

Oracle® Communications Convergent Charging Controller Installation Guide



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

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About This Document

Audience

This guide is for system administrators who install or uninstall Oracle Communications Convergent Charging Controller.

Prerequisites

Before installing or uninstalling Convergent Charging Controller, you should have an understanding of UNIX, Oracle Solaris, and a familiarity with IN concepts as well as an understanding of Oracle databases, SQL, and PL/SQL.

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

Related Documents

See the following documents for related information about Convergent Charging Controller:

- *Concepts*
- *System Administrator's Guide*
- *Configuration User's Guide*
- *Security Guide*

Document Conventions

Typographical Conventions

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

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

Convergent Charging Controller Installation Overview

Overview

Introduction

This chapter describes the Oracle Communications Convergent Charging Controller installed components and provides an overview of the Convergent Charging Controller installation procedure.

In this chapter

This chapter contains the following topics.

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Convergent Charging Controller Installed Components Overview

About Convergent Charging Controller Installed Components

During the Convergent Charging Controller installation process, you install and configure the following components:

- Oracle Database
- BRM SDK if your Convergent Charging Controller system will communicate with Oracle Communications Billing and Revenue Management (BRM) when using the BRM Portal Communications Protocol (PCP) interface
- Convergent Charging Controller software packages

Convergent Charging Controller Software

The following table describes the Convergent Charging Controller software sub-components installed.

Component	Provides
SMS	Service Management System (SMS) support for all other components. For example: <ul style="list-style-type: none"> • Data replication. • Statistics and alarm collection. • Security (users and permissions). • Report generation.
SLEE	The Service Logic Execution Environment (SLEE) for the Voucher and Wallet Server (VWS) and Service Logic Controller (SLC) nodes.

Component	Provides
ACS	Base call handling and processing capabilities, and the Control Plan Editor.
CCS	Rating, charging, subscriber and voucher capabilities.
SMCB	SMS rating and charging capabilities.
BE	Real-time charging, voucher redemption, and session control capabilities.
DSY	Diameter Sy Interface
MM	All messaging capabilities.
MM Navigator	Routing information lookup capabilities for messaging services.
RAP	CAMEL roaming capabilities.
UIS and UPC	USSD capabilities.
DAP	Outbound XML capabilities.
OSD	Inbound XML capabilities.
LCP	Location based capabilities.
SCA	SIP capabilities.
VSSP	ISUP capabilities.
SIGTRAN	M3UA and SUA capabilities.
PI	Provisioning capabilities.
CAP3_GW	CAP3 capabilities.
DCA	Inbound Diameter capabilities.
DCD	Outbound Diameter capabilities.
ECA	Inbound EDR/CDR processing capabilities.
ENUM	ENUM capabilities.
IS41	Inbound IS41 (CDMA) capabilities.
LCA	Inbound LDAP capabilities.
MFW	MAP Firewall capabilities.
MOB_ROAM	Additional roaming capabilities.
NGW	Notification Gateway capabilities.
NP_SERVICE_PACK	Number portability capabilities.
RCA	RADIUS capabilities.
SES	Subscriber event capabilities.
SEI	SMS to email capabilities.
SMINAP	CAPv1 capabilities.
TFR	TCAP relay capabilities.
VPN	Virtual private networking capabilities.

Certification

This release has been certified on:

- Solaris 11.3
- Oracle Database 19.13.0
- Oracle Linux 8 Update 4

Obsoleted Support

This release makes obsolete support of the following:

- Solaris 10
- Oracle Database 10.2
- Oracle Database 11g
- Oracle Database 11g Client
- Java 1.6
- Java 1.7

Convergent Charging Controller Installation Procedure Overview

Overview of the Installation Procedure

You install Convergent Charging Controller on each Service Management System (SMS), Voucher and Wallet Server (VWS), and Service Logic Controller (SLC) node. The installation procedure follows these steps:

Step	Action
1	Plan your installation. When planning your installation, you will need to: <ul style="list-style-type: none"> • Determine the scale of your implementation, for example, whether it is a small test system or a large production system. • Determine how many physical machines you need. • Plan the system topology, for example, which SMS, VWS, or SLC nodes will run on which machines.
2	Review the following system requirements: <ul style="list-style-type: none"> • Hardware requirements, such as disk space and memory size • Software requirements, such as operating system version, file system layout, and file sizes • Information requirements, such as IP addresses and host names
3	Perform pre-installation tasks: <ul style="list-style-type: none"> • Perform system preparation tasks such as disabling services and configuring the location of log files. • Install and configure the Oracle database on local or remote server. • Install and configure additional third-party software.
4	Install the Convergent Charging Controller product software on all nodes and optionally install service templates. <p>Note: If the database is on a remote server, ensure the required table spaces are added. See <i>Advanced Storage and Memory Sizing</i> (on page 25) for more details.</p>
5	Perform mandatory post-installation configuration tasks.
6	Verify the installation.

Installation Options

You install Convergent Charging Controller by using the Convergent Charging Controller Oracle Universal Installer (the installer). Using the installer, you can perform either a GUI installation or a silent installation using response files, similar to Oracle database installation.

Supporting Multi-Byte UTF-8 Character Sets

Convergent Charging Controller uses the AL32UTF8 database character set that supports multi-byte UTF-8 and traditional character sets. The Convergent Charging Controller Installation Manager automatically sets the character set to AL32UTF8 when you install Convergent Charging Controller.

Ensuring a Successful Installation

Introduction

The Convergent Charging Controller installation should be performed only by qualified personnel. You must be familiar with the Oracle Solaris operating system, Linux operating system, and Oracle Database software. You should be experienced with installing Solaris packages. It is recommended that the installation and configuration of the Oracle database be performed by an experienced database administrator.

Installation Guidelines

Follow these guidelines:

- As you install each component (for example, Oracle Database), verify that the component is installed successfully before continuing the installation process.
- Pay close attention to the system requirements. Before you begin installing the software, make sure your system has the required base software. In addition, make sure that you know all of the required configuration values, such as host names and port numbers.
- As you create new configuration values, write them down. In some cases, you might need to re-enter configuration values later in the procedure.

Planning Your Convergent Charging Controller Installation

Overview

Introduction

This chapter explains how to plan an Oracle Communications Convergent Charging Controller installation.

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About Planning Your Convergent Charging Controller Installation

Planning Your Convergent Charging Controller Installation

When planning your Convergent Charging Controller installation, you will need to decide:

- How many Service Management System (SMS), Voucher and Wallet Server (VWS), and Service Logic Controller (SLC) nodes to install
- Which node to install on which server
- If external storage is used, how to connect each server to the external storage
- If databases will be co-located at nodes or located remotely
- How to connect Convergent Charging Controller servers together in your network
- How to connect Convergent Charging Controller servers with the rest of your network
- How to integrate the Convergent Charging Controller solution into the telco infrastructure

Before installing Convergent Charging Controller, you should create an implementation plan that includes the following elements:

- A logical and physical overview of the solution, listing all nodes used in the solution and how they interact (for example: protocols used, and so on). If the solution is deployed geographically across multiple sites, then this should be reflected here.
- Hardware details for each node, including connected hardware such as external storage
- Rack mounting and cabling details
- Storage and database details
- IP network details
- Telco network integration details

For an overview of the Convergent Charging Controller architecture, see the discussion about the Convergent Charging Controller system architecture in *Convergent Charging Controller Concepts*.

About Cohosting Convergent Charging Controller Nodes

Cohosting multiple Convergent Charging Controller nodes on a single physical server is only supported in combination with virtualization technologies, such as the following:

- Oracle VM Server for SPARC or Oracle VM for Linux
- Hardware partitioning such as dynamic domains

Each node should have its own operating system, database instance, and storage layout. You could also use an existing database available on a remote server. See *Installing the Oracle Database Software* (on page 55) for details.

Detailed Planning

Storage Planning

Document the storage configuration. For each SMS, VWS, and SLC node, include the following information:

- How the internal disks will be organized
- Whether disks will be managed by a volume manager or a RAID controller or both
- What data will be stored on each disk or disk group
- How the external storage will be organized; for example, what are the Logical Unit Numbers (LUN), RAID groups, and so on
- How the servers will be connected to the storage and how you will make this access redundant
- Details of any specific parameters that will be set in the external storage, volume manager, and file systems

Database Planning

Document all database parameters for each SMS, VWS, and SLC node, including the following:

- Where the different database elements (such as data files, redo logs, archive logs, and so on) will be stored
- The values defined for the oracle environment variables (such as ORACLE_SID, ORACLE_BASE, ORACLE_HOME, and so on)
- The System Global Area (SGA) parameters
- Any other specific instance parameters you will use

Network Planning

To plan the network implementation:

- Document the different internal and external IP networks that will be used and create a schematic overview of these networks. Use this overview to describe which nodes have access to which networks.
- Document the physical configuration of the network. For example, document which Network Interface Card (NIC) ports will be used for which networks.
- Document how redundancy will be achieved; for example, through IP network multipathing (IPMP).
- Document Network Time Protocol (NTP) configuration. Either list existing NTP servers or define which nodes will be configured as NTP servers.
- Create a host register containing details of all IP addresses and netmasks for all nodes and networks.

Integration Planning

Plan for integration with the telco environment by documenting at least the following items:

- How the SLC nodes will be integrated into the telco environment. Create a schematic overview and use this overview to describe the interaction between the SLC nodes and the telco infrastructure (for example: MSC Signaling Gateways, IPs, and so on).
- Which transport and application protocols will be used in which scenarios (for example: M3UA, SUA, INAP, Camel, MAP, and so on).
- How traffic will be routed to and from the SLC nodes. For example, record details of SCCP/SUA routing, including SCCP addressing parameters, global title addresses, subsystems, and so on.
- How traffic will be load-balanced across the SLC nodes.
- Any protocol specific details for each application protocol. For example, for INAP or Camel, record which subsystem numbers and service keys will be used and which type of service will be invoked for each protocol.
- A detailed call-flow for each call scenario, showing the signaling units and signaling unit parameters being received and returned by the SLC nodes.

OSD Configuration Planning

You configure Open Services Development (OSD) to enable SLC nodes to receive HTTP/SOAP requests. The requests trigger control plans on the SLC. When configuring OSD, you should determine:

- How many OSD interfaces will run on each SLC
- The IP address and TCP port that each interface will use to listen for incoming connections

The SMS and VWS nodes also send HTTP/SOAP requests to the SLC nodes in order to submit SMS notifications. This means that at a minimum, you must configure OSD interfaces as targets for the SMS and VWS nodes.

Tip: You should use an:

- Internal LAN (if available) for the HTTP/SOAP traffic sent from the VWS and SMS nodes to the SLC nodes.
- External LAN for the HTTP/SOAP traffic coming from external systems

You should document the OSD configuration in a table and keep this information available for reference during the installation and configuration process.

OSD Configuration Example

The following table lists example OSD configuration for SMS notification requests.

SLC nodes	OSD interface	Sample IP:port values	Source nodes	Scenario
SLC1	osdInterface	10.1.0.10:2222	SMS, VWS1, VWS2	SMS Notification request
SLC2	osdInterface	10.1.0.20:2222	SMS, VWS1, VWS2	SMS Notification request

Replication Planning

You should document all replication elements, node IDs, and IP addresses in a table. This information will be needed when you configure replication following the installation.

Replication Reference Table Example

The **Replication** column in the following table shows the typical values for a fully configured system.

Node		Replication		UpdateRequester ID			
Name	Type	Node ID	Internal IP Address	Alarms	AVD	Stats	Rep IF
test_SMS	SMS	1	10.0.0.10	-	-	-	-
test_SLC1	SLC	301	10.0.0.11	601	-	701	901
test_SLC2	SLC	302	10.0.0.12	602	-	702	902
test_VWS1	VWS	351	10.0.0.21	651	611	751	951
test_VWS2	VWS	352	10.0.0.22	652	612	752	952

The table headings map to the following configuration fields:

- *Name* is the **Description**
- *Node ID* is the **Node Number** - this must be unique across the system
- *UpdateRequester ID* - this must be unique across the system
- *Internal IP Address* is the **Primary Node IP Address**

See the chapter on replication in *Service Management System Technical Guide* for information on replication and node numbering standards.

Convergent Charging Controller System Requirements

Overview

Introduction

This chapter describes the hardware and software requirements for Oracle Communications Convergent Charging Controller.

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Network Requirements

Introduction

All Convergent Charging Controller nodes require IP network connectivity to communicate with each other, as well as with other network elements such as management clients, provisioning systems, or telephony signaling transfer points. A typical Convergent Charging Controller implementation comprises the following logical networks:

- Management
- Billing
- Internal communication
- Signaling

IP Networks

The following table describes the logical IP networks and their Convergent Charging Controller implementation.

Network	Type	Purpose
Management	External	Provides external component access to the Convergent Charging Controller nodes; for example, to UIs for performing operations, to provisioning systems for creating subscriber accounts and recharging accounts, to a data warehouse for collecting event detail record (EDRs), and so on. It also allows the nodes to transmit data to peripheral systems, such as network management systems (as SNMP traps).

Network	Type	Purpose
Billing	Internal	Use an internal network for billing communication between the Convergent Charging Controller nodes, such as call reservation requests or wallet information requests. The billing network should not be accessible by external systems.
Internal communication	Internal	Use for all internal communications between the Convergent Charging Controller nodes, including data replication but excluding billing communication. The Internal network should not be accessible by external systems.
Signaling	External	Use two signaling networks for redundant signaling connectivity between the SLC nodes and the telephony network. For integration into: <ul style="list-style-type: none"> • A GSM or CDMA network, set up a multi-homed SCTP association between Signaling Gateways and the SLC nodes to carry M3UA or SUA (SIGTRAN) traffic. • An NGN network, use the signaling networks to set up two separate TCP/IP connections between the Media Gateway Controller (MGC or softswitch) and each SLC node. The connections between the SLC nodes and the Signaling Gateways or MGCs can be switched (systems on the same IP subnet) or routed (for systems on different IP subnets).

Connecting Networks

When setting up the Convergent Charging Controller network connections, you should:

- Connect management, billing, and internal networks to all nodes.
- Connect signaling networks to SLC nodes only.
- Use a single physical network for each logical network to ensure optimal performance and stability in production implementations. However, logical networks can share a single or multiple physical networks, if required.
- Ensure full redundancy for each network by using two or more network ports connected to an independent ethernet network.
- Use IP network multipathing (IPMP) to implement IP address and network interface failover capabilities on the Convergent Charging Controller nodes.

Logical Network Settings

The following table lists the settings you should use for bandwidth, latency, security, redundancy, and external routing for each type of logical network.

Logical Network	Bandwidth	Latency	Security	Redundancy	External Routing
Management	High	Medium	Yes	Yes	Yes
Billing	High	Low	No	Yes	No
Internal	High	Medium	No	Yes	No
Signaling	High	Low	No	Yes	Yes

Note: If you do not require routing for connectivity to peer signaling nodes, then you will not need external routing for the signaling network.

Logical Network Settings Table

This table explains the bandwidth, latency, security, redundancy, and external routing settings listed in *Logical Network Settings* (on page 10).

Setting	Description
Bandwidth	An indicator of the required bandwidth for this connection. Typical model IP connections have low bandwidth requirements, allowing them to be satisfied with shared infrastructure. Medium bandwidth requirements may require some quality of service. High bandwidth requirements may require a dedicated link, for example, over an E1/T1 bearer.
Latency	Latency requirements are relevant to performance and volume testing. The level of latency reflects how time critical the response is.
Security	The level of security required depends on whether or not the information being passed is sensitive or is financial information such as vouchers. You may need a dedicated connection for high levels of security.
Redundancy	Redundancy enables failover protection if a connection is lost.
External Routing	External routing is needed if the subnet will require routing beyond the Convergent Charging Controller solution.

Memory Requirements

About Memory Requirements

You will require at least eight gigabytes of RAM per node to completely install Convergent Charging Controller. You may require additional memory depending on the size and complexity of the deployment.

The exact amount of memory required on each SMS, VWS, and SLC node depends on memory requirements of:

- The operating system
- The Convergent Charging Controller application processes running on the node
- The Oracle Database instance processes and System Global Area (SGA) settings

Note: For information about advanced memory sizing, see *Advanced Storage and Memory Sizing* (on page 25).

Database Memory

For more information on memory requirements for the Convergent Charging Controller applications, including example settings for small, medium, and large production systems, see *Advanced Storage and Memory Sizing* (on page 25).

The following table lists the minimum Convergent Charging Controller Oracle database SGA settings for each Convergent Charging Controller node in your environment. You should review all settings for your specific deployment.

SGA Element	Recommended minimum setting (MB)		
	SMS	VWS	SLC
log_buffer	16	10	16
java_pool_size	160	0	160

SGA Element	Recommended minimum setting (MB)		
	SMS	VWS	SLC
shared_pool_size	512	512	512
pga_aggregate_target	256	64	256
large_pool_size	160	32	160
db_cache_size	48	128	48
db_keep_cache_size	32	32	32
db_recycle_cache_size	32	32	32
db_32k_cache_size	128	0	128

Storage Requirements

Introduction

Each node in a Convergent Charging Controller installation will consist of a number of logical sets of data. On some nodes, additional sets of data may be required, such as Oracle Archive logs, or data files may be divided to help optimize performance. For example, redo logs and data files could be separated in the Oracle Database Instance set.

You should follow these recommendations if possible:

- Dedicate the boot disk to OS and do not use it to store any other logical data groups.
- Maintain a mirror of the boot disk for redundancy.

General Storage Requirements

Each Convergent Charging Controller node will consist of at least the minimum logical sets of data listed in the following table.

Data Set	Mount Point
Operating system with <code>/var</code> file system and swap space	Boot disk
Convergent Charging Controller applications (binaries, libraries, log files, temporary files)	<code>/IN</code> (mandatory)
Oracle Database Server (binaries, <code>\$ORACLE_BASE</code> , <code>\$ORACLE_HOME</code>)	<code>/u01</code> (recommended)
Oracle Database instance (for example, data files, log files)	<code>/oracle/datafiles</code> (recommended)
Oracle redo log files	<code>/oracle/redologs</code> (recommended)

Swap sizing should be based on the following guidelines for each node.

For Oracle Enterprise Database 19c:

System RAM Size	Recommended Swap Size
1GB to 2GB	= 1.5x System RAM
>2GB to <16GB	= System RAM
>16GB	= 16GB

SMS Storage Requirements

The following table details the mount points and minimum storage requirements for the SMS node.

Data Set	Mount Point	Minimum Size
Convergent Charging Controller applications	/IN	20 GB
Oracle Database server 19.13.0 Enterprise Edition	/u01	12 GB
Oracle Database instance	/oracle/datafiles	80 GB

VWS Storage Requirements

The following table details the mount points and minimum storage requirements for the VWS node.

Data Set	Mount Point	Minimum Size
Convergent Charging Controller applications	/IN	20 GB
Oracle Database server	/u01	12 GB
Oracle Database instance	/oracle/datafiles	45 GB

SLC Storage Requirements

The following table details the mount points and minimum storage requirements for the SLC node.

Data Set	Mount Point	Minimum Size
Convergent Charging Controller applications	/IN	20 GB
Oracle Database server	/u01	12 GB
Oracle Database instance	/oracle/datafiles	25 GB

SMS Tablespace Requirements

The following table lists the minimum tablespace sizing required for an installation on the SMS node.

Component	Tablespace Name	Datafile Size (MB)	Number of Files	Total Size
ACS	ACS_DATA	200	2	400
	ACS_INDEX	200	1	200
	ACS_SUBURB_DATA1	200	4	800
	ACS_SUBURB_INDEX 1	200	4	800
CCS	CCS_CDR	2001	1	2001
	CCS_CDR_I	2001	1	2001
	CCS_DATA	2001	1	2001
	CCS_EVENT	2001	1	2001

Component	Tablespace Name	Datafile Size (MB)	Number of Files	Total Size
	CCS_EVENT_I	2001	1	2001
	CCS_INDEX	2001	1	2001
	CCS_SUBS	2001	1	2001
	CCS_SUBS_I	2001	1	2001
	CCS_VOUCHERS	2001	1	2001
	CCS_VOUCHERS_I	2001	1	2001
	CCS_XDB	2001	1	2001
ENUM	EN_DATA	200	1	200
	EN_INDEX	200	1	200
	EN_SUBS	200	1	200
	EN_SUBS_I	200	1	200
LCP	LCP_DATA	200	1	200
	LCP_INDEX	200	1	200
MM	MMX_DATA	200	1	200
	MMX_INDEX	200	1	200
NP_SERVICE_PAC K	NP_DATA	200	1	200
	NP_INDEX	200	1	200
	NP_SUBS	200	1	200
	NP_SUBS_I	200	2	400
OSD	OSD_DATA	200	1	200
	OSD_INDEX	200	1	200
PI	PI_DATA	200	1	200
	PI_INDEX	200	1	200
RCA	RCA_DATA	200	1	200
	RCA_INDEX	200	1	200
SES	SES_DATA	200	1	200
	SES_INDEX	200	1	200
SMS	REP_DATA	2001	1	2001
	SMF_ALARMS	2001	1	2001
	SMF_ALARMS_I	2001	1	2001
	SMF_AUD	2001	2	4002
	SMF_AUD_I	2001	1	2001
	SMF_DATA	200	2	400
	SMF_INDEX	200	1	200

Component	Tablespace Name	Datafile Size (MB)	Number of Files	Total Size
	SMF_STATS	2001	1	2001
	SMF_STATS_I	2001	1	2001
	SYSAUX	2001	1	2001
	SYSTEM	512	1	512
	TOOLS	2001	1	2001
	UNDOTBS2	2001	5	10005
	USERS	2001	1	2001
UIS	UIS_CDR	200	1	200
	UIS_CDR_I	200	1	200
	UIS_DATA	200	1	200
	UIS_INDEX	200	1	200
UPC	UPC_DATA	200	1	200
	UPC_INDEX	200	1	200
VPN	VPN_DATA	200	1	200
	VPN_INDEX	200	1	200

VWS Tablespace Requirements

The following table lists the minimum tablespace sizing required on the VWS node.

