



Avaya Call Management System Overview and Specification

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Chapter 1: Introduction

Purpose

This document describes tested product characteristics and capabilities including product overview and feature descriptions, interoperability, performance specifications, security, and licensing requirements.

Anyone who wants to gain a high-level understanding of the product features, functions, capacities, and limitations within the context of solutions and verified reference configurations will find the document useful.

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Chapter 2: Overview

An overview of CMS

Avaya Call Management System (CMS) is a software product for businesses and organizations that receive a large volume of contacts processed through the Automatic Call Distribution (ACD) systems. Avaya Call Management System supports the following ACDs:

- Avaya Aura[®] Communication Manager
- Avaya Contact Center – Extended Capacity Routing Core

CMS collects call traffic data, formats management reports, and supports an administrative interface to the supported ACDs.

CMS runs on the Red Hat Enterprise Linux[®] (RHEL) operating system and uses several operating system utilities to communicate with terminals and printers, log errors, and run processes. In addition, CMS utilizes the INFORMIX database management system, which provides an interface to the CMS historical database.

CMS stores ACD data in a real-time and historical database. Real-time databases include tables for the current and previous intra-hour interval data. The storage interval can be 15, 30, or 60 minutes. Historical databases include intrahour, daily, weekly, and monthly data tables. The historical database can store 370 days of intrahour historical data, five years or 1825 days of daily historical data, and ten years or 520 weeks of weekly and 120 months of monthly historical data.

CMS provides the following two options for contact center data resiliency:

- High Availability CMS: For data redundancy with two systems operating in tandem.
- Survivable CMS: For business continuity in multi-location contact centers and continued operation at the controlling site during a disaster.

This flexible and scalable software is ideal for small single-location contact centers, large multi-location applications, or contact centers of similar sizes. For example, you can use CMS to analyze the performance of a single agent, a specific skill, or multiple agents or agent skills on up to eight ACD systems.

CMS includes the Avaya CMS Supervisor (CMS Supervisor) feature to monitor contact center performance and activity from a PC within your contact center, at home, or on the road. Managers can use CMS Supervisor to monitor any area of contact center performance in real-time, such as the number of abandoned calls, average hold time, and number of calls in a queue. CMS also includes the CMS Supervisor Web feature to monitor contact center performance and activity with a web browser. In addition, the CMS Supervisor PC Client and Web Client support interfaces in several languages.

New in this release

Web Client Report Designer

Report Designer is the report editing tool of CMS Supervisor Web, in which you can design your reports.

RHEL8 Support

CMS Release 20.0 supports RHEL8.

RHEL8 doesn't support numeric user names

CMS in Release 20.0, RHEL8 no longer supports using numeric user names.

Audit Logging of Administrative Actions

All the CMS Web client now logs all administrative actions to a new log file.

Enterprise login

CMS Release 20.0 supports OKTA login and Microsoft Azure authenticated login.

Support for 1999 Web Client supervisors on a single server

CMS Release 20.0 supports 1999 web client supervisors on a single server.

Cloud Support

Avaya supports the deployment of CMS ova on GCP in addition to AWS and also supports Azure as part of the Avaya Enterprise Cloud offering.

Antivirus and Malware scanning support

The following Antivirus products are now supported on CMS:

- Microsoft Defender
- McAfee/Trellix

Configurable Web Client Timeout

CMS logs out the user if the web client is minimized for longer than a configurable period.

VMware 7.0 and 8.0 support - drop support for VMware 6.7 and older

CMS Release 20.0 supports VMware Releases 7.0. and later or VMware Releases 8.0.

CMS Release 20.0 does not support VMware Releases 6.5, or 6.7. If you want to upgrade to CMS Release 20.0 and your current system is on VMware 6.5, or 6.7, you must do a platform upgrade to a VMware system that has Release 7.0. or 8.0.

Important:

Avaya only supports VMware vSphere 6.5 and 6.7 and VMware vCenter 6.5 and 6.7 through permissive use agreements.

For more information about VMware support for new deployments and upgrades, see the following documents:

- Deploying Avaya Call Management System
- Planning for Avaya Call Management System Upgrades

- Upgrading Avaya Call Management System

Data Backup Product Support

CMS Supervisor Web supports a newer version of the following data backup products:

- IBM Spectrum 8.1.15 client release
- Netbackup 10.1

Database items expanded

Avaya expanded the length of many database fields to enhance the supported capacities of the Routing Core of the Avaya Contact Center – Extended Capacity program. For more information about database items, see *Avaya Call Management System Database Items and Calculations*.

Full upgrade required for releases older than Release 20.0

CMS Release 20.0 requires a full software or platform upgrade for all upgrades from CMS releases older than Release 20.0 due to the operating system update made in CMS 20.0. This limitation also applies to CMS R20 CI(RHEL7) upgrades that were part of the Avaya Contact Center – Extended Capacity offering.

ODBC logging

CMS release 20.0 provides a new log which captures snapshots of running ODBC/JDBC sessions.

CMS feature summary

This section provides a high-level description of several CMS features.

Related links

- [ACD administration](#) on page 11
- [Reporting](#) on page 12
- [Automatic Call Distribution integration](#) on page 12
- [About the CMS Tenancy feature](#) on page 13
- [LDAP integration](#) on page 14
- [Data backup](#) on page 15
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- [Enterprise Login](#) on page 17

ACD administration

CMS provides an administrative interface to the Automatic Call Distribution (ACD) system. Using CMS Supervisor, you can view or change parameters related to ACD, call vectoring, and Expert

Agent Selection (EAS) on ACD systems. An administrator can also run reports that analyze the operation of your call center.

For example, an administrator can:

- Add or remove agents from splits or skills.
- Move extensions between splits or skills.
- Change split or skill assignments.
- Change trunk group to split.
- Change trunk group to VDN.
- Change VDN-to-vector assignments.
- Start an agent trace.
- List the agents being traced.
- Create, copy, and edit call vectors.

Reporting

CMS provides real-time, historical, and integrated reporting to track all activities in the contact center. Using CMS reports available using CMS Supervisor, you can make business decisions based on entities such as agents, split/skills, vectors, vector directory numbers, and trunks.

CMS stores all the Automatic Call Distribution (ACD) data received from the ACD system in real-time and historical databases. Real-time databases include tables for the current and previous intrahour interval data. The storage interval can be 15, 30, or 60 minutes. Historical databases include tables for the intrahour, daily, weekly, and monthly data.

Automatic Call Distribution integration

CMS interfaces with the following Automatic Call Distribution (ACD) systems:

- Communication Manager Release 6.x
- Communication Manager Release 7.x
- Communication Manager Release 8.x
- Communication Manager Release 10.x
- Routing Core Server

In the Avaya Contact Center – Extended Capacity solution, the Avaya Call Management System supports the Communication Manager Automatic Call Distribution (ACD) and the Routing Core ACD.

Important:

Encryption of personal data in transit is only available with CMS Release 19.1 and later, and Communication Manager Release 8.1.2 and later.

To fully use all the features of a particular Communication Manager release, you must administer the proper release number on CMS. For more information, see *Avaya Call Management System and Communication Manager Connections, Administration, and Troubleshooting*, and *Deploying Avaya Contact Center – Extended Capacity*.

About the CMS Tenancy feature

The CMS Tenancy feature provides an extension to the current CMS user data access management feature to enable customers to restrict user access to CMS reporting data and functionality within their call center. The new tenant level access for users introduces restricted data access permissions for the following call center resources: agents, call work codes, split/skills, trunk groups, VDNs, and vectors.

Each tenant partition is assigned call center resources which are isolated from resources in the other tenant partitions. A tenant partition can be assigned a subset of call center resources, but not all call center resources must be assigned to a tenant partition. Some call center resources can be assigned across all tenants.

A user with tenant level access has permissions to access only those CMS resources which are assigned to the tenant partition. A user can be assigned permission to access more than one tenant.

Customers must install the Tenancy feature package to use the CMS Tenancy feature. Using this feature, customers can partition a subset of the ACD resources and assign the resources to tenants. A tenant or tenant partition enforces restricted access for CMS Supervisor users. Within a tenant, each tenant user can have access to a restricted set of call center resources and data based on their tenant assignments with that tenant.

The CMS tenancy feature and the Automatic Call Distribution (ACD) Tenancy feature are unrelated. All the administrative and tenant user actions for CMS Tenancy are carried out independent of ACD Tenancy. However, you must perform careful ACD administration to achieve effective CMS tenant partitioning and tenant reporting.

ACD tenant partitioning is administered on the ACD system and CMS tenant partitioning administration does not modify or impact ACD tenant partitioning administration. Tenant feature administration on CMS assigns resources such as agents, VDNs, and skills to a CMS tenant and defines how CMS tenant users can access call data that is stored in the CMS database.

