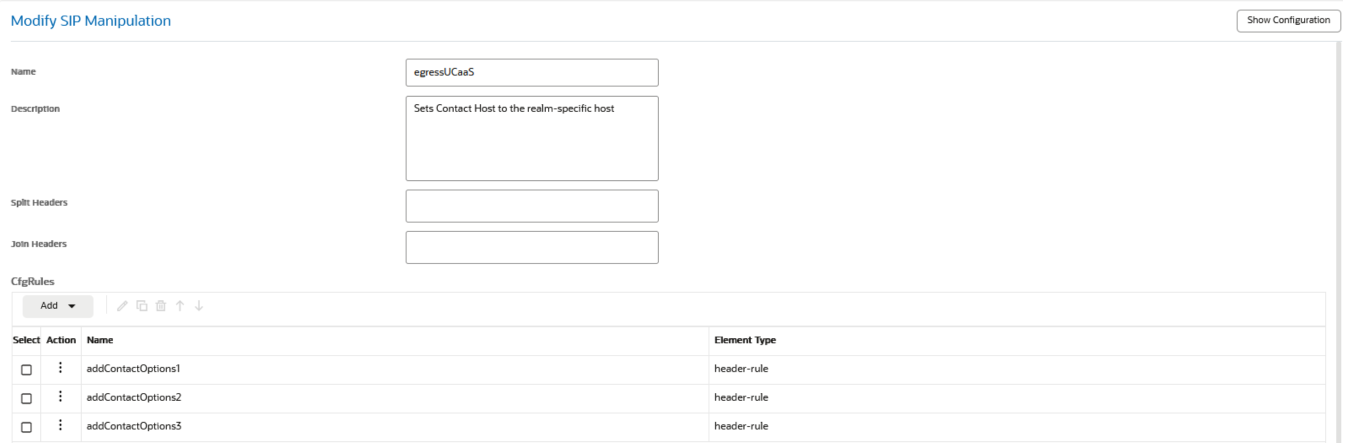
In the example, we want to poll the Global Session Agent from each of the 3 realms every ~30 seconds. By setting the ping-interval in the Global Session Agent to 11 seconds we ensure that each realms Contact host will be sent every 31 seconds to the Global Session Agent.

SIP Manipulation

We have a single SIP Manipulation (HMR) applied to the Session Agent as an ‘Outbound’ SIP Manipulation (to modify messages on egress). This SIP Manipulation is only applied to OPTIONS requests.

<table>
<tr><th colspan="6">SIP MANIPULATION</th></tr>
<tr><th>HEADER RULE NAME</th><th>HEADER NAME</th><th>ACTION</th><th>MSG TYPE</th><th>METHODS</th><th>COMPARISON TYPE</th></tr>
<tr><td><b>addContactOptions1</b></td><td>Contact</td><td>add</td><td>Out of Dialog</td><td>OPTIONS</td><td>boolean</td></tr>
<tr><th colspan="3">MATCH VALUE</th><th colspan="3">NEW VALUE</th></tr>
<tr><td colspan="3">$REGEX(".*T\d{2}:\d{2}:\d(0|3|6|9).*",$TIMESTAMP_UTC.$0)</td><td colspan="3">"&lt;sip:ping@sbc.customer1.carrier.com:"+$LOCAL_PORT+";transport=tls&gt;"</td></tr>
<tr><th>HEADER RULE NAME</th><th>HEADER NAME</th><th>ACTION</th><th>MSG TYPE</th><th>METHODS</th><th></th></tr>
<tr><td><b>addContactOptions2</b></td><td>Contact</td><td>add</td><td>Out of Dialog</td><td>OPTIONS</td><td></td></tr>
<tr><th colspan="3">MATCH VALUE</th><th colspan="3">NEW VALUE</th></tr>
<tr><td colspan="3">$REGEX(".*T\d{2}:\d{2}:\d(1|4|7).*",$TIMESTAMP_UTC.$0))</td><td colspan="3">"&lt;sip:ping@sbc.customer2.carrier.com:"+$LOCAL_PORT+";transport=tls&gt;"</td></tr>
<tr><th>HEADER RULE NAME</th><th>HEADER NAME</th><th>ACTION</th><th>MSG TYPE</th><th>METHODS</th><th>COMPARISON TYPE</th></tr>
<tr><td><b>addContactOptions3</b></td><td>Contact</td><td>add</td><td>Out of Dialog</td><td>OPTIONS</td><td>boolean</td></tr>
<tr><th colspan="3">MATCH VALUE</th><th colspan="3">NEW VALUE</th></tr>
<tr><td colspan="3">$REGEX(".*T\d{2}:\d{2}:\d(2|5|8).*",$TIMESTAMP_UTC.$0)</td><td colspan="3">"&lt;sip:ping@sbc.customer3.carrier.com:"+$LOCAL_PORT+";transport=tls&gt;"</td></tr>
</table>

Table 18. Method 2 – SBC SIP Manipulation



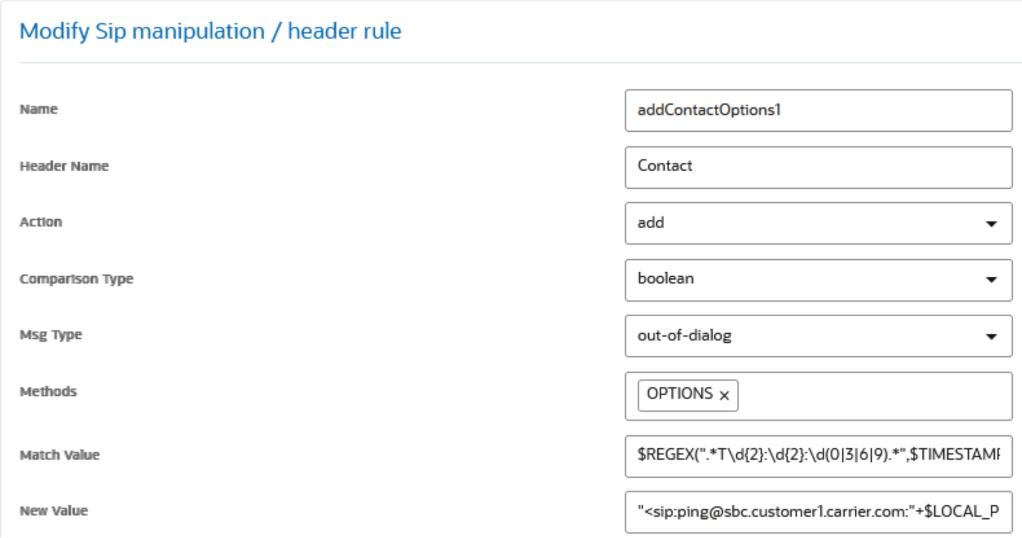
Modify SIP Manipulation

Name	egressUCaaS
Description	Sets Contact Host to the realm-specific host
Split Headers	
Join Headers	

CfgRules

Select	Action	Name	Element Type
☐	⋮	addContactOptions1	header-rule
☐	⋮	addContactOptions2	header-rule
☐	⋮	addContactOptions3	header-rule

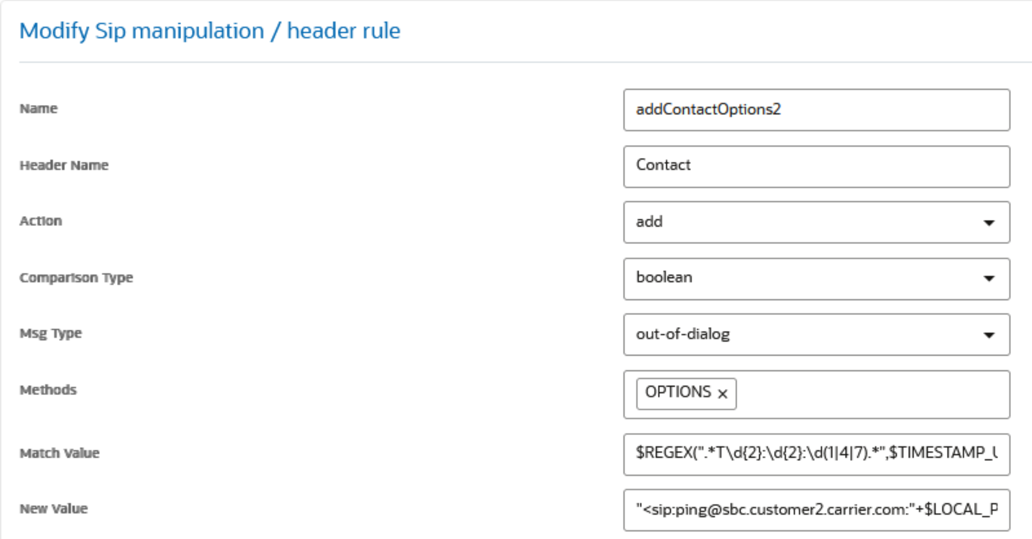
Image 14. Method 2 – E-SBC SIP Manipulation



Modify Sip manipulation / header rule

Name	addContactOptions1
Header Name	Contact
Action	add
Comparison Type	boolean
Msg Type	out-of-dialog
Methods	OPTIONS ×
Match Value	$REGEX(".*T\d{2}:\d{2}:\d(0\|3\|6\|9).*",$TIMESTAMP
New Value	"<sip:ping@sbc.customer1.carrier.com:"+$LOCAL_P

