SIP Feature Server Deployment Guide

SIP Feature Server 8.1.2

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Table of Contents

SIP Feature Server Deployment Guide

SIP Feature Server works in conjunction with SIP Server and other Genesys components to provide voicemail, device management, and other services.

You can set up multiple Feature Servers to handle load balancing. You can also achieve high availability through an N+1 configuration.

Planning and pre-installation

Plan and prepare your environment.

Known issues and recommendations

Architecture

Hardware and software prerequisites

Deploying

Deploy SIP Feature Server.

Review the configuration options

View sample deployments

SIP Feature Server 8.1.2 known issues and recommendations

This document includes SIP Feature Server issues and recommendations applicable to the 8.1.2 release.

If the group mailbox is full, the *Mailbox is full* prompt is not played when the mailbox is not accessed directly.

If an agent first connects to their personal mailbox and then switches to an available group mailbox, the **Mailbox is full** prompt is not played even if the group mailbox is full. This issue does not occur when the group mailbox is accessed directly.

This issue is fixed in SIP Feature Server 8.1.204.09 and later versions.

(SIPVM-7223)

Radio buttons are accessible in the page displayed at the back of the pop-up window.

In SIP Feature Server GAX Plugin UI, some of the radio buttons are accessible in the page that is displayed at the back of the pop-up window.

Recommended: Do not use the Radio buttons in the page behind the pop-up window when you're working on the pop-up window.

This issue is fixed in SIP Feature Server GAX Plugin UI 8.1.200.97 and later versions.

(SIPVM-7232)

Unable to import or export Calling Profile and Partition Definitions.

SIP Feature Server 8.1.204.03 does not import or export Calling Profile and Partition Definitions from/to a file.

This issue is fixed in SIP Feature Server 8.1.204.09 and later versions.

(SIPVM-7192)

SIP Feature Server version 8.1.203.15 does not support Forward On Busy routing

SIP Feature Server version 8.1.203.15 does not support **Forward On Busy** routing for Users and DNs with voicemail provisioned when Feature Server is connected to Cassandra using the CQL mode.

This issue is fixed in SIP Feature Server 8.1.204.03 and later versions. (SIPVM-7165)

SIP Feature Server Plugin for GAX renders voicemails and greetings with a delay in GAX UI

SIP Feature Server Plugin for GAX version 8.1.200.89 takes a long time to render voicemail messages and greetings in the GAX UI. Typically, each voicemail message and greetings take about 7 seconds to render, therefore the duration to render and list all the messages stored in a mailbox is also longer.

This issue is fixed in SIP Feature Server GAX Plugin 8.1.200.93 and later versions.

(SIPVM-7169)

SIP Feature Server doesn't store voicemail messages if the message size exceeds 5 mb

The size of the voicemail message recorded by SIP Feature Server is limited to 5 mb (typically 6-7 minutes duration) and recording is not stored if it exceeds 5 mb. This limitation exists regardless of a higher duration value set in the **voice-message-max-duration** option.

(SIPVM-7166)

Failure in creating or updating Dialplan partitions or bulk creation of calling profiles with SIP Feature Server 8.1.203.15

An attempt to create or update Dialplan partitions or bulk creation of calling profiles with Feature Server 8.1.203.15 might fail due to incorrect validation of Dialplan rules.

Workaround: Whenever you create or update the Dialplan partitions and face validation issues, reverify the failed partitions by making and reverting a change in the failed partition as given in the following example procedure:

1. In GAX, navigate to the Partition Edit page.
2. Clear the **Active** check box and save the changes.
3. On the same page, select the **Active** check box and then save the changes.

(SIPVM-7149)

Incorrect voicemail message count in GAX if Feature Server is deployed using CQL

When Feature Server is deployed using the CQL connection mode towards Cassandra backend, FS doesn’t provide the correct list of voicemail messages to end users when accessed via the GAX plugin UI. The GAX Plugin UI might display the count of messages as 0 whereas it displays the actual voicemail records on the screen. This issue occurs if the number of messages in a mailbox is equal to or greater than 10. This issue doesn’t affect deployments with Embedded Cassandra or when thrift protocol is used when connecting to Cassandra.

This issue exists in SIP Feature Server 8.1.203.15 and later versions.

(SIPVM-7141)

Feature Server connecting to a non-default port of Configuration Server / Configuration

Server Proxy during switchover

Despite the Feature Server's configuration to connect to a non-default port of Configuration Server / Configuration Server Proxy when the original primary connection drops, FS tries to connect to the default port of backup Configuration Server instance. This might lead to a failure to reconnect to the backup instance of Configuration Server if target and default ports have different settings (for example, secure vs non-secure).

Workaround: Ensure you configure SIP FS to connect to the default port of Configuration Server.

This issue exists in SIP Feature Server 8.1.202.42 and later versions.

(SIPVM-7134)

Dialplan switch page does not load in SIP Feature Server GAX Plugin UI if Switch Name has space.

If Switch Name is created with space then SIP FS GAX Plugin UI cannot load the Dialplan Switch page which doesn't allow modifying the default Dialplan calling profile.

Workaround: Create Switch Name without any space.

This issue is fixed in SIP Feature Server GAX Plugin 8.1.200.93 and later versions.

(SIPVM-7130)

SIP Server doesn't support TLS on Dialplan connections.

In SIP Feature Server version 8.1.203, FS Dialplan does not open secure port and ignore the server-side security settings by default even when Feature Server is configured to use secure connections and use secure server ports. This is to allow secure connections toward all Genesys backend servers when Dialplan is used in Feature Server. If TLS port is forced on Dialplan side, it will enable secure server port but SIP Server won't be able to connect to FS Dialplan.

(SIPVM-5686), (SIPVM-7067)

No retention limit can't be set when the limit option is configured in days

Workaround When using GAX to set retention limits for voicemail profiles, operation can fail when selecting "no limit" option, while retention is measured in days. When retention period specified in seconds then selecting "no limits" option will succeed. (SIPVM-6932)

SIP Feature Server is unable to connect to GAX Plugin

When SIP Feature Server starts in offline mode (no access to internet) and attempts to connect to GAX Plugin, an exception error is displayed. This issue occurs because of incorrectly referenced tiles in template, that is, template DTD (tiles 2) instead of the latest SIPFS tile, that is, tiles 3.

This issue is fixed in SIP Feature Server 8.1.200.83 and later versions.

(SIPVM-6841)

Limitation in usage of hyphen in HOSTNAME

SIP Feature Server doesn't parse the environment variable **HOSTNAME** if it contains '-' (hyphen) and it crashed during initialization.

Workaround: Genesys recommends not to use '-' (hyphen) in **HOSTNAME**. (SIPVM-6873)

Limitation on JDK version with four parts

SIP Feature Server will not start if the JDK version number comprises of four parts, for example, 11.0.14.1.

Workaround: Upgrade and/or downgrade to the base JDK version that comprises of three parts, for example, 11.0.18 (latest JDK version with three parts). (SIPVM-6822)

SIP Feature Server doesn't start due to an exception caused by jnr-*.jar files

SIP Feature Server might not start on some hosts after initial deployment or upgrade from previous version. In such scenarios, the logs contain the following exception error: **Std 09900 Exception java.lang.NoSuchMethodError: jnr.ffi.Platform.getStandardCLibraryName()Ljava/lang/String;**

Workaround: In the **<installation folder>/work directory**, locate and remove the **jnr-*.jar** files, and restart the application. (SIPVM-6714)

Memory leakage in SIP Feature Server

Memory leakage was observed in SIP Feature Server 8.1.202.35 when Prometheus metrics is queried. This issue is fixed in SIP Feature Server 8.1.202.46 and later versions. (SIPVM-6770)

SIP Feature Server will not support the older version of OpenJDK 8

SIP Feature Server will not start with older versions of OpenJDK 8. The use of latest version of OpenJDK 8 is recommended. (SIPVM-6665)

SIP Feature Server will not support Amazon Corretto OpenJDK 11

To start SIP Feature Server, download and configure this version of OpenJDK 11: https://jdk.java.net/java-se-ri/11. (SIPVM-6662)

Call Forwarding on `No answer` doesn't work for external numbers

Call Forwarding on `No answer` when called using the external number given for an **Agent DN** will not work. This issue exists in SIP Feature Server 8.1.202.00 and later versions. (SIPVM-6468)

Default rate limit value not applied when the values of request-rate-dm, request-rate-vm, and request-rate-gax options are set to alphabet, special characters, Boolean, or negative numbers in SIP Feature Server 8.1.202.40

When you use the 8.1.202.40 version of SIP Feature Server, the default rate limit value is not applied to SIP Feature Server when the options **request-rate-dm**, **request-rate-vm**, and **request-rate-gax** are set to alphabet, special characters, Boolean, or negative numbers. SIP Feature Server can process greater number of DM, VM, GAX requests than their respective default values. When set to a negative value, the rate limit is reached for requests lesser than the default value. (SIPVM-6480)

Difficult to navigate all the mailboxes in the list from the home screen.