CMS does not control the actual call operation or call delivery to agents and skills. Only ACD administration controls how calls are handled and delivered to agents. Therefore, ACD administration impacts data in CMS tenant reports, despite the restrictions imposed by CMS tenant administration.

For example, the administrator could create CMS tenant 1 and assign agent 1 and skill 1 to CMS tenant 1, and create CMS tenant 2 and assign agent 2 and skill 2 to CMS tenant 2. If agent 1 logs into skill 2 and receives calls for skill 2, the tenant 1 users will see the skill 2 call data in reports run for agent 1.

Thus, while the tenant user is restricted to running reports only for agents assigned to tenant 1, CMS will display all the call data for agent 1. This implies that the tenant user will see call data for skills assigned to a different tenant. CMS must display all the data for an agent or the summary data will be incomplete.

Therefore, you must plan tenant administration on both ACD and CMS very carefully prior to any implementation of tenancy.

The resources shared between tenants must be mutually exclusive. Thus, customers cannot assign the same call center resource to different tenants. This means that different tenants on an ACD cannot share an agent, call work code, split/skill, trunk group, VDN, and vector.

There are three types of users:

- **Administrator:** An administrator is a user who has access to all the functions of CMS, all CMS reports, and all CMS data. Administrators can provide admin level access, normal user access, or tenant level access to other users. Administrators have the added capability to create and administer tenant users.
- **Normal user:** A normal user has functionality similar to the earlier releases of CMS. A normal user is given read, write, and exception permissions by the administrator for ACDs, splits/skills, trunk groups, VDNs, and vectors.
- **Tenant user:** This user has tenant level access which can span multiple tenant partitions. This user has permissions for viewing or working with CMS resources within the tenant partitions to which the user is assigned.

*** Note:**

A tenant user is also assigned permission to access the split/skills, trunk groups, VDNs, and vectors within the tenant partition. Thus, additional restrictions within a tenant can be assigned to each individual tenant user.

*** Note:**

A tenant user can create custom reports or can design reports which are accessible only to the tenant user.

Examples of Tenancy usage

- Service Providers can use Tenancy to partition their ACDs so that CMS can be used by multiple tenants or customers within the same ACD, but without access to each other's data.
- A call center with multiple departments or business units that have separate independent functions can create tenants to allocate each business unit a different set of tenant partitions.
- Customers that have a hierarchical reporting structure can use tenancy to enable supervisors and report users to manage only a subset of the call center resources.

LDAP integration

CMS supports the use of Lightweight Directory Access Protocol (LDAP) Active Directory (AD) integration for CMS user management. It supports Active Directory for the Windows Server 2008, 2008 R2, 2012, 2012 R2, 2016, and 2019 versions. CMS can integrate with only a single AD system, not multiple AD systems, and Azure AD is not supported. The CMS user interface and management features do not change the CMS user experience when activating the LDAP integration.

With LDAP integration, CMS users authenticate against the configured LDAP server when a user logs on to CMS. With this feature, users need not use the Avaya Services engagement for CMS user password management.

You can administer both traditional CMS users (Linux) and LDAP authenticated users with CMS. When you activate the LDAP feature, the system updates the existing CMS User Data screen to provide an interface and identify the LDAP authenticated users. Once you administer a CMS user with LDAP authentication, the user gains access to CMS and is authenticated against the LDAP server when logging on to CMS. Linux password administration is not required.

With LDAP integration, CMS users can log on using all CMS interfaces, including:

- CMS Supervisor Web Client
- CMS Supervisor PC Client
- CMS ASCII

You can also encrypt the connection to the AD server to avoid exposing personal data over the LDAP connection. Data encryption with LDAP is an optional feature that you enable or disable when you install the LDAP authentication feature package.

Data backup

CMS supports data backup, migrations, and restores using several different methods:

- Tape
- USB storage device, non-tape backup
- NFS mounted file system, non-tape backup
- IBM Spectrum Protect (formerly Tivoli Storage Manager)
- Veritas NetBackup (formerly Symantic Netbackup)

Important:

When using NFS for backups on CMS 18.0.2 or later, you must use NFS Version 4 (v4). When upgrading from an older version of CMS that supports an older version of NFS, you must upgrade your NFS setup to NFS v4 after you upgrade your system.

CMS Supervisor

CMS Supervisor provides access for CMS reports and administration. It is available in several different interfaces:

- Web Client — The Web Client is a browser-based interface that is installed with the CMS server software. You do not have to install any software on individual PCs.
- PC Client — The PC Client is a Windows-based interface. To use the PC Client, you must install it on all user PCs.
- Mobile Client — The Mobile Client is an Apple iPad application that helps supervisors and operations managers in a call center monitor activity when they are away from their desks.

For more information about CMS Supervisor, see the following documents:

- *Avaya CMS Supervisor Clients Installation and Getting Started*
- *Administering Avaya Call Management System*
- *Avaya CMS Supervisor Reports*

Avaya Solutions Platform

CMS can be installed on Avaya Solutions Platform 130 Appliance servers for new installs and upgrades. The Avaya Solutions Platform servers are pre-installed with VMware ESXi software. The CMS OVA file is installed on the Avaya Solutions Platform server at the customer location.

Networking with IPv4 or IPv6

CMS supports both IPv4 and IPv6 connectivity. The integration between CMS and Automatic Call Distribution (ACD) over IPv4 or IPv6 is seamless. You can configure IPv4 or IPv6 connections with ACD by using the `cmsadm` command and `acd_create` option whether you are using IPv4 or IPv6. Whichever configuration you use, you must consistently use the IPv4 or IPv6 addresses.

CMS Supervisor Web Client and Mobile Client can also use either IPv4 or IPv6. CMS also integrates with CMS Supervisor PC Client, Terminal Emulator, and Network Reporting over IPv4 or IPv6. No extra configuration is required to enable the IPv6 capabilities of CMS reporting client applications. IPv6 protocol and name resolution, and connectivity is automatic. Use of IPv6 is transparent to CMS users. All features of CMS work exactly the same with IPv6 as they do with IPv4.

EASG

The Enhanced Access Security Gateway (EASG) package is integrated into CMS and provides secure authentication and auditing for all remote access into the maintenance ports.

EASG authentication is based on a challenge/response algorithm using a token-based private key-pair cryptographic authentication scheme. Secure auditing is also provided. Logs are available that include information such as successful log on, failed log on, errors, and exceptions.

EASG allows Avaya to control Avaya service engineer privileges when accessing customer products. EASG controls permission levels, such as `init`, `inads`, and `craft`, used by the service engineers.

On a CMS server, a dedicated EASG product certificate is installed under the EASG directory `/etc/asg`. This is mandatory that all Avaya products with EASG support use the `/etc/asg` directory for all EASG associated files and directories. The EASG product certificate uniquely identifies CMS major releases to the Avaya EASG server.

The product certificate is derived from the Avaya IT Root Certificate Authority (CA) and intermediate CAs. The Avaya EASG server uses CAs to create a response, and CMS uses the EASG product certificate public key to verify the response through the EASG Common RPM. The EASG product certificate is included in the CMS deployment. Customers need not do additional tasks to set up the certificate.

WebLM and PLDS

Avaya products use WebLM Release 8.0 or later to manage product licenses obtained using PLDS. For CMS licensing, the customer must use either a standalone WebLM server or have the WebLM server installed on a coresident Avaya product, such as Avaya Aura[®] System Manager.

Important:

You must use Centralized Licensing when licensing CMS. Enterprise licensing is not supported for CMS. That is, multiple CMS deployments cannot share one license file. After enabling Centralized Licensing, you must assign every license file to the license ID in WebLM.

For more information about installing license files, see the following documents:

- *Administering Avaya Aura[®] System Manager*

- *Administering standalone Avaya WebLM*

For WebLM licensing, you have 30 days to provide a valid host name to a WebLM Release 8.0 or later server where the CMS license is installed. If you cannot provide a valid host name, CMS enters the License Error mode for 30 days. After 30 days, CMS enters the License Restricted mode.

Enterprise Login

There are two login methods available with Avaya Call Management System:

- Local Login
- Enterprise Login

Local Login:

- Users use the administered CMS user ID and password to log in to CMS.
- LDAP Password authentication is available for Local Login by optionally administering individual users for password authentication through Microsoft Active Directory.

Enterprise Login:

- Microsoft Azure and OKTA are supported for login authentication.
- Only available for use with CMS Web Client.
- Multifactor authentication (MFA) is enforced if Microsoft Azure or OKTA is configured for MFA.
- The LDAP package is not required.
- The user must have a login ID configured on CMS.
- CMS administration is required to enable CMS to be recognized by Microsoft Azure or OKTA.

