

Oracle® Communications Convergent Charging Controller

Diameter Charging Driver Technical Guide



Release 15.2

G47593-01

January 2026

The Oracle logo, consisting of a solid red square with the word "ORACLE" in white, uppercase, sans-serif font centered within it.

ORACLE®

Copyright © 2026, Oracle and/or its affiliates.

This software and related documentation are provided under a license agreement containing restrictions on use and disclosure and are protected by intellectual property laws. Except as expressly permitted in your license agreement or allowed by law, you may not use, copy, reproduce, translate, broadcast, modify, license, transmit, distribute, exhibit, perform, publish, or display any part, in any form, or by any means. Reverse engineering, disassembly, or decompilation of this software, unless required by law for interoperability, is prohibited.

The information contained herein is subject to change without notice and is not warranted to be error-free. If you find any errors, please report them to us in writing.

If this is software, software documentation, data (as defined in the Federal Acquisition Regulation), or related documentation that is delivered to the U.S. Government or anyone licensing it on behalf of the U.S. Government, then the following notice is applicable:

U.S. GOVERNMENT END USERS: Oracle programs (including any operating system, integrated software, any programs embedded, installed, or activated on delivered hardware, and modifications of such programs) and Oracle computer documentation or other Oracle data delivered to or accessed by U.S. Government end users are "commercial computer software," "commercial computer software documentation," or "limited rights data" pursuant to the applicable Federal Acquisition Regulation and agency-specific supplemental regulations. As such, the use, reproduction, duplication, release, display, disclosure, modification, preparation of derivative works, and/or adaptation of i) Oracle programs (including any operating system, integrated software, any programs embedded, installed, or activated on delivered hardware, and modifications of such programs), ii) Oracle computer documentation and/or iii) other Oracle data, is subject to the rights and limitations specified in the license contained in the applicable contract. The terms governing the U.S. Government's use of Oracle cloud services are defined by the applicable contract for such services. No other rights are granted to the U.S. Government.

This software or hardware is developed for general use in a variety of information management applications. It is not developed or intended for use in any inherently dangerous applications, including applications that may create a risk of personal injury. If you use this software or hardware in dangerous applications, then you shall be responsible to take all appropriate fail-safe, backup, redundancy, and other measures to ensure its safe use. Oracle Corporation and its affiliates disclaim any liability for any damages caused by use of this software or hardware in dangerous applications.

Oracle®, Java, MySQL, and NetSuite are registered trademarks of Oracle and/or its affiliates. Other names may be trademarks of their respective owners.

Intel and Intel Inside are trademarks or registered trademarks of Intel Corporation. All SPARC trademarks are used under license and are trademarks or registered trademarks of SPARC International, Inc. AMD, Epyc, and the AMD logo are trademarks or registered trademarks of Advanced Micro Devices. UNIX is a registered trademark of The Open Group.

This software or hardware and documentation may provide access to or information about content, products, and services from third parties. Oracle Corporation and its affiliates are not responsible for and expressly disclaim all warranties of any kind with respect to third-party content, products, and services unless otherwise set forth in an applicable agreement between you and Oracle. Oracle Corporation and its affiliates will not be responsible for any loss, costs, or damages incurred due to your access to or use of third-party content, products, or services, except as set forth in an applicable agreement between you and Oracle.

Contents

1 System Overview

What is the Diameter Charging Driver	1
Diameter Credit Control	1
Process	2
Credit Control Messages	2
Attribute Value Pairs	2
Additional EDR Tags	3
Diagram	3
ccsConcepts	4
List of ccsConcepts	5

2 Split Charging and Voucher Domains

Wallets and Vouchers Split Recharging	1
Key Components	1
voucherDelegator	1
Diagram	2
Split Recharging Process	3
Bad PIN	4
Diagram	4
Checking Voucher Bad PIN	5

3 SCAP Compliance

SCAP	1
Application-Identifiers Values	1
Message Header	1
Supported AVPs	2
Result-Codes	2

4 Configuration

Configuration Overview	1
Configuration Components	1

eserv.config Configuration	2
Configuration File Format	2
eserv.config Files Delivered	2
Editing the File	2
Loading eserv.config Changes	3
Diameter eserv.config Configuration	3
CCS eserv.config Configuration	3
ccsServiceLibrary Configuration	3
RAR Configuration	4
SLEE.cfg Configuration	4
DCD SLEE Configuration	5
PeerSchemes Configuration Section	5
Example PeerSchemes	5
Peer Host Parameters	5
acs.conf Configuration	10
DCD acs.conf Configuration	10
DCD	10
DCD Parameters	10
DomainTypes	18
DomainTypes Parameters	18
dynamicWalletReload	22
Domains Parameters	23
AVPs	24
AVP Parameters	25
Example Configuration for an AVP Type of GroupedUnitValue	38
Example cdrTag/Operation Configuration	39
ContextCopy Parameters	40
TimeIn and TimeOut	42
Routes	42
Routes Parameters	42
HostSpecificData	44
HostSpecificData Parameters	44
NamedEventTypes	46
NamedEventTypes Parameters	46

5 Background Processes

diameterBeClient	1
Startup	1
Example DIAMETER Section	1
Statistics Logged by diameterBeClient	4
Enabling Statistics	4

DCD Statistics	5
Reports	6
Example Report	6
DCD EDRs	6
EDR Generation	6
DCD EDR Tags	7
Custom Tag Names	8
Example EDRs	8

6 About Installation and Removal

Installation and Removal Overview	1
DCD Packages	1
Checking the Installation	1
DCD SLC Directories and Files	1
DCD SMS Directories	2

About This Content

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.

A solid understanding of UNIX and a familiarity with IN concepts are an essential prerequisite 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.

Documentation Accessibility

For information about Oracle's commitment to accessibility, visit the Oracle Accessibility Program website at <http://www.oracle.com/pls/topic/lookup?ctx=acc&id=docacc>.

Access to Oracle Support

Oracle customers that have purchased support have access to electronic support through My Oracle Support. For information, visit <http://www.oracle.com/pls/topic/lookup?ctx=acc&id=info> or visit <http://www.oracle.com/pls/topic/lookup?ctx=acc&id=trs> if you are hearing impaired.

Related Resources

See these Oracle resources:

- Advanced Control Services Technical Guide
- Charging Control Services Technical Guide
- Charging Control Services User's Guide
- Diameter Charging Driver Alarms Guide
- Service Management System Technical Guide
- Service Management System User's Guide
- Service Logic Execution Environment Technical Guide

Conventions

The following text conventions are used in this document.

Convention	Meaning
boldface	Boldface type indicates graphical user interface elements associated with an action, or terms defined in text or the glossary.
<i>italic</i>	Italic type indicates book titles, emphasis, or placeholder variables for which you supply particular values.
monospace	Monospace type indicates commands within a paragraph, URLs, code in examples, text that appears on the screen, or text that you enter.

1

System Overview

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

This chapter does not advise on any specific Oracle Communications Convergent Charging Controller network or service implications of the product.

What is the Diameter Charging Driver

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*). You can extend the base protocol by adding 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.

DCD 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 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, see the vendor-specific AVPs under *DCD Parameters*.

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 and Vendor-ID field combination. The following Data formats are specified:

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

Additional EDR Tags

Resolved values for AVPs can be written to the Advanced Control Services Event Detail Record (ACS EDR) under a configured tag. These tags are not intended to be used to amend existing, predefined ACS tags. The feature is intended for situations where the customer wishes to add some new tag to the EDR.

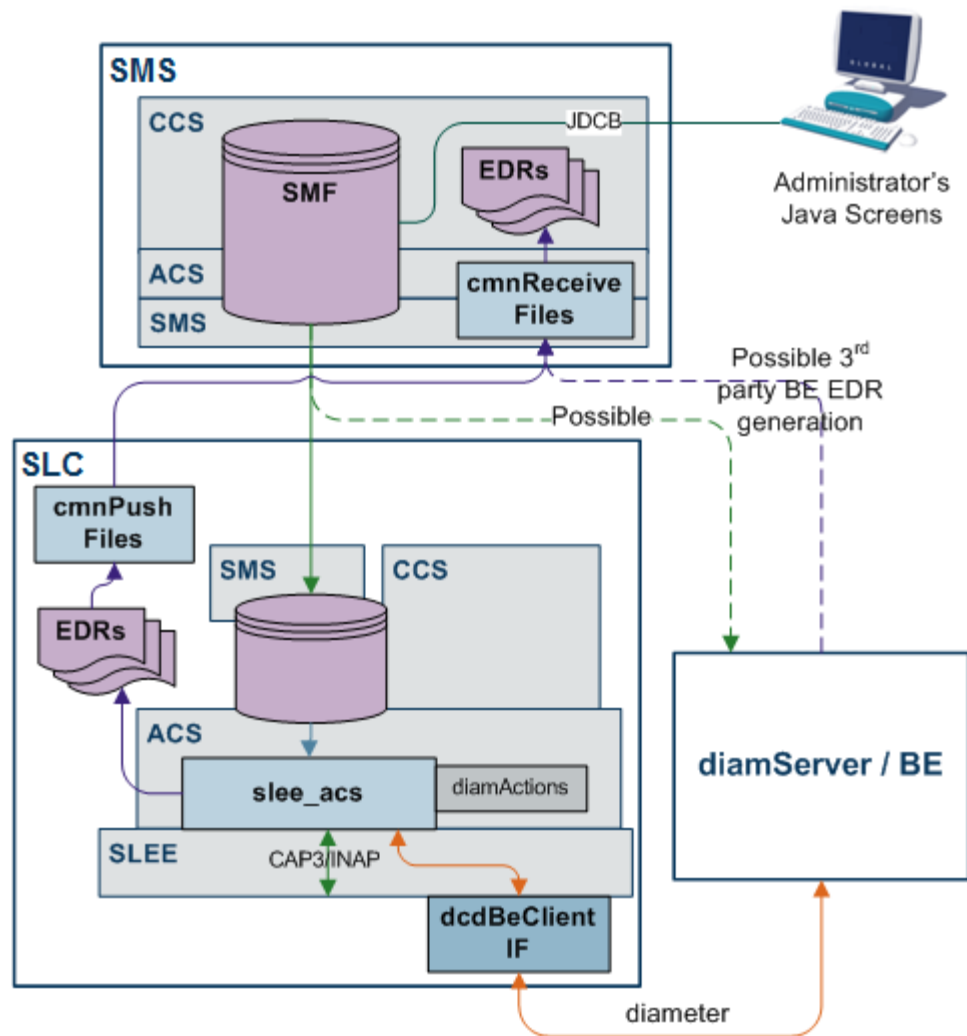
Conditions can be attached to the writing of the EDR value:

- 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, and append the new instance if the tag is not present.