Component	Tablespace Name	Datafile Size (MB)	Number of Files	Total Size
ACS	ACS_DATA	200	2	400
	ACS_INDEX	200	1	200
BE	BE_DATA	200	1	200
	BE_EVENT	2001	1	2001
	BE_EVENT_I	2001	1	2001
	BE_SUBS	2001	1	2001
	BE_SUBS_I	2001	1	2001
	BE_VOUCHERS	2001	1	2001
	BE_VOUCHERS_I	2001	1	2001
	SYSAUX	500	1	500
	SYSTEM	450	1	450
	TEMP	2001	5	10005
	REDO	101	16	1616

Component	Tablespace Name	Datafile Size (MB)	Number of Files	Total Size
	TOOLS	200	1	200
	UNDO	2001	5	10005
	USERS	200	1	200
CCS	CCS_DATA	200	1	200
	CCS_INDEX	200	1	200
	CCS_SUBS	2001	1	2001
	CCS_SUBS_I	2001	1	2001
	CCS_VOUCHERS	2001	1	2001
	CCS_VOUCHERS_I	2001	1	2001
SMS	SMF_DATA	100	1	100
	SMF_INDEX	100	1	100

SLC Tablespace Requirements

The following table lists the minimum tablespace sizing required on the SLC node.

Component	Tablespace Name	Datafile Size (MB)	Number of Files	Total Size
ACS	ACS_DATA	200	2	400
	ACS_INDEX	200	1	200
	ACS_SUBURB_DATA1	200	4	800
	ACS_SUBURB_INDEX 1	200	4	800
CCS	CCS_SCP_DATA	200	1	200
	CCS_SCP_INDEX	200	1	200
	CCS_SUBS	2001	1	2001
	CCS_SUBS_I	2001	1	2001
ENUM	EN_DATA	200	1	200
	EN_INDEX	200	1	200
	EN_SUBS	200	1	200
	EN_SUBS_I	200	1	200
LCP	LCP_DATA	200	1	200
	LCP_INDEX	200	1	200
MM	MMX_DATA	200	1	200
	MMX_INDEX	200	1	200
NP_SERVICE_PAC K	NP_DATA	200	1	200
	NP_INDEX	200	1	200

Component	Tablespace Name	Datafile Size (MB)	Number of Files	Total Size
	NP_SUBS	200	1	200
	NP_SUBS_I	200	1	20
OSD	OSD_DATA	200	1	200
	OSD_INDEX	200	1	200
RCA	RCA_DATA	200	1	200
	RCA_INDEX	200	1	200
SES	SES_DATA	200	1	200
	SES_INDEX	200	1	200
SMS	SMF_DATA	100	1	100
	SMF_INDEX	100	1	100
	SYSAUX	2001	1	2001
	SYSTEM	2001	1	2001
	TOOLS	2001	1	2001
	UNDOTBS1	2001	2	4002
	USERS	2001	1	2001
UIP	UIS_CDR	200	1	200
	UIS_CDR_INDEX	200	1	200
	UIS_DATA	200	1	200
	UIS_INDEX	200	1	200
UPC	UPC_DATA	200	1	200
	UPC_INDEX	200	1	200
VPN	VPN_DATA	200	1	200
	VPN_INDEX	200	1	200

Software and Hardware Requirements

Introduction

This section details the hardware platforms and prerequisite software required to install Convergent Charging Controller.

For details on installing the required system software, see the installation and setup documentation supplied with the software.

Hardware Platforms

The following table lists the minimum recommended and mandatory hardware platforms for the Convergent Charging Controller applications.

Hardware	Mandatory / Recommended	Required for
64-bit SPARC CPU architecture or Linux x86	Mandatory	All nodes
Storage Array (RID)	Recommended	SMS only
A PC with a screen resolution of 1024x768 pixels	Recommended	Installer and Clients

Prerequisite Software

The following table lists the additional Oracle and third-party software that you should install prior to installing Convergent Charging Controller.

Software	Version	Where to install
Oracle Solaris or Linux operating system. This includes the packages listed below.	11.3 (Solaris) 8.4 (Linux)	All nodes Note: When installing the nodes, ensure that all the nodes are installed on the same operating system.
Linux Kernel Stream Control Transmission Protocol: lksctp-tools.i686	-	SLC nodes
Oracle Database Server: 19c Enterprise Edition	19.13.0.0.0	SMS nodes
Oracle Database Server: 19c Standard Edition	19.13.0.0.0	SLC and VWS nodes
Oracle Java Runtime Environment (JRE)	8u321	GUI clients hosts
Oracle Java Development Kit (JDK). This includes the packages listed below: JDK 8	8u221	All nodes
Oracle Communications Billing and Revenue Management (BRM) SDK (on SLC nodes) See <i>Installing and Configuring BRM SDK</i> (on page 60) for more information.	BRM SDK 7.5.0.21.0	SLC Node Note: Copy 64 bit libraries libnzsdk64.so, libpcmext64.so and libportal64.so into BRM SDK installed 'lib' directory with proper permissions.
xinetd daemon	N/A	SMS nodes Note: This daemon is a prerequisite for running the cmnPushFiles and cmnReceiveFiles processes.
Httpd		SMS nodes
Elasticsearch OSS	7.10.2	Note: These are optional and only required if you are using EFK based logging support.
Kibana OSS	7.10.2	
Fluentd	1.12.3	

Software	Version	Where to install
Prometheus	2.27.1	Note: These are optional and only required if you are implementing Prometheus and Grafana based monitoring solution.
Grafana	7.5.6	
OpenSSL (Linux)	1.1.1*	All Nodes

Preparing the System

Introduction

Check the kernel parameters on the system to ensure the system is optimally configured.

Kernel Parameters

The following table shows the minimum and recommended values for kernel parameters on Solaris 11.3 for Oracle 19c databases, and lists the resource controls to use when modifying the parameter values with the **projadd** or **projmod** command.

Parameter	Replaced by Resource Control	Minimum Value	Recommended Value
semsys:seminfo_semmni	project.max-sem-ids	100	2048
semsys:seminfo_semmsl	process.max-sem-nsems	250	2048
shmsys:shminfo_shmmax	project.max-shm-memory	6GB	6GB
shmsys:shminfo_shmmni	project.max-shm-ids	100	2048
N/A	process.max-file-descriptor	65536	65536

For Oracle 19c database the minimum values are the same except for `project.max-shm-memory`, which depends on the amount of physical RAM in the system. If RAM is in the range 1 GB to 16 GB, you should set the minimum value for `project.max-shm-memory` to half the size of the physical memory. If RAM is greater than 16 GB, you should set `project.max-shm-memory` to a value of at least 8 GB.

For Linux:

- 1 Determine the sum of process parameters for all database instances on the system, the overhead for Oracle background processes, the system and other application requirements.
- 2 Set `semms` (total semaphores system-wide) to the larger of the value in 1 or 32000.
- 3 Set `semmsl` (semaphores per set) to 250.
- 4 Set `semmni` (total semaphore sets) to `semms/semmsl` rounded up to the nearest multiple of 1024.
- 5 For Linux and Oracle 19c, set the maximum number of asynchronous I/O requests allowed in `/etc/sysctl.conf` as follows:

```
fs.aio-max-nr = 3145728
```

After changing the `/etc/sysctl.conf`, run the following command as root to set the values in the system:

```
# /sbin/sysctl -p /etc/sysctl.conf
```

Modifying Resource Control Values

Follow these steps to set resource controls for Solaris 11.3.

Step	Action
1	Log in to the Convergent Charging Controller node as root user.

- 2 Use the **projadd** command to set the value of **process.max-file-descriptor**:

```
projadd -U oracle -K "process.max-file-descriptor=(priv,65536,deny) "
group.dba
```
- 3 Use the **projmod** command to set the value of **project.max-shm-memory**:

```
projmod -sK "project.max-shm-memory=(priv,32G,deny) " group.dba
```
- 4 Use the **projmod** command to set the value of **project.max-sem-ids**:

```
projmod -sK "project.max-sem-ids=(priv,2048,deny) " group.dba
```
- 5 Use the **projmod** command to set the value of **project.max-sem-nsems**:

```
projmod -sK "process.max-sem-nsems=(priv,2048,deny) " group.dba
```
- 6 Use the **projmod** command to set the value of **project.max-shm-ids**:

```
projmod -sK "project.max-shm-ids=(priv,2048,deny) " group.dba
```

For Linux, set the values by editing `/etc/sysctl.conf` and then using the following `/sbin/sysctl` command:

```
# /sbin/sysctl -p /etc/sysctl.conf
```

Setting the Semaphore Parameters for Linux

To set the semaphore parameters:

Step	Action
1	Log in as the root user.
2	Open the <code>/etc/sysctl.conf</code> file in a text editor.
3	Set values to the appropriate semaphore requirements. For example: <pre>kernel.sem = 2048 65536 128 2048 fs.file-max = 6815744 kernel.sem = 2048 65536 128 2048 kernel.shmmni = 4096 kernel.shmall = 1073741824 kernel.shmmax = 4398046511104 kernel.panic_on_oops = 1 net.ipv4.conf.all.rp_filter is 2 net.ipv4.conf.all.rp_filter = 2 net.ipv4.conf.default.rp_filter is 2 net.ipv4.conf.default.rp_filter = 2 fs.aio-max-nr = 1048576 net.ipv4.ip_local_port_range = 9000 65500 kernel.core_pattern = /var/crash/core-%h-%p-%e net.ipv4.tcp_rmem = 16777216 16777216 16777216 net.ipv4.tcp_wmem = 16777216 16777216 16777216 net.ipv4.tcp_mem = 16777216 16777216 16777216 net.core.optmem_max = 16777216 net.core.rmem_max = 2096304 net.core.wmem_max = 16777216 net.core.rmem_default = 16777216 net.core.wmem_default = 16777216</pre>
4	Save and close the file.
5	Activate the new semaphore settings by entering the following command: <pre>/sbin/sysctl -p</pre>

Note: For more information about semaphore settings, see the Oracle Database documentation.

Tuning the System's ZFS Performance

Note: If ZFS filesystem supports Oracle data files, ensure that ZFS record size is same as the Oracle block size. Set ZFS record size before the Oracle data files are created.

For Solaris, set the following parameters in your `/etc/system` file.

To tune the Convergent Charging Controller system's performance:

Note: The following settings are recommended for a machine with 16 GB of memory.

Step	Action
1	Disable ZFS from forcing a flush of the the disk array write cache: <code>set zfs:zfs_nocacheflush=1</code>
2	Set the ZFS file system's maximum cache size. For example, to set the maximum cache size to 5 GB: <code>set zfs:zfs_arc_max=0x140000000</code>
3	Set the ZFS file system's minimum cache size. For example, to set the minimum cache size to 5 GB: <code>set zfs:zfs_arc_min=0x140000000</code>
4	If your file system cache is small, disable prefetching: <code>set zfs:zfs_prefetch_disable=1</code> <code>set zfs:zfs_immediate_write_sz=8000</code>

For more information on tuning parameters for ZFS, see *Solaris ZFS Administration Guide*.

For Linux, see the discussion on installing a system with a btrfs root file system in the Oracle Linux 7 documentation.

Setting the Time Zone

Introduction

The same time zone must be used for all machines on which the Convergent Charging Controller applications are installed. GMT is the recommended time zone for all machines; however, the local time zone may be configured for hosts on which the Convergent Charging Controller GUI client runs.

Setting Time Zones to GMT

The Convergent Charging Controller applications use the default time zone unless it is overridden in the user's profile.

Locale and time zone are configured through SMF service properties.

Note: Ensure all accounts default to the GMT time zone. If you set or change the default time zone, set it on each node, and then restart each node.

To set the time zone to GMT in Solaris:

Step	Action
1	Log in as the root user.
2	Run the following command: <code>svccfg -s timezone:default setprop timezone/localtime= astring: GMT</code> <code>svcadm refresh timezone:default</code>

To set the time zone to GMT in Linux:

Step	Action
1	Log in as the root user.

- 2 Run the following command:
`timedatectl set-timezone GMT`
- 3 If the application is configured to read RTC time in local timezone, run the following command to set RTC in UTC:
`timedatectl set-local-rtc 0`
- 4 Edit `/etc/profile` and alter the TZ line to:
`export TZ=GMT`
- 5 Run the following command to check the time zone:
`-bash-4.2$ timedatectl`
The result would appear as:
Warning: ignoring the TZ variable, reading the system's timezone setting only.

```
Local time: Thu 2017-03-16 04:10:02 GMT
Universal time: Thu 2017-03-16 04:10:02 UTC
Timezone: GMT (GMT, +0000)
NTP enabled: no
NTP synchronized: yes
RTC in local TZ: no
DST active: n/a
```

You should synchronize the date and time for all nodes through Network Time Protocol (NTP). If no NTP server is available, then you should use the SMS nodes as NTP servers.

Important: It is critical that the date and time are synchronized across all Convergent Charging Controller nodes.

Checking the Time Zone

Follow these steps to verify that a UNIX system has time zones configured correctly for GUI operations and time zone dependent discounts.

Step	Action
1	Log on to the machine for which you want to check the time zone.
2	Run the following command: <code>env grep TZ</code> Result: TZ = GMT This indicates that the time zone directory is set to GMT.

Follow these steps to verify time zone on Linux machine.

Step	Action
1	Log in as a root user to the machine for which you want to check the time zone.

2 Run the following command to check the time zone:

```
-bash-4.2$ timedatectl
```

Result:

Warning: ignoring the TZ variable, reading the system's timezone setting only.

Local time: Thu 2017-03-16 04:10:02 GMT

Universal time: Thu 2017-03-16 04:10:02 UTC

Timezone: GMT (GMT, +0000)

NTP enabled: no

NTP synchronized: yes

RTC in local TZ: no

DST active: n/a

This indicates that the time zone is set to GMT.

Advanced Storage and Memory Sizing

Overview

Introduction

Precise storage and memory requirements depend on too many factors to be predicted accurately. This chapter provides estimate requirements for a number of example deployment scenarios of Oracle Communications Convergent Charging Controller.

In this chapter

This chapter contains the following topics.

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Types of Implementations

Introduction

This section provides estimated storage and memory requirements for a number of example deployment scenarios.

Example Size Scenarios

The following table describes the different scenarios for which sizing information is provided.

Scenario	Description
Test system	<p>This is the basic system installed as a minimum using the Convergent Charging Controller Installer. It comprises:</p> <ul style="list-style-type: none"> • One SMS node • One VWS pair (two nodes) • One SLC node <p>This system corresponds to the minimum storage requirements detailed in <i>Storage Requirements</i> (on page 12).</p>

Scenario	Description
Small production system	<p>A production system covering:</p> <ul style="list-style-type: none"> • Less than 1 million subscribers • Less than 24 million vouchers • Less than 1 million EDRs per day with 4 weeks retention <p>Comprising:</p> <ul style="list-style-type: none"> • One SMS node • One VWS pair (two nodes) • Two SLC nodes <p>For details, see <i>Small Production System Example</i> (on page 26).</p>
Medium production system	<p>A production system covering:</p> <ul style="list-style-type: none"> • Less than 1 million subscribers • Less than 120 million vouchers • Less than 10 million EDRs per day with 12 weeks retention <p>Comprising:</p> <ul style="list-style-type: none"> • One SMS node • Two VWS pairs (four nodes) • Four SLC nodes <p>For details, see <i>Medium Production System Example</i> (on page 32).</p>
Large production system	<p>A production system covering:</p> <ul style="list-style-type: none"> • Less than 10 million subscribers • Less than 240 million vouchers • Less than 20 million EDRs per day with 24 weeks retention <p>Comprising:</p> <ul style="list-style-type: none"> • One SMS node • Four VWS pairs (eight nodes) • Eight SLC nodes <p>For details, see <i>Large Production System Example</i> (on page 36).</p>

Small Production System Example

Introduction

This section provides examples of the estimated minimum storage and memory sizing requirements for deploying the Convergent Charging Controller applications in a small production environment.

Disk Storage on the SMS

The following table describes the estimated minimum disk storage required on the SMS to deploy the Convergent Charging Controller applications in a small production environment.

Mount Point	Contents	Required Space (MB)	Block Overhead	Allocated Space (MB)	Total Mount Point Space (GB)
/oracle/datafiles	Core Oracle database	17411	2%	17759	109
	Convergent Charging Controller application data files	67732	2%	69087	

Mount Point	Contents	Required Space (MB)	Block Overhead	Allocated Space (MB)	Total Mount Point Space (GB)
	CCS BE EDRs stored in the database	24012	2%	24492	
/oracle/redologs	Oracle redo logs	1616	2%	1648	2
/oracle/tempfiles	Oracle TEMP tablespace	10005	2%	10205	10
/oracle/archivelogs	Oracle archive logs	102400	2%	104448	102
/u01	Oracle software	5120	2%	5222	6
/IN		23896	2%	24376	24
Grand Total				257238	253

Disk Storage on the VWS

The following table describes the estimated minimum disk storage required on the VWS to deploy the Convergent Charging Controller applications in a small production environment.

Mount Point	Contents	Required Space (MB)	Block Overhead	Allocated Space (MB)	Total Mount Point Space (GB)
/oracle/datafiles	Core Oracle database	17408	2%	17756	40
	Convergent Charging Controller application data files	22610	2%	23062	
/oracle/redologs	Oracle redo logs	1600	2%	1632	2
/oracle/tempfiles	Oracle TEMP tablespace	10005	2%	10205	10
/oracle/archivelogs	Oracle archive logs	20480	2%	20890	21
/u01	Oracle software	5120	2%	5222	6
/IN		20480	2%	20890	21
Grand Total				99657	100

Disk Storage on the SLC

The following table describes the estimated minimum disk storage required on the SLC to deploy the Convergent Charging Controller applications in a small production environment.

Mount Point	Contents	Required Space (MB)	Block Overhead	Allocated Space (MB)	Total Mount Point Space (GB)
/oracle/datafiles	Core Oracle database	17408	2%	17756	26
	Convergent Charging Controller application data files	7702	2%	7856	
/oracle/redologs	Oracle redo logs	1600	2%	1632	2
/oracle/tempfiles	Oracle TEMP tablespace	10005	2%	10205	10
/u01	Oracle software	5120	2%	5222	6
/IN		20480	2%	20890	21
Grand Total				63561	65

Oracle Datafiles on the SMS

Oracle redo logs should be sufficiently sized to ensure that, under production load, a log switch occurs every 15 to 20 minutes. If redo logs are sized too small, then they fill up more quickly necessitating a redo log switch, which is a relatively expensive operation. The redo log switch interval can be determined by looking at the timestamps of the log switch messages that appear in the Oracle alert log. After installation, redo log sizes can be changed if desired by following the instructions in the Oracle Database documentation.

The following table provides details of the Oracle data files on the SMS for which sizing should be reviewed for a small production system.

Component	Tablespace Name	Data File Size (MB)	Number of Files	Total Size (MB)
SYSAUX	SYSAUX	500	1	500
SYSTEM	SYSTEM	2001	1	2001
TEMP	TEMP	2001	5	10005
TOOLS	TOOLS	2001	1	2001
UNDOTBS1	UNDOTBS1	2001	5	10005
SMS	USERS	2001	1	2001
ACS	CONTROL FILES	300	3	900
SMS	REDO LOGS	100	16	1600
ACS	ACS_DATA	200	1	200
	ACS_INDEX	200	1	200
CCS	CCS_DATA	2001	1	2001
	CCS_EVENT	2001	1	2001
	CCS_EVENT_I	2001	1	2001

Component	Tablespace Name	Data File Size (MB)	Number of Files	Total Size (MB)
	CCS_INDEX	2001	1	2001
	CCS_SUBS	2001	2	4002
	CCS_SUBS_I	2001	1	2001
	CCS_VOUCHERS	2001	2	4002
	CCS_VOUCHERS_I	2001	2	4002
	CCS_XDB	2001	1	2001
LCP	LCP_DATA	200	1	200
	LCP_INDEX	200	1	200
MM	MMX_DATA	300	1	300
	MMX_INDEX	300	1	300
OSD	OSD_DATA	300	1	300
	OSD_INDEX	200	1	200
PI	PI_DATA	200	1	200
	PI_INDEX	200	1	200
SMS	REP_DATA	2001	1	2001
	SMF_ALARMS	2001	3	6003
	SMF_ALARMS_I	2001	2	4002
	SMF_AUD	2001	7	14007
	SMF_AUD_I	2001	1	2001
	SMF_DATA	2001	1	2001
	SMF_INDEX	200	2	400
	SMF_STATS	2001	1	2001
	SMF_STATS_I	2001	2	4002
UIP	UIS_CDR	2001	1	2001
	UIS_CDR_I	2001	1	2001
	UIS_DATA	200	1	200
	UIS_INDEX	200	1	200
UPC	UPC_DATA	200	1	200
	UPC_INDEX	200	1	200

Partitioned Files on the SMS

The following table provides the estimated storage (in MB) for the partitioned tablespaces on the SMS in a small production environment.