Login authentication through a personal certificate is also available. Login authentication through a personal certificate is a requirement of the Joint Interoperability Test Command (JITC) certification. For Federal and Department of Defense (DoD) employees, personal certificates are encoded and provided by Common Access Card (CAC).

The CMS implementation does not limit support to requiring certificates to be on CACs. Personal certificates can be in a regular certificate store, such as Microsoft Certificate Store.

Related links

[CMS feature summary](#) on page 11

Chapter 3: Interoperability

Product compatibility

Communication Manager releases supported by CMS releases

Communication Manager release	CMS release							
	16.x	17.x	18.0	18.1	19.0	19.1	19.2	20.0
6.x	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
7.x	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
8.x	No	No	No	Yes	Yes	Yes	Yes	Yes
8.1.2+ Secure	No	No	No	No	No	Yes	Yes	Yes
10.x	No	No	No	No	No	No	Yes	Yes

Avaya Contact Center – Extended Capacity releases supported by CMS releases

Avaya Contact Center – Extended Capacity Routing Core release	CMS release
10.x	20.0

CMS server releases supported by CMS Supervisor

- 16.x
- 17.x
- 18.x
- 19.x
- 20.x

Software provided with CMS

- CMS server software
- CMS Supplemental Services
- Informix IDS
- Informix ESQLE SDK
- Informix ILS
- ODBC and JDBC

Operating system compatibility for the CMS server

CMS server software is compatible with Red Hat Enterprise Linux® (RHEL) 8.7.

Operating system support by browser type for CMS Supervisor Web Client

Microsoft Edge

Windows 10: versions 108 and 109

Windows 11: versions 108 and 109

Mozilla Firefox

Windows 10: versions 108 and 109

Windows 11: versions 108 and 109

macOS 12.6 (Monterey): versions 108 and 109

macOS 13.1 (Ventura): versions 108 and 109

Google Chrome

Windows 10: versions 108 and 109

Windows 11: versions 108 and 109

macOS 12.6 (Monterey): versions 108 and 109

macOS 13.1 (Ventura): versions 108 and 109

ChromeOS: versions 108 and 109

Apple Safari

macOS 12.6 (Monterey): version 15 and 16

macOS 13.1 (Ventura): version 16

Windows compatibility for the CMS Supervisor PC Client

The CMS Supervisor PC Client software supports the following Windows operating systems that meet its minimum requirements:

- Windows 10 version 21H2 and later
- Windows 11 version 21H2 and later

 **Note:**

Windows 10 S and Windows 11 S are not supported.

Windows service packs and patches

To ensure compatibility and security, install the latest service packs and security patches for your supported Windows operating system before installing CMS Supervisor or Network Reporting.

Supported upgrade scenarios

CMS supports the following upgrade scenarios:

- **Software Upgrades** — Upgrading from an older CMS software release and retaining the same hardware server or VMware server. You will back up the customer data, use software discs and a CMS OVA file to install the new Linux OS and CMS software, then migrate the customer data.
- **Platform Upgrades** — Upgrading from an older CMS software release and installing a new customer-provided VMware server or an Avaya Solutions Platform 130 Appliance VMware server. You will back up the customer data, use a CMS OVA file to install the new Linux OS and new CMS software, then migrate the customer data onto the new software release.
- **Base Load Upgrades** — Upgrading from an older CMS software release within the same minor release or an approved upgrade scenario. You will use a software disc or a CMS ISO image file to install the new Linux OS and CMS software.
- All upgrades from CMS releases older than Release 20.0 must use a full software or platform upgrade when upgrading to Release 20.0. This also applies to upgrades of CMS R20 CI that were part of the Avaya Contact Center – Extended Capacity offering.

For more information about upgrades, see the following documents:

- *Planning for Avaya Call Management System Upgrades*
- *Upgrading Avaya Call Management System*
- *Deploying Avaya Call Management System*
- *Avaya Call Management System Base Load Upgrade*

Software upgrades

The software upgrade process reuses existing CMS hardware that can support the new CMS software. The following models of hardware can support CMS 20.0, regardless of the current CMS release installed on the hardware:

- Avaya Solutions Platform 130 Appliance VMware servers
- Customer-provided VMware servers
- Dell R630
- Dell R730

- HPE DL380 G9
- Customer-provided Amazon Web Services (AWS) servers
- Customer-provided Google Cloud Platform (GCP) servers

Platform upgrades

CMS Release 20.0 supports platform upgrades from CMS Releases 16.x, 17.x, 18.x, 19.0, and 19.1.0.0 or 19.1.0.1 regardless of what hardware the CMS software currently resides.

 **Note:**

Contact your Avaya account team if you need to upgrade from CMS releases older than Release 16.x.

Chapter 4: Performance specifications

Capacity limits

Capacities are the maximum limits that a particular CMS hardware platform or VMware configuration can support. You must verify that none of the capacity limits are exceeded for a particular hardware platform. If you do, then you must use the next higher capacity hardware platform or configuration. For example, if you are using a small VMware configuration, you must move up to a medium or large VMware configuration.

Capacity Descriptions

The following topics describe the measurement you must use to determine which CMS hardware platform is required

Peak Busy Hour call volume

The busy hour call volume capacity is the call volume during the busiest hour of the day.

Calculate the busy hour call volume by adding each trunk seizure or line appearance seized during the busiest hour for all calls.

Concurrent supervisors

The concurrent supervisors capacity is the total maximum number of CMS supervisors and CMS terminal emulator logins that exist during the peak busy hour. The concurrent supervisors capacity is not the number of authorized logins, but the number of logins actually used.

 **Note:**

This capacity limit is the sum of the login count from each client type: CMS Supervisor PC client, CMS Supervisor Web client and CMS Supervisor Mobile Client, Terminal Emulator, and Network Reporting.

Calculate the number of concurrent supervisors by counting the maximum number of supervisor logins and the terminal emulator logins that exist during the busy hour period. Each login counts as one. Do not count the number of reports. This count must be 1600 or less.

Third-party software

The third-party software capacity is the number of external or third party interface applications. Some examples of third-party interfaces are Blue Pumpkin, ODBC, wallboards, Geotel, Operational Analyst, TCS, and IEX.

Calculate the amount of third-party software by counting the number of third party applications used.

Important:

The one exception to this rule is Geotel, which counts as two applications. Do not count each instance of the application. If you use wallboards, count the wallboards as one application. Do not add up the total number of wallboards.

Agent/skill pairs

The agent/skill pairs capacity is the total number of agent/skill pairs.

Calculate this capacity by multiplying the number of agents by the number of skills each agent can log in to. The number of agents and the number of skills are based on the switch administration. For example, if there are 20 agents, and each agent is administered with 5 skills, you would multiply agents by their skills for a value of 100 agent/skill pairs. You must count the total number of skills administered for the agent, not the number of skills used by the agent.

Reports per Supervisor session

The reports per Supervisor session capacity is the average number of simultaneous real-time reports each supervisor will run.

Report elements

One Report Element is equivalent to running the Skill Status report with a three-second refresh rate and the report returning one hundred rows of data. The Skill Status report is available from Realtime > Split/Skill > Skill Status report.

For context, there are two queries in the report:

1. Query **data1**: select csplit.INQUEUE + csplit.INRING, csplit.OLDESTCALL, csplit.EWTTOP, csplit.EWTHIGH, csplit.EWTMEDIUM, csplit.EWTLOW, SKSTATE from csplit
2. Query **data2**: select cagent.LOGID, cagent.LOGID, cagent.AUXREASON, cagent.AWORKMODE, cagent.DIRECTION, cagent.WORKSKILL, cagent.WORKSKLEVEL, cagent.AGTIME, cagent.VDN, cagent.AWORKMODE from cagent

Query **data1** returns one row with seven data fields, one of which has a synonym lookup.

Query **data2** returns ten fields; in our example, it would return 100 rows.

Six data fields have synonym lookups, and two are keyword lookups. (synonym and keyword lookups are approximately twice as expensive as plain data)

If you add a summary query, it adds to the load on the CMS.

If you run the Skill Status report with a three-second refresh rate and the report returns two hundred rows of data, this would be considered two report elements.

Integrated queries create a greater load on the server when started; however, they pull around the same amount of data as a real-time report after that time except for interval, day, and start-of-day boundaries.

Historical reports put a load on the server when you run, refresh or restart them.

Active agent traces

The active agent traces capacity is the number of agent traces running on the CMS.

Integrated Report refresh rate

CMS PC Supervisor refresh rate for Integrated reports is a minimum of 10 seconds. CMS Supervisor Web allows a 3 second refresh rate for Integrated Reports.

Average refresh rate

The average refresh rate capacity is the average refresh rate for real-time reports.