Diagram

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

Figure 1-1 Diameter Charging Driver



ccsConcepts

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 `ccsConcepts`. The specific formatting of the value field is 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.

List of ccsConcepts

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

ACS Action Handler

Here are the ccsConcepts from the ACS action handler.

Table 1-1 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.

Table 1-1 (Cont.) ACS Action Handler

Concept Label	Available	Comments
terminationCause	After a call is terminated	The esg values in the configuration for the ACS callEndReasons that map to specific termination cause values. <ul style="list-style-type: none"> • 0 = reasonNotSet • 1 = precallAnnouncementFailure • 2 = firstEventACRAbort • 3 = firstEventATAbort • 4 = secondEventACRAbort • 5 = secondEventATAbort • 6 = abortWaitingForBEResponse • 7 = releasedOnTCPExpiry • 8 = releasedNoFunds • 9 = disconnectedLegBNoFunds • 10 = calledPartyBusy • 11 = routeSelectFailure • 12 = callingPartyAbandon • 13 = noAnswer • 14 = callingPartyDisconnected • 15 = calledPartyDisconnected
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.

Table 1-1 (Cont.) ACS Action Handler

Concept Label	Available	Comments
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"> 'A' = Active 'D' = Dormant 'F' = Frozen 'P' = Pre-Use 'S' = Suspended 'T' = Terminated. Note that conversion to different representations is possible.
walletInfoSystemCurrency	After a walletInfo response	The system currency.
walletInfoUserCurrency	After a walletInfo response	The CCS_ACCT.CURRENCY value for this wallet.

ACS Service Context

Here are the ccsConcepts 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 ccsConcepts 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 InitialTimeReservation	
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	NamedEvent Actions	A string representing the CCS event Class.
eventName	NamedEvent Actions	A string of the CCS event name.
eventType	NamedEvent Actions	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.

Concept Label	Available	Comments
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 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"> • 1 Supervise • 2 Do not supervise • 3 Release • 4 Send message • 5 Play announcement • 6 Supervise without controlling
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 ccsConcepts 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 ccsConcepts from direct time charge.

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

Others

Here are the ccsConcepts 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 ccsConcepts 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"> • 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. • 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. • 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. <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																		
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																		
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.																		

Concept Label	Available	Comments												
voucherInfoBalanceValidityStart	WalletInfoRequest	A fixed date in the future when a given balance, charged with a voucher, becomes valid.												
voucherInfoBalanceValidityType	WalletInfoRequest	The units of the relative offset from the current date when the balance becomes valid. voucherInfoBalanceValidityType returns the following values: <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	Indicates what to do if the specified balance type is missing from the list of existing balances for the voucher. voucherInfoMissingBalancePolicy returns the following values: <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 the balance will be 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.												
voucherInfoVoucherSerialNumber	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.												

Concept Label	Available	Comments						
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>Note: Voucher type name is only available if a positive value is defined for voucherTypeCacheSize in the ccsActions 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 ccsConcept voucherTypeName.</p>						

2

Split Charging and Voucher Domains

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

Wallets and Vouchers Split Recharging

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:

Table 2-1 Key Components Enabling Split-Domain Architecture with DCD

Component	Description	Further Information
ACS voucherDelegator	Configures the <code>diamActions</code> which support different billing domains for recharges.	<i>voucherDelegator</i>
<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:

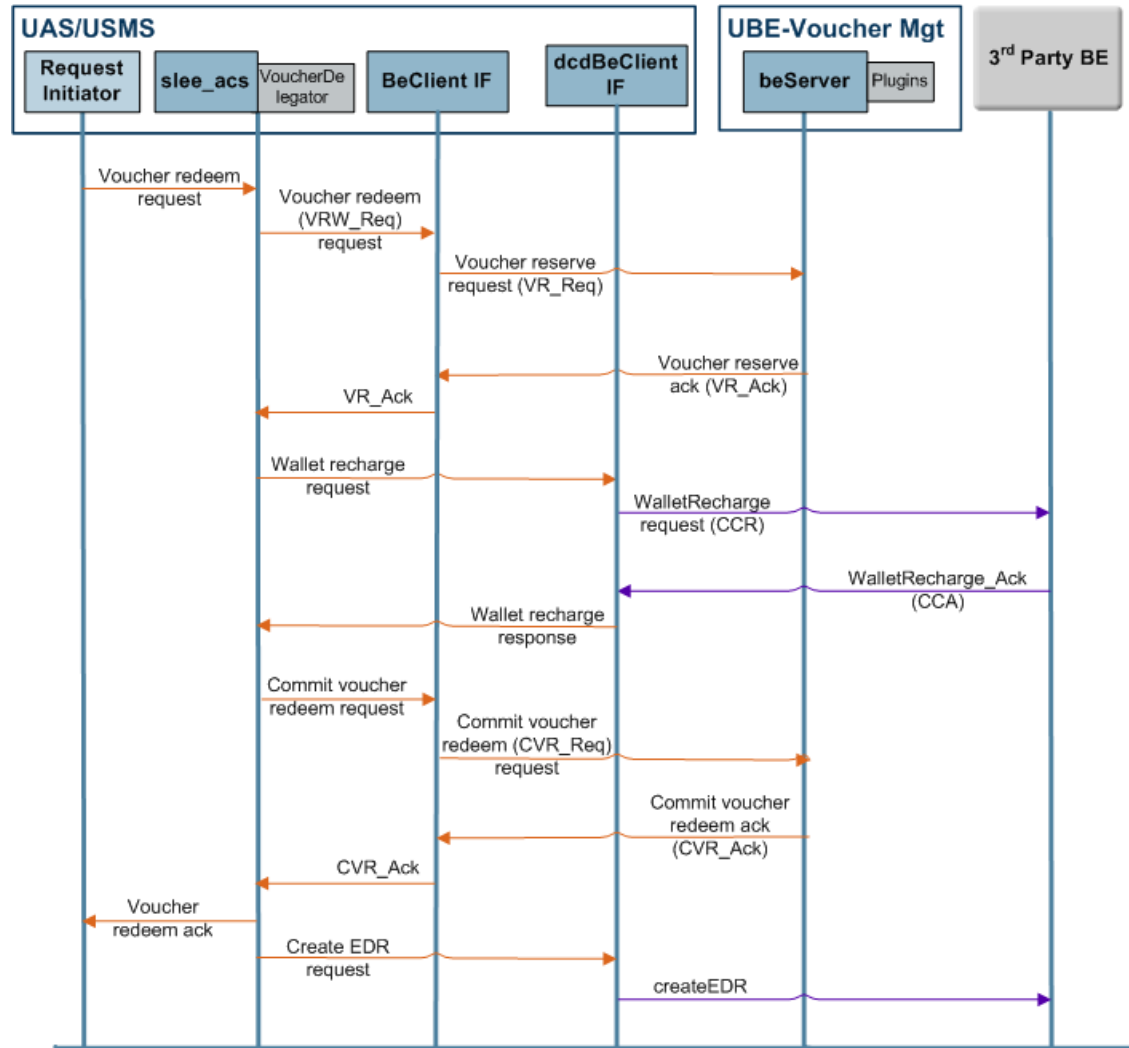
Table 2-2 voucherDelegator diamActions

Action	Expected Response	Description
Bad PIN	<ul style="list-style-type: none"> CCR named BadPINRequest, and CCA named BadPINResponse 	Sends a CCR to the BE, notifying that a given MSISDN has failed to redeem a voucher.
CreateEDR	<ul style="list-style-type: none"> CCR named CreateEDRRequest, and CCA named CreateEDRResponse 	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"> CCR named WalletRechargeRequest, and CCA named WalletRechargeResponse 	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.

Figure 2-1 Split Domain Wallet and Voucher Recharge Flow



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.

Table 2-3 Stages of Voucher Redemption and Third-Party Wallet Recharge

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

Table 2-3 (Cont.) Stages of Voucher Redemption and Third-Party Wallet Recharge

Stage	Description
3	VWS-Voucher Management checks whether: <ul style="list-style-type: none"> This VWS holds the details for the requested voucher The voucher PIN number is correct If the voucher can be redeemed If the voucher can be redeemed, VWS-Voucher Management reserves the voucher and passes a Voucher Reserve acknowledgment (VR_Ack) back to the voucherDelegator.
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	The Diameter Server checks whether: <ul style="list-style-type: none"> The details for the requested wallet Whether the wallet state allows it to be updated 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.
7	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. 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.
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.