Partitioned Tablespace Name	File Size	Weekly Storage	Data Files Per Week	Weekly Partitions Allocated	Total Tablespace Size (MB)
CCS_CDR_Yyyyy_Ww w	2001	3800	2	5	24012

Oracle Datafiles on the VWS

The following table provides details of the Oracle data files on the VWS for which sizing should be reviewed.

Component	Tablespace Name	Data File Size (MB)	Number of Files	Total Size (MB)
SYSAUX	SYSAUX	500	1	500
SYSTEM	SYSTEM	2001	1	2001
TEMP	TEMP	2001	5	10005
TOOLS	TOOLS	2001	1	2001
UNDO	UNDO	2001	5	10005
SMS	USERS	2001	1	2001
ACS	CONTROL FILES	300	3	900
SMS	REDO LOGS	100	16	1600
ACS	ACS_DATA	200	1	200
	ACS_INDEX	200	1	200
BE	BE_DATA	200	1	200
	BE_SUBS	2001	2	4002
	BE_SUBS_I	2001	1	2001
	BE_VOUCHERS	2001	1	2001
	BE_VOUCHERS_I	2001	1	2001
CCS	CCS_DATA	200	7	1400
	CCS_INDEX	200	2	400
	CCS_SUBS	2001	1	2001
	CCS_SUBS_I	2001	1	2001
	CCS_VOUCHERS	2001	2	4002
	CCS_VOUCHERS_I	2001	1	2001
SMS	SMF_DATA	100	1	100
	SMF_INDEX	100	1	100
UIP	UIS_DATA	200	1	200

Component	Tablespace Name	Data File Size (MB)	Number of Files	Total Size (MB)
	UIS_INDEX	200	1	200

Oracle Datafiles on the SLC

The following table provides details of the Oracle data files on the SLC for which sizing values should be reviewed.

Component	Tablespace Name	Data File Size (MB)	Number of Files	Total Size (MB)
SYSAUX	SYSAUX	500	1	500
SYSTEM	SYSTEM	2001	1	2001
TEMP	TEMP	2001	5	10005
TOOLS	TOOLS	2001	1	2001
UNDOTBS1	UNDOTBS1	2001	5	10005
SMS	USERS	2001	1	2001
ACS	CONTROL FILES	300	3	900
SMS	REDO LOGS	100	16	1600
ACS	ACS_DATA	200	1	200
	ACS_INDEX	200	1	200
CCS	CCS_SCP_DATA	200	2	400
	CCS_SCP_INDEX	200	2	400
	CCS_SCP_SUBS	2001	1	2001
	CCS_SCP_SUBS_I	2001	1	2001
LCP	LCP_DATA	200	1	200
	LCP_INDEX	200	1	200
MM	MMX_DATA	300	1	300
	MMX_INDEX	300	1	300
OSD	OSD_DATA	300	1	300
	OSD_INDEX	200	1	200
SMS	SMF_DATA	100	1	100
	SMF_DATA	100	1	100
UIS	UIS_CDR	2001	0	0
	UIS_CDR_INDEX	2001	0	0
	UIS_DATA	200	1	200
	UIS_INDEX	200	1	200
UPC	UPC_DATA	200	1	200

Component	Tablespace Name	Data File Size (MB)	Number of Files	Total Size (MB)
	UPC_INDEX	200	1	200

Memory Sizing for a Small Production System

The following table provides the estimated minimum memory requirements (in MB) for the Convergent Charging Controller applications deployed on a small production system.

SGA Element	SMS	VWS	SLC
log_buffer	16	16	16
java_pool_size	150	0	0
shared_pool_size	512	128	128
pga_aggregate_target	512	128	128
large_pool_size	256	32	0
db_cache_size	256	128	32
db_keep_cache_size	4096	5012	2048
db_recycle_cache_size	2048	2048	0
db_32k_cache_size	2048	0	0
Convergent Charging Controller applications	4096	4096	4096

Medium Production System Example

Introduction

This section provides examples of the minimum storage and memory sizing requirements for deploying the Convergent Charging Controller applications in a medium sized production environment.

Disk Storage on the SMS

The following table describes the estimated minimum disk storage required on the SMS to deploy the Convergent Charging Controller applications in a medium sized production environment.

Mount Point	Contents	Required Space (MB)	Block Overhead	Allocated Space (MB)	Total Mount Point Space (GB)
/oracle/datafiles	Core Oracle database	37418	2%	38166	677
	Convergent Charging Controller application data files	109753	2%	111948	
	CCS BE EDRs stored in database	532266	2%	542911	
/oracle/redologs	Oracle redo logs	1600	2%	1632	2
/oracle/tempfiles	Oracle TEMP tablespace	30015	2%	30615	30
/u01	Oracle software	120	2%	5222	6

Mount Point	Contents	Required Space (MB)	Block Overhead	Allocated Space (MB)	Total Mount Point Space (GB)
/oracle/datafiles	Core Oracle database	37418	2%	38166	677
	Convergent Charging Controller application data files	109753	2%	111948	
	CCS BE EDRs stored in database	532266	2%	542911	
/oracle/archivelogs	Oracle archive logs	102400	2%	104448	102
/IN	Convergent Charging Controller application	20480	2%	20890	55
	Incoming & processed EDR flat files	34180	2%	34863	
Grand Total				890696	872

Disk Storage on the VWS

The following table describes the estimated minimum disk storage required on the VWS to deploy the Convergent Charging Controller applications in a medium sized production environment.

Mount Point	Contents	Required Space (MB)	Block Overhead	Allocated Space (MB)	Total Mount Point Space (GB)
/oracle/datafiles	Core Oracle database	17408	2%	17756	56
	Convergent Charging Controller application data files	38218	2%	38982	
/oracle/redologs	Oracle redo logs	1600	2%	1632	2
/oracle/tempfiles	Oracle TEMP tablespace	10005	2%	10205	10
/oracle/archivelogs	Oracle archive logs	20480	2%	20890	21
/u01	Oracle software	5120	2%	5222	6
/IN		20480	2%	20890	21
Grand Total				115577	116

Disk Storage on the SLC

The following table describes the estimated minimum disk storage required on the SLC to deploy the Convergent Charging Controller applications in a medium sized production environment.

Mount Point	Contents	Required Space (MB)	Block Overhead	Allocated Space (MB)	Total Mount Point Space (GB)
/oracle/datafiles	Core Oracle database	17408	2%	17756	31
	Convergent Charging Controller application data files	13705	2%	13979	
/oracle/redologs	Oracle redo logs	1600	2%	1632	2
/oracle/tempfiles	Oracle TEMP tablespace	10005	2%	10205	10
/u01	Oracle software	5120	2%	5222	6
/IN		20480	2%	20890	21
Grand Total				69684	70

Additional Oracle Datafiles on the SMS

The following table provides details of the additional Oracle data files that will be used on the SMS. These data files are in addition to the minimum created automatically by the installation process for a test system.

Component	Tablespace Name	Data File Size (MB)	Number of Files	Total Size (MB)
TEMP	TEMP	2001	15	30015
UNDOTBS	UNDOTBS1	2001	15	30015
	UNDOTBS2	2001	15	30015
CCS	CCS_EVENT	2001	3	6003
	CCS_EVENT_I	2001	1	2001
	CCS_SUBS	2001	6	12006
	CCS_SUBS_I	2001	2	4002
	CCS_VOUCHERS	2001	10	20010
	CCS_VOUCHERS_I	2001	8	16008
SMS	SMF_ALARMS	2001	3	6003
	SMF_ALARMS_I	2001	2	4002
	SMF_AUD	2001	7	14007
	SMF_AUD_I	2001	1	2001
	SMF_STATS	2001	1	2001
	SMF_STATS_I	2001	2	4002

Partitioned Files on the SMS

The following table provides the estimated storage (in MB) for the partitioned tablespaces on the SMS in a medium sized production environment.

Partitioned Tablespace Name	File Size	Weekly Storage	Data Files Per Week	Weekly Partitions Allocated	Total Tablespace Size (MB)
CCS_CDR_Yyyyy_Www	2001	37700	19	13	532266

Additional Oracle Datafiles on the VWS

The following table provides details of the additional Oracle data files that will be used on the VWS. These data files are in addition to the minimum created automatically by the installation process for a test system.

Component	Tablespace Name	Data File Size (MB)	Number of Files	Total Size (MB)
BE	BE_SUBS	2001	3	6003
	BE_SUBS_I	2001	2	4002
	BE_VOUCHERS	2001	1	2001
	BE_VOUCHERS_I	2001	1	2001
CCS	CCS_DATA	200	5	1000
	CCS_INDEX	200	2	400
	CCS_SUBS	2001	4	8004
	CCS_SUBS_I	2001	1	2001
	CCS_VOUCHERS	2001	4	8004
	CCS_VOUCHERS_I	2001	2	4002

Additional Oracle Datafiles on the SLC

The following table provides details of the additional Oracle data files that will be used on the SLC in a medium production environment. These data files are in addition to the minimum created automatically by the installation process for test system.

Component	Tablespace Name	Data File Size (MB)	Number of Files	Total Size (MB)
CCS	CCS_SCP_DATA	200	2	400
	CCS_SCP_INDEX	200	2	400
	CCS_SUBS	2001	4	8004
	CCS_SUBS_I	2001	1	2001

Memory Sizing for a Medium Production System

The following table provides the estimated minimum memory requirements (in MB) for the Convergent Charging Controller applications deployed in a medium sized production environment.

SGA Element	SMS	VWS	SLC
log_buffer	16	16	16
java_pool_size	150	0	0
shared_pool_size	512	128	128
pga_aggregate_target	512	128	128
large_pool_size	512	32	0
db_cache_size	512	128	32
db_keep_cache_size	8192	12960	6464
db_recycle_cache_size	8192	2048	0
db_32k_cache_size	8192	0	0
Convergent Charging Controller applications	8192	8192	8192

Large Production System Example

Introduction

This section provides examples of the minimum storage and memory sizing requirements for deploying the Convergent Charging Controller applications in a large production environment.

Disk Storage on the SMS

The following table describes the estimated minimum disk storage required on the SMS to deploy the Convergent Charging Controller applications in a large production environment.

Mount Point	Contents	Required Space (MB)	Block Overhead	Allocated Space (MB)	Total Mount Point Space (GB)
<i>Data files (shared / global)</i>					
ASM +DATA Diskgroup	Core Oracle database	107453	2%	109602	2240
	Convergent Charging Controller application data files	163780	2%	167056	
	CCS BE EDRs stored in database	1976988	2%	2016528	
ASM +REDO Diskgroup	Oracle redo logs	1600	2%	1632	2
ASM +TEMP Diskgroup	Oracle TEMP tablespace	50025	2%	51026	50
<i>Other (shared / global)</i>					

Mount Point	Contents	Required Space (MB)	Block Overhead	Allocated Space (MB)	Total Mount Point Space (GB)
ASM +CRS Diskgroup	Oracle OCR	512	2%	522	1
ASM +CRS Diskgroup	Oracle voting	512	2%	522	1
/global/oracle	Oracle shared	10240	2%	10445	11
/global/IN	IN application logs	51200	2%	52224	51
/global/CCS	Processed EDR flat files	68359	2%	69727	69
/global/CDR	Incoming EDR flat files for CDRLoader1	17090	2%	17432	18
<i>Other (private / local)</i>					
/IN	Convergent Charging Controller applications	20480	2%	20890	21
/u01	Oracle software	5120	2%	5222	6
ASM +ARCH1 Diskgroup	Oracle archive logs	102400	2%	104448	102
ASM +ARCH2 Diskgroup	Oracle archive logs	102400	2%	104448	102
<i>Total</i>					
Shared/Global				2549009	2495
Private/Local				261120	258
Grand Total				2810129	2753

Disk Storage on the VWS

The following table describes the estimated minimum disk storage required on the VWS to deploy the Convergent Charging Controller applications in a large production environment.

Mount Point	Contents	Required Space (MB)	Block Overhead	Allocated Space (MB)	Total Mount Point Space (GB)
/oracle/datafiles	Core Oracle database	17408	2%	17756	59
	Convergent Charging Controller application data files	41820	2%	42656	
/oracle/redologs	Oracle redo logs	1600	2%	1632	2
/oracle/tempfiles	Oracle TEMP tablespace	10005	2%	10205	10
/oracle/archivelogs	Oracle archive logs	20480	2%	20890	21
/u01	Oracle software	5120	2%	5222	6
/IN		20480	2%	20890	21

Mount Point	Contents	Required Space (MB)	Block Overhead	Allocated Space (MB)	Total Mount Point Space (GB)
/oracle/datafiles	Core Oracle database	17408	2%	17756	59
	Convergent Charging Controller application data files	41820	2%	42656	
/oracle/redologs	Oracle redo logs	1600	2%	1632	2
Grand Total				119251	119

Disk Storage on the SLC

The following table describes the estimated minimum disk storage required on the SLC to deploy the Convergent Charging Controller applications in a large production environment.

Mount Point	Contents	Required Space (MB)	Block Overhead	Allocated Space (MB)	Total Mount Point Space (GB)
/oracle/datafiles	Core Oracle database	17408	2%	17756	37
	Convergent Charging Controller application data files	19708	2%	20102	
/oracle/redologs	Oracle redo logs	1600	2%	1632	2
/oracle/tempfiles	Oracle TEMP tablespace	10005	2%	10205	10
/u01	Oracle software	5120	2%	5222	6
/IN		20480	2%	20890	21
Grand Total				75807	76

Additional Oracle Datafiles on the SMS

The following table provides details of the additional Oracle data files that will be used on the SMS in a large production environment. These data files are in addition to the minimum created automatically by the installation process for a test system.

Component	Tablespace Name	Datafile Size (MB)	Number of Files	Total Size (MB)
TEMP	TEMP	2001	25	50025
UNDOTBS	UNDOTBS1	2001	25	50025
	UNDOTBS2	2001	25	50025
CCS	CCS_EVENT	2001	6	12006
	CCS_EVENT_I	2001	1	2001
	CCS_SUBS	2001	12	24012
	CCS_SUBS_I	2001	3	6003

Component	Tablespace Name	Datafile Size (MB)	Number of Files	Total Size (MB)
	CCS_VOUCHERS	2001	19	38019
	CCS_VOUCHERS_I	2001	16	32016
SMS	SMF_ALARMS	2001	3	6003
	SMF_ALARMS_I	2001	2	4002
	SMF_AUD	2001	7	14007
	SMF_AUD_I	2001	1	2001
	SMF_STATS	2001	1	2001
	SMF_STATS_I	2001	2	4002

Partitioned Files on the SMS

The following table provides the estimated storage (in MB) for the partitioned tablespaces on the SMS in a large production environment.

Partitioned Tablespace Name	File Size	Weekly Storage	Data Files Per Week	Weekly Partitions Allocated	Total Tablespace Size (MB)
CCS_CDR_Yyyyy_Ww w	2001	75350	38	25	1976988

Additional Oracle Datafiles on the VWS

The following table provides details of the additional Oracle data files that will be used on the VWS in a large production environment. These data files are in addition to the minimum created automatically by the installation process for a test system.

Component	Tablespace Name	Data File Size (MB)	Number of Files	Total Size (MB)
BE	BE_SUBS	2001	3	6003
	BE_SUBS_I	2001	2	4002
	BE_VOUCHERS	2001	1	2001
	BE_VOUCHERS_I	2001	1	2001
CCS	CCS_DATA	200	4	800
	CCS_INDEX	200	1	200
	CCS_SUBS	2001	6	12006
	CCS_SUBS_I	2001	1	2001
	CCS_VOUCHERS	2001	4	8004
	CCS_VOUCHERS_I	2001	2	4002

Additional Oracle Datafiles on the SLC

The following table provides details of the additional Oracle data files that will be used on the SLC in a large production environment. These data files are in addition to the minimum created automatically by the installation process for a test system.

Component	Tablespace Name	Data File Size (MB)	Number of Files	Total Size (MB)
CCS	CCS_SCP_DATA	200	2	400
	CCS_SCP_INDEX	200	2	400
	CCS_SUBS	2001	6	12006
	CCS_SUBS_I	2001	2	4002

Memory Sizing for a Large Production System

The following table provides the estimated minimum memory requirements (in MB) for the Convergent Charging Controller applications deployed in a large production environment.

SGA Element	SMS	VWS	SLC
log_buffer	16	16	16
java_pool_size	150	0	0
shared_pool_size	512	128	128
pga_aggregate_target	512	128	128
large_pool_size	512	32	0
db_cache_size	512	128	32
db_keep_cache_size	16384	17696	12368
db_recycle_cache_size	8192	2048	0
db_32k_cache_size	16384	0	0
Convergent Charging Controller applications	8192	8192	8192

Node-Specific Users

Introduction

This section provides information on the node-specific users and the privileges they should have.

Users on SMS Database Instance

Ensure the SMS database instance contains a user called SMF with the following privileges:

GRANTEE	PRIVILEGE	ADMIN OPTION
SMF	ALTER ANY INDEX	YES
SMF	ALTER ANY PROCEDURE	YES
SMF	ALTER ANY ROLE	YES
SMF	ALTER ANY SEQUENCE	YES
SMF	ALTER ANY TABLE	YES

GRANTEE	PRIVILEGE	ADMIN OPTION
SMF	ALTER ANY TRIGGER	YES
SMF	ALTER TABLESPACE	NO
SMF	ALTER USER	NO
SMF	CREATE ANY DIRECTORY	NO
SMF	CREATE ANY PROCEDURE	NO
SMF	CREATE ANY SEQUENCE	NO
SMF	CREATE ANY SYNONYM	NO
SMF	CREATE ANY TABLE	NO
SMF	CREATE ANY TRIGGER	NO
SMF	CREATE ANY VIEW	NO
SMF	CREATE DATABASE LINK	NO
SMF	CREATE MATERIALIZED VIEW	NO
SMF	CREATE PROCEDURE	NO
SMF	CREATE PUBLIC SYNONYM	NO
SMF	CREATE ROLE	NO
SMF	CREATE SEQUENCE	NO
SMF	CREATE SESSION	YES
SMF	CREATE TABLE	NO
SMF	CREATE TABLESPACE	NO
SMF	CREATE TRIGGER	NO
SMF	CREATE TYPE	NO
SMF	CREATE USER	NO
SMF	CREATE VIEW	NO
SMF	DELETE ANY TABLE	YES
SMF	DROP ANY DIRECTORY	NO
SMF	DROP ANY INDEX	NO
SMF	DROP ANY PROCEDURE	NO
SMF	DROP ANY ROLE	NO
SMF	DROP ANY SEQUENCE	NO
SMF	DROP ANY TABLE	NO
SMF	DROP ANY VIEW	NO
SMF	DROP PUBLIC DATABASE LINK	NO
SMF	DROP PUBLIC SYNONYM	NO
SMF	DROP TABLESPACE	NO
SMF	DROP USER	NO
SMF	EXECUTE ANY PROCEDURE	NO
SMF	GRANT ANY PRIVILEGE	NO
SMF	GRANT ANY ROLE	NO
SMF	INSERT ANY TABLE	YES
SMF	SELECT ANY TABLE	YES

GRANTEE	PRIVILEGE	ADMIN OPTION
SMF	UNLIMITED TABLESPACE	NO
SMF	UPDATE ANY TABLE	YES

Users on SLC Database Instance

Ensure the SLC database instance contains a user called SCP with the following privileges:

GRANTEE	PRIVILEGE	ADMIN OPTION
SCP	ALTER ANY INDEX	YES
SCP	ALTER ANY PROCEDURE	YES
SCP	ALTER ANY ROLE	YES
SCP	ALTER ANY SEQUENCE	YES
SCP	ALTER ANY TABLE	YES
SCP	ALTER ANY TRIGGER	YES
SCP	ALTER TABLESPACE	NO
SCP	ALTER USER	NO
SCP	CREATE ANY DIRECTORY	NO
SCP	CREATE ANY PROCEDURE	NO
SCP	CREATE ANY SEQUENCE	NO
SCP	CREATE ANY SYNONYM	NO
SCP	CREATE ANY TABLE	NO
SCP	CREATE ANY TRIGGER	NO
SCP	CREATE ANY VIEW	NO
SCP	CREATE DATABASE LINK	NO
SCP	CREATE MATERIALIZED VIEW	NO
SCP	CREATE PROCEDURE	NO
SCP	CREATE PUBLIC SYNONYM	NO
SCP	CREATE ROLE	NO
SCP	CREATE SEQUENCE	NO
SCP	CREATE SESSION	YES
SCP	CREATE TABLE	NO
SCP	CREATE TABLESPACE	NO
SCP	CREATE TRIGGER	NO
SCP	CREATE USER	NO
SCP	CREATE VIEW	NO
SCP	DELETE ANY TABLE	YES
SCP	DROP ANY INDEX	NO
SCP	DROP ANY PROCEDURE	NO
SCP	DROP ANY ROLE	NO
SCP	DROP ANY SEQUENCE	NO
SCP	DROP ANY TABLE	NO
SCP	DROP PUBLIC DATABASE LINK	NO

GRANTEE	PRIVILEGE	ADMIN OPTION
SCP	DROP PUBLIC SYNONYM	NO
SCP	DROP TABLESPACE	NO
SCP	DROP USER	NO
SCP	EXECUTE ANY PROCEDURE	NO
SCP	GRANT ANY PRIVILEGE	NO
SCP	GRANT ANY ROLE	NO
SCP	INSERT ANY TABLE	YES
SCP	SELECT ANY TABLE	YES
SCP	UNLIMITED TABLESPACE	NO
SCP	UPDATE ANY TABLE	YES

Users on VWS Database Instance

Ensure the VWS database instance contains a user called E2BE_ADMIN with the following privileges:

GRANTEE	PRIVILEGE	ADMIN OPTION
E2BE_ADMIN	ALTER SESSION	YES
E2BE_ADMIN	CREATE ANY CONTEXT	NO
E2BE_ADMIN	CREATE ANY DIRECTORY	NO
E2BE_ADMIN	CREATE ANY TRIGGER	NO
E2BE_ADMIN	CREATE MATERIALIZED VIEW	NO
E2BE_ADMIN	CREATE PROCEDURE	NO
E2BE_ADMIN	CREATE PUBLIC SYNONYM	NO
E2BE_ADMIN	CREATE ROLE	NO
E2BE_ADMIN	CREATE SEQUENCE	NO
E2BE_ADMIN	CREATE SESSION	YES
E2BE_ADMIN	CREATE TABLE	NO
E2BE_ADMIN	CREATE TRIGGER	NO
E2BE_ADMIN	CREATE USER	NO
E2BE_ADMIN	CREATE VIEW	NO
E2BE_ADMIN	DROP ANY CONTEXT	NO
E2BE_ADMIN	DROP PUBLIC SYNONYM	NO
E2BE_ADMIN	DROP USER	NO
E2BE_ADMIN	GRANT ANY PRIVILEGE	NO
E2BE_ADMIN	GRANT ANY ROLE	NO
E2BE_ADMIN	UNLIMITED TABLESPACE	NO

Convergent Charging Controller Pre-Installation Tasks

Overview

Introduction

This chapter explains the tasks you should perform before installing Oracle Communications Convergent Charging Controller.