Calculate this capacity by averaging the refresh rates set by your report users. For example, if one-half of the users use a 30-second refresh rate, and the other half use a 10-second refresh rate, you would calculate an average of 20.

Percent refresh rate at three seconds

The percent refresh rate at 3 seconds capacity is the percentage of real-time report users that require a refresh rate of 3 seconds

Capacity and scalability specifications

Important:

When the FIPS 140-2 encryption feature is activated, the following capacities are reduced by 10% for all models of CMS:

- Concurrent Supervisors
- Reports per Supervisor Session
- Report elements
- 30 Second Average Refresh Rate (including a 10% reduction in the listed 3 second refresh rate capacities)

FIPS 140-2 encryption consumes additional CPU and memory to support the more complex ciphers required by FIPS 140-2 guidelines. CMS applies the encryption for server/client

connections where the client is CMS Supervisor PC, or CMS Supervisor Web. Hence, the capacities for CMS between the CMS server and all client applications is reduced by 10%.

Capacities for new installations on VMware

The following table lists the capacities for new customer-provided VMware servers or Avaya-provided Avaya Solutions Platform 130 Appliance servers being sold for CMS:

Parameter	Small	Medium	Large	Extended
Peak busy-hour call volume	30,000	200,000	400,000	500,000
Concurrent CMS Supervisor sessions ¹	50	200	1,999	1,999
Concurrent agents	500	5,000	10,000	30,000
Third-party software	3	5	7	3
Agent skill pairs	100,000	200,000	800,000 ³	1,500,000 ³
Reports per CMS Supervisor session	3	5	10 ²	15 ²
Report elements ⁴	5	5	12	12
Percentage of supervisors that can run reports with a three-second refresh rate	10%	50%	100%	100%
Active agent traces	250	1,000	5,000	5,000
Internal Call History (ICH) records	4,000 per 20 minutes	4,000 per 20 minutes	4,000 per 20 minutes	4,000 per 20 minutes
External Call History (ECH) records	10,000 per 20 minutes	60,000 per 20 minutes	300,000 per 20 minutes	300,000 per 20 minutes

1. This value is the total number of active CMS Supervisor PC and Web Client sessions.
2. Three realtime and upto limit of historical.
3. Greater than 800GB of storage requires the creation of additional disk volumes.
4. For a definition of Report elements, see [Report elements](#) on page 23.

Capacities for upgrades on supported older hardware

The following table lists the capacities for existing platforms being upgraded to CMS 20.0. Only Dell R630, Dell R730, and HPE DL380 G9 systems can be upgraded to CMS 20.0.

*** Note:**

Hardware Upgrades are irrelevant to the Avaya Contact Center – Extended Capacity offering.

Capacity	CMS Low End Hardware Platform (HPE DL20)	CMS Midsize Hardware Platform (Dell R630)	CMS High End Hardware Platform (Dell R730 and HPE DL380 G9)
Peak busy-hour call volume	10,000	200,000	400,000
Concurrent supervisors ¹	30	200	1,600 ²
Concurrent Agents	400	5,000	10,000
Third-party software	3	3	7
Agent skill pairs	100,000	200,000	800,000
Reports per Supervisor session	5	5	10
Report elements	5	5	12
Active agent traces	200	1,000	5,000
30 seconds Average refresh rate	10% at 3 seconds	50% at 3 seconds	100% at 3 seconds
Internal Call History (ICH) records	4,000 per 20 mins	4,000 per 20 mins	4,000 per 20 mins
External Call History (ECH) records	300,000 per 20 mins	300,000 per 20 mins	300,000 per 20 mins

System wide capacities

CMS attribute	System wide capacity	Per ACD capacity (maximum capacities)
Agent skill pair	800,000	360,000
Total VDNs	54,000	30,000
Total splits or skills	54,000	8,000
Total trunks	100,000	24,000
Total trunk groups	8,000	2,000
Total vectors	32,000	8,000
Total call work codes	4,000	1,999
Agent trace records (AAR)	5,100,000	5,100,000

Maximum values with multiple ACD deployment

Basic Maximum Values					
Agent/skill pairs	300,000	300,000	400,000	500,000	800,000

Table continues...

¹ This value is the total number of active CMS Supervisor PC client and CMS Supervisor Web client sessions.

² Of the 1,600 sessions supported, only 800 can be CMS Supervisor Web client sessions.

Basic Maximum Values					
Interval length (minutes)	30	15	30	30	30
Interval data days saved	31	31	15	31	15
Daily data days saved	1,825	730	1,825	730	730

*** Note:**

There is no impact on daily, weekly, and monthly limits. When the capacity limit of agent skill pairs crosses 200,000, there is an impact on the interval data storage.

CMS reporting efficiency

Avaya provides a powerful solution with CMS that enables you to create custom reports designed to fit your individual needs. However, the overall capability of the CMS server is limited by the memory and CPU of each server.

Skill based reporting

The CMS server is optimized for skill based reporting. Avaya recommends that you create and use reports on skills instead of Agent Group reports. Skills that do not receive actual calls can be created on the Automatic Call Distribution (ACD). You can use these skills to provide reporting for the agents that are placed in that skill. To use Agent Group reports, follow the recommendations provided in Recommendations for custom reports on page 32.

Recommendations for report customization

When you design and use custom Agent Group reports, consider the following recommendations to optimize system performance:

- Agent Groups
 - The size of agent groups are recommended to be 99 agents or less. Agent groups of size 99 agents or less are recommended because system performance can be adversely affected.
 - If possible, report on consecutive Agent IDs in the same report
 - If possible, limit Agent Group reports and use skill based reports
- Number of agents or other elements in historical or real time reports
 - Carefully examine the number of agents, skills, VDNs, trunks, or other elements in one report. Limit the number of agents or other elements in a single report as much as possible.

- Custom report design
 - In historical reports, there should be no input for multiple dates when running against the interval database tables. Existing reports that allow multiple dates should be modified to gain access to the appropriate daily/weekly/monthly table instead of the interval table.
 - Any historical report that takes longer than a few seconds to complete should be reviewed for modification to improve performance.

Any real-time report that takes more than a few milliseconds to refresh should be reviewed or modified to improve performance.

Resources for system performance analysis

Customers can work with Avaya Professional Services to design and use custom reports in a manner that maximizes system performance. The Avaya Professional Services organization provides services that include a performance analysis of custom reports on a CMS server. Avaya Professional Services can also provide recommendations on how to efficiently design current or future reports in a manner that minimizes impact to CMS performance.

Changing the dictionary

Changes to the dictionary must occur during off hours when database updates are minimum. Otherwise, CMS Supervisor users will need to constantly query the database to update the cache on the computer where CMS Supervisor is running. This causes the real-time reports to hang, and users are denied access to CMS Supervisor.

Traffic specifications

See the entry for Peak busy-hour call volume in the new installation and upgrade tables in [Capacity and scalability specifications](#) on page 24.

Redundancy and high availability

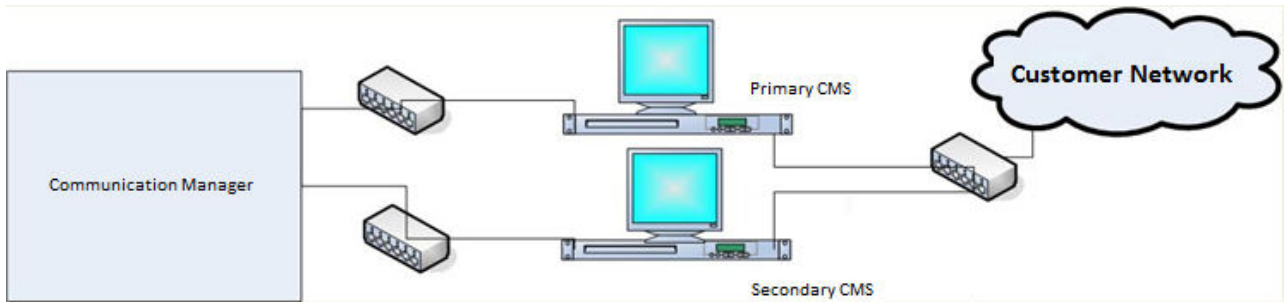
The primary purpose of the Avaya CMS High Availability (HA) option is to ensure an uninterrupted data stream between the communication server or switch and the CMS server. With HA, two CMS servers are connected to one communication server or switch. This connection eliminates the traditional single point of failure between the CMS server and the communication server or switch.

Both CMS servers collect data independently from the communication server. Both CMS servers provide full CMS capabilities. If either server fails, loses connection to the communication server, or must be brought down for maintenance, the alternate server can carry the entire CMS activity load.

