

**Oracle® Communications  
Convergent Charging Controller**

Diameter Charging Driver Technical Guide

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# About This Document

## Scope

The scope of this document includes all the information required to install, configure and administer the Diameter Charging Driver application.

## Audience

This guide was written primarily for system administrators and persons installing, configuring and administering the Diameter Charging Driver 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 an essential pre-requisite 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.

A familiarity with the Diameter protocol is also required. Refer to the following:

- RFC 3588 - Diameter Base Protocol
- RFC 4006 - Diameter Credit-Control Application

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:

- *Oracle Communications Convergent Charging Controller Advanced Control Services Technical Guide*
- *Oracle Communications Convergent Charging Controller Charging Control Services Technical Guide*
- *Oracle Communications Convergent Charging Controller Charging Control Services User's Guide*
- *Oracle Communications Convergent Charging Controller Diameter Charging Driver Alarms Guide*
- *Oracle Communications Convergent Charging Controller Service Management System Technical Guide*
- *Oracle Communications Convergent Charging Controller Service Management System User's Guide*
- *Oracle Communications Convergent Charging Controller Service Logic Execution Environment Technical Guide*

# Document Conventions

## Typographical Conventions

The following terms and typographical conventions are used in the Oracle Communications Convergent Charging Controller documentation.

Formatting Convention	Type of Information
<b>Special Bold</b>	Items you must select, such as names of tabs. Names of database tables and fields.
<i>Italics</i>	Name of a document, chapter, topic or other publication. Emphasis within text.
<b>Button</b>	The name of a button to click or a key to press. <b>Example:</b> To close the window, either click <b>Close</b> , or press <b>Esc</b> .
<b>Key+Key</b>	Key combinations for which the user must press and hold down one key and then press another. <b>Example:</b> <b>Ctrl+P</b> or <b>Alt+F4</b> .
Monospace	Examples of code or standard output.
<b>Monospace Bold</b>	Text that you must enter.
<i>variable</i>	Used to indicate variables or text that should be replaced with an actual value.
<b>menu option &gt; menu option &gt;</b>	Used to indicate the cascading menu option to be selected. <b>Example:</b> <b>Operator Functions &gt; Report Functions</b>
<a href="#">hypertext link</a>	Used to indicate a hypertext link.

Specialized terms and acronyms are defined in the glossary at the end of this guide.

# System Overview

## 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 Convergent Charging Controller network or service implications of the product.

### In this Chapter

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This chapter contains the following topics.

What is the Diameter Charging Driver.....	1
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## What is the Diameter Charging Driver

### Overview

Diameter is a protocol that focuses on network access and accounting. The Diameter base protocol provides the minimum requirements needed for Authentication, Authorization and Accounting (AAA) (*RFC 3588*).

This base protocol can be extended via the addition of new commands or AVPs. *RFC 4006* specifies such an extension for applications that can be used to implement real-time credit-control.

The Diameter Charging Driver (DCD) product provides functionality that allows the Prepaid Charging product to interface with applications using the *RFC 3588* and *RFC 4006* protocol. Typically it is expected that Prepaid Charging will interface with a third-party convergent real-time charging system.

The DCD product contains several components:

- Diameter protocol stack. Implements the RFC 3588/4006 protocol
- Dynamically loadable library (DLL), diamActions.so. Implements the required Prepaid Charging functionality
- Diameter client. Implements the network interface to the Diameter

### Diameter Credit Control

The Prepaid Charging product uses the Universal-Attempt-Termination-with-Billing (UATB) node for credit-control of telephony (voice) calls. There are a number of other CCS nodes that also use Diameter credit control actions.

*RFC 4006* defines credit-control in the following way:

- Credit-control is a process of checking whether credit is available, credit-reservation, deduction of credit from the end user account when service is completed and refunding of reserved credit that is not used.

The Diameter terminology defines an "interrogation" as the request/answer transaction between the client and server.

*RFC 4006* defines session based credit-control as:

- A credit-control process that makes use of several interrogations:
  - the first - used to reserve money from the user's account and to initiate the process
  - a possible intermediate - may be needed to request new quota while the service is being rendered.
  - the final - used to exit the process.

The credit-control server is required to maintain session state for session-based credit-control.

Telephony requires session based credit-control. A new session is created when the CCS product detects that an end-user is trying to establish a new telephony call.

Other nodes may use the DCD to send event based (rather than session based) credit control messages for one-time events, for example, SMS (text message).

### Process

Prepaid Charging uses the *dcdBeClient* (Diameter Charging Driver) to send a first interrogation to the Diameter Server. The server rates the request, reserves a suitable amount of money from the user's account, and returns the corresponding amount of credit resources. Prepaid Charging connects the telephony call and monitors the usage of the granted resources.

Prepaid Charging may send an intermediate interrogation to request a new quota of resources when the granted resources have been consumed. When the telephony call ends, Prepaid Charging sends a final interrogation to inform the Diameter Server of the actual amount of resources used. At this point the session is terminated.

### Credit Control messages

*RFC 4006* defines two new commands used for credit-control encapsulated in the following messages:

- Credit-Control-Request (CCR). Used by the credit-control client to request credit authorization from the credit-control server.
- Credit-Control-Answer (CCA). Used by the credit-control server to acknowledge a CCR from the credit-control client.

### AVPs

A detailed list of AVPs for the CCR and CCA messages is given in *RFC 4006* and copied in the next section of this document. Note the *CC-Request-Type* - an enumeration with the following values:

- INITIAL\_REQUEST - First interrogation
- UPDATE\_REQUEST - Intermediate interrogation
- TERMINATION\_REQUEST - Final interrogation
- EVENT\_REQUEST - Event based (not session based)

**Note:** DCD can be configured to support certain vendor specific applications that add AVPs to the accounting commands of Diameter base protocol. For more information, refer to vendor specific AVPs under *DCD parameters* (on page 41).

### Attribute Value Pairs

In the Diameter protocol message, parameters are specified as Attribute-Value Pairs (AVPs).

An AVP consists of a Code, Flags, Length, optional Vendor-ID and Data fields. The AVP Code, combined with the Vendor-Id field, identifies the attribute uniquely. The type (format) of the Data field is implied by the Code/Vendor-Id field combination. The following Data formats are specified:



- OctetString
- Integer32
- Integer64
- Unsigned32
- Unsigned64
- Float32
- Float64
- Address
- Time
- UTF8String
- DiameterIdentity
- DiameterURI
- Enumerated
- Grouped

### **Additional EDR tags**

Resolved values for AVPs can be written to the ACS EDR under a configured tag. These tags are not intended to be used to amend existing, pre-defined ACS tags.

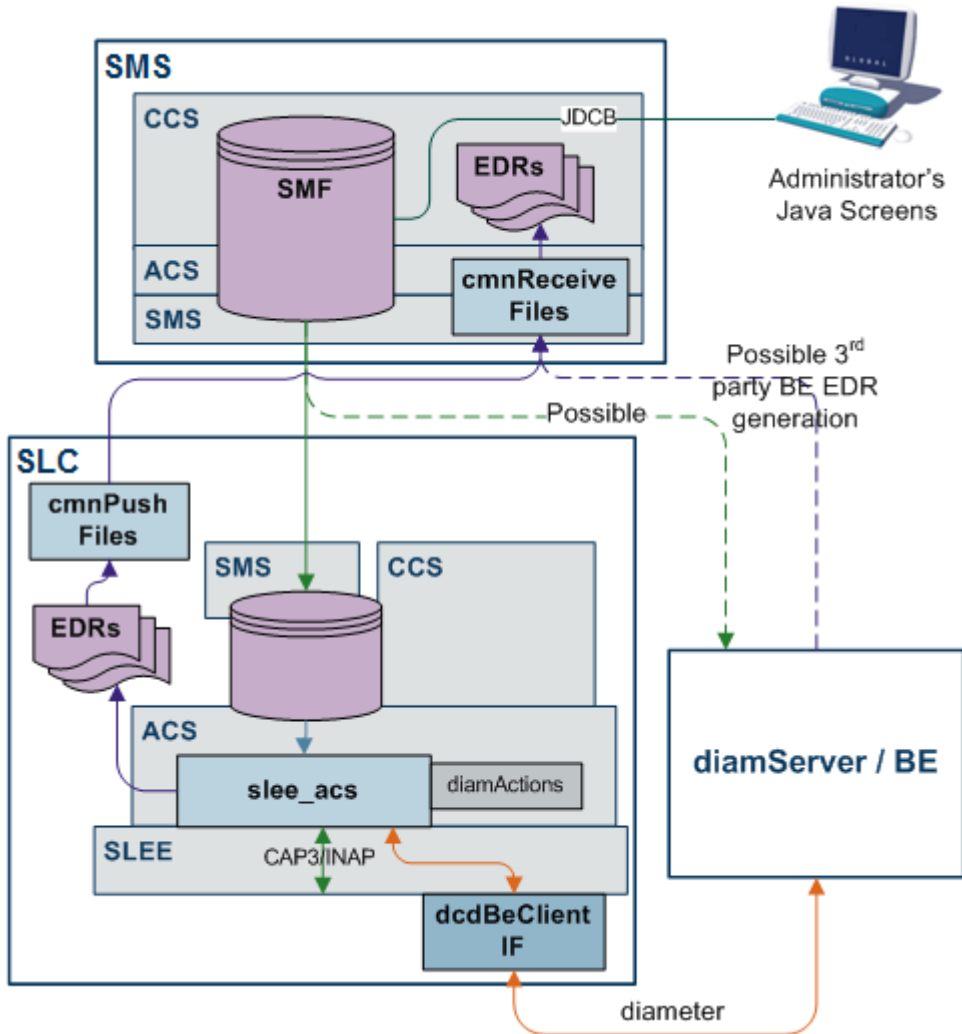
The feature is intended for situations where the customer wishes to add some new tag to the EDR.

Conditions can be attached to the writing of the EDR value:

- Replace it unconditionally, after removing any existing tags of same name.
- Append a new value instance unconditionally.
- Leave the EDR alone if the tag is present, append the new instance if the tag is not present.

## Diagram

Here is a high level diagram showing the Diameter Charging Driver.



## ccsConcepts

### List of ccsConcepts

Here is the list of all of the ccsConcepts that can be used in the AVPs section of the **eserv.config** file.

### Introduction

To match AVPs to variables in CCS, the DCD has "ccsConcepts". These can be a specific parameter of the CCS action, a general CCS variable, some of the call's context, or even an ACS profile value.

The DCD provides functionality to scale values by a factor, and also allows a mapping of one set of integers to another while reading/writing to CCS concepts. The specific formatting of the value field is quite configurable, see AVPs parameters for formatting details.

**Note:** The availability of each concept depends upon the action involved, and the previous actions of the control plan.

### ACS Action handler

Here are the CCS concepts from the ACS action handler.

Concept Label	Available	Comments
cascade	After a setCascade Override.	Also can be set by previous responses. The integer ID of the cascade to apply.
chargeInfoBalanceSystemValue	After a chargeInfo response	The balance Unit for the current item of the Charge structure. This is in units of the system currency.
chargeInfoBalanceType	After a chargeInfo response	The CCS ID of the balance Type for the current balance of the Charge structure.
chargeInfoBalanceUnitType	After a chargeInfo response	The CCS of the balance Unit for the current balance of the Charge structure. This is not necessary for a ChargeInfo in a response, it can be derived from the balance type.
chargeInfoBalanceUserValue	After a chargeInfo response	The balance Unit for the current item of the Charge structure. This is in units of the user's currency. Note that the system currency value is mandatory, while this entry is optional.
discountMaxCharge	After a setDiscount	Present after a setDiscount node or a response that has the discountMaxCharge present.
discountPeriod	After a setDiscount	Present after a setDiscount node or a response that has the discountPeriod present.
tariffCugName	After a setTariffPlan	The Closed User Group Name.
tariffPlan	After a setTariffPlan	Integer representing the tariff Plan.
terminationCause	After a call is terminated	The <b>esg</b> values in the configuration for the ACS <b>callEndReasons</b> that map to specific termination cause values. <ul style="list-style-type: none"> <li>• 0 = reasonNotSet</li> <li>• 1 = precallAnnouncementFailure</li> <li>• 2 = firstEventACRAbort</li> <li>• 3 = firstEventATABort</li> <li>• 4 = secondEventACRAbort</li> <li>• 5 = secondEventATABort</li> <li>• 6 = abortWaitingForBEResponse</li> <li>• 7 = releasedOnTCPEXpiry</li> <li>• 8 = releasedNoFunds</li> <li>• 9 = disconnectedLegBNoFunds</li> <li>• 10 = calledPartyBusy</li> <li>• 11 = routeSelectFailure</li> <li>• 12 = callingPartyAbandon</li> <li>• 13 = noAnswer</li> </ul>

Concept Label	Available	Comments
		<ul style="list-style-type: none"> <li>• 14 = callingPartyDisconnected</li> <li>• 15 = calledPartyDisconnected</li> </ul>
walletInfoActivationDate	After a walletInfo response	time_t of the wallet's activation date. The DCD handles conversion from time_t to DIAMETER times.
walletInfoBalanceExpiry	After a walletInfo response	The expiry date (in time_t) of the current balance. The DCD handles conversion from time_t to DIAMETER times.
walletInfoBalanceExponent	After a walletInfo response	An exponent to apply to the balance system value.
walletInfoBalanceLimitType	After a walletInfo response	The balances limit type: An integer representing one of: limitedPostpaid, postpaid, prepaid, singleUsePrepaid
walletInfoBalanceMaxCredit	After a walletInfo response	The maximum amount of credit allowed for this subscriber.
walletInfoBalanceSystemValue	After a walletInfo response	The balance Unit for the current item of the balance structure. This is in units of the system currency.
walletInfoBalanceType	After a walletInfo response	The CCS ID of the balance Type for the current balance of the Wallet structure.
walletInfoBalanceUnitType	After a walletInfo response	The CCS ID of the balance Unit for the current balance item of the Wallet structure. This is not necessary for a balance in a response, it can be derived from the balance type.
walletInfoBalanceUserValue	After a walletInfo response	The balance Unit for the current item of the Balance structure. This is in units of the user's currency. Note that the system currency value is mandatory, while this entry is optional.
walletInfoExpiry	After a walletInfo response	The expiry date (in time_t) of the wallet. The DCD handles conversion from time_t to DIAMETER times.
walletInfoLastAccess	After a walletInfo response	time_t of the wallet's last access. The DCD handles conversion from time_t to DIAMETER times.
walletInfoMaxConcurrent	After a walletInfo response	The maximum number of concurrent users allowed for this wallet.
walletInfoState	After a walletInfo response	A single character representing the wallet's state. One of: <ul style="list-style-type: none"> <li>• 'A' = Active</li> <li>• 'D' = Dormant</li> <li>• 'F' = Frozen</li> <li>• 'P' = Pre-Use</li> <li>• 'S' = Suspended</li> <li>• 'T' = Terminated.</li> </ul> Note that conversion to different representations is possible.
walletInfoSystemCurrency	After a walletInfo response	The system currency.

Concept Label	Available	Comments
walletInfoUserCurrency	After a walletInfo response	The CCS_ACCT.CURRENCY value for this wallet.

### ACS service context

Here are the CCS concepts from the ACS service context.

Concept Label	Available	Comments
acsCallID	always	The call ID from the SLEE
acsChargingDomain	always	The destined billing domain (logical collection of wallets) for this request.
acsProductType	always	The ACS product type ID
acsProfile	always	An ACS profile buffer from the Call plan. If the buffer is not set, then the AVP is not included.
acsServiceProvider	always	The ACS service provider ID
acsSubscriber	always	The CCS subscriber ID
acsSubscriberReference	always	The CCS subscriber number (ie their MSISDN)
acsTariffCode	After an initial reservation.	Tariff Code string returned in the Initial Reservation Response (if present).
acsUnnormalisedCalledNumber	always	The called party number digits from the IDP, without any attempt at normalization.
acsWallet	always	The CCS wallet ID (BE_WALLET.ID)
acsWalletReference	always	The CCS wallet Reference (the Billing System's reference to the wallet)
acsWalletType	always	The CCS wallet type. (CCS_WALLET_TYPE.ID)

### CCS time reservation

Here are the CCS concepts from CCS time reservation.

Concept Label	Available	Comments
callAnsweredTime	ConfirmTimeReservation	
callDurationDelta	Any Time Charging Action	
callDurationTotal	Any Time Charging Action	
callerTimeZone	After a DirectTimeCharge or InitialTimeReservation	
cli	After a DirectTimeCharge or InitialTimeReserv	

Concept Label	Available	Comments
	ation	
confirmTimeReservationStatus	After set from a response	Usually part of an confirmTimeReservationResponse.
destinationNumber	After a DirectTimeCharge or InitialTimeReservation	
discountPercentage	After a setDiscount or DirectNamedEvent or NamedEventReservation	Present after a setDiscount node or a response that has the discountPeriod present.
eventClass	NamedEventActions	A string representing the CCS event Class.
eventName	NamedEventActions	A string of the CCS event name.
eventType	NamedEventActions	An integer representing the type of CCS named event.
expectedReservationDelta	InitialTimeReservation and ExtendTimeReservation	
expectedReservationTotal	InitialTimeReservation and ExtendTimeReservation	
extraInformation		Usually call information for adding to Billing CDRs. Content varies for each action.
freeCallDisposition	After set from a response	Usually part of an initialTimeReservationResponse.
ignoreBalanceLimit	DirectNamedEvent, DirectTimeCharge, NamedEventReservation	
initialLowBalanceAnnouncement	After set from a response	Usually part of an initialTimeReservationResponse. The Announcement ID of the announcement to play.
initialLowBalanceIndicator	After set from a response	Usually part of an initialTimeReservationResponse. If present and non zero the indicated pre call warning announcement should be played to the subscriber.
lowCreditBuffer	After set from a response	Usually part of an initialTimeReservationResponse. Number of seconds from the end of the last good reservation period until a low credit beep

Concept Label	Available	Comments
		should be played
maxCallLength	After set from a response	Usually part of an initialTimeReservationResponse.
maxSeconds	After set from a response	Session Time left. Usually part of an xxxTimeReservationResponse.
maxUnitsRequested	NamedEvent Actions	
minUnitsRequested	NamedEvent Actions	
numUnitsGranted	After set from a response	
numUnitsUsed	ConfirmNamedEventReservation	
reservedLengthDelta	After set from a response	Usually part of an xxxTimeReservationResponse.
reservedLengthTotal	After set from a response	Usually part of an xxxTimeReservationResponse.
retrieveLCRNumbers	After set from a response	Usually part of an initialTimeReservationResponse.
revokeTimeReservationStatus	After set from a response	Usually part of an revokeTimeReservationResponse.
scpAction		This AVP is an enumeration with the following known values: <ul style="list-style-type: none"> <li>• 1 Supervise</li> <li>• 2 Do not supervise</li> <li>• 3 Release</li> <li>• 4 Send message</li> <li>• 5 Play announcement</li> <li>• 6 Supervise without controlling</li> </ul>
singleReservation	After set from a response	Usually part of an initialTimeReservationResponse.
timeReservationStatus	After set from a response	Usually part of an xxxTimeReservationResponse.
validityPeriod	After set from a response	

### Charge details

Here are the CCS concepts from charge details.

Concept Label	Available	Comments
balanceTypeFilter	WalletInfo	Request the Billing Engine to only return balances of this type.
balanceUnitFilter	WalletInfo	Request the Billing Engine to only return balances of this unit.

**Direct time charge**

Here are the CCS concepts from direct time charge.

Concept Label	Available	Comments
callDate	DirectTimeCharge	
ratingPrecision	InitialTimeReservation	Integer representing one of seconds, tenths-of-a-second or hundredths-of-a-second

**Others**

Here are the CCS concepts from others.

Concept Label	Available	Comments
freeform	always	Uses/updates the concept previously defined by setFreeform.
setFreeform	always	The next AVP of concept "freeform" will instead use/update the concept indexed by the value of this AVP.

**Voucher details**

Here are the CCS concepts from voucher details.