When you view accounts that has huge number of mailboxes assigned to it, it is difficult to view all the mailboxes in the list from the home screen.

Workaround: For these accounts, Genesys recommends to view their mailboxes from the **User profile** screen or search for a particular mailbox by typing its number in the **Search** field on the **Mailboxes** screen. (SIPVM-6401)

SIP Feature Server's UI has been deprecated from version 8.1.201.83

SIP Feature Server's UI has been deprecated from version 8.1.201.83 dated 09/14/16, and is not supported any further. Therefore, all administrative tasks must be performed using GAX.

Radio button options do not work in SIP Feature Server GAX Plugin UI when you use GAX 9.0.100.XX or later versions

When you use the 8.1.200.83 version of SIP Feature Server GAX Plugin with GAX version 9.0.100.XX or later versions, you cannot select any radio button option that is available in the SIP Feature Server Plugin User Interface. (SIPVM-6135)

Check box fields will not be visible in SIP Feature Server GAX Plugin UI when you use GAX 9.0.100.XX or later verions

When you use the 8.1.200.83 version of SIP Feature Server GAX Plugin with GAX version 9.0.100.XX or later versions, the check box fields that are provided for overriding the existing data during Bulk Upload/Bulk Assignment operations will not be visible in the SIP Feature Server Plugin User Interface. (SIPVM-6136)

Voicemail retrieval cannot be performed using PSTN network

Agents seated outside SBC cannot access the mailbox when they try to access or retrieve the voicemail through PSTN network. The call gets disconnected because PSTN number cannot be resolved by SIP Feature Server. Therefore, retrieving voicemail from remote telephone does not work. (SIPVM-6109)

SIP Feature Server cannot connect to the Configuration Server after switchover

When the Configuration Server is switched over or when the primary server is down, SIP Feature Server cannot connect to the backup Configuration Server. Therefore, the configuration objects that are created, updated, or deleted at that time are not reflected in SIP Feature Server. This issue occurs for SIP Feature Server versions from 8.1.202.20 to 8.1.202.23. This issue is fixed in SIP Feature Server 8.1.202.24 and later versions. (SIPVM-5988)

Feature Server plugin versions that support GAX version 8.5.260.xx or later

The following Feature Server plugins support GAX version 8.5.260.xx or later:

- Genesys SIP Feature Server Plugin for GAX 8.1.200.83 or later
- Genesys SIP Feature Server Device Management GAX Plugin 8.1.200.63 or later

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The fs-nodetool-utility module is not included in the 8.1.202.21 and 8.1.202.22 versions

The **fs-nodetool-utility** module is not included in the 8.1.202.21 and 8.1.202.22 versions of SIP Feature Server. Therefore, the **nodetool** command cannot be run when secure connection is enabled for Cassandra JMX port. To work around this issue, add **fs-nodetool-utility.jar** from previous versions, manually, and run the required commands.

SIP Feature Server is unable to connect to the configuration server

SIP Feature Server is unable to connect to the configuration server using auto-upgrade port when TLS support is enabled in the 8.1.202.20 version of SIP Feature Server. To work around this issue, use only the secure port when TLS support is enabled.

LastUpdateID displays null value

Sometimes, **LastUpdateID** in the Cassandra DB displays `null` value because of which the connection between SIP Feature Server and Configuration Manager or SIP Server fails. As a workaround, the reimport process must be run to reconfigure **lastUpdateID**. This workaround is applicable only for 8.1.202.17 or earlier versions of SIP Feature Server.

(SIPVM-5690)

Feature Server will not retrieve voicemail deposited in G729 codecs for 8.1.202.13 or previous versions

When you try to retrieve the voicemail that is deposited in G729 codecs for 8.1.202.13 or previous versions of Feature Server, the following exception will be thrown:

```
Unsupported audio file
```

(SIPVM-5524)

Issues in removing obsolete DNs that are assigned to an Agent

After reimporting Configuration Objects and then while removing obsolete configuration entities, an attempt to remove the obsolete DNs, which are statically assigned to an Agent, from the Cassandra database fails. The issue occurs only during reimport. (SIPVM-4723)

Issue in upgrading the device firmware using GAX

In DHCP based provisioning, the AudioCodes phones download the firmware from the URL configured in the 66/160 option. Therefore, the **fs_url** option in the **[DM]** section does not take effect for Audiocodes firmware upgrade.
(SIPVM-3614, Fix version: Feature Server: 8.1.201.63, DM-GAX plugin 8.1.200.38)

Null pointer exception during Feature Server History Log synchronization

When you delete a DN or an Agent Login from the configuration environment when Feature Server is down then a null pointer exception occurs when you restart Feature Server for History Log synchronization. (SIPVM-4563)

Workaround to handle incorrectly updated device in versions 8.1.201.65 or older

When a DN that is assigned to a device is deleted from the configuration environment by using GA/GAX, then the DN remains associated with the device. This issue applies to Feature Server versions 8.1.201.65 or older. (SIPVM-3672, SIPVM-3616, SIPVM-4176, SIPVM-4285)

Workaround
Upgrade to the latest Feature Server version, delete the associated device from Feature Server and provision the device again.

Feature Server upgrade from Jetty7.4 to Jetty7.6 has issues

After upgrading SIP FS from FS (running with Jetty 7.4) to FS (running with Jetty 7.6), the FS GAX Plugin displays `Access Denied`, and attempts to access the FS GAX UI return HTTP `error 500`.

Workaround Remove the old-version jar `org.apache.jasper.glassfish_2.1.0.v201007080150.jsp` from the *<fs-installation-path>*`/lib` directory and restart Feature Server.

To fully correct the issue: Upgrade to the latest FS (running with Jetty v9). The Feature Server from version 8.1.201.86 runs using Jetty v9. (SIPVM-4235)

Upgrade Feature Server from English (ENU) to International (INT) and vice versa in Windows

The setup for Feature Server version 8.1.201.87 for Windows does not recognize the previous Feature Server versions, and as a result, the maintenance update does not occur. Genesys recommends that you install version 8.1.201.88 to correct—or to avoid—this limitation. FS version 8.1.201.88 for Windows recognizes the previous Feature Server versions except 8.1.201.87. Use the following procedure to upgrade to/from version 8.1.201.87.

1. Back up the **cassandra_home** directory, including the **\etc** subdirectory.

2. Note the `cassandra_home` parameter in `launcher.xml` at the current location.
   Note: The "current location" is the location of the previously installed FS version that you are replacing.
3. Run **Setup.exe** from the 8.1.201.88 IP (the new version that you are installing).
   a. When prompted, enter the Configuration Server host/port and user name/password.
   b. Select the Feature Server Application object to be upgraded.
   c. When prompted, enter a new location that is different from the current location.
      Note: The "new location" is the location of the latest FS version that you are installing (8.1.201.88).
   d. Type the Cassandra path as it is specified in the **cassandra_home** parameter of the current **launcher.xml** (Refer Step 2).
4. After installing, restore/replace the files located in the **cassandra_home\etc** directories that you backed up in step 1.
5. Copy the **launcher.xml** file from its current location to the new location.
6. Copy the **\resources** directory from its current location to the new location.
7. Copy the **keystore** file from the current **FS\etc** directory to the new **FS\etc** directory.
8. In the new deployment, verify that:
   a. The Feature Server application object has its new version and working directory.
   b. **launcher.xml** contains the `cassandra_home` parameter (Refer Step 2).
   c. The file **\cassandra_home\etc\cassandra.yaml** has the same entries as before. Verify by comparing the new **cassandra.yaml** to the backed-up version (Refer Step 1).
   d. The **cassandra-topology.properties** file is in the new **\resources** directory—if the NetworkTopology strategy is being used.
   e. Check and adjust the SSL configuration as described on the Start SIP Server page, under the heading **Jetty 9 configuration**.
9. Stop Feature Server from Solution Control Interface (SCI) or Genesys Administrator (GA).
10. Start Feature Server from SCI or GA.

(SIPVM-4259)

Important upgrade step

If you are upgrading from a restricted release of SIP Feature Server 8.1.2 (any version prior to 8.1.200.83), you must manually restore the vms_host parameter, as follows:

1. Open `launcher.xml`.
2. In the vms_host section, in the line <format type="string" default="localhost" />, replace "localhost" with "0.0.0.0" or a specific IP address to restrict Feature Server web application access to that address.

If you are doing a fresh installation or upgrading from 8.1.200.83 or later, you can omit this step.

Synchronization of history fails in non-master Feature Server sites

Synchronization fails following creation / modification / deletion of Switch objects in non-master sites where all the Feature Servers in that site is down, even after all of the site's Feature Servers have been started up again.
Workaround Run the Reimport procedure to perform synchronization of those missing switch objects.

(SIPVM-3953)

Permissions Issues Trigger CFGHistoryLogExpired Error

Modifying objects in Configuration Manager when Feature Server is down can trigger a `CFGHistoryLogExpired` error in the Feature Server log, due to permissions issues—even if the number of changes is below the history log max-records limit.