Duplicate hardware is a key component of the CMS HA system. The function of the duplicate hardware is to eliminate a single point of failure in order to prevent data loss due to hardware failures. The dual ACD link feature addresses ACD link failures, and the alternative ACD link

provides increased ACD link reliability. A C-LAN circuit pack or an ethernet port provides TCP/ IP connectivity between the communication server and the CMS server. Each ACD link requires a separate C-LAN circuit pack or ethernet port that supports different network routes to eliminate as many single points of failure as possible.

The following figure displays a typical CMS HA configuration with a primary or active server and a secondary or standby server:



Dial plan specification

CMS supports up to 16 digit extensions for agent, login id, VDN, and station.

Chapter 5: Security

Security specifications

CMS provides the following security features:

- Operating system hardening

CMS achieves operating system hardening by the following procedures:

- Patching and patch qualification: CMS includes all necessary components including security patches at the time of release. Avaya receives additional patch notifications and certifies new Linux® OS patches. Avaya then assembles these patch clusters and makes the clusters available to customers through Product Change Notices (PCN).
- Operating System-level security logs and audit trails: You can use log files to detect suspicious system activity. The customer can review these log files on a routine basis for signs of unusual activities.
- Banner modifications: Altering the telnet and ftp network service banners hides operating system information from individuals who want to take advantage of known operating system security holes.
- Email and SMTP: You must not configure CMS as a mail relay and must disable the Simple Mail Transfer Protocol (SMTP) daemon.

*** Note:**

For details on FIPS 140-2 encryption, refer to *Maintaining and Troubleshooting Avaya Call Management System* and *Avaya Call Management System Release Notes*.

- Authentication and session encryption

CMS achieves authentication and session encryption by the following procedures:

- User authentication and authorization: CMS uses login and password security measures provided by Linux® OS and provides multiple levels of system access. To authenticate users, CMS uses OS capabilities based on Pluggable Authentication Modules (PAM). At the system level, CMS uses the standard operating system permissions. In CMS, you can administer data permissions for each user.
- Password complexity and expiration: You can enable and modify the password expiration attributes through the CMSADM menu. You can set the expiration intervals from 1 to 52 weeks.
- Logging for failed logins: You can log the failed login attempts in the system message log, `syslog`.
- Multiple login prevention: With the APS hardening offer, you cannot log in more than once concurrently.

- Use of ssh: CMS provides a simplified installation of secure Supervisor client login over a public or unsecured network. To do this installation, CMS uses Secure Shell (SSH), a protocol that encrypts the packets sent between a client workstation and a host server. This procedure secures the transmission of login information and other sensitive data.
- Data privacy regulations

Some organizations have enacted policies related to the handling of personal data. For example, the European Union issued the GDPR (General Data Protection Regulation) and the USA State of California created the CCPA (California Consumer Privacy Act). To support these policies, CMS provides encryption of data at rest, data in transit, and provides tools and guidelines for customers to manage personal data contained in CMS. For more information about how CMS protects personal data, see *Product Privacy Statement for Avaya Call Management System*.
- Encryption of personal data at rest

CMS provides encryption for personal data at rest. The encryption occurs at the Linux operating system level and is implemented using Linux Unified Key Setup (LUKS) during deployment of the OVA on the CMS server. After deploying the OVA, the user must enter an encryption “passphrase” to allow the system to boot up with the new encryption feature. This new encryption passphrase is also a critical part of maintenance with CMS because the customer must decide if a passphrase will be required for every reboot, even if the system restarts after a failure. If a passphrase is required, it can only be entered at the local system console, not remotely.
- Encryption of personal data in transit

CMS also provides encryption of personal data in transit between CMS and its connected Automatic Call Distribution (ACD) systems. The Switch Protocol Interface (SPI) link encryption is invisible to the user and is automatically implemented when you administer the link between the systems.

! **Important:**

Encryption of personal data in transit is only available with CMS Release 19.1 and later, and Communication Manager Release 8.1.2 and later.
- Additional encryption features

CMS provides optional methods customers can use to encrypt data:

 - Customers can encrypt data sent over LDAP connections to an Active Directory server.
 - Customers can encrypt data sent over ODBC and JDBC connections.
- Application security

CMS achieves application security by SPI link, application-level audit logging, and database security controls.
- Physical security

CMS achieves physical security by physical server protection and EEPROM/BIOS security.
- Services security and CMS support

CMS achieves services security and CMS support by remote connectivity and authentication, and services password management.

- Personal data in CMS

CMS stores the following types of personal data:

- Call center agent information.
- CMS user information.
- Phone numbers dialed by individuals placing calls into the call center.
- Phone numbers dialed by agents placing calls outside the call center.

The call center agent information and CMS user information is for employees of the company using CMS. The type of personal data CMS stores is limited to that information that facilitates standard employee work operations.

The information related to individuals calling into the call center is specific to digits dialed. The information related to agents calling outside the call center is also specific to digits dialed.

CMS provides logs and tools that help you manage personal data in CMS. For more information about how to manage personal data, see *Maintaining and Troubleshooting Avaya Call Management System*.

For more information about security best practices, see *Avaya Call Management System Security*.

General Data Protection Requirement (GDPR) support

General Data Protection Regulation (GDPR) is European Union (EU) legislation designed to strengthen and unify data protection laws for all individuals within the EU. This regulation applies to any organization that processes personal data of individuals in the EU.

GDPR affects the everyday operations of any department within organizations that act as data controllers. The regulation regards data controllers as entities that collect data from data subjects.

CMS stores several categories of personal data, such as Call Center Agent information, CMS User information, and some limited information about individuals calling into the contact center.

For more details about GDPR, see *Product Privacy Statement for Avaya Call Management System*.

EASG

The Enhanced Access Security Gateway (EASG) package is integrated into CMS and provides secure authentication and auditing for all remote access into the maintenance ports.

EASG authentication is based on a challenge/response algorithm using a token-based private key-pair cryptographic authentication scheme. Secure auditing is also provided. Logs are available that include information such as successful log on, failed log on, errors, and exceptions.

EASG allows Avaya to control Avaya service engineer privileges when accessing customer products. EASG controls permission levels, such as init, inads, and craft, used by the service engineers.

On a CMS server, a dedicated EASG product certificate is installed under the EASG directory `/etc/asg`. This is mandatory that all Avaya products with EASG support use the `/etc/asg` directory for all EASG associated files and directories. The EASG product certificate uniquely identifies CMS major releases to the Avaya EASG server.

The product certificate is derived from the Avaya IT Root Certificate Authority (CA) and intermediate CAs. The Avaya EASG server uses CAs to create a response, and CMS uses the EASG product certificate public key to verify the response through the EASG Common RPM. The EASG product certificate is included in the CMS deployment. Customers need not do additional tasks to set up the certificate.

Setting up the Secure Access Link (SAL) and Alarm Monitoring system

The Avaya default remote access is secure access link (SAL) which allows Avaya personnel to:

- Resolve product issues
- Optimize product performance
- Value the Avaya customer support entitlements

Use the following steps to create a new registration or to onboard technical personnel:

1. Go to <https://support.avaya.com>.
2. Log on with the user name and password.
3. On the home page, click **Diagnostics & Tools** and select **Global Registration Tool**.
4. On the Create A New Registration page, do one of the following steps:
 - Select **End to End Registration**.
 - Select **Technical Onboarding Only**.
5. Enter the 10-digit functional location number (sold-to number) for the customer.

Ensure that you include leading zeroes when entering the location number. For instance, if the location number is 12345678, you must add two leading zeroes before 12345678. For example, 0012345678.

 **Note:**

If the customer has completed the product registration process, then complete only the Technical Onboarding process to allow the SAL connectivity.

To complete the product registration process and prepare the technical onboarding, including the SAL Connectivity process, you must understand which product material code is eligible for Technical Onboarding during the product registration process. The GRT Tool Mapping table provides the list of product material codes for your reference.

You can download the GRT Tool Mapping table from the Avaya support site at: <https://support.avaya.com/css/P8/documents/100176973>.

 **Note:**

Save the Microsoft Excel spreadsheet.

Port utilization

The *Port Matrix for Avaya Call Management System* document lists all the ports and protocols that CMS uses. Avaya Direct, Business Partners, and customers can find the port matrix document at <http://support.avaya.com/products> under **Product Documents**. You can view the port matrix document only after you log in to the Avaya Support site using valid support site credentials.

Chapter 6: Licensing requirements

CMS agent licensing enforcement

Avaya policy states that the number of CMS agent licenses for simultaneously logged in Automatic Call Distribution (ACD) agents must be equivalent to or greater than the number of agent licenses in the ACD (Avaya Aura® Call Center Elite).

! **Important:**

An agent license in CMS is consumed for each agent logged in to at least one measured skill. Regardless of the number of skills assigned to an agent, only one CMS agent license is consumed when an agent logs in to one or more measured skills.