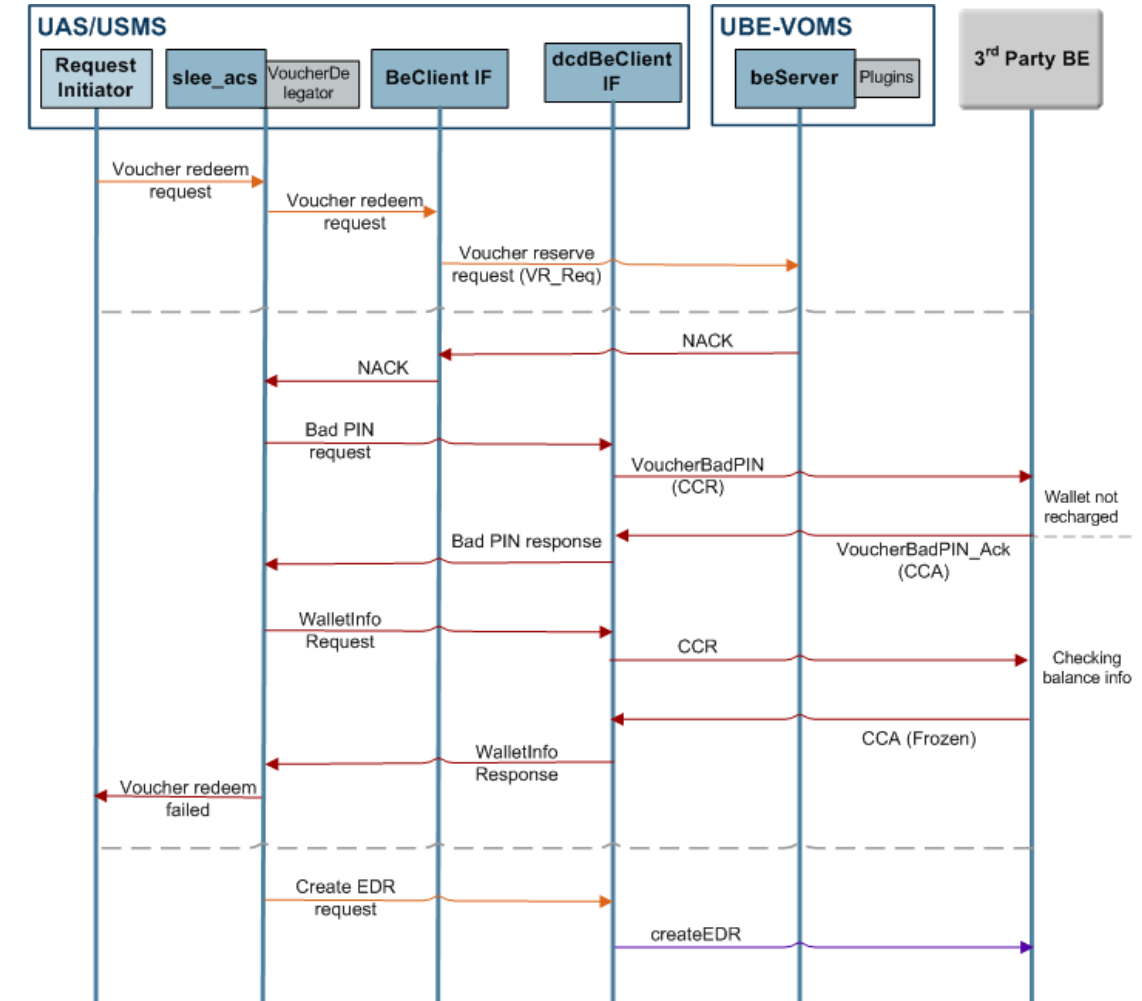
Bad PIN

The ACS voucherDelegator also handles Bad PIN 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.

Figure 2-2 Bad PIN Processing in Split-Domain Network



Checking Voucher Bad PIN

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

Table 2-4 Unsuccessful Voucher Redemption Due to 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"> The VWS holds the details for the requested voucher The voucher PIN number is correct If the voucher can be redeemed <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	<p>On successive Bad PIN attempts, the voucherDelegator cancels the voucher redemption and sends a Revoke Voucher Redeem (RVR) request to the BeClientIF which is passed onto VWS-Voucher Management.</p>

Table 2-4 (Cont.) Unsuccessful Voucher Redemption Due to Bad PIN

Stage	Description
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.

3

SCAP Compliance

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

SCAP

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` 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.

Table 3-1 Comparison of Application-Identifier Values in Diameter Base Protocol Draft 8 and RFC 3588

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.

Table 3-2 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> 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.

Table 3-3 Supported AVPs

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> is set to <i>true</i> .

Result-Codes

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

Table 3-4 Result Code Changes for SCAP Compliance

Result Code	[DRAFT8] Value	[3588] Value
DIAMETER_UNSUPPORTED_TRANSFORM	5010	-
DIAMETER_NO_COMMON_APPLICATION	5011	5010
DIAMETER_UN SUPPORT_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

4

Configuration

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

Configuration Overview

This section 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:

Table 4-1 Diameter Charging Driver Components

Component	Locations	Description	Further Information
eserv.config	all SLC machines	DCD is configured by the Diameter section of eserv.config .	<i>eserv.config Configuration</i>
eserv.config	all SLC machines	The WalletInformation cache is configured in the CCS section of eserv.config .	<i>CCS eserv.config Configuration</i>
SLEE.cfg	all SLC machines	The SLEE interface is configured to include the DCD service.	<i>SLEE.cfg Configuration and the SLEE Technical Guide</i>
acs.conf	all SLC machines	Configures the diamActions library.	<i>acs.conf Configuration</i>
oracleConfig.xsd	SMS	Defines acceptable structure for XML.	Not applicable
oracleConfigWorking.xml	SMS	The editable configuration.	Configuration Management
oracleConfigMaster.xml	SMS	The deployed (live) configuration used to generate the eserv.config .	Configuration Management

Note

The **.xsd** and **.xml** files are present only when the Configuration Management editor is installed.

eserv.config Configuration

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** file named **eserv.config.example**. The example file for DCD is:

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

Editing the File

You can edit the **eserv.config** file by using one of the following:

- The Configuration Management editor
- 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*.

CCS eserv.config Configuration

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

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.

The SLEE configuration file is located at **/IN/service_packages/SLEE/etc/SLEE.cfg**.

See *SLEE Technical Guide* for details about SLEE configuration.

DCD SLEE Configuration

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

```
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.

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 = 3868netmask6Bits = 128netmaskBits =
32permittedInstances = 0reqSctpInboundStreams =
8reqSctpOutboundStreams = 8sctp_hbinterval = 1000watchdogPeriod =
30connectionTimeout = 30inBufferSize = 0outBufferSize = 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 sectionschemeName
```

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

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 = 3868netmask6Bits = 128netmaskBits =
32permittedInstances = 0reqSctpInboundStreams =
8reqSctpOutboundStreams = 8sctp_hbinterval = 1000watchdogPeriod =
30connectionTimeout = 30inBufferSize = 0outBufferSize = 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* .

connectionTimeout

Syntax:	connectionTimeout = <i>timeout</i>
Description:	The timeout for re-establishing connections (<i>RFC 3588 Tc</i>).
Type:	Integer
Optionality:	Optional
Allowed:	In seconds
Default:	30
Example:	connectionTimeout = 30

inBufferSize

Syntax:	inBufferSize = <i>size</i>
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 = " <i>action</i> "
Description:	How to start the connection.
Type:	String
Optionality:	Mandatory

Allowed:	<ul style="list-style-type: none"> listen = listen for incoming connections connect = connect an outgoing connection.
Example:	<code>initiation = "connect"</code>

name

Syntax:	<code>name = "name"</code>
Description:	The name identifying either peer or group of peers.
Type:	String
Optionality:	Mandatory
Example:	<code>name = "host1"</code>

netmaskBits

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

netmask6Bits

Syntax:	<code>netmask6Bits = bits</code>
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:	<code>netmask6Bits = 128</code>

outBufferSize

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

peer_group

Syntax:	<code>peer_group = "name"</code>
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", <code>peer_group</code> defaults to "host1".
Example:	<code>peer_group = "host1"</code>

`permittedInstances`

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

`permittedOriginHosts`

Syntax:	<code>permittedOriginHosts = ["host"]</code>
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:	<code>permittedOriginHosts = ["host1.realm1.oracle.com" "host2.realm1.oracle.com"]</code>

`remote_port`

Syntax:	<code>remote_port = number</code>
Description:	The remote port number.
Type:	Integer
Optionality:	Optional
Default:	Defaults to the RFC specified 3868
Example:	<code>remote_port = 3868</code>

`RemoteAddresses`

Syntax:	<code>remoteAddresses = ["ipaddress"]</code>
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:	<code>remoteAddresses = ["192.168.1.10"]</code>

`reqSetpInboundStreams`

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

`reqSctpOutboundStreams`

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

`scheme`

Syntax:	<code>scheme = ["scheme", "scheme"]</code>
Description:	The list of schemes to which you have limited the peer.
Type:	Array of strings
Optionality:	If using <code>PeerSchemes</code> this is mandatory.
Allowed:	Names of configured schemes.
Example:	<code>scheme = ["scheme1", "scheme2"]</code>

`sctp_hbinterval`

Syntax:	<code>sctp_hbinterval = interval</code>
Description:	The interval for sctp heartbeats.
Type:	Integer
Optionality:	Optional
Allowed:	in milliseconds
Default:	1000
Example:	<code>sctp_hbinterval = 1000</code>

`transport`

Syntax:	<code>transport = "type"</code>
Description:	The protocol for this host peer.
Type:	String
Optionality:	Optional
Allowed:	<ul style="list-style-type: none"> • sctp • tcp
Default:	If not specified, then it uses the one from the global DCD section.
Example:	<code>transport = "tcp"</code>

`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

acs.conf Configuration

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 *IIN/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
```

DCD

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 = 300loggedInvalidPeriod =
300databaseCacheValiditySeconds = 18000 Origin-Host =
"ocpc.oracle.com"Origin-Realm = "ocpc.oracle.com"serviceContextID =
"ocpc@oracle.com"Auth-Application-Id =
4Vendor-Specific-Application-Id = [{Vendor-Id =
193Auth-Application-Id = 4Acct-Application-Id = 19302}]enableDraft8
= false# scheme = "SchemeA"honour_disconnect = trueVendor-Id =
16247Product-Name = "timeout_x = 30000000transmit_limit =
2trace_debug_flags = "all"statistics_interval =
300
```

```
statsCollection = false NotificationFilter = {CollectiveNotice = truePerPeerNotice =
{initial_request = trueupdate_request = truetermination_request = trueevent_request =
trueunknown_request = truetotal_request = truerequest_timeout =
trueon_request_type_result_codes = true}}
```

You may also set defaults for peer connection settings here. See *Peer Host Parameters* for details of the available options.