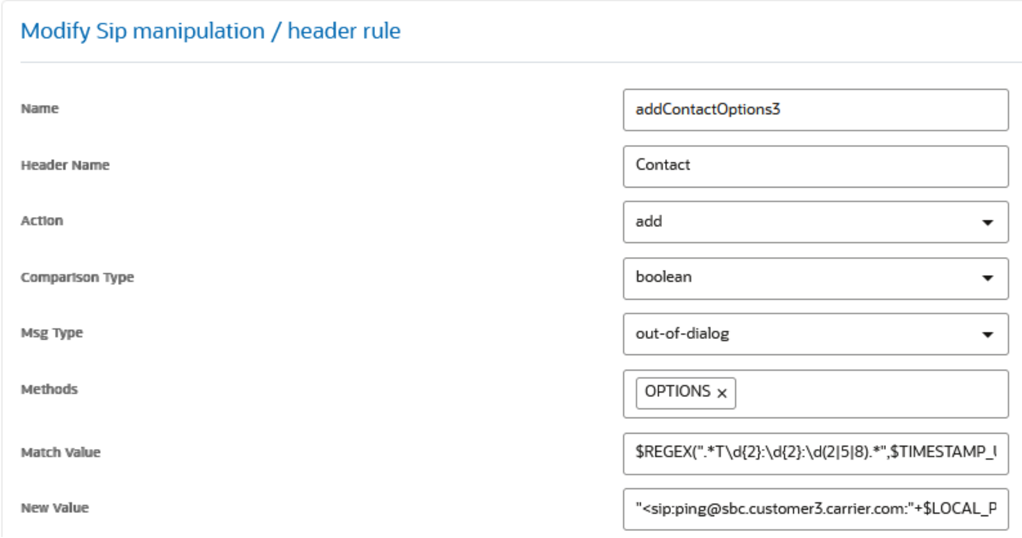
Image 15. Method 2 – E-SBC Header Rules



Modify Sip manipulation / header rule

Name	addContactOptions2
Header Name	Contact
Action	add
Comparison Type	boolean
Msg Type	out-of-dialog
Methods	OPTIONS ×
Match Value	$REGEX(".*T\d{2}:\d{2}:\d(1\|4\|7).*",$TIMESTAMP_U
New Value	"<sip:ping@sbc.customer2.carrier.com:"+$LOCAL_P

Image 16. Method 2 – E-SBC Header Rules



Modify Sip manipulation / header rule

Name	addContactOptions3
Header Name	Contact
Action	add
Comparison Type	boolean
Msg Type	out-of-dialog
Methods	OPTIONS ×
Match Value	$REGEX(".*T\d{2}:\d{2}:\d(2\|5\|8).*",$TIMESTAMP_U
New Value	"<sip:ping@sbc.customer3.carrier.com:"+$LOCAL_P

Image 17. Method 2 – E-SBC Header Rules

```
sip-manipulation
        name                                    egressUCaaS
        description                             Sets Contact Host to the realm-
specific host
        split-headers
        join-headers
        header-rule
                name                                    addContactOptions1
                header-name                             Contact
                action                                  add
                comparison-type                         boolean
                msg-type                                out-of-dialog
                methods                                 OPTIONS
                match-value
$REGEX(".*T\d{2}:\d{2}:\d(0|3|6|9).*",$TIMESTAMP_UTC.$0)
                new-value
"<sip:ping@sbc.customer1.carrier.com:"+$LOCAL_PORT+";transport=tls>"
        header-rule
                name                                    addContactOptions2
                header-name                             Contact
                action                                  add
                comparison-type                         boolean
                msg-type                                out-of-dialog
                methods                                 OPTIONS
                match-value
$REGEX(".*T\d{2}:\d{2}:\d(1|4|7).*",$TIMESTAMP_UTC.$0)
                new-value
"<sip:ping@sbc.customer2.carrier.com:"+$LOCAL_PORT+";transport=tls>"
        header-rule
                name                                    addContactOptions3
                header-name                             Contact
                action                                  add
                comparison-type                         boolean
                msg-type                                out-of-dialog
                methods                                 OPTIONS
                match-value
$REGEX(".*T\d{2}:\d{2}:\d(2|5|8).*",$TIMESTAMP_UTC.$0)
                new-value
"<sip:ping@sbc.customer3.carrier.com:"+$LOCAL_PORT+";transport=tls>"
```

Table 19. Method 2 – SBC HMR – Configuration

Session Agent

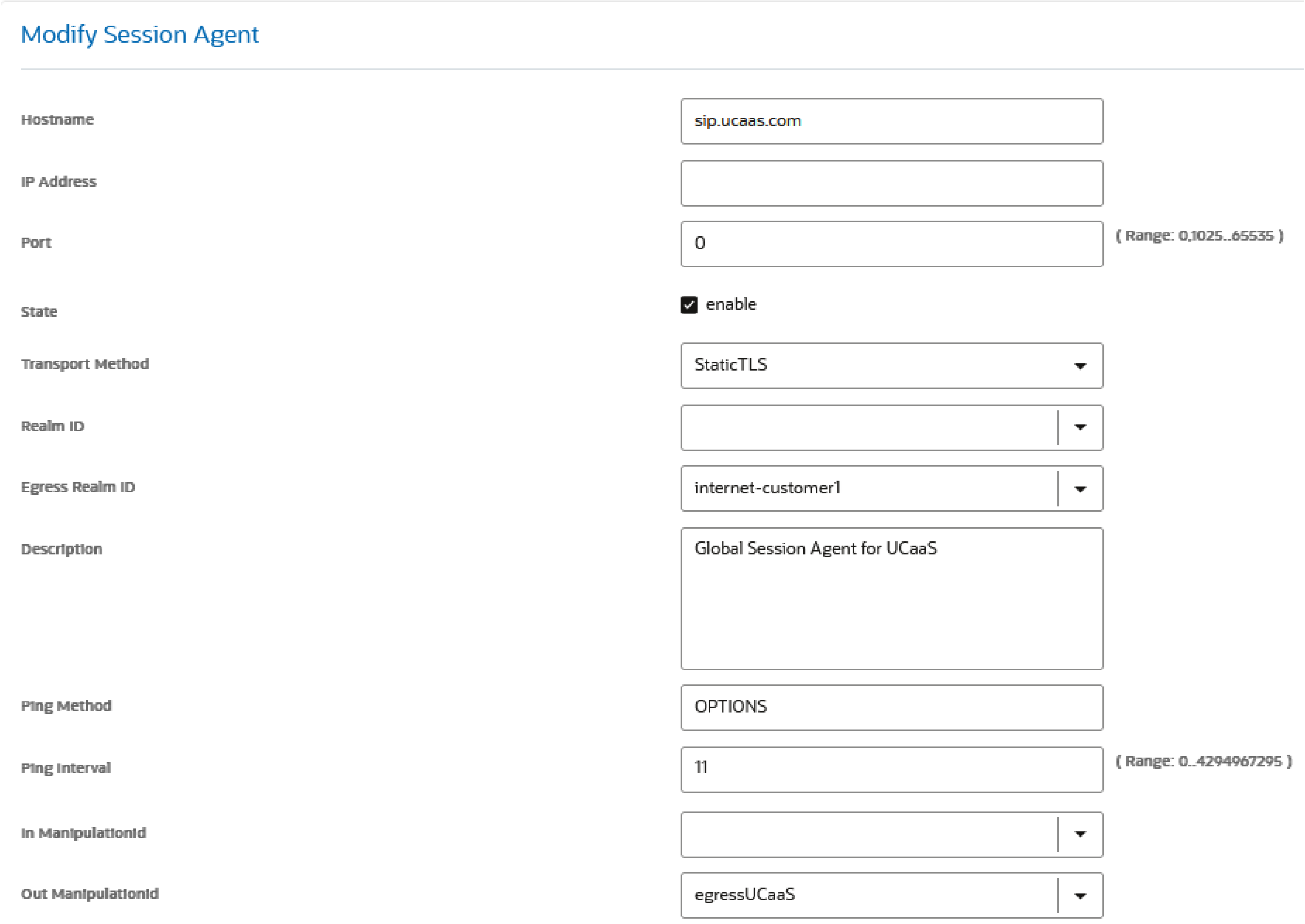
All we need to do is apply the Header Manipulation Rule to the Global Session Agent and set the appropriate, odd numbered ping-interval.

NOTE: For brevity, some configuration is omitted. The example shows DNS SRV Load Balancing enabled

Customer 1

HOSTNAME	OUT-MANIPUALTION	PING INTERVAL	DESCRIPTION
sip.ucaas.com	egressUCaaS	11	Global Session Agent for UCaaS

Table 20. Method 2 – SBC Session Agent



Modify Session Agent

Hostname	sip.ucaas.com	
IP Address		
Port	0	(Range: 0,1025..65535)
State	☑ enable	
Transport Method	StaticTLS	
Realm ID		
Egress Realm ID	internet-customer1	
Description	Global Session Agent for UCaaS	
Ping Method	OPTIONS	
Ping Interval	11	(Range: 0..4294967295)
In ManipulationId		
Out ManipulationId	egressUCaaS	

Image 18. Method 2 – E-SBC Session Agent

```
session-agent
        hostname                                sip.ucaas.com
        port                                    0
        transport-method                        StaticTLS
        egress-realm-id                         internet-customer1
        description                             Global Session Agent for UCaaS
        ping-method                             OPTIONS
        ping-interval                           11
        ping-all-addresses                      enabled
        out-manipulationid                      egressUCaaS
```

Table 21. Method 2 – SBC Session Agent – Configuration

Method #3 – Time-based Loopback

Components

This architecture uses the following components to achieve the configuration:

Oracle SBC/E-SBC:

- Local Policy
- Header Manipulation Rules (HMR)
- Realm Config
- Session Agent

If you're unfamiliar with these component features and how they work, it's recommended to read the relevant documentation prior to this Technical Brief.

Goals

In order for the UCaaS/CCaaS platform to assess the availability of multiple realms, it needs to see OPTIONS messages sent by each. We can combine mechanisms from both the previous 2 methods to address the weaknesses of them into a more complete, albeit more complex solution.