The ACD agent count is cumulative across all the ACDs monitored by CMS. For example, if CMS is reporting on two ACDs with 400 simultaneously logged-in measured ACD agents each, CMS must be licensed for 800 simultaneous agents.

The Agent licenses on CMS are based on the number of simultaneously logged in agents, not the number of administered agents. CMS is capable of reporting on all of the Logged In or Staffed Call Center Agents of any ACD that CMS is monitoring. For example, consider that agent Angela Smith leaves the company. CMS continues to report on Angela and her formerly assigned Agent Login ID even though Angela is an inactive agent on the ACD. In this example, agent Angela does not count as a simultaneously logged in agent.

While Avaya has no plans to change this policy at this time, Avaya reserves the right to amend or change this policy at its sole discretion.

Licensing overview

Avaya provides a Web-based License Manager (WebLM Release 8.0 or later) to manage licenses of Avaya CMS. WebLM facilitates easy tracking of licenses. To track and manage licenses, WebLM requires a license file from the Avaya Product Licensing and Delivery System (PLDS) website at <https://plds.avaya.com>.

Related links

[Licensed features in CMS](#) on page 36

[CMS license modes](#) on page 36

[License management](#) on page 37

[License enforcement](#) on page 38

[License log file](#) on page 42

[Alarms](#) on page 42

[Backing up and restoring WebLM](#) on page 43

Licensed features in CMS

CMS supports the following licensed features through PLDS licensing:

Features for a primary CMS

- Number of agents for a primary system
- Number of CMS Supervisor sessions for a primary system
- Number of Automatic Call Distribution (ACD) connections to ACD systems for a primary system

Features for an HA or Survivable CMS (including dual role)

- HA or Survivable system

The CMS application that it is on an HA or Survivable system. The system uses the HA feature license and not the primary feature license.

- Number of agents for an HA or Survivable system
- Number of CMS Supervisor sessions for an HA or Survivable system
- Number of ACD connections to ACD systems for an HA or Survivable system

Other features

- Number of ODBC and JDBC subscriptions

The ODBC and JDBC subscriptions are used for both primary and HA or Survivable CMS systems.

ODBC and JDBC access is available on both the primary CMS and an HA or Survivable CMS. Separate ODBC and JDBC licenses are required for each CMS in the deployment.

- Number of Command Line Interface (CLInt) external sessions
- Number of CLInt internal sessions

CMS license modes

CMS uses the following three modes for license checking:

- License Normal mode
- License Error mode
- License Restricted mode

The logs record any transitions among the modes and issue alarms for transition into Error and Restricted modes.

License Normal mode

The License Normal mode is a condition of no license violations. In this mode, the CMS instance gains access to WebLM and shares the latest license information.

License Error mode

The License Error mode is a condition of license violation. In the License Error mode, CMS:

- Issues a warning message when an administrative user logs in or when the user invokes `cmssvc` or `cmsadm`.
- Issues a daily alarm.

If the system is in License Error mode for more than 30 days, CMS takes actions to eliminate the violations or move the CMS into the License Restricted mode depending on the violations.

When the system clears all license violations for 8 consecutive days, CMS goes back to License Normal mode.

License Restricted Mode

When CMS switches into the License Restricted mode, the CMS instance:

- Terminates and blocks all user interface sessions.
The `cms` and `cmssvc` users may log back on using the ASCII interface. Using `cms`, you can gain access only to the System Setup and Maintenance submenus. Using `cmssvc`, you can gain access to the additional Services submenu.
- Terminates all external and internal CLInt sessions. The CMS instance blocks CLInt sessions from getting started.
- Terminates all JDBC or ODBC sessions and denies subsequent JDBC or ODBC sessions.
- Stops External Call History.

Once the system clears all license violations, the CMS instance switches back to the License Normal mode.

License management

CMS uses license enforcement to manage license checking. The system checks for license violations and performs the following tasks every 9 minutes:

- Retrieves the newest license information from WebLM.
- Retrieves the number of ACDs and renew, acquire, or release ACD licenses.
- Retrieves the agent login information and renew, acquire, or release agent licenses.
- Retrieves the supervisor login information and renew, acquire, or release supervisor licenses.
- Retrieves CLInt usage information and renew or acquire CLInt licenses
- Retrieves ODBC and JDBC usage information and renew, acquire, or release the ODBC and JDBC session licenses, as needed.
- Calculates the license status:
 - Log to eLog when new license violation is detected
 - Log to eLog when license status changed
 - Log the license status
- Takes appropriate action based on the calculated license status.

If the system cannot get the latest licensing information from WebLM, the system uses the existing license information for license checking.

License enforcement

The CMS instance enters License Restricted mode when any of the following license conditions are violated for 30 consecutive days:

- License Validity
- ACD Count
- Agent Count

The system stays in License Restricted mode until all license violations are corrected.

Other licenses, such as Supervisor Session Count, JDBC or ODBC Session Count, and CLInt Session Count, might cause the CMS instance to enter License Error mode if violated. However, the License Error mode does not cause the CMS instance to enter the License Restricted mode. Instead, CMS instance attempts to clear the errors by disconnecting any sessions above the valid license count.

License Validity

If CMS fails to get a valid license, any of the following conditions are true:

- CMS cannot connect to WebLM
- CMS cannot obtain a CMS license after connecting to WebLM
- CMS license expired
- CMS license has a version less than the currently running version

If CMS cannot obtain a license initially, the system does not consider the maximum capacity. Otherwise, it considers the previous capacities. In case of expired licenses or incorrectly versioned licenses without previous capacities, you can use the capacities specified in the improper license.

ACD Count

When you create an ACD, CMS ensures the number of ACD does not exceed the limit. However, if the licensed ACD count is lowered, CMS enters the License Error mode. If you do not remove the additional ACDs within 30 days, CMS enters the License Restricted mode. If you increase the number of ACDs in the license or remove the extra ACDs, the system removes the restriction.

Note:

The ACD count applies to the number of administered ACDs and not the number of active ACDs. Even if data collection is off or link is down for a ACD, the system counts ACD towards the limit. The system does not include the pseudo ACDs in the ACD count.

Furthermore, even if CMS is not up and running, technically the administered ACDs consume the ACD licenses. However, CMS does not maintain the license usage information with WebLM when CMS is not running.

In summary, you can clear the ACD license violation if you:

- Remove ACD(s) to the level of the licensed count

- Update the CMS license with an increased ACD count

Agent Count

CMS enters the License Error mode when the number of logged in agents exceeds the licensed count, the violation clears itself if the numbers stay below the limit for 8 days since the last violation.

For example, if the number of agents exceeds the limit on 1st, 4th, and 7th day, CMS clears the error on the 16th day if the system does not detect violation between 7th days and 16th day.

When the system does not clear the violation in 30 days, CMS enters the License Restricted mode upon the next violation. For example, if the number of agents exceeds the limit on 1st, 7th, 14th, 21st, 28th, and 33rd, CMS enters the License Restricted mode on the 33rd day. If there is no violation between 33rd and 41st day, CMS returns to the License Normal mode. If at any time during the 33rd and 41st day, the system updates the CMS license with an increased agent count, CMS returns to the License Normal mode if it does not experience other license violations.

In summary, you can clear the agent license violation when:

- No violation for eight consecutive days
- CMS license is updated with increased agent count

Supervisor session count

When a supervisor logs in, CMS checks the current session count against the latest licensed count. The system blocks the login to avoid going beyond the limit.

In a rare case, if the system decreases the licensed count and if the current login sessions exceed the decreased count, CMS enter the License Error mode.

If the supervisor session count exceeds the limit for 30 days, the system terminates all supervisor sessions. Supervisors must log in again.

ODBC and JDBC session count

CMS cannot block excessive ODBC and JDBC sessions. When the number of ODBC and JDBC sessions exceed the licensed count, CMS enters the License Error mode. The violation automatically clears if the number of sessions stays below the limit for 8 days since the last violation.

If you do not clear the violation within 30 days, CMS stays in the License Error mode. However, CMS randomly terminates ODBC and JDBC sessions to keep the count below threshold. After clearing the ODBC and JDBC license violation, if there are no further violations for 8 days, CMS switches back to the License Normal mode.

CLInt session count

There are two counts for CLInt sessions:

- For external use by non-CMS applications
- For internal use by CMS applications, such as RTA and ECH_handler

For example, the existing invocation now applies to the external count:

```
/cms/toolsbin/clint -u cmssvc
```

You can execute the `clint` program only if either of the counts is greater than zero (0). However, the session count only applies to real-time reporting. As soon as the CLInt session starts a real-time report, the system applies for the license. The session ends if it meets the limit.

