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About This Document

Scope

The scope of this document includes all the information required to install, configure and administer the Radius Control Agent application.

Audience

This guide was written primarily for system administrators and persons installing, configuring and administering the Radius Control Agent application. However, sections of the document may be useful to anyone requiring an introduction to the application.

Prerequisites

A solid understanding of UNIX and a familiarity with IN concepts are essential prerequisites for safely using the information contained in this technical guide. Attempting to install, remove, configure or otherwise alter the described system without the appropriate background skills could cause damage to the system; including temporary or permanent incorrect operation, loss of service, and may render your system beyond recovery.

Although it is not a prerequisite to using this guide, familiarity with the target platform would be an advantage.

This manual describes system tasks that should only be carried out by suitably trained operators.

Related documents

The following documents are related to this document:

- ACS Technical Guide
- CCS Technical Guide
- CCS User's Guide
- Radius Control Agent User's Guide
- Roaming Technical Guide
- SLEE Technical Guide
- SMS Technical Guide
- SMS User's Guide
Document Conventions

Typographical Conventions

The following terms and typographical conventions are used in the Oracle Communications Network Charging and Control (NCC) documentation.

<table>
<thead>
<tr>
<th>Formatting convention</th>
<th>Type of information</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Special Bold</strong></td>
<td>Items you must select, such as names of tabs. Names of database tables and fields.</td>
</tr>
<tr>
<td><strong>Italics</strong></td>
<td>Name of a document, chapter, topic or other publication. Emphasis within text.</td>
</tr>
<tr>
<td><strong>Button</strong></td>
<td>The name of a button to click or a key to press. Example: To close the window, either click <strong>Close</strong>, or press <strong>Esc</strong>.</td>
</tr>
<tr>
<td><strong>Key+Key</strong></td>
<td>Key combinations for which the user must press and hold down one key and then press another. Example: <strong>Ctrl+P</strong>, or <strong>Alt+F4</strong>.</td>
</tr>
<tr>
<td><strong>Monospace</strong></td>
<td>Examples of code or standard output.</td>
</tr>
<tr>
<td><strong>Monospace Bold</strong></td>
<td>Text that you must enter.</td>
</tr>
<tr>
<td><strong>variable</strong></td>
<td>Used to indicate variables or text that should be replaced.</td>
</tr>
<tr>
<td><strong>menu option &gt; menu option</strong></td>
<td>Used to indicate the cascading menu option to be selected, or the location path of a file. Example: <strong>Operator Functions &gt; Report Functions</strong> Example: <strong>/IN/html/SMS/HelpText/</strong></td>
</tr>
<tr>
<td><strong>hypertext link</strong></td>
<td>Used to indicate a hypertext link on an HTML page.</td>
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</tbody>
</table>

Specialized terms and acronyms are defined in the **Glossary** at the end of this guide.
Overview

Introduction

This chapter provides a high-level overview of the application. It explains the basic functionality of the system and lists the main components.

It is not intended to advise on any specific Oracle Communications Network Charging and Control (NCC) network or service implications of the product.

In this chapter

This chapter contains the following topics.

What is the Radius Control Agent?

What is the Radius Control Agent?

Introduction

The Radius Control Agent (RCA) is a SLEE interface that acts as the gateway between Radius and INAP, providing a seamless integration between prepaid PSDNs and applications such as ACS or Prepaid Charging. The connection to the Oracle SLC is through a CAMEL 2 interface.

RCA can also be configured to work between Cisco GGSN and Prepaid Charging by editing the eserv.config file and sms.jnlp files.

The following functionality is provided:

- Listening on specific ports for incoming Radius messages
- Sending Radius messages to predetermined ports
- Sending SLEE events to another SLEE application using a service key
- Constructing outgoing INAP messages
- Processing incoming INAP messages

RCA Profile Block list

Here are the profile blocks available when RCA is installed.

<table>
<thead>
<tr>
<th>Name</th>
<th>App block</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>Outgoing Extensions</td>
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<td>This profile block, if not empty, will be copied into a special extension profiles value in the outgoing Connect message.</td>
</tr>
<tr>
<td>Incoming Extensions</td>
<td>20</td>
<td>This profile block contains the profiles value from the special extension obtained from the InitialDP which enables applications, such as RCA, to communicate with slee_acs and the GGSN network node.</td>
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RCA primary tags

Here is a list of the profile primary tags used in the RCA service.

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<td>Core Radius login_ip_host</td>
<td>6690014</td>
<td>-</td>
<td>14</td>
</tr>
<tr>
<td>Core Radius login_ipv6_host</td>
<td>6690098</td>
<td>-</td>
<td>98</td>
</tr>
<tr>
<td>Core Radius login_lat_group</td>
<td>6690036</td>
<td>-</td>
<td>36</td>
</tr>
<tr>
<td>Core Radius login_lat_node</td>
<td>6690035</td>
<td>-</td>
<td>35</td>
</tr>
<tr>
<td>Core Radius login_lat_port</td>
<td>6690063</td>
<td>-</td>
<td>63</td>
</tr>
<tr>
<td>Core Radius login_lat_service</td>
<td>6690034</td>
<td>-</td>
<td>34</td>
</tr>
<tr>
<td>Core Radius login_service</td>
<td>6690015</td>
<td>-</td>
<td>15</td>
</tr>
<tr>
<td>Core Radius login_tcp_port</td>
<td>6690016</td>
<td>-</td>
<td>16</td>
</tr>
<tr>
<td>Core Radius message_authenticator</td>
<td>6690080</td>
<td>-</td>
<td>80</td>
</tr>
<tr>
<td>Core Radius nas_identifier</td>
<td>6690032</td>
<td>-</td>
<td>32</td>
</tr>
<tr>
<td>Core Radius nas_ip_address</td>
<td>6690004</td>
<td>-</td>
<td>4</td>
</tr>
<tr>
<td>Core Radius nas_ipv6_address</td>
<td>6690095</td>
<td>-</td>
<td>95</td>
</tr>
<tr>
<td>Core Radius nas_port</td>
<td>6690005</td>
<td>-</td>
<td>5</td>
</tr>
<tr>
<td>Core Radius nas_port_id</td>
<td>6690087</td>
<td>-</td>
<td>87</td>
</tr>
<tr>
<td>Core Radius nas_port_type</td>
<td>6690061</td>
<td>-</td>
<td>61</td>
</tr>
<tr>
<td>Core Radius password_retry</td>
<td>6690075</td>
<td>-</td>
<td>75</td>
</tr>
<tr>
<td>Core Radius port_limit</td>
<td>6690062</td>
<td>-</td>
<td>62</td>
</tr>
<tr>
<td>Core Radius prompt</td>
<td>6690076</td>
<td>-</td>
<td>76</td>
</tr>
<tr>
<td>Core Radius proxy_state</td>
<td>6690033</td>
<td>-</td>
<td>33</td>
</tr>
<tr>
<td>Core Radius reply_message</td>
<td>6690018</td>
<td>-</td>
<td>18</td>
</tr>
<tr>
<td>Core Radius service_type</td>
<td>6690006</td>
<td>-</td>
<td>6</td>
</tr>
<tr>
<td>Core Radius session_timeout</td>
<td>6690027</td>
<td>-</td>
<td>27</td>
</tr>
<tr>
<td>Core Radius state</td>
<td>6690024</td>
<td>-</td>
<td>24</td>
</tr>
<tr>
<td>Core Radius termination_action</td>
<td>6690029</td>
<td>-</td>
<td>29</td>
</tr>
<tr>
<td>Core Radius user_name</td>
<td>6690001</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>Core Radius user_password</td>
<td>6690002</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>MS- primary-DNS-server</td>
<td>6950028</td>
<td>311</td>
<td>28</td>
</tr>
<tr>
<td>MS-Primary-NBNS-Server</td>
<td>6950030</td>
<td>311</td>
<td>30</td>
</tr>
<tr>
<td>MS-Secondary-DNS-Server</td>
<td>6950029</td>
<td>311</td>
<td>29</td>
</tr>
<tr>
<td>MS-Secondary-NBNS-Server</td>
<td>6950031</td>
<td>311</td>
<td>31</td>
</tr>
</tbody>
</table>

**Note:** These tags are only present for RCA and are displayed on the ACS Configuration screen, **Profile Tag Details** tab.
Overview

Introduction

This chapter explains how to configure the Oracle Communications Network Charging and Control (NCC) application.

In this chapter

This chapter contains the following topics.

Configuration Overview 5
eserv.config Configuration 6
SLEE.cfg Configuration 7
acs.conf Configuration 8

Configuration Overview

Introduction

This topic provides a high level overview of how the RCA interface is configured.

There are configuration options which are added to the configuration files that are not explained in this chapter. These configuration options are required by the application and should not be changed.

Configuration components

The Radius Control Agent is configured by the following components:

<table>
<thead>
<tr>
<th>Component</th>
<th>Locations</th>
<th>Description</th>
<th>Further Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>eserv.config</td>
<td>all SLC machines</td>
<td>RCA is configured by the RADIUSControlAgent section of eserv.config.</td>
<td>eserv.config Configuration (on page 6)</td>
</tr>
<tr>
<td>acs.conf</td>
<td>all SLC machines</td>
<td>The acs.conf configures the acsChassis for RADIUS.</td>
<td>acs.conf Configuration (on page 8) and ACS Technical Guide.</td>
</tr>
<tr>
<td>SLEE.cfg</td>
<td>all SLC machines</td>
<td>The SLEE interface is configured to include the RCA service.</td>
<td>SLEE.cfg Configuration (on page 7) and SLEE Technical Guide.</td>
</tr>
</tbody>
</table>
eserv.config Configuration

Introduction

The eserv.config file is a shared configuration file, from which many NCC applications read their configuration. Each NCC machine (SMS, SLC, and VWS) has its own version of this configuration file, containing configuration relevant to that machine. The eserv.config file contains different sections; each application reads the sections of the file that contains data relevant to it.

The eserv.config file is located in the /IN/service_packages/ directory.

The eserv.config file format uses hierarchical groupings, and most applications make use of this to divide up the options into logical groupings.

Configuration file format

To organize the configuration data within the eserv.config file, some sections are nested within other sections. Configuration details are opened and closed using either { } or [ ].

- Groups of parameters are enclosed with curly brackets - { }
- An array of parameters is enclosed in square brackets - [ ]
- Comments are prefaced with a # at the beginning of the line

To list things within a group or an array, elements must be separated by at least one comma or at least one line break. Any of the following formats may be used, as in this example:

```
{ name="route6", id = 3, prefixes = [ "00000148", "0000473"] }
{ name="route7", id = 4, prefixes = [ "000001049" ] }
```

or

```
{  name="route6"
  id = 3
  prefixes = [
    "00000148"
    "0000473"
  ]
}
{  name="route7"
  id = 4
  prefixes = [
    "000001049"
  ]
}
```

or

```
{  name="route6"
  id = 3
  prefixes = [ "00000148", "0000473" ]
}
{  name="route7", id = 4
  prefixes = [ "000001049" ]
}
```

eserv.config files delivered

Most applications come with an example eserv.config configuration in a file called eserv.config.example in the root of the application directory, for example, /IN/service_packages/eserv.config.example.
Editing the file

Open the configuration file on your system using a standard text editor. Do not use text editors, such as Microsoft Word, that attach control characters. These can be, for example, Microsoft DOS or Windows line termination characters (for example: ^M), which are not visible to the user, at the end of each row. This will cause file errors when the application tries to read the configuration file.

Always keep a backup of your file before making any changes to it. This will ensure you have a working copy to which you can return.

Loading eserv.config changes

If you change the configuration file, then you must restart the appropriate parts of the service to enable the new options to take effect.

RCA eserv.config configuration

The eserv.config file must be configured to enable the RCA to work. All necessary configuration in eserv.config is done at installation time by the configuration script.

For any type of Radius client other than 3GPP2 (CDMA), it is necessary to edit the eserv.config and define a ClientType section. For example, this is necessary for a CISCO GGSN.

Note: The RCA configuration options in eserv.config are explained in the section on the radiusControlAgent (on page 9) background process.

SLEE.cfg Configuration

Introduction

The SLEE.cfg file must be configured to enable the RCA to work. All necessary SLEE configuration is done at installation time by the configuration script, this section is for information only.

The SLEE configuration file is located in:

/IN/service_packages/SLEE/etc/SLEE.cfg

Refer to SLEE Technical Guide for details on SLEE configuration.

RCA SLEE configuration

On install the following lines are added to the SLEE.cfg

```
SERVICEKEY=INTEGER 14 RADIUS
SERVICE=RADIUS 1 slee_acs CCS_DATA
INTERFACE=rca rca.sh /IN/service_packages/RCA/bin EVENT
```

Note: It is essential for the correct operation of this application that the SLEE Interface type is always set to EVENT.

SERVICEKEY
The SERVICEKEY entry specifies the SLEE service key for the RADIUS service. During rcaScp installation the value of the service key (default: 14) can be specified, or modified manually after install, if necessary.

SERVICE
The SERVICE entry specifies that the RADIUS service (that is, Service Key 14) corresponds to the CCS_DATA service entry in acs.conf.
acs.conf Configuration

Introduction

The acsChassis section in the acs.conf file on the SLC must be configured to enable the RCA to work. All necessary ACS configuration is done at installation time by the configuration script, this section is for information only. However, to enable RCA to work in the parameterised mode for Radius clients other than 3GPP2, it may be necessary to manually edit some of the parameters here as indicated.

Refer to the ACS Technical Guide for details on ACS configuration.

acsChassis configuration

On install the following lines are added to the acsChassis section of acs.conf.

```
ServiceEntry (CCS_DATA,cC,cC,ccsSvcLibrary.so)
minimumSizeOfConnectSleeEvent 1500
```

ServiceEntry
The ServiceEntry name (“CCS_DATA”) matches the SERVICE entry from SLEE.cfg.

minimumSizeOfConnectSleeEvent
This value is used to increase the parameters in the outgoing extensions. It is added manually to increase the default value, if required.

Default: 1024
Allowed:
Overview

Introduction

This chapter explains the processes which run automatically as part of the application. These processes are started automatically by one of the following:

- inittab
- crontab
- Service Logic Execution Environment SLEE

Note: This chapter also includes some plug-ins to background processes which do not run independently.

In this chapter

This chapter contains the following topics.

radiusControlAgent 9
Statistics 67

radiusControlAgent

Purpose

The radiusControlAgent process manages and processes the incoming Radius messages.

Startup

This process is started automatically by the SLEE. For more information see SLEE.cfg Configuration (on page 7).

Command line parameters

The radiusControlAgent process accepts the following command line parameters.