In this chapter

This chapter contains the following topics.

Preparing the System for Installation	45
About Checking Prerequisite Requirements	52
Installing a Browser	54
Installing and Configuring Oracle Database	55
Installing and Configuring BRM SDK	60

Preparing the System for Installation

About Preparing the System

To prepare the system before you install Convergent Charging Controller, you log in to each node in turn as the root user, and perform the following tasks:

- (Optional) Disable automount for the top directory of the mount point for all entries in the `auto_home` map file. See *Disabling automount for the Home Directory* (on page 46).
- Enable remote login for the root user. See *Enabling Remote Login* (on page 46).
- Configure the log notice alarms. See *Configuring Where to Log Notice Alarms* (on page 46).
- Configure the directory to use for reporting core dumps and storing core files. See *Configuring Core Dump Reporting* (on page 47).
- Disable any unnecessary system services. See *Disabling System Services* (on page 48).
- Open ports to Convergent Charging Controller in your Linux firewall. See *Opening Ports in Your Linux Firewall* (on page 48).
- Ensure machines automatically boot following a temporary power loss. See *Configuring Machines to Boot Automatically* (on page 50).
- Enable the SSH root login. See *Enabling SSH Root Login* (on page 50).
- Ensure Java 1.8 is installed. See the Oracle Java documentation.
- Configure the SSH SMF service. See *Configuring the SSH SMF Service* (on page 50).
- Configure the `/etc/system` file to make buffer-overflow attacks more difficult. See *Preventing Buffer Overflow Attacks* (on page 51).
- Disable the keyboard abort sequence. See *Disabling Keyboard Abort Sequence* (on page 51).
- Create the `/IN` Directory. See *Creating the /IN Directory* (on page 52).

Disabling automount for the Home Directory

Disable `automount` for each node's *home* top directory, where *home* is the highest level directory used for installation. Disabling `automount` for this location allows you to create an Oracle user for the database administrator in the *home* directory.

Follow these steps to disable `automount` for the *home* directory.

Step	Action
1	Open the following file in a text editor: For Solaris: <code>/etc/auto_master</code> For Linux: <code>/etc/auto.master</code>
2	Comment out the line containing <code>auto_home</code> by inserting <code>#</code> at the beginning of the line. For example: <code># /home auto_home -nobrowse</code>
3	Save and close the file.
4	Restart <code>autofs</code> to remount the file system by running the command: For Solaris: <code>/usr/sbin/svcadm restart autofs</code> For Linux: <code>systemctl restart autofs.service</code>
5	Create a symbolic link <code>/export/home</code> to <code>/home</code> by running the command: <code>ln -s /home /export/home</code> Result: This allows you to write to both the <code>/export/home</code> and the <code>/home</code> directories. Note: If <code>/export</code> does not exist, create the directory before linking <code>/home</code> by running the command: <code>mkdir /export</code>

Enabling Remote Login

In Solaris, comment out the following line in the `/etc/default/login` file by inserting `#` at the beginning of the line:

```
# CONSOLE=/dev/console
```

This enables you to log in remotely as the root user from every remote client.

Configuring Where to Log Notice Alarms

Configure where to log notice alarms, which contain informational messages that are generated during the installation process.

Follow these steps to log notice level alarms.

Step	Action
1	Open the following file in a text editor: For Solaris: <code>/etc/syslog.conf</code> For Linux: <code>/etc/rsyslog.conf</code>

Step	Action
2	<p>Add the following line:</p> <p>For Solaris:</p> <pre>*.notice;kern.debug;daemon.notice;mail.crit logfile</pre> <p>where <i>logfile</i> is the log file name including the absolute path; for example, <i>/var/adm/messages</i>.</p> <p>For Linux:</p> <pre>*.=notice;kern.=debug;daemon.=notice;mail.=crit logfile</pre> <p>where <i>logfile</i> is the log file name including the absolute path; for example, <i>/var/log/messages</i>.</p>
3	Save and close the file.
4	For Linux only, restart logging by running the command: systemctl restart rsyslog.service

Configuring Core Dump Reporting

On Linux

1. In */etc/profile*, if there is a `ulimit -S -c 0` command, change it to or add the following command:

```
ulimit -S -c unlimited > /dev/null 2>&1
```

This will set the soft limit for core files to be unlimited.

2. In */etc/security/limits.conf*, set:

```
* soft core unlimited
```

3. In */etc/sysctl.conf*, define the path of the core dump and the file name format for core files:

```
kernel.core_pattern = /var/crash/core-%h-%p-%e
```

where the format specifiers are

```
%h - system hostname
%p - PID of dumped process
%e - executable file name
```

4. In */etc/sysctl.conf*, set `fs.suid_dumpable` to 2 to make core dumps readable by root only:

```
fs.suid_dumpable = 2
```

Load the changed sysctl settings:

```
# sysctl -p
```

5. In */etc/abrt/abrt-action-save-package-data.conf*, set the following:

```
OpenPGPCheck = no (to collect core dumps from unsigned packages)
```

```
ProcessUnpackaged = yes (to collect core dumps from unpackaged software)
```

6. Restart the `abrt` daemon.

For Oracle Linux 7:

```
/bin/systemctl restart abrt.service
/bin/systemctl restart abrt-ccpp.service
```

On Solaris

The following command sets the init core file pattern for core dump reporting.

```
coreadm -i core. %f.%p
```

Set up the `coreadm` to report core dumps and to store core files in a defined directory.

Use the following commands to report core dumps and store core files in the `/var/crash` directory:

```
/usr/bin/coreadm -g /var/crash/core-%n-%p-%f -e global
/usr/bin/coreadm -e global-setid
/usr/bin/coreadm -d proc-setid
/usr/bin/coreadm -d process
/usr/bin/coreadm -e log
/usr/bin/coreadm -u
```

Important: You should use a dedicated volume for storing core files to ensure that other system, or application directories, are not affected if this directory becomes full.

Disabling System Services

You can disable the following system services, if they are not needed:

- FTP
- Telnet
- Rlogin
- Sendmail

For Solaris, use the `svcadm` command to disable the system services.

Example commands:

```
svcadm disable ftp
svcadm disable telnet
svcadm disable rlogin
svcadm disable sendmail
```

For Linux, use the `systemctl` command to disable the system service.

Example command:

```
systemctl stop ftp.service
systemctl stop telnet.service
systemctl stop rlogin.service
systemctl stop sendmail.service
systemctl disable --now ftp.service
```

Opening Ports in Your Linux Firewall

Follow these steps to open ports in your Linux firewall.

Step	Action
1	Log in as the root user.
2	Run the following command to configure the tables provided by the Linux kernel firewall: yum install iptables-services
3	Run the following command to view your firewall's current configuration: iptables -L
4	Run the following command for each Convergent Charging Controller port through which the firewall should accept incoming traffic: iptables -A INPUT -p tcp --dport <i>portNumber</i> -j ACCEPT where <i>portNumber</i> is the Convergent Charging Controller port through which the firewall accepts incoming traffic. For more information on ports, see <i>List of Ports Used by Convergent Charging Controller</i> (on page 49). The new configuration rule is added to your firewall rules table.

Step	Action
5	Run the following command to save the configuration in the firewall rules table: <code>/sbin/service iptables save</code>
6	Run the following command to reinitialize the iptables service: <code>service iptables restart</code> The configuration changes take effect after you reinitialize the iptables service.
7	Run the following command to backup your firewall rules table to an external file: <code>iptables-save > filename</code> where <i>filename</i> is the path and name of the file in which to save your firewall rules table. You can use this file to distribute the firewall rules table to other nodes or to restore your firewall rules table after a system reboot.

Important: Your changes to the firewall rules table are lost after a system reboot. After a system reboot, you must re-open the ports in your Linux firewall by running the following command:

```
iptables-restore < filename
```

where *filename* is the path and name of the file you saved in step 7.

List of Ports Used by Convergent Charging Controller

The following table lists the ports used by Convergent Charging Controller.

Port Number	Description
25	Email client port
53	ENCA port
80	acsStatisticsDBInserter, acsStatsMaster, and acsStatsLocal port
161	smsAlarmRelay port
1490	Used by ACS
1495	ccsSSMMaster port
1500	ccsMFileCompiler and beServer port
1521	SQL*Net port
1812	radiusControlAgent core port
1813	radiusControlAgent accounting port
2003	SEI EMI report port
2027	ccsVWARSEpiry and ccsExpiryMessageGenerator port CCS GPG key import screens, cmnPushFiles/cmnReceiveFiles for CCS EDRs
2028	cmnPushFiles/cmnReceiveFiles for ACS EDRs
2031	cmnPushFiles/cmnReceiveFiles for UIS EDRs
2484	Oracle database secure listening port
2500	Email server port
2999	piClientIF port
3033	SMPP remote port
3072	smsTrigDaemon and xmlTcapInterface port
3615	SCA remote communication port
3799	radiusControlAgent dynamic authorization port

Port Number	Description
3868	diameterControlAgent and diameterBeClient listening port
4099	dapIF listening port
5060	SCA TCP and UDP port
5096	XMS TCP and UDP port
5556	ccsBeOrb naming server port
7654	sigtran_monitor_daemon listening port
7669	smsCompareResyncServer
8888	smsInterface port
9999	xmlInterface port
12343	smsMaster and updateLoader port
12344	smsCompareResyncClient port
12696	VWS node port
14875	m3uaCdmaGateway test interface port
14876	m3uaCdmaGateway soak test interface port

Configuring Machines to Boot Automatically

On Solaris, set the `eeeprom auto-boot` parameter value to `true` using the following command. This will ensure that the machine will automatically boot following a temporary power loss, such as a power outage.

Example

```
eeeprom "auto-boot?"=true
```

Enabling SSH Root Login

Follow these steps to enable SSH root login.

Step	Action
1	In the <code>/etc/ssh/sshd_config</code> file, set the <code>PermitRootLogin</code> parameter value to <code>yes</code> .
2	Save and close the file.
3	Run the following command: For Solaris: <pre>\$ svcadm -v restart svc:/network/ssh:default</pre> For Linux: <pre>\$ systemctl restart sshd.service</pre>

Configuring the SSH SMF Service

Run the following commands to configure the SSH SMF service to ensure the SSH daemon is running in `/milestone/multi-user` mode (run-level 2):

For Solaris:

```
svccfg -s network/ssh delprop dependents/ssh_multi-user-server
svccfg -s network/ssh setprop dependents/ssh_multi-user = fmri: /milestone/multi-user
svccfg: Type required for new properties
svcadm refresh network/ssh
```



```
svcadm restart network/ssh
```

Installing HTTPD

Follow these steps to install HTTPD.

Step	Action
1	Login as root user.
2	Do one of the following: <ul style="list-style-type: none"> • For Solaris, run the following commands: <pre># pkg install web/server/apache-22</pre> <pre># svcadm enable /network/http:apache22</pre> • For Linux, do the following: <ol style="list-style-type: none"> a) Set SELinux to Permissive. b) Run the following commands: <pre># yum install httpd</pre> <pre># service httpd start</pre>

Preventing Buffer Overflow Attacks

For Solaris, ensure that the following line in the `/etc/system` file is set to 1:

```
set noexec_user_stack = 1
```

This makes buffer-overflow attacks more difficult by marking the stack as non-executable.

For Linux, no settings are required.

Disabling Keyboard Abort Sequence

For Solaris, ensure that the following line in the `/etc/default/kbd` file is set to **disable**:

```
KEYBOARD_ABORT=disable
```

This permanently changes the software default effect of the keyboard abort sequence.

For Linux, no settings are required.

Creating Users

The following sections explain the procedures to create users and groups in each CCC node.

The CCC application requires a single user of any given name to operate. A default username of 'smf_oper' is provided, but can be changed at install time. The CCC_runtime_user can invoke the CCC installation, but this is not mandatory. If you select to use a different user, then it is mandatory to first create the CCC_runtime_user.

User profiles

If you plan to run the CCC application as a different CCC_runtime_user to the default, it is required to either set:

- 1 The home directory of the CCC_runtime_user to '/IN/service_packages/SMS'
- 2 Add the following line entry to the .profile of the CCC_runtime_user so the correct environment is configured automatically at login following the installation.

```
if [ -f /IN/service_packages/SMS/.profile-??* ]; then
```

```
. /IN/service_packages/SMS/.profile-??*;
fi
```

Creating esg group for Each Node

Follow these steps to create esg group for each Convergent Charging Controller Node:

Step	Action
1	Login as root user.
2	Run the following command to create the esg group: <code>/usr/sbin/groupadd -g <i>gid</i> esg</code> where <i>gid</i> is a unique group id for the operating system

Creating the /IN Directory

Follow these steps to create the /IN directory. The directory must be accessed through the primary user account installing Convergent Charging Controller.

Step	Action
1	Log in as the root user.
2	Run the following command: <code>\$ mkdir /IN</code>
3	Run the following command to set the permissions for the /IN directory: <code>chmod 775 /IN</code> <code>chown CCC_installation_user:esg /IN</code>

About Checking Prerequisite Requirements

Verify that your system meets prerequisite requirements before you install Convergent Charging Controller. The installer includes a prerequisite check mode that performs the following tests:

- The system meets minimum software and hardware requirements
- The esg group exists
- The Oracle user, CCC_runtime_user and CCC_installation_user exists and belongs to the esg group and the group that owns the Oracle database (for example 'dba').
- The /IN directory exists and has readable, writable, and executable (775) file permissions
- JAVA_HOME and JAVA_HOME/bin should be set in PATH variable, so that java executable can be accessed from any location

Perform a prerequisite check by running the following command on each Convergent Charging Controller node:

```
touch oraInvFile
```

```
java -jar ./cccInstaller_platform.jar -invPtrLoc oraInvFile -prereqchecker -silent -entryPoint nodeType
```

where:

- *platform* is **Linux** or **SunOS**.
- *oraInvFile* is the name and location of the Oracle Inventory file (**/IN/oralnst.loc**). You can point to the default file created by the Oracle Database installer. If the Convergent Charging Controller installation user account cannot read the default file, create an **oralnst.loc** file in a writeable location.

- *nodeType* is the type of test to perform. Valid values are shown in the following table:

nodeType Value	Tests Performed
minimum	<ul style="list-style-type: none"> • Checks that all users and groups have been created. • Checks that the /IN directory exists.
sms	<ul style="list-style-type: none"> • Checks that all users and groups required by the SMS have been created. • Checks that the /IN directory exists.
slc	<ul style="list-style-type: none"> • Checks that all users and groups required by the SLC have been created. • Checks that the /IN directory exists. • Check SLC software dependencies.
vws	<ul style="list-style-type: none"> • Checks that the users and groups required by the VWS have been created. • Checks that the /IN directory exists. • Check VWS software dependencies.

During the prerequisite check process, the installer informs you whether your system passes each test by using one of the following settings:

Setting	Description
Passed	Your node passed the specified test.
Failed	Your node did not pass the specified test. This setting is for informational purposes only. It does not prevent you from installing Convergent Charging Controller.
Not executed	The installer could not perform the specified test. This output includes additional information about how to perform the test manually.

The following shows sample output from the `ccclnstaller_platform.jar` script when *nodeType* is set to `slc`:

```
Preparing to launch the Oracle Universal Installer from /tmp/OraInstall2018-07-27_10-32-44AM
Oracle Prerequisite Checker Version 13.9.1.0.0 Production
Copyright (C) 1999, 2016, Oracle. All rights reserved.
```

```
Starting execution of prerequisite checks
Total No of checks: 8
```

```
Performing check for CheckEsgGroupExists
Checking OS group esg exists.
Check complete. The overall result of this check is: Passed
```

```
Check complete: Passed
```

```
=====
Performing check for CheckUserBelongsToEsgGroup
Checking you belong to the OS esg group.
Check complete. The overall result of this check is: Passed
```

```
Check complete: Passed
```

```
=====
Performing check for CheckOracleBelongsToEsgGroup
Checking oracle user belongs to the OS esg group.
Check complete. The overall result of this check is: Passed
```

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```
Check complete: Passed
=====
Performing check for checkUserBelongsToDbGroup
Checking you belong to the OS database group.
Check complete. The overall result of this check is: Passed
```

```
Check complete: Passed
=====
Performing check for CheckDirectoryExists
Checking /IN directory exists and has 775 permissions.
Check complete. The overall result of this check is: Failed
```

```
Check complete: Failed
Problem: The directory /IN must exist and have 775 permissions.
Recommendation: Create the /IN directory with 775 permissions.
```

```
=====
Performing check for CheckPortalDirectoryExists
Checking the BRM SDK is installed (PortalDevKit 7.5).
Check complete. The overall result of this check is: Passed
```

```
Check complete: Passed
=====
Performing check for CheckXinetdExists
Checking xinetd (linux) or inetd (solaris) are installed.
Check complete. The overall result of this check is: Passed
```

```
Check complete: Passed
=====
Performing check for CheckLksctpExists
Checking lksctp-tools exists (linux only)
Check complete. The overall result of this check is: Passed
```