Architectural Overview

High Level

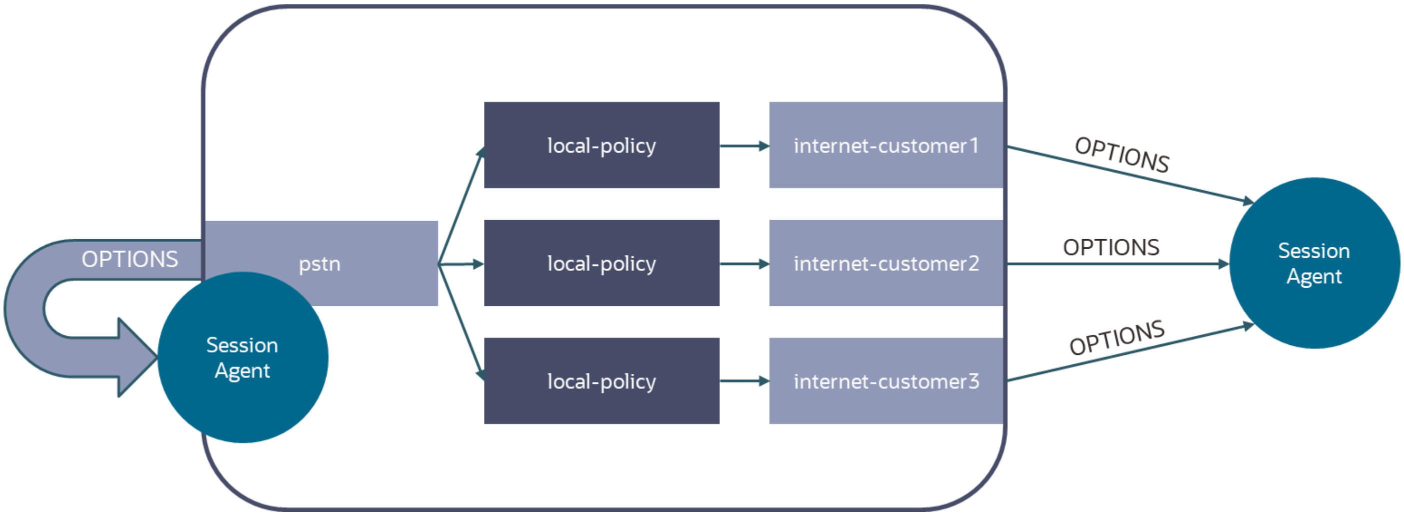


Image 19. Architectural Overview – Time-based Loopback

Low Level

This method requires us to create a Session Agent that represents the Core/PSTN interface of the SBC which we can then use to generate OPTIONS requests on. These OPTIONS requests can then be modified by a similar HMR to Method 2 to stagger unique 'From' headers, which we can then independently route using Local Policy from the appropriate egress Realms to the Global Session Agent. This provides more granularity than Method 1 as we have direct control over how the OPTIONS requests are generated.

Additionally, for a Global Session Agent using DNS SRV Load Balancing we can choose to 'Round Robin' between the endpoints for each OPTIONS request to ensure that we continuously send to all of them. However, when calls are being passed through, the Round Robin function would count both OPTIONS and INVITE's together, so some endpoints may receive fewer OPTIONS messages than others.

SIP Manipulation

PSTN-side

We have a single SIP Manipulation (HMR) applied to the Dummy Session Agent as an ‘Inbound’ SIP Manipulation (to modify messages on egress). This is based on the SIP Manipulation used in Method 2, but alters the From header.

SIP MANIPULATION

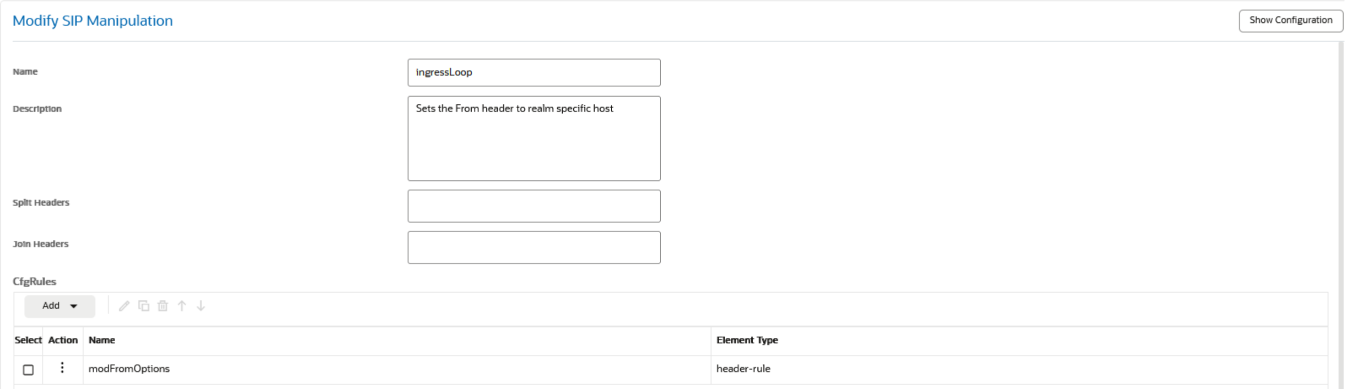
HEADER RULE NAME	HEADER NAME	ACTION	MSG TYPE	METHODS
modFromOptions	From	Manipulate	Out of Dialog	OPTIONS

<table>
<tr><th>ELEMENT RULE NAME</th><th>TYPE</th><th>ACTION</th><th>PARAMETER NAME</th><th>COMPARISON TYPE</th></tr>
<tr><td><b>modFromOptionsHost1</b></td><td>uri-host</td><td>replace</td><td></td><td>boolean</td></tr>
<tr><th colspan="3">MATCH VALUE</th><th colspan="2">NEW VALUE</th></tr>
<tr><td colspan="3">$REGEX(".*T\d{2}:\d{2}:\d(0|3|6|9).*",$TIMESTAMP_UTC.$0)</td><td colspan="2">sbc.customer1.carrier.com</td></tr>
</table>

<table>
<tr><th>ELEMENT RULE NAME</th><th>TYPE</th><th>ACTION</th><th>PARAMETER NAME</th><th>COMPARISON TYPE</th></tr>
<tr><td><b>modFromOptionsHost2</b></td><td>uri-host</td><td>replace</td><td></td><td>boolean</td></tr>
<tr><th colspan="3">MATCH VALUE</th><th colspan="2">NEW VALUE</th></tr>
<tr><td colspan="3">$REGEX(".*T\d{2}:\d{2}:\d(1|4|7).*",$TIMESTAMP_UTC.$0)</td><td colspan="2">sbc.customer2.carrier.com</td></tr>
</table>

<table>
<tr><th>ELEMENT RULE NAME</th><th>TYPE</th><th>ACTION</th><th>PARAMETER NAME</th><th>COMPARISON TYPE</th></tr>
<tr><td><b>modFromOptionsHost3</b></td><td>uri-host</td><td>replace</td><td></td><td>boolean</td></tr>
<tr><th colspan="3">MATCH VALUE</th><th colspan="2">NEW VALUE</th></tr>
<tr><td colspan="3">$REGEX(".*T\d{2}:\d{2}:\d(2|5|8).*",$TIMESTAMP_UTC.$0)</td><td colspan="2">sbc.customer3.carrier.com</td></tr>
</table>

Table 22. Method 3 – SBC SIP Manipulation



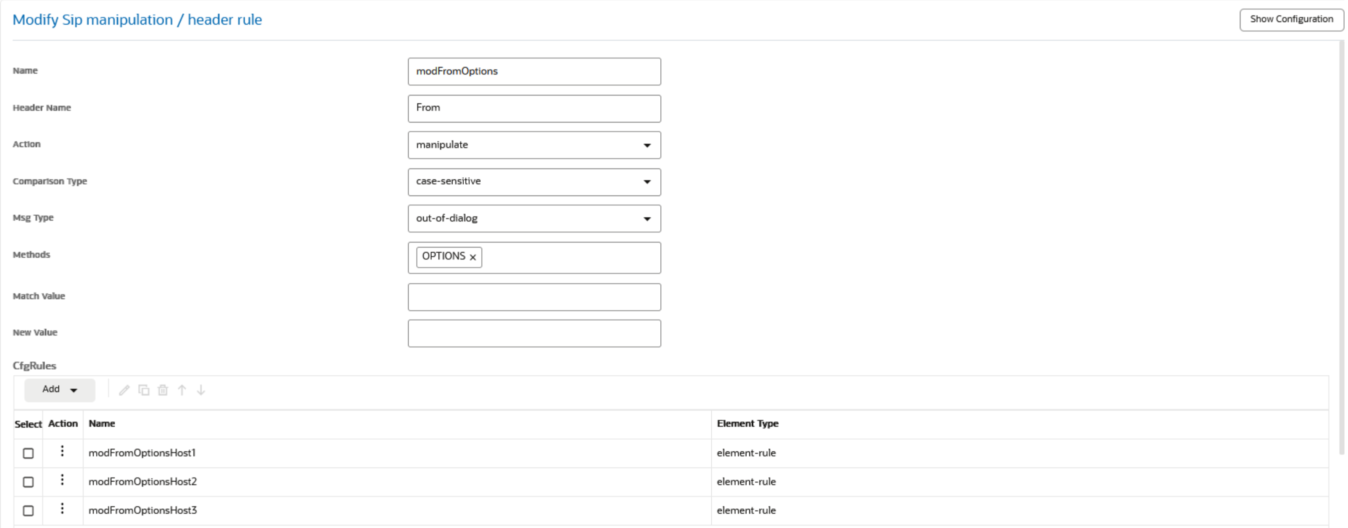
Modify SIP Manipulation

Name	ingressLoop
Description	Sets the From header to realm specific host
Split Headers	
Join Headers	