Auth-Application-Id

Syntax:	Auth-Application-Id = <i>ID</i>
Description:	This AVP value is set to the Credit-Control as DCD uses Credit-Control capability by default.
Type:	Integer
Optionality:	Optional (not sent if not set).
Allowed:	
Default:	Not sent
Notes:	<ul style="list-style-type: none"> This AVP can be configured as a sub-AVP to support <i>Vendor-Specific-Application-Id</i>. In case of vendor specific configuration, this value should NOT be set globally.
Example:	Auth-Application-Id = 4

Acct-Application-Id

Syntax:	Acct-Application-Id = <i>ID</i>
Description:	This AVP value is configured as a sub-AVP to support <i>Vendor-Specific-Application-Id</i> .
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 <i>Vendor-Specific-Application-Id</i> .
Example:	Acct-Application-Id = 12300

diameterMessageLength

Syntax:	diameterMessageLength = <i>size</i>
Description:	Maximum size of CCA packet received.
Type:	Integer
Optionality:	Optional (default used if not set)
Allowed:	
Default:	8192
Notes:	
Example:	diameterMessageLength = 32768

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 parameter.
Type:	Boolean
Optionality:	Optional (default used if not set).
Allowed:	true, false
Default:	false
Notes:	
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 = <i>period</i>
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 = <i>period</i>
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

Syntax:	NotificationFilter = { CollectiveNotice = PerPeerNotice = {} }
Description:	This section sets flags allowing the appropriate notification to be enabled or suppressed.
Type:	Section of boolean parameters
Optionality:	Optional, default used if not set
Default:	All values default to true (that is, statistics recording in DCD alarm log enabled).
Notes:	Settings are only applicable to statistics that are recorded in the DCD alarm log.
Example:	NotificationFilter = {CollectiveNotice = truePerPeerNotice = {initial_request = trueupdate_request = truetermination_request = trueevent_request = trueunknown_request = truetotal_request = trerequest_timeout = truenon_request_type_result_codes = true}}

CollectiveNotice

Syntax:	collectiveNotice = true false
----------------	-------------------------------

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

PerPeerNotice

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

Origin-Host

Syntax:	<code>Origin-Host = "diameterId"</code>
Description:	The Diameter AVP Origin-Host - fully qualified domain name.
Type:	String
Optionality:	Optional
Notes:	May be specified for each host. See <i>HostSpecificData Parameters</i> .
Example:	<code>Origin-Host = "ocpc.oracle.com"</code>

Origin-Realm

Syntax:	<code>Origin-Realm = "diameterId"</code>
----------------	--

Description:	The Diameter AVP Origin-Realm.
Type:	String
Optionality:	Optional
Notes:	May be specified for each host. See <i>HostSpecificData Parameters</i> .
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= <i>integer</i>
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: <ul style="list-style-type: none"> • 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 = <i>int</i>
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= " <i>type</i> "
Description:	The global scheme to use.

Type:	String
Optionality:	If you use the <code>peerSchemes</code> section, then this is mandatory.
Example:	<code>scheme = "schemeA"</code>

`serviceDomainInterfaceName`

Syntax:	<code>serviceDomainInterfaceName = "name"</code>
Description:	The interface name of the Diameter BE client (in SLEE.cfg).
Type:	String
Optionality:	Optional
Default:	<code>dcdBeClient</code>
Example:	<code>serviceDomainInterfaceName = "dcdBeClient"</code>

`serviceContextID`

Syntax:	<code>erviceContextID = "ContextID"</code>
Description:	The Diameter AVP Service-Context-Id.
Type:	String
Optionality:	Mandatory
Example:	<code>serviceContextID = "ocpc@oracle.com"</code>

`statistics_interval`

Syntax:	<code>statistics_interval = seconds</code>
Description:	This is how often to record aggregate (average, min, max) latency statistics.
Type:	Integer
Optionality:	Mandatory
Allowed:	In seconds.
Default:	300 (that is, 5 minutes)
Example:	<code>statistics_interval = 300</code>

`statsCollection`

Syntax:	<code>statsCollection = true false</code>
Description:	Whether to collect statistics in DCD.
Type:	Boolean
Optionality:	Optional (default used if not set)
Allowed:	true – Enable statistics collection. false – Disable statistics collection.
Default:	true
Example:	<code>statsCollection = false</code>

`timeout_x`

Syntax:	<code>timeout_x =timer</code>
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:	<ul style="list-style-type: none"> This AVP can be configured as a sub-AVP to support <i>Vendor-Specific-Application-Id</i>. It is mandatory to specify vendorId when configuring vendor specific AVPs for SCAP.
Example:	Vendor-Id = 16247

Vendor-Specific-Application-Id

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

Example:	Vendor-Specific-Application-Id = [{Vendor-Id = 123Acct-Application-Id = 12345}]
-----------------	---

DomainTypes

The `DomainTypes` section lists all 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 =
falsereleaseOnLowCredit = falsedefaultSessionFailover =
0defaultEventFailover = 0defaultFailureHandling =
0balanceEnquiryMethod = "balanceCheck"includeDcdCdrFields =
falsedefaultFixedCostDuration = 86400conversionScale = lenableScap
= falseoverwriteZeroCallAnswerTime = falseDomains =
[{First_Domain}{Next_Domain}]AVPs =
[{First_AVP}{Next_AVP}{...}]}
```

`balanceEnquiryMethod`

Syntax:	<code>balanceEnquiryMethod = "method"</code>
Description:	The method to use to allow balance queries.
Type:	String
Optionality:	Optional (default used if not set)
Allowed:	<ul style="list-style-type: none"> "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:	<code>balanceEnquiryMethod = "balanceCheck"</code>

`defaultEventFailover`

Syntax:	<code>defaultEventFailover = failover</code>
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 <i>RFC 4006</i> : <ul style="list-style-type: none"> • 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 <code>defaultSessionFailover</code> parameter.
Example:	<code>defaultEventFailover = 0</code>

`defaultFailureHandling`

Syntax:	<code>defaultFailureHandling = number</code>
Description:	How to behave until a Credit-Control-Failure-Handling AVP (as defined in <i>RFC 4006</i>) is received from the server.
Type:	Integer
Optionality:	Optional (default used if not set).
Allowed:	<ul style="list-style-type: none"> • 0 – Terminate • 1 – Continue • 2 – Retry and Terminate
Default:	0 (Terminate)
Notes:	
Example:	<code>defaultFailureHandling = 0</code>

`defaultFixedCostDuration`

Syntax:	<code>defaultFixedCostDuration = duration</code>
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:	<code>defaultFixedCostDuration = 86400</code>

`defaultSessionFailover`

Syntax:	<code>defaultSessionFailover = failover</code>
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 <i>RFC 4006</i> : <ul style="list-style-type: none"> • 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:	<code>defaultSessionFailover = 0</code>

`enableScap`

Syntax:	<code>enableScap = true false</code>
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:	<ul style="list-style-type: none"> • true – Enabled for SCAP compliance • false – Disabled for SCAP compliance
Default:	false
Notes:	
Example:	<code>enableScap = false</code>

`forceWalletReload`

Syntax:	<code>forceWalletReload = true false</code>
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:	<code>forceWalletReload = true</code>

`includeDcdCdrFields`

Syntax:	<code>includeDcdCdrFields = true false</code>
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 <i>DCD EDR Tags</i> for the list of DCD tags.
Example:	<code>includeDcdCdrFields = false</code>

`insufficientFundsDropCallResultCodes`

Syntax:	<pre>insufficientFundsDropCallResultCodes= [Integer Integer]</pre>
----------------	--

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:	<pre>insufficientFundsDropCallResultCodes = [4013 4014]</pre>

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 <i>CCS User's Guide</i> .
Example:	name = "DIAMETER"

overwriteZeroCallAnswerTime

Syntax:	overwriteZeroCallAnswerTime = true false
Description:	Enables overwriting of Charging-Start-Timestamp using the EventTimestamp.
Type:	Boolean
Optionality:	Optional (default used if not set).
Allowed:	<ul style="list-style-type: none"> true – Overwrite the charging start time. false – If a call is not answered (that is, CallAnswerTime is zero), 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: <ul style="list-style-type: none"> 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 <code>releaseOnLowCredit</code> to false if you have configured Diameter servers to assume that unused units are still available for the client. Otherwise, set <code>releaseOnLowCredit</code> to true to ensure that the client has enough unused units reserved for the insufficient funds message. The <code>releaseOnLowCredit</code> parameter should be placed immediately after the <code>voidUnusedReservation</code> parameter in the eserv.config file.
Example:	<code>releaseOnLowCredit = false</code>

routing

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

schemeName

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

voidUnusedReservation

Syntax:	<code>voidUnusedReservation = true false</code>
Description:	Whether or not to void unused reservations.
Type:	Boolean
Optionality:	Optional
Allowed:	true, false
Default:	false
Notes:	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.
Example:	<code>voidUnusedReservation = false</code>

dynamicWalletReload

The `dynamicWalletReload` section defines the profile to use to determine whether to dynamically force wallet reloads. A wallet reload is forced when 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* section.

① Note

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

Example dynamicWalletReload

Here are the example parameters:

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

Domains Parameters

Here is an example of the Domains section.