Usage:

radiusControlAgent -d -c config_section

The available parameters are:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>-d</td>
<td>Displays the values assigned to the configuration options for the RCA at startup, as defined in eserv.config.</td>
</tr>
<tr>
<td>-c config_section</td>
<td>Specifies which section in eserv.config to load. If this parameter is not defined, the default used is RADIUSControlAgent.</td>
</tr>
</tbody>
</table>
Example eserv.config

The following provides an example of the lines added to the eserv.config file on the SLC when you install Radius Control Agent.

```plaintext
RADIUSControlAgent = {
    ConfigName = "default"
    TimerInterface = "Timer"
    DestinationSK = 14
    OracleUserAndPassword = "/"
    WorkingDirectory = "/IN/service_packages/RCA"
    CorePort = 1812
    AccountingPort = 1813
    DynamicAuthorisationPort = 3799
    Window = 300
    NumberOfRetries = 10
    ServiceKey = 14
    CalledStationExtensionId = 1
    SfAccessPointExtensionId = 2
    CorrelationIdExtensionId = 3
    NoA = 5
    DurationThresholdQuotaGap = 10
    VolumeThresholdQuotaGap = 10000
}

NumberRules = [{
    fromNoa=4, remove=0, prepend="00"
} {
    fromNoa=3, remove=0, prepend="0064"
} {
    prefix="0064", min=11, remove=4, prepend="", resultNoa=3
} {
    prefix="00", min=5, remove=2, prepend="", resultNoa=4
} {
    prefix="0", min=9, remove=1, resultNoa=3
} {
    prefix="", min=9, remove=0, resultNoa=3
}]

PollSleeCount = 100
SelectTimeout = 10000
MinimumSLEEEventSize = 1024

BearerCapability_CodingStandard = 0
BearerCapability_ITC = 0
BearerCapability_TransferMode = 0
BearerCapability_ITR = 0
BearerCapability_uiProto1 = 1
VolumeConversionRatio = 1
UseCAP2ApplicationContext = false

IgnoredInapOpsList = [34,35,56]
CallingPartyCategory = 0
EventTypeBCSM = "ETBanalyzedInformation"
CalledPartyBCDNumber = "1111"

RADIUSUserNameAsCLI = true
RADIUSUserNameAsLocationNumber = true
MaxUdrOpenTime = 600
MaxUdrSize = 1024

defaultClientType = "Cisco"
ClientTypes = [
    { clientTypeName = "3GPP2"
        parameterisedRCA = false
        IPAddresses = [
            { address = "192.168.1.100" }
        ]
    }
]```


```json
{
  clientTypeName: "Cisco",
  parameterisedRCA: true

  IPAddresses: [
    { address: "192.168.14.100" }
    { address: "192.168.1.100" }
    { address: "192.168.1.101" }
  ]

  ParameterisedRCAFields: {
    QualifyingAttributeRules: [
      { AttributeValuePairs: [
        { attr: 81, attrType: "string", value: "abc" }
        { vendorID: 10415, attr: 21, attrType: "integer", value: 4 }
      ]
      }
      { AttributeValuePairs: [
        { attr: 181, attrType: "string", value: "2" }
        { attr: 182, attrType: "integer", value: 4 }
        { vendorID: 10415, attr: 121, attrType: "integer", anyValue: true }
      ]
      }
    ]
    sendAccessRejectMessages: false
    sendAccountingResponses: false
    expectResponsesFromDisconnectRequest: true
    useQuotainAccessAccept: false
    useThresholdinAccessAccept: false
    QuotaAttributeinAccessAccept: { vendorID: 10415, attr: 10, type = "QVdigits" }
    ThresholdAttributeinAccessAccept: { vendorID: 10415, attr: 10, type = "QVdigits" }
    sendZeroQuotaAccessAcceptOnFundsExpiry: false
    noFundsDisconnectMethod = "DisconnectRequest"
    messageAfterFinalAccessRequest = "emptyAccessAccept"

  ExtendedAttributeTypes: [
    {
      type: "QVdigits"
      pattern: "QV*"
      selectNth = 1
      firstFactor = "1"
      secondFactor = "0"
    }

    {
      type: "CiscoOverflow"
      pattern: "I*;*"
      selectNth = 1
      firstFactor = "4292967296"
      secondFactor = "1"
    }
  ]

  IncomingMapping: {
    Attributes: [
      { attr = 1, attrName = "User-Name", attrType = "string", storeToTag = 6690001 }
      { attr = 2, attrName = "User-Password", attrType = "string", storeToTag = 6690002 }
    ]
  }
}```
Chapter 3

{ attr = 3, attrName = "CHAP-Password", attrType = "string", storeToTag = 6690003 }  
{ attr = 4, attrName = "NAS-IP-Address", attrType = "IPv4", storeToTag = 6690004 }  
{ attr = 5, attrName = "NAS-Port", attrType = "integer", storeToTag = 6690005 }  
{ attr = 6, attrName = "Service-Type", attrType = "integer", storeToTag = 6690006 }  
{ attr = 7, attrName = "Framed-Protocol", attrType = "integer", storeToTag = 6690007 }  
{ attr = 8, attrName = "Framed-IP-Address", attrType = "IPv4", storeToTag = 6690008 }  
{ attr = 9, attrName = "Framed-IP-Netmask", attrType = "IPv4", storeToTag = 6690009 }  
{ attr = 22, attrName = "Framed-Route", attrType = "string", storeToTag = 6690022 }  
{ attr = 25, attrName = "Class", attrType = "string", storeToTag = 6690025 }  
{ attr = 27, attrName = "Session-Timeout", attrType = "integer", storeToTag = 6690027 }  
{ attr = 28, attrName = "Idle-Timeout", attrType = "string", storeToTag = 6690028 }  
{ attr = 30, attrName = "Called-Station-ID", attrType = "string", storeToTag = 6690030 }  
{ attr = 31, attrName = "Calling-Station-ID", attrType = "string", storeToTag = 6690031 }  
{ attr = 32, attrName = "NAS-Identifier", attrType = "string", storeToTag = 6690032 }  
{ attr = 40, attrName = "Acct-Status-Type", attrType = "integer", storeToTag = 6690040 }  
{ attr = 41, attrName = "Acct-Delay-Time", attrType = "integer", storeToTag = 6690041 }  
{ attr = 42, attrName = "Acct-Input-Octets", attrType = "integer", storeToTag = 6690042 }  
{ attr = 43, attrName = "Acct-Output-Octets", attrType = "integer", storeToTag = 6690043 }  
{ attr = 44, attrName = "Acct-Session-Id", attrType = "string", storeToTag = 6690044 }  
{ attr = 45, attrName = "Acct-Authentic", attrType = "integer", storeToTag = 6690045 }  
{ attr = 46, attrName = "Acct-Session-Time", attrType = "integer", storeToTag = 6690046 }  
{ attr = 47, attrName = "Acct-Input-Packets", attrType = "integer", storeToTag = 6690047 }  
{ attr = 48, attrName = "Acct-Output-Packets", attrType = "integer", storeToTag = 6690048 }  
{ attr = 60, attrName = "CHAP-Challenge", attrType = "string", storeToTag = 6690060 }  
{ attr = 61, attrName = "NAS-Port-Type", attrType = "string", storeToTag = 6690061 }  
{ attr = 96, attrName = "Framed-IPv6-Prefix", attrType = "string", storeToTag = 6690096 }  

# Cisco Vendor Specific

{ vendorID=9, attr=1, keystring="csg:billing_plan=" attrName="Rulebase-ID", attrType="string", storeToTag = 6820001 }  
{ vendorID=9, attr=1, keystring="csg:quota_server=" attrName="Quota-Server-Address", attrType="string", storeToTag = 6820002 }  
{ vendorID=9, attr=1, Keystring="csg:downlink_nexthop=" attrName = "Downlink-Nexthop", attrType="string", storeToTag = 6820003 }  

# 3GPP Vendor Specific
Chapter 3

Background Processes

```json
{ vendorID = 10415, attr = 1, attrName = "3GPP-IMSI", attrType = "string", storeToTag = 6760001 }
{ vendorID = 10415, attr = 2, attrName = "3GPP-Charging_Id", attrType = "string", storeToTag = 6760002 }
{ vendorID = 10415, attr = 3, attrName = "3GPP-PDPType", attrType = "integer", storeToTag = 6760003 }
{ vendorID = 10415, attr = 4, attrName = "3GPP-CG-Address", attrType = "IPv4", storeToTag = 6760004 }
{ vendorID = 10415, attr = 5, attrName = "3GPP-GPRS-QoS-Profile", attrType = "string", storeToTag = 6760005 }
{ vendorID = 10415, attr = 6, attrName = "3GPP-SGSN-Address", attrType = "IPv4", storeToTag = 6760006 }
{ vendorID = 10415, attr = 7, attrName = "3GPP-GGSN-Address", attrType = "IPv4", storeToTag = 6760007 }
{ vendorID = 10415, attr = 8, attrName = "3GPP-IMSI-MCC-MNC", attrType = "string", storeToTag = 6760008 }
{ vendorID = 10415, attr = 9, attrName = "3GPP-GGSN-MCC-MNC", attrType = "string", storeToTag = 6760009 }
{ vendorID = 10415, attr = 10, attrName = "3GPP-NSAPI", attrType = "string", storeToTag = 6760010 }
{ vendorID = 10415, attr = 12, attrName = "3GPP-Selection-Mode", attrType = "string", storeToTag = 6760012 }
{ vendorID = 10415, attr = 13, attrName = "3GPP-Charging-Characteristics", attrType = "string", storeToTag = 6760013 }
{ vendorID = 10415, attr = 18, attrName = "3GPP-SGSN-MCC-MNC", attrType = "string", storeToTag = 6760018 }
{ vendorID = 10415, attr = 20, attrName = "3GPP-IMEISV", attrType = "octets", storeToTag = 6760020 }
{ vendorID = 10415, attr = 21, attrName = "3GPP-RAT-Type", attrType = "integer", storeToTag = 6760021 }
{ vendorID = 10415, attr = 22, attrName = "3GPP-User-LOC-Info", attrType = "octets", storeToTag = 6760022 }
{ vendorID = 10415, attr = 23, attrName = "3GPP-MS-TimeZone", attrType = "octets", storeToTag = 6760023 }
```

ValueEditingRules = [

```json
{ attrName = "User-Name" ifStartsWith = "ADMIN" removeFront = 5 ifEndsWith = ".com" removeBack = 4 }
```

] DecryptTags = [

```json
{ fromTag = 6690002, decryptToTag = 6760099 }
```

] HardcodedValues = [

```json
{tag=6820005, tagType="string", value = "gprs:teardown-ind=yes" }
{tag=6820006, tagType="string", value = "PrimaryDNSserver" }
{tag =327689, tagType="string", value = "1111" }
{tag =327690, tagType="string", value = "027774444" }
{tag =327691, tagType="string", value = "2008" }
{tag =327713, tagType="string", value = "49393404" }
{tag =327801, tagType="string", value = "88888" }
{tag =327703, tagType="string", value = "777777" }
{tag =327868, tagType="string", value = "666666" }
```

] ReleaseCall = [

```json
```

]"
Chapter 3

```plaintext
InitialDPMapping = {
    callingPartyNumber = {
        tag = 6690031
        NumberRules = [
            { prefix="0064", min=11, remove=4, prepend="", resultNoa=3 }
            { prefix="00", min=5, remove=2, prepend="", resultNoa=4 }
            { prefix="0", min=9, remove=1, resultNoa=3 }
            { prefix="", remove=0, resultNoa=3 }
        ]
    }
    calledPartyBCDNumber = {
        tag = 327689
        NumberRules = [
            { prefix="0064", min=11, remove=4, prepend="", resultNoa=3 }
            { prefix="00", min=5, remove=2, prepend="", resultNoa=4 }
            { prefix="0", min=9, remove=1, resultNoa=3 }
            { prefix="", remove=0, resultNoa=3 }
        ]
    }
    locationNumberTag = {
        tag = 0
        NumberRules = [
            { prefix="0064", min=11, remove=4, prepend="", resultNoa=3 }
            { prefix="00", min=5, remove=2, prepend="", resultNoa=4 }
            { prefix="0", min=9, remove=1, resultNoa=3 }
            { prefix="", remove=0, resultNoa=3 }
        ]
    }
    callReferenceNumberTag = 0
}  
InitialDPExtensions = [6760003, 6760006, 6690004]

ConnectMapping = {
    destinationRoutingAddress = {
        tag = 327689
        NumberRules = [
            { fromNoa=4, remove=0, prepend="00" }
            { fromNoa=3, remove=0, prepend="0064" }
        ]
    }
    originalCalledPartyID = {
        tag = 327713
        NumberRules = [
            { fromNoa=4, remove=0, prepend="00" }
            { fromNoa=3, remove=0, prepend="0064" }
        ]
    }
    callingPartysCategoryTag = 327801
    redirectingPartyId = {
        tag = 327703
        NumberRules = [
            { fromNoa=4, remove=0, prepend="00" }
            { fromNoa=3, remove=0, prepend="0064" }
        ]
    }
```

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Chapter 3

Chapter 3, Background Processes

```

`genericNumbersAdditionalCallingPartyNumber = {
  tag = 327868
  NumberRules = [
    { fromNoa=4, remove=0, prepend="00" }
    { fromNoa=3, remove=0, prepend="0064" }
  ]
}`

ConnectExtensions = [
  { vendorID = 311, attr = 30, attrName = "PrimaryNBNSserver", attrType = "IPv4", profileBlockTag = 6950030 }
]

OutgoingMappingToLocalSwitch = {
  AccessAcceptMapping = [
    {attr = 6, attrName = "Service-Type", attrType = "integer", fromTag = 6690006 }
    {attr = 7, attrName = "Framed-Protocol", attrType = "integer", fromTag = 6690007 }
    {attr = 8, attrName = "Framed-IP-Address", attrType = "IPv4", fromTag = 6690008 }
    {attr = 9, attrName = "Framed-IP-Netmask", attrType = "IPv4", fromTag = 6690009 }
    {attr = 22, attrName = "Framed-Route", attrType = "integer", fromTag = 6690022 }
    {attr = 25, attrName = "Class", attrType = "string", fromTag = 6690025 }
    {attr = 27, attrName = "Session-Timeout", attrType = "integer", fromTag = 6690027 }
    {attr = 28, attrName = "Idle-Timeout", attrType = "integer", fromTag = 6690028 }
    {vendorID = 311, attr = 30, attrName = "PrimaryNBNSserver", attrType = "IPv4", fromTag = 6950030 }
    {vendorID = 9, attr = 1, attrName = "TeardownInd", attrType = "string", fromTag = 6820005 }
  ]
  DisconnectRequestMapping = [
    {vendorID = 10415, attr = 1, attrName = "3GPP-IMSI", attrType = "string", fromTag = 6760001 }
    {vendorID = 10415, attr = 10, attrName = "3GPP-NSAPI", attrType = "string", fromTag = 6760010 }
    {vendorID = 9, attr = 1, attrName = "TeardownInd", attrType = "string", fromTag = 6820005 }
    {attr = 44, attrName = "Acct-Session-Id", attrType = "string", fromTag = 6690044 }
    {attr = 6, attrName = "Service-Type", attrType = "integer", fromTag = 6690006 }
    {attr = 4, attrName = "NAS-IP-Address", attrType = "IPv4", fromTag = 6690004 }
    {attr = 8, attrName = "Framed-IP-Address", attrType = "IPv4", fromTag = 6690008 }
    {attr = 18, attrName = "originalCalledPartyID", attrType = "string", fromTag = 327713 }
  ]
}

# Charging

UseUnitsFromAccessRequest = false
UseFinalUnitsFromAccountingRequest = true
```
CumulativeConversionRules = false
AccountingRequestConversionRules = [
    { ruleName = "rule1",
      attributeList = [
      { attributeTag = 6690042, multiplier = 0.00001 } # Deciseconds in ACR = 0.00001 * input-octets +
      { attributeTag = 6690043, multiplier = 0.00001 } # 0.00001 * output-octets
    ]
    }
    { ruleName = "rule2",
      attributeList = [
      { attributeTag = 6690046, multiplier = 10 } # Deciseconds in ACR = 10 * session-time
    ]
    }
]
conversionFactor = 100000.0
clientThresholdQuotaGap = 100
SessionInactiveRules = [
    {AttributeValuePairs = [
      { attr = 81, attrType = "string", value = "2" } # and
      { attr = 82, attrType = "integer", value = 4 } # and
      { vendorID = 10415, attr = 21, attrType = "integer", value = 4 }
    ]}
    # or
    {AttributeValuePairs = [
      { attr = 81, attrType = "string", value = "2" } # and
      { attr = 82, attrType = "integer", value = 4 } # and
      { vendorID = 10415, attr = 21, attrType = "integer", value = 3 }
    ]}
]
ServiceKeyRules = [
    {AttributeValuePairs = [
      { attr = 61, attrType = "string", value = "2" }
      { attr = 62, attrType = "integer", value = 4 }
      { vendorID = 10415, attr = 21, attrType = "integer", value = 4 }
    ]
    sleepServiceKey=231
    inapServiceKey=231
]
CorrelationAttributes = {
    AccountingRequest = [
      { vendorID = 10415, attr = 2 } # 3GPP-Charging-Id
      , attr = 1
      , attr = 6
    ]
    AccessRequest = [
      { vendorID = 10415, attr = 2 } # 3GPP-Charging-Id
      , attr = 1
      , attr = 6
    ]
}
systemErrorAttribute = {
    attr = 0 # attr = 0 means do not add any such attribute
    attrType="string"
    value = "System Error"
}
invalidMessageSequenceAttribute = {
    attr = 0 # attr = 0 means do not add any such attribute
    attrType="string"
    value = "Invalid Message Sequence"
}

insufficientFundsAttribute = {
    attr = 0 # attr = 0 means do not add any such attribute
    attrType="string"
    value = "Insufficient Funds"
}

timeoutAttribute = {
    attr = 0 # attr = 0 means do not add any such attribute
    attrType="string"
    value = "Session Timed Out"
}

replyMessagestoAttribute = 0     # 18 would seem sensible but Cisco do not support it

sessionTimeout = 3600
idleTimeout = 600
eventTimestampInAccessAccept = false

} #end ParameterisedRCAFields

}

}


tracing = {
    enabled = false
    outputFile = "/IN/service_packages/RCA/tmp/rcaTrace.log"
    outputFileCycle = 512
    maxFileSizeKB = 0
    maxNumFiles = 4
    callsPerMinute = 2
    origAddress = [
        ""
    ]
    destAddress = [
        ""
    ]
    useTONNPI = true