Concept Label	Available	Comments
voucherInfoBalanceExpiryExtension	WalletInfoRequest	The expiry extension period for adjusting the balance expiry date of the voucher.



Concept Label	Available	Comments																		
voucherInfoBalanceExpiryExtensionPolicy	WalletInfoRequest	<p>Indicates how to apply the balance expiry extension period to the balance expiry date.</p> <p>New Expiry Policies include the following:</p> <ul style="list-style-type: none"> <li>• First Use with Offset allows a recharged balance expiry date to be set a number of months or hours after the first use of the balance</li> <li>• First Use - Account Cycle allows a recharged balance expiry date to be set, aligned with the account cycle on the first use of the balance</li> <li>• First Use - Bill Cycle allows a recharged balance expiry date to be set, aligned with the billing cycle on the first use of the balance</li> </ul> <p>voucherInfoBalanceExpiryExtensionPolicy returns the following values:</p> <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Meaning</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>best</td> <td>Take the largest expiry date based on current, today, other periods and this extension</td> </tr> <tr> <td>1</td> <td>extend</td> <td>Extend the existing expiry date by the specified extension period</td> </tr> <tr> <td>2</td> <td>extendFromToday</td> <td>Today + extension period, or the existing expiry, whichever is larger</td> </tr> <tr> <td>3</td> <td>override</td> <td>Not used when applying an extension</td> </tr> <tr> <td>4</td> <td>dontChange</td> <td>Do not set or change an expiry date</td> </tr> </tbody> </table>	Value	Name	Meaning	0	best	Take the largest expiry date based on current, today, other periods and this extension	1	extend	Extend the existing expiry date by the specified extension period	2	extendFromToday	Today + extension period, or the existing expiry, whichever is larger	3	override	Not used when applying an extension	4	dontChange	Do not set or change an expiry date
Value	Name	Meaning																		
0	best	Take the largest expiry date based on current, today, other periods and this extension																		
1	extend	Extend the existing expiry date by the specified extension period																		
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3	override	Not used when applying an extension																		
4	dontChange	Do not set or change an expiry date																		

Concept Label	Available	Comments												
voucherInfoBalanceExpiryExtensionType	WalletInfoRequest	<p>The unit of the extension value available for this balance (example: hours or months).</p> <p>voucherInfoBalanceExpiryExtensionType returns the following values:</p> <table border="1"> <thead> <tr> <th>Value</th> <th>Meaning</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>Hours</td> </tr> <tr> <td>1</td> <td>Months</td> </tr> </tbody> </table>	Value	Meaning	0	Hours	1	Months						
Value	Meaning													
0	Hours													
1	Months													
voucherInfoBalanceType	WalletInfoRequest	The CCS ID of the balance type for the current balance of the voucher structure.												
voucherInfoBalanceValidityOffset	WalletInfoRequest	A relative offset from the current date when a given balance, charged with a voucher, becomes valid.												
voucherInfoBalanceValidityStart	WalletInfoRequest	A fixed date in the future when a given balance, charged with a voucher, becomes valid.												
voucherInfoBalanceValidityType	WalletInfoRequest	<p>The units of the relative offset from the current date when the balance becomes valid.</p> <p>voucherInfoBalanceValidityType returns the following values:</p> <table border="1"> <thead> <tr> <th>Value</th> <th>Meaning</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>Hours</td> </tr> <tr> <td>1</td> <td>Months</td> </tr> </tbody> </table>	Value	Meaning	0	Hours	1	Months						
Value	Meaning													
0	Hours													
1	Months													
voucherInfoMissingBalancePolicy	WalletInfoRequest	<p>Indicates what to do if the specified balance type is missing from the list of existing balances for the voucher.</p> <p>voucherInfoMissingBalancePolicy returns the following values:</p> <table border="1"> <thead> <tr> <th>Value</th> <th>Name</th> <th>Meaning</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>allow</td> <td>Create the balance (and bucket, if applicable) and set it to the specified value</td> </tr> <tr> <td>1</td> <td>fail</td> <td>Reject the recharge (Invalid Recharge Value)</td> </tr> <tr> <td>2</td> <td>ignoreBalance</td> <td>Skip this balance and process the rest of the recharge</td> </tr> </tbody> </table>	Value	Name	Meaning	0	allow	Create the balance (and bucket, if applicable) and set it to the specified value	1	fail	Reject the recharge (Invalid Recharge Value)	2	ignoreBalance	Skip this balance and process the rest of the recharge
Value	Name	Meaning												
0	allow	Create the balance (and bucket, if applicable) and set it to the specified value												
1	fail	Reject the recharge (Invalid Recharge Value)												
2	ignoreBalance	Skip this balance and process the rest of the recharge												
voucherInfoNewBucket	WalletInfoRequest	If this value is set to true, the voucher value will be added to the balance as a new bucket.												
voucherInfoReplaceBalance	WalletInfoRequest	If this value is set to true, all existing buckets of												

Concept Label	Available	Comments						
	st	the balance will removed, and a new bucket is created with the specified voucher value.						
voucherInfoValue	WalletInfoRequest	The voucher balance recharge details.						
voucherInfoVoucher	WalletInfoRequest	The database key of the voucher being redeemed.						
voucherInfoVoucherNumber	WalletInfoRequest	The voucher number of the voucher being redeemed.						
voucherInfoVoucherSerialStr	WalletRechargeRequest	Populates the Voucher Serial Number in a DCD AVP, so that it may be used to audit and track the voucher redemption.						
voucherInfoWalletExpiryExtension	WalletInfoRequest	The extension period to apply to the wallet expiry date of the recharged wallet.						
voucherInfoWalletExpiryExtensionPolicy	WalletInfoRequest	Indicates how to apply the wallet expiry extension period to the wallet expiry date.						
voucherInfoWalletExpiryExtensionType	WalletInfoRequest	<p>The unit of the expiry extension for the wallet that the voucher will recharge (example: hours or months).</p> <p>voucherInfoWalletExpiryExtensionType returns the following values:</p> <table border="1"> <thead> <tr> <th>Value</th> <th>Meaning</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>Hours</td> </tr> <tr> <td>1</td> <td>Months</td> </tr> </tbody> </table>	Value	Meaning	0	Hours	1	Months
Value	Meaning							
0	Hours							
1	Months							
voucherRechargeFailureDate Time	WalletRechargeRequest	Returns the timestamp of any previous voucher recharge failure. If there has not been a previous voucher recharge failure, then zero (0) is returned.						
voucherRechargeFailureFlag	WalletRechargeRequest	<p>Returns the value of one (1) if the voucher is not redeemed and a failed voucher redeem attempt has been made.</p> <p>Returns zero (0) for all other voucher states. For example, if a redeem attempt has never been made for the voucher or if the voucher has been redeemed successfully.</p>						
voucherTypeName	WalletInfoRequest	<p>Returns the name of the type of voucher being redeemed.</p> <p><b>Note:</b> Voucher type name is only available if a positive value is defined for <code>voucherTypeCacheSize</code> in the <code>ccsActions</code> section. When this cache is configured, CCS will be able to use the batch of the voucher being redeemed to lookup the voucher type, and that name will then be available to the <code>ccsConcept voucherTypeName</code>.</p>						



# Split Charging and Voucher Domains

## Overview

### Introduction

This chapter explains how the DCD components handle split charging and voucher redemption when wallets and vouchers are hosted by different billing domains.

### In this chapter

---

This chapter contains the following topics.

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Bad PIN .....	18

## Wallets and Vouchers Split Recharging

### Introduction

CCS supports charging services for redeeming vouchers and updating wallets when they reside on the same billing domain. The DCD product provides functionality that allows the Prepaid Charging product to extend this support to separate voucher and wallet domains in CCS.

DCD can be configured to support a CCS-based convergent billing solution where separate billing systems are used to host:

- Vouchers and redemption functions  
**Example:** Oracle VWS-Voucher Management
- Wallets and charging functions  
**Example:** A third-party billing system.

In order to achieve this, DCD can be extended using `ccsConcepts` required to support voucher redemption.

### Key components

The key components that enable this split-domain architecture with DCD are as follows:

Component	Description	Further Information
ACS voucherDelegator	Configures the <code>diamActions</code> which support different billing domains for recharges.	<i>voucherDelegator</i> (on page 16)
<code>ccsConcepts</code>	Support voucher redemption variables.	Voucher details

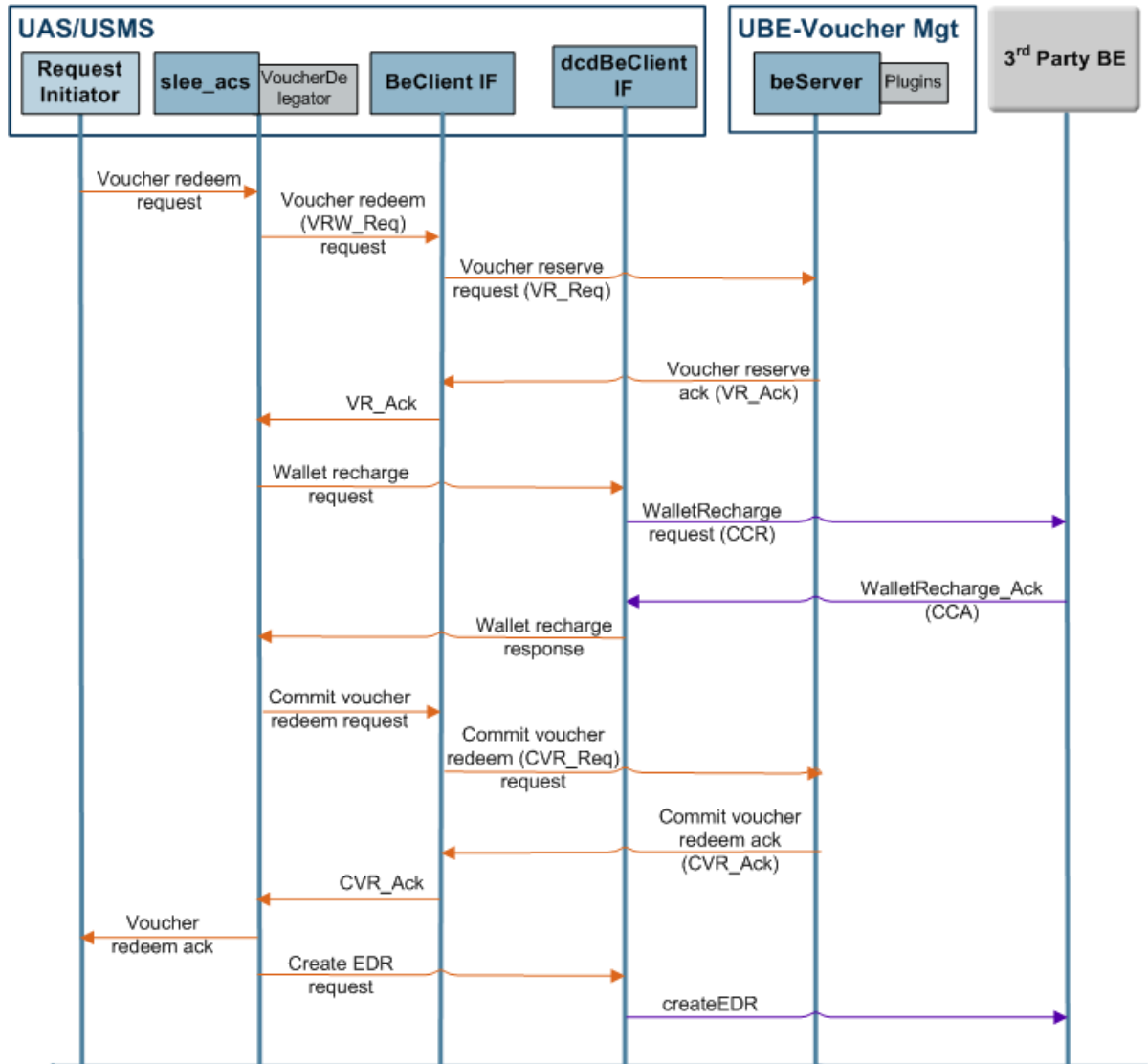
## voucherDelegator

The voucherDelegator is a slee\_acs process which implements the following diamActions enabling split domain recharging over DCD:

Action	Expected Response	Description
BadPIN	<ul style="list-style-type: none"> <li>• CCR named BadPINRequest, and</li> <li>• CCA named BadPINResponse</li> </ul>	Sends a CCR to the BE, notifying that a given MSISDN has failed to redeem a voucher.
CreateEDR	<ul style="list-style-type: none"> <li>• CCR named CreateEDRRequest, and</li> <li>• CCA named CreateEDRResponse</li> </ul>	Sends a list of tags and values as AVPs to the third-party BE which will be added to the BE EDR.
WalletRecharge	<ul style="list-style-type: none"> <li>• CCR named WalletRechargeRequest, and</li> <li>• CCA named WalletRechargeResponse</li> </ul>	Sends a CCR to the third-party BE with a wallet recharge request, and expects a CCA with a wallet recharge response.

## Diagram

Here is an example of the split-domain wallet and voucher recharging process. Note that the third-party billing engine server is also the Diameter Server in this example.



## Split recharging process

This table describes the stages involved in redeeming a voucher using VWS-Voucher Management and recharging a wallet on a third-party domain.

Stage	Description
1	<p>Voucher redemption is triggered using any of the following methods:</p> <ul style="list-style-type: none"> <li>• IVR feature nodes in a control plan</li> <li>• Interaction with a customer services representative (who uses the Voucher Management screen)</li> <li>• (if MM is installed) Short Messages sent from the subscriber's handset, and</li> <li>• (if USSD GW is installed) menus and fast access.</li> </ul> <p>The information from the request initiator is passed to the voucherDelegator, which sends</p>

Stage	Description
	a message to the relevant BeClientIF process to reserve the voucher.
2	The BeClientIF sends a Voucher Reserve (VR_Req) request to VWS-Voucher Management.
3	<p>VWS-Voucher Management checks whether:</p> <ul style="list-style-type: none"> <li>• this VWS holds the details for the requested voucher</li> <li>• the voucher PIN number is correct, and</li> <li>• if the voucher can be redeemed.</li> </ul> <p>If the voucher can be redeemed, VWS-Voucher Management reserves the voucher and passes a Voucher Reserve acknowledgment (VR_Ack) back to the voucherDelegator.</p>
4	The voucherDelegator processes the message and sends a Wallet Recharge request to the dcdBeClientIF in an attempt to recharge the wallet on the Diameter Server (in this case the third-party BE).
5	The dcdBeClientIF constructs a CCR with a WalletRecharge action and interrogates the Diameter Server for wallet recharge.
6	<p>The Diameter Server checks whether:</p> <ul style="list-style-type: none"> <li>• the details for the requested wallet, and</li> <li>• whether the wallet state allows it to be updated.</li> </ul> <p>If the wallet can be recharged, the Diameter Server sends a CCA response back to the dcdBeClientIF with a Wallet Recharge acknowledgment, which is reported back to the voucherDelegator.</p>
7	<p>The voucherDelegator then sends a Commit Voucher Redeem (CVR_Req) request to the BeClientIF which is sent to VWS-Voucher Management for redeeming the voucher.</p> <p>If the voucher redeem succeeds, VWS-Voucher Management responds with a Commit Voucher Redeem acknowledgement (CVR_Ack) to the BeClientIF which is reported back to the voucherDelegator.</p>
8	The voucherDelegator processes the message and informs the request initiator of the successful voucher redemption wallet recharge.
9	The voucherDelegator then initiates the createEDR action for the relevant EDRs to be produced on the Diameter Server.
10	If either the voucher redemption or the wallet recharge failed, appropriate Not Acknowledgment (Nack) messages at each stage and this is recorded in the final set of EDRs generated.

## Bad PIN

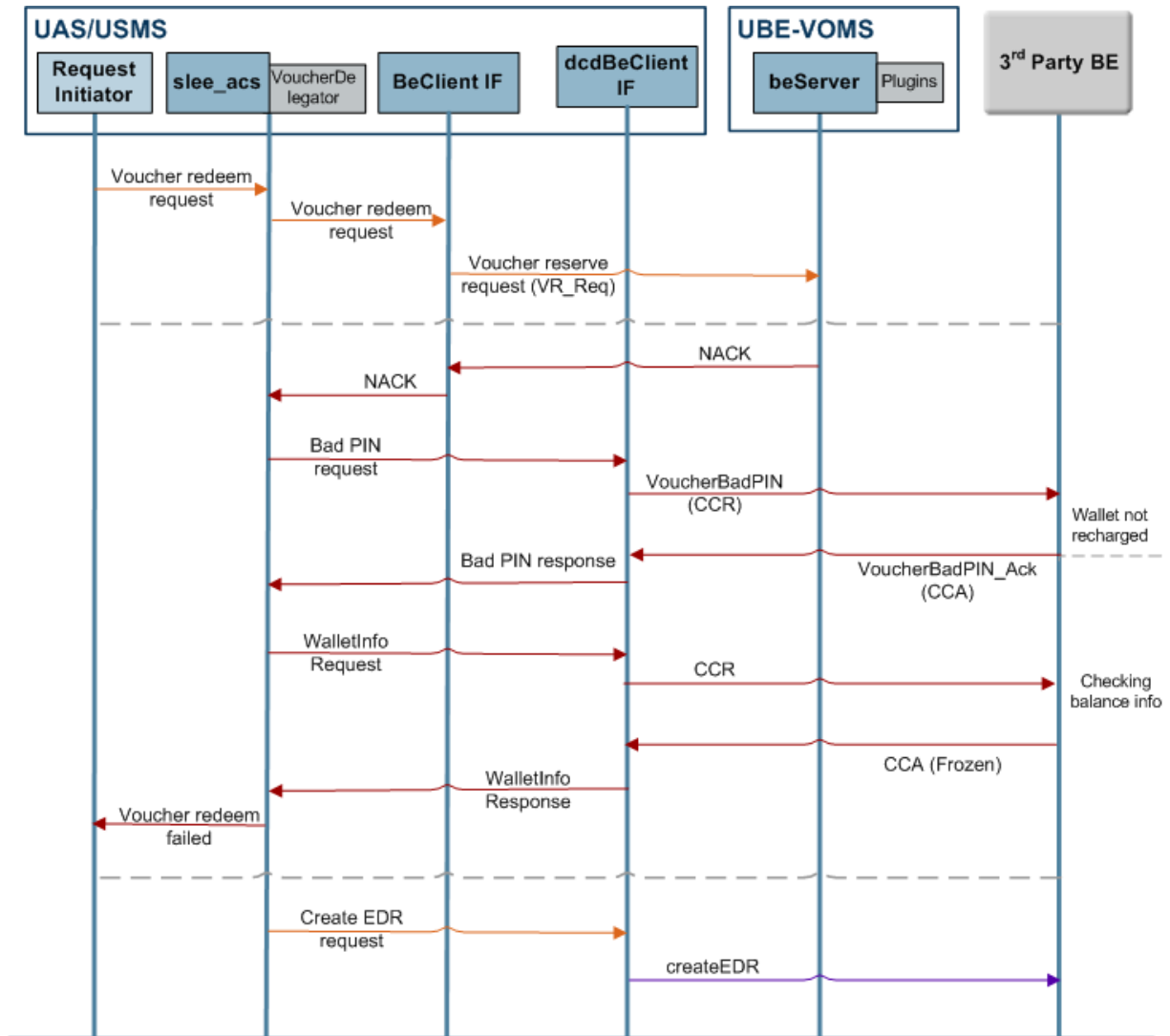
### Description

The ACS voucherDelegator also handles BadPIN processing and notifies the BE that controls wallet recharging if a subscriber (MSISDN) has failed to redeem a voucher.



## Diagram

Here is an example of Bad PIN processing on a split-domain wallet and voucher network. Note that the third-party billing engine server is also the Diameter Server in this example.



## Checking voucher bad PIN

This table describes an unsuccessful voucher redemption due to a Bad PIN.