(GCLOUD-6067)

Agent Login Incorrectly Deleted

When an Agent Login is assigned to an Agent/User and the Agent/User is being deleted in CME, Feature Server incorrectly deletes the Agent Login from the Cassandra database.

(SIPVM-3847)

Agents Not Logged Out

Agents are not logged out from Audiocodes/Genesys phones if the corresponding line is removed. Recommendation: Do not delete the line before logging out the agent.

(SIPVM-3619)

Mailbox Counters Show Incorrect Value

Mailbox counters show an incorrect value while a user performs Voicemail operations.

(SIPVM-3425)

Omit punctuation from DNs

Feature Server does *not* ignore punctuation such as commas, brackets, periods in a DN. For example, the dialing instruction in `{"instruction": "Dial(2,555)", "priority": 1}` is read as `"Dial (2)"` because of the comma following the 2. Do not include punctuation in a DN when creating or sending dialing instructions to Feature Server.

(SIPVM-1021)

Install plugin upgrades as new

The new versions of Genesys SIP Feature Server Plugin for Genesys Administrator Extension and

Genesys SIP Feature Server Device Management GAX Plugin must be installed as new—the current upgrade process does not succeed.

Workaround

Uninstall each plugin first. Then install each new version as a new product.

Important: If uninstalling the older plugin versions does not remove the `.jar` files from the directory `<GAX Installation Directory>\plug-ins`, then you must remove them manually before installing the latest versions of the plugins.

(SIPVM-3566)

If you create a profile with time zone configuration in version 8.1.201.54 or earlier, and then upgrade the Feature Server to version 8.1.201.55 or later, further operations in Device Management may fail after the upgrade.

Workaround:

Reconfigure the time zone in the existing profiles.

(SIPVM-3579)

Device management: Polycom phones

- Polycom VVX phones only: When upgrading from Polycom firmware 5.0.0 to 5.0.1, set the Firmware Upgrade Timeout to `30`.
- When Automatic Call Distribution (ACD) is enabled:
  - Polycom SoundPoint phones with firmware version 4.1.0 or 4.1.1 become unresponsive on agent login.
  - Polycom SoundPoint phones with firmware version 4.0.8 or lower do not display Not Ready reason codes.
  - See Supported Hard Phones to determine the best firmware version for your phones.

(SIPVM-3255)

Multisite: Calls not forwarded between sites

In a multisite environment, users cannot set call forwarding from one site to another. (SIPVM-3430)

Workaround

Set the forwarding profile to enable external destinations, and then try to forward to the external version of an internal number: 800-555-7003, for example, rather than 7003.

Changes to call forwarding settings are sometimes ignored

If an agent sets call forwarding from their agent desktop application, such as Workspace, that setting

immediately synchronizes to Feature Server. However, changes to call forwarding settings on Feature Server made through the GAX-based UI are not synchronized back to SIP Server. SIP Server retains the previous forwarding settings, resulting in unexpected behavior. (SIPVM-3409)

Workaround

Have agents choose only one location to set and change forwarding: either their agent desktop application, or the Feature Server UI.

Changing a forwarding profile needs page refresh

After the selection of a new forwarding profile for a user, the User Properties page might not reflect the change. (SIPVM-3383)

Workaround

Refresh the browser page to view the proper settings for that profile.

Do not rename switches

Renaming a switch causes Feature Server to treat the switch as a new switch, creating duplicate data in Cassandra. Do not rename any switch.

Device management: Firmware upgrades

- Firmware upgrades initiated for a device may fail if the upgrade timer expires during a call.
- In business continuity deployment, a peer site cannot upgrade the firmware of phones belonging to the original site.
- If Feature Server terminates during a firmware upgrade, and the firmware upgrade completes after Feature Server is running again, the firmware version and upgrade status are not properly updated.
  Workaround

  Resync or restart the device to correctly update the Device Firmware version and upgrade status.

Device management: Audiocodes SBC

Provisioning of multiple lines on a device behind an Audiocodes SBC may not work correctly. (SIPVM-3392)

Workaround

Use an Audiocodes SBC version 6.80A or later.

Device management: Bulk assignment

You cannot use bulk upload to overwrite a device by interchanging the DNs. (SIPVM-3338)

Device management: Synchronization

- A re-enabled device can fail to synchronize for up to an hour, until the periodic request is sent for the configuration file. (SIPVM-3330)

  Workaround

  After enabling a disabled device, an administrator can restart the device manually for immediate effect.

- When an assigned DN is disabled and then deleted in Genesys Administrator, synchronization of the device cannot occur until the device is rebooted.

Device management: Yealink phones

- You can disable and enable only phones that are updated to firmware 34.72.0.20 or later. (SIPVM-3401)
- In a Business Continuity environment where one site is inoperative, ACD agents using Yealink phones cannot log in. (SIPVM-3285)
- When you disable Call Forwarding using the Feature Server device profile **Call Settings**, phone users can still forward calls from Yealink phones.

Device management: Agent login

ACD agents cannot effectively log in from multiple devices. The device accepts their credentials, but their only option is to log out. (SIPVM-3267)

Device management: LDAP

- Genesys and AudioCodes phones: users cannot use the Number Attribute to search LDAP directories. (SIPVM-3218)
- Active Directory (LDAP) is not supported for Yealink Model T-20.
- To use LDAP, Polycom phones with firmware versions below 4.x require an appropriate license.

Notifications: Firefox formatting

Notifications: in the Firefox browser, the email and web message bodies do not retain line breaks. (SIPVM-3001)

Device management: IVR Provisioning

High availability for IVR provisioning is not supported. For example, if Feature Server terminates during IVR provisioning, the administrator must re-provision the phone.

Device management: HTTPS

AudioCodes phones do not require CA certification configuration for Hypertext Transfer Protocol Secure (HTTPS) support.

Feature Server and GAX Server synchronization

You must always keep Feature Servers and GAX Servers synchronized within one second.

Keep one Feature Server instance running at all times

To avoid discrepancies between the Cassandra and Configuration Server databases, keep at least one Feature Server with active confSync running at all times.

Upgrade steps

If you are running the Feature Server-based dial plan, to upgrade your environment from 8.1.200.88 to 8.1.201.xx you must take the following actions:

1. Run the Voicemail Enabled migration script.
2. A user setting of Unconditional Forwarding in 8.1.200 sets an empty value for Forward All Calls To; all calls automatically go to voicemail. You must add the voicemail access number to Forward All Calls To. (SIPVM-2320)
3. If the switch-level forwarding options in 8.1.200 were set to `Voicemail`, after upgrade these values are `System (Voicemail)`. The administrator must set custom values at the switch level for Forwarding On Busy and Forwarding On No Answer, save the values, then reset those values to `System (Off)`. (SIPVM-2315)

Feature Server GAX Plug-in does not support HTTPS

Feature Server GAX Plug-in does not support HTTPS URLs. (SIPVM-2852)

Workaround

Specify only http URLs as values for the **fs_urls** configuration option.

Multiple data center environment: exception occurs in nodes during startup

During the initial startup of a multiple data center environment, a `TokenRangeOfflineException` occurs, with a log message "[Voicemail] Failed to read mailbox". The cause is a **voicemail-quorum** configuration option value of `true`. (SIPVM-2840)

Workaround

When you first start Feature Server in a multiple data center environment, set the **[VoicemailServer]voicemail-quorum** configuration option value to `false`. After startup is complete, reset the value to `true`.

Master Feature Server can wait indefinitely for other nodes to start

After the master Feature Server starts, it sometimes waits indefinitely in the initializing state, waiting for other nodes to be started so it can retrieve all system data about the Cassandra cluster.

Workaround

If the master Feature Server is waiting at the initializing state, start the other Feature Server nodes in the Cassandra cluster.

Too many non-functioning Cassandra nodes can lead to inconsistent data

In a multi-node environment, if the option **voicemail-quorum** = `true` and the number of non-functioning Cassandra nodes is greater than or equal to the calculated quorum value (**replication_factor**/2 + 1, rounded down), Feature Server may return MWIs with incorrect counts, because not enough nodes are available to apply Cassandra Read /Write Consistency policies.

Workaround

Do not take multiple Feature Server instances offline at one time.

Installation on Windows 2012

Before attempting to install Feature Server under Windows 2012, verify that you have the latest Feature Server 8.1.201.xx installation package (IP) or CD. Open the IP Readme located on your CD or IP. If the Readme does not list Windows 2012 support, then you must obtain the latest Feature Server 8.1.201.xx IP.