}


**RADIUSControlAgent parameters**

The configuration parameters for the radiusControlAgent are automatically added to the RCA section of eserv.config at installation.

The available parameters are:

**AccountingPort**

*Syntax:*  
AccountingPort = value

*Description:*  
Defines the port number used by the RCA to receive incoming Radius accounting messages.

*Type:*  
Integer
Optionality: Optional
Allowed: Any valid port number
Default: 1813
Notes:
Example: AccountingPort = 1813

**BearerCapability_CodingStandard**

Syntax: `BearerCapability_CodingStandard = value`
Description: Defines the bearer capability coding standard.
Type: Integer
Optionality: Optional
Allowed:
- 0 = ITU_T
- 1 = ISO IEC
- 2 = National
- 3 = Network
Default: No default
Notes: By default, this parameter is not used.
Example: `BearerCapability_CodingStandard = 0`

**BearerCapability_ITC**

Syntax: `BearerCapability_ITC = value`
Description: Defines the ITC bearer capability.
Type: Integer
Optionality: Optional
Allowed:
- 0 = Speech
- 8 = Unrestricted Digital Information (UDI)
- 9 = Restricted Digital Information (RDI)
- 16 = 3.1 KHz Audio
- 17 = UDI with tones / announcements
- 24 = Video
Default: No default
Notes: By default, this parameter is not used.
Example: `BearerCapability_ITC = 8`

**BearerCapability_ITR**

Syntax: `BearerCapability_ITR = value`
Description: Defines the bearer capability information transfer rate.
Type: Integer
Optionality: Optional
Allowed:
- 0 = Packet
- 16 = 64 kb per second
17 = 2 * 64 kb per second
19 = 384 kb per second
21 = 1536 kb per second
23 = 1920 kb per second
24 = Multirate

Default: No default
Notes: By default this parameter is not used.
Example: BearerCapability_ITR = 0

**BearerCapability_TransferMode**

Syntax: `BearerCapability_TransferMode = value`
Description: Defines the bearer capability transfer mode.
Type: Integer
Optionality: Optional
Allowed:
- 0 = Circuit
- 2 = Packet
Default: No default
Notes: By default, this parameter is not used.
Example: BearerCapability_TransferMode = 0

**BearerCapability_uiProto1**

Syntax: `BearerCapability_uiProto1 = value`
Description: Defines the bearer capability user information layer protocol.
Type: Integer
Optionality: Optional
Allowed:
- 1 = ITU V110 I460 X30
- 2 = G.711 U LAW
- 3 = G.711 A LAW
- 4 = G.721 32 KBits
- 5 = H.221/ H.242
- 6 = H.223 / H.245
- 7 = Non-ITU SRA
- 8 = ITU V.120
- 9 = X31 HDLC
- 255 = Not present
Default: No default
Notes: By default, this parameter is not used.
Example: BearerCapability_uiProto1 = 1

**CalledPartyBCDNumber**

Syntax: `CalledPartyBCDNumber = "str"`
Description: A fixed number to send in the InitialDP, used as a dummy value in calculating tariffs (in the case of WiFi there is no real called party).
Type: String
Optionality: Optional
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Allowed:
Default: No default
Notes: Contains a dummy value taken from eserv.config. If not specified, will not be sent in the InitialDP.
Example: CalledPartyBCDNumber = "1111"

**CalledStationExtensionId**

Syntax: CalledStationExtensionId = value
Description: Defines the ACS extension field where the called party URL is stored.
Type: Integer
Optionality: Mandatory
Allowed:
Default: No default
Notes: Contains a dummy value taken from eserv.config. If not specified, will not be sent in the InitialDP.
Example: CalledStationExtensionId = 1

**CallingPartyCategory**

Syntax: CallingPartyCategory = value
Description: Defines the calling party category to use in all outgoing IDP messages.
Type: Integer
Optionality: Optional
Allowed: Any valid calling party category number
Default: 0
Notes: 
Example: CallingPartyCategory = 0

**ClientTypes**

Syntax: ClientTypes = [
  clientTypeName = "str"
  parameterisedRCA = true|false
  IPAddresses = ["str"
  ]
]
Description: Lists the attributes of the Radius type client switches that will be supported.
Type: Array
Optionality: Optional (default used if not set).
Allowed:
Default: 
Notes: 
Example: ClientTypes = [
  clientTypeName = "Cisco"
  parameterisedRCA = true
  IPAddresses = ["123.456.78.900"
  ]
]
clientTypeName
Syntax: clientTypeName = "str"
Description: Name of the Radius type client switch that will be supported by RCA.
Type: String
Optionality: Optional (default used if not set).
Allowed: 
Default: 
Notes: 
Example: clientTypeName = "Cisco"

parameterisedRCA
Syntax: parameterisedRCA = true|false
Description: Indicates if the default RCA processing logic for 3GPP2 or the one for Cisco GGSN should be used.
Type: Boolean
Optionality: Optional (default used if not set).
Allowed: 
- true - parameterised for Cisco GGSN logic
- false - default RCA logic
Default: 
Notes: 
Example: parameterisedRCA = true

IPAddresses
Syntax: IPAddresses = ["addr1","addr2", "addrn"]
Description: The IP addresses of the SLCs handling calls for this client type.
Type: Numeric string
Optionality: Optional (default used if not set).
Allowed: 
Default: 
Notes: 
Example: IPAddresses = [ 
{ address = "100.100.10.100" } 
]

ConfigName
Syntax: ConfigName = "str"
Description: The Name, defined in the Global Config screen, that is assigned to the database configuration (configured through the RCA screens in the SMS) to be loaded.
Type: String
Optionality: Optional
Allowed: Any defined configuration name
Default: "default"
Notes: 
Example: ConfigName = "default"
CorePort
Syntax: CorePort = value
Description: Defines the port number used to receive incoming Radius core messages.
Type: Integer
Optionality: Optional
Allowed: Any valid port number
Default: 1812
Notes: Example: CorePort = 1812

CorrelationIdExtensionId
Syntax: CorrelationIdExtensionId = value
Description: Specifies which IDP extension to put the correlation ID into, as an ASN.1 octet string.
Type: Integer
Optionality: Optional
Allowed:
Default: 3
Notes: If you want to print the RADIUS Correlation-ID in the EDR, there must be an extensionNumber parameter in the acs.conf with an extension type matching the value of this parameter. This number must not be one used by any other extension. Refer to ACS Technical Guide for details.
Example: CorrelationIdExtensionId = 3

DestinationSK
Syntax: DestinationSK = value
Description: An integer that defines the SLEE service key for all INAP SLEE outward messages sent by the RCA.
Type: Integer
Optionality: Optional
Allowed: Any valid service key integer
Default: 14
Notes: Example: DestinationSK = 14

DurationThresholdQuotaGap
Syntax: DurationThresholdQuotaGap = value
Description: Gap between duration-threshold and duration-quota (seconds).
Type: Integer
Optionality: Optional
Allowed:
Default: 10
Notes: Example: DurationThresholdQuotaGap = 10
DynamicAuthorisationPort

**Syntax:**
`DynamicAuthorisationPort = value`

**Description:**
Defines the port number that RCA sends Radius dynamic authorisation messages to.

**Type:**
Integer

**Optionality:**
Optional

**Allowed:**
Any valid port number

**Default:**
3799

**Notes:**

**Example:**
`DynamicAuthorisationPort = 3799`

EventTypeBCSM

**Syntax:**
`EventTypeBCSM = "str"`

**Description:**
Defines the BCSM event type to use in all outgoing IDP messages.

**Type:**
String

**Optionality:**
Optional

**Allowed:**
- ETBcollectedInfo
- ETBanalyzedInformation

**Default:**
ETBanalyzedInformation

**Notes:**

**Example:**
`EventTypeBCSM = "ETBanalyzedInformation"

IgnoredInapOpsList

**Syntax:**
`IgnoredInapOpsList = [val1,val2,valn]`

**Description:**
Lists the INAP operations that cannot be handled by the RCA, and hence ignored.

**Type:**
Integer

**Optionality:**
Optional

**Allowed:**
Any INAP operation number

**Default:**
None

**Notes:**

**Example:**
`IgnoredInapOpsList = [34,35,56]`

MaxUdrOpenTime

**Syntax:**
`MaxUdrOpenTime = value`

**Description:**
Defines the time (in seconds) that UDRs can remain open.

**Type:**
Integer

**Optionality:**
Optional

**Allowed:**

**Default:**
600

**Notes:**

**Example:**
`MaxUdrOpenTime = 600`

MaxUdrSize

**Syntax:**
`MaxUdrSize = value`

**Description:**
Defines the maximum size (in kilobytes) for a UDR file.
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Type: Integer
Optionality: Optional
Allowed: 1024
Default: 1024
Notes: If the size limit is exceeded by the current UDR record, the RCA completes the record in the current file and then creates a new file for the next record.
Example: MaxUdrSize = 1024

MinimumSLEEEventSize
Syntax: MinimumSLEEEventSize = value
Description: The minimum size of the slee event containing the InitialDP.
Type: Integer
Optionality: Optional (default used if not set).
Allowed: 1024
Default: 1024
Notes: If the profile extensions are too large, that is, if there are a lot of items in InitialDPExtensions, increase this parameter.
Example: MinimumSLEEEventSize = 1024

NoA
Syntax: NoA = value
Description: Defines the Nature of Address value to use in the outgoing IDPs.
Type: Integer
Optionality: Optional
Allowed:
- 1 = international
- 2
- 3
- 4
- 5 = unknown
Default: 5
Notes:
Example: NoA = 5

NumberOfRetries
Syntax: NumberOfRetries = value
Description: Defines the maximum number of retries allowed before the interaction is terminated.
Type: Integer
Optionality: Optional
Allowed: 10
Default: 10
Notes:
Example: NumberOfRetries = 10
OracleUserAndPassword

Syntax: OracleUserAndPassword = "str/str"
Description: The Oracle username and password for the RCA.
Type: String
Optionality: Optional
Allowed:
Default: /
Notes:
Example: OracleUserAndPassword = "/"

PollSleeCount

Syntax: PollSleeCount = value
Description: Poll the SLEE this many times for each UDP poll.
Type: Integer
Optionality: Optional
Allowed:
Default: 100
Notes:
Example: PollSleeCount = 100

RADIUSUserNameAsCLI

Syntax: RADIUSUserNameAsCLI = true|false
Description: Defines the CLI.
Type: Boolean
Optionality: Optional
Allowed:
Default: true
Notes:
Example: RADIUSUserNameAsCLI = true

RADIUSUserNameAsLocationNumber

Syntax: RADIUSUserNameAsLocationNumber = true|false
Description: Defines the location number.
Type: Boolean
Optionality: Optional
Allowed:
Default: true
Notes:
Example: RADIUSUserNameAsLocationNumber = true
SelectTimeout
Syntax: SelectTimeout = value
Description: Timeout of the UDP select call (microseconds).
Type: Integer
Optionality: Optional
Allowed: 
Default: 10000
Notes: 
Example: SelectTimeout = 10000

ServiceKey
Syntax: ServiceKey = value
Description: Defines the Service Key to use in the outgoing IDPs.
Type: Integer
Optionality: Optional
Allowed: 
Default: 14
Notes: 
Example: ServiceKey = 14

SfAccessPointExtensionId
Syntax: SfAccessPointExtensionId = value
Description: The InitialDP extension slot number to use for the RADIUS SF-Access-Point-Id, that is, the name of the WiFi hotspot the subscriber is establishing the connection through.
Type: Integer
Optionality: Optional
Allowed: 
Default: 2
Notes: If you want to print the RADIUS SF-Access-Point-Id in the EDR, there must be an extensionNumber parameter in the acs.conf with an extension type matching the value of this parameter. This number must not be one used by any other extension. Refer to ACS Technical Guide for details.
Example: SfAccessPointExtensionId = 2

TimerInterface
Syntax: TimerInterface = "str"
Description: The timer interface used by the RCA to set its timers.
Type: String
Optionality: Optional
Allowed: 
Default: "Timer"
Notes: 
Example: TimerInterface = "Timer"
UseCAP2ApplicationContext
Syntax: UseCAP2ApplicationContext = true|false
Description: If set to true, enables the use of CAP2 application context for compatibility with older Prepaid Charging versions.
Type: Boolean
Optionality: Optional (default used if not set).
Allowed: true, false
Default: false
Notes:
Example: UseCAP2ApplicationContext = false

VolumeConversionRatio
Syntax: VolumeConversionRatio = value
Description: How many octets are considered equal to one second for charging.
Type: Integer
Optionality: Optional (default used if not set).
Allowed: Minimum allowed value is 1, maximum is 1048576.
Default: 1 (that is, 1 octet is reported as 1 second)
Notes: This only affects volume charges. All reservations will be rounded up to be whole chunks, so this is also the billing granularity for volume reservations.
Example: VolumeConversionRatio = 1

VolumeThresholdQuotaGap
Syntax: VolumeThresholdQuotaGap = value
Description: Gap between duration-threshold and duration-quota (octets).
Type: Integer
Optionality: Optional
Allowed: Default: 10000
Notes:
Example: VolumeThresholdQuotaGap = 10000

Window
Syntax: Window = value
Description: Defines the accept time delay window (seconds) for an incoming message. It has been provided to prevent replay attack.
Type: Integer
Optionality: Optional
Allowed: Default: 300 seconds
Notes:
Example: Window = 300
WorkingDirectory

Syntax:  WorkingDirectory = "str"
Description:  The name for the base directory used by the RCA to store UDR and core files.
Type:  String
Optionality:  Optional
Allowed:  
Default:  /IN/service_packages/RCA
Notes:  
Example:  WorkingDirectory = "/IN/service_packages/RCA"

NumberRules parameters

Description
This section defines the global number normalisation rules for RCA. They are found within NumberRules = [ ].
This section is optional.