Stage	Description
1	<p>When VWS-Voucher Management receives a Voucher Reserve (VR_Req) request, it checks whether:</p> <ul style="list-style-type: none"> <li>the VWS holds the details for the requested voucher</li> <li>the voucher PIN number is correct, and</li> <li>if the voucher can be redeemed.</li> </ul> <p>If the voucher PIN is incorrect, VWS-Voucher Management updates the bad PIN counter and returns a Bad PIN Increase (BPIN) count to the BeClientIF which informs the voucherDelegator.</p>
2	On successive Bad PIN attempts, the voucherDelegator cancels the voucher redemption

Stage	Description
	and sends a Revoke Voucher Redeem (RVR) request to the BeClientIF which is passed onto VWS-Voucher Management.
3	VWS-Voucher Management responds with a Revoke Voucher Redeem (RVR_Ack) acknowledgement which means that the voucher redemption request stands cancelled.
4	The voucherDelegator then sends a Bad PIN request to the dcdBeClientIF in an attempt to cease any transactions on the wallet domain.
5	The dcdBeClientIF constructs a CCR with a BadPINRequest action and notifies the Diameter Server.
6	The Diameter Server confirms and sends a CCA back to the dcdBeClientIF with a BadPINResponse, which is reported to the voucherDelegator.
7	The voucherDelegator processes the message and informs the request initiator that the voucher redemption was unsuccessful.
8	The voucherDelegator then initiates the createEDR action for the relevant EDRs to be produced on the Diameter Server.

# SCAP Compliance

## Overview

### Introduction

This chapter explains the summary of changes that affect DCD to make it SCAP compliant.

### In this chapter

---

This chapter contains the following topics.

SCAP ..... 21

## SCAP

### Introduction

Ericsson SCAP is a vendor specific protocol that utilizes the Draft version 8 of the Diameter Base Protocol (the predecessor to *RFC 3588*).

The Convergent Charging Controller Diameter protocol is based upon the final version of *RFC 3588*. The base protocol is further extended to support the use of CCR (Credit-Control-Request) / CCA (Credit-Control-Answer) messages, described by *RFC 4006*.

SCAP, on the other hand, adds Attribute Value Pair (AVP)s to Diameter base protocol's Accounting-Request (ACR) and Accounting-Answer (ACA) commands.

DCD may be reconfigured to permit it to interact with an Ericsson SCAP compliant server as a SCAP client. Variances between the SCAP and normal Credit-Control charging approaches available within DCD are described below.

**Note:** The necessary changes will take effect only if the *enableDraft8* (on page 43) is set to `true`.

### Application-identifiers values

This table lists the different Application-identifier values between the Diameter Base Protocol Draft 8 and RFC 3588 final version.

Draft 8	Final
-	Diameter Common Messages 0
NASREQ 1	NASREQ 1
CMS Security 2	Mobile-IP 2
Mobile IP 4	-
Relay 0xffffffff	Relay 0xffffffff

## Message header

This table describes the changes to message header values.

Section Heading	Comment
Vendor-Id	This should be changed in outbound messages (at the Oracle Diameter stack level). See <i>Vendor-Id</i> (on page 48) for SCAP specific changes.
T-flag	The T-flag (retransmit) is used by a Diameter client to indicate to the server that a message has been retransmitted (possibly due to loss of message). This flag is not supported by Draft 8, and hence it is not set while retransmitting duplicate DCD messages to SCAP.

## Supported AVPs

This table describes the changes to the supported AVPs to enable SCAP compliance.

Supported AVP	Comment
Event-Timestamp	DCD to send vendor specific version for Ericsson SCAP.
Inband-Security-Id	This AVP is not sent during capabilities exchange, if SCAP support is configured, that is, when <i>enableDraft8</i> (on page 43) is set to <code>true</code> .

## Result-Codes

This table describes the changes to the Result-Codes to enable SCAP compliance.

Result Code	[DRAFT8] Value	[3588] Value
DIAMETER_UNSUPPORTED_TRANSFORM	5010	-
DIAMETER_NO_COMMON_APPLICATION	5011	5010
DIAMETER_UNSUPPORT_VERSION	5012	5011
DIAMETER_UNABLE_TO_COMPLY	5013	5012
INVALID_BIT_IN_HEADER	5014	5013
INVALID_AVP_LENGTH	5015	5014
INVALID_MESSAGE_LENGTH	5016	5015
INVALID_AVP_BIT_COMBO	5017	5016
DIAMETER_NO_COMMON_SECURITY	-	5017

# Configuration

## Overview

### Introduction

This chapter explains how to configure the Oracle Communications Convergent Charging Controller application.

### In this chapter

---

This chapter contains the following topics.

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RAR Configuration .....	26
SLEE.cfg Configuration .....	26
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## Configuration Overview

### Introduction

This topic provides a high level overview of how the DCD 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 Diameter Charging Driver is configured by the following components:

Component	Locations	Description	Further Information
eserv.config	all SLC machines	DCD is configured by the Diameter section of <b>eserv.config</b> .	<b>eserv.config Configuration</b> (on page 24).
eserv.config	all SLC machines	The WalletInformation cache is configured in the CCS section of <b>eserv.config</b>	<b>CCS eserv.config Configuration</b> (on page 25).
SLEE.cfg	all SLC machines	The SLEE interface is configured to include the DCD service.	<b>SLEE.cfg Configuration</b> (on page 26) and the <b>SLEE Technical Guide</b> .
acs.conf	all SLC machines	Configures the diamActions library.	<b>acs.conf Configuration</b> (on page 27)
oracleConfig.xsd	SMS	Defines acceptable structure for XML.	
oracleConfigWor	SMS	The editable configuration.	Configuration

Component	Locations	Description	Further Information
king.xml			Management
oracleConfigMaster.xml	SMS	The deployed (live) configuration used to generate the <b>eserv.config</b> .	Configuration Management

**Note:** The .xsd and .xml files are only present if the Configuration Management editor has been installed. Refer to Configuration Management.

## eserv.config Configuration

### Introduction

The **eserv.config** file is a shared configuration file, from which many Oracle Communications Convergent Charging Controller applications read their configuration. Each Convergent Charging Controller 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 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 can 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**. The example file for DCD is:

```
/IN/service_packages/DCD/etc/eserv.config.dcd.example
```

## Editing the file

There are two ways to edit the **eserv.config** file, depending upon whether or not you are using the Configuration Management editor. If you are not, you can edit the file using a text editor.

**Warning:** If you are using the Configuration Management editor, you cannot use a text editor to edit the DCD section.

### Text editor

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 causes 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 ensures you have a working copy to which you can return.

## Loading eserv.config changes

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

## Diameter eserv.config configuration

The **eserv.config** file must be configured to enable the DCD to work. Most of the necessary DCD configuration in **eserv.config** is done at installation time by the configuration script. However, realms and hosts need to be configured.

**Note:** The DCD configuration options in **eserv.config** are explained in the section on the *diameterBeClient background process* (on page 29).

# CCS eserv.config Configuration

## Introduction

DCD maintains a WalletInformation cache. To enable updates to the WalletInformation cache, the service handles for the services using DCD must be mapped to the `libdcdCcsSvcExtra.so` library. You will need to configure the mapping in the `CCS.ccsServiceLibrary.ccsPluginExtend` of **eserv.config**.

## ccsServiceLibrary configuration

Here is an example of the `ccsServiceLibrary` configuration for DCD in the CCS section of **eserv.config**.

```
ccsServiceLibrary = {
    ccsPluginExtend = [
        {
            library="libdcdCcsSvcExtra.so"
        }
    ]
}
```

```
}
```

## RAR Configuration

You enable processing of re-authorization requests (RARs) in Diameter Control Agent (DCA).

For information about enabling RAR processing in DCA, see the RAR configuration section in *Diameter Control Agent Technical Guide*.

When RAR processing is enabled, DCA marks the first INITIAL\_REQUEST as RAR enabled to allow DCD to process any subsequent RARs. You can specify the amount of time DCD should wait for a response to an RAR sent to the Diameter client via DCA by configuring the `rarSleeTimeout` parameter in the DIAMETER section of the `eserv.config` file:

```
DIAMETER = {
    DCD = {
        rarSleeTimeout = seconds
    }
}
```

where *seconds* is the amount of time in seconds that the DCD will wait for a response to an RAR sent to the Diameter client via DCA.

After this timeout lapses, DCD responds to the Diameter server with a re-authorization acknowledgement (RAA) containing the DIAMETER\_UNABLE\_TO\_DELIVER (3002) result code. If the DCA responds after the DCD has sent an RAA, the DCA response is ignored.

**Note:** The `rarSleeTimeout` value must be greater than 0 (zero), and is set to 10 by default. You are recommended to set the value of the `rarSleeTimeout` greater than the value of the `rarClientTimeout` in the DCAInstances section of `eserv.config`.

To disable the timeout, set `rarSleeTimeout` to 0 (zero). A value of 0 (zero) means that no SLEE timeout will be used.

**Note:** If RAR processing is not enabled in DCA, then DCD will respond to the diameter server with an RAA containing the corresponding result code set in the `rarResultCode`.

## SLEE.cfg Configuration

### Introduction

The SLEE.cfg file must be configured to enable the DCD 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 at:

```
//N/service_packages/SLEE/etc/SLEE.cfg
```

Refer to *SLEE Technical Guide* for details on SLEE configuration.

### DCD SLEE configuration

On installation, the following line is added to the SLEE.cfg

```
INTERFACE=dcdBeClient diameterBeClient.sh /IN/service_packages/DCD/bin EVENT
```

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



## acs.conf Configuration

### Introduction

The `acs.conf` file must be configured to enable the application to work. All necessary configuration is done at installation time by the configuration script; this section is for information only.

The ACS configuration file is located at `/IN/service_packages/ACS/etc/acs.conf`.

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

### DCD acs.conf configuration

On installation, the following line is added to the `acs.conf`.

```
ChassisPlugin diamActions.so
```



# Background Processes

## Overview

### Introduction

This chapter explains the process which runs automatically as part of the Oracle Communications Convergent Charging Controller application. This process is started automatically by the SLEE.

### In this chapter

---

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## diameterBeClient

### Purpose

The diameterBeClient takes SLEE messages from the diamActions library and converts them to Diameter messages. It also maintains all Diameter connections.

### Startup

The diamActions library and diameterBeClient will load the configuration (from the **eserv.config** file and the SLC database) on startup and on receiving a SIGHUP, at which point it needs to reload the config.

### Example DIAMETER section

Here is an example DIAMETER section configuration in the **eserv.config** file.

```
DIAMETER = {
    DCD = {
        serviceDomainInterfaceName = "dcdBeClient"
        loggedNotificationPeriod = 300
        loggedInvalidPeriod = 300

        databaseCacheValiditySeconds = 18000

        Origin-Host = "ocpc.oracle.com"

        Origin-Realm = "ocpc.oracle.com"
```

```

serviceContextID = "ocpc@oracle.com"

Auth-Application-Id = 4

Vendor-Specific-Application-Id = [
  {
    Vendor-Id = 193
    Auth-Application-Id = 4
    Acct-Application-Id = 19302
  }
]

enableDraft8 = false

# scheme = "SchemeA"

honour_disconnect = true

Vendor-Id = 16247

Product-Name = ""

timeout_x = 30000000

transmit_limit = 2

trace_debug_flags = "all"

statistics_interval = 300

NotificationFilter = {
  CollectiveNotice = true
  PerPeerNotice = {
    initial_request = true
    update_request = true
    termination_request = true
    event_request = true
    unknown_request = true
    total_request = true
    request_timeout = true
    non_request_type_result_codes = true
  }
}

}

DomainTypes = [
{
  name = "DIAMETER"

  schemeName = "SchemeA"

  routing = "Round Robin"

  voidUnusedReservation = false

  defaultSessionFailover = 0
  defaultEventFailover = 0
  defaultFailureHandling = 0

  balanceEnquiryMethod = "balanceCheck"
}

```

```

includeDcdCdrFields = false

defaultFixedCostDuration = 86400
enableScap = false
overwriteZeroCallAnswerTime = false

Domains = [
{
  name = "myDomainA"

  routing = "Round Robin"

  realmFailureWaitSeconds = 20

  weighting = 1
}
{
  name = "myDomainB"

  routing = "Failover"

  realmFailureWaitSeconds = 20

  weighting = 1
}
]

AVPs = [
{
  name = "ConfirmNamedEventReservationRequest"
  mandatoryContents = [
    "Subscription-Id"
    "Service-Identifier"
    "NE-Used-Service-Unit"
  ]
  optionalContents = []
}
{
  avpCode = 443

  name = "Subscription-Id"
  type = "Grouped"
  mandatoryContents = [
    "Subscription-Id-Type"
    "Subscription-Id-Data"
  ]
  optionalContents = []
}
{
  avpCode = 450
  name = "Subscription-Id-Type"
  type = "Enumerated"

  literal = "0"          # END_USER_E164
}
{
  avpCode = 444
  name = "Subscription-Id-Data"
  type = "UTF8String"

  ccsConcept = "acsProfile"
  profileBlock = 18
}
]

```

```

profileTag = 327686
profileFormat = "LNSTRING"
conditionProfileBlock = 17
conditionProfileTag = 2009
conditionValue = 14
}
{
  avpCode = 439
  name = "Service-Identifier"
  type = "Unsigned32"
  ccsConcept = "eventType"
  cdrTag = "DIAMETER_SERVICE_ID"
  cdrOperation = "replace"
}
{
  avpCode = 446
  name = "NE-Used-Service-Unit"
  type = "Grouped"
  mandatoryContents = [
    "CC-Service-Specific-Units-Used"
  ]
}
{
  avpCode = 417
  name = "CC-Service-Specific-Units-Used"
  type = "Unsigned64"
  ccsConcept = "numUnitsUsed"

  vendorId = 0
  flags = 0
  repeating = false
  maxOccurrences = 10
  conversion = [
    {
      esg = 1
      vendor = 2
      serviceProvider = 1
    }
    {
      esg = 3
      vendor = 2
      serviceProvider = 2
    }
  ]

  conversionScale = 1
  conversionRounding = "floor"
  interpretBase = 10

  octetLength = 0
}
{
  name = "3GPP-MS-TimeZone"
  vendorId = 10415 #3GPP
  avpCode = 23
  ccsConcept = "callerMsTimeZone"
  type = "OctetString"
  octetLength = 2
}
{
  avpCode = 900

```

```

    vendorId = 16247
    name = "Custom-Scp-Action"
    type = "Enumerated"
    ccsConcept = "scpAction"
    repeating = true
  }

  {
    name = "DirectNamedEventRequest-Money Refund"
    mandatoryContents = [
      "Subscription-Id"
      "SOS-TopUp-RequestedAction"
      "Charging-Start-Timestamp"
    ]
  }

  {
    name = "SOS-TopUp-RequestedAction"
    type = "Enumerated"
    value = "5"
    avpCode = 436
  }

  {
    name = "WalletRechargeRequest"
    mandatoryContents = [
      "Subscription-Id"
      "TopUp-RequestedAction"
      "Charging-Start-Timestamp"
      "Topup-Amount"
      "Topup-Voucher-Number"
      "Topup-Voucher-Type"
      "Topup-Voucher-Id"
      "Topup-Voucher-Serial-Number"
      "Source-System-Id"
    ]
    optionalContents = [
      "Voucher-Recharge_Failed-Flag"
      "Voucher-Recharge_Failed_Date_Time"
      "Topup-Voucher-Balance-Validity-Start"
      "Topup-Voucher-Balance-Validity-Relative"
    ]
  }

  {
    name = "Voucher-Recharge_Failed-Flag"
    type = "Integer32"
    vendorId = 581
    avpCode = 50998
    ccsConcept = "voucherRechargeFailureFlag"
    includeIf = true
  }

  {
    name = "Voucher-Recharge_Failed-Date-Time"
    type = "Integer32"
    vendorId = 581
    avpCode = 50999
    ccsConcept = "voucherRechargeFailureDateTime"
    excludeWhenIn = "0"
  }

  {

```

```

    name = "TopUp-RequestedAction"
    type = "Enumerated"
    value = "4"
    avpCode = 436
}

{
    name = "Charging-Start-Timestamp"
    type = "Integer32"
    profileBlock = 18
    profileTag = 327999
    avpCode = 12000
}

{
    name = "Topup-Voucher-Number"
    avpCode = 12001
    ccsConcept = "voucherInfoVoucher"
    type = "Integer32"
}

{
    name = "Topup-Amount"
    avpCode = 12002
    type = "Grouped"
    mandatoryContents = [
        "Value-Digits"
    ]
    optionalContents = [
        "Exponent"
    ]
}

{
    name = "Value-Digits"
    avpCode = 12003
    ccsConcept = "voucherInfoValue"
    type = "Integer32"
}

{
    name = "Topup-Voucher-Type"
    avpCode = 12005
    ccsConcept = "voucherTypeName"
    type = "UTF8String"
}

{
    name = "Topup-Voucher-Id"
    vendorId = 581
    avpCode = 50026
    ccsConcept = "voucherInfoVoucherId"
    type = "Integer32"
}

{
    name = "Topup-Voucher-Serial-Number"
    avpCode = 12008
    ccsConcept = "voucherInfoVoucherSerialStr"
    type = "UTF8String"
}

{

```



```

    name = "Topup-Voucher-Balance-Validity-Start"
    avpCode = 12009
    ccsConcept = "voucherInfoBalanceValidityStart"
    type = "Time"
  }
  {
    name = "Topup-Voucher-Balance-Validity-Relative"
    avpCode = 12010
    type = "Grouped"
    optionalContents = [
      "Topup-Voucher-Balance-Validity-Offset"
      "Topup-Voucher-Balance-Validity-Type"
    ]
  }
  {
    name = "Topup-Voucher-Balance-Validity-Offset"
    avpCode = 12011
    ccsConcept = "voucherInfoBalanceValidityOffset"
    type = "Integer32"
  }
  {
    name = "Topup-Voucher-Balance-Validity-Type"
    avpCode = 12012
    ccsConcept = "voucherInfoBalanceValidityType"
    type = "Enumerated"
  }
  {
    name = "WalletRechargeResponse"
    mandatoryContents = [
      "Topup-Balance-Information"
      "Topup-Receipt-Number"
    ]
  }
  {
    name = "Topup-Balance-Information"
    vendorId = 581 # Intec
    avpCode = 50030
    type = "Grouped"
    mandatoryContents = [
      "Topup-Balance-Type-ID"
    ]
    optionalContents = [
      "Topup-Balance-Expire-Date"
      "Topup-Unit-Value"
    ]
  }
  {
    name = "Topup-Balance-Type-ID"
    avpCode = 50020
    vendorId = 581 # Intec
    ccsConcept = "walletInfoBalanceType"
    type = "Integer32"
  }
  {
    name = "Topup-Balance-Expire-Date"
    vendorId = 581 # Intec

```

```

    avpCode = 50032
    ccsConcept = "walletInfoBalanceExpiry"
    type = "Integer32"
}

{
    name = "Topup-Unit-Value"
    vendorId = 581 # Intec
    avpCode = 50099
    type = "Grouped"
    mandatoryContents = [
        "Topup-Value-Digits"
    ]
    optionalContents = [
        "Topup-Exponent"
    ]
}

{
    name = "Topup-Value-Digits"
    avpCode = 50020
    vendorId = 581 # Intec
    ccsConcept = "walletInfoBalanceSystemValue"
    type = "Integer32"
}

{
    name = "Topup-Exponent"
    avpCode = 50199 # the ICD doesn't define this but it's not an issue
    for testing
    vendorId = 581 # Intec
    type = "Integer32"
}

{
    name = "Topup-Receipt-Number"
    avpCode = 50024
    type = "UTF8String"
}

{
    name = "CreateEDRRequest"
}

{
    name = "CreateEDRResponse"
}

{
    name = "BadPINRequest"
}

{
    name = "BadPINResponse"
}

{
    name = "Termination-Cause"
    avpCode = 295
    type = "Enumerated"
    ccsConcept = "terminationCause"
    conversion = [
        {