Cassandra cluster outages can cause data synchronization issues

If the Cassandra cluster is not operational at all times, data synchronization-related issues in Feature Server instances can occur. (SIPVM-2280)

Forwarding On Busy or No Answer: calls not depositing voicemail to original mailbox

When a user or DN has Forwarding On Busy enabled (On), callers are unable to deposit voicemail into the mailbox of the user or DN they originally called. When Forwarding On Busy or No Answer is set to EXTERNAL_PUBLIC, the call does not return to the original mailbox. (SIPVM-2135)

Non-agents are incorrectly having mailboxes created automatically

In a standalone deployment, non-agents are incorrectly having mailboxes created automatically during initial import and real-time synchronization of data into Cassandra from Configuration Server. (SIPVM-2134)

Calls to agents with multiple mailboxes are sent to the first associated mailbox

When a person is statically associated to two agent logins, each of which has its own mailbox configured, all calls are sent to the first associated Agent Login mailbox. (SIPVM-2124)

Use IP addresses

Use IP Address or local host name, not FQDN, to access the Web application. FQDNs can cause unexpected logouts.

Group Mailbox Administrator privileges

Only users with the Group Mailbox Administrator role can use the web application or TUI to upload or change greetings and passwords.

When the network is disabled on the host on which Feature Server is running, Windows may terminate unexpectedly

Windows may terminate unexpectedly if the host on which Feature Server is running is removed from the network by clicking `Disable` from the Windows `Local Area Connection` dialog box. (SIPVM-1333)

Workaround

Stop Feature Server before disconnecting the network.

Message priority is not being considered during retrieval

The message priority selected during a call deposit is not taken into consideration during voicemail retrieval. (SIPVM-1248)

TUI: mailboxes are accessible only with mailbox credentials

In the Telephone User Interface (TUI), User and Group mailboxes can be accessed only with mailbox credentials (mailbox number). DN, agent, and user credentials to access mailboxes is not supported. (SIPVM-859)

Planning and pre-installation

Before installing and configuring SIP Feature Server, you must plan your environment and install required hardware and software.

In your planning, you must:

- Meet hardware and software prerequisites such as operating system, hardware, and Genesys and third-party components.
- Review the current known issues and recommendations for this release.

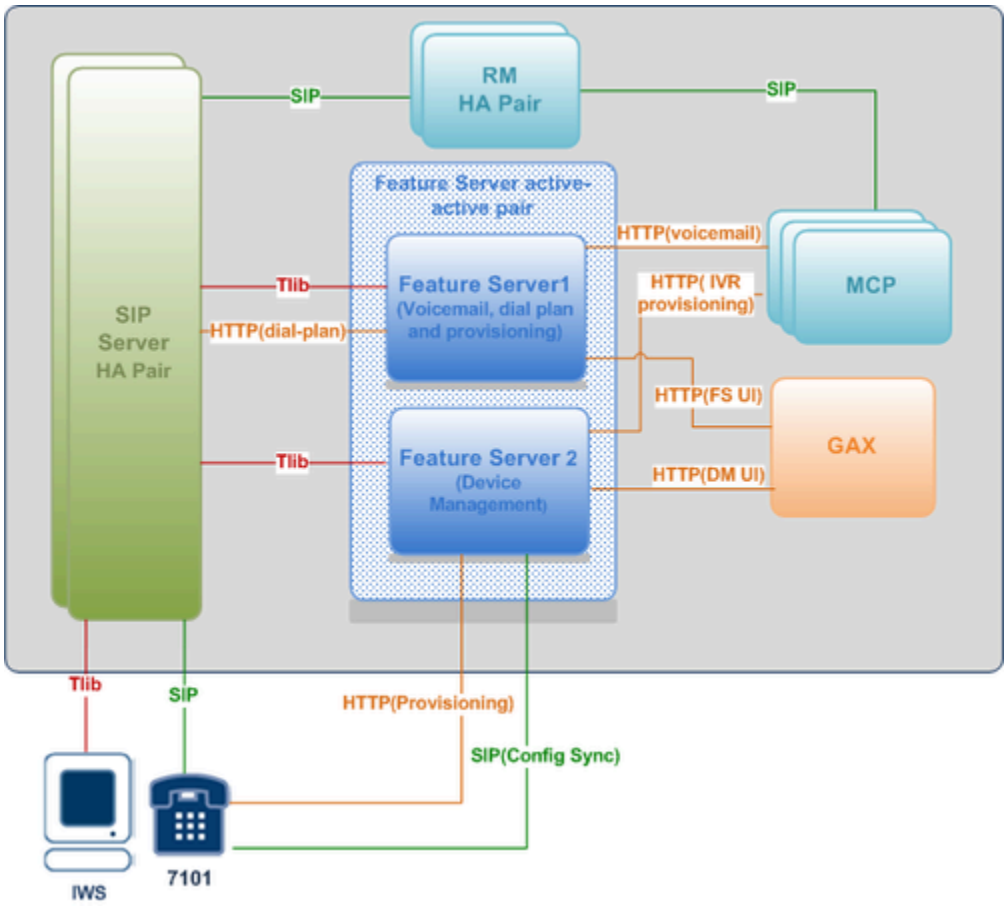
Architecture

SIP Feature Server provides a scalable, load-balanced architecture that enables you to add Feature Server instances as your needs expand. A Cassandra-based data cluster maintains data consistency and performance across all instances.

Deployment options

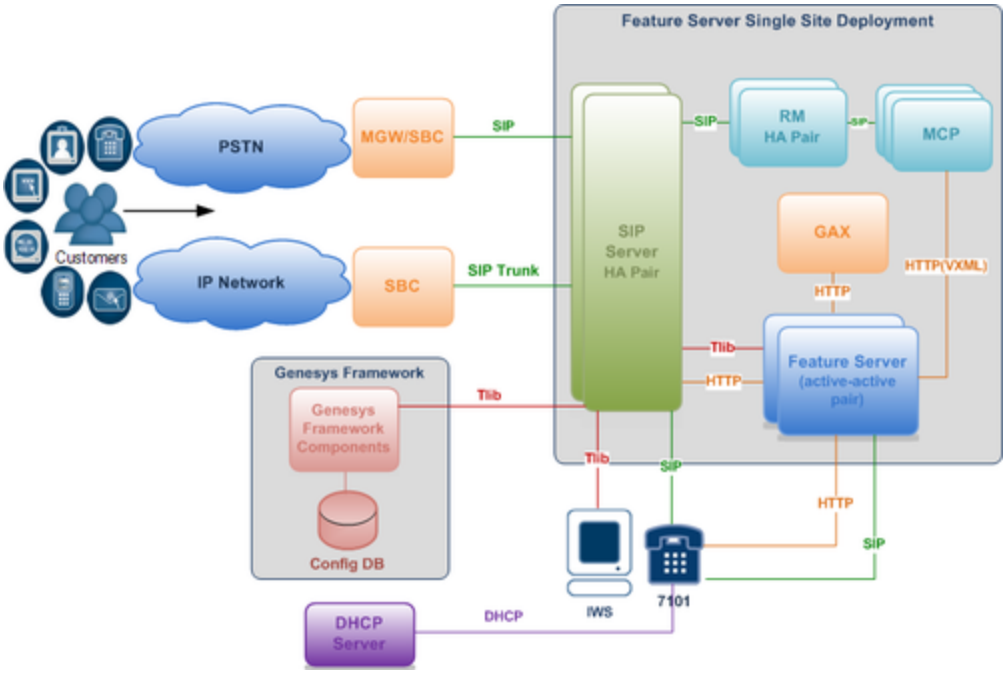
Standard Feature Server deployment includes a High Availability (HA) installation with a SIP Server pair and at least two Feature Servers, one primarily dedicated to voicemail, dial plan, and provisioning, and the other to device management. Multi-site (multi-switch) deployments replicate that basic structure for each switch. Business Continuity adds a further layer of reliability.

You can use these sample deployments as a model for your chosen deployment option.