CfgRules

Select	Action	Name	Element Type
□	⋮	modFromOptions	header-rule

Image 20. Method 3 – E-SBC SIP Manipulation



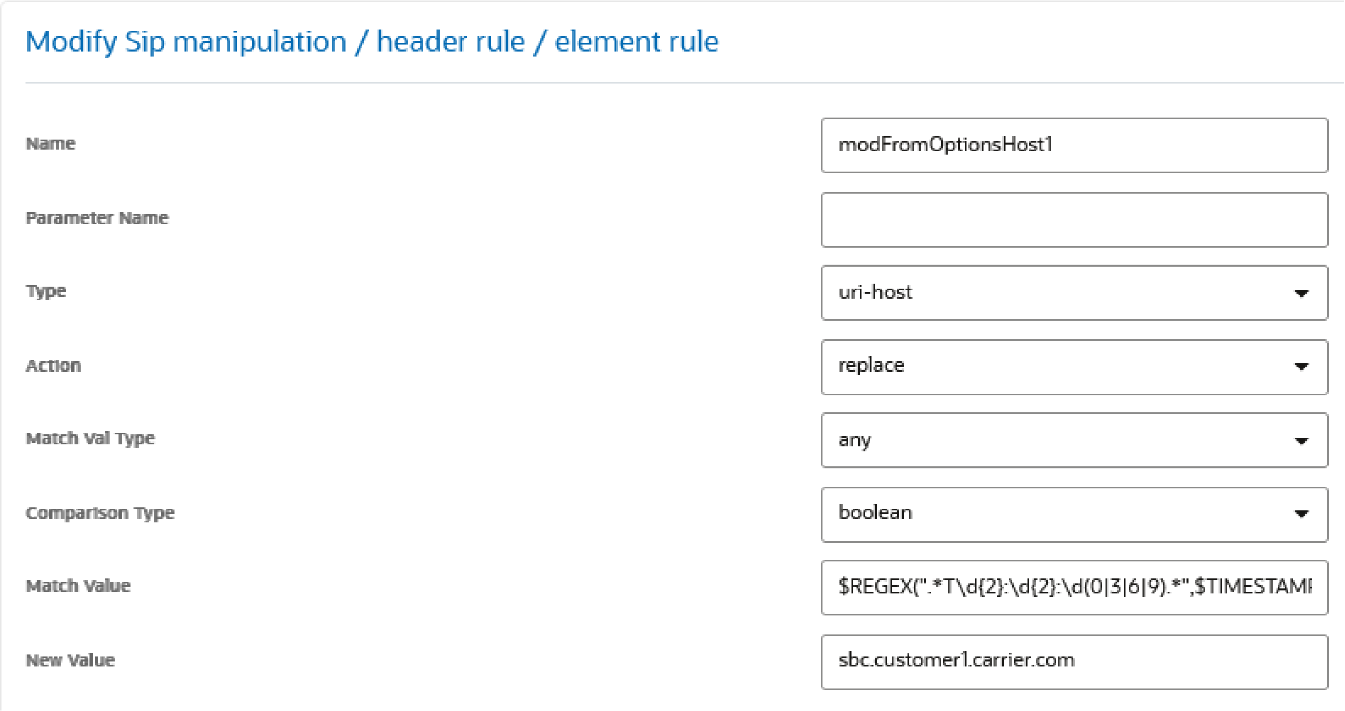
Modify Sip manipulation / header rule

Name	modFromOptions
Header Name	From
Action	manipulate
Comparison Type	case-sensitive
Msg Type	out-of-dialog
Methods	OPTIONS ×
Match Value	
New Value	

CfgRules

Select	Action	Name	Element Type
□	⋮	modFromOptionsHost1	element-rule
□	⋮	modFromOptionsHost2	element-rule
□	⋮	modFromOptionsHost3	element-rule

Image 21. Method 3 – E-SBC Header Rule



Modify Sip manipulation / header rule / element rule

Name: modFromOptionsHost1

Parameter Name:

Type: uri-host

Action: replace

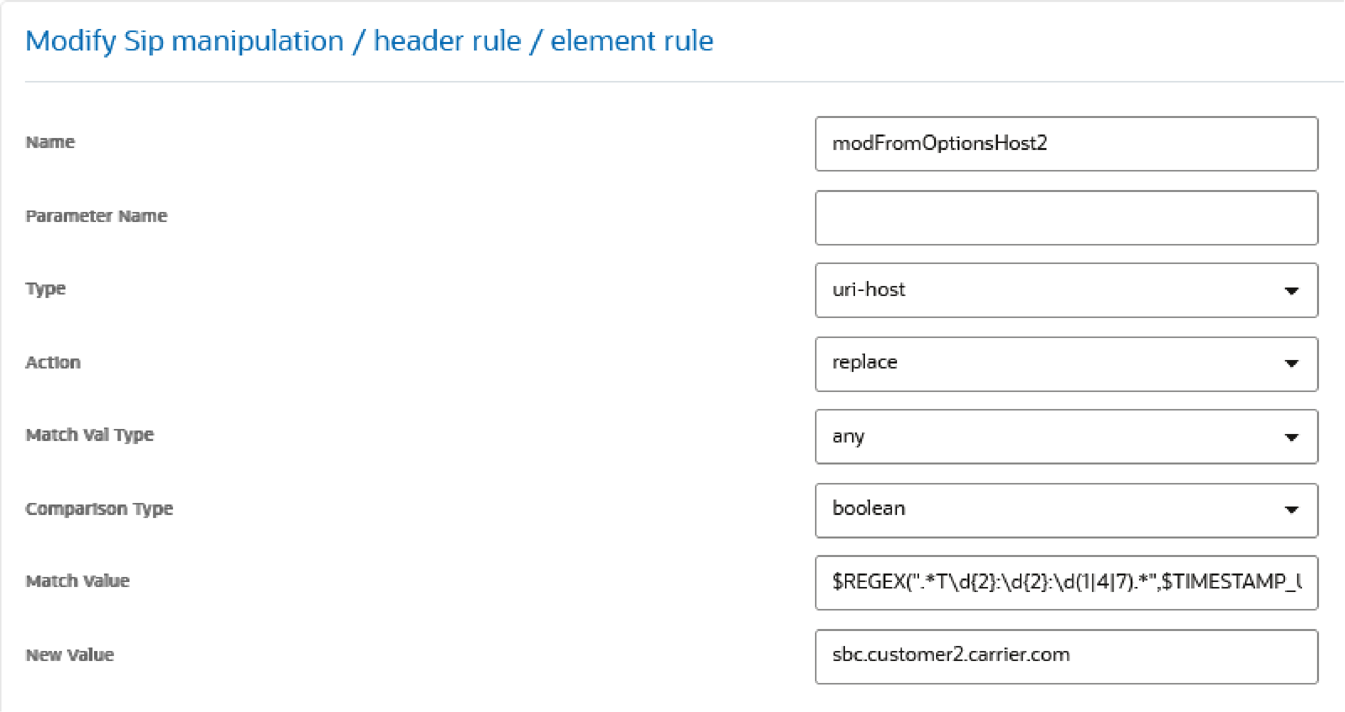
Match Val Type: any

Comparison Type: boolean

Match Value: `$REGEX(".*T\d{2}:\d{2}:\d(0|3|6|9).*",$TIMESTAMP`

New Value: sbc.customer1.carrier.com

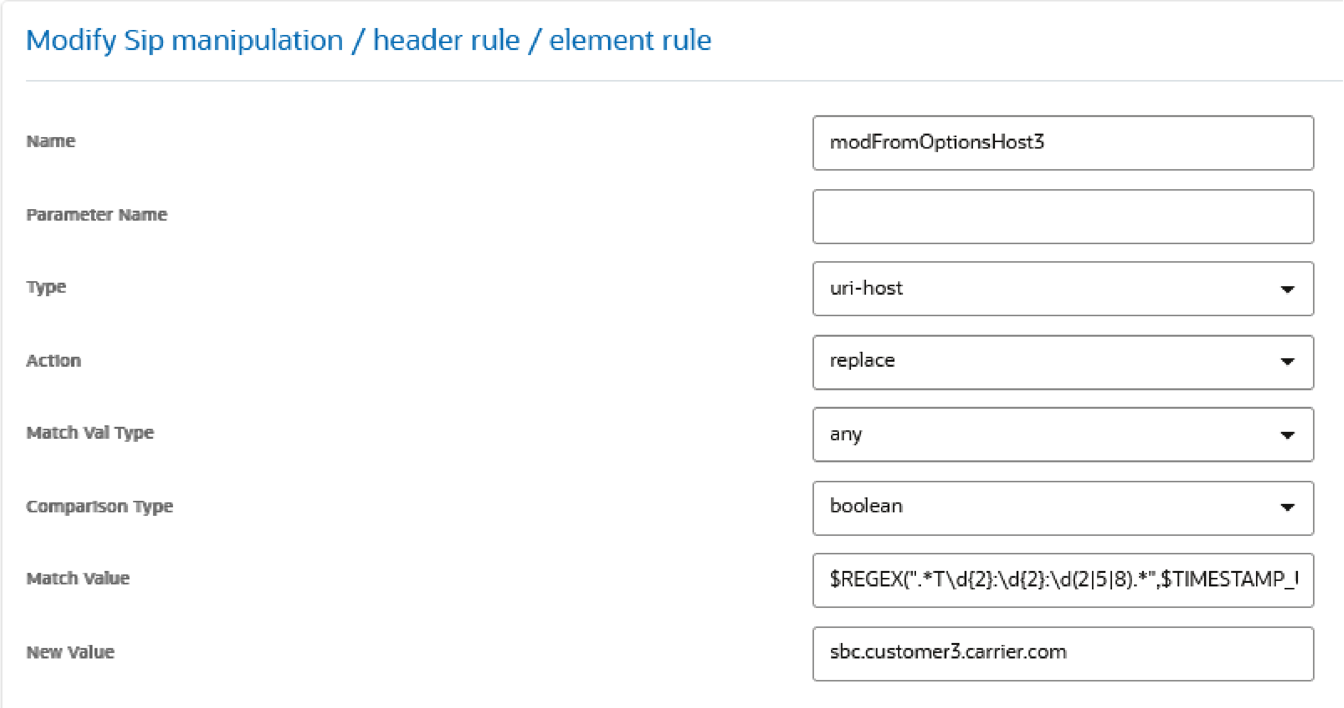
Image 22. Method 3 – E-SBC Element Rules