```

```

        esg = 8 # releasedNoFunds
        vendor = 6 # DIAMETER_AUTH_EXPIRED
    }
    {
        esg = 9 # disconnectedLegBNoFunds
        vendor = 6 # DIAMETER_AUTH_EXPIRED
    }

    {
        esg = 14 # callingPartyDisconnected
        vendor = 1 # DIAMETER_LOGOUT
    }
    {
        esg = 15 # calledPartyDisconnected
        vendor = 1 # DIAMETER_LOGOUT
    }
    ]
}

ContextCopy = [
{
    contextItem = "scpActionSupervise"
    profileBlock = 17
    profileTag = 6356992 # Hex 0x00610000
    profileFormat = "INTEGER"
}
{
    contextItem = "scpActionDoNotSupervise"
    profileBlock = 17
    profileTag = 6356993 # Hex 0x00610001
    profileFormat = "INTEGER"
}
{
    contextItem = "scpActionRelease"
    profileBlock = 17
    profileTag = 6356994 # Hex 0x00610002
    profileFormat = "INTEGER"
}
{
    contextItem = "scpActionSendMessage"
    profileBlock = 17
    profileTag = 6356995 # Hex 0x00610003
    profileFormat = "INTEGER"
}
{
    contextItem = "scpActionPlayAnnouncement"
    profileBlock = 17
    profileTag = 6356996 # Hex 0x00610004
    profileFormat = "INTEGER"
}
{
    contextItem = "scpActionSuperviseWithoutControlling"
    profileBlock = 17
    profileTag = 6356997 # Hex 0x00610005
    profileFormat = "INTEGER"
}
{
    contextItem = "callState"
    profileBlock = 17
    profileTag = 6356998 # Hex 0x00610006
    profileFormat = "INTEGER"
}
]

```

```

    }
    {
        contextItem = "sendCount"
        profileBlock = 17
        profileTag = 6356999 # Hex 0x0061007
        profileFormat = "INTEGER"
    }
    {
        contextItem = "preCallAnnouncementId"
        profileBlock = 17
        profileTag = 6357000 # Hex 0x0061008
        profileFormat = "INTEGER"
    }
    {
        contextItem = "preCallLowBalance"
        profileBlock = 17
        profileTag = 6357001 # Hex 0x0061009
        profileFormat = "INTEGER"
    }
}

TimeIn = {
    profileBlock = 17
    profileTag = 6357002 # Hex 0x006100a, continuing from example ContextCopy
    values
    profileFormat = "TIME"
}
TimeOut = {
    profileBlock = 17
    profileTag = 6357003 # Hex 0x006100b
    profileFormat = "TIME"
}

}
] # End of DomainTypes array

PeerSchemes = [
{
    schemeName = "SchemeA"

    Peers = [
    {
        name = "host1"

        scheme = [ "scheme1", "scheme2" ]

        permittedOriginHosts = [
            "host1.realm1.oracle.com"
        ]

        peer_group = "host1"

        transport = "tcp"

        initiation = "connect"

        RemoteAddresses = [
            "192.168.1.10"
        ]

        remote_port = 3868

        netmask6Bits = 128
    }
    ]
}
]

```

```

    netmaskBits = 32

    permittedInstances = 0

    reqSctpInboundStreams = 8
    reqSctpOutboundStreams = 8

    sctp_hbinterval = 1000

    watchdogPeriod = 30

    connectionTimeout = 30

    inBufferSize = 0
    outBufferSize = 0
} # end of Peer host1
{
    name = "host2"

    scheme = [ "scheme1", "scheme2" ]

    permittedOriginHosts = [
        "host1.realm1.oracle.com"
    ]

    peer_group = "host1"

    transport = "tcp"

    initiation = "connect"

    RemoteAddresses = [
        "192.168.1.11"
    ]

    remote_port = 3868

    netmask6Bits = 128

    netmaskBits = 32

    permittedInstances = 0

    reqSctpInboundStreams = 8
    reqSctpOutboundStreams = 8

    sctp_hbinterval = 1000

    watchdogPeriod = 30

    connectionTimeout = 30

    inBufferSize = 0
    outBufferSize = 0

} # end of Peer host1
} # End of Scheme A
{

```

```

schemeName = "SchemeB"

Peers = [
{
    name = "host1"

    scheme = [ "scheme1", "scheme2" ]

    permittedOriginHosts = [
        "host1.realm1.oracle.com"
    ]

    peer_group = "host1"

    transport = "tcp"

    initiation = "connect"

    RemoteAddresses = [
        "192.168.1.10"
    ]

    remote_port = 3868

    netmask6Bits = 128

    netmaskBits = 32

    permittedInstances = 0

    reqSctpInboundStreams = 8
    reqSctpOutboundStreams = 8

    sctp_hbinterval = 1000

    watchdogPeriod = 30

    connectionTimeout = 30

    inBufferSize = 0
    outBufferSize = 0

    } # end of Peer host1
]
} # End of Scheme B
] # End of PeerSchemes section

routes = [
{
    realm = "FirstRealm"
    host = "host1.realm1.oracle.com"

    priority = 1
    round_robin = 0
    direct = true
}
]

NamedEventTypes = [
{
    eventClass = "abc"
    eventName = "def"
    eventType = 123
    isDebit = true
}
]

```

```

    }
    {
        eventClass = "ghi"
        eventName = "jkl"
        eventType = 456
    }
]

HostSpecificData = [
    {
        name = "ocpc.oracle.com"

        DCD = {
            Origin-Host = "ocpc.oracle.com"
            Origin-Realm = "ocpc.oracle.com"
        }

        routes = [
            {
                realm = "myDomainA"
                host = "host1.realm1.oracle.com"

                priority = 1
                round_robin = 0
                direct = true
            }
        ]
    }
]
}

```

## DCD

### Introduction

The `DCD` section holds global configuration for the DCD application.

**Note:** This section is optional.

### DCD parameters

Here are the parameters for the `DCD` section.

```

DCD = {
    serviceDomainInterfaceName = "dcdBeClient"
    loggedNotificationPeriod = 300
    loggedInvalidPeriod = 300

    databaseCacheValiditySeconds = 18000

    Origin-Host = "ocpc.oracle.com"

    Origin-Realm = "ocpc.oracle.com"

    serviceContextID = "ocpc@oracle.com"

    Auth-Application-Id = 4

```

```

Vendor-Specific-Application-Id = [
  {
    Vendor-Id = 193
    Auth-Application-Id = 4
    Acct-Application-Id = 19302
  }
]

enableDraft8 = false

# scheme = "SchemeA"

honour_disconnect = true

Vendor-Id = 16247

Product-Name = ""

timeout_x = 30000000

transmit_limit = 2

trace_debug_flags = "all"

statistics_interval = 300

NotificationFilter = {
  CollectiveNotice = true
  PerPeerNotice = {
    initial_request = true
    update_request = true
    termination_request = true
    event_request = true
    unknown_request = true
    total_request = true
    request_timeout = true
    non_request_type_result_codes = true
  }
}
}
}

```

You may also set defaults for peer connection settings here. See *Peer host parameters* (on page 80) for details of the available options.

#### Auth-Application-Id

<b>Syntax:</b>	Auth-Application-Id = <i>ID</i>
<b>Description:</b>	This AVP value is set to the Credit-Control as DCD uses Credit-Control capability by default.
<b>Type:</b>	Integer
<b>Optionality:</b>	Optional (not sent if not set).
<b>Allowed:</b>	
<b>Default:</b>	Not sent
<b>Notes:</b>	<ul style="list-style-type: none"> <li>• This AVP can be configured as a sub-AVP to support <i>Vendor-Specific-Application-Id</i> (on page 49).</li> <li>• In case of vendor specific configuration, this value should NOT be set globally.</li> </ul>



**Example:** Auth-Application-Id = 4

Acct-Application-Id

**Syntax:** Acct-Application-Id = *ID*

**Description:** This AVP value is configured as a sub-AVP to support *Vendor-Specific-Application-Id* (on page 49).

**Type:** Integer

**Optionality:** Optional (not sent if not set).

**Allowed:**

**Default:** Not sent

**Notes:** Either one, or both of *Auth-Application-Id* or *Acct-Application-Id* should be set in order to support *Vendor-Specific-Application-Id* (on page 49).

**Example:** Acct-Application-Id = 12300

checkDefinedAvpFlags

**Syntax:** checkDefinedAvpFlags = *true|false*

**Description:** Whether to check incoming AVPs for flags that are defined in the base Diameter protocol, or in any of the Diameter application specifications, so that unknown mandatory AVPs can be excluded.

**Type:** Boolean

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

**Allowed:** true – Check flags of incoming AVPs  
false – Do not check flags of incoming AVPs

**Default:** true

**Example:** checkDefinedAvpFlags = false

databaseCacheValiditySeconds

**Syntax:** databaseCacheValiditySeconds = *seconds*

**Description:** Defines how long to keep data from the database after loading it.

**Type:** Integer

**Optionality:** Optional

**Allowed:** Seconds

**Default:** 18000 seconds (5 hours)

**Example:** databaseCacheValiditySeconds = 18000

enableDraft8

**Syntax:** enableDraft8 = *true|false*

**Description:** Indicates if Draft 8 version of the Diameter base protocol should be used. This is required to support the *enableScap* (on page 51) parameter.

**Type:** Boolean

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

**Allowed:** true, false

**Default:** false

**Notes:**

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**Example:**           enableDraft8 = false

enableDraft8

**Syntax:**           excludeWhenEmpty = *true|false*

**Description:**     Causes DCD to not send a parent Attribute-Value Pair (AVP) if all its child AVPs are empty.

**Type:**            Boolean

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

**Allowed:**         true, false

**Default:**        false

**Notes:**

**Example:**         excludeWhenEmpty = true

honour\_disconnect

**Syntax:**           honour\_disconnect = *true|false*

**Description:**     This is whether to use the RFC 3588 disconnect logic.

**Type:**            Boolean

**Optionality:**     Optional

**Allowed:**         true, false

**Default:**        false

**Notes:**           By default the RFC3588 disconnect logic is enabled. If your server incorrectly sends DPR messages, then disable this by setting to false.

**Example:**         honour\_disconnect = true

loggedInvalidPeriod

**Syntax:**           loggedInvalidPeriod = *period*

**Description:**     This is how often to announce the number of invalid messages.

**Type:**            Integer

**Optionality:**     Optional

**Allowed:**         Seconds

**Default:**        300

**Example:**         loggedInvalidPeriod = 300

loggedNotificationPeriod

**Syntax:**           loggedNotificationPeriod = *period*

**Description:**     This is how often to announce the number of recent message parse errors.

**Type:**            Integer

**Optionality:**     Optional

**Allowed:**         Seconds

**Default:**        300

**Example:**         loggedNotificationPeriod = 300

## NotificationFilter

<b>Syntax:</b>	<pre>NotificationFilter = {     CollectiveNotice =     PerPeerNotice = {} }</pre>
<b>Description:</b>	This section sets flags allowing the appropriate notification to be enabled or suppressed.
<b>Type:</b>	Section of boolean parameters
<b>Optionality:</b>	Optional, default used if not set
<b>Default:</b>	All values default to true (that is, statistics recording in DCD alarm log enabled).
<b>Notes:</b>	Settings are only applicable to statistics that are recorded in the DCD alarm log.
<b>Example:</b>	<pre>NotificationFilter = {     CollectiveNotice = true     PerPeerNotice = {         initial_request = true         update_request = true         termination_request = true         event_request = true         unknown_request = true         total_request = true         request_timeout = true         non_request_type_result_codes = true     } }</pre>

## CollectiveNotice

<b>Syntax:</b>	<pre>collectiveNotice = true false</pre>
<b>Description:</b>	Enables or suppresses the recording of CCR request type statistics.
<b>Type:</b>	Boolean
<b>Optionality:</b>	Optional (default used if not set).
<b>Allowed:</b>	<ul style="list-style-type: none"> <li>• true - enable CCR request type statistics</li> <li>• false - suppress CCR request type statistics</li> </ul>
<b>Default:</b>	true
<b>Notes:</b>	Counts are collective across all peers and not separated on a per peer basis.
<b>Example:</b>	<pre>collectiveNotice = true</pre>

## PerPeerNotice

<b>Syntax:</b>	<pre>PerPeerNotice = {request_type = true false&gt; list}</pre>
<b>Description:</b>	Enables/suppresses statistic counts per peer for both CCR and CCA for the listed CC_Request_types.
<b>Type:</b>	Section of boolean parameters
<b>Optionality:</b>	Optional (default used if not set).
<b>Allowed:</b>	Each request type can be set to: <ul style="list-style-type: none"> <li>• true (statistic enabled)</li> <li>• false (statistic suppressed)</li> </ul> See example for list of request types.
<b>Default:</b>	All values default to true (statistic enabled).
<b>Notes:</b>	

**Example:**

```
PerPeerNotice = {
    initial_request = true
    update_request = true
    termination_request = true
    event_request = true
    unknown_request = true
    total_request = true
    request_timeout = true
    non_request_type_result_codes = true
}
```

#### Origin-Host

**Syntax:** Origin-Host = "*diameterId*"  
**Description:** The Diameter AVP Origin-Host - fully qualified domain name.  
**Type:** String  
**Optionality:** Optional  
**Notes:** May be specified for each host. See *HostSpecificData parameters* (on page 87).  
**Example:** Origin-Host = "ocpc.oracle.com"

#### Origin-Realm

**Syntax:** Origin-Realm = "*diameterId*"  
**Description:** The Diameter AVP Origin-Realm.  
**Type:** String  
**Optionality:** Optional  
**Notes:** May be specified for each host. See *HostSpecificData parameters* (on page 87).  
**Example:** Origin-Realm = "ocpc.oracle.com"

#### Product-Name

**Syntax:** Product-Name = "*name*"  
**Description:** The Product name for CER/CEA.  
**Type:** String  
**Optionality:** Optional  
**Default:** empty  
**Example:** Product-Name = ""

#### rarResultCode

**Syntax:** rarResultCode = *integer*  
**Description:** What happens when diameterBeClient receives a Re-Auth-Request  
**Type:** Integer  
**Optionality:** Optional (default used if not set)  
**Allowed:** Any integer  
**Default:** rarResultCode = 3001, DIAMETER\_COMMAND\_UNSUPPORTED

- Notes:** When `diameterBeClient` receives a RAR:
- If the value is omitted or specified as 3001, it logs an error message and responds with Re-Auth-Answer (Result-Code=3001).
  - If a value other than 3001 is specified, it does not log an error message and responds with Re-Auth-Answer (Result-Code=the specified `rarResultCode`).

`diameterBeClient` takes no further action and does not send the Re-Auth-Request to `slee_acs`.

**Example:** `rarResultCode = 3001`

`rarsleeTimeout`

**Syntax:** `rarSLEETimeout = int`

**Description:** The number of seconds DCD will wait for a response from a RAR sent to the Diameter client via DCA

**Type:** Integer

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

**Allowed:** `>=0`

**Default:** 10

`scheme`

**Syntax:** `scheme= "type"`

**Description:** The global scheme to use.

**Type:** String

**Optionality:** If you use the `peerSchemes` section, then this is mandatory.

**Example:** `scheme = "schemeA"`

`serviceDomainInterfaceName`

**Syntax:** `serviceDomainInterfaceName = "name"`

**Description:** The interface name of the Diameter BE client (in `SLEE.cfg`).

**Type:** String

**Optionality:** Optional

**Default:** `dcdBeClient`

**Example:** `serviceDomainInterfaceName = "dcdBeClient"`

`serviceContextID`

**Syntax:** `serviceContextID = "ContextID"`

**Description:** The Diameter AVP Service-Context-Id.

**Type:** String

**Optionality:** Mandatory

**Example:** `serviceContextID = "ocpc@oracle.com"`

`statistics_interval`

**Syntax:** `statistics_interval = seconds`

**Description:** This is how often to record aggregate (average, min, max) latency statistics.

**Type:** Integer

**Optionality:** Mandatory

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**Allowed:** In seconds.  
**Default:** 300 (that is, 5 minutes)  
**Example:** `statistics_interval = 300`

### `timeout_x`

**Syntax:** `timeout_x = timer`  
**Description:** The RFC 4006 Tx timer.  
**Type:** Integer  
**Optionality:** Optional  
**Allowed:** In microseconds  
**Default:** 30000000  
**Example:** `timeout_x = 30000000`

### `trace_debug_flags`

**Syntax:** `trace_debug_flags = "flags"`  
**Description:** The debug flags to turn on if tracing (in the client) is requested by the actions library.  
**Type:** String  
**Optionality:** Optional  
**Default:** "all"  
**Example:** `trace_debug_flags = "all"`

### `transmit_limit`

**Syntax:** `transmit_limit = limit`  
**Description:** The maximum number of retransmits (including the original transmission) allowed for a message.  
**Type:** Integer  
**Optionality:** Optional  
**Example:** `transmit_limit = 2`

### `Vendor-Id`

**Syntax:** `Vendor-Id = ID`  
**Description:** The Vendor ID for CER/CEA.  
**Type:** Integer  
**Optionality:** Optional  
**Default:** 16247 (the Oracle Vendor-Id)  
**Notes:**

- This AVP can be configured as a sub-AVP to support *Vendor-Specific-Application-Id* (on page 49).
- It is mandatory to specify `vendorId` when configuring vendor specific AVPs for SCAP.

**Example:** `Vendor-Id = 16247`

## Vendor-Specific-Application-Id

<b>Syntax:</b>	Vendor-Specific-Application-Id = [ <pre>       {         Vendor-Id = int         #Auth-Application-Id = int         Acct-Application-Id = int       }       ]</pre>
<b>Description:</b>	Lists the Vendor specific AVPs required for enabling SCAP.
<b>Type:</b>	Parameter array
<b>Optionality:</b>	Optional (default used if not set).
<b>Allowed:</b>	
<b>Default:</b>	Parameter array is not specified.
<b>Notes:</b>	Do NOT set the global <i>Auth-Application-Id</i> (on page 42) if configuring this parameter array.
<b>Example:</b>	Vendor-Specific-Application-Id = [ <pre>       {         Vendor-Id = 123         Acct-Application-Id = 12345       }       ]</pre>

## DomainTypes

### Introduction

The `DomainTypes` section lists all the DCD domain types and the associated configuration.