```
Domains = [{name = "myDomainA"routing = "Round Robin"
realmFailureWaitSeconds = 20weighting = 1}{name =
"myDomainB"routing = "Failover"realmFailureWaitSeconds =
20weighting = 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 <i>CCS User's Guide</i> .
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
-----------------	------------------------------

routing

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

weighting

Syntax:	weighting = weight
Description:	The domain's weighting, if our Domain Type is using Round Robin routing.
Type:	Integer
Optionality:	Optional
Allowed:	
Default:	1
Notes:	<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"> myDomainA has a weighting of 1 myDomainB a weighting of 1 myDomainC a weighting of 2 <p>myDomainA has 25% of the total usage. If myDomainC becomes unavailable, then myDomainA will have 50%.</p>
Example:	weighting = 1

AVPs

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

An example is provided in the `eserv.config.default` file.

The actions for which configuration is required are:

- BadPINRequest, BadPINResponse
- ConfirmNamedEventReservationRequest, ConfirmNamedEventReservationResponse
- ConfirmTimeReservationRequest, ConfirmTimeReservationResponse
- CreateEDRRequest, CreateEDRResponse
- DirectNamedEventRequest, DirectNamedEventResponse
- DirectTimeChargeRequest, DirectTimeChargeResponse
- ExtendTimeReservationRequest, ExtendTimeReservationResponse

- GetNamedEventRatesRequest, GetNamedEventRatesReponse
- InitialTimeReservationRequest, InitialTimeReservationReponse
- NamedEventReservationRequest, NamedEventReservationReponse
- RevokeNamedEventReservationRequest, RevokeNamedEventReservationReponse
- RevokeTimeReservationRequest, RevokeTimeReservationReponse
- WalletRechargeRequest, WalletRechargeResponse
- WalletInfoRequest, WalletInfoReponse

AVP Parameters

Here is an example of the AVPs section.

```
AVPs = [{name = "ConfirmNamedEventReservationRequest"
mandatoryContents =
["Subscription-Id" "Service-Identifier" "NE-Used-Service-Unit"]optionalContents
= []}{avpCode = 443name = "Subscription-Id"type =
"Grouped"mandatoryContents =
["Subscription-Id-Type" "Subscription-Id-Data"]optionalContents =
[]}{avpCode = 450name = "Subscription-Id-Type"type =
"Enumerated"literal = "0" # END_USER_E164}{avpCode = 444name =
"Subscription-Id-Data"type = "UTF8String"ccsConcept =
"acsProfile"profileBlock = 18profileTag = 327686profileFormat =
"LNSTRING"conditionProfileBlock = 17conditionProfileTag =
2009conditionValue = 14}{avpCode = 439name =
"Service-Identifier"type = "Unsigned32"ccsConcept =
"eventType"cdrTag = "DIAMETER_SERVICE_ID"cdrOperation =
"replace"}{avpCode = 446name = "NE-Used-Service-Unit"type =
"Grouped"mandatoryContents =
["CC-Service-Specific-Units-Used"]}{avpCode = 417name =
"CC-Service-Specific-Units-Used"type = "Unsigned64"ccsConcept =
"numUnitsUsed"vendorId = 0flags = 0repeating = falsemaxOccurrences
= 10conversion = [{esg = 1vendor = 2serviceProvider = 1}{esg =
3vendor = 2serviceProvider = 2}]conversionScale =
1conversionRounding = "floor"interpretBase = 10octetLength =
0}{avpCode = 900vendorId = 16247name = "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 =
581avpCode = 50998ccsConcept =
"voucherRechargeFailureFlag"includeIf = true} {name =
"Voucher-Recharge_Failed-Date-Time"type = "Integer32"vendorId =
```

```

581avpCode = 50999ccsConcept =
"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 = 12003ccsConcept = "voucherInfoValue"type =
"Integer32"} {name = "Topup-Voucher-Type"avpCode = 12005ccsConcept
= "voucherTypeName"type = "UTF8String"} {name =
"Topup-Voucher-Id"vendorId = 581avpCode = 50026ccsConcept =
"voucherInfoVoucherId"type = "Integer32"}{ name =
"Topup-Voucher-Serial-Number"avpCode = 12008ccsConcept =
"voucherInfoVoucherSerialNumber"type = "Unsigned64"}{name =
"Topup-Voucher-Balance-Validity-Start"avpCode = 12009ccsConcept =
"voucherInfoBalanceValidityStart"type = "Time"}{name =
"Topup-Voucher-Balance-Validity-Relative"avpCode = 12010type =
"Grouped"optionalContents =
["Topup-Voucher-Balance-Validity-Offset" "Topup-Voucher-Balance-Validity-Type"]}
{name
= "Topup-Voucher-Balance-Validity-Offset"avpCode = 12011ccsConcept
= "voucherInfoBalanceValidityOffset"type = "Integer32"}{name =
"Topup-Voucher-Balance-Validity-Type"avpCode = 12012ccsConcept =
"voucherInfoBalanceValidityType"type = "Enumerated"}{name =
"WalletRechargeResponse"mandatoryContents =
["Topup-Balance-Information" "Topup-Receipt-Number"]} {name =
"Topup-Balance-Information"vendorId = 581 # IntecavpCode =
50030type = "Grouped"mandatoryContents =
["Topup-Balance-Type-ID" ]optionalContents =
["Topup-Balance-Expire-Date" "Topup-Unit-Value"]} {name =
"Topup-Balance-Type-ID"avpCode = 50020vendorId = 581 #
IntecccsConcept = "walletInfoBalanceType"type = "Integer32"}{name =
"Topup-Balance-Expire-Date"vendorId = 581 # IntecavpCode =
50032ccsConcept = "walletInfoBalanceExpiry"type =
"Integer32"}{ avpCode = 445

name = "Unit-Value-Topup"

type = "GroupedUnitValue"

ccsConcept = "voucherInfoValue"

conversionScale = -100

signInversion = true

mandatoryContents = [ "Value-Digits-Topup" ]

optionalContents =
[ "Exponent-Outgoing" ] } { avpCode =
447 name = "Value-Digits-Topup" type =
"Integer64" }

{ avpCode = 429 name = "Exponent-Outgoing" type =

```

```
"Integer32" literal = "1" } {name =
"Topup-Value-Digits"avpCode = 50020vendorId = 581 # IntecccsConcept
= "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 = 50024type =
"UTF8String"} {name = "CreateEDRRequest"} {name =
"CreateEDRResponse"} {name = "BadPINRequest"} {name =
"BadPINResponse"}{name = "Termination-Cause"avpCode = 295type =
"Enumerated"ccsConcept = "terminationCause"conversion = [{esg = 8 #
releasedNoFundsvendor = 6 # DIAMETER_AUTH_EXPIRED}{esg = 9 #
disconnectedLegBNoFundsvendor = 6 # DIAMETER_AUTH_EXPIRED}{esg = 14
# callingPartyDisconnectedvndor = 1 # DIAMETER_LOGOUT}{esg = 15 #
calledPartyDisconnectedvndor = 1 # DIAMETER_LOGOUT}}]}
```

avpCode

Syntax:	avpCode = <i>code</i>
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 = " <i>concept</i> "
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 <i>ccsConcepts</i> .
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 = " <i>tag_name</i> "
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:	<ul style="list-style-type: none"> • 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:	<code>cdrTag = "CMX_EN"</code>
-----------------	--------------------------------

`cdrOperation`

Syntax:	<code>cdrOperation = "operation"</code>
Description:	The operation to perform on the <code>cdrTag</code> value in the EDR record.
Type:	String
Optionality:	Optional – only referred to if <code>cdrTag</code> is non-blank.
Allowed:	<ul style="list-style-type: none"> • replace • leave • append Not case sensitive, for example Replace = REPLACE = replace
Default:	replace
Notes:	<ul style="list-style-type: none"> • If <code>cdrOperation</code> is specified, <code>cdrTag</code> 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:	<code>cdrOperation = "replace"</code>

`conditionProfileBlock`

Syntax:	<code>conditionProfileBlock = block_number</code>
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 <i>not</i> be populated.
Example:	<code>conditionProfileBlock = 17</code>

`conditionProfileTag - 1.0.4 - 94934`

Syntax:	<code>conditionProfileTag = tag_number</code>
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 <i>not</i> be populated.
Example:	<code>conditionProfileTag = 2009</code>

`conditionValue`

Syntax:	<code>conditionValue = condition</code>
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:	<code>conditionValue = 14</code>

conversion

Syntax:	<code>conversion = [mapping]</code>
Description:	An array of integer values, defining a mapping from the Oracle enumeration to the billing vendor's equivalent enumeration value. The <code>serviceProvider</code> array parameter is optional, and it allows you to limit a conversion to a single service provider.
Type:	Integer
Optionality:	Mandatory
Notes:	<ul style="list-style-type: none"> It is used if the AVP type is any of the integer types (including enumeration). This mapping is performed regardless of the <code>ccsConcept</code>, and is the responsibility of the AVP traverser, not the <code>ccsConcept</code> helper functions. For AVPs associated with Balance Type concepts, do not include in the <code>conversion</code> array any balance types that are specified in the Balance Type Mapping tab of the SMS Service Management screen. Otherwise, the conversions from both sources could be applied.
Example:	<code>conversion = [{esg = 880vendor = 880880serviceProvider = 1}{esg = 890vendor = 890890serviceProvider = 2}]</code>

esg

Syntax:	<code>esg = int</code>
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 <i>ACS Action handler</i> for <code>esg</code> values defined for the Termination-Cause AVP in the configuration.
Example:	<code>esg = 3</code>

vendor

Syntax:	<code>vendor = int</code>
Description:	The billing vendor's integer value in the conversion array that maps to the equivalent <code>esg</code> 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: For more information, see the table below.
Example:	vendor = 6