NumberRules parameters
The following parameters define the number normalisation rules for RCA:

prefix
Syntax:  prefix = "pref"
Description:  Contains a digit or digits. Used to attempt to match the first digit or digits of a prefix number with the specified value. If the digit or digits match, the prefix part of the number rule is met.
Type:  String
Optionality:  Optional
Allowed:  One or more decimal digits
Notes:  This parameter is an element of the NumberRules parameter array.
Example:  prefix = "25"

fromNoa
Syntax: fromNoa = int
Description:  Used when attempting to match the nature of address (NoA) number contained in a message. If there is a match, the fromNoa part of the number rule is evaluated.
Type:  Integer
Optionality:  Required
Allowed:  2 – For unknown NoAs
3 – For national NoAs
4 – For international NoAs
Notes:  If you omit fromNoa from the NumberRules parameter section, then no matching rule will be found.
Example: fromNoa = 3
**min**

**Syntax:** \( \text{min} = \text{num} \)

**Description:** Specifies the minimum number of digits a number may contain. To meet the min part of the number rule, the number of digits in the number must be equal to or greater than the value of \( \text{min} \).

**Type:** Integer

**Optionality:** Optional (default used if not set)

**Default:** 0

**Notes:** The value of the \( \text{min} \) parameter must be greater than or equal to the value of the \( \text{remove} \) (on page 29) parameter.

**Example:** \( \text{min} = 5 \)

**max**

**Syntax:** \( \text{max} = \text{num} \)

**Description:** Specifies the maximum number of digits a number may contain. To meet the max part of the number rule, the number of digits in the number must be equal to or less than the value of \( \text{max} \).

**Type:** Integer

**Optionality:** Optional (default used if not set)

**Default:** 999

**Example:** \( \text{max} = 9 \)

**remove**

**Syntax:** \( \text{remove} = \text{num} \)

**Description:** The number of digits stripped from the beginning of a number.

**Type:** Integer

**Optionality:** Required

**Notes:** The value of the \( \text{remove} \) parameter must be less than or equal to the value of the \( \text{min} \) (on page 29) parameter.

**Example:** \( \text{remove} = 2 \)

**prepend**

**Syntax:** \( \text{prepend} = "\text{digits}" \)

**Description:** Defines digits added to the beginning of a number.

**Type:** String

**Optionality:** Optional

**Allowed:** Any combination of decimal digits, or a null string (""").

**Notes:**
- If the \( \text{remove} \) and \( \text{prepend} \) parameters are both used in the same number rule, "prepend" is added to the beginning of the number after the number has been modified by the \( \text{remove} \) parameter.
- The \( \text{prepend} \) parameter is an element of the NumberRules parameter array.

**Example:** \( \text{prepend} = "0" \)
resultNoa

Syntax: \[ resultNoa = noa \]

Description: A nature of address (NOA) sent to the network.

Type: Integer

Optionality: Optional

Notes:
- A value is typically specified in demoralization rules.
- This parameter is an element of the NumberRules parameter array.

Example: \[ resultNoa = 4 \]

ParameterisedRCAFields section

Description

The parameters in this section are used to configure RCA for Cisco GGSN call handling. They are found within ParameterisedRCAFields = { }.

This section needs to be configured for all client types other than 3GPP2 (CDMA). When the client type is 3GPP2, the default RCA configuration is used.

ParameterisedRCAFields

```
ParameterisedRCAFields = {
    QualifyingAttributeRules = [
        { AttributeValuePairs = [
            {attr = 81, attrType = "string", value = "abc" }]
        },
        { AttributeValuePairs = [
            { attr = 181, attrType = "string", value = "2" },
            { attr = 182, attrType = "integer", value = 4 }]
        }]
    sendAccessRejectMessages = false
    sendAccountingResponses = false
    expectResponsesFromDisconnectRequest = true
    useQuotaInAccessAccept = false
    useThresholdInAccessAccept = false
    QuotaAttributeInAccessAccept = { vendorID = 10415, attr = 10, type = "QVdigits" }
    ThresholdAttributeInAccessAccept = { vendorID = 10415, attr = 10, type = "QVdigits" }
    sendZeroQuotaAccessAcceptOnFundsExpiry = false
    noFundsDisconnectMethod = "DisconnectRequest"
    messageAfterFinalAccessRequest = "emptyAccessAccept"
    ExtendedAttributeTypes = [
        { type = "QVdigits"
          pattern = "QV*"
          selectNth = 1
          firstFactor = "1"
          secondFactor = "0"
        }]
```


type = "CiscoOverflow"
pattern = "I*;*"
selectNth = 1
firstFactor = "4292967296"
secondFactor = "1"
}

IncomingMapping = {

Attributes = [

{ attr = 1, attrName = "User-Name", attrType = "string",
storeToTag = 6690001 }]
{ attr = 2, attrName = "User-Password", attrType = "string",
storeToTag = 6690002 }]
{ attr = 3, attrName = "CHAP-Password", attrType = "string",
storeToTag = 6690003 }]
{ attr = 4, attrName = "NAS-IP-Address", attrType = "IPv4",
storeToTag = 6690004 }]
{ attr = 5, attrName = "NAS-Port", attrType = "integer",
storeToTag = 6690005 }]
{ attr = 6, attrName = "Service-Type", attrType = "integer",
storeToTag = 6690006 }]
{ attr = 7, attrName = "Framed-Protocol", attrType = "integer",
storeToTag = 6690007 }]
{ attr = 8, attrName = "Framed-IP-Address", attrType = "IPv4",
storeToTag = 6690008 }]
{ attr = 9, attrName = "Framed-IP-Netmask", attrType = "IPv4",
storeToTag = 6690009 }]
{ attr =22, attrName = "Framed-Route", attrType = "string",
storeToTag = 6690022 }]
{ attr =25, attrName = "Class", attrType = "string",
storeToTag = 6690025 }]
{ attr =27, attrName = "Session-Timeout", attrType = "integer",
storeToTag = 6690027 }]
{ attr =28, attrName = "Idle-Timeout", attrType = "string",
storeToTag = 6690028 }]
{ attr =30, attrName = "Called-Station-ID", attrType = "string",
storeToTag = 6690030 }]
{ attr =31, attrName ="Calling-Station-ID", attrType = "string",
storeToTag = 6690031 }]
{ attr =32, attrName = "NAS-Identifier", attrType = "string",
storeToTag = 6690032 }]
{ attr =40, attrName = "Acct-Status-Type", attrType = "integer",
storeToTag = 6690040 }]
{ attr =41, attrName = "Acct-Delay-Time", attrType = "integer",
storeToTag = 6690041 }]
{ attr =42, attrName = "Acct-Input-Octets", attrType = "integer",
storeToTag = 6690042 }]
{ attr =43, attrName = "Acct-Output-Octets", attrType = "integer",
storeToTag = 6690043 }]
{ attr =44, attrName = "Acct-Session-Id", attrType = "string",
storeToTag = 6690044 }]
{ attr =45, attrName = "Acct-Authentic", attrType = "integer",
storeToTag = 6690045 }]
{ attr =46, attrName = "Acct-Session-Time", attrType = "integer",
storeToTag = 6690046 }]
{ attr =47, attrName = "Acct-Input-Packets", attrType = "integer",
storeToTag = 6690047 }]
{ attr =48, attrName = "Acct-Output-Packets", attrType = "integer",
storeToTag = 6690048 }]
{ attr =60, attrName = "CHAP-Challenge", attrType = "string",
storeToTag = 6690060 }]
{ attr =61, attrName = "NAS-Port-Type", attrType = "string",
storeToTag = 6690061 }]


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{ attr =96, attrName = "Framed-IPv6-Prefix", attrType = "string", storeToTag = 6690096 }

# Cisco Vendor Specific

{ vendorID=9, attr=1, keystring="csg:billing_plan=",
  attrName="Rulebase-ID", attrType="string", storeToTag = 6820001 }
{ vendorID=9, attr=1, keystring="csg:quota_server=",
  attrName="Quota-Server-Address", attrType="string", storeToTag = 6820002 }
{ vendorID=9, attr=1, keystring="csg:downlink_nexthop=",
  attrName = "Downlink-Nexthop", attrType="string", storeToTag = 6820003 }

# 3GPP Vendor Specific

{ vendorID = 10415, attr = 1, attrName = "3GPP-IMSI", attrType = "string", storeToTag = 6760001 }
{ vendorID = 10415, attr = 2, attrName = "3GPP-Charging_Id", attrType = "string", storeToTag = 6760002 }
{ vendorID = 10415, attr = 3, attrName = "3GPP-PDPType", attrType = "integer", storeToTag = 6760003 }
{ vendorID = 10415, attr = 4, attrName = "3GPP-CG-Address", attrType = "IPv4", storeToTag = 6760004 }
{ vendorID = 10415, attr = 5, attrName = "3GPP-GPRS-QoS-Profile", attrType = "string", storeToTag = 6760005 }
{ vendorID = 10415, attr = 6, attrName = "3GPP-SGSN-Address", attrType = "IPv4", storeToTag = 6760006 }
{ vendorID = 10415, attr = 7, attrName = "3GPP-GGSN-Address", attrType = "IPv4", storeToTag = 6760007 }
{ vendorID = 10415, attr = 8, attrName = "3GPP-IMSI-MCC-MNC", attrType = "string", storeToTag = 6760008 }
{ vendorID = 10415, attr = 9, attrName = "3GPP-GGSN-MCC-MNC", attrType = "string", storeToTag = 6760009 }
{ vendorID = 10415, attr =10, attrName = "3GPP-NSAPI", attrType = "string", storeToTag = 6760010 }
{ vendorID = 10415, attr =12, attrName = "3GPP-Selection-Mode", attrType = "string", storeToTag = 6760012 }
{ vendorID = 10415, attr =13, attrName = "3GPP-Charging-Characteristics", attrType = "string", storeToTag = 6760013 }
{ vendorID = 10415, attr =18, attrName = "3GPP-SGSN-MCC-MNC", attrType = "string", storeToTag = 6760018 }
{ vendorID = 10415, attr =20, attrName = "3GPP-IMEISV", attrType = "octets", storeToTag = 6760020 }
{ vendorID = 10415, attr =21, attrName = "3GPP-RAT-Type", attrType = "integer", storeToTag = 6760021 }
{ vendorID = 10415, attr =22, attrName = "3GPP-User-Loc-Info", attrType = "octets", storeToTag = 6760022 }
{ vendorID = 10415, attr =23, attrName = "3GPP-MS-TimeZone", attrType = "octets", storeToTag = 6760023 }

ValueEditingRules = [ 
  
  attrName = "User-Name"
  ifStartsWith = "ADMIN"
  removeFront = 5
  ifEndsWith = ".com"
  removeBack = 4
]

DecryptTags = [ 
  
  fromTag = 6690002, decryptToTag = 6760099
]

HardcodedValues = [ 

{tag=6820005, tagType="string", value = "gprs:teardown-ind=yes" }
{tag=6820006, tagType="string", value = "PrimaryDNSServer" }
{tag =327689, tagType="string", value = "1111" }
{tag =327690, tagType="string", value = "027774444" }
{tag =327691, tagType="string", value = "2008" }
{tag =327713, tagType="string", value = "49393404" }
{tag =327801, tagType="string", value = "88888" }
{tag =327703, tagType="string", value = "777777" }
{tag =327868, tagType="string", value = "666666" }

ReleaseCall = [
  {code=41, vendorID=9, attr=1, tagType="string", value = "gprs:teardown-ind=yes" }
  {code=31, vendorID=9, attr=1, tagType="string", value = "gprs:teardown-ind=no" }
]

InitialDPMapping = {
  callingPartyNumber = {
    tag = 6690031
    NumberRules = [
      { prefix="0064",  min=11, remove=4, prepend="", resultNoa=3 }
      { prefix="00",  min=5, remove=2, prepend="", resultNoa=4 }
      { prefix="0",  min=9, remove=1, resultNoa=3 }
      { prefix="", remove=0, resultNoa=3 }
    ]
  }
  calledPartyBCDNumber = {
    tag = 327689
    NumberRules = [
      { prefix="0064",  min=11, remove=4, prepend="", resultNoa=3 }
      { prefix="00",  min=5, remove=2, prepend="", resultNoa=4 }
      { prefix="0",  min=9, remove=1, resultNoa=3 }
    ]
  }
  locationNumberTag = {
    tag = 0
    NumberRules = [
      { prefix="0064",  min=11, remove=4, prepend="", resultNoa=3 }
      { prefix="00",  min=5, remove=2, prepend="", resultNoa=4 }
    ]
  }
  callReferenceNumberTag = 0
}

InitialDPExtensions = [6760003,6760006,6690004]

ConnectMapping = {
  destinationRoutingAddress = {
    tag = 327689
    NumberRules = [
      { fromNoa=4, remove=0, prepend="00" }
      { fromNoa=3, remove=0, prepend="0064" }
    ]
  }
  originalCalledPartyID = {
    tag = 327713
  }
}
NumberRules = [  
    { fromNoa=4, remove=0, prepend="00"  
    { fromNoa=3, remove=0, prepend="0064"  
    }  
}  

callingPartysCategoryTag = 327801  
redirectingPartyId = {  
tag = 327703  
NumberRules = [  
    { fromNoa=4, remove=0, prepend="00"  
    { fromNoa=3, remove=0, prepend="0064"  
    }  
}  
genericNumbersAdditionalCallingPartyNumber = {  
tag = 327868  
NumberRules = [  
    { fromNoa=4, remove=0, prepend="00"  
    { fromNoa=3, remove=0, prepend="0064"  
    }  
}  
}  
ConnectExtensions = [  
    { vendorID = 311, attr = 30, attrName = "PrimaryNBNServer", attrType = "IPv4", profileBlockTag = 6950030 }  
}  
OutgoingMappingtoSwitch = {  
    AccessAcceptMapping = [  
        {attr = 6, attrName = "Service-Type", attrType = "integer", fromTag = 6690006 }  
        {attr = 7, attrName = "Framed-Protocol", attrType = "integer", fromTag = 6690007 }  
        {attr = 8, attrName = "Framed-IP-Address", attrType = "IPv4", fromTag = 6690008 }  
        {attr = 9, attrName = "Framed-IP-Netmask", attrType = "IPv4", fromTag = 6690009 }  
        {attr =22, attrName = "Framed-Route", attrType = "integer", fromTag = 6690022 }  
        {attr =25, attrName = "Class", attrType = "string", fromTag = 6690025 }  
        {attr =27, attrName = "Session-Timeout", attrType = "integer", fromTag = 6690027 }  
        {attr =28, attrName = "Idle-Timeout", attrType = "integer", fromTag = 6690028 }  
    ]  
    DisconnectRequestMapping = [  
        {vendorID = 10415, attr = 1, attrName = "3GPP-IMSI", attrType = "string", fromTag = 6760001 }  
        {vendorID = 10415, attr = 10, attrName = "3GPP-NSAPI", attrType = "string", fromTag = 6760010 }  
        {vendorID = 9, attr = 1, attrName = "TeardownInd", attrType = "string", fromTag = 6820005 }  
        {attr =44, attrName = "Acct-Session-Id", attrType = "string", fromTag = 6690044 }  
        {attr = 6, attrName = "Service-Type", attrType = "integer", fromTag = 6690006 }  
    ]  
}
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Background Processes