**Note:** This section is mandatory, and it must include one domain type, with a name and scheme defined.

### DomainTypes parameters

Here is an example high-level structure showing the parameters for the `DomainTypes` section.

```

DomainTypes = [
{
  name = "DIAMETER"

  schemeName = "SchemeA"

  routing = "Round Robin"

  voidUnusedReservation = false

  releaseOnLowCredit = false

  defaultSessionFailover = 0
  defaultEventFailover = 0
  defaultFailureHandling = 0

  balanceEnquiryMethod = "balanceCheck"

  includeDcdCdrFields = false

  defaultFixedCostDuration = 86400

  conversionScale = 1
}
```

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```
enableScap = false
overwriteZeroCallAnswerTime = false

Domains = [
    {First_Domain
    }

    {Next_Domain
    }

]

AVPs = [

    {First_AVP
    }

    {Next_AVP
    }

    {...
    }

]

]
```

### balanceEnquiryMethod

**Syntax:** balanceEnquiryMethod = *"method"*

**Description:** The method to use to allow balance queries.

**Type:** String

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

**Allowed:**

- "balanceCheck" uses a Balance Check message with a Service Identifier set to "Information" to trigger the query, or
- "reqActionViewBalance" uses a special Requested-Action AVP with a value of VIEW\_BALANCE(5) to trigger the query

**Default:** "balanceCheck"

**Notes:**

**Example:** balanceEnquiryMethod = "balanceCheck"

### defaultEventFailover

**Syntax:** defaultEventFailover = *failover*

**Description:** The default event failover.

**Type:** Integer

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

**Allowed:** The failover corresponds to the values defined for Credit Control Failure Handling AVP in *RFC 4006*:

- 0 - Terminate
- 1 - Continue
- 2 - Retry and Terminate

**Default:** 0 (Failover not supported)

**Notes:** Until the BE responds for the event, the failover behavior is determined by this and the `defaultSessionFailover` parameter.



**Example:**            `defaultEventFailover = 0`

`defaultFailureHandling`

**Syntax:**            `defaultFailureHandling = number`

**Description:**     How to behave until a Credit-Control-Failure-Handling AVP (as defined in *RFC 4006*) is received from the server.

**Type:**             Integer

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

**Allowed:**          0 - Terminate  
                       1 - Continue  
                       2 - Retry and Terminate

**Default:**          0 (Terminate)

**Notes:**

**Example:**           `defaultFailureHandling = 0`

`defaultFixedCostDuration`

**Syntax:**            `defaultFixedCostDuration = duration`

**Description:**     The default time to use for free and fixed cost calls.

**Type:**             Integer

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

**Allowed:**          In seconds. May be any positive value.

**Default:**          86400 (one day)

**Notes:**

**Example:**           `defaultFixedCostDuration = 86400`

`defaultSessionFailover`

**Syntax:**            `defaultSessionFailover = failover`

**Description:**     The default session failover.

**Type:**             Integer

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

**Allowed:**          Corresponds to the values defined for Credit Control Failure Handling AVP in *RFC 4006*:

- 0 - Terminate
- 1 - Continue
- 2 - Retry and Terminate

**Default:**          0 (Failover not supported)

**Notes:**            Until the BE responds in a session, the failover behavior for a CC session is determined by this.

**Example:**           `defaultSessionFailover = 0`

`enableScap`

**Syntax:**            `enableScap = true|false`

**Description:**     If set to true, support for Ericsson SCAP (Service Charging Application Protocol) to DCD is enabled. This ensures SCAP type accounting messages are used for credit control, rather than CCR/CCA.

**Type:** Boolean  
**Optionality:** Optional (default used if not set).  
**Allowed:**

- true - enabled for SCAP compliance
- false - disabled for SCAP compliance

**Default:** false  
**Notes:**  
**Example:** enableScap = false

forceWalletReload

**Syntax:** forceWalletReload = true|false  
**Description:** Defines whether or not the cache may be used for balance inquiries.  
**Type:** Boolean  
**Optionality:** Optional (default used if not set).  
**Allowed:** true, false  
**Default:** false  
**Notes:**  
**Example:** forceWalletReload = true

includeDcdCdrFields

**Syntax:** includeDcdCdrFields = true|false  
**Description:** Whether or not to record the Result-Code in call EDRs.  
**Type:** Boolean  
**Optionality:** Optional (default used if not set).  
**Allowed:** true, false  
**Default:** false  
**Notes:** See *DCD EDR tags* (on page 91) for the list of DCD tags.  
**Example:** includeDcdCdrFields = false

insuffucientFundsDropCallResultCodes

**Syntax:** insufficientFundsDropCallResultCodes = [  
Integer  
Integer  
]  
**Description:** Indicates a call drop immediately without granting any further time reservation including the withheld ones without sending back a CCR-T.  
**Type:** Integer  
**Optionality:** Optional  
**Allowed:** Any predefined value  
**Default:** None  
**Notes:** insufficientFundsDropCallResultCodes parameter values are only enabled when voidUnusedReservation is set to false. If voidUnusedReservation set to true, insufficientFundsDropCallResultCodes parameter values are ignored and the default result codes, 4010 and 4012 are used.

**Example:**

```
insufficientFundsDropCallResultCodes = [
4013
4014
]
```

name

**Syntax:** name = "type"  
**Description:** The name of the Domain Type as defined in Prepaid Charging.  
**Type:** String  
**Optionality:** Mandatory  
**Allowed:** Defined in Prepaid Charging from available DIAMETER domain types on the **Domain** tab of the Service Management screen. Refer to *CCS User's Guide*.  
**Example:** name = "DIAMETER"

overwriteZeroCallAnswerTime

**Syntax:** overwriteZeroCallAnswerTime = true|false  
**Description:** Enables overwriting of the Charging-Start-Timestamp using the EventTimestamp.  
**Type:** Boolean  
**Optionality:** Optional (default used if not set).  
**Allowed:**

- true - overwrite charging start time
- false - if a call is not answered (that is, CallAnswerTime is zero) then set the charging start timestamp AVP to 'Jan 1, 1970 00:00:00.0000 UTC'.

**Default:** false  
**Notes:**  
**Example:** overwriteZeroCallAnswerTime = false

releaseOnLowCredit

**Syntax:** releaseOnLowCredit = true|false  
**Description:** Whether to terminate a session after the expiry of the initial reservation when the reservation length is less than or equal to the low credit buffer. When `releaseOnLowCredit` is set to:

- true, DCD terminates sessions after the expiry of the initial reservation
- false, DCD does not terminate the session

**Type:** Boolean  
**Optionality:** Required  
**Allowed:** true, false  
**Default:** false  
**Notes:** When a call session using DCD with the UATB feature node is approaching a credit threshold, the UATB node needs enough usage units to provide an insufficient funds message. You should set `releaseOnLowCredit` to false if you have configured Diameter servers to assume that unused units are still available for the client. Otherwise set `releaseOnLowCredit` to true to ensure that the client has enough unused units reserved for the insufficient funds message.  
The `releaseOnLowCredit` parameter should be placed immediately after the `voidUnusedReservation` parameter in the `eserv.config` file.  
**Example:** releaseOnLowCredit = false

## Chapter 5

### routing

<b>Syntax:</b>	<code>routing = "name"</code>
<b>Description:</b>	The algorithm to use when picking domains within the domain type.
<b>Type:</b>	String
<b>Optionality:</b>	Optional
<b>Allowed:</b>	<ul style="list-style-type: none"><li>• "Round Robin" (a weighted round robin algorithm)</li><li>• "Failover"</li></ul>
<b>Default:</b>	"Round Robin"
<b>Example:</b>	<code>routing = "Round Robin"</code>

### schemeName

<b>Syntax:</b>	<code>schemeName = "name"</code>
<b>Description:</b>	The name of the peer scheme to use with this domain type.
<b>Type:</b>	String
<b>Optionality:</b>	Mandatory
<b>Example:</b>	<code>schemeName = "SchemeA"</code>

### voidUnusedReservation

<b>Syntax:</b>	<code>voidUnusedReservation = true false</code>
<b>Description:</b>	Whether or not to void unused reservations.
<b>Type:</b>	Boolean
<b>Optionality:</b>	Optional
<b>Allowed:</b>	true, false
<b>Default:</b>	false
<b>Notes:</b>	Diameter states that the server and client should consider any previously reserved, but unused, time in a subsequent reservation as no longer reserved. This is counter to most telephony models, so is disabled by default. To enable (for this domain type), set this parameter to true.
<b>Example:</b>	<code>voidUnusedReservation = false</code>

## dynamicWalletReload

The `dynamicWalletReload` section defines the profile to use to determine whether or not to dynamically force wallet reloads. A wallet reload will be forced if the `profileFormat` value is one of the following:

- "INTEGER" and the data in the profile is 1 (stored as 4-bytes)
- "BOOLEAN" and the data in the profile is 1 (stored as a single byte)
- "STRING" and the data in the profile is one of:
  - "true"
  - "yes"
  - "y"
  - "1"

The parameters are defined in the *ContextCopy parameters* (on page 76) section.

#### Notes:

- Only the profile formats listed here will be supported, all other values will be ignored.
- The `forceWalletReload` parameter must be set to false (or not specified).

### Example dynamicWalletReload

Here are the example parameters.

```
dynamicWalletReload = {
  profileBlock = 17
  profileTag = 6357900
  profileFormat = "INTEGER"
}
```

### Domains parameters

Here is an example of the Domains section.

```
Domains = [
  {
    name = "myDomainA"

    routing = "Round Robin"

    realmFailureWaitSeconds = 20

    weighting = 1
  }
  {
    name = "myDomainB"

    routing = "Failover"

    realmFailureWaitSeconds = 20

    weighting = 1
  }
]
```

name

**Syntax:** name = "*name*"  
**Description:** The name of the domain as defined in Prepaid Charging.  
**Type:** String  
**Optionality:** Mandatory  
**Allowed:** Defined in Prepaid Charging from available DIAMETER domains on the **Domain** tab of the Service Management screen. Refer to *CCS User's Guide*.  
**Example:** name = "myDomainA"

realmFailureWaitSeconds

**Syntax:** ArraySize = *as*  
**Description:** How long we wait for a Realm that has had a failure before retrying it.  
**Type:** Integer  
**Optionality:** optional  
**Allowed:** in seconds  
**Default:** 30  
**Example:** realmFailureWaitSeconds = 20

## Chapter 5

### routing

<b>Syntax:</b>	<code>routing = "type"</code>
<b>Description:</b>	The routing type to use when picking Realms within this Domain.
<b>Type:</b>	String
<b>Optionality:</b>	Optional
<b>Allowed:</b>	<ul style="list-style-type: none"><li>• "Round Robin" (a weighted round robin algorithm)</li><li>• "Failover"</li></ul>
<b>Default:</b>	"Round Robin"
<b>Example:</b>	<code>routing = "Round Robin"</code>

### weighting

<b>Syntax:</b>	<code>weighting = weight</code>
<b>Description:</b>	The domain's weighting, if our Domain Type is using Round Robin routing.
<b>Type:</b>	Integer
<b>Optionality:</b>	Optional
<b>Allowed:</b>	
<b>Default:</b>	1
<b>Notes:</b>	<p>The weighting determines how many times the domain is used. The weightings of all the active domains are added together and the domain receives its percentage of usage.</p> <p>For example:</p> <ul style="list-style-type: none"><li>• myDomainA has a weighting of 1</li><li>• myDomainB a weighting of 1</li><li>• myDomainC a weighting of 2</li></ul> <p>myDomainA has 25% of the total usage. If myDomainC becomes unavailable, then myDomainA will have 50%.</p>
<b>Example:</b>	<code>weighting = 1</code>

## AVPs

In the `AVPs` section, we define (as a tree-like structure) the configurable AVP part of the message for every action that uses Diameter requests and responses.

A worked example is provided in the `eserv.config.default` file.

The actions for which configuration is required are:

- BadPINRequest, BadPINResponse
- ConfirmNamedEventReservationRequest, ConfirmNamedEventReservationResponse
- ConfirmTimeReservationRequest, ConfirmTimeReservationResponse
- CreateEDRRRequest, CreateEDRRResponse
- DirectNamedEventRequest, DirectNamedEventResponse
- DirectTimeChargeRequest, DirectTimeChargeResponse
- ExtendTimeReservationRequest, ExtendTimeReservationResponse
- GetNamedEventRatesRequest, GetNamedEventRatesResponse
- InitialTimeReservationRequest, InitialTimeReservationResponse
- NamedEventReservationRequest, NamedEventReservationResponse
- RevokeNamedEventReservationRequest, RevokeNamedEventReservationResponse
- RevokeTimeReservationRequest, RevokeTimeReservationResponse

- WalletRechargeRequest, WalletRechargeResponse
- WalletInfoRequest, WalletInfoResponse

## AVPs parameters

Here is an example of the AVPs section.

```

AVPs = [
  {
    name = "ConfirmNamedEventReservationRequest"
    mandatoryContents = [
      "Subscription-Id"
      "Service-Identifier"
      "NE-Used-Service-Unit"
    ]
    optionalContents = []
  }
  {
    avpCode = 443

    name = "Subscription-Id"
    type = "Grouped"
    mandatoryContents = [
      "Subscription-Id-Type"
      "Subscription-Id-Data"
    ]
    optionalContents = []
  }
  {
    avpCode = 450
    name = "Subscription-Id-Type"
    type = "Enumerated"

    literal = "0"          # END_USER_E164
  }
  {
    avpCode = 444
    name = "Subscription-Id-Data"
    type = "UTF8String"

    ccsConcept = "acsProfile"
    profileBlock = 18
    profileTag = 327686
    profileFormat = "LNSTRING"
    conditionProfileBlock = 17
    conditionProfileTag = 2009
    conditionValue = 14
  }
  {
    avpCode = 439
    name = "Service-Identifier"
    type = "Unsigned32"
    ccsConcept = "eventType"
    cdrTag = "DIAMETER_SERVICE_ID"
    cdrOperation = "replace"
  }
  {
    avpCode = 446
    name = "NE-Used-Service-Unit"
    type = "Grouped"
    mandatoryContents = [

```

```

        "CC-Service-Specific-Units-Used"
    ]
}
{
    avpCode = 417
    name = "CC-Service-Specific-Units-Used"
    type = "Unsigned64"
    ccsConcept = "numUnitsUsed"

    vendorId = 0
    flags = 0
    repeating = false
    maxOccurrences = 10
    conversion = [
        {
            esg = 1
            vendor = 2
            serviceProvider = 1
        }
        {
            esg = 3
            vendor = 2
            serviceProvider = 2
        }
    ]

    conversionScale = 1
    conversionRounding = "floor"
    interpretBase = 10

    octetLength = 0
}
{
    avpCode = 900
    vendorId = 16247
    name = "Custom-Scp-Action"
    type = "Enumerated"
    ccsConcept = "scpAction"
    repeating = true
}
{
    name = "DirectNamedEventRequest-Money Refund"
    mandatoryContents = [
        "Subscription-Id"
        "SOS-TopUp-RequestedAction"
        "Charging-Start-Timestamp"
    ]
}
{
    name = "SOS-TopUp-RequestedAction"
    type = "Enumerated"
    value = "5"
    avpCode = 436
}
{
    name = "WalletRechargeRequest"
    mandatoryContents = [
        "Subscription-Id"
        "TopUp-RequestedAction"
    ]
}

```



```

        "Charging-Start-Timestamp"
        "Topup-Amount"
        "Topup-Voucher-Number"
        "Topup-Voucher-Type"
        "Topup-Voucher-Id"
        "Topup-Voucher-Serial-Number"
        "Source-System-Id"
    ]
    optionalContents = [
        "Voucher-Recharge_Failed-Flag"
        "Voucher-Recharge_Failed_Date_Time"
        "Topup-Voucher-Balance-Validity-Start"
        "Topup-Voucher-Balance-Validity-Relative"
    ]
}

{
    name = "Voucher-Recharge_Failed-Flag"
    type = "Integer32"
    vendorId = 581
    avpCode = 50998
    ccsConcept = "voucherRechargeFailureFlag"
    includeIf = true
}

{
    name = "Voucher-Recharge_Failed-Date-Time"
    type = "Integer32"
    vendorId = 581
    avpCode = 50999
    ccsConcept = "voucherRechargeFailureDateTime"
    excludeWhenIn = "0"
}

{
    name = "TopUp-RequestedAction"
    type = "Enumerated"
    value = "4"
    avpCode = 436
}

{
    name = "Charging-Start-Timestamp"
    type = "Integer32"
    profileBlock = 18
    profileTag = 327999
    avpCode = 12000
}

{
    name = "Topup-Voucher-Number"
    avpCode = 12001
    ccsConcept = "voucherInfoVoucher"
    type = "Integer32"
}

{
    name = "Topup-Amount"
    avpCode = 12002
    type = "Grouped"
    mandatoryContents = [
        "Value-Digits"
    ]
}
]

```

```

        optionalContents = [
            "Exponent"
        ]
    }

    {
        name = "Value-Digits"
        avpCode = 12003
        ccsConcept = "voucherInfoValue"
        type = "Integer32"
    }

    {
        name = "Topup-Voucher-Type"
        avpCode = 12005
        ccsConcept = "voucherTypeName"
        type = "UTF8String"
    }

    {
        name = "Topup-Voucher-Id"
        vendorId = 581
        avpCode = 50026
        ccsConcept = "voucherInfoVoucherId"
        type = "Integer32"
    }

    {
        name = "Topup-Voucher-Serial-Number"
        avpCode = 12008
        ccsConcept = "voucherInfoVoucherSerialStr"
        type = "UTF8String"
    }

    {
        name = "Topup-Voucher-Balance-Validity-Start"
        avpCode = 12009
        ccsConcept = "voucherInfoBalanceValidityStart"
        type = "Time"
    }

    {
        name = "Topup-Voucher-Balance-Validity-Relative"
        avpCode = 12010
        type = "Grouped"
        optionalContents = [
            "Topup-Voucher-Balance-Validity-Offset"
            "Topup-Voucher-Balance-Validity-Type"
        ]
    }

    {
        name = "Topup-Voucher-Balance-Validity-Offset"
        avpCode = 12011
        ccsConcept = "voucherInfoBalanceValidityOffset"
        type = "Integer32"
    }

    {
        name = "Topup-Voucher-Balance-Validity-Type"
        avpCode = 12012
        ccsConcept = "voucherInfoBalanceValidityType"
    }

```

```

    type = "Enumerated"
  }
  {
    name = "WalletRechargeResponse"
    mandatoryContents = [
      "Topup-Balance-Information"
      "Topup-Receipt-Number"
    ]
  }
  {
    name = "Topup-Balance-Information"
    vendorId = 581 # Intec
    avpCode = 50030
    type = "Grouped"
    mandatoryContents = [
      "Topup-Balance-Type-ID"
    ]
    optionalContents = [
      "Topup-Balance-Expire-Date"
      "Topup-Unit-Value"
    ]
  }
  {
    name = "Topup-Balance-Type-ID"
    avpCode = 50020
    vendorId = 581 # Intec
    ccsConcept = "walletInfoBalanceType"
    type = "Integer32"
  }
  {
    name = "Topup-Balance-Expire-Date"
    vendorId = 581 # Intec
    avpCode = 50032
    ccsConcept = "walletInfoBalanceExpiry"
    type = "Integer32"
  }
  {
    name = "Topup-Unit-Value"
    vendorId = 581 # Intec
    avpCode = 50099
    type = "Grouped"
    mandatoryContents = [
      "Topup-Value-Digits"
    ]
    optionalContents = [
      "Topup-Exponent"
    ]
  }
  {
    name = "Topup-Value-Digits"
    avpCode = 50020
    vendorId = 581 # Intec
    ccsConcept = "walletInfoBalanceSystemValue"
    type = "Integer32"
  }
  {
    name = "Topup-Exponent"

```

```

    avpCode = 50199 # the ICD doesn't define this but it's not an issue
    for testing
    vendorId = 581 # Intec
    type = "Integer32"
}

{
    name = "Topup-Receipt-Number"
    avpCode = 50024
    type = "UTF8String"
}