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 Abort-Session-Request 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.

serviceProvider

Syntax:	serviceProvider = <i>int</i>
Description:	If mentioned, the conversion is limited to the specific service provider.
Type:	Integer
Optionality:	Optional
Allowed:	
Default:	
Notes:	
Example:	serviceProvider = 2

conversionScale

Syntax:	conversionScale = <i>scale</i>
Description:	Defines a conversion factor of esg values to calculate server values.
Type:	Integer
Optionality:	Optional

Allowed:	<ul style="list-style-type: none"> 0 – Applies the scale factor specified in the Balance Type Mapping tab of the SMS Service Management screen. If the Balance Type Mapping tab does not contain an applicable mapping, DCD applies a scale factor of 1. For more information, see <i>CCS User's Guide</i>. Any non-zero integer – Applies the scale factor to all instances of the AVP in request and response messages. For example, if you set <code>conversionScale</code> to 100, DCD multiplies the values by 100 for all balance type AVPs.
Default:	1
Notes:	<ul style="list-style-type: none"> For request AVPs – Positive means multiply, negative means divide. For response AVPs – Positive means divide, negative means multiply. All conversion rules are applied before scaling is applied.
Example:	<code>conversionScale = -10</code> This example multiplies incoming Diameter values by 10.

`conversionRounding`

Syntax:	<code>conversionRounding = "rounding_type"</code>
Description:	The conversion method used between internal and server numeric values.
Type:	String
Optionality:	Optional (default used if not set).
Allowed:	<ul style="list-style-type: none"> floor – Drop any fractions. ceiling – Round up fractional parts. round – Round to the nearest whole number. That is, x.5 or higher is rounded up and others are rounded down.
Default:	floor
Notes:	<ul style="list-style-type: none"> If an AVP has the <code>conversionScale</code> parameter set, <code>conversionRounding</code> can also be set. For GroupedUnitValue AVP types, use the <code>conversionRounding</code> parameter to specify the type of rounding applied after applying an exponent value.
Example:	<code>conversionRounding = "round"</code>

`excludeIf`

Syntax:	<code>excludeIf = true false</code>
Description:	DCD outgoing messages will exclude AVP values that match this rule.
Type:	Boolean
Optionality:	Optional.
Allowed:	true, false
Default:	N/A
Notes:	The AVP type 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.
Example:	<code>excludeIf = false</code>

`excludeIfMatches`

Syntax:	<code>excludeIfMatches = "search_string"</code>
Description:	DCD outgoing messages will exclude AVP values that match this rule. The AVP type should be set to "UTF8String".

Type:	String
Optionality:	Optional
Allowed:	" <i>search_string</i> " : Check for the specified search string anywhere in the string. " <i>^search_string</i> \$" : Check the specified search string matches the whole string. " <i>^search_string</i> " : Check for the specified search string at the beginning of the string. " <i>search_string</i> \$" : Check for the specified search string at the end of the string
Default:	N/A
Notes:	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.
Example:	<code>excludeIfMatches = "f006\$"</code>

`excludeWhenIn`

Syntax:	<code>excludeWhenIn = "range list"</code>
Description:	DCD outgoing messages will exclude AVP values that match this rule.
Type:	Integer
Optionality:	Optional .
Allowed:	delimited range (numbers from x to y) : " <i>x..y</i> " greater than or equal to x : " <i>>=x</i> " less than or equal to x : " <i><=x</i> " any of the listed numbers x, y or z (list may be any length) : " <i>x,y,z</i> " a single number x : " <i>x</i> "
Default:	N/A
Notes:	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.
Example:	<code>excludeWhenIn = "1..99"</code>

`flags`

Syntax:	<code>flags = number</code>
Description:	What flags to override in the AVP header (as octet value). For example, for M, V bits: <code>flags = 192</code>
Type:	Integer
Optionality:	Optional (default used if not set).
Allowed:	
Default:	0
Notes:	If the <code>vendorID</code> parameter value is greater than zero, then V-bit will be set regardless.
Example:	<code>flags = 192</code>

`includeIf`

Syntax:	<code>includeIf = true false</code>
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 <code>excludeIf</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.
Example:	<code>includeIf = true</code>

`includeIfMatches`

Syntax:	<code>includeIfMatches = "search_string"</code>
Description:	DCD outgoing messages will include AVP values that match this rule.
Type:	Integer
Optionality:	Optional .
Allowed:	" <i>search_string</i> " : Check for the specified search string anywhere in the string. " <i>^search_string</i> \$" : Check the specified search string matches the whole string. " <i>^search_string</i> " : Check for the specified search string at the beginning of the string. " <i>search_string</i> \$" : 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 <code>excludeIfMatches</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.
Example:	<code>includeIfMatches = "^f003"</code>

`includeWhenIn`

Syntax:	<code>includeWhenIn = "range list"</code>
Description:	DCD outgoing messages will include AVP values that match this rule.
Type:	Integer
Optionality:	Optional.
Allowed:	delimited range (numbers from x to y) : " <i>x..y</i> " greater than or equal to x : " <i>>=x</i> " less than or equal to x : " <i><=x</i> " any of the listed numbers x, y or z (list may be any length) : " <i>x,y,z</i> " a single number x : " <i>x</i> "
Default:	N/A
Notes:	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.
Example:	<code>includeWhenIn = "12,14,16,-18,20,22"</code>

`interpretBase`

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

literal

Syntax:	<code>literal = "value"</code>
Description:	A literal value.
Type:	String
Optionality:	Optional
Default:	empty
Notes:	<ul style="list-style-type: none"> • 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. • This parameter was previously "value".
Example:	<code>literal = "1"</code>

mandatoryContents

Syntax:	<code>mandatoryContents = "avps"</code>
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:	<pre>mandatoryContents = ["Subscription-Id-Type" "Subscription-Id-Data"]</pre>

maxOccurrences

Syntax:	<code>maxOccurrences = value</code>
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 <code>maxOccurrences</code> 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 <code>variable="index"</code> . This takes the value of the current loop index.
Example:	<code>maxOccurrences = 10</code>

name

Syntax:	<code>name = "name"</code>
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:	<code>name = "CC-Money"</code>

octetLength

Syntax:	<code>octetLength = value</code>
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:	<code>octetLength = 0</code>

optionalContents

Syntax:	<code>optionalContents = "avps"</code>
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:	<pre>optionalContents = ["Service-Identifier" "Requested-Service-Unit" "Subscription- Id"]</pre>
-----------------	--

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:	<p>The value given for this must be one of the valid storage formats for ACS profile fields. The allowable values for this parameter are:</p> <ul style="list-style-type: none"> • 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:	<code>repeating = true false</code>
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 <code>getConcept</code> call indicates no more concept data is available. In the unpacking of a response, repeating AVPs are extracted (and <code>setConcept</code> calls made) until the Diameter stack indicates there are no more to retrieve.
Example:	<code>repeating = true</code>

signInversion

Syntax:	<code>signInversion = true false</code>
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: <ul style="list-style-type: none"> • 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:	<code>signInversion = true</code>

type

Syntax:	<code>type = "type"</code>
Description:	The type of AVP.
Type:	String
Optionality:	Optional. 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.

Allowed:	<p>If specified, this string value 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:</p> <ul style="list-style-type: none"> • OctetString • Integer32 • Integer64 • Unsigned32 • Unsigned64 • Grouped • GroupedUnitValue • Address • Time • UTF8String • DiameterIdentity • DiameterURI • Enumerated <p>Note: Float32 and Float64, although defined in RFC 3588, are not supported because CCS does not use floating point values.</p>
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:	<code>type = "Grouped"</code>

vendorId

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

Example Configuration for an AVP Type of GroupedUnitValue

This section shows how DCD converts balance-related AVPs with a type of GroupedUnitValue. For more information, see *type* .

Example Configuration for Request Messages:

The following example configuration specifies to perform the following for outgoing request messages with an AVP type of GroupedUnitValue:

- Divide the value by 100
- Apply sign inversion

```
{ avpCode = 445 name = "Unit-Value-Topup" type =
"GroupedUnitValue" ccsConcept = "voucherInfoValue" conversionScale
= -100 signInversion = true mandatoryContents = [
"Value-Digits-Topup" ] optionalContents = [ "Exponent-Outgoing" ] }
{ avpCode = 447 name = "Value-Digits-Topup" type = "Integer64" } {
```

```
avpCode = 429 name = "Exponent-Outgoing" type = "Integer32" literal
= "1" }
```

For example, if a voucher top-up in Convergent Charging Controller has a value of -2000, DCD converts it to 20 after applying scaling and sign inversion. In this case, the GroupedUnitValue AVP in the outgoing request message to the third-party application would have Value-Digits set to 2 and Exponent set to 1.

① Note

An exponent is always sent for GroupedUnitValue AVPs. If the `literal` parameter is not defined, it defaults to 0.