[{attr = 4, attrName = "NAS-IP-Address", attrType = "IPv4", fromTag = 6690004 }]
[{attr = 8, attrName = "Framed-IP-Address", attrType = "IPv4", fromTag = 6690008 }]
[{attr = 18, attrName = "originalCalledPartyID", attrType = "string", fromTag = 327713 }]

# Charging

UseUnitsFromAccessRequest = false
UseFinalUnitsFromAccountingRequest = true
CumulativeConversionRules = false
AccountingRequestConversionRules = [
  {ruleName = "rule1",
   attributeList = [
     {attributeTag = 6690042, multiplier = 0.00001} # Deciseconds in ACR = 0.00001 * input-octets +
     {attributeTag = 6690043, multiplier = 0.00001} #
     0.00001 * output-octets
   ]
  }
  {ruleName = "rule2",
   attributeList = [
     {attributeTag = 6690046, multiplier = 10} # Deciseconds in ACR = 10 * session-time
   ]
  }
]
conversionFactor = 100000.0
clientThresholdQuotaGap = 100

SessionInactiveRules = [
  {AttributeValuePairs = [
    {attr = 81, attrType = "string", value = "2" } # and
    {attr = 82, attrType = "integer", value = 4 } # and
    {vendorID = 10415, attr = 21, attrType = "integer", value = 4 }
  ]} # or
  {AttributeValuePairs = [
    {attr = 81, attrType = "string", value = "2" } # and
    {attr = 82, attrType = "integer", value = 4 } # and
    {vendorID = 10415, attr = 21, attrType = "integer", value = 3 }
  ]}
]
ServiceKeyRules = [
  {AttributeValuePairs = [
    {attr = 61, attrType = "string", value = "2" }
    {attr = 62, attrType = "integer", value = 4 }
    {vendorID = 10415, attr = 21, attrType = "integer", value = 4 }
  ]
  sleeServiceKey=231
  inapServiceKey=231
]

CorrelationAttributes = {
  AccountingRequest = [
    {vendorID = 10415, attr = 2} # 3GPP-Charging-Id
    { , attr = 1 }
]
ParameterisedRCAFields parameters

The parameters available in this section are:

sendAccessRejectMessages

**Syntax:**

```
sendAccessRejectMessages = <bool>
```

**Description:**

Determines if RCA can send Access-Rejects messages to Cisco.

**Type:**

Boolean

**Optionality:**

Optional (default used if not set).

**Allowed:**

- true - Access-Rejects can be sent
- false - Access-Rejects cannot be sent

**Default:**

**Notes:**

If false, Disconnect-Request messages are used instead.

**Example:**

```
sendAccessRejectMessages = false
```
sendAccountingResponses
Syntax: sendAccountingResponses = <bool>
Description: Determines if Accounting-Response messages are sent in response to Accounting-Request.
Type: Boolean
Optionality: Optional (default used if not set).
Allowed: 
- true
- false
Default:
Notes:
Example: sendAccountingResponses = false

expectResponsesFromDisconnectRequest
Syntax: expectResponsesFromDisconnectRequest = <bool>
Description: Determines if RCA expects the Cisco client to send Disconnect-ACK and Disconnect-NAK messages.
Type: Boolean
Optionality: Optional (default used if not set).
Allowed: 
- true
- false
Default:
Notes:
Example: expectResponsesFromDisconnectRequest = true

useQuotainAccessAccept
Syntax: useQuotainAccessAccept = <bool>
Description: Determines if RCA indicates the total usage quota for a user, when sending an Access-Accept.
Type: Boolean
Optionality: Optional (default used if not set).
Allowed: 
- true
- false
Default:
Notes:
Example: useQuotainAccessAccept = false

useThresholdinAccessAccept
Syntax: useThresholdinAccessAccept = <bool>
Description: When RCA sends an Access-Accept message, this parameter determines if a quota threshold is added to show how much the user is allowed to use before sending another Access-Request.
Type: Boolean
Optionality: Optional (default used if not set).
Allowed: 
- true
- false
Default:
Notes:
Example:  

useThresholdinAccessAccept = false

QuotaAttributeinAccessAccept
Syntax:
QuotaAttributeinAccessAccept = {
   vendorID = <int>, attr = <int>, type = "str"
}
Description: Indicates the attribute in the Access-Accept messages which stores the usage quota.
Type: Structure
Optionality: Optional (default used if not set).
Allowed:
Default:
Notes: When the optional type parameter is set for QuotaAttributeinAccessAccept, then these AVPs are interpreted according to the extended types rules.
Example: QuotaAttributeinAccessAccept = { vendorID = 12345, attr = 10, type = "QVdigits" }

ThresholdAttributeinAccessAccept
Syntax:
ThresholdAttributeinAccessAccept = {
   vendorID = <int>, attr = <int>, type = "<str>"
}
Description: Indicates the attribute in the Access-Accept messages which stores the quota threshold.
Type: Structure
Optionality: Optional (default used if not set).
Allowed:
Default:
Notes: When the optional type parameter is set for ThresholdAttributeinAccessAccept, then these AVPs are interpreted according to the extended types rules.
Example: ThresholdAttributeinAccessAccept = { vendorID = 12345, attr = 10, type = "QVdigits" }

sendZeroQuotaAccessAcceptOnFundsExpiry
Syntax: sendZeroQuotaAccessAcceptOnFundsExpiry = <true|false>
Description: Sets whether to allow termination on fund expiry by sending an Access-Accept and then waiting for an Accounting Request.
Type: Boolean
Optionality: Optional (default used if not set).
Allowed: 
\begin{itemize}
   \item true - allow termination on fund expiry by sending an Access-Accept
   \item false - do not allow termination on fund expiry
\end{itemize}
Default: false
Notes:
Example: sendZeroQuotaAccessAcceptOnFundsExpiry = false
noFundsDisconnectMethod
Syntax: noFundsDisconnectMethod = <str>
Description: The method (message) used to terminate connections if no funds are available.
Type: String
Optionality: Optional (default used if not set).
Allowed: DisconnectRequest
          AccountingResponseSTOP
          AccessReject
Default: 
Notes: 
Example: noFundsDisconnectMethod = "DisconnectRequest"

messageAfterFinalAccessRequest
Syntax: messageAfterFinalAccessRequest = <str>
Description: Indicates which message to send when receiving Access-Request for an inactive session.
Type: String
Optionality: Optional (default used if not set).
Allowed: emptyAccessAccept
          disconnectRequest
          noMessage
Default: 
Notes: 
Example: messageAfterFinalAccessRequest = "emptyAccessAccept"

UseUnitsfromAccessRequest
Syntax: UseUnitsfromAccessRequest = <bool>
Description: Determines if the units used by the session are derived from subsequent Access-Request messages or Accounting-Request messages.
Type: Boolean
Optionality: Optional (default used if not set).
Allowed: 
          • true - use Access-Request messages
          • false - use Accounting-Request messages
Default: 
Notes: 
Example: UseUnitsfromAccessRequest = false

UseFinalUnitsFromAccountingRequest
Syntax: UseFinalUnitsFromAccountingRequest = <true|false>
Description: Set to override UseUnitsfromAccessRequest.
Type: Boolean
Optionality: Optional (default used if not set).
Allowed: 
          • true - get all except final units from access request, get final units from accounting request.
          • false - do not override UseUnitsfromAccessRequest.
Default: false
Notes:
Example: UseFinalUnitsFromAccountingRequest = true

CumulativeConversionRules
Syntax: CumulativeConversionRules = <bool>
Description: If this is true then the result of AccountingRequestConversionRules is added on to the amount already used.
If it is false the result is taken as the total amount used for the session.
Type: Boolean
Optionality: Optional (default used if not set).
Allowed: • true - add result to the amount
• false - use result as total amount for session
Default: false
Notes:
Example: CumulativeConversionRules = true

AccountingRequestConversionRules
Syntax: AccountingRequestConversionRules = [
    {ruleName = <str>,
     attributeList = [
         { attributeTag = <int>, multiplier = <int> }
     ]
    }
]
Description: The given attributes are multiplied by the multipliers and then summed to give a deciseconds equivalent.
Type: Array
Optionality: Optional (default used if not set).
Allowed:
Default:
Notes:
Example: AccountingRequestConversionRules = [
    {ruleName = "rule1",
     attributeList = [
         { attributeTag = 6690042, multiplier = 0.00001
         }]
    }
    {ruleName = "rule2",
     attributeList = [
         { attributeTag = 6690046, multiplier = 10
         }]
    }
]
conversionFactor
Syntax: conversionFactor = <int>
Description: The multiplication factor that is applied to the Apply charging decisecond.
Type: Integer
Optionality: Optional (default used if not set).
Allowed: Default:
Notes: Example: conversionFactor = 100000.0

clientThresholdQuotaGap
Syntax: clientThresholdQuotaGap = <int>
Description: The difference between the quota and the threshold specified in the Access-Accept, i.e.
threshold = quota - clientThresholdQuotaGap
Type: Integer
Optionality: Optional (default used if not set).
Allowed: Default:
Notes: For parameterised clients, the units of clientThresholdQuotaGap are decisecond equivalents.
Example: clientThresholdQuotaGap = 100

SessionInactiveRules
Syntax: SessionInactiveRules = 
{AttributeValuePairs = 
  {attr = <int>, attrType = <str>, value = <int> } 
  { attr = <int>, attrType = <str>, value = <int> } 
  { vendorID = <int>, attr = <int>, attrType = <str>, value = <int> } 
}
Description: If the Access-request matches any of the specified rules, then the session is not active.
Type: Array
Optionality: Optional (default used if not set).
Allowed: Default:
Notes: Example: SessionInactiveRules = 
{AttributeValuePairs = 
  {attr = 81, attrType = "string", value = "2" } 
  { attr = 82, attrType = "integer", value = 4 } 
  { vendorID = 10415, attr = 21, attrType = "integer", value = 4 } 
}
ServiceKeyRules

**Syntax:**
```
ServiceKeyRules = [
  {AttributeValuePairs = [
    attr = <int>, attrType = <str>, value = <int> }
  { attr = <int>, attrType = <str>, value = <int> }
  { vendorID = <int>, attr = <int>, attrType = <str>, value = <int> }
]
```
```
sleeServiceKey=<int>
inapServiceKey=<int>
```

**Description:**
The rules for setting the Service Keys, if different from the defaults defined in the global RCA section.

**Type:** Array

**Optionality:** Optional.

**Example:**
```
ServiceKeyRules = [
  {AttributeValuePairs = [
    attr = 61, attrType = "string", value = "2" }
    { attr = 62, attrType = "integer", value = 4 }
    { vendorID = 10415, attr = 21, attrType = "integer", value = 4 }

  sleeServiceKey=231
  inapServiceKey=231
]
```

SessionInactiveRules

**Syntax:**
```
ReleaseCall = [
  { code = <int>, vendorID = <int>, attr = <int>,
    tagType = <str>, value = <tagType> }
]
```

**Description:**
Maps release call causes into specific attributes, before being put into outgoing messages such as outgoing Disconnect-Request or Access-Reject messages.

**Type:** Array

**Optionality:** Optional.

**Allowed:** None

**Default:** None

**Notes:**

**Example:**
```
ReleaseCall = [
  { code = 41, vendorID = 9, attr = 1, "gprs:teardown-ind=no" }
  { code = 31, vendorID = 9, attr = 1, "gprs:teardown-ind=yes" }
]
```
CorrelationAttributes

Syntax:

```
CorrelationAttributes = {
    AccountingRequest = [{
        vendorID = <int>, attr = <int>
    }, attr = <int>]
    AccessRequest = [{
        vendorID = <int>, attr = <int>
    }, attr = <int>]
}
```

Description: Attributes specified here are used to correlate incoming Access-Request or Accounting-Request messages with existing sessions.

Type: Array

Optionality: Optional (default used if not set).

Allowed: None

Default: None

Notes: None

Example:

```
CorrelationAttributes = {
    AccountingRequest = [{
        vendorID = 10415, attr = 2,
        attrType = "string",
        stripPrefix = "parent-session-id=",
        stripSuffix = ""
    }],
    AccessRequest = [{
        vendorID = 10415, attr = 2,
        attrType = "string",
        stripPrefix = "",
        stripSuffix = ""
    }]
}
```

systemErrorAttribute

Syntax:

```
systemErrorAttribute = {
    attr = <int>
    attrType = <str>
    value = <str>
}
```

Description: The attribute to be added to the following when the session is terminated due to a system error, i.e., the error is not caused by the radius client:

- Disconnect-Request
- Access-Reject
- Accounting-Request (STOP)

Type: Array

Optionality: Optional (default used if not set).

Allowed: None

Default: None

Notes: None

Example:

```
systemErrorAttribute = {
    attr = 1
    attrType = "string"
    value = "System Error"
}```
invalidMessageSequenceAttribute

Syntax:

```
invalidMessageSequenceAttribute = {
    attr = <int>
    attrType = <str>
    value = <str>
}
```

Description: The attribute to be added to the following when the session is terminated due to an invalid Radius message sequence, i.e, the error is caused by the radius client:

- Disconnect-Request
- Access-Reject or
- Accounting-Request (STOP)

Type: Array
Optionality: Optional (default used if not set).
Allowed: 
Default: 
Notes: 
Example: 

```
invalidMessageSequenceAttribute = {
    attr = 0
    attrType = "string"
    value = "Invalid Message Sequence"
}
```

insufficientFundsAttribute

Syntax:

```
isufficientFundsAttribute = {
    attr = <int>
    attrType = <str>
    value = <str>
}
```

Description: The attribute to be added to the following when the session is terminated due to insufficient funds:

- Disconnect-Request
- Access-Reject or
- Accounting-Request (STOP)

Type: Array
Optionality: Optional (default used if not set).
Allowed: 
Default: 
Notes: 
Example: 

```
isufficientFundsAttribute = {
    attr = 0
    attrType = "string"
    value = "Insufficient Funds"
}
```
Chapter 3

1. Disconnect-Request
2. Access-Reject or
3. Accounting-Request (STOP)

Type: Array
Optionality: Optional (default used if not set).
Allowed: 
Default: 
Notes: 
Example:

```
timeoutAttribute = {
    attr = 0
    attrType="string"
    value = "Session Timed Out"
}
```

**replyMessagestoAttribute**

**Syntax:** `replyMessagestoAttribute = <int>`
**Description:** The Attribute number to send reply messages in.
**Type:** Integer
**Optionality:** Optional (default used if not set).
**Allowed:** 
**Default:** 
**Notes:** A value of 0 ensures the Reply Messages is not sent at all.
**Example:** `replyMessagestoAttribute = 0`

**sessionTimeout**

**Syntax:** `sessionTimeout = <seconds>`
**Description:** The number of seconds to wait for a subsequent Access-Accept message before terminating the session.
**Type:** Integer
**Optionality:** Optional (default used if not set).
**Allowed:** 
**Default:** 
**Notes:** 
**Example:** `sessionTimeout = 3600`

**idleTimeout**

**Syntax:** `idleTimeout = <seconds>`
**Description:** The number of seconds to maintain state of inactivity before terminating the session.
**Type:** Integer
**Optionality:** Optional (default used if not set).
**Allowed:** 
**Default:** 
**Notes:** 
**Example:** `idleTimeout = 600`
eventTimestampInAccessAccept

Syntax: eventTimestampInAccessAccept = <bool>

Description: Determines whether to add the event timestamp core radius field in the Access-Accept message.

Type: Boolean

Optionality: Optional (default used if not set).

Allowed: • true
        • false

Default: None

Notes: None

Example: eventTimestampInAccessAccept = false

QualifyingAttributeRules

Introduction

This section specifies the rules which must be matched before this client configuration will be selected for a given Radius message.

Each rule set is a list of AVPs, all of which must be matched to the contents of the incoming message. If any rule set matches then the message can be processed by this client type, otherwise the RCA will look for another client associated with the same IP address.

QualifyingAttributeRules is a part of the ParameterisedRCAFields section.

Example

Here is an example of the QualifyingAttributeRules configuration section.