Modify Sip manipulation / header rule / element rule

Name	modFromOptionsHost2
Parameter Name	
Type	uri-host
Action	replace
Match Val Type	any
Comparison Type	boolean
Match Value	$REGEX(".*T\d{2}:\d{2}:\d(1\|4\|7).*",$TIMESTAMP_
New Value	sbc.customer2.carrier.com

Image 23. Method 3 – E-SBC Element Rules



Modify Sip manipulation / header rule / element rule

Name	modFromOptionsHost3
Parameter Name	
Type	uri-host
Action	replace
Match Val Type	any
Comparison Type	boolean
Match Value	$REGEX(".*T\d{2}:\d{2}:\d(2\|5\|8).*",$TIMESTAMP_
New Value	sbc.customer3.carrier.com

Image 24. Method 3 – E-SBC Element Rules

```
sip-manipulation
        name                                    ingressLoop
        description                             Sets the From header to realm specific
host
        split-headers
        join-headers
        header-rule
                name                                    modFromOptions
                header-name                             From
                action                                  manipulate
                comparison-type                         case-sensitive
                msg-type                                out-of-dialog
                methods                                 OPTIONS
                match-value
                new-value
                element-rule
                        name                                    modFromOptionsHost1
                        parameter-name
                        type                                    uri-host
                        action                                  replace
                        match-val-type                          any
                        comparison-type                         boolean
                        match-value
$REGEX(".*T\d{2}:\d{2}:\d(0|3|6|9).*",$TIMESTAMP_UTC.$0)
                        new-value
sbc.customer1.carrier.com
                element-rule
                        name                                    modFromOptionsHost2
                        parameter-name
                        type                                    uri-host
                        action                                  replace
                        match-val-type                          any
                        comparison-type                         boolean
                        match-value
$REGEX(".*T\d{2}:\d{2}:\d(1|4|7).*",$TIMESTAMP_UTC.$0)
                        new-value
sbc.customer2.carrier.com
                element-rule
                        name                                    modFromOptionsHost3
                        parameter-name
                        type                                    uri-host
                        action                                  replace
                        match-val-type                          any
                        comparison-type                         boolean
                        match-value
$REGEX(".*T\d{2}:\d{2}:\d(2|5|8).*",$TIMESTAMP_UTC.$0)
                        new-value
sbc.customer3.carrier.com
```

Table 23. Method 3 – SBC HMR – PSTN-side Configuration

UCaaS-side

We have a single SIP Manipulation (HMR) applied to all of the ‘Internet’ Realms as an ‘Outbound’ SIP Manipulation (to modify messages on egress). This SIP Manipulation is only applied to OPTIONS requests. This is the same HMR that is used in Method 1.

The first Manipulation will alter any already present Contact header to set the host to the value specified in the egress realms Trunk Context field. The second will add a Contact header with the appropriate value, but only if one is not already present.

SIP MANIPULATION

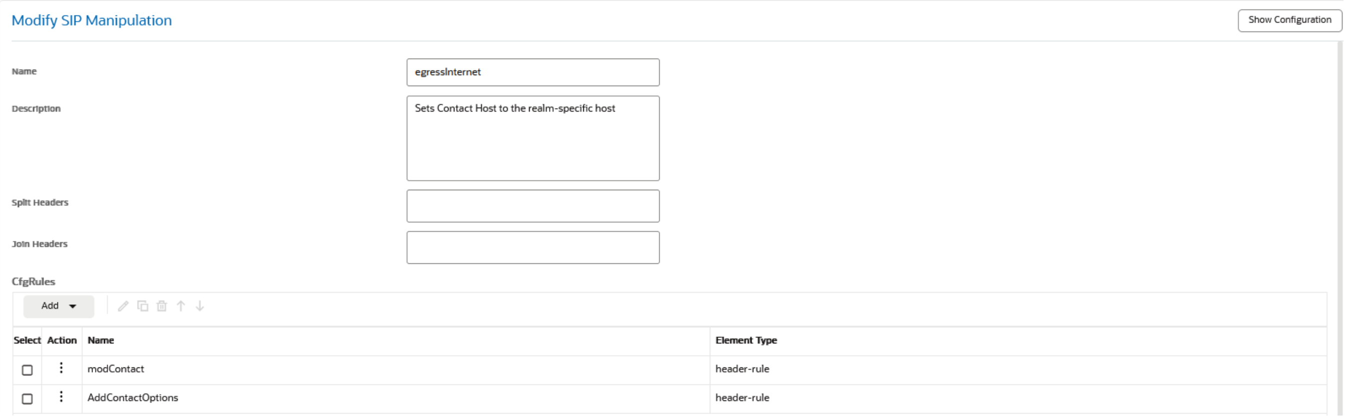
HEADER RULE NAME	HEADER NAME	ACTION	MSG TYPE	METHODS
modContact	Contact	Manipulate	Out of Dialog	OPTIONS

ELEMENT RULE NAME	TYPE	ACTION	PARAMETER NAME	COMPARISON TYPE	MATCH VALUE	NEW VALUE
modContactHost	uri-host	replace		case-sensitive		$TRUNK_GROUP_CONTEXT

HEADER RULE NAME	HEADER NAME	ACTION	MSG TYPE	METHODS	COMPARISON TYPE
AddContactOptions	Contact	add	Out of Dialog	OPTIONS	boolean

MATCH VALUE	NEW VALUE
!$modContact.$modContactHost	"<sip:ping@"+$TRUNK_GROUP_CONTEXT+":"+$LOCAL_PORT+";transport=tls>"

Table 24. Method 3 – SBC SIP Manipulation



Modify SIP Manipulation

Name: egressInternet

Description: Sets Contact Host to the realm-specific host

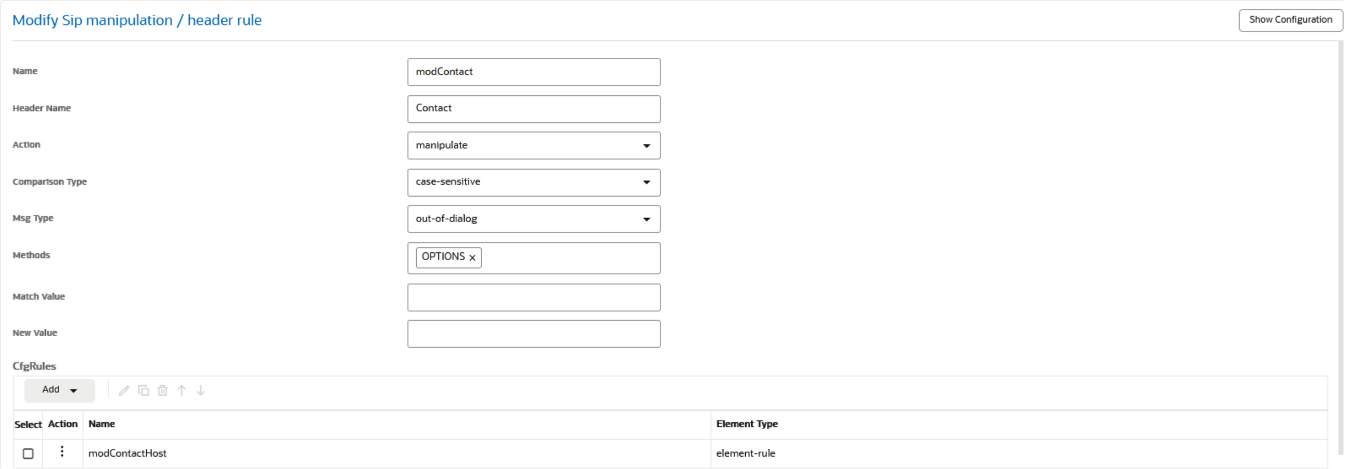
Split Headers:

Join Headers:

CfgRules

Select	Action	Name	Element Type
□	⋮	modContact	header-rule
□	⋮	AddContactOptions	header-rule

Image 25. Method 3 – E-SBC SIP Manipulation



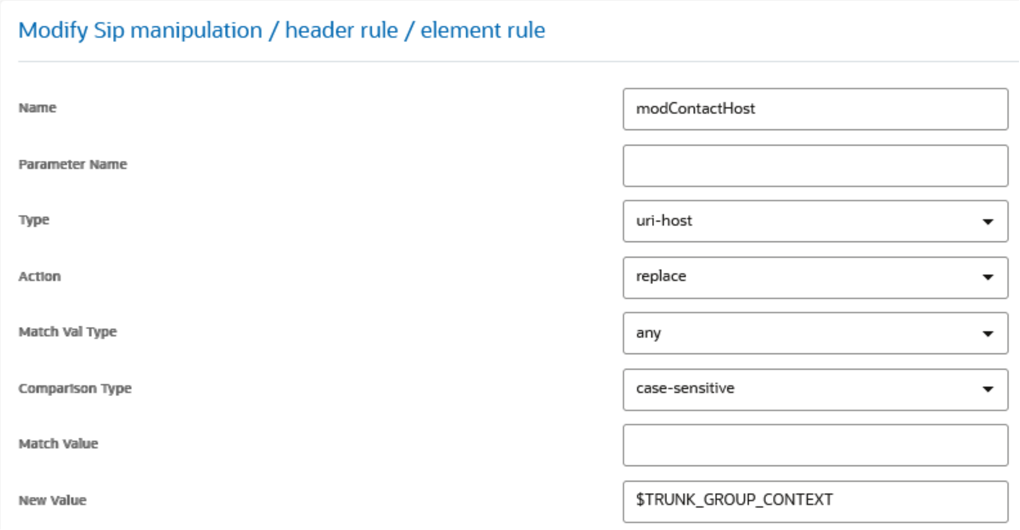
Modify Sip manipulation / header rule

Name	modContact
Header Name	Contact
Action	manipulate
Comparison Type	case-sensitive
Msg Type	out-of-dialog
Methods	OPTIONS ×
Match Value	
New Value	