Example Configuration for Response Messages:

The following example configuration specifies to apply sign inversion to incoming response messages with an AVP type of GroupedUnitValue:

```
{ avpCode = 252 name = "ORA-Credit-Floor" vendorId = 3512
type = "GroupedUnitValue" ccsConcept = "walletInfoBalanceMaxCredit"
signInversion = true mandatoryContents = [
"Value-Digits-Credit-Floor" ] optionalContents = [
"Exponent-Incoming" ] } { avpCode = 447 name =
"Value-Digits-Credit-Floor" type = "Integer64" } { avpCode = 429
name = "Exponent-Incoming" type = "Integer32" }
```

For example, if an incoming response message from a third-party application contains a GroupedUnitValue AVP with Value-Digits set to 5 and Exponent set to 3, DCD converts the credit floor value to -5000 after applying sign inversion.

① Note

If the exponent is not supplied in the incoming answer message, DCD applies an exponent of 0 to meet RFC 4006 guidelines.

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 = 13000name = "ChargingMaxEventClassAndEventName"type
= "Grouped"mandatoryContents =
["CMX-eventClass" "CMX-eventName" "DIA-Service-Identifier" ]optionalContents
= []}{avpCode = 13001name = "CMX-eventClass"ccsConcept =
"eventClass"type = "UTF8String"cdrTag = "CMX_EC"cdrOperation =
"append"}{avpCode = 13002name = "CMX-eventName"ccsConcept =
"eventName"type = "UTF8String"cdrTag = "CMX_EN"cdrOperation =
"leave"}{# This 'AVP' represents the RFC 4006
Service-Identifier.avpCode = 439name = "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 can be copied during 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 = 17profileTag = 6356992 # Hex
0x00610000profileFormat = "INTEGER"}{contextItem =
"scpActionDoNotSupervise"profileBlock = 17profileTag = 6356993 #
Hex 0x00610001profileFormat = "INTEGER"}{contextItem =
"scpActionRelease"profileBlock = 17profileTag = 6356994 # Hex
0x00610002profileFormat = "INTEGER"}{contextItem =
"scpActionSendMessage"profileBlock = 17profileTag = 6356995 # Hex
0x00610003profileFormat = "INTEGER"}{contextItem =
"scpActionPlayAnnouncement"profileBlock = 17profileTag = 6356996 #
Hex 0x00610004profileFormat = "INTEGER"}{contextItem =
"scpActionSuperviseWithoutControlling"profileBlock = 17profileTag =
6356997 # Hex 0x00610005profileFormat = "INTEGER"}{contextItem =
"callState"profileBlock = 17profileTag = 6356998 # Hex
0x00610006profileFormat = "INTEGER"}{contextItem =
"sendCount"profileBlock = 17profileTag = 6356999 # Hex
0x00610007profileFormat = "INTEGER"}{contextItem =
"preCallAnnouncementId"profileBlock = 17profileTag = 6357000 # Hex
0x00610008profileFormat = "INTEGER"}{contextItem =
"preCallLowBalance"profileBlock = 17profileTag = 6357001 # Hex
0x00610009profileFormat = "INTEGER"}]contextItem

```

Syntax:	contextItem = "name"
Description:	The name of the DCD context item from the allowed list.
Type:	String
Optionality:	Optional

Allowed:	<ul style="list-style-type: none"> • "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 = decival
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

Use TimeIn and TimeOut to copy a timestamp at the beginning of a call (TimeIn) and to record elapsed time during a call (TimeOut). If present, the timestamps are 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 these parameters are omitted, no timestamps are 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* section.

Example TimeIn and TimeOut

Here are the example parameters.

```
TimeIn = {profileBlock = 17profileTag = 6357002 # Hex
0x006100a, continuing from example ContextCopy valuesprofileFormat
= "TIME"}TimeOut = {profileBlock = 17 profileTag = 6357003 # Hex
0x006100bprofileFormat = "TIME"}
```

Routes

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 = 1round_robin = 0direct =
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 <i>HostSpecificData Parameters</i> .
Example:	<code>direct = true</code>

host

Syntax:	<code>host = "permitted_origin_host"</code>
Description:	The host name of the next-hop as configured in <code>DCD.Peers.permittedOriginHosts</code> for the relevant peer.
Type:	String
Optionality:	Mandatory
Allowed:	This is the <code>permittedOriginHosts</code> value of the peer. May be specified for each host. See <i>HostSpecificData Parameters</i> .
Example:	<code>host = "host1.realm1.oracle.com"</code>

priority

Syntax:	<code>priority = priority</code>
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 <i>HostSpecificData Parameters</i> .
Example:	<code>priority = 1</code>

realm

Syntax:	<code>realm = name</code>
Description:	The Realm identity.
Type:	String
Optionality:	Mandatory
Allowed:	As configured in the Domain tab of the Service Management screen. Refer to <i>CCS User's Guide</i> for details. May be specified for each host. See <i>HostSpecificData Parameters</i> .
Example:	<code>realm = "FirstRealm"</code>

round_robin

Syntax:	<code>round_robin = weight</code>
Description:	The weight for round_robin selection.
Type:	Integer
Optionality:	Optional
Default:	0
Notes:	Zero indicates a failover type selection. See <i>routing</i> for details. May be specified for each host. See <i>HostSpecificData Parameters</i> .
Example:	<code>round_robin = 0</code>

HostSpecificData

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* and *Routes Parameters* 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 = 1round_robin = 0direct =
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:	See <i>Routes Parameters</i> 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 <i>Routes Parameters</i> for the global setting.
Example:	host = "host1.realm1.oracle.com"

name

Syntax:	name = <i>hostname</i>
Description:	The identifier correlating to machine hostname (SLC node).
Type:	String
Optionality:	Mandatory if the optional <code>HostSpecificData</code> section is defined.
Allowed:	
Default:	
Notes:	

Example:	name = "ocpc.oracle.com"
-----------------	--------------------------

Origin-Host

Syntax:	Origin-Host = " <i>diameterId</i> "
Description:	The Diameter AVP Origin-Host - fully qualified domain name.
Type:	String
Optionality:	Optional (default used if not set).
Allowed:	
Default:	
Notes:	See <i>DCD Parameters</i> for the global setting.
Example:	Origin-Host = "ocpc.oracle.com"

Origin-Realm

Syntax:	Origin-Realm = " <i>diameterId</i> "
Description:	The Diameter AVP Origin-Realm.
Type:	String
Optionality:	Optional (default used if not set).
Allowed:	
Default:	
Notes:	See <i>DCD Parameters</i> for the global setting.
Example:	Origin-Realm = "ocpc.oracle.com"

priority

Syntax:	priority = <i>priority</i>
Description:	This is the priority of the route.
Type:	Integer
Optionality:	Optional
Notes:	Only those routes with the lowest priority are used. See <i>Routes Parameters</i> 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 <i>Routes Parameters</i> for the global setting.
Example:	realm = "myDomainA"

round_robin

Syntax:	round_robin = <i>weight</i>
----------------	-----------------------------

Description:	This is the weight for round_robin selection.
Type:	Integer
Optionality:	Optional
Default:	0
Notes:	Zero indicates a failover type selection. See <i>routing</i> for details. See <i>Routes Parameters</i> for the global setting.
Example:	round_robin = 0

NamedEventTypes

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 = 123isDebit = true}{eventClass = "ghi"eventName =
"jkl"eventType = 456}]
```

`eventClass`

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

`eventName`

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

`eventType`

Syntax:	<code>eventType = type</code>
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

5

Background Processes

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.

diameterBeClient

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 = 300loggedInvalidPeriod =
300databaseCacheValiditySeconds = 18000 Origin-Host =
"ocpc.oracle.com"Origin-Realm = "ocpc.oracle.com"serviceContextID =
"ocpc@oracle.com"Auth-Application-Id =
4Vendor-Specific-Application-Id = [{Vendor-Id =
193Auth-Application-Id = 4Acct-Application-Id = 19302}]enableDraft8
= false# scheme = "SchemeA"honour_disconnect = trueVendor-Id =
16247Product-Name = "timeout_x = 30000000transmit_limit =
2trace_debug_flags = "all"statistics_interval =
300NotificationFilter = {CollectiveNotice = truePerPeerNotice =
{initial_request = trueupdate_request = truetermination_request =
trueevent_request = trueunknown_request = true}total_request =
true}request_timeout = true}non_request_type_result_codes =
true}}DomainTypes = [{name = "DIAMETER"schemeName =
"SchemeA"routing = "Round Robin" voidUnusedReservation =
falsedefaultSessionFailover = 0defaultEventFailover =
0defaultFailureHandling = 0balanceEnquiryMethod =
"balanceCheck"includeDcdCdrFields = falsedefaultFixedCostDuration =
86400enableScap = falseoverwriteZeroCallAnswerTime = falseDomains =
[{name = "myDomainA"routing = "Round Robin" realmFailureWaitSeconds
= 20weighting = 1}{name = "myDomainB"routing =
"Failover"realmFailureWaitSeconds = 20weighting = 1}]AVPs = [{name
= "ConfirmNamedEventReservationRequest" mandatoryContents =
["Subscription-Id" "Service-Identifier" "NE-Used-Service-Unit"]optionalContents
= []}{avpCode = 443name = "Subscription-Id"type =
"Grouped"mandatoryContents =
["Subscription-Id-Type" "Subscription-Id-Data"]optionalContents =
```