{
    name = "CreateEDRRequest"
}

{
    name = "CreateEDRResponse"
}

{
    name = "BadPINRequest"
}

{
    name = "BadPINResponse"
}

{
    name = "Termination-Cause"
    avpCode = 295
    type = "Enumerated"
    ccsConcept = "terminationCause"
    conversion = [
        {
            esg = 8 # releasedNoFunds
            vendor = 6 # DIAMETER_AUTH_EXPIRED
        }
        {
            esg = 9 # disconnectedLegBNoFunds
            vendor = 6 # DIAMETER_AUTH_EXPIRED
        }
        {
            esg = 14 # callingPartyDisconnected
            vendor = 1 # DIAMETER_LOGOUT
        }
        {
            esg = 15 # calledPartyDisconnected
            vendor = 1 # DIAMETER_LOGOUT
        }
    ]
}
]
avpCode

```

**Syntax:** avpCode = *code*

**Description:** The numeric tag code that is to be set whenever an AVP of this type is created (for example, added to a request message). It can also be used to ascertain the type of AVP unpacked from a response message.

**Type:** Integer

**Optionality:** Mandatory  
**Example:** `avpCode = 888005`

`ccsConcept`

**Syntax:** `ccsConcept = "concept"`  
**Description:** The “CCS concept” to which the AVP directly relates.  
**Type:** String  
**Optionality:** Optional. Used by some, though not all AVPs.  
**Allowed:** The value is a string value, associated in the code with an enumeration. See *ccsConcepts* (on page 4).  
**Notes:** The AVPs are ultimately filled out from available "ccsConcepts". These represent variables available to the DCD actions library at the time of sending the message.  
**Example:** `ccsConcept = "acsProfile"`

`cdrTag`

**Syntax:** `cdrTag = "tag_name"`  
**Description:** The EDR tag name to amend the EDR record with, depending on the `cdrOperation` parameter value.  
**Type:** String  
**Optionality:** Optional  
**Allowed:** Alphanumeric characters only, plus underscore.  
**Default:** None  
**Notes:**

- `cdrTag` is optional, but if `cdrOperation` is specified then `cdrTag` must also be specified.
- For an AVP you can just specify `cdrTag`, then `cdrOperation` will default to "replace".
- The tag name should refer to a DCD tag, not one of the pre-defined ACS tags. Otherwise the operation will have no effect.

**Example:** `cdrTag = "CMX_EN"`

`cdrOperation`

**Syntax:** `cdrOperation = "operation"`  
**Description:** The operation to perform on the `cdrTag` value in the EDR record.  
**Type:** String  
**Optionality:** Optional - only referred to if `cdrTag` is non-blank.  
**Allowed:**

- `replace`
- `leave`
- `append`

Not case sensitive, for example `Replace = REPLACE = replace`  
**Default:** `replace`  
**Notes:**

- If `cdrOperation` is specified then `cdrTag` must also be specified.
- `replace` - if this tag is present, all instances are removed from the EDR and then append this instance to the EDR.
- `leave` - if this tag already exists, do nothing, otherwise append this instance to the EDR.

- `append` - regardless of existence or not of this tag, append this instance to the EDR.

**Example:** `cdrOperation = "replace"`

#### `conditionProfileBlock`

**Syntax:** `conditionProfileBlock = block_number`  
**Description:** The profile block to use for conditional AVP filling.  
**Type:** Integer  
**Optionality:** Optional (when omitted no condition checking is performed).  
**Allowed:** Any valid profile block number.  
**Default:** None  
**Notes:** If both the block and tag are specified, and there is no data in the location, then condition checking will fail and the AVP will *not* be populated.  
**Example:** `conditionProfileBlock = 17`

#### `conditionProfileTag - 1.0.4 - 94934`

**Syntax:** `conditionProfileTag = tag_number`  
**Description:** The profile block field to use for conditional AVP filling.  
**Type:** Integer  
**Optionality:** Optional (missing then no condition checking is performed).  
**Allowed:** Any valid profile field number.  
**Default:** None  
**Notes:** If both the block and tag are specified, and there is no data in the location, then condition checking will fail and the AVP will *not* be populated.  
**Example:** `conditionProfileTag = 2009`

#### `conditionValue`

**Syntax:** `conditionValue = condition`  
**Description:** The value to use to determine if AVP filling is to be performed.  
**Type:** Integer  
**Optionality:** Optional (default used if omitted).  
**Allowed:** Any positive integer.  
**Default:** 1  
**Notes:** This example populates the AVP if and only if profile block/tag contains value 14.  
**Example:** `conditionValue = 14`

#### `conversion`

**Syntax:** `conversion = [mapping]`  
**Description:** An array of integer values, defining a mapping from the Oracle enumeration to the billing vendor's equivalent enumeration value.  
`serviceProvider` is optional, and allows a limiting of a specific conversion to a single service provider.  
**Type:** Integer  
**Optionality:** Mandatory  
**Notes:** It is used if the AVP type is any of the integer types (including enumeration). This mapping is performed regardless of the `ccsConcept`, and is the responsibility of the AVP traverser, not the `ccsConcept` helper functions.

**Example:**

```

conversion = [
  {
    esg = 880
    vendor = 880880
    serviceProvider = 1
  }
  {
    esg = 890
    vendor = 890890
    serviceProvider = 2
  }
]

```

**esg****Syntax:**

```
esg = int
```

**Description:**

The integer value in the conversion array that indicates which equivalent value should be used by the billing vendor.

**Type:**

Integer

**Optionality:**

Mandatory

**Allowed:****Default:****Notes:**

This value differs based on the AVP that uses it.

For example, see *ACS Action handler* (on page 5) for `esg` values defined for the Termination-Cause AVP in the configuration.

**Example:**

```
esg = 3
```

**vendor****Syntax:**

```
vendor = int
```

**Description:**

The billing vendor's integer value in the conversion array that maps to the equivalent `esg` value.

**Type:**

Integer

**Optionality:**

Mandatory

**Allowed:****Default:**

**Notes:** This value differs based on the AVP that uses it.  
For example, the vendor values defined for the `Termination-Cause` AVP in the configuration are as follows:

Integer	Reason	Comment
1	DIAMETER_LOGOUT	The user initiated a disconnect
2	DIAMETER_SERVICE_NOT_PROVIDED	This value is used when the user disconnected prior to the receipt of the authorization answer message.
3	DIAMETER_BAD_ANSWER	This value indicates that the authorization answer received by the access device was not processed successfully.
4	DIAMETER_ADMINISTRATIVE	The user was not granted access, or was disconnected, due to administrative reasons, such as the receipt of a <code>Abort-Session-Request</code> message.
5	DIAMETER_LINK_BROKEN	The communication to the user was abruptly disconnected.
6	DIAMETER_AUTH_EXPIRED	The user's access was terminated since its authorized session time has expired.
7	DIAMETER_USER_MOVED	The user is receiving services from another access device.
8	DIAMETER_SESSION_TIMEOUT	The user's session has timed out, and service has been terminated.

**Example:** `vendor = 6`

```
serviceProvider
```

**Syntax:** `serviceProvider = int`

**Description:** If mentioned, the conversion is limited to the specific service provider.

**Type:** Integer

**Optionality:** Optional

**Allowed:**

**Default:**

**Notes:**

**Example:** `serviceProvider = 2`



`conversionScale`

<b>Syntax:</b>	<code>conversionScale = scale</code>
<b>Description:</b>	Defines a scaling of <code>esg</code> integer values to get server integer values.
<b>Type:</b>	Integer
<b>Optionality:</b>	Optional
<b>Allowed:</b>	Any integer
	If set to 0, uses the scale that was assigned to the server domain type and balance type. You can view the scaling factor from the <b>Third-Party Resource Scale</b> field in the <b>Balance Type Mapping</b> tab of the CCS Service Management screen. For more information, see <i>CCS User's Guide</i> .
<b>Default:</b>	1
<b>Notes:</b>	For request AVPs, positive means multiply and negative means divide. For response AVPs, positive means divide and negative means multiply. Any scaling occurs AFTER conversion rules defined above.
<b>Example:</b>	<code>conversionScale = -10</code> Convert incoming Diameter seconds into deci-seconds.

`conversionRounding`

<b>Syntax:</b>	<code>conversionRounding = "rounding_type"</code>
<b>Description:</b>	The conversion method to use between internal and server numeric values. If an AVP has the <code>conversionScale</code> parameter set, you can also configure <code>conversionRounding</code> . Otherwise, the <code>conversionRounding</code> parameter is ignored.
<b>Type:</b>	String
<b>Optionality:</b>	Optional (default used if not set).
<b>Allowed:</b>	<ul style="list-style-type: none"> <li>• floor - any fractions are dropped</li> <li>• ceiling - round up fractional parts</li> <li>• round - round to nearest whole number. That is, x.5 or higher will be rounded up and others will be rounded down</li> </ul>
<b>Default:</b>	floor - existing behavior is preserved
<b>Notes:</b>	
<b>Example:</b>	<code>conversionRounding = "round"</code>

`excludeIf`

<b>Syntax:</b>	<code>excludeIf = true false</code>
<b>Description:</b>	DCD outgoing messages will exclude AVP values that match this rule.
<b>Type:</b>	Boolean
<b>Optionality:</b>	Optional.
<b>Allowed:</b>	true, false
<b>Default:</b>	N/A
<b>Notes:</b>	The AVP <code>type</code> should be set to "Integer32". If <code>includeIf</code> is also defined then DCD logs a warning that the configuration is inconsistent. Depending on which parameter appears first in the configuration file DCD will load either <code>excludeIf</code> or <code>includeIf</code> , but not both.
<b>Example:</b>	<code>excludeIf = false</code>

## Chapter 5

### excludeIfMatches

<b>Syntax:</b>	<code>excludeIfMatches = "search_string"</code>								
<b>Description:</b>	DCD outgoing messages will exclude AVP values that match this rule. The AVP type should be set to "UTF8String".								
<b>Type:</b>	String								
<b>Optionality:</b>	Optional								
<b>Allowed:</b>	<table><tr><td><code>"search_string"</code></td><td>Check for the specified search string anywhere in the string</td></tr><tr><td><code>"^search_string\$"</code></td><td>Check the specified search string matches the whole string</td></tr><tr><td><code>"^search_string"</code></td><td>Check for the specified search string at the beginning of the string</td></tr><tr><td><code>"search_string\$"</code></td><td>Check for the specified search string at the end of the string</td></tr></table>	<code>"search_string"</code>	Check for the specified search string anywhere in the string	<code>"^search_string\$"</code>	Check the specified search string matches the whole string	<code>"^search_string"</code>	Check for the specified search string at the beginning of the string	<code>"search_string\$"</code>	Check for the specified search string at the end of the string
<code>"search_string"</code>	Check for the specified search string anywhere in the string								
<code>"^search_string\$"</code>	Check the specified search string matches the whole string								
<code>"^search_string"</code>	Check for the specified search string at the beginning of the string								
<code>"search_string\$"</code>	Check for the specified search string at the end of the string								
<b>Default:</b>	N/A								
<b>Notes:</b>	If <code>includeIfMatches</code> is also defined then DCD logs a warning that the configuration is inconsistent. Depending on which parameter appears first in the configuration file DCD will load either <code>excludeIfMatches</code> or <code>includeIfMatches</code> , but not both.								
<b>Example:</b>	<code>excludeIfMatches = "f006\$"</code>								

### excludeWhenIn

<b>Syntax:</b>	<code>excludeWhenIn = "range list"</code>														
<b>Description:</b>	DCD outgoing messages will exclude AVP values that match this rule.														
<b>Type:</b>	Integer														
<b>Optionality:</b>	Optional .														
<b>Allowed:</b>	<table><tr><td>delimited range</td><td>"x..y"</td></tr><tr><td>(numbers from x to y)</td><td></td></tr><tr><td>greater than or equal to x</td><td>"&gt;=x"</td></tr><tr><td>less than or equal to x</td><td>"&lt;=x"</td></tr><tr><td>any of the listed numbers x, y or z</td><td>"x,y,z"</td></tr><tr><td>(list may be any length)</td><td></td></tr><tr><td>a single number x</td><td>"x"</td></tr></table>	delimited range	"x..y"	(numbers from x to y)		greater than or equal to x	">=x"	less than or equal to x	"<=x"	any of the listed numbers x, y or z	"x,y,z"	(list may be any length)		a single number x	"x"
delimited range	"x..y"														
(numbers from x to y)															
greater than or equal to x	">=x"														
less than or equal to x	"<=x"														
any of the listed numbers x, y or z	"x,y,z"														
(list may be any length)															
a single number x	"x"														
<b>Default:</b>	N/A														
<b>Notes:</b>	The AVP <code>type</code> should be set to "Integer32". If <code>includeWhenIn</code> is also defined then DCD logs a warning that the configuration is inconsistent. Depending on which parameter appears first in the configuration file DCD will load either <code>excludeWhenIn</code> or <code>includeWhenIn</code> , but not both.														
<b>Example:</b>	<code>excludeWhenIn = "1..99"</code>														

### flags

<b>Syntax:</b>	<code>flags = number</code>
<b>Description:</b>	What flags to override in the AVP header (as octet value). For example, for M, V bits: <code>flags = 192</code>
<b>Type:</b>	Integer

**Optionality:** Optional (default used if not set).  
**Allowed:**  
**Default:** 0  
**Notes:** If the `vendorID` parameter value is greater than zero, then V-bit will be set regardless.  
**Example:** `flags = 192`

#### `includeIf`

**Syntax:** `includeIf = true|false`  
**Description:** DCD outgoing messages will include AVP values that match this rule.  
**Type:** Boolean  
**Optionality:** Optional.  
**Allowed:** true, false  
**Default:**  
**Notes:** The AVP `type` should be set to "Integer32".  
 If `excludeIf` is also defined then DCD logs a warning that the configuration is inconsistent. Depending on which parameter appears first in the configuration file DCD will load either `excludeIf` or `includeIf`, but not both.  
**Example:** `includeIf = true`

#### `includeIfMatches`

**Syntax:** `includeIfMatches = "search_string"`  
**Description:** DCD outgoing messages will include AVP values that match this rule.  
**Type:** Integer  
**Optionality:** Optional .  
**Allowed:**

- `search_string` Check for the specified search string anywhere in the string
- `^search_string$` Check the specified search string matches the whole string
- `^search_string` Check for the specified search string at the beginning of the string
- `search_string$` Check for the specified search string at the end of the string

**Default:** N/A  
**Notes:** The AVP `type` should be set to "UTF8String".  
 If `excludeIfMatches` is also defined then DCD logs a warning that the configuration is inconsistent. Depending on which parameter appears first in the configuration file DCD will load either `excludeIfMatches` or `includeIfMatches`, but not both.  
**Example:** `includeIfMatches = "^f003"`

#### `includeWhenIn`

**Syntax:** `includeWhenIn = "range|list"`  
**Description:** DCD outgoing messages will include AVP values that match this rule.  
**Type:** Integer

<b>Optionality:</b>	Optional.
<b>Allowed:</b>	delimited range "x..y" (numbers form x to y) greater than or equal to x ">=x" less than or equal to x "<=x" any of the listed numbers x, y or z "x,y,z" (list may be any length) a single number x "x"
<b>Default:</b>	N/A
<b>Notes:</b>	If <code>includeWhenIn</code> is also defined, then DCD logs a warning that the configuration is inconsistent. Depending on which parameter appears first in the configuration file DCD will load either <code>excludeWhenIn</code> or <code>includeWhenIn</code> , but not both.
<b>Example:</b>	<code>includeWhenIn = "12,14,16,-18,20,22"</code>

### `interpretBase`

<b>Syntax:</b>	<code>interpretBase = number</code>
<b>Description:</b>	Defines the base to use when interpreting numbers that are stored as strings.
<b>Type:</b>	Integer
<b>Optionality:</b>	Optional (default used if not set).
<b>Allowed:</b>	<ul style="list-style-type: none"> <li>• 0 - see notes</li> <li>• 8 - octal</li> <li>• 10 - decimal</li> <li>• 16 - hexadecimal</li> </ul>
<b>Default:</b>	10 (decimal)
<b>Notes:</b>	If the configured value is 0 then strings will be interpreted in the order of decimal constant, octal constant or hexadecimal constant. Any of these may be preceded by a + or a - sign. A: <ul style="list-style-type: none"> <li>• Decimal constant - begins with a non-zero digit and consists of a sequence of decimal digits</li> <li>• Octal constant - has a prefix of 0 (zero) followed by a sequence of the digits 0 to 7, or</li> <li>• Hexadecimal constant - has a prefix of 0x or 0X followed by a sequence of the decimal digits and letters a (or A) to f (or F).</li> </ul>
<b>Example:</b>	<code>interpretBase = 10</code>

### `literal`

<b>Syntax:</b>	<code>literal = "value"</code>
<b>Description:</b>	A literal value.
<b>Type:</b>	String
<b>Optionality:</b>	Optional
<b>Default:</b>	empty
<b>Notes:</b>	<ul style="list-style-type: none"> <li>• In some cases where we use the AVP definition to create a request message, we may wish to simply specify a literal value rather than obtain the information from a <code>ccsConcept</code> field. In these cases we specify the value here, in string form, and it will be converted to the required type when requested from the configuration AVP object.</li> </ul>

- This parameter was previously "value".

**Example:** `literal = "1"`

`mandatoryContents`

**Syntax:** `mandatoryContents = "avps"`

**Description:** A simple string array, applicable to AVPs of type "Grouped" and those with no type, specifying the AVPs (by name) that must be included in this AVP

**Type:** String array

**Optionality:** Optional

**Default:** empty

**Example:** `mandatoryContents = [
 "Subscription-Id-Type"
 "Subscription-Id-Data"
]`

`maxOccurrences`

**Syntax:** `maxOccurrences = value`

**Description:** The number of repeating AVPs (whether a group or an individual field). It does not actually limit how many AVPs can be processed; it limits how the AVP is physically 'unloaded' into a contiguous range of profile variables.

**Type:** Integer

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

**Allowed:**

**Default:** 0 - The default value means that all AVP values are unloaded into the same configured profile block/tag (admittedly not very useful, but this ensures backwards compatibility).

**Notes:** To unload an array of AVPs into a \*series\* of profile tag variables `maxOccurrences` is set to the number of different values to be captured.

The first will be unloaded into the profile tag configured for the AVP.

The second will be unloaded into that tag+1, and so on.

**Note:** When unloading a repeating group the specially-defined variable 'index' can be obtained by coding an AVP with `variable="index"`. This takes the value of the current loop index.

**Example:** `maxOccurrences = 10`

`name`

**Syntax:** `name = "name"`

**Description:** The name of the AVP, which can be used by the code for direct retrieval, as well as logging and debug messages.

**Type:** String

**Optionality:** Mandatory

**Example:** `name = "CC-Money"`

`octetLength`

**Syntax:** `octetLength = value`

**Description:** How many bytes to use for integer quantities, if the `type` is "OctetString".

**Type:** Integer  
**Optionality:** Optional  
**Allowed:** Should be a number 0 through 4.  
**Notes:** 0 is a special case meaning encode the value as an ASCII string, and determine the number of bytes from the string size. For responses the values 1-4 simply mean treat as integer encoded, and use the number of bytes given.  
**Example:** `octetLength = 0`

`optionalContents`

**Syntax:** `optionalContents = "avps"`  
**Description:** A simple string array, applicable to AVPs of type "Grouped" and those with no type, specifying the AVPs (by name) that may be included in this AVP  
**Type:** String  
**Optionality:** Optional  
**Default:** empty  
**Example:**

```
optionalContents = [  
    "Service-Identifier"  
    "Requested-Service-Unit"  
    "Subscription-Id"  
]
```

`profileBlock`

**Syntax:** `profileBlock = num`  
**Description:** The profile block  
**Type:** Integer  
**Optionality:** Used only if the `ccsConcept` field is a profile variable.  
**Allowed:** The value given for this is a number, and must be valid for a profile block (that is, in the range 0 through 18).  
**Notes:** This parameter is used to identify the profile block it will be stored into/retrieved from. See also the related parameters, `profileTag` and `profileFormat`.  
**Example:** `profileBlock = 9`

`profileFormat`

**Syntax:** `profileFormat = "format"`  
**Description:** The format of the profile.  
**Type:** String  
**Optionality:** Used only if the `ccsConcept` field is a profile variable.  
**Allowed:** The value given for this must be one of the valid storage formats for ACS profile fields. The allowable values for this parameter are:

- STRING
- NSTRING
- LNSTRING
- INTEGER
- UNSIGNED64
- RAW
- TIME
- BOOLEAN
- ARRAY

**Default:** INTEGER  
**Notes:** This parameter is used to identify its storage format. See also the related parameters, `profileBlock` and `profileTag`.  
**Example:** `profileFormat = "LNSTRING"`

#### `profileTag`

**Syntax:** `profileTag = num`  
**Description:** The profile tag.  
**Type:** Integer  
**Optionality:** Used only if the `ccsConcept` field is a profile variable.  
**Notes:** This parameter is used to identify the profile tag it will be stored into/retrieved from. See also the related parameters, `profileBlock` and `profileFormat`.  
**Example:** `profileTag = 999`

#### `repeating`

**Syntax:** `repeating = true|false`  
**Description:** Allows the configuration-driven code to recognize that there may be a number of repeating instances of this AVP in its containing group, not just one.  
**Type:** Boolean  
**Optionality:** Mandatory  
**Allowed:** true, false  
**Notes:** In the building of a request, repeating AVPs are added until the `getConcept` call indicates no more concept data is available. In the unpacking of a response, repeating AVPs are extracted (and `setConcept` calls made) until the Diameter stack indicates there are no more to retrieve.  
**Example:** `repeating = true`

#### `signInversion`

**Syntax:** `signInversion = true | false`  
**Description:** When this parameter is true it converts the value from positive to negative and vice versa for AVP types of `Integer32` and `Integer64`. If this parameter is true for an AVP then:

- An outbound positive DCD concept value will be converted to a negative value in the AVP.
- An outbound negative DCD concept value will be converted to positive value in the AVP.
- An inbound positive AVP value will be converted to a negative DCD concept value.
- An inbound negative AVP value will be converted to a positive DCD concept value.

**Type:** Boolean  
**Optionality:** Optional (default used if not set)  
**Allowed:** true, false  
**Default:** false  
**Notes:**  
**Example:** `signInversion = true`

type

<b>Syntax:</b>	<code>type = "type"</code>
<b>Description:</b>	The type of AVP
<b>Type:</b>	String
<b>Optionality:</b>	There is a scenario where type may be omitted altogether. When defining the AVPs that make up a request message, you can list them as mandatory or optional contents in an AVP that has no other information. This means the contents should be directly placed into the request message without (for example) an intervening group.
<b>Allowed:</b>	This is a string value that, if specified, must be the name of any previously defined AVP in the configuration, or one of the following base types that are described in the Diameter RFC 3588 specification: <ul style="list-style-type: none"> <li>• OctetString</li> <li>• Integer32</li> <li>• Integer64</li> <li>• Unsigned32</li> <li>• Unsigned64</li> <li>• Grouped</li> <li>• Address</li> <li>• Time</li> <li>• UTF8String</li> <li>• DiameterIdentity</li> <li>• DiameterURI</li> <li>• Enumerated</li> </ul>

**Note:** Float32 and Float64, although defined in RFC 3588, are not supported. This is because CCS does not use floating point values.

**Notes:** Specify the name of a previously defined AVP when you want to relate two CCS concept fields to the same base type without having to repeat the full definition of that base type. All the attributes of the base type are inherited except the base type name, repeating attribute and ccsConcept value.

**Example:** `type = "Grouped"`

vendorId

<b>Syntax:</b>	<code>vendorId = ID</code>
<b>Description:</b>	A number that identifies the vendor ID of the corresponding Diameter AVP.
<b>Type:</b>	Integer
<b>Optionality:</b>	Optional
<b>Default:</b>	0
<b>Notes:</b>	It will be used whenever we have to insert this AVP into a request message.
<b>Example:</b>	<code>vendorId = 0</code>

## Example cdrTag/Operation configuration

The `cdrTag` and `cdrOperation` parameters can be used by any AVP/ccsConcepts pairing.

The following is just an example of how to configure these parameters.