CfgRules

Select	Action	Name	Element Type
□	⋮	modContactHost	element-rule

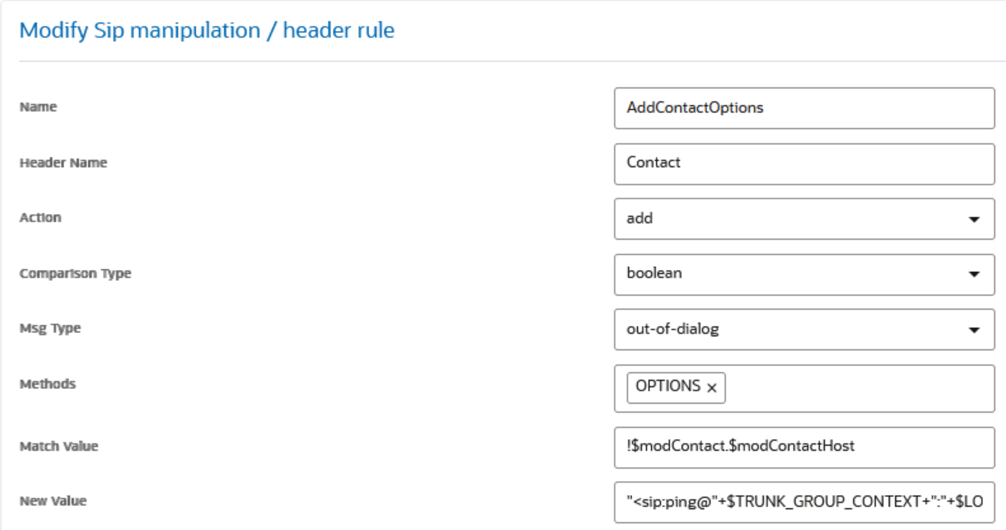
Image 26. Method 3 – E-SBC Header Rule



Modify Sip manipulation / header rule / element rule

Name	modContactHost
Parameter Name	
Type	uri-host
Action	replace
Match Val Type	any
Comparison Type	case-sensitive
Match Value	
New Value	$TRUNK_GROUP_CONTEXT

Image 27. Method 3 – E-SBC Element Rule



Modify Sip manipulation / header rule

Name	AddContactOptions
Header Name	Contact
Action	add
Comparison Type	boolean
Msg Type	out-of-dialog
Methods	OPTIONS ×
Match Value	!$modContact.$modContactHost
New Value	"<sip:ping@"+$TRUNK_GROUP_CONTEXT+":"+$LO

Image 28. Method 3 – E-SBC Header Rule

```
sip-manipulation
        name                                    egressInternet
        description                             Sets Contact Host to the realm-
specific host
        split-headers
        join-headers
        header-rule
                name                                    modContact
                header-name                             Contact
                action                                  manipulate
                comparison-type                         case-sensitive
                msg-type                                out-of-dialog
                methods                                 OPTIONS
                match-value
                new-value
                element-rule
                        name                                    modContactHost
                        parameter-name
                        type                                    uri-host
                        action                                  replace
                        match-val-type                          any
                        comparison-type                         case-sensitive
                        match-value
                        new-value                               $TRUNK_GROUP_CONTEXT
        header-rule
                name                                    AddContactOptions
                header-name                             Contact
                action                                  add
                comparison-type                         boolean
                msg-type                                out-of-dialog
                methods                                 OPTIONS
                match-value                             !$modContact.$modContactHost
                new-value
"<sip:ping@"+$TRUNK_GROUP_CONTEXT+":"+$LOCAL_PORT+";transport=tls>"
```

Table 25. Method 3 – SBC HMR – Configuration

Session Agent

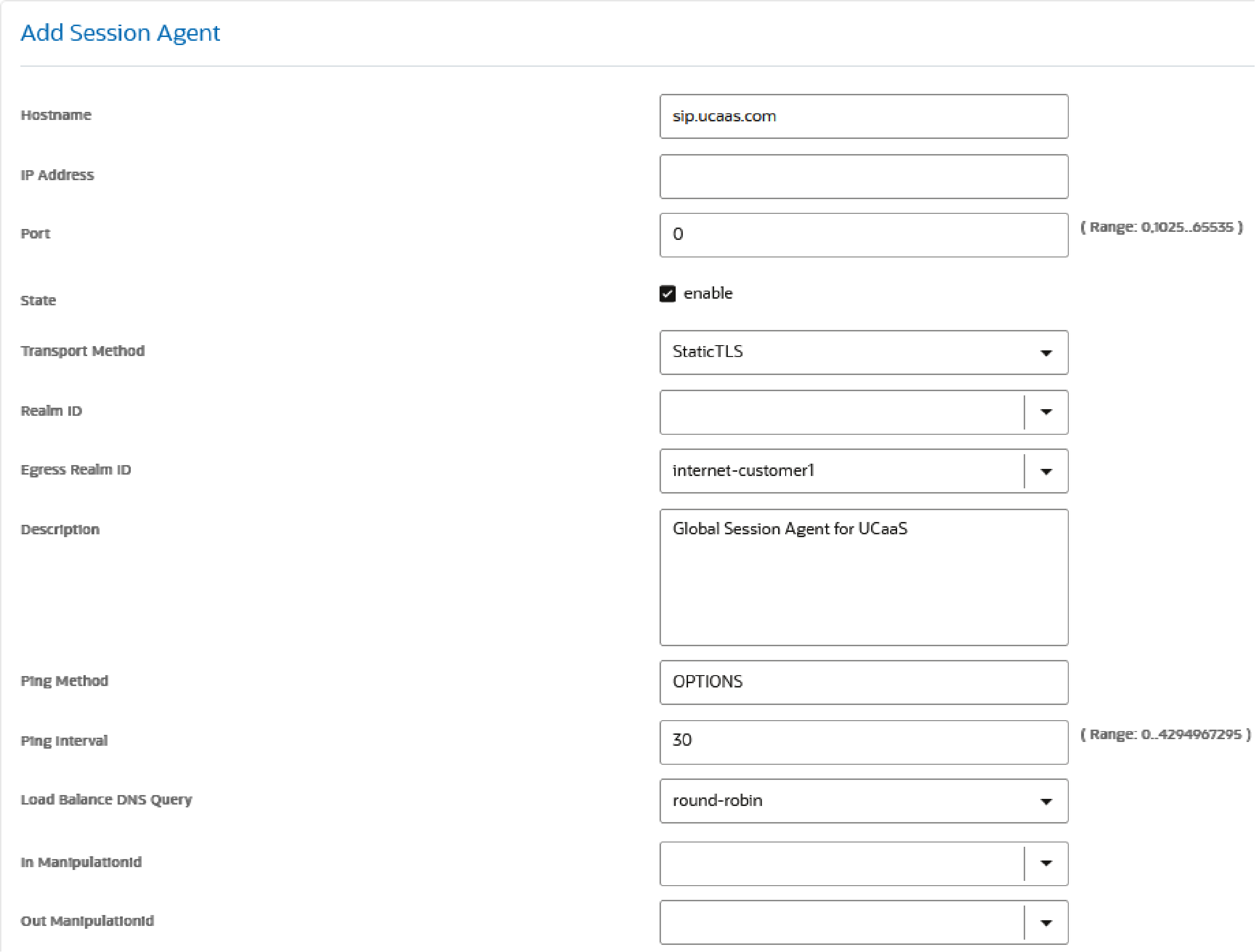
We will need a ‘dummy’ Session Agent that represents the SBC’s own Core/PSTN interface to generate the OPTIONS and apply the HMR. The IP address used here matches the IP address for the SIP Interface in the same realm:

NOTE: For brevity, some configuration is omitted.

PSTN-side

HOSTNAME	OUT-MANIPUALTION	PING INTERVAL	DESCRIPTION
sip.ucaas.com	egressUCaaS	11	Global Session Agent for UCaaS

Table 26. Method 3 – SBC Session Agent



Add Session Agent

Hostname	sip.ucaas.com	
IP Address		
Port	0	(Range: 0,1025..65535)
State	☑ enable	
Transport Method	StaticTLS	
Realm ID		
Egress Realm ID	internet-customer1	
Description	Global Session Agent for UCaaS	
Ping Method	OPTIONS	
Ping Interval	30	(Range: 0..4294967295)
Load Balance DNS Query	round-robin	
In ManipulationId		
Out ManipulationId		

Image 29. Method 3 – E-SBC Session Agent

```
session-agent
        hostname                                sip.ucaas.com
        port                                    0
        transport-method                        StaticTLS
        egress-realm-id                         internet-customer1
        description                             Global Session Agent for UCaaS
        ping-method                             OPTIONS
        ping-interval                           30
        load-balance-dns-query                  round-robin
```

Table 27. Method 3 – SBC Session Agent – Configuration

Local Policy

Each Local Policy is a simple 1:1 mapping from the From header host the HMR modified to the Global Session Agent via the corresponding egress realm. The Example here outlines the configuration for 3 realm pairs.