Core Feature Server architecture

Single-site deployment

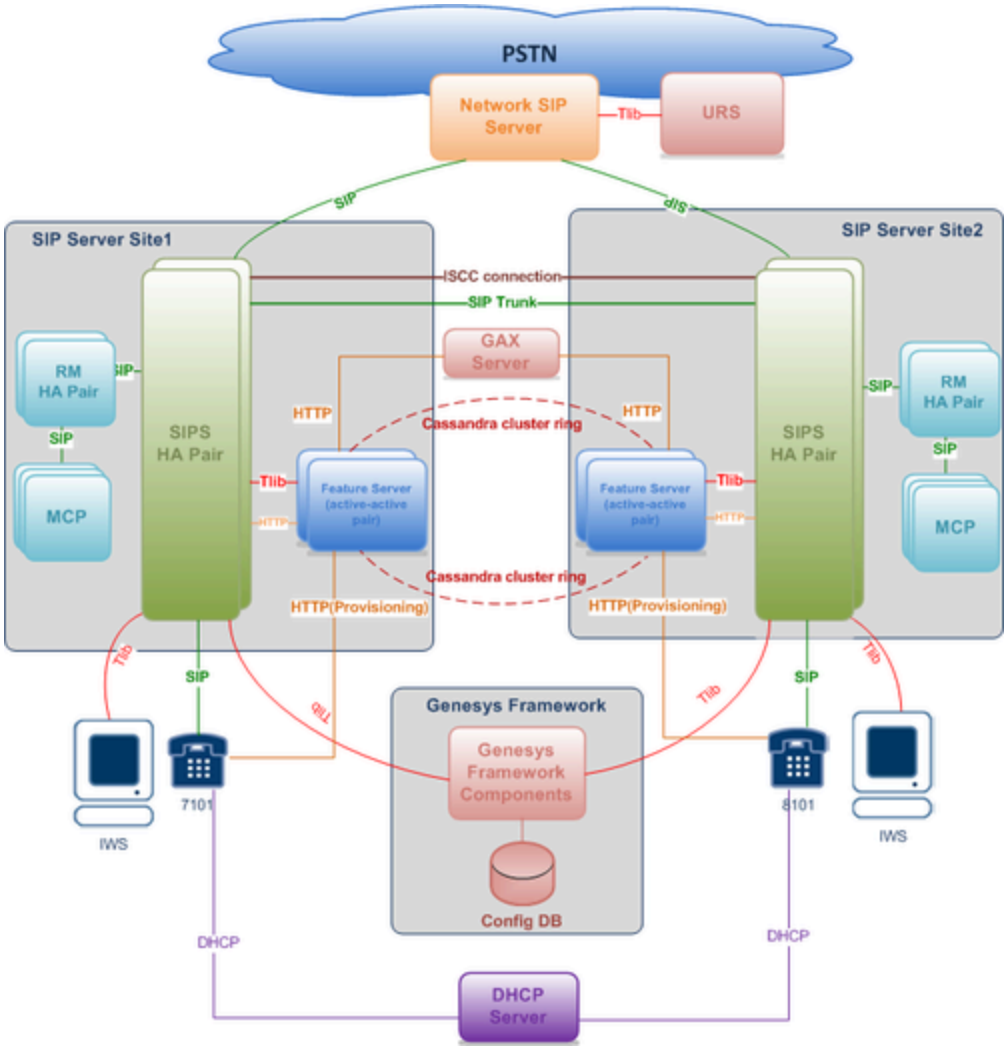


Standard single-site Feature Server architecture

Each Feature Server connects to only one SIP Server, but all Feature Servers use a common Cassandra cluster that sites can share, enabling any user to access voicemail from any site. Further, because all the Feature Server nodes share the same Cassandra database, if one Feature Server is down, the other Feature Servers can operate without loss of functionality.

To learn more about SIP Server HA deployment, see SIP Server 8.1 High-Availability Deployment Guide.

Multi-site deployment



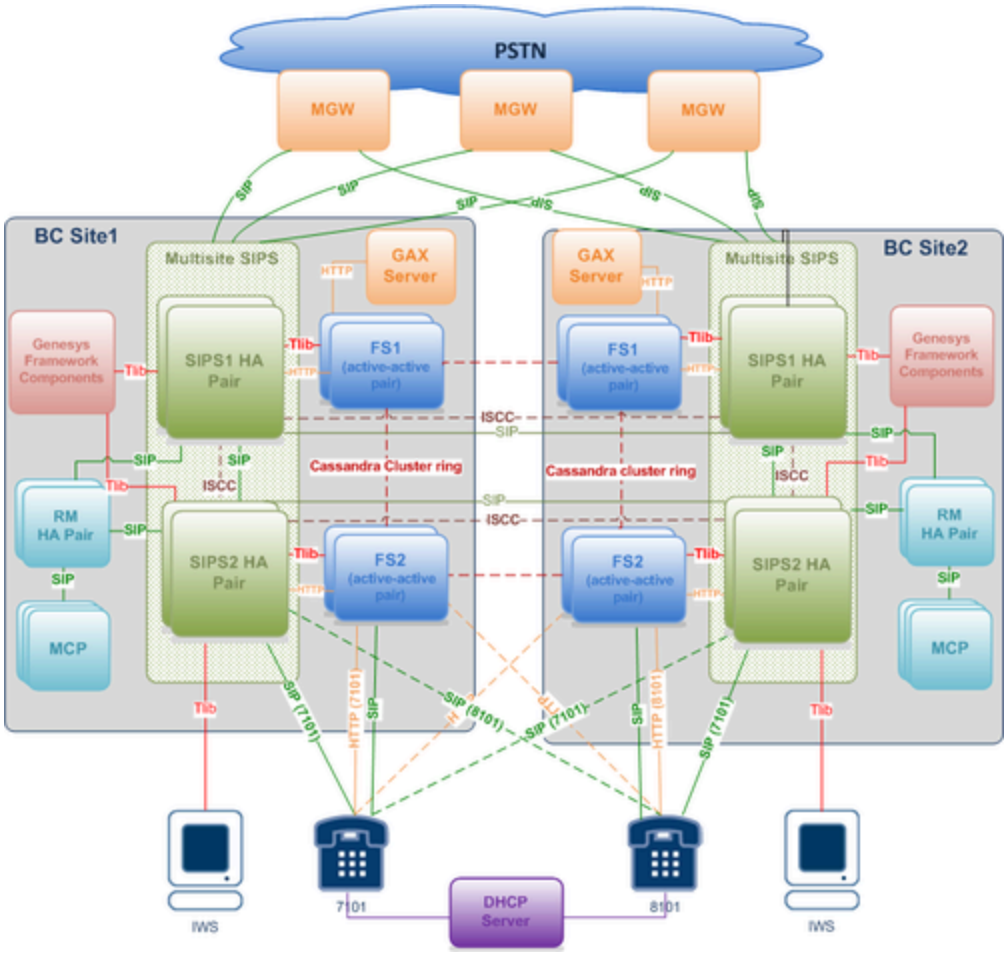
Standard multi-site Feature Server architecture

You can deploy SIP Feature Server across multiple data centers, in an active-active configuration. Feature configuration is the same for both multi-site and single-site deployments.

You can install Feature Server in a multi-tenant framework, but each Feature Server deployment can service only a single Tenant.

Business Continuity deployment

Business Continuity provides the ability for a group of agents to continue offering critical business functions to customers in the event of a loss of all Genesys components running at a particular site. Specifically, phones can connect and be administered on either site when the other is inoperable.



Feature Server Business Continuity architecture

> **Important**
>
> Business Continuity deployments do not support IVR provisioning.

Feature Server Business Continuity deployment begins with a SIP Server Business Continuity deployment, then adds the standard Feature Server multisite deployment. Each site acts as the backup for the other.

Business Continuity deployment requires you to create at least one device profile for each site. You then specify Business Continuity settings for each profile.

Provisioning and dial plan setup

Initial program configuration occurs primarily in Genesys Administrator (GA). You can create users, DNs, and mailboxes only in GA. To set up your dial plan, a highly configurable set of call disposition

patterns, you can select either of two methods:

- the Feature Server plug-in for Genesys Administrator Extension (GAX)
- the existing SIP Server methodology, using GA

Administrators can also use the Feature Server GAX plug-in to provision users, devices, voicemail, and call settings.

> **Important**
> A Feature Server's dial plan URL must be configured only on a VOIP Service DN that was created on the Switch controlled by the SIP Server that is connected to that particular Feature Server. Step 2 in Configure SIP Server for Feature Server describes creating the VOIP Service DN.

Voicemail

SIP Feature Server combines with Genesys Voice Platform (GVP) and SIP Server to handle voicemail tasks.

The Feature Server GAX plug-in and the Telephone User Interface (TUI) enable users to specify mailbox settings and manage their voicemail.

> **Important**
> A single Feature Server GAX Plugin cannot serve multiple tenants.

Device management

The Device Management GAX Plug-in provides an administrative interface for provisioning and management of SIP phones, including extension assignment, standard and custom configuration, firmware updates, and IVR provisioning. Feature Server supports phones behind SBCs and firewalls.

Data management

> **Important**

> Beginning with SIP Feature Server version 8.1.203.XX, the **Embedded Cassandra cluster** mode is being deprecated and the feature will be completely removed in future versions.