```
QualifyingAttributeRules = [
  { AttributeValuePairs = [
    { attr = 81, attrType = "string", value = "abc" } 
    {vendorID = 10415, attr = 21, attrType = "integer", value = 4 } 
  ] 
  { AttributeValuePairs = [
    { attr = 181, attrType = "string", value = "2" } 
    { attr = 182, attrType = "integer", value = 4 } 
    { vendorID = 10415, attr = 121, attrType = "integer", anyValue = true} 
  ] 
}
]
```

QualifyingAttributeRules parameters

The parameters available in this section are:
AttributeValuePairs

Syntax: 

```
AttributeValuePairs = [
    { attr = <int> , attrType = "<type>" , value = "<str>|<int>" |
    { vendorID = <int> , attr = <int> , attrType = "<type>" ,
      anyValue = <true|false> }
]
```

Description: Defines an attribute rule for matching AVPs. An AVP will match if its value in the incoming message agrees with the value configured here. If the rule includes the parameter anyValue=true then any value will be accepted.

Type: Array

Optionality: Required.

Allowed: 

Default: 

Notes: attr, attrType and vendorID parameters are defined in IncomingMapping section (on page 50).

Example: 

```
AttributeValuePairs = [
    { attr = 181 , attrType = "string" , value = "2" |
    { vendorID = 10415 , attr = 121 , attrType = "integer" , anyValue = true } |
]
```

value

Syntax: 

```
value = <attrType>
```

Description: The value to match against the AVP value.

Type: Dependent on the value of attrType.

Optionality: Optional.

Allowed: 

Default: 

Notes: 

Example: value = "abc"
value = 4

anyValue

Syntax: 

```
anyValue = <true|false>
```

Description: When set to true, any value for the AVP will be matched.

Type: Boolean

Optionality: Optional.

Allowed: 

Default: 

Notes: 

Example: anyValue = true
ExtendedAttributeTypes section

Introduction

This section defines extended AVP types which can be referred to in IncomingMapping and OutgoingMapping through the attrType parameter.

ExtendedAttributeTypes is a part of the ParameterisedRCAFields section.

Example usage

ExtendedAttributeTypes configuration allows you to configure an IncomingMapping.Attributes item where, for example, attrType = "QVdigits". The RCA will handle this configuration by transforming the incoming string to a 32-bit integer. It will ignore the "QV" and pick out the digits that follow it. The decodeAttributesFromRadiusMessage code will detect where the type is extended (i.e. where the type is not one of the defined types) and hand off to a helper function to do the processing and return the TypeAndValue object. For example:

```json
ExtendedAttributeTypes = [
  {
    type = "QVdigits"
    pattern = "QV*"
    selectNth = 1
    firstFactor = "0"
    secondFactor = "1"
  }
]
```

You can also use ExtendedAttributesType configuration to define patterns with more than one group of fixed digits, and instruct the code which group to extract. For example:

```json
ExtendedAttributeTypes = [
  {
    type = "QUDdigits"
    pattern = "QU;*; D;*;*"
    selectNth = 2
    firstFactor = "0"
    secondFactor = "1"
  }
]
```

This configuration will process the input value: QU;512000;256000; D;512000;25600 as follows and pick out the last number:

- extract the second group of numbers
- zeroise the first number by multiplying it by the firstFactor value (0), and
- extract the second number.

Note: Numbers are always multiplied by the applicable factor and then added together.
ExtendedAttributeTypes parameters

The parameters available in this section are:

- **type**
  
  **Syntax:** `type = "<str>"`
  
  **Description:** Defines the name of the extended AVP type.
  
  **Type:** String
  
  **Optionality:** Optional.
  
  **Allowed:** None.
  
  **Default:** None.
  
  **Notes:**
  
  **Example:** `type = "QVdigits"

- **pattern**
  
  **Syntax:** `pattern = "<str>"`
  
  **Description:** Defines the pattern to use to help extract the extended AVP type.
  
  **Type:** String
  
  **Optionality:** Optional.
  
  **Allowed:** None.
  
  **Default:** None.
  
  **Notes:**
  
  **Example:** `pattern = "QV;*;*"

- **selectNth**
  
  **Syntax:** `selectNth = <int>`
  
  **Description:** Where fields repeat, defines which fields to use.
  
  **Type:** Integer
  
  **Optionality:** Optional.
  
  **Allowed:** None.
  
  **Default:** None.
  
  **Notes:**
  
  **Example:** `selectNth = 1"
Chapter 3

**firstFactor**

**Syntax:**

```text
firstFactor = "1"
```

**Description:**

Where there are two numbers this is the multiplication factor to apply to the first number.

**Type:** String

**Optionality:** Optional.

**Allowed:** A numeric value.

**Default:**

**Notes:**

**Example:**

```text
firstFactor = "1"
```

**secondFactor**

**Syntax:**

```text
secondFactor = "<str>"
```

**Description:**

Where there are two numbers this is the multiplication factor to apply to the second number.

**Type:** String

**Optionality:** Optional.

**Allowed:** A numeric value.

**Default:**

**Notes:**

**Example:**

```text
secondFactor = "4378"
```

---

**IncomingMapping section**

**Introduction**

This section specifies how the attributes are copied from each Radius message received into the attribute map for each session in RCA.

IncomingMapping is a part of the ParameterisedRCAFields section.

**Notes:**

- All attributes used by RCA, whether to send them to ACS, or put them in an outgoing Radius message must be specified in this section.
- Although arbitrary tags may be specified for this section, it is strongly suggested that the convention followed in the eserv.config be used as it matches the pre-provisioned tags in the ACS_PROFILE_DETAILS table. For more information on ACS_PROFILE_DETAILS table, see ACS Technical Guide.

**Parameters**

The parameters available in this section are:

**Attributes**

**Syntax:**

```text
Attributes = [
  { attr = 1, attrName = "User-Name",          
    attrType = "string", storeToTag = 6690001 }
]
```

**Description:**

Contains the list of attributes obtained from the special extension incoming on the InitialDP.
Type: Array
Optionality: Optional (default used if not set).

Attributes = [
    { attr = 1, attrName = "User-Name", attrType = "string", storeToTag = 6690001 }
]

attr
Syntax: attr = <int>
Description: Attribute number.
Type: Integer
Optionality: Optional (default used if not set).

attrName
Syntax: attrName = <str>
Description: Name or description of the attribute supported by radius.
Type: String
Optionality: Optional (default used if not set).

attrType
Syntax: attrType = <str>
Description: The datatype of the attribute.
Type: String
Optionality: Optional (default used if not set).
Allowed:
- string means string, UTF-8 encoded
- octets means an octet string
- integer means integers, enums or “framed”
- “IPv4” means 00.00.00.00 thru FF.FF.FF.FF encoded in 4 octets

Example: attrType = "integer"
storeToTag
Syntax: \texttt{storeToTag = \textless tag\textgreater}
Description: Decimal value of the RCA tag to which the attribute is stored.
Type: Numeric string
Optionality: Optional (default used if not set).
Allowed: 
Default: 
Notes: 
Example: \texttt{storeToTag = 6690003}

vendorID
Syntax: \texttt{vendorID = \textless int\textgreater}
Description: The ID assigned to vendor specific tags as per industrial standards.
Type: Numeric string
Optionality: Optional (default used if not set).
Allowed: Any valid vendor ID, for example:
- Cisco - 9
- 3GPP - 10415
- Microsoft - 311
Default: 
Notes: 
Example: \texttt{vendorID = 10415}

**ValueEditingRules section**

**Introduction**
This section defines rules for editing incoming values before they are placed in the map. Checks can be made on both prefix and suffix values within the same rule.

ValueEditingRules is a part of the ParameterisedRCAFields section.

**Example**

\[
\text{ValueEditingRules} = \begin{array}{|c|}
\hline
\text{attrName} = \"User-Name\" \\
\text{ifStartsWith} = \"ADMIN\" \\
\text{removeFront} = 5 \\
\text{ifEndsWith} = \".com\" \\
\text{removeBack} = 4 \\
\hline
\end{array}
\]

**ValueEditingRules parameters**
The parameters available in this section are:
**attrName**

- **Syntax:** attrName = "<str>
- **Description:** The name of the attribute to apply the rule to.
- **Type:** String
- **Optionality:** Optional.
- **Allowed:**
- **Default:** None
- **Notes:**
- **Example:** attrName = "User-Name"

**ifStartsWith**

- **Syntax:** ifStartsWith = "<str>
- **Description:** Defines the prefix to look for. If defined, then the removeFront parameter must also be defined.
- **Type:** String
- **Optionality:** Optional.
- **Allowed:**
- **Default:** None
- **Notes:**
- **Example:** ifStartsWith = "ADMIN"

**removeFront**

- **Syntax:** removeFront = <int
- **Description:** Defines the number of prefix characters to remove. May only be used in conjunction with the ifStartsWith parameter.
- **Type:** Integer
- **Optionality:** Optional.
- **Allowed:**
- **Default:** None
- **Notes:**
- **Example:** removeFront = 5

**ifEndsWith**

- **Syntax:** ifEndsWith = "<str>
- **Description:** The suffix to look for. If specified, then the removeBack parameter must also be specified.
- **Type:** String
- **Optionality:** Optional.
- **Allowed:**
- **Default:** None.
- **Notes:**
- **Example:** ifEndsWith = ".com"
removeBack
Syntax: \texttt{removeBack = <int>}
Description: The number suffix characters to remove. Must be used in conjunction with the
ifEndsWith parameter.
Type: Integer
Optionality: Optional.
Example: \texttt{removeBack = 4}

DecryptTags

Introduction
DecryptTags takes an attribute item such as a password, from the incoming mapping and uses it to
create a new decrypted attribute item.
DecryptTags is a part of the ParameterisedRCAFields section.

Example
DecryptTags = [
  { fromTag = 6690002, decryptToTag = 6760099 }
]

DecryptTags parameters

The parameters available in this section are:
fromTag
Syntax: \texttt{fromTag = <int>}
Description: Defines the tag where the attribute item to be decrypted is stored.
Type: Integer
Optionality: Optional.
Allowed: None.
Default: None.
Notes: 
Example: \texttt{fromTag = 6690002}

decryptToTag
Syntax: \texttt{decryptToTag = <int>}
Description: Defines the tag where the new decrypted attribute item will be stored.
Type: Integer
Optionality: Optional.
Example: \[\text{decryptToTag} = 6760099\]

### HardcodedValues

#### Description

This section specifies the hard-coded values which are always put into the attribute map, at the start of each session. This is a part of the ParameterisedRCAFields section.

Hard coded values are specified for the following parameters:

#### Example

Here is an example of the HardcodedValues configuration section.

```plaintext
HardcodedValues = [
    \{\text{tag}=6820005, \text{tagType}="string", \text{value} = "gprs:teardown-ind=yes" \},
    \{\text{tag}=6820006, \text{tagType}="string", \text{value} = "PrimaryDNSserver" \},
    \{\text{tag}=327689, \text{tagType}="string", \text{value} = "1111" \},
    \{\text{tag}=327690, \text{tagType}="string", \text{value} = "027774444" \},
    \{\text{tag}=327691, \text{tagType}="string", \text{value} = "2008" \},
    \{\text{tag}=327713, \text{tagType}="string", \text{value} = "49393404" \},
    \{\text{tag}=327801, \text{tagType}="string", \text{value} = "88888" \},
    \{\text{tag}=327703, \text{tagType}="string", \text{value} = "777777" \},
    \{\text{tag}=327868, \text{tagType}="string", \text{value} = "666666" \}
]
```

#### Parameters

The parameters available in this section are:

- **tag**
  - **Syntax:** \(\text{tag} = \langle \text{tag} \rangle\)
  - **Description:** Decimal value of the RCA tag in the attribute map to which the hard-coded value is stored.
  - **Type:** Numeric string
  - **Optionality:** Optional (default used if not set).
  - **Default:**
  - **Notes:**
  - **Example:** \(\text{tag} = 6780007\)

- **tagtype**
  - **Syntax:** \(\text{tagtype} = \langle \text{str} \rangle\)
  - **Description:** The datatype of the RCA tag in the attribute map.
  - **Type:** String
  - **Optionality:** Optional (default used if not set).
Allowed:

- string means string, UTF-8 encoded
- octets means an octet string
- integer means integers, enums or “framed”
- "IPv4" means 00.00.00.00 thru FF.FF.FF.FF encoded in 4 octets

Default:

Notes:

Example: \( \text{tagtype} = \text{"IPv4"} \)

value

Syntax: \( \text{value} = \text{<str>} \)

Description: The hard-coded value stored in the attribute map.

Type: String

Optionality: Optional (default used if not set).

Example: \( \text{value} = \text{"1111"} \)

InitialDPMapping

Introduction

The InitialDPMapping section specifies how values are obtained from the attribute map to the InitialDP which RCA sends to ACS. This is a part of the ParameterisedRCAFields section.

Here is an example of the InitialDPMapping configuration section:

```yaml
ParameterisedRCAFields = {
  InitialDPMapping = {
    callingPartyNumber = {
      tag = 6690031
      NumberRules = [
        { prefix="0064", min=11, remove=4, prepend="", resultNoa=3 }
        { prefix="00", min=5, remove=2, prepend="", resultNoa=4 }
        { prefix="0", min=9, remove=1, resultNoa=3 }
        { prefix="", remove=0, resultNoa=3 }
      ]
    }
    calledPartyBCDNumber = {
      tag = 327689
      NumberRules = [
        { prefix="0064", min=11, remove=4, prepend="", resultNoa=3 }
        { prefix="00", min=5, remove=2, prepend="", resultNoa=4 }
        { prefix="0", min=9, remove=1, resultNoa=3 }
        { prefix="", remove=0, resultNoa=3 }
      ]
    }
    locationNumberTag = {
      tag = 0
      NumberRules = [
        { prefix="0064", min=11, remove=4, prepend="", resultNoa=3 }
        { prefix="00", min=5, remove=2, prepend="", resultNoa=4 }
        { prefix="0", min=9, remove=1, resultNoa=3 }
      ]
    }
  }
}
```
Parameters

The parameters available in this section are:

callingPartyNumber

Syntax: `callingPartyNumber = {` 
```
tag = <int> 
   NumberRules = []
```
}

Description: Maps the calling party number values from the attribute map to RCA tag.
- tag maps to the RCA specific ACS primary tag.
- NumberRules define denormalisation rules of the calling party number.

Type: Array
Optionality: Optional (default used if not set).
Allowed: 
Default: 
Notes: If NumberRules are not defined, the denormalisation rules defined globally in `NumberRules` (on page 28) are applicable.
Example: `callingPartyNumber = {` 
```
tag = 123456 
   NumberRules = [ 
      {fromNoa=4,remove=0, prepend="00" } 
      { fromNoa=3,remove=0, prepend="0064" } 
   ]
```
}

calledPartyBCDNumber

Syntax: `calledPartyBCDNumber = {` 
```
tag = <int> 
   NumberRules = []
```
}

Description: Maps the calledParty BCDNumber values from the attribute map to RCA tag.
- tag maps to the RCA specific ACS primary tag.
- NumberRules define denormalisation rules of the calledPartyBCDNumber.

Type: Array
Optionality: Optional (default used if not set).
Allowed: 
Default: 
Notes: If NumberRules are not defined, the denormalisation rules defined globally in `NumberRules` (on page 28) are applicable. For more information, see `CalledPartyBCDNumber` (on page 19).
Example: `calledPartyBCDNumber = {` 
```
tag = 103456 
   NumberRules = [ 
```
}
locationNumberTag

Syntax:

```
locationNumberTag  = {
    tag = <int>
    NumberRules = []
}
```

Description: Maps the locationNumberTag values from the attribute map to RCA tag.
- tag maps to the RCA specific ACS primary tag. A value of 0 (zero) means do not put a location number into the IDP.
- NumberRules define denormalisation rules of the locationNumberTag.

Type: Array
Optionality: Optional (default used if not set).
Allowed: 
Default: 
Notes: If NumberRules are not defined, the denormalisation rules defined globally in NumberRules (on page 28) are applicable.
A tag value of 0 (zero) means do not put a location number in the IDP.
Example:

```
locationNumberTag  = {
    tag = 123455
}
```

callReferenceNumberTag

Syntax:

```
callReferenceNumberTag  = <int>
```

Description: Maps the callReferenceNumberTag values from the attribute map to RCA tag.

Type: Numeric string
Optionality: Optional (default used if not set).
Allowed: 
Default: 
Notes: A value of 0 (zero) means do not put a call reference number in the IDP.
Example:

```
callReferenceNumberTag  = 789654
```

InitialDPExtensions

Syntax:

```
InitialDPExtensions = [<tag1>, <tag2>, <tag3>]
```

Description: Specifies the tags to copy from the attribute map into the extension 701 profile block in the IDP.
The extension type 701 is used to encode profile blocs in the InitialDP and Connects operations.

Type: Numeric String
Optionality: Optional (default used if not set).
Allowed: 
Default: 
Notes: 
Example: 

```
InitialDPExtensions = [6890003,6450006,6660006]
```
ConnectMapping

Introduction

ConnectMapping specifies the values to copy into the attribute map from the Connect message sent by ACS to RCA. This is a part of the ParameterisedRCAFields section.

Here is an example of the ConnectMapping section:

```plaintext
ParameterisedRCAFields = {
    ConnectMapping = {
        destinationRoutingAddress = {
            tag = 327689
            NumberRules = [
                { fromNoa=4, remove=0, prepend="00" },
                { fromNoa=3, remove=0, prepend="0064" }
            ]
        },
        originalCalledPartyID = {
            tag = 327713
            NumberRules = [
                { fromNoa=4, remove=0, prepend="00" },
                { fromNoa=3, remove=0, prepend="0064" }
            ]
        },
        callingPartysCategoryTag = 327801
        redirectingPartyId = {
            tag = 327703
            NumberRules = [
                { fromNoa=4, remove=0, prepend="00" },
                { fromNoa=3, remove=0, prepend="0064" }
            ]
        },
        genericNumbersAdditionalCallingPartyNumber = {
            tag = 327868
            NumberRules = [
                { fromNoa=4, remove=0, prepend="00" },
                { fromNoa=3, remove=0, prepend="0064" }
            ]
        }
    }
    ConnectExtensions = [
        { vendorID = 311, attr = 30, attrName = "PrimaryNBNSserver", attrType = "IPv4", profileBlockTag = 6950030 }
    ]
}
```

Parameters

The parameters available in this section are:
destinationRoutingAddress
Syntax:  
```destinationRoutingAddress = {
  tag = <int>
  NumberRules = []
}
```
Description: Maps the destinationRoutingAddress values from the INAP Connect message to the RCA tag in attribute map.
- `tag` specifies the RCA tag to use for mapping.
- `NumberRules` define normalisation rules of the destinationRoutingAddress.

Type: Array
Optionality: Optional (default used if not set).
Allowed: 
Default: 
Notes: If `NumberRules` are not defined, the denormalisation rules defined globally in `NumberRules` (on page 28) are applicable.
Example: 
```destinationRoutingAddress = {
  tag = 327689
  NumberRules = [
    {fromNoa=4,remove=0, prepend="00" }
    { fromNoa=3,remove=0, prepend="0064" }
  ]
}
```

originalCalledPartyID
Syntax:  
```originalCalledPartyID = {
  tag = <int>
  NumberRules = []
}
```
Description: Maps the originalCalledPartyID values from the INAP Connect message to the RCA tag in attribute map.
- `tag` specifies the RCA tag to use for mapping.
- `NumberRules` define normalisation rules of the destinationRoutingAddress.

Type: Array
Optionality: Optional (default used if not set).
Allowed: 
Default: 
Notes: If `NumberRules` are not defined, the denormalisation rules defined globally in `NumberRules` (on page 28) are applicable.
Example: 
```originalCalledPartyID = {
  tag = 355689
  NumberRules = [
    {fromNoa=4,remove=0, prepend="00" }
    { fromNoa=3,remove=0, prepend="0064" }
  ]
}
```
callingPartysCategoryTag

Syntax:

```plaintext
callingPartysCategoryTag = {
    tag = <int>
    NumberRules = []
}
```

Description: Maps the callingPartysCategoryTag values from the INAP Connect message to the RCA tag in attribute map.
- `tag` specifies the RCA tag to use for mapping.
- `NumberRules` define normalisation rules of the destinationRoutingAddress.

Type: Array
Optionality: Optional (default used if not set).
Allowed:
Default:
Notes: If `NumberRules` are not defined, the denormalisation rules defined globally in `NumberRules` (on page 28) are applicable.
Example:

```plaintext
callingPartysCategoryTag = {
    tag = 327889
    NumberRules = [
        {fromNoa=4, remove=0, prepend="00"},
        {fromNoa=3, remove=0, prepend="0064"}
    ]
}
```

redirectingPartyId

Syntax:

```plaintext
redirectingPartyId = {
    tag = <int>
    NumberRules = []
}
```

Description: Maps the value for the redirecting party id from the INAP Connect message to the RCA tag in attribute map.
- `tag` specifies the RCA tag to use for mapping.
- `NumberRules` define normalisation rules of the destinationRoutingAddress.

Type: Array
Optionality: Optional (default used if not set).
Allowed:
Default:
Notes: If `NumberRules` are not defined, the denormalisation rules defined globally in `NumberRules` (on page 28) are applicable.
Example:

```plaintext
redirectingPartyId = {
    tag = 327703
    NumberRules = [
        {fromNoa=4, remove=0, prepend="00"},
        {fromNoa=3, remove=0, prepend="0064"}
    ]
}
```
genericNumbersAdditionalCallingPartyNumber

Syntax:
```
genericNumbersAdditionalCallingPartyNumber = {  
tag = <int>  
  NumberRules = []  
}
```

Description: Maps the genericNumbersAdditionalCallingPartyNumber values from the INAP Connect message to the RCA tag in attribute map.
- `tag` specifies the RCA tag to use for mapping.
- `NumberRules` define normalisation rules of the destinationRoutingAddress.

Type: Array
Optionality: Optional (default used if not set).
Allowed: 
Default: 
Notes: If `NumberRules` are not defined, the denormalisation rules defined globally in `NumberRules` (on page 28) are applicable.
Example:
```
genericNumbersAdditionalCallingPartyNumber = {  
tag = 366689  
  NumberRules = [  
    {fromNoa=4,remove=0, prepend="00" }  
    { fromNoa=3,remove=0, prepend="0064" }  
  ]  
}
```

ConnectExtensions

Syntax:
```
ConnectExtensions = [  
  { vendorID = <int>, attr = <int>, attrName = <str>, attrType = <str>, profileBlockTag = <int> }  
]
```

Description: Specifies the values to copy from the extension 701 profile block in the Connect message (sent by ACS to RCA) into the attribute map. The extension type 701 is used to encode profile blocks in the InitialDP and Connects operations.

Type: Numeric String
Optionality: Optional (default used if not set).
Allowed: 
Default: 
Notes: 
Example:
```
ConnectExtensions = [  
  { vendorID = 007, attr = 30, attrName = "PrimaryNBNSserver", attrType = "IPv4", profileBlockTag = 6950030 }  
]
```

OutgoingMappingtoSwitch

Introduction

This section specifies which tags to copy from the attribute map into the attributes in the Radius messages sent by RCA. OutgoingMapping is a part of the ParameterisedRCAFields section.
Chapter 3

The section AccessAcceptMapping describes the attribute map for handling Access-Accept messages, while the configuration in DisconnectRequestMapping section is used for Disconnect-Request messages.

**Parameters**

The following parameters are common to the IncomingMapping section:

- `attr` (on page 51)
- `attrName` (on page 51)
- `attrType` (on page 51)
- `vendorID` (on page 52)

The rest of the parameters are described below:

**AccessAcceptMapping**

**Syntax:**

```
AccessAcceptMapping = [
    { attr = <int>, attrName = "<str>", attrType = "<type>", fromTag = <int> }
]
```

**Description:** Defines the attribute mapping for Access-Accept messages.

**Type:** Array

**Optionality:** Optional.

**Allowed:**

**Default:**

**Notes:**

**Example:**

```python
AccessAcceptMapping = [
    { attr = 6, attrName = "Service-Type", attrType = "integer", fromTag = 6690006 }
    { attr = 7, attrName = "Framed-Protocol", attrType = "integer", fromTag = 6690007 }
]
```

**DisconnectRequestMapping**

**Syntax:**

```
DisconnectRequestMapping = [
    { vendorID = <int>, attr = <int>, attrName = "<str>", attrType = "<type>", fromTag = <int> }
]
```

**Description:** Defines the attribute mapping for Access-Accept messages.

**Type:** Array

**Optionality:** Optional.

**Allowed:**

**Default:**

**Notes:**

**Example:**

```python
AccessAcceptMapping = [
    { vendorID = 10415, attr = 1, attrName = "3GPP-IMSI", attrType = "string", fromTag = 6760001 }
    { vendorID = 10415, attr = 10, attrName = "3GPP-NSAPI", attrType = "string", fromTag = 67600010 }
]
```

**fromTag**

**Syntax:**