License enforcement with different license modes

The following table lists how the licensing for different features are enforced in the different licensing modes:

Feature	Normal Mode	Error Mode occurs when...	Violation clears itself when...	If Error Mode continues for 30 days...	Restricted Mode behavior
WebLM Licensing	CMS is getting a valid license from WebLM	<ul style="list-style-type: none"> • Cannot access WebLM • Cannot get CMS license from WebLM • Wrong CMS version • CMS license expired 	CMS is getting a valid license from WebLM	System enters Restricted Mode	<ul style="list-style-type: none"> • All CMS Supervisor, CLInt, ODBC, and JDBC sessions terminated • Access to CMS is restricted to cms and cmssvc logins via the ASCII interface. Only Setup, Maintenance, and Services submenus are available. • New CLInt access blocked • New ODBC and JDBC access blocked. • Data collection continues. • ECH data recording stops.

Table continues...

Feature	Normal Mode	Error Mode occurs when...	Violation clears itself when...	If Error Mode continues for 30 days...	Restricted Mode behavior
ACD Count	Adding of ACDs are denied if over the limit	Licensed count is lowered below the number of existing ACDs	Excess ACD(s) are removed or License count is increased to match the existing ACD count.	Enter Restricted Mode	<ul style="list-style-type: none"> • All CMS Supervisor, CLInt, ODBC, and JDBC sessions terminated • Access to CMS is restricted to cms and cmssvc logins via the ASCII interface. Only Setup, Maintenance, and Services submenus are available. • New CLInt access blocked • New ODBC and JDBC access blocked. • Data collection continues. • ECH data recording stops.
Agent Count	Agent logins monitored	Agent logins exceed licensed count on a given day	Licensed count is not exceeded for 8 consecutive days or Licensed count is increased	Enter Restricted Mode upon next violation	<ul style="list-style-type: none"> • All CMS Supervisor, CLInt, ODBC, and JDBC sessions terminated • Access to CMS is restricted to cms and cmssvc logins via the ASCII interface. Only Setup, Maintenance, and Services submenus are available. • New CLInt access blocked • New ODBC and JDBC access blocked. • Data collection continues. • ECH data recording stops.

Table continues...

Feature	Normal Mode	Error Mode occurs when...	Violation clears itself when...	If Error Mode continues for 30 days...	Restricted Mode behavior
CMS Supervisor Session Count	CMS Supervisor log ons are denied if the licensed count is reached.	Licensed count is lowered below the existing number of logged on CMS Supervisor users	CMS Supervisor users log off and log ons are at or below the licensed count	All CMS Supervisor sessions are terminated; CMS Supervisor users must log on again	NA
ODBC and JDBC Session Count	ODBC and JDBC sessions are at or below the licensed count	Sessions exceed the licensed count	Licensed count is not exceeded for 8 consecutive days	ODBC and JDBC sessions are randomly terminated until at the licensed count	NA
CLInt Session Count	CLInt sessions running real time reports are terminated if the licensed count is exceeded	The CLInt license limit is lowered below existing number of CLInt sessions	CLInt sessions terminate to at or below the licensed count	All CLInt sessions are terminated; sessions must be restarted	NA

License log file

The system saves a licensing log file in the following location to record the status of licensing:

```
/cms/env/lm/license.log
```

You can configure CMS to store the status log for up to 45 days.

Alarms

Based on the AOM settings, the system forwards the alarms either through the socket connection or through SNMP agent to INADS and/or customer network management system.

CMS provides three levels of alarms:

- Warning
- Minor
- Major

When CMS enters the License Error mode, the system triggers a Minor alarm. When the server enters the Restricted mode, the system triggers a major alarm. The Major alarm stays until the server returns to the Normal mode.

Backing up and restoring WebLM

The CMS instance does support backing up or restoring the current license state. To restore CMS from a catastrophic loss, you must restart the CMS instance. The system gets the license data from WebLM and determines the license state.

Third-party components

Certain software programs or portions thereof included in the Software may contain software (including open source software) distributed under third party agreements (“Third Party Components”), which may contain terms that expand or limit rights to use certain portions of the Software (“Third Party Terms”). Information regarding distributed Linux OS source code (for those product that have distributed Linux OS source code) and identifying the copyright holders of the Third Party Components and the Third Party Terms that apply is available in the Documentation or on Avaya’s website at: <https://support.avaya.com/Copyright>.

You agree to the Third Party Terms for any such Third Party Components.

Chapter 7: Resources

Documentation

CMS and CMS Supervisor Documents

Title	Description	Audience
Overview		
<i>Avaya Call Management System Overview and Specification</i>	Describes tested product characteristics and product capabilities including feature descriptions, interoperability, performance specifications, security, and licensing requirements.	Sales engineers, Administrators
<i>Product Privacy Statement for Avaya Call Management System</i>	Describes how personal data is stored and processed by CMS.	Administrators
Installation, upgrades, maintenance, and troubleshooting		
<i>Deploying Avaya Call Management System</i>	Describes how to plan, deploy, and configure CMS on new VMware-based installations.	Avaya support personnel
<i>Deploying Avaya Call Management System on an Infrastructure as a Service Environment</i>	Describes how to plan, deploy, and configure CMS on new Amazon Web Services and Google Cloud Platform environments.	Avaya support personnel
<i>Planning for Avaya Call Management System Upgrades</i>	Describes the procedures customers must plan for before and after upgrading to a new CMS release.	Administrators
<i>Upgrading Avaya Call Management System</i>	Describes the procedures required to upgrade to a new CMS release.	Avaya support personnel
<i>Maintaining and Troubleshooting Avaya Call Management System</i>	Describes how to configure, maintain, and troubleshoot CMS.	Avaya support personnel, Administrators
<i>Avaya Call Management System and Communication Manager Connections, Administration, and Troubleshooting</i>	Describes how to connect and administer the Automatic Call Distribution (ACD) systems used by CMS.	Avaya support personnel, Administrators

Table continues...

Title	Description	Audience
<i>Avaya Call Management System Base Load Upgrade</i>	Describes the procedures to upgrade from one base load (for example, 19.1.0.0) to another base load (for example, 19.1.0.1). Not all releases support base load upgrades.	Administrators
<i>Using Avaya Call Management System LAN Backup</i>	Describes how to back up your CMS data using a LAN connection to a remote server.	Administrators
<i>Avaya Call Management System High Availability Connectivity, Upgrade and Administration</i>	Describes how to connect to HA servers and upgrade to HA.	Avaya support personnel, Administrators
<i>Using Avaya Call Management System High Availability and Admin-Sync</i>	Describes how to install and maintain your CMS High Availability (HA) system.	Avaya support personnel, Administrators
Administration		
<i>Administering Avaya Call Management System</i>	Provides instructions on administering a call center using CMS Supervisor.	Avaya support personnel, Administrators
<i>Avaya Call Management System Call History Interface</i>	Describes the format of the Call History data files and how to transfer these files to another computer.	Administrators
<i>Using ODBC and JDBC with Avaya Call Management System</i>	Describes how to use Open Database Connectivity (ODBC) and Java Database Connectivity (JDBC) with CMS.	Administrators
<i>Avaya Call Management System Database Items and Calculations</i>	Describes each database item and calculation that CMS tracks and how CMS calculates the values displayed on CMS reports and CMS Supervisor reports.	Administrators, Report designers
<i>Avaya Call Management System Custom Reports</i>	Describes how to design and create custom reports in CMS.	Administrators, Operations personnel, Report designers
<i>Avaya Call Management System Security</i>	Describes how to implement security features in CMS.	Avaya support personnel, Administrators
CMS Supervisor		
<i>Avaya CMS Supervisor Clients Installation and Getting Started</i>	Describes how to install and configure CMS Supervisor.	Avaya support personnel, Administrators
<i>Avaya CMS Supervisor Reports</i>	Describes how to use CMS Supervisor reports.	Administrators, Operations personnel

Table continues...

Title	Description	Audience
<i>Avaya CMS Supervisor Report Designer</i>	Describes how to create new reports and to edit existing reports through Report Designer and Report Wizard.	Administrators, Operations personnel, Report designers

Avaya Solutions Platform Documents

Title	Description	Audience
<i>Avaya Solutions Platform Overview and Specification</i>	Describes the key features of Avaya Solutions Platform server	IT Management, sales and deployment engineers, solution architects, support personnel
<i>Installing the Avaya Solutions Platform 130 Appliance</i>	Describes how to install Avaya Solutions Platform 130 Series servers.	Sales and deployment engineers, solution architects, support personnel
<i>Maintaining and Troubleshooting Avaya Solutions Platform 130 Appliance</i>	Describes procedures to maintain and troubleshoot Avaya Solutions Platform 130 Series servers.	Sales and deployment engineers, solution architects, support personnel
<i>Avaya Solutions Platform 130 Series iDRAC9 Best Practices</i>	Describes procedures to use the iDRAC9 tools on the Avaya Solutions Platform 130 Series servers.	Sales and deployment engineers, solution architects, support personnel

Related links

[Finding documents on the Avaya Support website](#) on page 46

[Accessing the port matrix document](#) on page 47

[Avaya Documentation Center navigation](#) on page 47

Finding documents on the Avaya Support website

Procedure

1. Go to <https://support.avaya.com>.
2. At the top of the screen, type your username and password and click **Login**.
3. Click **Support by Product > Documents**.
4. In **Enter your Product Here**, type the product name and then select the product from the list.
5. In **Choose Release**, select the appropriate release number.