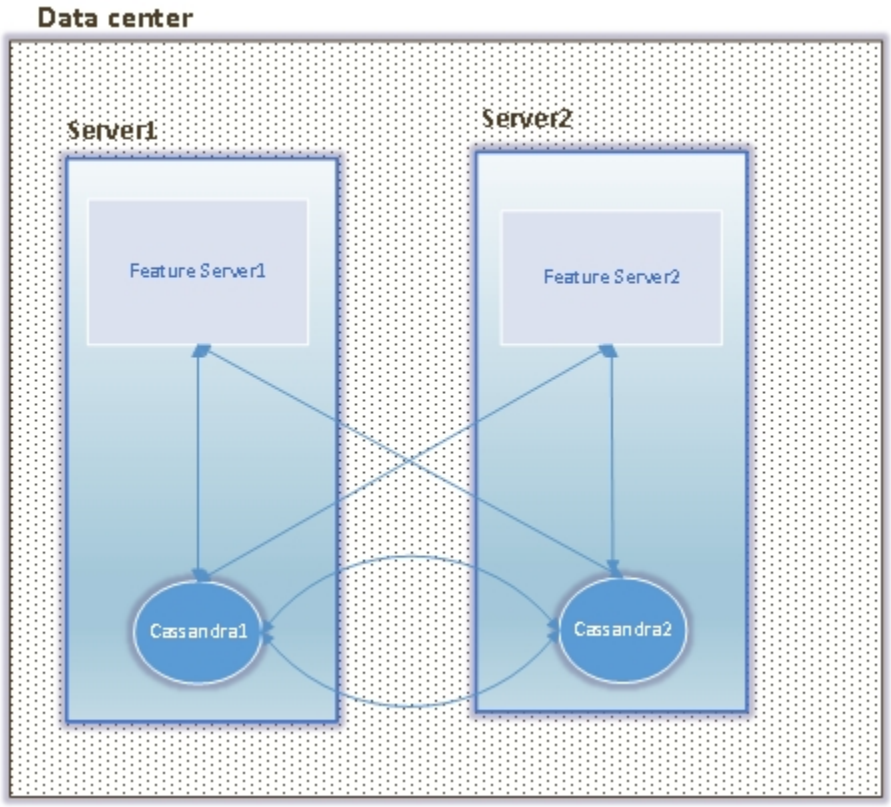
SIP Feature Server uses Apache Cassandra data clusters to replicate data across the environment, achieving scalability and high availability. Feature server supports the Co-located/External Cassandra cluster mode.

In co-located/external Cassandra cluster:

1. Cassandra must be installed and configured separately.
2. SIP Feature Server supports Cassandra version 2.2.8 or higher.
3. SIP Feature Server does not control Cassandra monitoring tasks such as start, restart, or stop. This control is performed separately.
4. SIP Feature Server supports secure connection with Cassandra.

Co-located Cassandra cluster

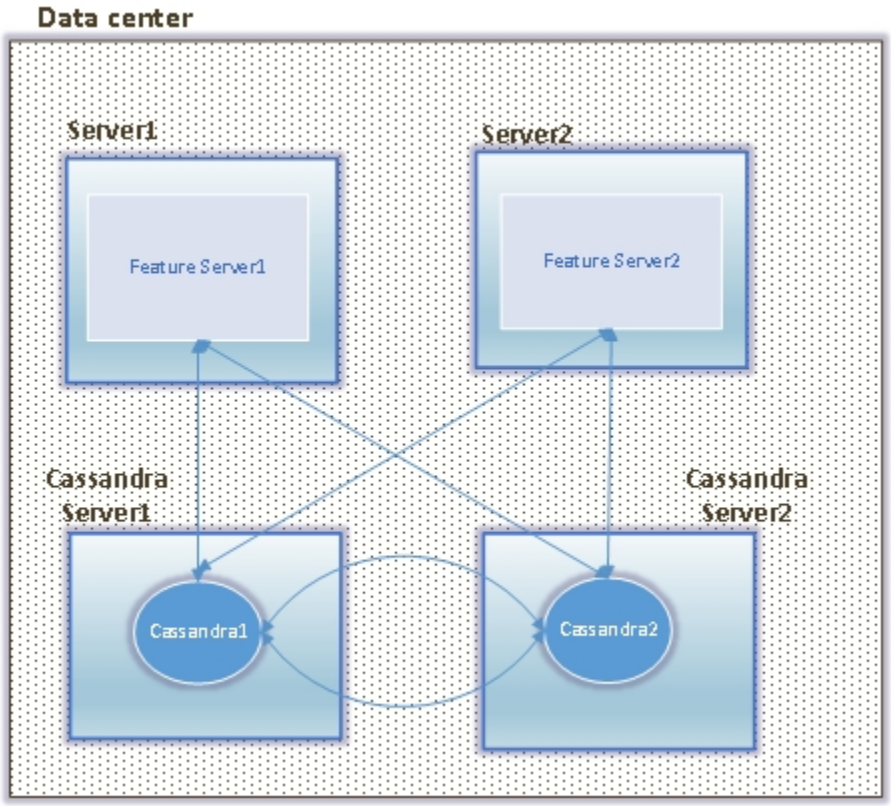
In the Co-located Cassandra cluster mode, Cassandra is deployed separately but in the same host where SIP Feature Server is deployed.



SIP Feature Server with co-located Cassandra cluster

External Cassandra cluster

In the External Cassandra cluster mode, Cassandra is deployed separately and in a different host.



SIP Feature Server with external Cassandra cluster

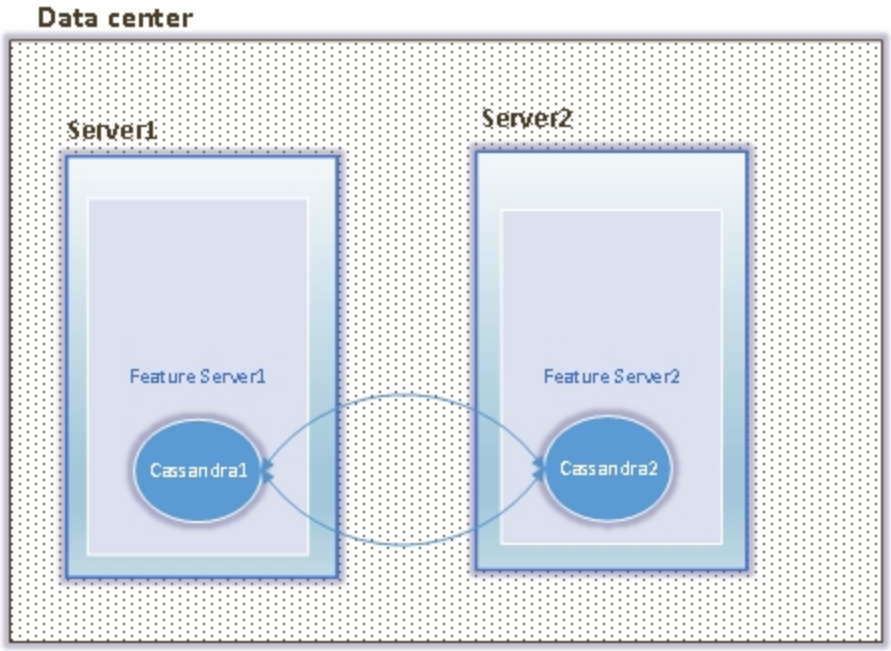
Legacy Cassandra Cluster Deployments

Legacy Cassandra cluster deployments include Embedded Cassandra cluster which is being deprecated and it will not be supported in future versions. If your deployment model involves embedded Cassandra cluster, Genesys recommends to migrate your data with other Cassandra cluster deployments such as Co-located or External Cassandra clusters.

In the Embedded Cassandra cluster deployment:

1. SIP Feature Server uses its own embedded Cassandra and Cassandra is not required to be installed separately.
2. Cassandra starts when SIP Feature Server is started.
3. SIP Feature Server supports Cassandra monitoring and maintenance.

The SIP Feature Server installer deploys the embedded Cassandra cluster.



SIP Feature Server with embedded Cassandra cluster

Hardware and software prerequisites

Before you install Feature Server, ensure that your system is equipped with the hardware, software and other related requirements detailed in this section.

Hardware

The following table lists the hardware requirements:

Category	Prerequisite
Host	Install Feature Server on its own dedicated host, unless you are deploying to a small or lab environment. Do not co-locate any other applications on this host.

Operating system	To view supported operating systems, see the Genesys Supported Operating Environment Reference Guide.
	• All Feature Servers in your environment must run on either Linux or Windows. You cannot mix Linux and Windows machines.
	• If you are running RHEL 7/8/9, you must:
	  • Install all RHEL 7/8 compatibility packages
	  • Install libcurl.so.3 (64-bit only) (Feature Server requires libcurl 3.0.0 to start).
	  • Create a symbolic link for `libcurl.so.3` (64-bit only):
	`cd /usr/lib64`
	`ln -s /usr/lib64/libcurl.so.4.3.0 ./libcurl.so.3`

RAM	4GB of RAM or above available to the Java process.

Software

The following table lists the software requirements:

Category	Prerequisite
Java Runtime Environment (JRE)	**SIP Feature Server 8.1.204 and later:** Supported Java

Category	Prerequisite
	Runtime Environments: OpenJDK 17. **SIP Feature Server 8.1.203 and earlier:** Supported Java Runtime Environments: JRE 7, JRE 8, OpenJDK 8, OpenJDK 11, and OpenJDK 17. **Java heap size** By default, the Java heap size is set to 1GB in **launcher.xml**. To avoid java heap memory error, increase the Java heap size to 1/4th of the system's RAM size as this is the maximum permissible Java heap size. To increase the Java heap size, update the default value of the **jvm_option2** option in **launcher.xml**. Below is an example **launcher.xml** file for a Feature Server machine that has 16GB RAM with a 4GB java heap size. `<parameter name="jvm_option2" displayName="jvm_option2" mandatory="true" hidden="true" readOnly="true"><description><![CDATA[Cassandra related]]></description><valid-description><![CDATA[]]></valid-description><effective-description/><format type="string" default="-Xmx4g" /><validation></validation></parameter>` **Note:** If you are using the **launcher_64** executable, you will need to update **launcher_64.xml** instead of **launcher.xml**.
Python 3	**Supported Python versions**: 3.8, 3.9.