```
fromTag = <tag>
```

**Description:** Decimal value of the RCA tag from which the attribute value is copied.
Tracing parameters

Introduction

The parameters in this section are used for tracing activities. They are all found within the `tracing = { }` statement.

Tracing parameters

The available parameters are:

- **callsPerMinute**
  
  **Syntax:** `callsPerMinute = value`
  
  **Description:** Maximum number of initiated calls per minute for which tracing will be activated.
  
  **Type:** Integer
  
  **Optionality:** Optional
  
  **Allowed:** Any integer
  
  **Default:** 2
  
  **Notes:**
  
  **Example:** `callsPerMinute = 2`

- **destAddress**
  
  **Syntax:** `destAddress = [addr1, addr2, addrn]`
  
  **Description:** List of destination addresses that are to be traced.
  
  **Type:** Numeric string
  
  **Optionality:** Optional
  
  **Allowed:**
  
  - Any valid addresses
  
  - ""
  
  **Default:** ""
  
  **Notes:**
  
  "" = trace all known destination addresses.
  
  **Example:**
  
  `destAddress = [ "" ]`

- **enabled**
  
  **Syntax:** `enabled = true|false`
  
  **Description:** Switches tracing on or off.
  
  **Type:** Boolean
  
  **Optionality:** Optional
  
  **Allowed:**
  
  - true
  
  **Example:**
  
  `enabled = `true` `false`
false

Default: false
Notes: If false, the rest of the parameters can be ignored.
Example: enabled = false

maxFileSizeKB
Syntax: maxFileSizeKB = value
Description: Maximum file size in KB for the trace file(s).
Type: Integer
Optionality: Optional
Allowed: Any integer
Default: 0
Notes: 0 = unlimited file size.
If maxFileSizeKB is > 0 and if maxNumFiles is > 0 then every outputFileCycle trace will check to see if the outputFile size is > maxFileSizeKB.
If so, the file is renamed to outputFile.N where N is from 1 to maxNumFiles.

Example: maxFileSizeKB = 0

maxNumFiles
Syntax: maxNumFile = value
Description: Maximum number of trace files to use
Type: Integer
Optionality: Optional
Allowed: Any integer
Default: 4
Notes: If maxFileSizeKB is > 0 and if maxNumFiles is > 0 then every outputFileCycle trace will check to see if the outputFile size is > maxFileSizeKB.
If so, the file is renamed to outputFile.N where N is from 1 to maxNumFiles.

Example: maxNumFiles = 4

origAddress
Syntax: origAddress = [addr1, addr2, addrn]
Description: List of originating addresses that are to be traced.
Type: Numeric string
Optionality: Optional
Allowed: Any valid addresses
Notes: "" = trace all known originating addresses.
Example: origAddress = ["" ""]
Chapter 3

outputFile
Syntax: outputFile = "path_and_filename"
Description: Primary trace output file
Type: String
Optionality: Mandatory
Allowed: Any existing file path and name
Default: no default
Notes: See also notes for maxNumFiles.
Example: outputFile = "/IN/service_packages/RCA/tmp/rcaTrace.log"

outputFileCycle
Syntax: outputFileCycle = value
Description: Close and re-open the trace file every N calls
Type: Integer
Optional: Optional
Allowed: Any integer
Default: 512
Notes: The maxFileSizeKB exceeded is checked for at this time also, and a new trace file started if required.
Example: outputFileCycle = 512

useTONNPI
Syntax: useTONNPI = true|false
Description: Indicates whether to include TON and NPI in the address for trace prefix matching or not
Type: Boolean
Optionality: Optional
Allowed:
  • true
  • false
Default: true
Notes:
Example: useTONNPI = true

Failure
If the radiusControlAgent fails, no RCA messages will be processed.

Log output
The radiusControlAgent process writes output to:
/IN/service_packages/RCA/tmp/rca.log
Notes:
As with other NCC software, the contents of this log depend on the value of the DEBUG environment variable. To find out the location of this file, check `/IN/service_packages/RCA/bin/rca.sh` and see where it redirects the output from radiusControlAgent.

If rca.sh calls radiusControlAgent with the `-d` option, RCA will log a dump of its config on startup or config re-read.

### Trace output

The radiusControlAgent process writes any trace output to:

`/IN/service_packages/RCA/tmp/rcaTrace.log`

**Notes:**

- This is specified in `eserv.config` `RADIUSControlAgent.tracing.outputFile`.
- If the `cmnTraceOutput` debug section is enabled (in the DEBUG environment variable) the trace output will also be present in the main RCA log file, which is more convenient as any alarms or debug output will appear along with the trace output.

### Statistics

**Introduction**

Statistics from the RCA are automatically collected from startup. There is no need or requirement for any configuration.

**Viewing statistics**

All the RCA statistics collected can be viewed through the SMS reporting mechanism. See *SMS User's Guide*.

**Statistics collected**

This table describes the statistics collected when the RCA is active.

<table>
<thead>
<tr>
<th>Statistic</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACCESS_ACCEPTS_SENT</td>
<td>All Access-Accept messages sent.</td>
</tr>
<tr>
<td>ACCESS_REJECTS_SENT</td>
<td>All Access-Reject messages sent.</td>
</tr>
<tr>
<td>ACCESS_REQUESTS_RECEIVED</td>
<td>All Access-Request messages received.</td>
</tr>
<tr>
<td>ACCOUNTING_REQUESTS_RECEIVED</td>
<td>All Accounting-Request messages received.</td>
</tr>
<tr>
<td>ACCOUNTING_RESPONSES_SENT</td>
<td>All Accounting-Response messages sent.</td>
</tr>
<tr>
<td>DISCONNECT_ACKS_RECEIVED</td>
<td>All Disconnect-Ack messages received.</td>
</tr>
<tr>
<td>DISCONNECT_NAKS_RECEIVED</td>
<td>All Disconnect-Nak messages received.</td>
</tr>
<tr>
<td>DISCONNECT_REQUESTS_SENT</td>
<td>All Disconnect-Request messages sent.</td>
</tr>
<tr>
<td>SESSIONS_ALLOWED</td>
<td>All sessions allowed by Prepaid Charging.</td>
</tr>
<tr>
<td>SESSIONS_DENIED</td>
<td>All sessions denied by Prepaid Charging.</td>
</tr>
</tbody>
</table>

**Note:** For example, when the subscriber does not have sufficient credit, or is not allowed to use the WiFi service.
<table>
<thead>
<tr>
<th>Statistic</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SESSIONS_DENIED_IN_ERR</td>
<td>All sessions denied due to errors of communication between RCA and Prepaid Charging.</td>
</tr>
</tbody>
</table>
| SESSIONS_DENIED_RADIUS_ERR      | All sessions denied due to errors in the initial RADIUS Access-Request message.  
Note: For example, if the Access-Request message is missing a parameter required by RCA.                                                                                               |
| SESSIONS_ENDED_DISCONNECTED     | All sessions ended due to the subscriber's funds running out.                                                                                                                                                                           |
| SESSIONS_ENDED_IN_ERR           | All sessions ended due to errors of communication between RCA and Prepaid Charging.  
Note: This count does not include RADIUS sessions denied due to errors of communication between RCA and Prepaid Charging – those are counted in SESSIONS_DENIED_IN_ERR. |
| SESSIONS_ENDED_RADIUS_ERR       | All sessions ended due to RADIUS protocol errors.                                                                                                                                                                                      |
| SESSIONS_ENDED_TIMEOUT          | All sessions ended due to timeouts enforced by RCA.                                                                                                                                                                                   |
| SESSIONS_ENDED_USER_HUNGUP      | All sessions ended due to the subscriber hanging up.                                                                                                                                                                                  |
| SESSIONS_INITIATED              | All sessions initiated by the Orbyte.  
Note: This is different to the number of RADIUS Access-Request messages received, as a single session may consist of many Access-Requests (one for the initial quota reservation, followed by on-line quota updates). |
| SESSIONS_TOTAL_DURATION         | Sum total duration of all RADIUS sessions ended due to the subscriber’s funds running out or the subscriber hanging up.  
Note: This is a session duration count of the “normal cases”. The average session duration can be calculated by dividing this statistic by the sum of statistics SESSIONS_ENDED_DISCONNECTED and SESSIONS_ENDED_USER_HUNGUP. |
Overview

Introduction

This chapter provides details of the installation and removal process for the application.

In this chapter

This chapter contains the following topics.

Installation and Removal Overview 69
RCA Table Replication 70
Checking the Installation 72

Installation and Removal Overview

Introduction

For information about the following requirements and tasks, see *NCC Installation Guide*:

- NCC system requirements
- Pre-installation tasks
- Installing and removing NCC packages

Radius Control Agent packages

An installation of Radius Control Agent includes the following packages, on the:

- SMS:
  - rcaSms
- SLC:
  - rcaScp

Removing RCA from the crontab

When removing rcaScp, follow these steps to remove the rca_get_read_count.sh entry from the crontab on the SLC.

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Log in as acs_oper.</td>
</tr>
<tr>
<td>2</td>
<td>At the command line prompt, type <code>crontab -e</code></td>
</tr>
<tr>
<td></td>
<td><strong>Note</strong>: To edit the crontab, use the vi editor.</td>
</tr>
<tr>
<td>3</td>
<td>Delete the entry for rca_get_read_count.sh</td>
</tr>
<tr>
<td>4</td>
<td>Save the file and restart the SLEE.</td>
</tr>
</tbody>
</table>
RCA Table Replication

Introduction
Tables and statistics must be replicated to the SLC to complete the installation of the rcaScp package.
The following RCA tables must be replicated to the SLC in the given order:

- RCA_IP_ADDRESS
- RCA_ADDRESS_LIST_ENTRY
- RCA_BILL_TYPE_PREFIX
- RCA_CLI_ADDR_LIST
- RCA_CONFIG_READ_SCHEDULER
- RCA_RELEASE_MESSAGE
- RCA_GLOBAL_CONFIG
- RCA_SVC_OPT_LIST-ENTRY

The following RCA statistics table must be replicated to the SLC:

- SMF_STDEF_RCA

Replicating the RCA tables
Follow these steps to replicate the RCA tables to the SLC.

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>From the main SMS screen, select the <strong>Operator Functions &gt; Node Management</strong> menu options.</td>
</tr>
<tr>
<td>2</td>
<td>Select the <strong>Table Replication</strong> tab. <strong>Result:</strong> You see the tab, showing the available and allocated replication groups.</td>
</tr>
<tr>
<td>3</td>
<td>Expand the RCA group in the <strong>Available Replication Groups</strong> list.</td>
</tr>
</tbody>
</table>
### Step 4
Click on the table to be replicated, and drag it to the appropriate SLC node under Service Control Points in the **Allocated Replication Groups** list.

**Note:** To check which nodes are SLC nodes, you can use Find and Search on the **Replication Nodes** tab.

### Step 5
Repeat step 4 for all the tables to be replicated.

### Step 6
Click **Save**.

### Step 7
Click **Create Config File**.

### Step 8
To ensure the data has been replicated, check the database on the SLC.

---

**Replicating the RCA statistics**

Follow these steps to replicate the RCA statistics to the SLC.

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>From the main SMS screen, select the <strong>Operator Functions &gt; Node Management</strong> menu options. Select the <strong>Table Replication</strong> tab. <strong>Result:</strong> You see the tab, showing the available and allocated replication groups.</td>
</tr>
<tr>
<td>3</td>
<td>Expand the SMS group in the <strong>Available Replication Groups</strong> list.</td>
</tr>
<tr>
<td>4</td>
<td>Expand the SMF_STATISTICS_DEFN table.</td>
</tr>
<tr>
<td>5</td>
<td>Click on the SMF_STDEF_RCA replication group, and drag it to the appropriate SLC node under Service Control Points in the <strong>Allocated Replication Groups</strong> list. <strong>Note:</strong> Which nodes are SLC nodes can be checked by using Find and Search on the <strong>Replication Nodes</strong> tab.</td>
</tr>
</tbody>
</table>

---
<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>Click <strong>Save</strong>.</td>
</tr>
<tr>
<td>7</td>
<td>Click <strong>Create Config File</strong>.</td>
</tr>
<tr>
<td>8</td>
<td>Check the database on the SLC to ensure the data has been replicated.</td>
</tr>
</tbody>
</table>

## Checking the Installation

### Introduction

Refer to these check lists to ensure the Radius Control Agent has been installed correctly.

### RCA database tables - SMS

The following tables should exist in the SMF database on the SMS:

- RCA_ADDRESS_LIST
- RCA_ADDRESS_LIST_ENTRY
- RCA_BILL_TYPE_PREFIX
- RCA_CLI_ADDR_LIST
- RCA_CONFIG_READ_SCHEDULER
- RCA_GLOBAL_CONFIG
- RCA_IP_ADDRESS
- RCA_RELEASE_MESSAGE
- RCA_SERVICE_OPTION
- RCA_SVC_OPTION_LIST
- RCA_SVC_OPT_LIST_ENTRY
- SMS_STDEF_RCA

### RCA database tables - SLC

The following tables should exist on the SCP database on the SLC.

- RCA_ADDRESS_LIST_ENTRY
- RCA_BILL_TYPE_PREFIX
- RCA_CLI_ADDR_LIST
- RCA_CONFIG_READ_SCHEDULER
- RCA_GLOBAL_CONFIG
- RCA_IP_ADDRESS
- RCA_RELEASE_MESSAGE
- RCA_SVC_OPT_LIST_ENTRY
- SMS_STDEF_RCA

### RCA directories and files

The RCA installation creates the following directories:

- `/IN/service_packages/RCA/bin`
- `/IN/service_packages/RCA/cdr`
The RCA installation installs the following binaries and interfaces:

- /IN/service_packages/RCA/core
- /IN/service_packages/RCA/db
- /IN/service_packages/RCA/etc
- /IN/service_packages/RCA/lib
- /IN/service_packages/RCA/tmp

The RCA installation installs the following example configuration file:

- /IN/services_packages/RCA/eserv.config

The RCA installation installs the following shared library:

- /IN/services_packages/RCA/lib/librcaalarm.so
NCC Glossary of Terms

AAA

ACS
Advanced Control Services configuration platform.

ANI
Automatic Number Identification - Term used in the USA by long-distance carriers for CLI.

ASN.1
Abstract Syntax Notation One - a formal notation used for describing data transmitted by telecommunications protocols. ASN.1 is a joint ISO/IEC and ITU-T standard.

AVP
Attribute Value Pair, used in Diameter to represent properties of a particular request or answer.

BCSM
Basic Call State Model - describes the basic processing steps that must be performed by a switch in order to establish and tear down a call.

BE
Billing Engine

CAMEL
Customized Applications for Mobile network Enhanced Logic
This is a 3GPP (Third Generation Partnership Project) initiative to extend traditional IN services found in fixed networks into mobile networks. The architecture is similar to that of traditional IN, in that the control functions and switching functions are remote. Unlike the fixed IN environment, in mobile networks the subscriber may roam into another PLMN (Public Land Mobile Network), consequently the controlling function must interact with a switching function in a foreign network. CAMEL specifies the agreed information flows that may be passed between these networks.

CCS
1) Charging Control Services (or Prepaid Charging) component.
2) Common Channel Signalling. A signalling system used in telephone networks that separates signalling information from user data.

CDMA
Code Division Multiple Access is a method for describing physical radio channels. Data intended for a specific channel is modulated with that channel's code. These are typically pseudo-random in nature, and possess favourable correlation properties to ensure physical channels are not confused with one another.
CG
Call Gap / Call Gapping

CLI
Calling Line Identification - the telephone number of the caller. Also referred to as ANI.

cron
Unix utility for scheduling tasks.

crontab
File used by cron.

Diameter
A feature rich AAA protocol. Utilises SCTP and TCP transports.

DP
Detection Point

DTMF
Dual Tone Multi-Frequency - system used by touch tone telephones where one high and one low frequency, or tone, is assigned to each touch tone button on the phone.

EDR
Event Detail Record

Note: Previously CDR. The industry standard for CDR is EDR (Event Detail Record). Over time EDR will replace CDR in the NCC documentation.

FDA
First Delivery Attempt - the delivery of a short message directly to the SME rather than relaying it through the MC.

GPRS
General Packet Radio Service - employed to connect mobile cellular users to PDN (Public Data Network- for example the Internet).

GSM
Global System for Mobile communication.

It is a second generation cellular telecommunication system. Unlike first generation systems, GSM is digital and thus introduced greater enhancements such as security, capacity, quality and the ability to support integrated services.
HLR
The Home Location Register is a database within the HPLMN (Home Public Land Mobile Network). It provides routing information for MT calls and SMS. It is also responsible for the maintenance of user subscription information. This is distributed to the relevant VLR, or SGSN (Serving GPRS Support Node) through the attach process and mobility management procedures such as Location Area and Routing Area updates.

HPLMN
Home PLMN

HTML
HyperText Markup Language, a small application of SGML used on the World Wide Web. It defines a very simple class of report-style documents, with section headings, paragraphs, lists, tables, and illustrations, with a few informational and presentational items, and some hypertext and multimedia.

IDP
INAP message: Initial DP (Initial Detection Point)

IMSI
International Mobile Subscriber Identifier. A unique identifier allocated to each mobile subscriber in a GSM and UMTS network. It consists of a MCC (Mobile Country Code), a MNC (Mobile Network Code) and a MSIN (Mobile Station Identification Number).

The IMSI is returned by the HLR query (SRI-SM) when doing FDA. This tells the MSC exactly who the subscriber is that the message is to be sent to.

IN
Intelligent Network

INAP
Intelligent Network Application Part - a protocol offering real time communication between IN elements.

Initial DP
Initial Detection Point - INAP Operation. This is the operation that is sent when the switch reaches a trigger detection point.

IP
1) Internet Protocol
2) Intelligent Peripheral - This is a node in an Intelligent Network containing a Specialized Resource Function (SRF).

IP address
Internet Protocol Address - network address of a card on a computer

ITU
International Telecommunication Union
MC
Message Centre. Also known as SMSC.

MCC
Mobile Country Code. In the location information context, this is padded to three digits with leading zeros. Refer to ITU E.212 ("Land Mobile Numbering Plan") documentation for a list of codes.

MNC
Mobile Network Code. The part of an international address following the mobile country code (MCC), or at the start of a national format address. This specifies the mobile network code, that is, the operator owning the address. In the location information context, this is padded to two digits with a leading zero. Refer to ITU E.212 ("Land Mobile Numbering Plan") documentation for a list of codes.

MS
Mobile Station

MSC
Mobile Switching Centre. Also known as a switch.

MSIN
Mobile Station Identification Number.

MT
Mobile Terminated

NOA
Nature Of Address - a classification to determine in what realm (Local, National or International) a given phone number resides, for the purposes of routing and billing.

NPI
Number Plan Indicator

Oracle
Oracle Corporation

PLMN
Public Land Mobile Network

RADIUS
Remote Authentication Dial-In User Service - a system of distributed security that secures remote access to networks and network services against unauthorised access.

SCP
Service Control Point. Also known as SLC.
**SCTP**
Stream Control Transmission Protocol. A transport-layer protocol analogous to the TCP or User Datagram Protocol (UDP). SCTP provides some similar services as TCP (reliable, in-sequence transport of messages with congestion control) but adds high availability.

**SGML**

**SGSN**
Serving GPRS Support Node

**SLC**
Service Logic Controller (formerly UAS).

**SLEE**
Service Logic Execution Environment

**SME**
Short Message Entity - an entity which may send or receive Short Messages. It may be located in a fixed network, a mobile, or an SMSC.

**SMS**
Depending on context, can be:
- Short Message Service
- Service Management System platform
- NCC Service Management System application

**SN**
Service Number

**SRF**
Specialized Resource Function - This is a node on an IN which can connect to both the SSP and the SLC and delivers additional special resources into the call, mostly related to voice data, for example play voice announcements or collect DTMF tones from the user. Can be present on an SSP or an Intelligent Peripheral (IP).

**SRI**
Send Routing Information - This process is used on a GSM network to interrogate the HLR for subscriber routing information.

**SSP**
Service Switching Point
TCP
Transmission Control Protocol. This is a reliable octet streaming protocol used by the majority of applications on the Internet. It provides a connection-oriented, full-duplex, point to point service between hosts.

URL
Uniform Resource Locator. A standard way of specifying the location of an object, typically a web page, on the Internet.

VLR
Visitor Location Register - contains all subscriber data required for call handling and mobility management for mobile subscribers currently located in the area controlled by the VLR.

VWS
Oracle Voucher and Wallet Server (formerly UBE).
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