```
Check complete: Passed
=====
PrereqChecks complete
```

The log(s) can be found here: /tmp/OraInstall2018-07-27_10-32-44AM.

Installing a Browser

Browser and Java for Convergent Charging Controller UI

To enable you to access the Convergent Charging Controller UI, ensure that the required Java version and the browser listed in the following table are installed on your client system.

Note: Convergent Charging Controller supports client systems that use Windows XP or higher.

Browser/Java	Description
Java	Java 8u321
Browser	Any browser supporting the required Java version, such as IE 11 or Chrome 99

Installing and Configuring Oracle Database

About Installing and Configuring Oracle Database

You need to install Oracle Database Server on all nodes:

- Enterprise Edition for SMS or Standard Edition for non-partitioned deployments
- Standard Edition for all other nodes (SLC, VWS1, VWS2)

Installing the Oracle Database Software

You can install Oracle database for Convergent Charging Controller in the following ways:

- Install Oracle database on remote host.
- Install Oracle database on local host.

Install Oracle Enterprise Database Server 19c

For detailed installation instructions, see *Database Installation Guide for Oracle Solaris*.

Oracle Database Software Installation Guidelines

Follow these guidelines when installing Oracle Enterprise Database software.

Installation Entity	Guideline Value
Oracle Software Owner User	Username: oracle Home directory: /home/oracle
OSDBA Group	dba
Oracle Base Directory (ORACLE_BASE)	/u01/app/oracle
Oracle 19c database (ORACLE_HOME)	/u01/app/oracle/product/19.0.0
Oracle database datafile directory	/oracle/datafiles

Installation Entity	Guideline Value
Oracle user <code>.profile</code> (<code>/home/oracle/.profile</code>)	<p>Configure the oracle user's <code>.profile</code> file with the following variables consistent with your environment.</p> <pre># Set up terminal, non-interactive, default vt100 TERM=vt100 export TERM if [-t 0] ; then # Set some options set -o vi stty erase "^H" kill "^U" intr "^C" eof "^D" stty hupcl ixon ixoff set -o vi fi umask 022 MAIL=/usr/mail/\${LOGNAME:?} export MAIL ORACLE_BASE=/u01/app/oracle export ORACLE_BASE ORACLE_HOME=\$ORACLE_BASE/product/release_version export ORACLE_HOME LD_LIBRARY_PATH_64=\$ORACLE_HOME/lib export LD_LIBRARY_PATH_64 LD_LIBRARY_PATH=\$ORACLE_HOME/lib export LD_LIBRARY_PATH PATH=\$PATH:\$ORACLE_HOME/bin:/usr/bin:/etc:/usr/ccs/bin:/usr/openwin/bin:/usr/local/bin:/usr/sbin EDITOR=vi export EDITOR ORACLE_SID=[SMF SCP E2BE]</pre> <p>where <code>release_version</code> is 19.13.0 as per the Oracle database version used.</p> <p>Note: <code>ORACLE_SID</code> must be set to one of:</p> <ul style="list-style-type: none"> • SMF for SMS node • SCP for SLC nodes • E2BE for VWS nodes <pre>export ORACLE_SID (Solaris only)ulimit -s unlimited ulimit -n 4096 export PATH</pre>

Installation Entity	Guideline Value
Global profile (/etc/profile)	<p>Configure your system's global profile as required for your environment. For example,</p> <pre>PS1='\${LOGNAME}@\$(/usr/bin/hostname):\$([["\${LOGNAME}" == "root"]] && printf "%s" "\${PWD}# " printf "%s" "\${PWD}\$ ")'</pre> <pre>ORACLE_BASE=/u01/app/oracle export ORACLE_BASE ORACLE_HOME=\$ORACLE_BASE/product/release_version export ORACLE_HOME ORACLE_CLIENT_HOME=\$ORACLE_HOME export ORACLE_CLIENT_HOME LD_LIBRARY_PATH=\$ORACLE_CLIENT_HOME/lib:\$LD_LIBRARY_PATH export LD_LIBRARY_PATH PATH=\$PATH:\$ORACLE_HOME/bin export PATH ORACLE_SID=[SMF SCP E2BE]</pre> <p>Where <i>release_version</i> is 19.13.0 as per the Oracle database version used.</p> <p>Note: ORACLE_SID must be set to one of:</p> <ul style="list-style-type: none"> • SMF for SMS node • SCP for SLC nodes • E2BE for VWS nodes <pre>export ORACLE_SID</pre>
System resources for Oracle (Solaris only)	<p>Set the following parameters and create a project for the oracle user on your system:</p> <pre>max-shm-memory = 16G max-sem-ids = 100 max-sem-nsems = 256 max-shm-ids = 100</pre> <p>Create a project for this as follows:</p> <pre># projadd -U oracle -K "project.max-shm- memory=(priv,16G,deny)" group.dba # projmod -sK "project.max-sem-ids=(priv,100,deny)" group.dba # projmod -sK "process.max-sem-nsems=(priv,256,deny)" group.dba # projmod -sK "project.max-shm-ids=(priv,100,deny)" group.dba</pre>

Installation Entity	Guideline Value
System resources for Oracle (Linux only)	<ol style="list-style-type: none"> 1 Determine the sum of process parameters for all database instances on the system, the overhead for Oracle background processes, the system and other application requirements. 2 Set <code>semms</code> (total semaphores system-wide) to the larger of the value in 1 or 32000. 3 Set <code>semmsl</code> (semaphores per set) to 250. 4 Set <code>semmsn</code> (total semaphore sets) to <code>semms/semmsl</code> rounded up to the nearest multiple of 1024. 5 For Linux and Oracle 19c, set the maximum number of asynchronous I/O requests allowed in <code>/etc/sysctl.conf</code> as follows: <pre style="margin-left: 40px;">fs.aio-max-nr = 3145728</pre> <p>After changing the <code>/etc/sysctl.conf</code>, run the following command as root to set the values in the system:</p> <pre style="margin-left: 40px;"># /sbin/sysctl -p /etc/sysctl.conf</pre>

Oracle Server Installation Guidelines

Follow these guidelines when using Oracle Universal Installer to install Oracle 19c on all nodes.

Installation Option	Guideline Values
Installation Method	Basic
Installation Type	Enterprise edition for partitioned SMS nodes Standard editions for VWS, SLC, and non-partitioned SMS nodes
Create Starter Database	No
Configuration Option	Install database software only

Oracle 19c Client Installation Guidelines

Follow these guidelines when using Oracle Universal Installer to install the Oracle 19c client.

Installation Option	Guideline Values
Installation Type	Custom
Download Software	Skip software updates
Available Product Components	Oracle Database Utilities, Oracle Net Listener
Oracle Net Configuration Assistant	Oracle Net configuration is not needed. When prompted by the Oracle Net Configuration Assistant, cancel the assistant by clicking Cancel and confirming you want to cancel the assistant.

Configuring the Oracle Database to Start Automatically

You should implement startup scripts to automatically start the local database instance on system startup.

You can use the `/etc/init.d/oracleDB.sh` example Oracle startup and shutdown scripts to configure the system to start the Oracle database automatically on startup (and shut down automatically on system shutdown).

You should configure automatic startup for the Oracle database at system run level 2 instead of the default run level 3. Automatic shutdown can be configured for run levels 0 and 1 as well. You create symbolic links in the appropriate run level directories to the example startup and shutdown scripts.

To configure automatic startup and shutdown for using the example scripts, log in as the root user, and run the following commands:

For Solaris, see the discussion about automating shutdown and startup in *Oracle Database Administrator's Reference for Linux and UNIX-Based Operating System*.

For Linux:

```
chmod 700 /etc/init.d/dbora.sh
ln -s /etc/init.d/dbora.sh /etc/rc0.d/K10oracle
ln -s /etc/init.d/dbora.sh /etc/rc1.d/K10oracle
rm -f /etc/rc2.d/K10oracle
ln -s /etc/init.d/dbora.sh /etc/rc2.d/S99oracle
rm -f /etc/rc3.d/S99oracle
```

Note: After entering these commands, the symbolic link between `/etc/init.d/oracleDB.sh` and `K10oracle` in the `/etc/rc0.d` and the `/etc/rc1.d` directories mean that the Oracle instance will be stopped when the system is set to an init level below 2.

Oracle Database Instances

You can opt to automatically create Oracle database instances during the installation of the Convergent Charging Controller software packages. A single database instance is created on each Convergent Charging Controller node.

The following table shows the mapping between each node type and the named database instance on the node.

Node Type	Database Instance
SMS	SMF
VWS	E2BE
SLC	SCP

Setting Database Parameters for SMS Databases

Oracle recommends setting the following database parameters in the underlying databases used by Service Management System (SMS) nodes.

Database Parameter	Guideline Value
JOB_QUEUE_PROCESSES	20

To set the database parameters for SMS databases:

Step	Action
1	Ensure that you have SYSDBA privileges.
2	Go to the computer on which the Oracle database is installed.
3	Start SQL*Plus: C:\> sqlplus /NOLOG
4	Connect to the database as SYSDBA: SQL> CONNECT / AS SYSDBA

Step	Action
5	Set the JOB_QUEUE_PROCESSES initialization parameter to: <code>ALTER SYSTEM SET JOB_QUEUE_PROCESSES=20 SCOPE=BOTH</code>
6	Shut down Oracle database: <code>SQL> SHUTDOWN</code>
7	Restart Oracle database: <code>SQL> STARTUP</code>
8	Exit SQL*Plus: <code>SQL> EXIT</code>

Installing and Configuring BRM SDK

The Oracle Communications Billing and Revenue Management (BRM) SDK must be installed before installing CCC. This is not delivered with CCC and must be installed separately. See *Convergent Charging Controller BRM Charging Driver Technical Guide* for details.

BRM SDK 7.5.0.21.0 must be installed for CCC 12.0.5 release. Further copy 64 bit libraries `libzsd64.so`, `libpcmx64.so` and `libportal64.so` into BRM SDK installed 'lib' directory with proper permissions.

Installing Convergent Charging Controller

Overview

Introduction

This chapter describes how to install Oracle Communications Convergent Charging Controller. Before you install Convergent Charging Controller, read the following chapters:

- Convergent Charging Controller Installation Overview
- Planning Your Convergent Charging Controller Installation
- Convergent Charging Controller System Requirements
- Advanced Storage and Memory Sizing
- Convergent Charging Controller Pre-Installation Tasks

In this chapter

This chapter contains the following topics.

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Convergent Charging Controller Installation Options

You can install Convergent Charging Controller in the GUI mode (using Oracle Universal Installer) or in silent mode.

- **GUI mode:** Use the GUI mode when you want to interact with the Installer during installation. See *Installation Types*.
- **Silent mode:** Use the silent mode when you are installing Convergent Charging Controller using the same configuration repeatedly. The silent mode does not use the GUI and it runs in the background. See *Installing Convergent Charging Controller in Silent Mode* for more information.

Convergent Charging Controller Installation Types

When installing Convergent Charging Controller in the GUI mode, you can select the type of installation:

SMS Node: Service Management System (SMS) installs the Convergent Charging Controller SMS application and the SMS database. See *Installing Convergent Charging Controller on the SMS Node Using the GUI* (on page 62).

SLC Node: Service Logic Controller (SLC) installs the Convergent Charging Controller SLC application and the SLC database. See *Installing Convergent Charging Controller on the SLC Node Using the GUI* (on page 65).

SLC With Test Tools: Service Logic Controller (SLC) installs the Convergent Charging Controller SLC application, the SLC Test Tools, and the SLC database. See *Installing Convergent Charging Controller on the SLC with Testing Tools Node Using the GUI* (on page 68).

VWS Node: Voucher and Wallet Server (VWS) installs the Convergent Charging Controller application, the VWS database, and the VWS application. See *Installing Convergent Charging Controller on the VWS Node Using the GUI* (on page 71).

Installing Convergent Charging Controller on the SMS Node Using the GUI

Install Convergent Charging Controller on either an Oracle Solaris 11.3 (64-bit) server or an Oracle Linux 8.4 server.

To install Convergent Charging Controller on an SMS node:

Step	Action
1	Log in as the root user.
2	Create a CCC sub-directory in the <code>/var/spool/pkg</code> directory: <pre>cd /var/spool/pkg mkdir CCC</pre> <p>Note: The amount of space available in this directory must be at least three times the size of the archive. For example, if the archive is 500 MB, the temporary directory should be at least 1500 MB.</p>
3	Go to the Oracle software delivery Web site: http://edelivery.oracle.com/ and download the <code>CCC_v12_0_5_0_0_platform.zip</code> software pack to the <code>/var/spool/pkg/CCC</code> directory, where <code>platform</code> is <code>Linux</code> or <code>SunOS</code> .
4	Go to the <code>/var/spool/pkg/CCC</code> directory and unzip the <code>CCC_v12_0_5_0_0_platform.zip</code> file: <pre>unzip CCC_v12_0_5_0_0_platform.zip</pre>
5	Log in as the user (non-root) installing Convergent Charging Controller. <p>Note: Ensure that the non-root user installing Convergent Charging Controller has access to the esg and Oracle database group (e.g. dba).</p>
6	Run the following commands: <pre>export DISPLAY=IP_address:0 export JAVA_HOME=Java_home</pre> where: <ul style="list-style-type: none"> <code>IP_address</code> is the IP address of the computer on which you run the SMS GUI. <code>Java_home</code> is the directory in which JDK 1.8 is installed.
7	Ensure that the SMS node meets all prerequisites by running the following commands: <pre>touch /IN/oraInst.loc java -jar ./cccInstaller_platform.jar -invPtrLoc /IN/oraInst.loc - prereqchecker -silent -entryPoint sms</pre>

Step	Action
8	<p>Do one of the following:</p> <ul style="list-style-type: none"> To start the Installer: <pre>java -jar ./cccInstaller_platform.jar -invPtrLoc /IN/oraInst.loc</pre> To start the Installer and create a silent installer response file during the installation: <pre>java -jar ./cccInstaller_platform.jar -logLevel finest -record -destinationFile path</pre> where <i>path</i> is the response file location. <p>The installer screen appears.</p>
9	<p>Click Next.</p> <p>The Installation Inventory screen appears.</p> <p>In the Inventory Directory field, enter the path to the OralInventory directory, or click Browse to select the directory.</p> <p>In the Operating System Group field, select group (esg) from the drop-down list.</p> <p>Click Next.</p> <p>The Installation Location screen appears.</p>
10	<p>In the Name field, enter /IN.</p>
11	<p>Click Next.</p> <p>The Installation Type screen appears.</p> <p>Note: The Convergent Charging Controller installer creates an oralInventory directory if it does not detect any installed Oracle products on the system. The oralInventory directory contains information about all Oracle products installed on your system. You can find the default location of the oralInventory directory by opening the /etc/oralnst.loc (Linux) file or the /var/opt/oracle/oralnst.loc (Solaris) file.</p>
12	<p>Select SMS.</p>
13	<p>Click Next.</p> <p>The Oracle User screen appears.</p>
14	<p>In the Oracle DB Owner field, retain the default oracle, which is the user name with permissions to create the Oracle database instance.</p> <p>Verify the Oracle DB Group field.</p> <p>Specify the CCC runtime user in the Application Owner field.</p> <p>Click Next.</p> <p>The Database Server Paths screen appears.</p>
15	<p>Confirm one of the following:</p> <p>The database, schema, and application will be installed. Select this option to install all items on the same node.</p> <p>The database already exists and both the schema and application will be installed. Select this option if you have already created the database including datafiles on this or a remote node but not the database schema or application.</p> <p>The database and schema already exists and only the application will be installed. Select this option if the database and schema already exists on this or a remote node and you want to only install the application.</p>

Step	Action
16	<p>If you are installing all items on the same node:</p> <p>In the Base directory field, retain the default, <code>/u01/app/oracle</code>.</p> <p>In the Oracle home directory field, enter <code>/u01/app/oracle/product/19.0.0</code> for 19c database.</p> <p>In the Datafile directory field, enter the path to the datafiles directory in which to create CCC database instance data files.</p> <p>In the Redolog directory field, enter the path to the redolog directory in which to create CCC database redo log files.</p> <p>Click Next.</p> <p>In the Oracle database password field, enter the password for the Oracle database administrative accounts.</p> <p>In the Confirm password field, enter the password again to confirm.</p> <p>Note: If the password is less than 8 characters, a warning appears. You can click OK to proceed.</p>
17	<p>If items already exist on the same or remote node:</p> <p>Select one of the below options:</p> <ol style="list-style-type: none"> <li data-bbox="284 798 1351 1018"> <p>If you select Standard Database option, configure the following:</p> <p>In the Oracle client home directory field, enter <code>/u01/app/oracle/product/19.0.0</code> for 19c client.</p> <p>In the Oracle SID field, enter SMF.</p> <p>In the Database hostname field, enter the host where the database is located.</p> <p>In the Oracle database password field, enter the password for the Oracle database administrative accounts on associated with the Database hostname.</p> <li data-bbox="284 1018 1351 1354"> <p>If you select RAC Database option, configure the following:</p> <p>In the Oracle client home directory field, enter <code>/u01/app/oracle/product/19.0.0</code> for 19c client.</p> <p>In the Oracle SID field, enter SMF.</p> <p>In the Database hostname field, enter the host where the database is located.</p> <p>In the Oracle database password field, enter the password for the Oracle database administrative accounts on associated with the Database hostname.</p> <p>In the Database Port field, enter the port that is required to connect to the database host.</p> <p>In the Service database hostname field, enter the fully qualified service DB hostname.</p>
18	<p>In the Screen superuser password field, enter the password for the SMS GUI administrator account.</p> <p>Note: The password must match the password for the Oracle database installed on the SMS node.</p>
19	<p>In the Confirm password field, enter the password again to confirm.</p>
20	<p>Click Next.</p> <p>The PI Admin screen appears.</p>
21	<p>In the PI admin password field, enter the password for the PI administrator user account.</p>
22	<p>In the Confirm password field, enter the password again to confirm.</p>
23	<p>Click Next.</p> <p>The SMS EDR Paths screen appears.</p>
24	<p>In the CDR Loader Input directory field, retain the default path to the directory of a single system to store CDR input files.</p>
25	<p>In the CDR Loader Output directory field, retain the default path to the directory of a single system to store CDR output files.</p>

Step	Action
26	<p>Click Next.</p> <p>The Default Template Screen appears.</p> <p>If you want the default templates to be installed, check the Install PCST checkbox, else uncheck the Install PCST checkbox.</p>
27	<p>Click Next.</p> <p>The System Currency Details screen appears.</p>
28	<p>Set the following fields:</p> <p>Base Value - default is 100</p> <p>Big Symbol - default is \$</p> <p>Little Symbol - default is c</p> <p>Separator - default is .</p>
29	<p>Click Next.</p> <p>Prerequisite check screen appears.</p>
30	<p>Based on the OS, few prerequisite checks are performed on clicking Next.</p> <p>The Installation Summary screen appears.</p>
31	<p>Review the selections you have made in the preceding screens, and click Install.</p> <p>The Installation Progress screen appears.</p>
32	<p>Click Next.</p> <p>The Installation Complete screen appears.</p>
33	<p>Click Finish.</p>
34	<p>Log onto the SMS as the root user.</p> <pre>cd /IN/bin ./postinstallRoot.sh [-n]</pre> <p>where -n is an optional flag. It is used to indicate if CCC will be installed without a VWS node.</p> <p>Note: You can reuse the script at any time to complete or retry failures occurring on previous invocations.</p>
35	<p>Log onto the SMS as the CCC_runtime user (the user that was given in step 15 for application owner field).</p> <pre>cd /IN/bin ./postinstallUser.sh</pre> <p>The script will prompt for information to be used as part of the runtime configuration.</p> <p>Note: You can reuse the script at any time to complete or retry failures occurring on previous invocations.</p>

Installing Convergent Charging Controller on the SLC Node Using the GUI

Install Convergent Charging Controller on either an Oracle Solaris 11.3 (64-bit) server or Oracle Linux 8.4 server.

Note: Ensure that SMS is installed before installing SLC.

To install Convergent Charging Controller on the SLC node:

Step	Action
1	Log in as the root user.
2	<p>Create a CCC sub-directory in the <code>/var/spool/pkg</code> directory:</p> <pre>cd /var/spool/pkg mkdir CCC</pre> <p>Note: The amount of space available in this directory must be at least three times the size of the archive. For example, if the archive is 500 MB, the temporary directory should be at least 1500 MB.</p>
3	<p>Go to the Oracle software delivery Web site:</p> <p>http://edelivery.oracle.com/</p> <p>and download the <code>CCC_v12_0_5_0_0_platform.zip</code> software pack to the <code>/var/spool/pkg/CCC</code> directory, where <code>platform</code> is <code>Linux</code> or <code>SunOS</code>.</p>
4	<p>Go to the <code>/var/spool/pkg/CCC</code> directory and unzip the <code>CCC_v12_0_5_0_0_platform.zip</code> file:</p> <pre>unzip CCC_v12_0_5_0_0_platform.zip</pre>
5	<p>Log in as the user (non-root) installing Convergent Charging Controller, and go to the <code>/var/spool/pkg/CCC</code> directory.</p> <p>Note: Ensure that the non-root user installing Convergent Charging Controller has access to the <code>esg</code> and Oracle database group (e.g. <code>dba</code>).</p>
6	<p>Run the following commands:</p> <pre>export DISPLAY=IP_address:0 export JAVA_HOME=Java_home</pre> <p>where:</p> <ul style="list-style-type: none"> • <code>IP_address</code> is the IP address of the computer on which the Convergent Charging Controller GUI installer appears. • <code>Java_home</code> is the directory in which JDK 1.8 is installed.
7	<p>Ensure that the SLC node meets all prerequisites by running the following command:</p> <pre>touch /IN/oraInst.loc</pre> <pre>java -jar ./cccInstaller_platform.jar -invPtrLoc /IN/oraInst.loc -prereqchecker -silent -entryPoint slc</pre>
8	<p>Do one of the following:</p> <ul style="list-style-type: none"> • To access the Installer: <pre>java -jar ./cccInstaller_platform.jar -invPtrLoc /IN/oraInst.loc</pre> • To start the Installer and create a silent installer response file during the installation: <pre>java -jar ./cccInstaller_platform.jar -logLevel finest -record -destinationFile path</pre> <p>where <code>path</code> is the response file location.</p> <p>The Installer screen appears.</p>
9	<p>Click Next.</p> <p>The Installation Inventory screen appears.</p> <p>In the Inventory Directory field, enter the path to the <code>Orainventory</code> directory, or click Browse to select the directory.</p> <p>In the Operating System Group field, select group (<code>esg</code>) from the drop-down list.</p> <p>Click Next.</p> <p>The Installation Location screen appears.</p>

Step	Action
10	In the Name field, enter /IN .
11	Click Next . The Installation Type screen appears.
	Note: The Convergent Charging Controller installer creates an oralInventory directory if it does not detect any installed Oracle products on the system. The oralInventory directory contains information about all Oracle directory products installed on your system. You can find the default location of the oralInventory directory by opening the /etc/oralnst.loc (Linux) file or the /var/opt/oracle/oralnst.loc (Solaris) file.
12	Select SLC .
13	Click Next . The Oracle User screen appears.
14	In the Oracle DB Owner field, retain the default oracle , which is the user name with permissions to create the Oracle database instance. Verify the Oracle DB Group field. Specify the CCC runtime user in the Application Owner field. Click Next . The Database Server Paths screen appears.
15	Confirm one of the following: The database, schema, and application will be installed. Select this option to install all items on the same node. The database already exists and both the schema and application will be installed. Select this option if you have already created the database including datafiles on this or a remote node but not the database schema or application. The database and schema already exists and only the application will be installed. Select this option if the database and schema already exists on this or a remote node and you want to only install the application.
16	If you are installing all items on the same node: In the Base directory field, retain the default, /u01/app/oracle . In the Oracle home directory field, enter /u01/app/oracle/product/19.0.0 for 19c database. In the Datafile directory field, enter the path to the datafiles directory in which to create CCC database instance data files. In the Redolog directory field, enter the path to the redolog directory in which to create CCC database redo log files. Click Next . In the Oracle database password field, enter the password for the Oracle database administrative accounts. In the Confirm password field, enter the password again to confirm. Note: If the password is less than 8 characters, a warning appears. You can click OK to proceed.

Step	Action
17	<p>If items already exist on the same or remote node: Select one of the below options:</p> <p>a. If you select Standard Database option, configure the following: In the Oracle client home directory field, enter <code>/u01/app/oracle/product/19.0.0</code> for 19c client. In the Oracle SID field, enter SCP. In the Database hostname field, enter the host where the database is located. In the Oracle database password field, enter the password for the Oracle database administrative accounts on associated with the Database hostname.</p> <p>b. If you select RAC Database option, configure the following: In the Oracle client home directory field, enter <code>/u01/app/oracle/product/19.0.0</code> for 19c client. In the Oracle SID field, enter SCP. In the Database hostname field, enter the host where the database is located. In the Oracle database password field, enter the password for the Oracle database administrative accounts on associated with the Database hostname. In the Database Port field, enter the port that is required to connect to the database host. In the Service database hostname field, enter the fully qualified service DB hostname.</p>
18	In the SMS Host name field, enter the qualified hostname for the SMS server used to configure the clients that will connect to the SMS server.
19	Click Next . The Installation Summary screen appears.
20	Review the selections you have made in the preceding screens, and click Install . The Installation Progress screen appears.
21	Click Next . The Installation Complete screen appears.
22	Click Finish .
23	Log onto the SLC as the root user. <code>cd /IN/bin</code> <code>./postinstallRoot.sh</code>
	Note: You can reuse the script at any time to complete or retry failures occurring on previous invocations.

Installing Convergent Charging Controller on the SLC with Testing Tools Node Using the GUI

Install Convergent Charging Controller on either an Oracle Solaris 11.3 (64-bit) server or an Oracle Linux 8.4 server.

Note: Ensure that SMS is installed before installing SLC with Test Tools.

To install Convergent Charging Controller on the SLC with Testing Tools node:

Step	Action
1	Log in as the root user.

Step	Action
2	<p>Create a CCC sub-directory in the <code>/var/spool/pkg</code> directory:</p> <pre>cd /var/spool/pkg mkdir CCC</pre> <p>Note: The amount of space available in this directory must be at least three times the size of the archive. For example, if the archive is 500 MB, the temporary directory should be at least 1500 MB.</p>
3	<p>Go to the Oracle software delivery Web site: http://edelivery.oracle.com/ and download the <code>CCC_v12_0_5_0_0_platform.zip</code> software pack to the <code>/var/spool/pkg/CCC</code> directory, where <i>platform</i> is Linux or SunOS.</p>
4	<p>Go to the <code>/var/spool/pkg/CCC</code> directory and unzip the <code>CCC_v12_0_5_0_0_platform.zip</code> file:</p> <pre>unzip CCC_v12_0_5_0_0_platform.zip</pre>
5	<p>Log in as the user (non-root) installing Convergent Charging Controller, and go to the <code>/var/spool/pkg/CCC</code> directory.</p> <p>Note: Ensure that the non-root user installing Convergent Charging Controller has access to the <code>esg</code> and Oracle database group (e.g. <code>dba</code>).</p>
6	<p>Run the following commands:</p> <pre>export DISPLAY=IP_address:0 export JAVA_HOME=Java_home</pre> <p>where:</p> <ul style="list-style-type: none"> • <i>IP_address</i> is the IP address of the computer on which the Convergent Charging Controller GUI Installer appears. • <i>Java_home</i> is the directory in which JDK 1.8 is installed.
7	<p>Ensure that the SLC node meets all prerequisites by running the following command:</p> <pre>touch /IN/oraInst.loc java -jar ./cccInstaller_platform.jar -invPtrLoc /IN/oraInst.loc -prereqchecker -silent -entryPoint slc</pre>
8	<p>Do one of the following:</p> <ul style="list-style-type: none"> • To access the Installer: <pre>java -jar ./cccInstaller_platform.jar -invPtrLoc /IN/oraInst.loc</pre> • To start the Installer and create a silent installer response file during the installation: <pre>java -jar ./cccInstaller_platform.jar -logLevel finest -record -destinationFile path</pre> where <i>path</i> is the response file location. <p>The Installer screen appears.</p>
9	<p>Click Next.</p> <p>The Installation Inventory screen appears.</p> <p>In the Inventory Directory field, enter the path to the <code>OralInventory</code> directory, or click Browse to select the directory.</p> <p>In the Operating System Group field, select group (<code>esg</code>) from the drop-down list.</p> <p>Click Next.</p> <p>The Installation Location screen appears.</p>
10	<p>In the Name field, enter <code>/IN</code>.</p>

Step	Action
11	<p>Click Next.</p> <p>The Installation Type screen appears.</p>
	<p>Note: The Convergent Charging Controller installer creates an oralnventory directory if it does not detect any installed Oracle products on the system. The oralnventory directory contains information about all Oracle products installed on your system. You can find the default location of the oralnventory directory by opening the /etc/orainst.loc (Linux) file or the /var/opt/oracle/orainst.loc (Solaris) file.</p>
12	<p>Select SLC With Test Tools to install the SLC application, the SLC With Testing Tools, and the SLC database.</p>
13	<p>Click Next.</p> <p>The Oracle User screen appears.</p>
14	<p>In the Oracle DB Owner field, retain the default oracle, which is the user name with permissions to create the Oracle database instance.</p> <p>Verify the Oracle DB Group field.</p> <p>Specify the CCC runtime user in the Application Owner field.</p> <p>Click Next.</p> <p>The Database Server Paths screen appears.</p>
15	<p>Confirm one of the following:</p> <p>The database, schema, and application will be installed. Select this option to install all items on the same node.</p> <p>The database already exists and both the schema and application will be installed. Select this option if you have already created the database including datafiles on this or a remote node but not the database schema or application.</p> <p>The database and schema already exists and only the application will be installed. Select this option if the database and schema already exists on this or a remote node and you want to only install the application.</p>
16	<p>If you are installing all items on the same node:</p> <p>In the Base directory field, retain the default, /u01/app/oracle.</p> <p>In the Oracle home directory field, enter /u01/app/oracle/product/19.0.0 for 19c database.</p> <p>In the Datafile directory field, enter the path to the datafiles directory in which to create CCC database instance data files.</p> <p>In the Redolog directory field, enter the path to the redolog directory in which to create CCC database redo log files.</p> <p>Click Next.</p> <p>In the Oracle database password field, enter the password for the Oracle database administrative accounts.</p> <p>In the Confirm password field, enter the password again to confirm.</p> <p>Note: If the password is less than 8 characters, a warning appears. You can click OK to proceed.</p>

Step	Action
17	<p>If items already exist on the same or remote node: Select one of the below options:</p> <p>a. If you select Standard Database option, configure the following: In the Oracle client home directory field, enter <code>/u01/app/oracle/product/19.0.0</code> for 19c client. In the Oracle SID field, enter SCP. In the Database hostname field, enter the host where the database is located. In the Oracle database password field, enter the password for the Oracle database administrative accounts on associated with the Database hostname.</p> <p>b. If you select RAC Database option, configure the following: In the Oracle client home directory field, enter <code>/u01/app/oracle/product/19.0.0</code> for 19c client. In the Oracle SID field, enter SCP. In the Database hostname field, enter the host where the database is located. In the Oracle database password field, enter the password for the Oracle database administrative accounts on associated with the Database hostname. In the Database Port field, enter the port that is required to connect to the database host. In the Service database hostname field, enter the fully qualified service DB hostname.</p>
18	In the SMS Host name field, enter the qualified hostname for the SMS server used to configure the clients that will connect to the SMS server.
19	Click Next . The Installation Summary screen appears.
20	Review the selections you have made in the preceding screens, and click Install . The Installation Progress screen appears.
21	Click Next . The Installation Complete screen appears.
22	Click Finish .
23	Log onto the SLC as the root user. <code>cd /IN/bin</code> <code>./postinstallRoot.sh</code>
	Note: You can reuse the script at any time to complete or retry failures occurring on previous invocations.

Installing Convergent Charging Controller on the VWS Node Using the GUI

Install Convergent Charging Controller on either an Oracle Solaris 11.3 (64-bit) server or an Oracle Linux 8.4 server.

Note: Ensure that SMS is installed before installing VWS.

To install Convergent Charging Controller on a VWS node:

Step	Action
1	Log in as the root user.

Step	Action
2	<p>Create a CCC sub-directory in the <code>/var/spool/pkg</code> directory:</p> <pre>cd /var/spool/pkg mkdir CCC</pre> <p>Note: The amount of space available in this directory must be at least three times the size of the archive. For example, if the archive is 500 MB, the temporary directory should be at least 1500 MB.</p>
3	<p>Go to the Oracle software delivery Web site: http://edelivery.oracle.com/ and download the <code>CCC_v12_0_5_0_0_platform.zip</code> software pack to the <code>/var/spool/pkg/CCC</code> directory, where <i>platform</i> is Linux or SunOS.</p>
4	<p>Go to the <code>/var/spool/pkg/CCC</code> directory and unzip the <code>CCC_v12_0_5_0_0_platform.zip</code> file:</p> <pre>unzip CCC_v12_0_5_0_0_platform.zip</pre>
5	<p>Log in as the user (non-root) installing Convergent Charging Controller, and go to the <code>/var/spool/pkg/CCC</code> directory.</p> <p>Note: Ensure that the non-root user installing Convergent Charging Controller has access to the <code>esg</code> and Oracle database group (e.g. <code>dba</code>).</p>
6	<p>Run the following commands:</p> <pre>export DISPLAY=IP_address:0 export JAVA_HOME=Java_home</pre> <p>where:</p> <ul style="list-style-type: none"> • <i>IP_address</i> is the IP address of the computer on which the CCC GUI appears. • <i>Java_home</i> is the directory in which JDK 1.8 is installed.
7	<p>Ensure that the VWS node meets all prerequisites by running the following command:</p> <pre>touch /IN/oraInst.loc java -jar ./cccInstaller_platform.jar -invPtrLoc /IN/oraInst.loc -prereqchecker -silent -entryPoint vws</pre>
8	<p>Do one of the following:</p> <ul style="list-style-type: none"> • To access the Installer: <pre>java -jar ./cccInstaller_platform.jar -invPtrLoc /IN/oraInst.loc</pre> • To start the Installer and create a silent installer response file during the installation: <pre>java -jar ./cccInstaller_platform.jar -logLevel finest -record -destinationFile path</pre> where <i>path</i> is the response file location. <p>The Installer screen appears.</p>
9	<p>Click Next.</p> <p>The Installation Inventory screen appears.</p> <p>In the Inventory Directory field, enter the path to the <code>OralInventory</code> directory, or click Browse to select the directory.</p> <p>In the Operating System Group field, select group (<code>esg</code>) from the drop-down list.</p> <p>Click Next.</p> <p>The Installation Location screen appears.</p>
10	<p>In the Name field, enter <code>/IN</code>.</p>

Step	Action
11	<p>Click Next.</p> <p>The Installation Type screen appears.</p>
	<p>Note: The Convergent Charging Controller installer creates an oralInventory directory if it does not detect any installed Oracle products on the system. The oralInventory directory contains information about all Oracle products installed on your system. You can find the default location of the oralInventory directory by opening the /etc/oralnst.loc (Linux) file or the /var/opt/oracle/oralnst.loc (Solaris) file.</p>
12	<p>Select VWS.</p>
13	<p>Click Next.</p> <p>The Oracle User screen appears.</p>
14	<p>In the Oracle DB Owner field, retain the default oracle, which is the user name with permissions to create the Oracle database instance.</p> <p>Verify the Oracle DB Group field.</p> <p>Specify the CCC runtime user in the Application Owner field.</p> <p>Click Next.</p> <p>The Database Server Paths screen appears.</p>
15	<p>Confirm one of the following:</p> <p>The database, schema, and application will be installed. Select this option to install all items on the same node.</p> <p>The database already exists and both the schema and application will be installed. Select this option if you have already created the database including datafiles on this or a remote node but not the database schema or application.</p> <p>The database and schema already exists and only the application will be installed. Select this option if the database and schema already exists on this or a remote node and you want to only install the application.</p>
16	<p>If you are installing all items on the same node:</p> <p>In the Base directory field, retain the default, /u01/app/oracle.</p> <p>In the Oracle home directory field, enter /u01/app/oracle/product/19.0.0 for 19c database.</p> <p>In the Datafile directory field, enter the path to the datafiles directory in which to create CCC database instance data files.</p> <p>In the Redolog directory field, enter the path to the redolog directory in which to create CCC database redo log files.</p> <p>Click Next.</p> <p>In the Oracle database password field, enter the password for the Oracle database administrative accounts.</p> <p>In the Confirm password field, enter the password again to confirm.</p> <p>Note: If the password is less than 8 characters, a warning appears. You can click OK to proceed.</p>

Step	Action
17	<p>If items already exist on the same or remote node: Select one of the below options:</p> <p>a. If you select Standard Database option, configure the following: In the Oracle client home directory field, enter <code>/u01/app/oracle/product/19.0.0</code> for 19c client. In the Oracle SID field, enter E2BE. In the Database hostname field, enter the host where the database is located. In the Oracle database password field, enter the password for the Oracle database administrative accounts on associated with the Database hostname.</p> <p>b. If you select RAC Database option, configure the following: In the Oracle client home directory field, enter <code>/u01/app/oracle/product/19.0.0</code> for 19c client. In the Oracle SID field, enter E2BE. In the Database hostname field, enter the host where the database is located. In the Oracle database password field, enter the password for the Oracle database administrative accounts on associated with the Database hostname. In the Database Port field, enter the port that is required to connect to the database host. In the Service database hostname field, enter the fully qualified service DB hostname.</p>
18	In the SMS Host name field, enter the qualified hostname for the SMS server used to configure the clients that will connect to the SMS server.
19	Click Next . The VWS Config screen appears.
20	Enter the information for VWS configuration.
21	In the SMS EDR Input directory field, enter the full name and path to the directory to store SMS EDR input files.
22	Select the Primary VWS node check box to install the primary node of a VWS pair.
23	Click Next . The Installation Summary screen appears.
24	Review the selections you have made in the preceding screens, and click Install . The Installation Progress screen appears.
25	Click Next . The Installation Complete screen appears.
26	Click Finish .
27	Log onto the VWS as the root user. <code>cd /IN/bin</code> <code>./postinstallRoot.sh</code>
	Note: You can reuse the script at any time to complete or retry failures occurring on previous invocations.
28	Log onto the VWS as the CCC_runtime user. <code>cd /IN/bin</code> <code>./postinstallUser.sh</code> The script will prompt for information to be used as part of the runtime configuration.
	Not: You can reuse the script at any time to complete or retry failures occurring on previous invocations.

Installing Convergent Charging Controller in Silent Mode

Use silent install mode when you are installing Convergent Charging Controller using the same configuration repeatedly. Silent install mode does not use the GUI, and it runs in the background.

About the Response File

A response file contains answers to installation questions that you would otherwise provide in an interactive installation session. Each answer is stored as a value for a variable identified in the response file.

You can generate a response file that contains the parameters and values during the Convergent Charging Controller GUI installation.

To generate a complete response file, run the following command to launch the Installer in the GUI mode:

```
java -jar ./cccInstaller_platform.jar -logLevel finest -record -destinationFilePath
where destinationFilePath is the response file location.
```

Note: The generated response file does not have a user password for security reasons. You must add the following parameters manually to the response file:

```
ORACLE_DATABASE_PASSWORD
ORACLE_DATABASE_PASSWORD_CONFIRM
```

```
NCC_SCREENINGS_SU_PASSWORD
NCC_SCREENINGS_SU_PASSWORD_CONFIRM
```

```
PI_ADMIN_PASSWORD
PI_ADMIN_PASSWORD_CONFIRM
```

where:

- *password* is the password for the Oracle database, Convergent Charging Controller screens, and PI Admin.
- *password_confirm* is the same password entered for the Oracle database, Convergent Charging Controller screens, and PI Admin.

Installing Convergent Charging Controller in Silent Mode

To install Convergent Charging Controller in silent mode:

Step	Action
1	Create a copy of the <i>response</i> file that was generated during the GUI installation and open it in a text editor.
2	Enter the values in the parameters to reflect the Convergent Charging Controller installation requirements. Note: In silent install mode, the Convergent Charging Controller installer treats incorrect context, format, or type values within a response file as if no value were specified.
3	Save and close the file.

Step	Action
4	<p>Go to the /IN directory and run the following command:</p> <pre><code>\${JAVA_HOME}/bin/java -jar ./cccInstaller_Platform.jar -logLevel finest -silent -responseFile path, where path is the Convergent Charging Controller response file name and location.</code></pre> <p>For example:</p> <pre><code>\${JAVA_HOME}/bin/java -jar ./cccInstaller_Linux.jar -logLevel finest -silent -responseFile /tmp/smsinstallresponse.rsp</code></pre> <p>The installation runs silently in the background.</p>

Following install on the SMS

Step	Action
1	<p>Log onto the SMS as the root user.</p> <pre><code>cd /IN/bin</code></pre> <pre><code>./postinstallRoot.sh [-n]</code></pre> <p>where -n is an optional flag. It is used to indicate if CCC will be installed without a VWS node.</p> <p>Note: You can reuse the script at any time to complete or retry failures occurring on previous invocations.</p>
2	<p>Log onto the SMS as the CCC_runtime user.</p> <pre><code>cd /IN/bin</code></pre> <pre><code>./postinstallUser.sh</code></pre> <p>The script will prompt for information to be used as part of the runtime configuration.</p> <p>Note: You can reuse the script at any time to complete or retry failures occurring on previous invocations.</p>

Following install on the SLC

Step	Action
1	<p>Log onto the SLC as the root user.</p> <pre><code>cd /IN/bin</code></pre> <pre><code>./postinstallRoot.sh</code></pre> <p>Note: You can reuse the script at any time to complete or retry failures occurring on previous invocations.</p>

Following install on the VWS

Follow these steps to

Step	Action
1	<p>Log onto the VWS as the root user.</p> <pre>cd /IN/bin ./postinstallRoot.sh</pre> <p>Note: You can reuse the script at any time to complete or retry failures occurring on previous invocations.</p>
2	<p>Log onto the VWS as the CCC_runtime user.</p> <pre>cd /IN/bin ./postinstallUser.sh</pre> <p>The script will prompt for information to be used as part of the runtime configuration.</p> <p>Note: You can reuse the script at any time to complete or retry failures occurring on previous invocations.</p>

About Installation Logs

You can check the log files in the **oralInventory/logs** directory. The default location of the **oralInventory** directory is in the **/IN/oralnst.loc** file.

Use the following log files to monitor installation and post-installations:

- **installActionTimeStamp.log**
- **oralInstallTimeStamp.err**
- **oralInstallTimeStamp.out**
- **silentInstallTimeStamp.log** (for the silent mode installation)

where *TimeStamp* is the date and time the log file was created.

The database schema installation log files for Convergent Charging Controller are available in **/IN/logs** directory.

Removing Files After a Failed Installation

If **ccclnstaller_platform.jar** fails during the installation process, some Convergent Charging Controller files may remain on your system.

Follow these steps to remove any Convergent Charging Controller files that remain on your system after a failed installation.

Step	Action
1	<p>As root remove any remaining CCC files by running the following command:</p> <p>Go to the /IN/bin directory.</p> <pre>./removeDatabase.sh ./removeApplication.sh</pre> <p>Remove the inventory.lock file from the /u01/app/oralInventory/locks directory.</p>

Post-Installation Tasks

Overview

Introduction

This chapter describes the post-installation tasks you must perform after installing Oracle Communications Convergent Charging Controller.

In this chapter

This chapter contains the following topics.

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About Post-Installation Tasks

Post Installation Initial Configuration Tasks

The post-installation configuration tasks set the initial configuration for each Convergent Charging Controller node. You should perform these tasks after completing the Convergent Charging Controller installation on all nodes.

See *Post-Installation Initial Configuration* (on page 80) for more information.

About CDR Storage Configuration Tasks

The call data records (CDRs) generated by the system will be stored in the database. On production deployments, you should configure table partitioning for the CCS_BE_CDR table to define the following:

- The number of files needed each week to store CDR data
- The number of weeks to hold CDR data before it is purged from the database
- The location for the CDR data files

For details on CDR table partitioning configuration, see *Setting Up CDR Storage* (on page 85).

Note: For more information on CDR and EDR records, and how they are generated, see *Event Detail Record Reference Guide*.

About SSL Configuration Tasks

Convergent Charging Controller supports secure network logins through Secure Socket Layer (SSL) connections from the Convergent Charging Controller UI to the database. You specify whether SSL connections to the database are enabled on your system by setting the `jnlp.sms.EncryptedSSLConnection` Java application property in JNLP files. At installation, this property is set to true, and SSL connections to the database are enabled by default. To disable SSL connections to the database, set `jnlp.sms.EncryptedSSLConnection` to false. See *Disabling SSL Connections to the SMS Database* (on page 80) for more information.

If you plan to use SSL connections to the database, you must perform a number of additional configuration tasks. See *Enabling SSL Connections to the Database* (on page 86) for more information.

Disabling SSL Connections to the SMS Database

Follow these steps to disable SSL connections to the database.

Step	Action
1	Open the <code>sms.jnlp</code> , <code>acs.jnlp</code> , <code>vpn.jnlp</code> , and <code>ccp.jnlp</code> files on the SMS node. The <code>sms.jnlp</code> , <code>acs.jnlp</code> , and <code>vpn.jnlp</code> files are located in the <code>/IN/html</code> directory. The <code>ccp.jnlp</code> file is located in the <code>/IN/html/ccp</code> directory.
2	Set the <code>jnlp.sms.EncryptedSSLConnection</code> property to false by adding the following entry: <pre><property name="jnlp.sms.EncryptedSSLConnection" value="false" /></pre>
3	Save and close the file.

To test without configuring secure login, turn off the security checking in the screen JNLP files.

For example, set the following in the `sms.jnlp` file:

```
<property name="jnlp.sms.EncryptedSSLConnection" value="false" />
```

Post-Installation Initial Configuration

About Initial Configuration Tasks

Perform the following initial configuration tasks after completing the Convergent Charging Controller installation on all nodes:

- Set up IP addresses and hostnames to servers. See *Setting IP Addresses and Hostnames* (on page 81).
- Update the tablespace storage allocation on each node in accordance with system implementation type. For example, a large production system will require greater storage allocation than a small production system. See *Update Oracle Tablespace Storage* (on page 82).
- Update Oracle SGA parameters on each node. See *Update Oracle SGA Parameters* (on page 82).
- Update the Oracle `cpu_count` parameter. See *Update Oracle cpu_count Parameter* (on page 82).
- Update the Oracle Database default profile password for life time. See *Update Oracle Database Default Profile Password Life Time* (on page 82).
- Set shared memory limits for the Convergent Charging Controller system. See *Setting Shared Memory Limits* (on page 83).
- Set the number of database connections. See *Setting the Number of Connections to the Database* (on page 83).
- If you want to use Internet Protocol version 6 (IPv6) addresses, update the `eserv.config` file with the configuration for CORBA services. See *About CORBA Services Configuration for IPv6* (on page 84).

Setting SSH StrictHostKeyChecking

Follow these steps on each node to set SSH `StrictHostKeyChecking` for the `smf_oper` user.

Step	Action
1	Log in to the SMS as the <code>smf_oper</code> user.
2	Using a text editor, create the <code>/IN/service_packages/SMS/.ssh/config</code> file.
3	Include these lines: <pre>Host * StrictHostKeyChecking no</pre>
4	Save the config file.
5	Repeat these steps for the SLC and VWS nodes, logging on as the <code>smf_oper</code> user each time.

Setting IP Addresses and Hostnames

Ensure that the `/etc/hosts` file on all nodes includes entries for all hosts and their aliases. Some host aliases are automatically defined when you install Convergent Charging Controller. Therefore, you should include at least the following predefined host entries in the `/etc/hosts` file.

- `sms_host sms usms usms.CdrPush`
- `be_host_1 be1`
- `scp_host scp uas1 acsStatsMaster uas.ccsSSMMaster`
- `be_host_2 be2`

where:

- `sms_host` is the IP address for the SMS node
- `be_host_1` is the IP address for the primary VWS node
- `scp_host` is the IP address for the SLC node
- `be_host_2` is the IP address for the secondary VWS node

Perform these steps on each node to set up IP addresses and hostnames for the servers.

Step	Action
1	Log in to the node.
2	Configure all network interfaces in the <code>/etc/hosts</code> file. Refer to your network plan for configuration values. See <i>Network Planning</i> (on page 6) for more information. Example <code>/etc/hosts</code> file <pre>localhost 127.0.0.1 localhost 192.68.44.136 be1 192.68.44.130 sms usms usms.CdrPush 192.68.44.133 scp uas1 acsStatsMaster uas.ccsSSMMaster 192.68.44.139 be2</pre>

Step	Action
3	<p>For platforms that are built on a zone server, modify the loop-back interface (lo0) and localhost entries to remove any association with the server hostname.</p> <p>For example, change the following entry from:</p> <pre>:::1 pte69-zone1 localhost 127.0.0.1 pte69-zone1 localhost loghost</pre> <p>to this:</p> <pre>:::1 localhost 127.0.0.1 localhost loghost</pre>
4	On the SMS node, restart the smsMaster process.

Update Oracle Tablespace Storage

On each node in turn, update the tablespace storage allocation on the database instance on the node, to suit your deployment. Add or resize data files as required. See your Oracle Database administrator for information on resizing your tablespaces.

Update Oracle SGA Parameters

On each node in turn, update the Oracle SGA parameters for the database instance on the node to suit your deployment.

Update Oracle `cpu_count` Parameter

`cpu_count` specifies the number of CPUs available for Oracle Database to use. This parameter greatly affects the size of **Startup Overhead In Shared Pool** and is therefore set to 4 in the default `init.ora` files installed by Convergent Charging Controller.

The `cpu_count` parameter may either be unset allowing Oracle Database to use all CPUs be tuned for a specific target system. Because this may increase the size of **Startup Overhead In Shared Pool**, the `shared_pool_size` parameter must be updated accordingly. The recommended initial value for `shared_pool_size` is **Startup Overhead In Shared Pool** + 256M.

The current size of the **Startup Overhead In Shared Pool** can be retrieved with the following SQL query:

```
select * from v$sgainfo where name = 'Startup overhead in Shared Pool';
```

See the chapter on configuring memory manually in *Oracle Database Administrator's Guide* for more information about specifying the shared pool size for your database.

Update Oracle Database Default Profile Password Life Time

An Oracle database user is created for each Convergent Charging Controller user based on the default user profile in the database. The default profile includes a password expiration duration of 180 DAYS for Oracle 19c databases.

When using Oracle 19c databases, set the default profile `PASSWORD_LIFE_TIME` parameter to **UNLIMITED** before creating Convergent Charging Controller users to avoid login errors due to expired passwords. If your security policy requires user password changes at regular intervals you must implement a procedure allowing users to change their passwords before expiration to prevent access failure. See *Oracle Database Security Guide* for the version of Oracle database you are using for a detailed description of how to use password management and protection.

Setting Shared Memory Limits

On Solaris, follow these steps on each node to set shared memory limits for the Convergent Charging Controller system.

Step	Action
1	Log in as the root user.
2	Add the <code>esg</code> project group and set the shared memory limits for it by running the following commands: <pre>projadd -G esg -c "esg group project" -K "project.max-shm-memory=(priv,4G,deny)" group.esg projmod -sK "project.max-sem-ids=(priv,2048,deny)" group.esg projmod -sK "process.max-sem-nsems=(priv,2048,deny)" group.esg projmod -sK "project.max-shm-ids=(priv,2048,deny)" group.esg</pre>

On Linux, follow these steps on each node to set shared memory limits for the Convergent Charging Controller system.

- 1 Determine the sum of process parameters for all database instances on the system, the overhead for Oracle background processes, the system and other application requirements.
- 2 Set `semms` (total semaphores system-wide) to the larger of the value in 1 or 32000.
- 3 Set `semmsl` (semaphores per set) to 250.
- 4 Set `semmsi` (total semaphore sets) to `semms/semmsl` rounded up to the nearest multiple of 1024.
- 5 For Linux and Oracle 19c, set the maximum number of asynchronous I/O requests allowed in `/etc/sysctl.conf` as follows:

```
fs.aio-max-nr = 3145728
```

After changing the `/etc/sysctl.conf`, run the following command as root to set the values in the system:

```
# /sbin/sysctl -p /etc/sysctl.conf
```

Setting the Number of Connections to the Database

Oracle database static parameters are defined in the `initSMF.ora` file located in the `$ORACLE_HOME/dbs` directory.

The `processes` parameter in the Static Parameters section of `initSMF.ora` defines the maximum number of connections allowed to the Oracle database. For a Convergent Charging Controller installation, set this parameter to 400 or a higher.

Example configuration in `initSMF.ora`

```
# Static Parameters
#####
....
processes = 400
...
```

Setting the `beServiceTrigger` User and Password

If you configured the `beServiceTrigger` as part of the `SMS postInstallUser.sh` script, then you can skip this section.

`beServiceTrigger` sends BPL requests to the Convergent Charging Controller Open Services Development (OSD) application for event processing. The `beServiceTrigger` user allows `beServiceTrigger` to access external systems, such as a client ASP that is accessed through OSD during event processing. `beServiceTrigger` retrieves the user credentials (username and password) from a secure credentials vault on the SMS node. The credentials vault is used for storing user names and passwords securely and for authorizing users. For more information about `beServiceTrigger`, see *Voucher and Wallet Server Technical Guide*.

If you want to use `beServiceTrigger` for sending real time wallet notifications to OSD, set the `beServiceTrigger` user credentials by using the `beServiceTriggerUser` utility. To enable `beServiceTrigger` to connect to the OSD interface on the SLC, set the user and password for `beServiceTrigger` and the OSD client ASP to be the same.

Follow these steps to set the `beServiceTrigger` username and password.

Step	Action
1	Log in to the SMS as <code>smf_oper</code> user.
2	Go to the following directory, where the <code>beServiceTriggerUser</code> utility is located: <code>/IN/service_packages/E2BE/bin</code>
3	Run the following command to set the username and password for <code>beServiceTrigger</code> : <code>beServiceTriggerUser -d/@SMF</code>
4	Restart the SLEE on the VWS by running the following command as <code>ebe_oper</code> user: <code>/IN/service_packages/SLEE/bin/slee-ctrl restart</code>

About CORBA Services Configuration for IPv6

The `/IN/service_packages/eserv.config` file on the SMS defines configuration for Convergent Charging Controller.

`/IN/service_packages/eserv.config`

If you are using IP version 6 addresses, you must include the `CorbaServices` section in the `eserv.config` file. If you are using only IP version 4 addresses, the procedure in this section is optional.

The `CorbaServices` section in the `eserv.config` configuration file on the SMS node defines common connection parameters for CORBA services. The `CorbaServices` configuration overrides the default and command-line values specified for CORBA listen ports and addresses. You configure the `CorbaServices` section of the `eserv.config` file on the SMS by using the following syntax:

```
CorbaServices = {
    AddressInIOR = "hostname"
    smsTaskAgentOrbListenPort = port
    smsReportDaemonOrbListenPort = port
    smsTrigDaemonOrbListenPort = port
    ccsBeOrbListenPort = port
    OrbListenAddresses = [
        "ip_address1",
        "ip_address2",
    ]
}
```

where:

- `hostname` is the hostname or IP address to place in the IOR (Interoperable Object Reference) for the CORBA service.
- `port` is the number of the port on which the CORBA service will listen.

- *ip_address1*, *ip_address2* list the IP addresses on which CORBA services listen for incoming requests. The list of IP addresses in the `OrbListenAddresses` parameter can include both IP version 6 and IP version 4 addresses.

If the `OrbListenAddresses` parameter is not set, or you do not specify any IP addresses, the CORBA service listens on all the IP addresses available on the host. Loopback IP addresses and special IP addresses, as defined in RFC 5156, are excluded.

For more information about configuring CORBA services, see *Convergent Charging Controller Service Management System Technical Guide*.

Example CORBA Services Configuration on the SMS

The following example shows the `CorbaServices` configuration section in the `eserv.config` file for CORBA services on the SMS node.

```
CorbaServices = {
    AddressInIOR = "sms_machine.oracle.com"
    OrbListenAddresses = [
        "2001:db8:0:1050:0005:ffff:ffff:326b"
        "192.0.2.0"
    ]
    smsTaskAgentOrbListenPort = 6332
    smsReportDaemonListenPort = 6333
    smsTrigDaemonOrbListenPort = 6334
    ccsBeOrbListenPort = 6335
}
```

Setting Up CDR Storage

About CDR Storage Configuration

If you installed Convergent Charging Controller in a production environment, configure CDR table (`CCS_BE_CDR`) partitioning to define how CDRs will be stored.

Note: We cannot partition CDR table if the SMS node is on remote database because partitioning requires DBA privilege.

Setting Up CDR Table Partitioning

Follow these steps to set up CDR table partitioning for CDR storage.

Step	Action
1	As the root user on the SMS node, edit the <code>/IN/service_packages/CCSPART/etc/ccspart.cfg</code> file.
2	Specify appropriate values for these parameters: <ul style="list-style-type: none"> • WEEKLY_DATAFILE_COUNT: Specify the number of 200 MB data files required per week to hold CDR data. Note: CDR data files may contain multiple CDR records, potentially of different types. • WEEKS_TO_KEEP_PARTITION: Specify the number of weeks CDR data should remain available on the SMS node before being purged from the database. • DATAFILE_PATH: Specify the location on the disk where CDR data files will be created.

Setting Up Voucher Storage

About Voucher Storage Configuration

If you installed Convergent Charging Controller in a production environment, configure voucher table (CCS_VOUCHER_REFERENCE) partitioning to define how vouchers will be stored.

Note: You cannot partition voucher table if the SMS node is on remote database because partitioning requires DBA privilege.

Setting Up Voucher Table Partitioning

Follow these steps to set up voucher table partitioning for voucher storage.

Step	Action
1	As the root user on the SMS node, edit the <code>/IN/service_packages/CCSVCHRPART/etc/ccs_voucher_reference_part.cfg</code> file.
2	Specify appropriate values for these parameters: <ul style="list-style-type: none"> • WEEKLY_DATAFILE_COUNT: Specify the number of 200 MB data files required per week to hold voucher data. Note: Voucher data files may contain multiple voucher records, potentially of different types. • WEEKS_TO_KEEP_PARTITION: Specify the number of weeks voucher data should remain available on the SMS node before being purged from the database. • DATAFILE_PATH: Specify the location on the disk where voucher data files will be created.

Enabling SSL Connections to the Database

About SSL Connections to the Database

Convergent Charging Controller supports secure network logins through Secure Socket Layer (SSL) connections from the Convergent Charging Controller UI to the database.

To configure SSL connections to the database, perform the following steps on the SMS node:

Step	Action
1	Create the Oracle wallet that identifies the database server. See <i>About Creating the Oracle Wallet</i> .
2	Update the <code>listener.ora</code> file to define the location of the Oracle wallet and the listen port for SSL connections to the database. See <i>Updating the listener.ora file</i> (on page 89).
3	Update the <code>sqlnet.ora</code> file to define the location of the Oracle wallet. See <i>Updating the sqlnet.ora file</i> (on page 91).
4	The Convergent Charging Controller installation automatically sets the Java application properties to enable SSL connections to the database. Check the configuration in your JNLP files to ensure that configuration has been set correctly. See <i>About Java Applet Configuration</i> (on page 95).
5	Clear the temporary Internet files from the Java cache.

Setting Up the Oracle Wallet to Use Self-Signed Certificates

Follow these steps to set up the Oracle server wallet to use self-signed certificates by using `setupOracleWallet.sh`.

Step	Action
1	Log in to the SMS as oracle user.
2	Run the following command: <code>/IN/service_packages/SMS/bin/setupOracleWallet.sh</code>
3	Answer <code>y</code> to the following prompt: Do you wish to proceed with the configuration (y/n):
4	When requested, enter the following information: <ul style="list-style-type: none"> • The base directory for the Oracle wallet • The two-letter international country (ISO) code for your country • The wallet password to use for the root CA wallet and the server wallet. You will be prompted for the password each time the wallet is accessed. <p>Note: Wallet passwords have length and content validity checks applied to them. Generally, passwords should have a minimum length of eight characters and contain alphabetic characters combined with numbers and special characters.</p>
5	Answer <code>y</code> to the following prompt: Would you like to use a self-signed root certificate to sign the SMS server certificate? When processing completes, the self-signed root certificate is exported to the following file: <code>./root/b64certificate.txt</code> <code>./root</code> is a sub-directory of the base directory for the Oracle wallet. You must import this certificate into the Java <code>lib\security\cacerts</code> file on each client PC.

Adding Trusted Certificates to the Keystore on Client PCs

If you are using self-signed certificates, update the keystore on client PCs to trust certificates from the SMS server that have been signed by the root CA.

Note: Certificates signed by a commercial CA are already trusted by definition, therefore update the keystore on client PCs only if you are using self-signed certificates.

Follow these steps to add a trusted certificate for the SMS server to the Java keystore on a client PC.

Step	Action
1	Copy the root CA certificate <code>./root/b64certificate.txt</code> to the client PC.
2	As an Administrator user on the client PC, open the command tool window and run the following command: <code>keytool -importcert -keystore "\cacerts_path\java\lib\security\cacerts" -alias SMS -file "\path\.\b64certificate.txt"</code> where <code>cacerts_path</code> is the path to the <code>java\lib\security\cacerts</code> file and <code>path</code> is the location of the certificate file on the client PC.

Step	Action
3	When prompted, enter the password for the keystore. Note: The Java installation sets the keystore password to <code>changeit</code> by default.
4	Answer yes to the following prompt: <code>Trust this certificate? [no]:</code> Oracle keytool updates the keystore on the client PC to trust certificates from the SMS server that have been signed with the root CA.

Setting Up the Oracle Wallet to Use CA-Signed Certificates

Note: This procedure assumes that the commercial CA's own root certificate is available in the following file:

`./root/b64certificate.txt`

`./root` is a sub-directory of the base directory for the Oracle wallet.

Follow these steps to set up the Oracle server wallet to use certificates signed by a commercial CA by using `setupOracleWallet.sh`.

Step	Action
1	Log in to SMS as the oracle user.
2	Run the following command: <code>./IN/service_packages/SMS/bin/setupOracleWallet.sh</code>
3	Answer <code>y</code> to the following prompt: <code>Do you wish to proceed with the configuration (y/n):</code>
4	When requested, enter the following information: <ul style="list-style-type: none"> • The base directory for the Oracle wallet • The two-letter international country (ISO) code for your country • The password to use for the server wallet. You will be prompted for the password each time the wallet is accessed. <p>Note: Wallet passwords have length and content validity checks applied to them. Generally, passwords should have a minimum length of eight characters and contain alphabetic characters combined with numbers and special characters.</p>
5	Answer <code>n</code> to the following prompt: <code>Would you like to use a self-signed root certificate to sign the SMS server certificate?</code> The script creates the server auto login wallet and exports the certificate-signing request to the following file: <code>./server/creq.txt</code> <code>./server</code> is a sub-directory of the base directory for the Oracle wallet.
6	Send the certificate-signing request to the commercial CA for signing.
7	When the commercial CA returns the signed certificate, place the signed certificate in the following file: <code>./server/cert.txt</code>

Step	Action
8	Place the root certificate from the commercial CA in the following file: <code>./root/b64certificate.txt</code>
9	Log in as the oracle user on the SMS and run the following command: <pre>/IN/service_packages/SMS/bin/setupOracleWallet.sh -s ./server/cert.txt -t ./root/b64certificate.txt -w wallet_base_directory</pre> <ul style="list-style-type: none"> • <code>./server/cert.txt</code> specifies the location of the signed server certificate • <code>./root/b64certificate.txt</code> specifies the location of the root certificate from the commercial CA • <code>wallet_base_directory</code> specifies the Oracle wallet base directory <p>The <code>setupOracleWallet.sh</code> script completes by adding the trusted CA certificate and the CA-signed certificate to the server wallet.</p>

Updating the listener.ora file

Follow these steps to configure the Oracle listener.

Step	Action
1	Log in to SMS as the <code>oracle</code> user, or run the following command from a root login to become the user <code>oracle</code> : <code>su - oracle</code> <p>Note: Logging in as the <code>oracle</code> user ensures that the path to all of the Oracle binaries is correct and that file ownership for Oracle files is preserved.</p>
2	Go to the directory containing the <code>listener.ora</code> file. The location of the <code>listener.ora</code> file depends on the version of Oracle Database installed and the options selected at installation. It is located in one of the following directories by default: <code>ORACLE_HOME/network/admin</code> <code>/var/opt/oracle/</code> where <code>ORACLE_HOME</code> is the directory in which your Oracle Database is installed.
3	Edit the <code>listener.ora</code> file by using a text editor such as <code>vi</code> ; for example: <code>vi listener.ora</code>

Step	Action
4	Add a new description to the listener description list that specifies the protocol and port to use for secure SSL connections to the database. You must set <code>PROTOCOL</code> to <code>TCPS</code> and <code>PORT</code> to 2484 for secure SSL connections.

Use the following syntax:

```
LISTENER=
  (DESCRIPTION_LIST =
    (DESCRIPTION= (ADDRESS_LIST=
      (ADDRESS=
        (PROTOCOL=TCPS)
        (HOST=hostname)
        (PORT=2484)
      )))
  )
```

where `hostname` is the hostname of the SMS node.

Note: The standard Oracle listener TCP port is 1521. However, SSL connections use the standard port for the TCPS protocol, port 2484, instead. The TCPS protocol entry in the `listener.ora` file must appear *after* the TCP protocol entry.

Note: If there is a firewall between screen clients and the SMS, you must open port 2484 in the firewall.

Example:

The following example shows `DESCRIPTION_LIST` configuration for an SMS node called "hostSMP":