Genesys requirements	Install and configure:
	• **Genesys Management Framework**: See the Genesys Administrator Management Framework Deployment Guide for details.
	• **Genesys Media Server 8.5.x (recommended) or 8.1.5 (minimum) components**: Resource Manager and Media Control Platform. See Genesys Media Server 8.5 Deployment Guide.
	• **Genesys Administrator Extension**: 8.1.400.59 or higher. See the Genesys Administrator Extension Deployment Guide for details.
	• **Genesys SIP Server**
	  • **A SIP Server 8.1.1 (or later) instance for managing agents**: ACD functionality requires SIP Server 8.1.101.56 or later. Note: If you want to use an existing premise SIP Server to also process voicemail, you must use SIP Server version 8.1 or higher.
	  • To provision phones with Feature Server

Category	Prerequisite
	version 8.1.201.52 or later requires SIP Server version 8.1.101.75 or later. See the Genesys SIP Server Deployment guide for details. See the Genesys SIP Server Deployment Guide for details. • **All application templates**: Use the supplied templates for SIP Feature Server.

Device management

You can manage SIP desk phones from Polycom, AudioCodes, Genesys, and Yealink using the SIP Device Management area of Genesys Administrator Extension (GAX). If you require this feature, then install and configure the following:

- Syslog server (mandatory)
- LDAP server (optional)
- NTP server (optional)

For details on the implementation, see Implement device management.

Sizing

Feature Server provides three tools to help you size your environment:

- To calculate the database (embedded Cassandra) disk space requirements for voicemail and device management, enter your information in column B of the SIP Feature Server 8.1.2 Sizing Guide. The guide also calculates network disk space needed for device management functionality.
- To calculate sizing requirements that match your performance needs, use this Feature Server Sizing Tool.
- Feature Server requires a minimum of one Cassandra node per data center. However, it is also based on the number of replicas that are required in a data center to provide resiliency and fault tolerance.
- For help with other sizing requirements, view Voicemail Performance Test Results.

Cassandra

You should configure Genesys SIP Feature Server to use separately deployed Cassandra cluster. You can also co-locate Cassandra nodes with Feature Server or have them deployed using separate

infrastructure. For more details on Cassandra deployment, refer Cassandra documentation.

Genesys recommends to have the following minimum hardware and software requirements to set up the Cassandra nodes.

Category	Requirements
Operating System	All Cassandra nodes in your environment must run on either Linux or Windows. You cannot mix Linux and Windows machines. The clocks on all the Cassandra nodes and Feature Server must be synchronized.
RAM	8 GB of RAM or above.
Runtime environment	For Cassandra 2.2.x, JDK 1.8, 64 bit For Cassandra 3.x, JDK 1.8, 64 bit For Cassandra 4.x, JDK 1.8, 64 bit
User resource limits	For Linux environment, ensure that the following user resource limits are present and use the `ulimit -a` command to view the current limits: • memlock - unlimited • nofile - 100000 • nproc - 32768 • as - unlimited

Ports

> **Important**
> Do not use the following ports for any other applications that share the host on which you install Feature Server/Cassandra.

Feature Server Nodes

Feature Server uses the following default ports.

Port	Used for
8080	http
8443	https
8800	Dial plan

Cassandra Nodes

Cassandra nodes use the default ports such as 7000, 7001, and 9042.

Port	Used for
7000	Cassandra Storage_port
7001	Cassandra SSL_Storage_port
9042	CQL port (Cassandra v2.2, Cassandra v3.x, Cassandra 4.x)

> **Important**
>
> If you use Embedded Cassandra and/or versions of Feature Server prior to 8.1.203.XX, you might need ports 9160 and 7199/9192 available for thrift and JMX communications.

Deploying SIP Feature Server

Complete these tasks to configure SIP Feature Server instances for standalone operation.

1. Configure SIP Feature Server applications
2. Deploy co-located/external Cassandra cluster
3. Configure SIP Feature Server for co-located/external Cassandra cluster
4. Implement the Feature Server GAX Plug-in
5. Implement device management
6. Start and verify SIP Feature Server
7. Configure SIP Server for Feature Server
8. Configure voicemail

Cassandra Cluster Tasks

- Add a New Data Center
- Configure Regional Voicemail Storage

You can use these sample deployments as a model for your chosen deployment option.

Videos

The following videos provide an overview and procedure of the deployment process. For detailed information, refer to the other topics covered in this section.

Deployment Process for Windows

Installing Feature Server Part I/III

Link to video

Installing Feature Server Part II/III

Link to video

Installing Feature Server Part III/III

Link to video

Deployment Process for Linux

Installing Feature Server Part I/III

Link to video

Installing Feature Server Part II/III

Link to video

Installing Feature Server Part III/III

Link to video

Configure SIP Feature Server applications

Your Feature Server deployment differs depending on the deployment option you choose: single-site, multisite (with one or multiple data centers), or Business Continuity (single-site or multisite). If you haven't yet decided, review the options.

You must install and configure Cassandra database management system before installing Feature Server.

> **Important**
>
> Feature Server versions prior to 8.1.203 might have been installed with the embedded Cassandra database. This setup is now obsolete and not recommended for new deployments.

These instructions include the Cassandra options specific to Feature Server. To learn more about Cassandra, see the Cassandra wiki and the DataStax Cassandra documentation website.

> **Important**
>
> After SIP Feature Server is started for the first time, the option **[Cluster].disable-initial-import** must be configured and set to `true`. For more details, refer to Configuration Options.

Single-site

To deploy Feature Server on a single site, you deploy two Feature Server instances configured as an active-active HA (High Availability) pair, running with a single SIP switch and SIP Server. See Deployment Options for architectural details.

To deploy SIP Feature Server on a single site:

1. Ensure that you have met all the installation prerequisites for SIP Feature Server. If you assign port numbers, ensure that you do not use any of the reserved ports.
2. Configure the SIP Feature Server applications: In Genesys Administrator, use the supplied template (**Templates > GenesysSIPFeatureServer_812.apd**) to create an application. Note the Application object name, which the application installer requires.
3. Create a Host for the target machine.
4. If this is the first Feature Server instance you are deploying:
   - Designate it to handle the initial synchronization of data from Configuration Server to all Feature

Servers in a tenant. In the **Cluster > Options** tab of the Feature Server `Application` in Genesys Administrator, set `master` to `true`. See Configuration options.

- In the **Cassandra** section:
  - set **replicationOptions** to `DC1=2`
  - set **replicationStrategyClassName** to `NetworkTopologyStrategy`

5. For new deployments,
   1. set **connection-type** to `cql` in the **Cassandra** section.
      - If you use Cassandra prior to 4.X or you are deploying Feature Server in an environment that has Embedded Cassandra and your Cassandra version isn't listening on port 9042, you might need to set the value to `thrift`.
   2. set **nodes** in the **Cassandra** section with a list of Cassandra cluster node(s) that works with the newly deployed instance of Feature Server.
   3. set **cassandra-counter** to `false` in the **VoicemailServer** section. SIP Feature Server uses Cassandra counters to maintain the MWI count for the mailboxes. The Cassandra counters are not stable and may result in inconsistency in the MWI count. When **cassandra-counter** is set to `false`, Feature Server maintains consistency in the MWI count at all times.
6. For the other Feature Server, in the **Cluster** section of the Feature Server `Application`, set `master` to `false` and `confsync` to `false`.
   Important: Ensure that you designate only one Feature Server instance as the master.
7. In the Feature Server Connections tab, add the SIP Server to the Feature Server. Ensure that the PortID is the default SIP Server port.
8. Ensure that your Configuration Server history log settings are large enough to accommodate all configuration changes that occur whenever you simultaneously shut down your master Feature Server and your confsync-enabled Feature Server (note that such shutdowns are not recommended; try to leave at least one confsync-enabled server running at all times). In the **[history-log]** section of the Configuration Server application object:
   - set **expiration** to at least the maximum number of days you expect your servers to be offline
   - set **max-records** to the maximum number of configuration records you expect your servers to handle during the offline period

   For option details, see Configuration Server Configuration Options.
9. Review the current known issues and recommendations for this release.
10. To install Feature Server, run `install.sh` (Linux) or `setup.exe` (Windows) from the product DVD. Follow the installer prompts, using the default values except for:
    - Set the deployment mode to `Standalone`.
    - Supply the Cassandra cluster name (use the same name for all Cassandra instances in the Cassandra cluster).

> **Important**
>
> Depending on the version of Feature Server you use, you might have to provide a Cassandra storage location that is not part of the installation directory and Seeds (the IP address of the master Feature Server). Setting these options initialize the embedded Cassandra used in previous releases. Skip this step

> if you plan to use external Cassandra with the latest version of Feature Server.