The **Choose Release** field is not available if there is only one release for the product.

6. In the **Content Type** filter, click a document type, or click **Select All** to see a list of all available documents.

For example, for user guides, click **User Guides** in the **Content Type** filter. The list only displays the documents for the selected category.

7. Click **Enter**.

Accessing the port matrix document

Procedure

1. Go to <https://support.avaya.com>.
2. Log on to the Avaya website with a valid Avaya user ID and password.
3. On the Avaya Support page, click **Support by Product > Documents**.
4. In **Enter Your Product Here**, type the product name, and then select the product from the list of suggested product names.
5. In **Choose Release**, select the required release number.
6. In the **Content Type** filter, select one or both the following categories:
 - **Application & Technical Notes**
 - **Design, Development & System Mgt**

The list displays the product-specific Port Matrix document.
7. Click **Enter**.

Avaya Documentation Center navigation

For some programs, the latest customer documentation is now available on the Avaya Documentation Center website at <https://documentation.avaya.com>.

Important:


For documents that are not available on Avaya Documentation Center, click **More Sites > Support** on the top menu to open <https://support.avaya.com>.

Using the Avaya Documentation Center, you can:

- Search for keywords.
To filter by product, click **Filters** and select a product.
- Search for documents.
From **Products & Solutions**, select a solution category and product, and then select the appropriate document from the list.
- Sort documents on the search results page.
- Click **Languages** (🌐) to change the display language and view localized documents.
- Publish a PDF of the current section in a document, the section and its subsections, or the entire document.
- Add content to your collection using **My Docs** (☆).

Navigate to the **Manage Content > My Docs** menu, and do any of the following:

- Create, rename, and delete a collection.

- Add topics from various documents to a collection.
- Save a PDF of the selected content in a collection and download it to your computer.
- Share content in a collection with others through email.
- Receive collection that others have shared with you.
- Add yourself as a watcher using the **Watch** icon ().

Navigate to the **Manage Content > Watchlist** menu, and do the following:

- Enable **Include in email notification** to receive email alerts.
- Unwatch selected content, all content in a document, or all content on the Watch list page.

As a watcher, you are notified when content is updated or deleted from a document, or the document is removed from the website.

- Share a section on social media platforms, such as Facebook, LinkedIn, and Twitter.
- Send feedback on a section and rate the content.

 **Note:**

Some functionality is only available when you log in to the website. The available functionality depends on your role.

Viewing Avaya Mentor videos

Avaya Mentor videos provide technical content on how to install, configure, and troubleshoot Avaya products.

About this task

Videos are available on the Avaya Support website, listed under the video document type, and on the Avaya-run channel on YouTube.

- To find videos on the Avaya Support website, go to <https://support.avaya.com/> and do one of the following:
 - In **Search**, type `Avaya Mentor Videos`, click **Clear All** and select **Video** in the **Content Type**.
 - In **Search**, type the product name. On the Search Results page, click **Clear All** and select **Video** in the **Content Type**.

The **Video** content type is displayed only when videos are available for that product.

In the right pane, the page displays a list of available videos.

- To find the Avaya Mentor videos on YouTube, go to www.youtube.com/AvayaMentor and do one of the following:
 - Enter a key word or key words in the **Search Channel** to search for a specific product or topic.

- Scroll down Playlists, and click a topic name to see the list of videos available for the topic. For example, Contact Centers.

 **Note:**

Videos are not available for all products.

Support

Go to the Avaya Support website at <https://support.avaya.com> for the most up-to-date documentation, product notices, and knowledge articles. You can also search for release notes, downloads, and resolutions to issues. Use the online service request system to create a service request. Chat with live agents to get answers to questions, or request an agent to connect you to a support team if an issue requires additional expertise.

Related links

[Using the Avaya InSite Knowledge Base](#) on page 49

Using the Avaya InSite Knowledge Base

The Avaya InSite Knowledge Base is a web-based search engine that provides:

- Up-to-date troubleshooting procedures and technical tips
- Information about service packs
- Access to customer and technical documentation
- Information about training and certification programs
- Links to other pertinent information

If you are an authorized Avaya Partner or a current Avaya customer with a support contract, you can access the Knowledge Base without extra cost. You must have a login account and a valid Sold-To number.

Use the Avaya InSite Knowledge Base for any potential solutions to problems.

1. Go to <http://www.avaya.com/support>.
2. Log in to the Avaya support website with a valid Avaya user ID and password.
The system displays the Avaya Support page.
3. Click **Support by Product > Product-specific Support**.
4. In **Enter Product Name**, enter the product, and press `Enter`.
5. Select the product from the list, and select a release.
6. Click the **Technical Solutions** tab to see articles.
7. Select relevant articles.

Glossary

Automatic Call Distribution

A programmable feature at the contact center. Automatic Call Distribution (ACD) handles and routes voice communications to queues and available agents. ACD also provides management information that can be used to determine the operational efficiency of the contact center.

From the perspective of CMS, when you describe “an ACD”, you are describing a Communication Manager system.

Aux-Work

In Avaya Agent and Avaya Agent Web Client, the agent status in which the agent is logged in but unavailable to receive a new contact.

Call Prompting

A switch feature that routes incoming calls based on information supplied by the caller such as an account number. The caller hears an announcement, and the system prompts the user to select from the options listed in the announcement.

Call Work Code (CWC)

An ACD capability using which the agent can enter a string of digits during or after the call and send the digits to CMS for management reporting.

dequeued and abandoned (DABN)

A trunk state in which the trunk quickly becomes idle after the caller abandons the call.

Dictionary

A CMS capability used to assign easily interpreted names to contact center entities such as login IDs, splits/skills, trunk groups, VDNs, and vectors.

direct agent ACD (DACD)

An agent state in which the agent is on a direct agent ACD call.

direct agent ACW (DACW)

An agent state in which the agent is in the after call work (ACW) state for a direct agent ACD call.

direct inward dialing (DID)

The use of an incoming trunk to dial directly from a public network to a communications system without help from an attendant.

entity

A generic term for an agent, split/skill, trunk, trunk group, VDN, or vector.

Expected wait time

An estimate of how long a caller will have to wait to be served by a call center while in queue considering the current and past traffic, handling time, and staffing conditions. Time spent in vector processing before being queued and the time spent ringing an agent with manual answering operation is not included in the Expected Wait Time (EWT) prediction. With an Avaya communication server and CMS, the EWT is a communication server-based calculation.

Expert Agent Selection

A standard feature that bases call distribution on agent skill, such as language capability. Expert Agent Selection (EAS) matches the skills required to handle a call to an agent who has at least one of the required skills.

forced busy (FBUSY)

A trunk state in which the caller receives a forced busy signal.

forced disconnect (FDISC)

A trunk state in which the caller receives a forced disconnect.

Look Ahead Interflow

A switch feature that can be used to balance the call load among multiple contact centers. Look Ahead Interflow (LAI) works with Call Vectoring and ISDN PRI trunks to intelligently route calls between contact centers. With LAI, multiple contact centers can share workloads, expand hours of coverage, and handle calls transparently in different time zones.

maintenance busy (MBUSY)

A trunk state in which the trunk is out of service for maintenance purposes.

Outbound Call Management (OCM)

A set of switch and adjunct features using Adjunct/Switch Applications Interface (ASAI) that distributes outbound calls initiated by an adjunct to internal extensions, which are usually ACD agents.

skill

An attribute that is associated with an ACD agent and that qualifies the agent to handle calls requiring the attribute. An agent can be assigned up to 60 skills. For example, the ability to speak a particular language or the expertise to handle a certain product.

switch

A system providing voice or voice and data communication services for a group of terminals. From the perspective of CMS, a “switch” is an ACD system.

trunk

A telephone circuit that carries calls between two switches, between a central office and a switch, or between a central office and a telephone.

trunk group

A group of trunks that are assigned the same dialing digits, either a phone number or a direct inward dialed (DID) prefix.

Vector Directory Number (VDN)

An extension to the Avaya Aura[®] Communication Manager automatic call distributor that directs an incoming call to a vector. A vector is a user-defined sequence of functions, such as routing the call to a destination, giving a busy signal, or playing a recorded message.

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