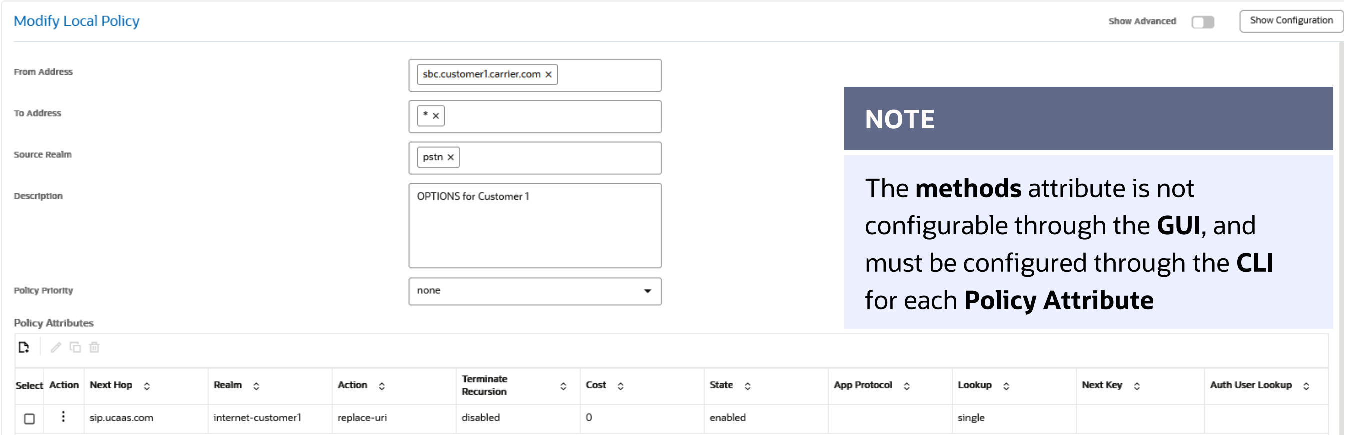
Customer 1

TO ADDRESS	FROM ADDRESS	SOURCE REALM	DESCRIPTION
*	sbc.customer1.carrier.com	pstn	Route Calls & OPTIONS for Customer 1

Table 28. Method 3 – SBC Local Policy for Customer 1

NEXT HOP	NEXT HOP REALM	ACTION	METHODS
sip.ucaas.com	internet-customer1	Replace URI	OPTIONS

Table 29. Method 3 – SBC Local Policy – Policy Attribute for Customer 1



Modify Local Policy

From Address	sbc.customer1.carrier.com ×
To Address	* ×
Source Realm	pstn ×
Description	OPTIONS for Customer 1
Policy Priority	none

Policy Attributes

Select	Action	Next Hop	Realm	Action	Terminate Recursion	Cost	State	App Protocol	Lookup	Next Key	Auth User Lookup
□	⋮	sip.ucaas.com	internet-customer1	replace-uri	disabled	0	enabled		single		

Image 30. Method 3 – E-SBC Local Policy for Customer 1

NOTE

The **methods** attribute is not configurable through the **GUI**, and must be configured through the **CLI** for each **Policy Attribute**

```
local-policy
        from-address                            sbc.customer1.carrier.com
        to-address                              *
        source-realm                            pstn
        description                             Route OPTIONS for Customer 1
        state                                   enabled
        policy-attribute
                next-hop                                sip.ucaas.com
                realm                                   internet-customer1
                action                                  replace-uri
                terminate-recursion                     enabled
                state                                   enabled
                app-protocol                            SIP
                methods                                 OPTIONS
```

Table 30. Method 3 – SBC Local Policy – Configuration for Customer 1

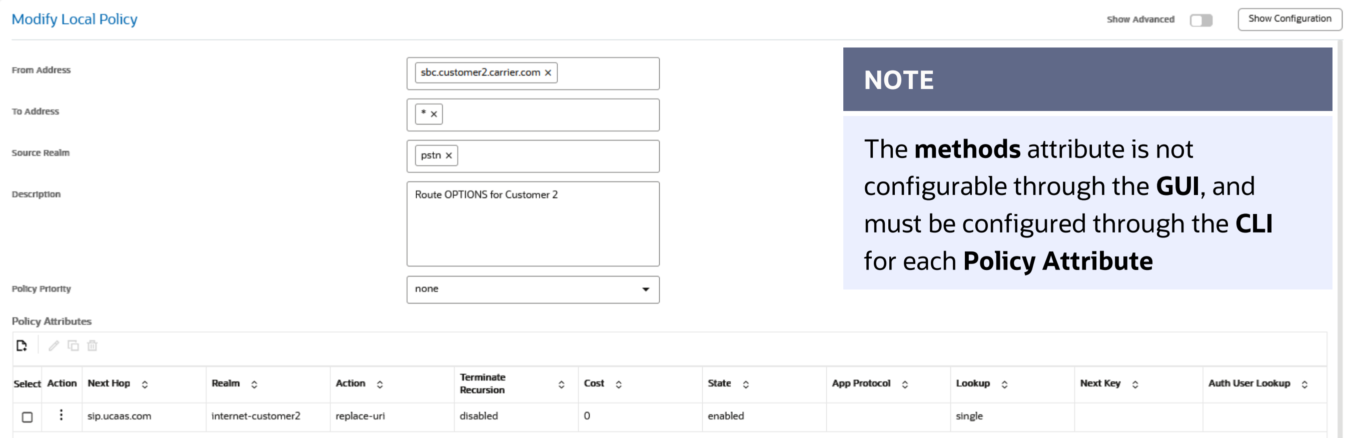
Customer 2

TO ADDRESS	FROM ADDRESS	SOURCE REALM	DESCRIPTION
*	sbc.customer2.carrier.com	pstn	Route OPTIONS for Customer 2

Table 31. Method 3 – SBC Local Policy for Customer 2

NEXT HOP	NEXT HOP REALM	ACTION	METHODS
sip.ucaas.com	internet-customer2	Replace URI	OPTIONS

Table 32. Method 3 – SBC Local Policy – Policy Attribute for Customer 2



From Address	sbc.customer2.carrier.com ×
To Address	* ×
Source Realm	pstn ×
Description	Route OPTIONS for Customer 2
Policy Priority	none

Policy Attributes

Select	Action	Next Hop	Realm	Action	Terminate Recursion	Cost	State	App Protocol	Lookup	Next Key	Auth User Lookup
□	⋮	sip.ucaas.com	internet-customer2	replace-uri	disabled	0	enabled		single		

NOTE

The **methods** attribute is not configurable through the **GUI**, and must be configured through the **CLI** for each **Policy Attribute**

Image 31. Method 3 – E-SBC Local Policy for Customer 2

```
local-policy
        from-address                            sbc.customer2.carrier.com
        to-address                              *
        source-realm                            pstn
        description                             Route OPTIONS for Customer 2
        state                                   enabled
        policy-attribute
                next-hop                                sip.ucaas.com
                realm                                   internet-customer2
                action                                  replace-uri
                terminate-recursion                     enabled
                state                                   enabled
                app-protocol                            SIP
                methods                                 OPTIONS
```

Table 33. Method 3 – SBC Local Policy – Configuration for Customer 2

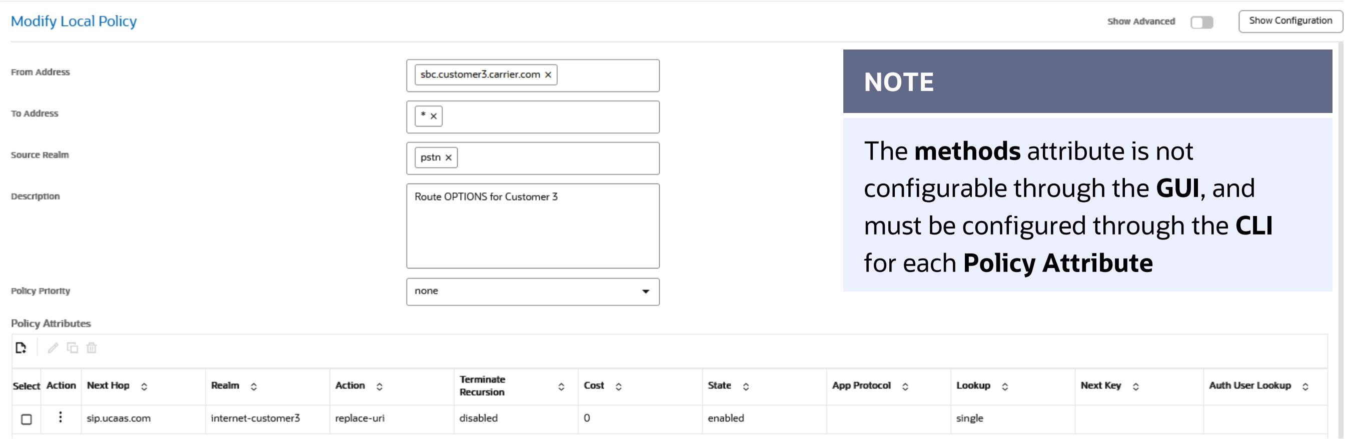
Customer 3

TO ADDRESS	FROM ADDRESS	SOURCE REALM	DESCRIPTION
*	sbc.customer3.carrier.com	pstn	Route OPTIONS for Customer 3

Table 34. Method 3 – SBC Local Policy for Customer 3

NEXT HOP	NEXT HOP REALM	ACTION	METHODS
sip.ucaas.com	internet-customer3	Replace URI	OPTIONS

Table 35. Method 3 – SBC Local Policy – Policy Attribute for Customer 3



Modify Local Policy

From Address	sbc.customer3.carrier.com ×
To Address	* ×
Source Realm	pstn ×
Description	Route OPTIONS for Customer 3
Policy Priority	none

Policy Attributes

Select	Action	Next Hop	Realm	Action	Terminate Recursion	Cost	State	App Protocol	Lookup	Next Key	Auth User Lookup
□	⋮	sip.ucaas.com	internet-customer3	replace-uri	disabled	0	enabled		single		

NOTE

The **methods** attribute is not configurable through the **GUI**, and must be configured through the **CLI** for each **Policy Attribute**

Image 32. Method 3 – E-SBC Local Policy for Customer 3

```
local-policy
    from-address                        sbc.customer3.carrier.com
    to-address                          *
    source-realm                        pstn
    description                         Route OPTIONS for Customer 3
    state                               enabled
    policy-attribute
        next-hop                                sip.ucaas.com
        realm                                   internet-customer3
        action                                  replace-uri
        terminate-recursion                     enabled
        state                                   enabled
        app-protocol                            SIP
        methods                                 OPTIONS
        media-profiles
```