```
{
```



```

# This 'AVP' simply defines the list of AVPs for a direct named event
reservation.

# Give this AVP a position in the configuration 'tree'. This is just
# a label to allow representation of the tree to the actions library.
name = "DirectNamedEventRequest"

# Define the list of AVPs (by name) for this node. Note that the AVPs are at the
# sibling level for this node if there are no type or avpCode parameters for this
node.
# An error will occur if mandatory contents are not available, but non-present
optional
# contents are silently ignored.
mandatoryContents = [
    "Service-Identifier"
    "ChargingMaxEventClassAndEventName"
]
optionalContents = []
}
{

avpCode = 13000
name = "ChargingMaxEventClassAndEventName"
type = "Grouped"
mandatoryContents = [
    "CMX-eventClass"
    "CMX-eventName"
    "DIA-Service-Identifier"
]
optionalContents = []
}
{

avpCode = 13001
name = "CMX-eventClass"
ccsConcept = "eventClass"
type = "UTF8String"
cdrTag = "CMX_EC"
cdrOperation = "append"
}
{

avpCode = 13002
name = "CMX-eventName"
ccsConcept = "eventName"
type = "UTF8String"
cdrTag = "CMX_EN"
cdrOperation = "leave"
}
{
# This 'AVP' represents the RFC 4006 Service-Identifier.
avpCode = 439
name = "DIA-Service-Identifier"
type = "Unsigned32"
ccsConcept = "eventType"
cdrTag = "DIA_SI"
cdrOperation = "replace"
}
...

```

## ContextCopy parameters

The ContextCopy section defines the profiles in which DCD call context data may be copied to at call time. This is normally for the purposes of control plan branching.

### Example ContextCopy section

Here is an example of the ContextCopy section.

```
ContextCopy = [
{
  contextItem = "scpActionSupervise"
  profileBlock = 17
  profileTag = 6356992 # Hex 0x00610000
  profileFormat = "INTEGER"
}
{
  contextItem = "scpActionDoNotSupervise"
  profileBlock = 17
  profileTag = 6356993 # Hex 0x00610001
  profileFormat = "INTEGER"
}
{
  contextItem = "scpActionRelease"
  profileBlock = 17
  profileTag = 6356994 # Hex 0x00610002
  profileFormat = "INTEGER"
}
{
  contextItem = "scpActionSendMessage"
  profileBlock = 17
  profileTag = 6356995 # Hex 0x00610003
  profileFormat = "INTEGER"
}
{
  contextItem = "scpActionPlayAnnouncement"
  profileBlock = 17
  profileTag = 6356996 # Hex 0x00610004
  profileFormat = "INTEGER"
}
{
  contextItem = "scpActionSuperviseWithoutControlling"
  profileBlock = 17
  profileTag = 6356997 # Hex 0x00610005
  profileFormat = "INTEGER"
}
{
  contextItem = "callState"
  profileBlock = 17
  profileTag = 6356998 # Hex 0x00610006
  profileFormat = "INTEGER"
}
{
  contextItem = "sendCount"
  profileBlock = 17
  profileTag = 6356999 # Hex 0x00610007
  profileFormat = "INTEGER"
}
{
  contextItem = "preCallAnnouncementId"
  profileBlock = 17
  profileTag = 6357000 # Hex 0x00610008
  profileFormat = "INTEGER"
}
]
```

```

    {
        contextItem = "preCallLowBalance"
        profileBlock = 17
        profileTag = 6357001 # Hex 0x0061009
        profileFormat = "INTEGER"
    }
]

```

contextItem

**Syntax:** contextItem = "name"

**Description:** The name of the DCD context item from the allowed list.

**Type:** String

**Optionality:** Optional

**Allowed:**

- "scpActionSupervise"
- "scpActionDoNotSupervise"
- "scpActionRelease"
- "scpActionSendMessage"
- "scpActionPlayAnnouncement"
- "scpActionSuperviseWithoutControlling"
- "callState"
- "sendCount"
- "preCallAnnouncementId"
- "preCallLowBalance"

**Default:**

**Notes:** All the supported context items are listed in the example.

**Example:** contextItem = "scpActionSupervise"

profileBlock

**Syntax:** profileBlock = val

**Description:** The profile block to use.

**Type:** Integer

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

**Allowed:**

**Default:**

**Notes:** Examples all use 17 (temporary storage)

**Example:** profileBlock = 17

profileFormat

**Syntax:** profileFormat = "format"

**Description:** The profile tag format

**Type:** String

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

**Allowed:**

- "INTEGER"
- "STRING"
- "TIME"

**Default:**

**Notes:**

**Example:** `profileFormat = "INTEGER"`

`profileTag`

**Syntax:** `profileTag = decimal`

**Description:** The profile tag in which to store data.

**Type:** Integer

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

**Allowed:**

**Default:**

**Notes:** Example tag values are all in the DCD range (0x0061nnnn), but will need to be configured in ACS and Prepaid Charging before they are available for use.

In the example, 6356992 is value of Hex 0x00610000

**Example:** `profileTag = 6356992`

### TimeIn and TimeOut

TimeIn and TimeOut are used to copy a timestamp at the beginning of a call (TimeIn), and recording elapsed time during a call (TimeOut). If present, the timestamps will be stored in the configured profile fields.

- TimeIn - the time the CCA was received by the SLC from the VWS
- TimeOut - the time the CCR was sent from the SLC to the VWS

These parameters are optional - if omitted, no timestamps will be recorded.

Example tag values are all in the DCD range (0x0061nnnn), but will need to be configured in ACS and Prepaid Charging before they are available for use.

The parameters are defined in the *ContextCopy parameters* (on page 76) section.

#### Example TimeIn and TimeOut

Here are the example parameters.

```
TimeIn = {
    profileBlock = 17
    profileTag = 6357002 # Hex 0x006100a, continuing from example ContextCopy
    values
    profileFormat = "TIME"
}
TimeOut = {
    profileBlock = 17
    profileTag = 6357003 # Hex 0x006100b
    profileFormat = "TIME"
}
```

## PeerSchemes Configuration Section

### Example PeerSchemes

Here is a high level structure of the configuration of a scheme in the `PeerSchemes` section.

**Note:** The `PeersSchemes` or `Peers` section is mandatory.

```
PeerSchemes = [
{
    schemeName = "SchemeA"
```

```

Peers = [
{
    name = "host1"

    scheme = [ "scheme1", "scheme2" ]

    permittedOriginHosts = [
        "host1.realm1.oracle.com"
    ]

    peer_group = "host1"

    transport = "tcp"

    initiation = "connect"

    RemoteAddresses = [
        "192.168.1.10"
    ]

    remote_port = 3868

    netmask6Bits = 128

    netmaskBits = 32

    permittedInstances = 0

    reqSctpInboundStreams = 8
    reqSctpOutboundStreams = 8

    sctp_hbinterval = 1000

    watchdogPeriod = 30

    connectionTimeout = 30

    inBufferSize = 0
    outBufferSize = 0

} # end of Peer host1

{
    Peer_Host2_Parameters
}
]
} # End of Scheme A

{
    schemeName = "SchemeB"

    Peers = [

        Parameters_for_SchemeB_peers

    ]
} # End of Scheme B
] # End of PeerSchemes section

```

schemeName

<b>Syntax:</b>	schemeName = "name"
<b>Description:</b>	The name identifying the scheme.
<b>Type:</b>	String
<b>Optionality:</b>	Mandatory
<b>Example:</b>	schemeName = "SchemeA"

### Peer host parameters

The following parameters are used for a peer host. They are found within the `Peers` section.

**Note:** The `PeerSchemes` or `Peers` section is mandatory.

The available parameters are:

```
{
    name = "host1"

    scheme = [ "scheme1", "scheme2" ]

    permittedOriginHosts = [
        "host1.realm1.oracle.com"
    ]

    peer_group = "host1"

    transport = "tcp"

    initiation = "connect"

    RemoteAddresses = [
        "192.168.1.10"
    ]

    remote_port = 3868

    netmask6Bits = 128

    netmaskBits = 32

    permittedInstances = 0

    reqSctpInboundStreams = 8
    reqSctpOutboundStreams = 8

    sctp_hbinterval = 1000

    watchdogPeriod = 30

    connectionTimeout = 30

    inBufferSize = 0
    outBufferSize = 0
} # end of Peer host1
```

**Note:** All the peer configuration items from "transport" on down can also have global defaults set in the `DIAMETER.DCD` section. See *DCD* (on page 41).

`connectionTimeout`

**Syntax:** `connectionTimeout = timeout`  
**Description:** The timeout for re-establishing connections (*RFC 3588 Tc*).  
**Type:** Integer  
**Optionality:** Optional  
**Allowed:** in seconds  
**Default:** 30  
**Example:** `connectionTimeout = 30`

`inBufferSize`

**Syntax:** `inBufferSize = size`  
**Description:** The size of the socket receive buffer.  
**Type:** Integer  
**Optionality:** Mandatory  
**Allowed:** in bytes  
**Default:** 0 (means to use the OS default)  
**Example:** `inBufferSize = 0`

`initiation`

**Syntax:** `initiation = "action"`  
**Description:** How to start the connection.  
**Type:** String  
**Optionality:** Mandatory  
**Allowed:**

- `listen` = listen for incoming connections
- `connect` = connect an outgoing connection.

**Example:** `initiation = "connect"`

`name`

**Syntax:** `name = "name"`  
**Description:** The name identifying either peer or group of peers.  
**Type:** String  
**Optionality:** Mandatory  
**Example:** `name = "host1"`

`netmaskBits`

**Syntax:** `netmaskBits = bits`  
**Description:** The number of bits for netmask.  
**Type:** Integer  
**Optionality:** Mandatory  
**Default:** 32 (bits for netmask, that is, a single machine (/32))  
**Example:** `netmaskBits = 32`

### netmask6Bits

**Syntax:** netmask6Bits = *bits*  
**Description:** The number of bits for the IP version 6 prefix  
**Type:** Integer  
**Optionality:** Mandatory  
**Default:** 128 (bits for the address prefix, that is, a single machine (/128))  
**Example:** netmask6Bits = 128

### outBufferSize

**Syntax:** outBufferSize = *size*  
**Description:** The size of the socket send buffer.  
**Type:** Integer  
**Optionality:** Mandatory  
**Allowed:** in bytes  
**Default:** 0 (means to use the OS default)  
**Example:** outBufferSize = 0

### peer\_group

**Syntax:** peer\_group = "*name*"  
**Description:** The peer group that the peer host connects to. If multiple peer hosts belong to the peer group, only one peer host is connected.  
The peer group works in failover mode only; it does not support round-robin mode.  
**Type:** String  
**Optionality:** Optional  
**Default:** Defaults to the value specified by the *name* parameter. For example, if the *name* parameter is set to "host1", *peer\_group* defaults to "host1".  
**Example:** peer\_group = "host1"

### permittedInstances

**Syntax:** permittedInstances = *number*  
**Description:** The number of permitted instances.  
**Type:** Integer  
**Optionality:** Mandatory  
**Notes:** If set to 0 then allow all.  
**Example:** permittedInstances = 0

### permittedOriginHosts

**Syntax:** permittedOriginHosts = [*host*]  
**Description:** The list of peer names that will be checked against the OriginHost AVP during the capabilities exchange.  
**Type:** String  
**Optionality:** Mandatory  
**Notes:** This parameter accepts at least one host and will accept any one of them when it gets the Capabilities Exchange Answer. These are the hosts allowed to talk to this client.



**Example:**

```
permittedOriginHosts = [
  "host1.realm1.oracle.com"
  "host2.realm1.oracle.com"
]
```

remote\_port

**Syntax:** remote\_port = *number*  
**Description:** The remote post number.  
**Type:** Integer  
**Optionality:** Optional  
**Default:** Defaults to the RFC specified 3868  
**Example:** remote\_porp = 3868

RemoteAddresses

**Syntax:** remoteAddresses = ["ipaddress"]  
**Description:** The list of remote IP addresses.  
**Type:** Array of string parameters  
**Optionality:** Mandatory  
**Notes:** If an address becomes unavailable the list will be cycled through.  
**Example:**

```
remoteAddresses = [
  "192.168.1.10"
]
```

reqSctpInboundStreams

**Syntax:** reqSctpInboundStreams = *number*  
**Description:** The number of requested inbound sctp streams.  
**Type:** Integer  
**Optionality:** Mandatory  
**Notes:** There is no guarantee you will actually get these.  
**Example:** reqSctpInboundStreams = 8

reqSctpOutboundStreams

**Syntax:** reqSctpOutboundStreams = *number*  
**Description:** The number of requested outbound sctp streams.  
**Type:** Integer  
**Optionality:** Mandatory  
**Notes:** There is no guarantee you will actually get these.  
**Example:** reqSctpOutboundStreams = 8

scheme

**Syntax:** scheme = [ "scheme", "scheme" ]  
**Description:** The list of schemes to which you have limited the peer.  
**Type:** Array of strings  
**Optionality:** If using PeerSchemes this is mandatory.  
**Allowed:** Names of configured schemes.

**Example:** `scheme = [ "scheme1", "scheme2" ]`

`sctp_hbinterval`

**Syntax:** `sctp_hbinterval = interval`

**Description:** The interval for sctp heartbeats.

**Type:** Integer

**Optionality:** Optional

**Allowed:** in milliseconds

**Default:** 1000

**Example:** `sctp_hbinterval = 1000`

`transport`

**Syntax:** `transport = "type"`

**Description:** The protocol for this host peer.

**Type:** String

**Optionality:** Optional

**Allowed:**

- sctp
- tcp

**Default:** If not specified, then it uses the one from the global DCD section.

**Example:** `transport = "tcp"`

`watchdogPeriod`

**Syntax:** `watchdogPeriod = period`

**Description:** The quiet period before sending a DWR. (*RFC 3588 Tw*).

**Type:** Integer

**Optionality:** Mandatory

**Allowed:** in seconds

**Default:** 30

**Example:** `watchdogPeriod = 30`

## Routes

### Introduction

The `Routes` section is used to specify the routing configuration for the BeClient, that is, how to select a peer of the realm.

### Routes parameters

Here is an example routes section of the `DIAMETER` section of the `eserv.config` file.

```
routes = [  
  {  
    realm = "FirstRealm"  
    host = "host1.realm1.oracle.com"  
  
    priority = 1  
    round_robin = 0  
    direct = true
```

```

    }
  ]
direct

```

**Syntax:** `direct = true|false`

**Description:** Whether this is a direct server connection, or if a proxy/agent is used.

**Type:** Boolean

**Optionality:** Optional

**Allowed:** true, false

**Default:** true

**Notes:** May be specified for each host. See *HostSpecificData parameters* (on page 87).

**Example:** `direct = true`

```
host
```

**Syntax:** `host = "permitted_origin_host"`

**Description:** The host name of the next-hop as configured in `DCD.Peers.permittedOriginHosts` for the relevant peer.

**Type:** String

**Optionality:** Mandatory

**Allowed:** This is the `permittedOriginHosts` value of the peer.  
May be specified for each host. See *HostSpecificData parameters* (on page 87).

**Example:** `host = "host1.realm1.oracle.com"`

```
priority
```

**Syntax:** `priority = priority`

**Description:** The priority of the route.

**Type:** Integer

**Optionality:** Optional

**Notes:** Only those routes with the lowest priority are used.  
May be specified for each host. See *HostSpecificData parameters* (on page 87).

**Example:** `priority = 1`

```
realm
```

**Syntax:** `realm = name`

**Description:** The Realm identity.

**Type:** String

**Optionality:** Mandatory

**Allowed:** As configured in the **Domain** tab of the Service Management screen. Refer to *CCS User's Guide* for details.  
May be specified for each host. See *HostSpecificData parameters* (on page 87).

**Example:** `realm = "FirstRealm"`

```
round_robin
```

**Syntax:** `round_robin = weight`

**Description:** The weight for round\_robin selection.

**Type:** Integer

<b>Optionality:</b>	Optional
<b>Default:</b>	0
<b>Notes:</b>	Zero indicates a failover type selection. See <i>routing</i> (on page 54) for details. May be specified for each host. See <i>HostSpecificData parameters</i> (on page 87).
<b>Example:</b>	<code>round_robin = 0</code>

## NamedEventTypes

### Introduction

The `NamedEventTypes` section is used to define a mapping from the Prepaid Charging descriptor of a named event (the `eventClass` and `eventName`) to a single integer (`eventType`) for availability to the Service-Identifier AVP.

### NamedEventTypes parameters

Here is an example of the `NamedEventTypes` section.

```
NamedEventTypes = [
  {
    eventClass = "abc"
    eventName = "def"
    eventType = 123
    isDebit = true
  }
  {
    eventClass = "ghi"
    eventName = "jkl"
    eventType = 456
  }
]
```

#### eventClass

<b>Syntax:</b>	<code>eventClass = "class"</code>
<b>Description:</b>	The event class.
<b>Type:</b>	String
<b>Optionality:</b>	Optional
<b>Allowed:</b>	Defined on the <b>Named Event</b> tab on the Rating Management screen. Refer to <i>CCS User's Guide</i> for details.
<b>Example:</b>	<code>eventClass = "abc"</code>

#### eventName

<b>Syntax:</b>	<code>eventName = "name"</code>
<b>Description:</b>	The event name.
<b>Type:</b>	String
<b>Optionality:</b>	Optional
<b>Allowed:</b>	Defined on the <b>Named Event</b> tab on the Rating Management screen. Refer to <i>CCS User's Guide</i> for details.
<b>Example:</b>	<code>eventClass = "def"</code>

eventType

**Syntax:** eventType = *type*  
**Description:** The event type for availability to the Service-Identifier AVP.  
**Type:** integer  
**Optionality:** Optional  
**Allowed:** Mapping to agreed event type with server vendor.  
**Example:** eventType = 123

isDebit

**Syntax:** isDebit = *true|false*  
**Description:** Whether this named event represents a debit or credit for the subscriber.  
**Type:** Boolean  
**Optionality:** Optional  
**Allowed:** true, false  
**Default:** true  
**Example:** isDebit = true

## HostSpecificData

### Introduction

The following is an optional section, with members defined according to hostname. The purpose is to represent data specific to particular hosts. This permits a common configuration file to be deployed to multiple machines.

Settings here should override global settings, for the specified host only. See *DCD parameters* (on page 41) and *Routes parameters* (on page 84) for global settings of these parameters.

### HostSpecificData parameters

Here is an example of the HostSpecificData parameters.