```

[]){avpCode = 450name = "Subscription-Id-Type"type =
"Enumerated"literal = "0" # END_USER_E164}{avpCode = 444name =
"Subscription-Id-Data"type = "UTF8String"ccsConcept =
"acsProfile"profileBlock = 18profileTag = 327686profileFormat =
"LNSTRING"conditionProfileBlock = 17conditionProfileTag =
2009conditionValue = 14}{avpCode = 439name =
"Service-Identifier"type = "Unsigned32"ccsConcept =
"eventType"cdrTag = "DIAMETER_SERVICE_ID"cdrOperation =
"replace"}{avpCode = 446name = "NE-Used-Service-Unit"type =
"Grouped"mandatoryContents =
["CC-Service-Specific-Units-Used"]}{avpCode = 417name =
"CC-Service-Specific-Units-Used"type = "Unsigned64"ccsConcept =
"numUnitsUsed"vendorId = 0flags = 0repeating = falsemaxOccurrences
= 10conversion = [{esg = 1vendor = 2serviceProvider = 1}{esg =
3vendor = 2serviceProvider = 2}]conversionScale =
1conversionRounding = "floor"interpretBase = 10octetLength = 0}{
name = "3GPP-MS-TimeZone" vendorId = 10415 #3GPP
avpCode = 23 ccsConcept = "callerMsTimeZone" type =
"OctetString" octetLength = 2}{avpCode = 900vendorId =
16247name = "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 =
581avpCode = 50998ccsConcept =
"voucherRechargeFailureFlag"includeIf = true} {name =
"Voucher-Recharge_Failed-Date-Time"type = "Integer32"vendorId =
581avpCode = 50999ccsConcept =
"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 = 12003ccsConcept = "voucherInfoValue"type =
"Integer32"} {name = "Topup-Voucher-Type"avpCode = 12005ccsConcept
= "voucherTypeName"type = "UTF8String"} {name =
"Topup-Voucher-Id"vendorId = 581avpCode = 50026ccsConcept =
"voucherInfoVoucherId"type = "Integer32"}{ name =
"Topup-Voucher-Serial-Number"avpCode = 12008ccsConcept =
"voucherInfoVoucherSerialNumber"type = "Unsigned64"}{name =
"Topup-Voucher-Balance-Validity-Start"avpCode = 12009ccsConcept =
"voucherInfoBalanceValidityStart"type = "Time"}{name =
"Topup-Voucher-Balance-Validity-Relative"avpCode = 12010type =

```

```

"Grouped"optionalContents =
["Topup-Voucher-Balance-Validity-Offset" "Topup-Voucher-Balance-Validity-Type"]}
{name
= "Topup-Voucher-Balance-Validity-Offset"avpCode = 12011ccsConcept
= "voucherInfoBalanceValidityOffset"type = "Integer32"}{name =
"Topup-Voucher-Balance-Validity-Type"avpCode = 12012ccsConcept =
"voucherInfoBalanceValidityType"type = "Enumerated"}{name =
"WalletRechargeResponse"mandatoryContents =
["Topup-Balance-Information" "Topup-Receipt-Number"]} {name =
"Topup-Balance-Information"vendorId = 581 # IntecavpCode =
50030type = "Grouped"mandatoryContents =
["Topup-Balance-Type-ID" ]optionalContents =
["Topup-Balance-Expire-Date" "Topup-Unit-Value"]} {name =
"Topup-Balance-Type-ID"avpCode = 50020vendorId = 581 #
IntecccsConcept = "walletInfoBalanceType"type = "Integer32"}{name =
"Topup-Balance-Expire-Date"vendorId = 581 # IntecavpCode =
50032ccsConcept = "walletInfoBalanceExpiry"type = "Integer32"}
{avpCode = 445vendorId = 581name = "Topup-Unit-Value"type =
"GroupedUnitValue"ccsConcept =
"walletInfoBalanceSystemValue"conversionScale = signInversion -
truemandatoryContents = ["Topup-Value-Digits"]optionalContents =
["Topup-Exponent"]} {avpCode = 447name = "Topup-Value-Digits"type =
"Integer64"} {avpCode = 449name = "Topup-Exponent"type =
"Integer32"literal = "1"} {name = "Topup-Receipt-Number"avpCode =
50024type = "UTF8String"} {name = "CreateEDRRequest"} {name =
"CreateEDRResponse"} {name = "BadPINRequest"} {name =
"BadPINResponse"}{name = "Termination-Cause"avpCode = 295type =
"Enumerated"ccsConcept = "terminationCause"conversion = [{esg = 8 #
releasedNoFundsvendor = 6 # DIAMETER_AUTH_EXPIRED}{esg = 9 #
disconnectedLegBNoFundsvendor = 6 # DIAMETER_AUTH_EXPIRED}{esg = 14
# callingPartyDisconnectedvndor = 1 # DIAMETER_LOGOUT}{esg = 15 #
calledPartyDisconnectedvndor = 1 # DIAMETER_LOGOUT}}]}ContextCopy
= [{contextItem = "scpActionSupervise"profileBlock = 17profileTag =
6356992 # Hex 0x00610000profileFormat = "INTEGER"}{contextItem =
"scpActionDoNotSupervise"profileBlock = 17profileTag = 6356993 #
Hex 0x00610001profileFormat = "INTEGER"}{contextItem =
"scpActionRelease"profileBlock = 17profileTag = 6356994 # Hex
0x00610002profileFormat = "INTEGER"}{contextItem =
"scpActionSendMessage"profileBlock = 17profileTag = 6356995 # Hex
0x00610003profileFormat = "INTEGER"}{contextItem =
"scpActionPlayAnnouncement"profileBlock = 17profileTag = 6356996 #
Hex 0x00610004profileFormat = "INTEGER"}{contextItem =
"scpActionSuperviseWithoutControlling"profileBlock = 17profileTag =
6356997 # Hex 0x00610005profileFormat = "INTEGER"}{contextItem =
"callState"profileBlock = 17profileTag = 6356998 # Hex
0x00610006profileFormat = "INTEGER"}{contextItem =
"sendCount"profileBlock = 17profileTag = 6356999 # Hex
0x00610007profileFormat = "INTEGER"}{contextItem =
"preCallAnnouncementId"profileBlock = 17profileTag = 6357000 # Hex
0x00610008profileFormat = "INTEGER"}{contextItem =
"preCallLowBalance"profileBlock = 17profileTag = 6357001 # Hex
0x00610009profileFormat = "INTEGER"}]TimeIn = {profileBlock =
17profileTag = 6357002 # Hex 0x0061000a, continuing from example
ContextCopy valuesprofileFormat = "TIME"}TimeOut = {profileBlock =
17 profileTag = 6357003 # Hex 0x0061000bprofileFormat = "TIME"}}] #
End of DomainTypes arrayPeerSchemes = [{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 = 3868netmask6Bits = 128netmaskBits =
32permittedInstances = 0reqSctpInboundStreams =
8reqSctpOutboundStreams = 8sctp_hbinterval = 1000watchdogPeriod =
30connectionTimeout = 30inBufferSize = 0outBufferSize = 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 = 3868netmask6Bits = 128netmaskBits =
32permittedInstances = 0reqSctpInboundStreams =
8reqSctpOutboundStreams = 8sctp_hbinterval = 1000watchdogPeriod =
30connectionTimeout = 30inBufferSize = 0outBufferSize = 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 = 3868netmask6Bits = 128netmaskBits =
32permittedInstances = 0reqSctpInboundStreams =
8reqSctpOutboundStreams = 8sctp_hbinterval = 1000watchdogPeriod =
30connectionTimeout = 30inBufferSize = 0outBufferSize = 0} # end of
Peer host1]} # End of Scheme B] # End of PeerSchemes sectionroutes
= [{realm = "FirstRealm" host = "host1.realm1.oracle.com" priority
= 1round_robin = 0direct = true}]NamedEventTypes = [{eventClass =
"abc"eventName = "def"eventType = 123isDebit = 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 = 1round_robin = 0direct =
true}]}}]
```

Statistics Logged by diameterBeClient

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

To enable statistics on an SCP after installing the database entries on the SMF.

1. On the **Table Replication** tab of the SMS Node Management screen, select the DCD replication entry:

```
SMS->SMF_STATISTICS_DEFN->SMF_STDEF_DCD
```

and drag it over to the allocated Replication Groups. Refer to *Configuring Table Replication* in the *SMS User's Guide* for details.

- After creating the config file, you need to send a HUP to the smsStatsDaemon to force a reread of the database entries:

```
# fuser -s 1
/IN/service_packages/SMS/bin/smsStatsDaemon
```

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 sent 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 2007Finish Date: 30 October 2007Report Type:
Totals24 October 2007, 21:20:12Node Name Statistics ID

      Totals-----
-----
-----mtv-tst-scp10 DIAMETER_FAILURE_UNKNOWN

3mtv-tst-scp10 DIAMETER_SUCCESS

319mtv-tst-scp10 DIAMETER_FAILURE_5xxx

14mtv-tst-scp10 DIAMETER_CC_TYPE_INITIAL

214mtv-tst-scp10 DIAMETER_FAILURE_1xxx

2mtv-tst-scp10 DIAMETER_TIMEOUT

63mtv-tst-scp10 DIAMETER_CC_TYPE_UPDATE

185mtv-tst-scp10 DIAMETER_FAILURE_3xxx

8mtv-tst-scp10 DIAMETER_CC_TYPE_TERMINATION

86mtv-tst-scp10 DIAMETER_CC_TYPE_EVENT

14mtv-tst-scp10 DIAMETER_FAILURE_4xxx

39Completed
```

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. See *Event Detail Record Reference Guide* 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
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: <i>DiameterIdentity;time;SLEE_CallID</i> Where: <ul style="list-style-type: none"> <i>DiameterIdentity</i> is that of the SLC (that is, the Origin-Host used in the CCR message) <i>time</i> is the time of the first request (expressed as the number of seconds since the Unix epoch time) <i>SLEE_CallID</i> is a unique call identifier used by the SLEE processes to track each active session
Concept:	Session-ID
Notes:	The values for <i>time</i> and <i>SLEE_CallID</i> are in decimal format, but they are actually sent out in hexadecimal format.
Example:	DIA_SID=scpl.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 that are 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
```

6

About Installation and Removal

This chapter provides information about the installed components for the Oracle Communications 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.

Installation and Removal Overview

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

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**