Table 36. Method 3 – SBC Local Policy – Configuration for Customer 3

Realm Config

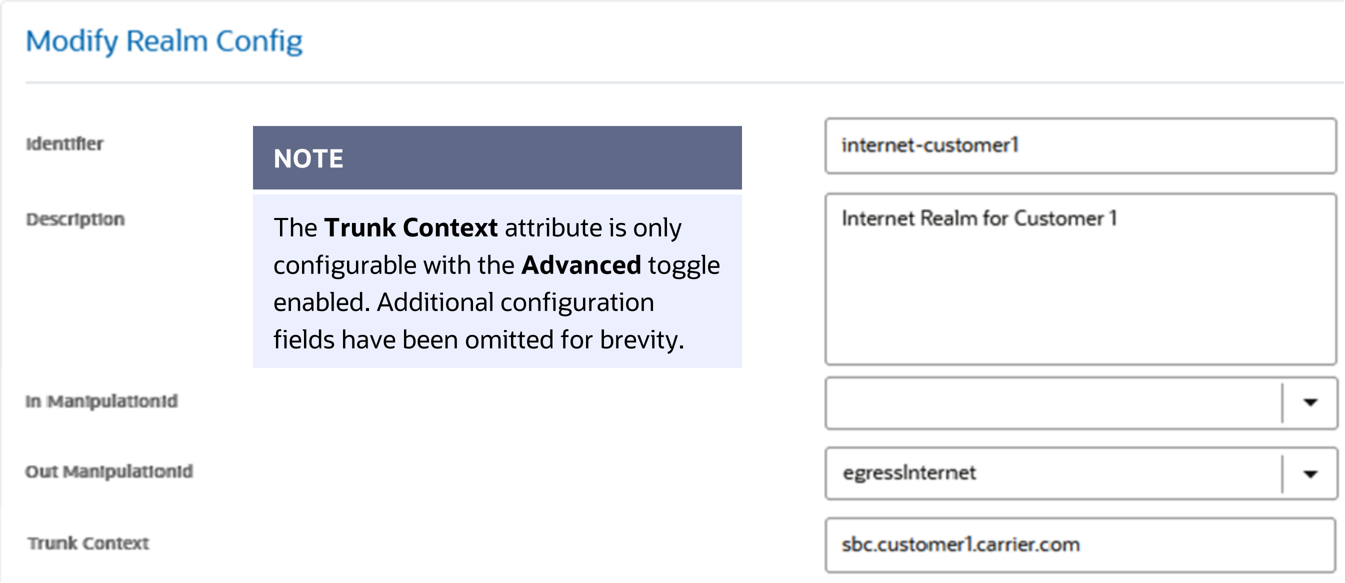
In order to apply the previous Header Manipulation Rule, the following configuration must be applied to the 'Internet' realms facing the Global Session Agent. The Trunk Context must be set to the appropriate FQDN or IP that represents the SBC's realm, and must be reachable from the Global Session Agent.

NOTE: For brevity, the 'PSTN' realms are not outlined here, as they require no special configuration for this method.

Customer 1

IDENTIFER	OUT-MANIPUALTION	TRUNK CONTEXT	DESCRIPTION
internet-customer1	egressInternet	sbc.customer1.carrier.com	Internet Realm for Customer 1

Table 37. Method 3 – SBC Realm Config for Customer 1



Modify Realm Config

Identifier	internet-customer1
Description	Internet Realm for Customer 1
In ManipulationId	
Out ManipulationId	egressInternet
Trunk Context	sbc.customer1.carrier.com

NOTE

The **Trunk Context** attribute is only configurable with the **Advanced** toggle enabled. Additional configuration fields have been omitted for brevity.

Image 33. Method 3 – E-SBC Realm Config for Customer 1

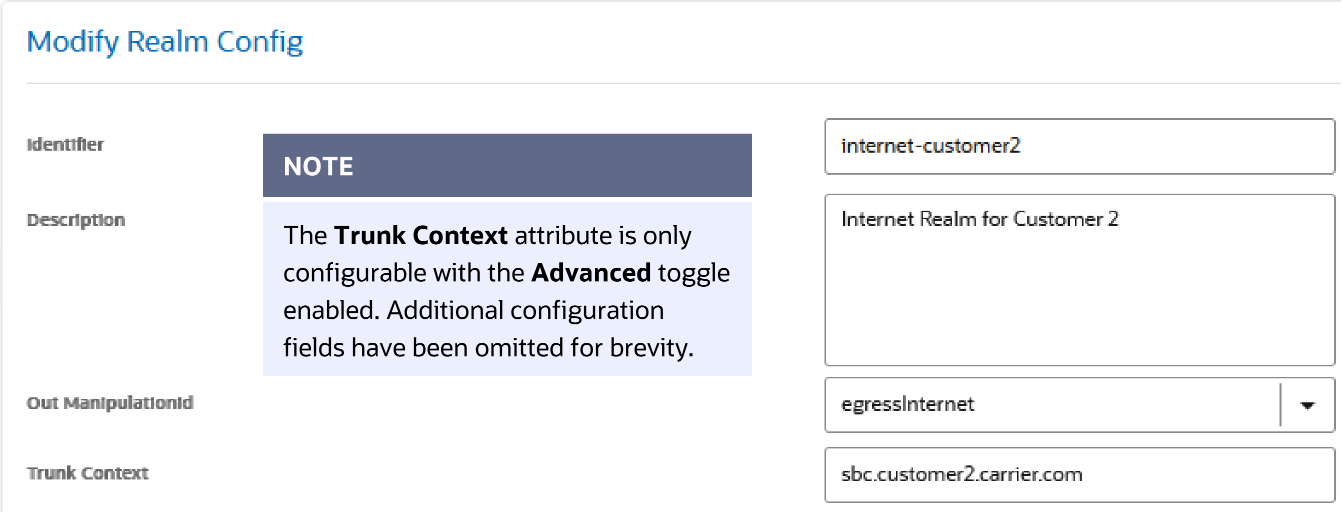
```
realm-config
        identifier                              internet-customer1
        description                             Internet Realm for Customer 1
        network-interfaces                      s0p0:0.4
        out-manipulationid                      egressInternet
        trunk-context                           sbc.customer1.carrier.com
```

Table 38. Method 3 – SBC Realm Config – Configuration for Customer 1

Customer 2

IDENTIFER	OUT-MANIPUALTION	TRUNK CONTEXT	DESCRIPTION
internet-customer2	egressInternet	sbc.customer2.carrier.com	Internet Realm for Customer 2

Table 39. Method 3 – SBC Realm Config for Customer 2



Modify Realm Config

Identifier	internet-customer2
Description	Internet Realm for Customer 2
Out ManipulationId	egressInternet
Trunk Context	sbc.customer2.carrier.com

NOTE

The **Trunk Context** attribute is only configurable with the **Advanced** toggle enabled. Additional configuration fields have been omitted for brevity.

Image 34. Method 3 – E-SBC Realm Config for Customer 2

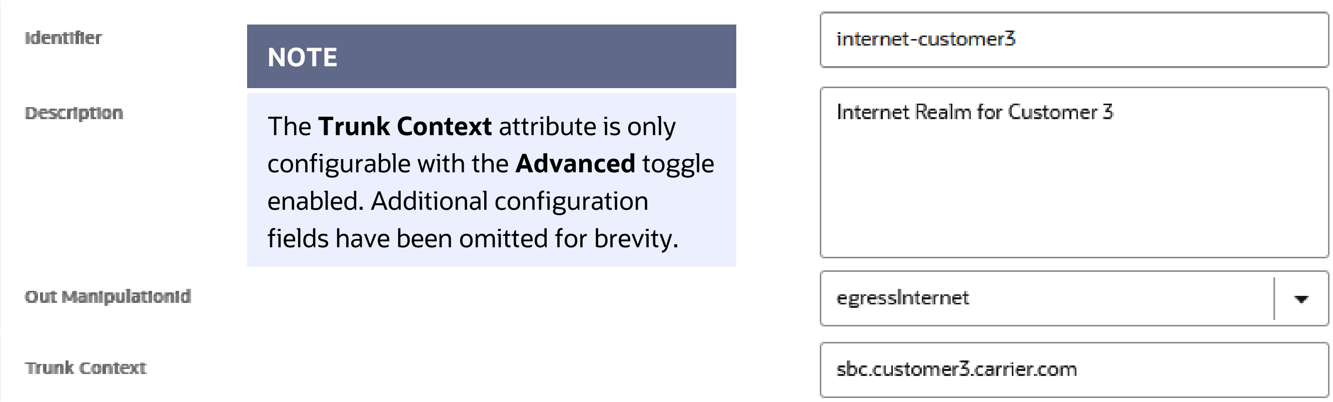
```
realm-config
        identifier                              internet-customer2
        description                             Internet Realm for Customer 2
        network-interfaces                      s0p0:0.4
        out-manipulationid                      egressInternet
        trunk-context                           sbc.customer2.carrier.com
```

Table 40. Method 3 – SBC Realm Config – Configuration for Customer 2

Customer 3

IDENTIFER	OUT-MANIPUALTION	TRUNK CONTEXT	DESCRIPTION
internet-customer3	egressInternet	sbc.customer3.carrier.com	Internet Realm for Customer 3

Table 41. Method 3 – SBC Realm Config for Customer 3



Identifier	internet-customer3
Description	Internet Realm for Customer 3
Out ManipulationId	egressInternet
Trunk Context	sbc.customer3.carrier.com

NOTE

The **Trunk Context** attribute is only configurable with the **Advanced** toggle enabled. Additional configuration fields have been omitted for brevity.

Image 35. Method 3 – E-SBC Realm Config for Customer 3

```
realm-config
        identifier                              internet-customer3
        description                             Internet Realm for Customer 3
        network-interfaces                      s0p0:0.4
        out-manipulationid                      egressInternet
        trunk-context                           sbc.customer3.carrier.com
```

Table 42. Method 3 – SBC Realm Config – Configuration for Customer 3

Closing Thoughts

There are many variations on these methods that could be used to build on these concepts, and optimizations to these methods are welcome.

Connect with us

Call +**1.800.ORACLE1** or visit **oracle.com**. Outside North America, find your local office at: **oracle.com/contact**.

blogs.oracle.com   facebook.com/oracle   twitter.com/oracle