```
HostSpecificData = [
  {
    name = "ocpc.oracle.com"

    DCD = {
      Origin-Host = "ocpc.oracle.com"
      Origin-Realm = "ocpc.oracle.com"
    }

    routes = [
      {
        realm = "myDomainA"
        host = "host1.realm1.oracle.com"

        priority = 1
        round_robin = 0
        direct = true
      }
    ]
  }
]
```

## Chapter 5

```
    }  
  ]
```

direct

**Syntax:** `direct = true|false`  
**Description:** Whether this is a direct server connection, or if a proxy/agent is used.  
**Type:** Boolean  
**Optionality:** Optional  
**Allowed:** true, false  
**Default:** true  
**Notes:** See *Routes parameters* (on page 84) for the global setting.  
**Example:** `direct = true`

host

**Syntax:** `host = "name"`  
**Description:** This is the host name of the next-hop.  
**Type:** String  
**Optionality:** Mandatory  
**Allowed:** This is the permittedOriginHosts value of the peer.  
**Notes:** See *Routes parameters* (on page 84) for the global setting.  
**Example:** `host = "host1.realm1.oracle.com"`

name

**Syntax:** `name = "hostname"`  
**Description:** The identifier correlating to machine hostname (SLC node).  
**Type:** String  
**Optionality:** Mandatory if the optional `HostSpecificData` section is defined.  
**Allowed:**  
**Default:**  
**Notes:**  
**Example:** `name = "ocpc.oracle.com"`

Origin-Host

**Syntax:** `Origin-Host = "diameterId"`  
**Description:** The Diameter AVP Origin-Host - fully qualified domain name.  
**Type:** String  
**Optionality:** Optional (default used if not set).  
**Allowed:**  
**Default:**  
**Notes:** See *DCD parameters* (on page 41) for the global setting.  
**Example:** `Origin-Host = "ocpc.oracle.com"`

Origin-Realm

**Syntax:** `Origin-Realm = "diameterId"`  
**Description:** The Diameter AVP Origin-Realm.

**Type:** String  
**Optionality:** Optional (default used if not set).  
**Allowed:**  
**Default:**  
**Notes:** See *DCD parameters* (on page 41) for the global setting.  
**Example:** `Origin-Realm = "ocpc.oracle.com"`

#### priority

**Syntax:** `priority = priority`  
**Description:** This is the priority of the route.  
**Type:** Integer  
**Optionality:** Optional  
**Notes:** Only those routes with the lowest priority are used.  
 See *Routes parameters* (on page 84) for the global setting.  
**Example:** `priority = 1`

#### realm

**Syntax:** `realm = "realmname"`  
**Description:** The realm name, as configured in the Prepaid Charging screens.  
**Type:** String  
**Optionality:** Mandatory  
**Allowed:**  
**Default:**  
**Notes:** See *Routes parameters* (on page 84) for the global setting.  
**Example:** `realm = "myDomainA"`

#### round\_robin

**Syntax:** `round_robin = weight`  
**Description:** This is the weight for round\_robin selection.  
**Type:** Integer  
**Optionality:** Optional  
**Default:** 0  
**Notes:** Zero indicates a failover type selection. See *routing* (on page 54) for details.  
 See *Routes parameters* (on page 84) for the global setting.  
**Example:** `round_robin = 0`

## Statistics logged by diameterBeClient

### Introduction

Diameter statistics are generated by each SLC, and then transferred at periodic intervals to the Service Management System (SMS) for permanent storage and analysis.

An existing statistics system (smsStats) provides functions for the collection of basic statistical events. This is provided in the Convergent Charging Controller SMS application. Refer to *SMS Technical Guide* for details.

## Enabling statistics

Follow these steps to enable statistics on an SCP after installing the database entries on the SMF.

Step	Action
1	On the <b>Table Replication</b> tab of the SMS Node Management screen, select the DCD replication entry: <code>SMS-&gt;SMF_STATISTICS_DEFN-&gt;SMF_STDEF_DCD</code> and drag it over to the allocated Replication Groups. Refer to <i>Configuring Table Replication</i> in the <i>SMS User Guide</i> for details.
2	After creating the config file, you need to send a HUP to the smsStatsDaemon to force a reread of the database entries: <code># fuser -s 1 /IN/service_packages/SMS/bin/smsStatsDaemon</code>

## DCD statistics

SMS statistics are logged with APPLICATION\_ID = 'DCD' (application number 97)

The following statistics are defined:

- DIAMETER\_MIN\_LATENCY - Minimum Latency
- DIAMETER\_MAX\_LATENCY - Maximum Latency
- DIAMETER\_AVERAGE\_LATENCY - Average Latency
- DIAMETER\_CC\_TYPE\_INITIAL - Initial Requests sent
- DIAMETER\_CC\_TYPE\_UPDATE - Update Requests sent
- DIAMETER\_CC\_TYPE\_TERMINATION - Termination Requests sent
- DIAMETER\_CC\_TYPE\_EVENT - Event Requests sent
- DIAMETER\_TIMEOUT - CCRs timed out
- DIAMETER\_SUCCESS - CCAs received with success result code
- DIAMETER\_FAILURE\_3xxx - CCAs received, error code in range 3000 to 3999
- DIAMETER\_FAILURE\_4xxx - CCAs received, error code in range 4000 to 4999
- DIAMETER\_FAILURE\_5xxx - CCAs received, error code in range 5000 to 5999
- DIAMETER\_FAILURE\_1xxx - CCAs received, error code in range 1000 to 1999
- DIAMETER\_FAILURE\_UNKNOWN - CCAs received, error code in undefined range
- RAA\_GENERATED\_SENT - RAA generated from stored RAR, send to server
- RAA\_NO\_OUTSTANDING\_RAR - rejecting received RAA, no record of RAR
- RAA\_RECEIVED - RAA received from DCA
- RAA\_SENT - RAA send to Diameter server
- RAA\_SENT\_WITH\_ERROR - RAA sent to Diameter server, with error indication
- RAA\_TIMEOUT\_ALREADY\_CLEARED - RAA received, but timeout already cleared
- RAA\_UNKNOWN\_SESSION\_ID - RAA rejecting received RAA, unknown session ID
- RAR\_RECEIVED - RAR received from diameter server
- RAR\_SEND\_FAIL - RAR failed to send RAR to DCA, no dialog etc.
- RAR\_SENT - RAR sent to DCA
- RAR\_TIMEOUT\_RAA\_SENT - RAR send timeout, and RAA reject sent to server
- TERM\_REQUEST\_BEFORE\_RAA - Termination request before RAA received
- RAR\_UNKNOWN\_SESSION\_ID - RAR received with unknown session ID



- RAR\_NOT\_ENABLED\_RESPONSE - RAR received gets configured resultcode
- For all statistics, the Destination-Realm or Host ID involved is put into SMF\_STATISTICS.DETAIL.

## Reports

The following reports are available:

- DCD System Stats
- DCD System Stats by Realm/Host

Reports are generated using the SMS Report Functions screen. Refer to *SMS User's Guide* for details.

## Example report

Here is an example DCD System Stats report.

```
DCD Statistics Listing
=====
Start Date: 15 October 2007
Finish Date: 30 October 2007
Report Type: Totals

24 October 2007, 21:20:12

Node Name           Statistics ID                               Totals
-----
mtv-tst-scp10      DIAMETER_FAILURE_UNKNOWN                   3
mtv-tst-scp10      DIAMETER_SUCCESS                           319
mtv-tst-scp10      DIAMETER_FAILURE_5xxx                       14
mtv-tst-scp10      DIAMETER_CC_TYPE_INITIAL                   214
mtv-tst-scp10      DIAMETER_FAILURE_1xxx                       2
mtv-tst-scp10      DIAMETER_TIMEOUT                           63
mtv-tst-scp10      DIAMETER_CC_TYPE_UPDATE                    185
mtv-tst-scp10      DIAMETER_FAILURE_3xxx                       8
mtv-tst-scp10      DIAMETER_CC_TYPE_TERMINATION               86
mtv-tst-scp10      DIAMETER_CC_TYPE_EVENT                    14
mtv-tst-scp10      DIAMETER_FAILURE_4xxx                      39

Completed
```

## DCD EDRs

### EDR generation

EDRs are generated and processed by the slee\_acs on the SLC and uploaded at regular intervals to the SMS using the cmnPushFiles process.

Diameter Charging Driver (DCD) tags are appended to the EDRs generated by the Advanced Control Services application. Refer to *Event Detail Record Reference Guide*, topic *ACS EDR tags* for the full list and descriptions.

### DCD EDR tags

Here are the EDR tags produced by DCD.

DIA\_RC (result code)

**Description:** Number indicating diameter result-code received in CCA message.  
**Format:** Integer  
**Concept:** Result-Code

## Chapter 5

### Notes:

**Example:** DIA\_RC=2001

DIA\_REQ (current session message number)

**Description:** Sequential number, indicating message within the current session.

**Format:** Integer

**Concept:** CC-Request-Number

**Notes:** For Diameter event based messages, this will always be 0, and hence not recorded.

**Example:** DIA\_REQ=1

DIA\_SID (session id)

**Description:** This is a unique value identifying the Diameter session.

**Format:** Of the form:

*DiameterIdentity;time;SLEE\_CallID*

Where:

- *DiameterIdentity* is that of the SLC (that is, the Origin-Host used in the CCR message)
- *time* is the time of the first request (expressed as the number of seconds since the Unix epoch time)
- *SLEE\_CallID* is a unique call identifier used by the SLEE processes to track each active session

**Concept:** Session-ID

**Notes:** The values for *time* and *SLEE\_CallID* are in decimal format, but they are actually sent out in hexadecimal format.

**Example:** DIA\_SID=scp1.oracle.com;47A228C3;15459A

DIA\_TIME (time ccr sent)

**Description:** The time the CCR was sent, in hundredths of second

**Format:** Date - "YYYY-MM-DD-HH-MM-SSSS"

**Concept:** Session-ID

**Notes:**

**Example:** DIA\_TIME=2008-03-27-20-41-3831

## Custom tag names

The `cdrTag` configuration parameter allows for an EDR to have tag names customer defined.

### Example EDRs

Here are some example EDRs generated by DCD.

Refer to *ACS EDR Tags* for the non-DCD tags.

#### Example 1

Whole EDR for an InitialTimeReservation and ConfirmTimeReservation:

EDR:

```
'VOICE_MO|CID=285222|OA=0|OTI=0|CUST=1|SN=0777666444|TN=0777666444|CGN=8888887|CLI=8888887|SK=1|TCS=20080327204138|TCE=20080327204241|LPN=|LAC=|CS=4|CPC=10|CC=|CPNI=0|PCNA=|TPNI=0|PTNA=|CGNA=|TGNA=|TFN=ST-2,SDTN-21,uatb-3,PB-22,END-14|LGID=0|CPN=uatbWcseBrch|CAET=3|CCET=60.0|CA=60777666555|RELC=17|OCPI=|CPNN=3|CGNN=3|CPPI=1|NOAT=1|CBAT=0|FATS=0|CCTS=20080327204138|HTS=20080327204138|AIDL=|DIA_SID=nzwn-test03-z2;47ec0682;45a26|DIA_REQ=0|DIA_RC=2001|DIA_TIME=2008-03-27-20-41-3831|DIA_SID=nzwn-test03-z2;47ec0682;45a26|DIA_REQ=1|DIA_RC=2001|DIA_TIME=2008-03-27-20-41-3847|FCA=60777666555|WALR=86'
```

Note the DCD part of the EDR. All four tags are present twice:

- The Initial Time Reservation  
DIA\_SID=nzwn-test03-z2;47ec0682;45a26|DIA\_REQ=0|DIA\_RC=2001|DIA\_TIME=2008-03-27-20-41-3831|
- The Termination Time Reservation  
DIA\_SID=nzwn-test03-z2;47ec0682;45a26|DIA\_REQ=1|DIA\_RC=2001|DIA\_TIME=2008-03-27-20-41-3847|

### Example 2

Whole EDR for DirectNamedEvent:

EDR:

```
'VOICE_MO|CID=287224|OA=0|OTI=0|CUST=1|SN=0777666444|TN=|CGN=8888887|CLI=8888887|SK=1|TCS=20080327231115|TCE=0|LPN=|LAC=|CS=1|CPC=10|CC=|CPNI=0|PCNA=|TPNI=0|PTNA=|CGNA=|TGNA=|TFN=ST-1,bevt-2,END-3|LGID=0|CPN=DirectDebit|CAET=0|CCET=0.0|CA=|RELC=31|OCPI=|CPNN=3|CGNN=3|CPPI=1|NOAT=0|CBAT=0|FATS=0|CCTS=0|HTS=0|AIDL=|DIA_SID=nzwn-test03-z2;47ec2993;461f8|DIA_RC=2001|DIA_TIME=2008-03-27-23-11-1577'
```

Note in the DCD part of the EDR that event based EDRs only need to receive DIA\_SID, DIA\_RC and DIA\_TIME, that is, no DIA\_REQ:

```
DIA_SID=nzwn-test03-z2;47ec2993;461f8|DIA_RC=2001|DIA_TIME=2008-03-27-23-11-1577'
```

### Example 3

For cdrTag for MMM\_TAG and ZZZ\_TAG, the following would be an example of what the resulting EDR would look like.

```
CCS_BE|CID=205383|OA=0|OTI=0|CUST=1|SN=1130|TN=|CGN=0212994768|CLI=0212994768|SK=3|TCS=20091117192600|LPN=|LAC=|CS=1|CPC=10|CC=|CPNI=0|PCNA=|TPNI=0|PTNA=|CGNA=|TGNA=|TFN=ST-1,CCDR-8,CCDR-12,CCDR-14,bevt-2,DISC-3,END-7|LGID=0|CPN=ST-BE-END|OCPI=|CPNN=3|CGNN=3|CPPI=1|NOAT=0|CBAT=0|FATS=0|CCTS=0|HTS=0|AIDL=|AAA_TAG=11111|CMX_EC=CR96791|CMX_EN=BasicTest|DIA_SID=eng-host06-z6.usp.co.nz;4b02f8c8;32247|DIA_RC=2001|DIA_TIME=2009-11-17-19-26-0062|MMM_TAG=55555|ZZZ_TAG=777
```



# About Installation and Removal

## Overview

### Introduction

This chapter provides information about the installed components for the Convergent Charging Controller application described in this guide. It also lists the files installed by the application that you can check for, to ensure that the application installed successfully.

### In this Chapter

---

This chapter contains the following topics.

Installation and Removal Overview .....	95
Checking the Installation .....	95

## Installation and Removal Overview

### Introduction

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

- Convergent Charging Controller system requirements
- Pre-installation tasks
- Installing and removing Convergent Charging Controller packages

### DCD packages

An installation of DCD includes the following packages, on the:

- SMS:
  - dcdSms
- SLC:
  - dcdScp

## Checking the Installation

### Introduction

Refer to these check lists to ensure the package has been installed correctly.

### DCD SLC directories and files

The DCD installation on the SLC creates the following directories:

- `/IN/service_packages/DCD/bin`
- `/IN/service_packages/DCD/etc`

- `/IN/service_packages/DCD/lib`
- `/IN/service_packages/DCD/tmp`

The DCD installation installs the following binaries and interfaces:

- `/IN/services_packages/DCD/bin/diameterBeClient`

The DCD installation installs the following example configuration file:

- `/IN/services_packages/DCD/etc/eserv.config.dcd.example`

The DCD installation installs the following shared library:

- `/IN/services_packages/DCD/lib/diamActions.so`

### **DCD SMS directories**

Check that the statistics and control plans have been installed correctly.

The DCD installation on the SMS creates the following directories:

- `/IN/service_packages/DCD/db`
- `/IN/service_packages/DCD/lib`

# Glossary of Terms

## AAA

Authentication, Authorization, and Accounting. Specified in Diameter RFC 3588.

## ACS

Advanced Control Services configuration platform.

## AVP

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

## CC

Country Code. Prefix identifying the country for a numeric international address.

## CCA

Credit-Control-Answer, used in Diameter by the credit-control server to acknowledge a Credit-Control-Request (CCR) from the credit-control client.

## CCR

Credit-Control-Request, used in Diameter by the credit-control client to request credit authorization from the credit-control server.

## 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.

## CEA

Peer message: Capabilities Exchange Answer

## CER

Peer message: Capabilities Exchange Request

## Convergent

Also “convergent billing”. Describes the scenario where post-paid and pre-paid calls are handed by the same service platform and the same billing system. Under strict converged billing, post-paid subscribers are essentially treated as “limited credit pre-paid”.

## cron

Unix utility for scheduling tasks.

## Diameter

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

## **DP**

Detection Point

## **DPR**

Peer message: Disconnect Peer Request

## **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.

## **DWR**

Peer message: Device Watchdog Request

## **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.

## **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)

## **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.

## **ISDN**

Integrated Services Digital Network - set of protocols for connecting ISDN stations.

## **IVR**

Interactive Voice Response - systems that provide information in the form of recorded messages over telephone lines in response to user input in the form of spoken words or, more commonly, DTMF signalling.

## **MAP**

Mobile Application Part - a protocol which enables real time communication between nodes in a mobile cellular network. A typical usage of the protocol would be for the transfer of location information from the VLR to the HLR.

## **Messaging Manager**

The Messaging Manager service and the Short Message Service components of Oracle Communications Convergent Charging Controller product. Component acronym is MM (formerly MMX).

## **MIN**

Mobile Identification Number, also known as an MSID.

## **MM**

Messaging Manager. Formerly MMX, see also *XMS* (on page 101) and *Messaging Manager* (on page 99).

## **MSID**

Mobile Subscriber Identification, also known as an MIN.

## **MSISDN**

Mobile Station ISDN number. Uniquely defines the mobile station as an ISDN terminal. It consists of three parts; the country code (CC), the national destination code (NDC) and the subscriber number (SN).

## **Peer**

Remote machine, which for our purposes is capable of acting as a Diameter agent.

## **PIN**

Personal Identification Number

## **RAA**

Session message: Re-Auth Answer

## **RAR**

Session message: Re-Auth Request

## **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.

## **Session**

Diameter exchange relating to a particular user or subscriber access to a provided service (for example, a telephone call).

## **SGML**

Standard Generalized Markup Language. The international standard for defining descriptions of the structure of different types of electronic document.

## **SLC**

Service Logic Controller (formerly UAS).

## **SLEE**

Service Logic Execution Environment

## **SMS**

Depending on context, can be:

- Service Management System hardware platform
- Short Message Service
- Service Management System platform
- Convergent Charging Controller 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).

## **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.

## **USSD**

Unstructured Supplementary Service Data - a feature in the GSM MAP protocol that can be used to provide subscriber functions such as Balance Query and Friends and Family Access.

## **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).

## **XML**

eXtensible Markup Language. It is designed to improve the functionality of the Web by providing more flexible and adaptable information identification.

It is called extensible because it is not a fixed format like HTML. XML is a 'metalanguage' — a language for describing other languages—which lets you design your own customized markup languages for limitless different types of documents. XML can do this because it's written in SGML.

## **XMS**

Three letter code used to designate some components and path locations used by the Oracle Communications Convergent Charging Controller *Messaging Manager* (on page 99) service and the Short Message Service. The published code is *MM* (on page 99) (formerly *MMX*).



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