```
LISTENER=
  (DESCRIPTION_LIST =
    (DESCRIPTION= (ADDRESS_LIST=
      (ADDRESS=
        (PROTOCOL=IPC)
        (KEY=SMF)
      )))
    (DESCRIPTION= (ADDRESS_LIST=
      (ADDRESS=
        (PROTOCOL=TCP)
        (HOST=hostSMP)
        (PORT=1521)
      )))
    (DESCRIPTION= (ADDRESS_LIST=
      (ADDRESS=
        (PROTOCOL=TCPS)
        (HOST=hostSMP)
        (PORT=2484)
      )))
  )
```

Note: For the SMF database, `ORACLE_SID` has been set to `SMF`. The listener can be made aware of this by adding an `ADDRESS` entry to `ADDRESS_LIST`.

Step	Action
5	<p>Add a new <code>WALLET_LOCATION</code> entry that specifies the directory that contains the server wallet that was created by <code>setupOracleWallet.sh</code>.</p> <p>Use the following syntax:</p> <pre data-bbox="386 405 1123 531"> WALLET_LOCATION = (SOURCE = (METHOD = FILE) (METHOD_DATA = (DIRECTORY = <i>directory_name</i>))) </pre> <p>where <i>directory_name</i> is the Oracle server directory.</p> <p>Example</p> <p>The following example shows a <code>WALLET_LOCATION</code> configuration for the Oracle server wallet created in the directory named <code>/u01/app/wallets/oracle/server</code></p> <pre data-bbox="386 741 1339 867"> WALLET_LOCATION = (SOURCE = (METHOD = FILE) (METHOD_DATA = (DIRECTORY = /u01/app/wallets/oracle/server))) </pre>
6	<p>Add the following entries:</p> <pre data-bbox="386 961 1068 1014"> SSL_CLIENT_AUTHENTICATION=FALSE SSL_CIPHER_SUITES=(TLS_RSA_WITH_AES_128_CBC_SHA) </pre> <p>Notes: You must also:</p> <ul data-bbox="378 1108 1417 1255" style="list-style-type: none"> • Configure the same entries for <code>WALLET_LOCATION</code>, <code>SSL_CLIENT_AUTHENTICATION</code>, and <code>SSL_CIPHER_SUITES</code> in the <code>sqlnet.ora</code> file. • Set the <code>jnlp.sms.sslCipherSuites</code> Java application property in your JNLP files and the <code>SSL_CIPHER_SUITES</code> parameter to the same value.
7	<p>Save and close the file.</p>
8	<p>Stop and restart the listener using the updated configuration by running the following commands:</p> <pre data-bbox="378 1392 586 1446"> lsnrctl stop lsnrctl start </pre>

Updating the `sqlnet.ora` file

Follow these steps to configure the Oracle `sqlnet.ora` file for SSL connections to the database.

Note: You must configure new entries for `WALLET_LOCATION`, `SSL_CLIENT_AUTHENTICATION`, and `SSL_CIPHER_SUITES` in the `sqlnet.ora` file that are the same as those configured in the `listener.ora` file.

Step	Action
1	<p>Log in to the SMS as the <code>oracle</code> user, or run the following command from a root login to become the <code>oracle</code> user:</p> <pre>su - oracle</pre> <p>Note: Logging in as the <code>oracle</code> user ensures that the path to all Oracle binaries is correct and that file ownership for Oracle files is preserved.</p>
2	<p>Go to the directory containing the <code>sqlnet.ora</code> file. The location of the <code>sqlnet.ora</code> file depends on the version of Oracle database installed and the options selected at installation. It is located in one of the following directories by default:</p> <pre>ORACLE_HOME/network/admin</pre> <pre>/var/opt/oracle/</pre> <p>where <code>ORACLE_HOME</code> is the directory in which the Oracle database is installed.</p>
3	<p>Edit the <code>sqlnet.ora</code> file by using a text editor such as <code>vi</code>; for example:</p> <pre>vi sqlnet.ora</pre>
4	<p>Add a new <code>WALLET_LOCATION</code> entry that specifies the directory of the server wallet that was created by <code>setupOracleWallet.sh</code>.</p> <p>Use the following syntax:</p> <pre>WALLET_LOCATION = (SOURCE = (METHOD = FILE) (METHOD_DATA = (DIRECTORY = <i>directory_name</i>)))</pre> <p>where <code>directory_name</code> is the Oracle server directory.</p> <p>Example</p> <p>The following example shows a <code>WALLET_LOCATION</code> configuration for the Oracle server wallet created in the directory named <code>/u01/app/wallets/oracle/server</code></p> <pre>WALLET_LOCATION = (SOURCE = (METHOD = FILE) (METHOD_DATA = (DIRECTORY = /u01/app/wallets/oracle/server)))</pre>
5	<p>Add the following new entries:</p> <pre>SSL_CLIENT_AUTHENTICATION=FALSE</pre> <pre>SSL_CIPHER_SUITES=(TLS_RSA_WITH_AES_128_CBC_SHA)</pre>
6	<p>Save and close the file.</p>

Updating the `eserv.config` File

The default `/IN/service_packages/eserv.config` file on the VWS contains placeholder variables that need to be changed to actual values before the application can startup.

Parameter	Usage
<code>#{OUI_BE_SERVER_ID}</code>	<p>The VWS billing engine domain number this node belongs to.</p> <p>Note: Creating a domain is a manual activity following the CCC installation.</p>

Parameter	Usage
<code>#{OUI_SLC_HOST}</code>	The SLC hostname of the node running OSD services. This enables notifications to be generated from the VWS to be sent by the SLC to the external network.

Note: All affected parameters can be auto populated by the `/IN/bin/postInstallUser.sh` script on the VWS. If you select to use this procedure, then you are required to have

- A fully installed SMS node.
- Each VWS node is already defined in the replication configuration on the SMS.
- The VWS billing engine domain is defined in the CCS configuration on the SMS.

Configure SEI in the SLC Node

(Optional) Configure SEI in the SLC node. See the discussion about SEI configuration in *SMS Email Interface Technical Guide*.

Configuring Replication and Table Nodes

One way to configure replication is through the SMS screens.

To configure replication nodes and tables, see the discussion about replication nodes in *Service Management System User Guide*.

Note: Replicate the `smf_normalization`, `smf_denormalization`, and `smf_seed` tables on the SLC and VWS nodes for the slee processes to load Credential Vault data.

The CCC installer also provides a command line utility script to create a replication node on a fully operational SMS node. This avoids using the SMS screens. Run the script as the `CCC_runtime_user`:

```
/IN/bin/addReplicationNode.sh -n <node_number> -h <host_name> [-p <primary ip address>] [-s <secondary ip address>] [-d <description>]
```

<code>-n <node_number></code>	Mandatory	Unique replication node id of the slave. Must be between 301 and 399. 301 - 349 defines SLC node. 350 - 399 defines VWS node.
<code>-h <host_name></code>	Mandatory	Unqualified hostname of the replication slave.
<code>-p <primary ip address></code>	Optional	Either IP address or hostname of the slave node. If not supplied, will use the <code>-h</code> parameter.
<code>-s <secondary ip address></code>	Optional	Secondary IP address or hostname of slave node. No default value. This can be null.
<code>-d <description></code>	Optional	Node description.

Note:

- The script does not validate either the hostname or ip address.
- When configuring SLC nodes an attempt to initiate a full replication resync will occur. The resync will fail if the SLC node is not installed or the `updateLoader` is not running on the SLC. The configuration will persist and a resync can be attempted at a later date by the user.
- If you require spaces in the description then use quotes round the entire string.

A replication node can be removed using a further utility script. Run the script as the `CCC_runtime_user`.

```
/IN/bin/removeReplicationNode.sh -n <node_number>
```

`-n <node_number>` mandatory. Node number.

Creating an ACS Customer

To create an ACS customer, see the discussion about creating an ACS customer in *Advanced Control Services User Guide*.

Creating a Domain

One way to configure the domain is through the SMS screens.

To create a domain, see the discussion about domain in *Charging Control Services User Guide*. After creating a new domain, restart the SMS screen and create `replication.config` file. To create `replication.config` file, see the discussion about Table Replication in *Charging and Control Service Management System User's Guide*.

The CCC installer also provides a command line utility script to create a domain on a fully operational SMS node. This avoids using the SMS screens. Run the script as the `CCC_runtime_user`:

```
/IN/bin/addUbeDomain.sh -n <name> -m <max_accounts> [-c] [-v] [-t] [-a]
```

`-n <name>` mandatory. Domain name.
`-m <max_accounts>` mandatory. Maximum number of accounts allowed.
`-c` optional. Defines a charging domain.
`-v` optional. Defines a voucher domain.
`-t` optional. Defines a tracking domain.
`-a` optional. Sets all the `-c -v -t` parameters.

Note: The domain is not fully created at this point.

Each VWS node configured is required to be assigned to the billing domain. Run the script as the `CCC_runtime_user`:

```
/IN/bin/addUbeDomainNode.sh -d <domain_name> -m <node_name> -n <node_number>
[-a <address>] [-r <remote_db>] [-s <oracle_sid>] [-c <client_port>] [-i
<internal_port>]
```

`-d <domain_name>` mandatory. Domain name.
`-m <node_name>` mandatory. Node name.
`-n <node_number>` mandatory. The replication node id. Must be between 350 and 399.
`-a <address>` optional. The hostname or ip address of the node, derived from the node number if not supplied.
`-r <remote_db>` optional. Hostname of the remote database, only supply if database node is not on target node.
`-s <oracle_sid>` optional. Oracle SID on remote database, default E2BE.
`-c <client_port>` optional. Client port, default 1500.
`-i <internal_port>` optional. Internal port, default 1600.

Note: The domain is not fully created at the point.

To finalize the domain configuration and establish replication to each node in the domain, run the script as the CCC_runtime_user:

```
IN/bin/addUbeDomainReplication.sh -d <domain_name> -p <primary_node_id> [-s <secondary_node_id>]
```

-d <domain_name> mandatory. Domain name.
 -p <primary_node_id> mandatory. Primary node replication id.
 -s <secondary_node_id> optional. Secondary node replication id.

Note: The script will attempt to initiate a full replication resync. The resync will fail if the VWS node is not installed or the updateLoader is not running. The configuration will persist and a resync can be attempted at a later date by the user.

Changes by the addUbeDomainReplication.sh script can be undone. Run the script as the CCC_runtime_user:

```
/IN/bin/removeUbeDomainReplication.sh -d <domain_name>
```

<domain_name> mandatory. Domain name.

Creating a MFILE

To create the MFILE, see the discussion about MFILE generation in *Charging Control Services User Guide*.

About Java Applet Configuration

To enable secure SSL connections to the database, the following Java application configuration must be set in the **acs.jnlp**, **ccp.jnlp**, **sms.jnlp**, and **vpn.jnlp** files.

Follow these steps to configure the Java applet parameters for the secure SSL connections to the database if they have not been configured by the installation.

Step	Action
1	Log in as the root user.
2	Edit the acs.jnlp , ccp.jnlp , sms.jnlp , and vpn.jnlp files by using a text editor such as vi; for example: <pre>vi /IN/html/sms.jnlp</pre> The acs.jnlp , sms.jnlp , and vpn.jnlp files are located in the /IN/html/ directory. The ccp.jnlp file is located in the /IN/html/ccp directory.
3	Configure the <code>secureConnectionDatabaseHost</code> Java property value in the resources section of the .jnlp file. Set PROTOCOL to TCPS and set PORT to 2484 . The property values must be all on one line in the .jnlp file: <pre><property name="jnlp.sms.secureConnectionDatabaseHost" value="(DESCRIPTION= (ADDRESS_LIST= (ADDRESS=(PROTOCOL=TCPS) (HOST=host_ip_addr) (PORT=2484))) (CONNECT_DATA= (SERVICE_NAME=db_sid)))" /></pre>

where:

- `host_ip_addr` is the host name or IP address of the SMS node
- `db_sid` is the database SID

Step	Action
4	Set the <code>EncryptedSSLConnection</code> property in the resources section of the <code>.jnlp</code> file to <i>true</i> : <code><property name="jnlp.sms.EncryptedSSLConnection" value="true" /></code>
5	Set the <code>sslCipherSuites</code> property in the resources section of the <code>.jnlp</code> file to <code>TLS_RSA_WITH_AES_128_CBC_SHA</code> : <code><property name = "jnlp.sms.sslCipherSuites" value="(TLS_RSA_WITH_AES_128_CBC_SHA)" /></code>
6	Save and close the file.

Verifying the Convergent Charging Controller Installation

Overview

Introduction

This chapter explains how to verify that the Oracle Communications Convergent Charging Controller applications work correctly following the installation.

In this chapter

This chapter contains the following topics.

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About Verifying the Installation

Introduction

Verify the Convergent Charging Controller installation to ensure the system works correctly after installation. This chapter describes how to set up Convergent Charging Controller and the tests that you should run to verify the installation. These tests cover the basic features of the installation.

Prerequisites

Before you start verifying the installation, you must ensure that all:

- Nodes are running
- Post-installation tasks are completed

Note: If you have the Application Management Pack for Communications available in your Oracle Enterprise Manager installation, the availability test will be automatically reported after discovery of the nodes. Otherwise the following manual steps can be performed:

On the SMS Node

Check that the SMS processes are running by running the following commands:

```
ps -ef | grep smsNamingServer
ps -ef | grep smsTaskAgent
ps -ef | grep smsMaster
ps -ef | grep ccsBeOrb
```

Check the Oracle listener is running by running the following command:

```
lsnrctl status
```

To verify the SLC and VWS nodes on SMS:

Step	Action
1	Log into SMS as the root user.
2	Click the Operators tab and select Node Management .
3	In the All Nodes screen, enter the node details in the Node Name field. The node name can be either SLC or VWS.
4	In the Replication Nodes screen, enter the node number in the Node Number field.
5	Click Find . The Find Replication Node dialogue box appears.
6	Click Search . Result: The available nodes details are displayed.

On the SLC Node

Check that the SLC processes are running by running the following commands:

```
ps -ef | grep slee_acs
ps -ef | grep replicationIF
ps -ef | grep diameterBeClient
ps -ef | grep BeClient
```

On VWS Node

Check that the SLC processes are running by running the following commands:

```
ps -ef | grep beServer
ps -ef | grep beVWARS
ps -ef | grep beSync
ps -ef | grep beGrovellier
```

About Collecting Diagnostic Data with RDA HCVE

Overview

Remote Diagnostic Agent (RDA) is an Oracle standard tool that you use to collect diagnostic data about your Convergent Charging Controller system. When you submit a service request (SR) to Oracle Technical Support, you must also provide an RDA output file. The RDA output file provides a comprehensive view of your system configuration and contains diagnostic data used by Oracle Technical Support to diagnose problems. This minimizes the number of requests from Oracle Technical Support for additional information, which can reduce the service request resolution time.

RDA includes a Health Check Validation Engine (HCVE) module that checks your Convergent Charging Controller installation for known issues and common practices that impact performance, availability, and functionality. When you run HCVE, it generates a detailed report in both HTML and text formats that detail possible issues it has found on your system. You can then use the report for preventive maintenance to avoid any service disruption.

HCVE Validations on Convergent Charging Controller Systems

RDA HCVE performs a variety of checks of your Convergent Charging Controller system, such as ensuring that:

- Sufficient memory and disk space is available.

- The appropriate packages and scripts are installed and are configured correctly.
- The appropriate flags and parameters are set.
- acsDbCleanup.sh is configured correctly.
- The log files are set up correctly.
- The Convergent Charging Controller system is configured to startup and shutdown the Oracle database appropriately.
- The appropriate permissions for running scripts are set correctly.

Convergent Charging Controller OUI Installer Screens

Overview

This appendix describes the information you need to provide for each screen when you install Oracle Communications Convergent Charging Controller in interactive mode. You can also access the information by clicking Help during installation.

Note: This document does not substitute for Convergent Charging Controller installation instructions. You should read all chapters in Convergent Charging Controller Installation Guide in preparation for installing Convergent Charging Controller, including "*Convergent Charging Controller System Requirements* (on page 9)" for information you need to collect in preparation for installation, and "*Installing Convergent Charging Controller* (on page 61)" for installation procedures.

Convergent Charging Controller OUI Installer Screens

Installation Inventory

Specify the name and location of the directory where all Oracle installations are done.

Field	Description
Inventory Directory	Enter the name and the full path to the directory where all Oracle installations are done.
Operating System Group	Select the primary Oracle inventory group.

Installation Location

Specify the name and location of the directory in which to install Convergent Charging Controller.

Field	Description
Name	Enter the name and the full path to the /IN directory in which to install Convergent Charging Controller.

Installation Type

Select the installation type.

Field	Description
SMS	Installs the Convergent Charging Controller Service Management System (SMS) application and the SMS database. You use the SMS GUI to configure and manage Convergent Charging Controller.

Field	Description
SLC	Installs the Convergent Charging Controller Service Logic Controller (SLC) application and the SLC database. You use SLC to provide the logic to manage the calls, sessions, messages in Convergent Charging Controller. Note: Ensure that SMS is installed before installing SLC.
SLC With Test Tools	Installs the Convergent Charging Controller Service Logic Controller (SLC) application, the SLC database, and the SLC test tools. Note: Ensure that SMS is installed before installing SLC With Test Tools.
VWS	Installs the Convergent Charging Controller Voucher and Wallet Server (VWS) application and VWS database. The Voucher and Wallet Server manages charging, vouchers, balances, and subscribers. Note: Ensure that SMS is installed before installing VWS.

Oracle User

Enter the Oracle database user details.

Field	Description
Oracle DB owner	Retain the default, oracle , which is the user name with permissions to create the Oracle database instance.
Oracle DB group	The OS group which owns the Oracle database. For example 'dba'.

Application User

Enter the CCC runtime user details.

Field	Description
Application owner	The CCC_runtime_user i.e. the OS user that will run the application.
Application group	The CCC OS group. Fixed to 'esg'.

Database Paths

Select one from the provided options.

Option	Description
The database, schema and application will all be installed	Select this option to install all items on the same node.
The database already exists and both the schema and application will be installed	Select this option if you have already created the database including datafiles on this or a remote node but not the database schema or application.
The database and schema already exists and only the application will be installed	Select this option if the database and schema already exists on this or a remote node and you want to only install the application.

Database Datafiles

Database Server Paths

Specify the location of the base directory and the Oracle home directory.

Field	Description
Base directory	Enter the name and the full path to the oracle base directory in which the database creation scripts are installed. The oracle base directory is the directory in which the Oracle database is installed.
Oracle home	Enter name and the full path to the Oracle Database home directory in which Oracle 19c database is installed.

Datafile and Redolog Paths

Specify the location of the datafile and redo log directories.

Field	Description
Datafile directory	Enter the full path to the directory where the oracle datafiles are stored.
Redo log directory	Enter the full path to the directory to store the database redo log files.

Existing Database

Database User Password

Enter the previously existing Oracle database password administrative account.

Field	Description
Oracle SID	Enter the Oracle SID.
Database hostname	Enter the hostname where the database is located.
Database user (smf, scp or e2be)	Enter the database user name.
Oracle database password	Enter the password for the Oracle database administrative accounts.
Database Port	Enter the port that is required to connect to the database host.
Service database hostname	Enter the fully qualified service DB hostname.

SMS GUI

Enter the information for SMS GUI.

Field	Description
Screen superuser password	Enter the password for the SMS GUI administrator user account. Note: The password must match with the Oracle password defined for the Oracle database installed on the SMS node.
Confirm password	Enter the password again for confirmation.
Timezone	Enter the time zone in which the date and time are displayed in the SMS GUI.

PI Admin

Enter the information for Provisioning Interface (PI) configuration.

Field	Description
PI admin password	Enter the password for PI administrator user account.
Confirm password	Enter the password again for confirmation.

SMS EDR Paths

Enter the path to the directories in which the SMS event data record (EDR) files are stored.

Field	Description
CDR Loader Input directory	Retain the default path to the directory of a single file system to store CDR input files.
CDR Loader Output directory	Retain the default path to the directory of a single file system to store CDR output files.

Default Template

Select the option to install default template.

Field	Description
Install PCST	Check the box to install Prepaid Charging Service Template (PCST).

Default Currency

Enter the details of default system currency.

Field	Description
System Currency	Select the currency name from the Name drop down box. Note: Only valid currency names are available from the list.
Base Value	Enter the ratio of subunits to main units of currency in the Base field. Example: 100 cents per euro = a ratio of 100.
Big Symbol	Enter the symbol that represents the main unit of the currency in the Big Symbol field (for example, € for euros).
Little Symbol	Enter the symbol that represents the subunit of the currency in the Little Symbol field (for example, c for cents).
Separator	Enter the separator used to separate the main unit from the subunit of the currency in the Separator field. Example: In the currency of: Euros - the separator is a comma (for example, 3,20) Dollars - the separator is a decimal point (for example, \$4.00)

Replication

Enter the information of the SMS host from which the current node is replicated.

Field	Description
SMS Host name	Enter the qualified hostname for the SMS server used to configure the clients that will connect to the SMS server.

VWS Config

Enter the information Voucher and Wallet Server (VWS) configuration.

Field	Description
SMS EDR Input directory	Enter the name and the full path to the directory in which the SMS event data record (EDR) input files are stored.
Primary VWS node	Select to install the primary node of a VWS pair.

Maintaining a Remote Database

If the SMS node is on a remote database, the following scripts (which require DBA privileges) should be run on the database node, or equivalent schema management for partitioning needs to be implemented:

- smsAddArchiveLog.sh
- hotbackup.sh
- archbackup.sh
- oraLockMonitor.sh
- fragmentation_install_oui.sh
- CCSPART_uninstall.sh
- CCSPART_create_schema.sh
- CCSPART_maintenance.sh
- CCSPART_statistics.sh
- CCSPART_capacity_monitor.sh
- CCSCPART_check_oracle.sh
- CCSCPART_statistics.sh
- CCSCPART_add_week.sh
- CCSCPART_capacity_monitor.sh
- CCSCPART_restart_job_processes.sh
- CCSCPART_install.sh
- CCSCPART_rman_exclude.sh
- CCSCPART_maintenance.sh
- CCSCPART_uninstall.sh
- CCSCPART_drop_week.sh
- CCSCPART_list_partitions.sh
- CCSVCHRPART_uninstall.sh
- CCSVCHRPART_statistics.sh
- CCSVCHRPART_capacity_monitor.sh
- CCSVCHRPART_maintenance.sh
- CCSVCHRPART_create_schema.sh