11. Set the **startCassandra** parameter (`com.genesyslab.common.application.cassandraServer`) to `false` in **<Feature Server installed directory>\launcher.xml** (or launcher_64.xml on linux).
12. Set up the co-located/external Cassandra cluster by referring the following articles:
    - Deploy co-located/external Cassandra cluster
    - Configure SIP Feature Server for co-located/external Cassandra cluster.
13. If this is the master Feature Server, disable the server firewall.
14. Repeat the above steps to create the non-master Feature Server, keeping in mind the differences between the master instance and the other instance.
15. If your environment includes **more than two** Feature Server instances per SIP switch, create an FQDN that includes the IP addresses of all the **N** Feature Server instances (the total number of instances minus 1), then set up a DNS server (your choice) to distribute the workload if the first instance goes down.
    For example, if 172.24.128.34, 172.24.128.35, and 172.24.128.36 are the IP addresses of three instances, you create the FQDN with any of the two instances: `FQDN1 = fs.genesys.com`, which resolves to 172.24.128.34 and 172.24.128.35. You use the IP address of the "extra" instance as the *FS(n+1) IP address*, and the *FQDN1* value, during the Configure voicemail and Implement device management procedures.
16. To enable a Transport Layer Security autodetect (upgradable) connection, configure an autodetection port. See Introduction to Genesys Transport Layer Security in Genesys 8.1 Security Deployment Guide.
17. If you are planning to use the **Dialplan** functionality, provide the **process-launcher** option in the **python** section pointing to a Python 3.X executable.
18. Set the remaining Feature Server configuration options.

Appendix

Use the following configuration if you're using an Embedded Cassandra cluster in your SIP Feature Server deployment. However, note that this cluster mode is being deprecated beginning with version 8.1.203.xx and will no longer be supported in future versions.

To configure an embedded Cassandra cluster, follow all the steps from the above procedure but replace the Step-11 configuration with the following:

1. Edit the file ***Cassandra storage location*/etc/Cassandra.yaml**:
   - Verify that the file contains these properties and values, and update as needed (do not change any other values):
     - `cluster_name: 'FeatureServerCluster'` (or whatever name you supplied as the Cassandra cluster name during installation)
     - `data_file_directories: Cassandra storage location/storage/data`
     - `commitlog_directory: Cassandra storage location/storage/commitlog`
     - `endpoint_snitch: PropertyFileSnitch/GossipingPropertyFileSnitch`
     - `listen_address: IP address or FQDN of the instance that you are configuring`

- `saved_caches_directory: Cassandra storage location/storage/saved_caches`
- `storage_port: 7000` (set each Cassandra node to 7000)
- `-seeds: master Feature Server IP address or FQDN`
  Cassandra nodes use the seed node list to find each other and learn the topology of the ring.

2. For `PropertyFileSnitch`, in the Feature Server home/resources folder, create or edit the **cassandra-topology.properties** file and add the following, where the data center names are the names you specified in the **replicationOptions** configuration option earlier:
   - `#Cassandra Node IP=Data Center:Rack`
   - `IP or FQDN of the FS1 host=data center 1 name:RAC1`
   - `IP or FQDN of the FS2 host=data center 1 name:RAC2`
3. For `GossipingPropertyFileSnitch`, in the Feature Server home/resources folder, create or edit the **cassandra-rackdc.properties** file in each node and add data center and rack information specific to that node, where the data center names are the names you specified in the **replicationOptions** configuration option earlier:
   - `dc=name of data center to which the specific node belongs`
   - `rack=name of rack to which the specific node belongs`

Multisite (single DC)

You can deploy Feature Server in a multisite (multi-switch) environment, using one or multiple data centers:

- Use a single data center if your sites are co-located.
- Use multiple data centers, one for each site, if your sites are in different physical locations.

Multisite configurations require a minimum of four Feature Server instances, two for each site.

To deploy SIP Feature Server in a multisite, single-data center environment:

1. Ensure that you have met all the installation prerequisites for SIP Feature Server. If you assign port numbers, ensure that you do not use any of the reserved ports.
2. Configure the SIP Feature Server applications: In Genesys Administrator, use the supplied template (**Templates > GenesysSIPFeatureServer_812.apd**) to create an application. Note the Application object name, which the application installer requires.
3. Create a Host for the target machine.
4. If this is the first Feature Server instance you are deploying:
   - Designate it to handle the initial synchronization of data from Configuration Server to all Feature Servers in a tenant. In the **Cluster > Options** tab of the Feature Server `Application` in Genesys Administrator, set `master` to `true`. See Configuration options.
   - In the **Cassandra** section:
     - set **replicationOptions** to `DC1=3` or more, depending on the number of nodes in the cluster:

increment the value by one for each node you add beyond 4.

- set **replicationStrategyClassName** to `NetworkTopologyStrategy`

5. For new deployments,
   1. set **connection-type** to `cql` in the **Cassandra** section.
      1. If you use Cassandra prior to 4.X or you are deploying Feature Server in an environment that has Embedded Cassandra and your Cassandra version isn't listening on port 9042, you might need to set the value to `thrift`.
   2. set **nodes** in the **Cassandra** section with a list of Cassandra cluster node(s) that works with the newly deployed instance of Feature Server.
   3. set **cassandra-counter** to `false` in the **VoicemailServer** section. SIP Feature Server uses Cassandra counters to maintain the MWI count for the mailboxes. The Cassandra counters are not stable and may result in inconsistency in the MWI count. When **cassandra-counter** is set to `false`, Feature Server maintains consistency in the MWI count at all times.
6. On **one** other Feature Server instance on each site, in the **Cluster** section of the Feature Server `Application`, set `master` to `false` and `confsync` to `true`. On **all** other instances, set `master` to `false` and `confsync` to `false`.
   Important: Ensure that you designate only one Feature Server instance as the master.
7. In the Feature Server Connections tab, add the SIP Server to the Feature Server. Ensure that the PortID is the default SIP Server port.
8. Ensure that your Configuration Server history log settings are large enough to accommodate all configuration changes that occur whenever you simultaneously shut down your master Feature Server and your confsync-enabled Feature Server (note that such shutdowns are not recommended; try to leave at least one confsync-enabled server running at all times). In the **[history-log]** section of the Configuration Server application object:
   - set **expiration** to at least the maximum number of days you expect your servers to be offline
   - set **max-records** to the maximum number of configuration records you expect your servers to handle during the offline period

   For option details, see Configuration Server Configuration Options.
9. Review the current known issues and recommendations for this release.
10. To install Feature Server, run `install.sh` (Linux) or `setup.exe` (Windows) from the product DVD. Follow the installer prompts, using the default values except for:
    - Set the deployment mode to `Standalone`.
    - Supply the Cassandra cluster name (use the same name for all Cassandra instances in the Cassandra cluster).

    > **Important**
    > Depending on the version of Feature Server you use, you might have to provide a Cassandra storage location that is not part of the installation directory and Seeds (the IP address of the master Feature Server). Setting these options initialize the embedded Cassandra used in previous releases. Skip this step if you plan to use external Cassandra with the latest version of Feature Server.

11. Set the **startCassandra** parameter (`com.genesyslab.common.application.cassandraServer`) to

`false` in **<Feature Server installed directory>\launcher.xml** (or launcher_64.xml on linux).

12. Set up the co-located/external Cassandra cluster by referring the following articles:
    - Deploy co-located/external Cassandra cluster
    - Configure SIP Feature Server for co-located/external Cassandra cluster.
13. If this is the master Feature Server, disable the server firewall.
14. Repeat the above steps for each Feature Server instance you want to create (at least four total), keeping in mind the differences between the master instance and the other instances.
15. If your environment includes **more than two** Feature Server instances per SIP switch, create an FQDN that includes the IP addresses of all the **N** Feature Server instances (the total number of instances minus 1), then set up a DNS server (your choice) to distribute the workload if the first instance goes down.
    For example, if 172.24.128.34, 172.24.128.35, and 172.24.128.36 are the IP addresses of three instances, you create the FQDN with any of the two instances: `FQDN1 = fs.genesys.com`, which resolves to 172.24.128.34 and 172.24.128.35. You use the IP address of the "extra" instance as the *FS(n+1) IP address*, and the *FQDN1* value, during the Configure voicemail and Implement device management procedures.
16. To enable a Transport Layer Security autodetect (upgradable) connection, configure an autodetection port. See Introduction to Genesys Transport Layer Security in Genesys 8.1 Security Deployment Guide.
17. If you are planning to use the **Dialplan** functionality, provide the **process-launcher** option in the **python** section pointing to a Python 3.X executable.
18. Set the remaining Feature Server configuration options.

Appendix

Use the following configuration if you're using an Embedded Cassandra cluster in your SIP Feature Server deployment. However, note that this cluster mode is being deprecated beginning with version 8.1.203.xx and will no longer be supported in future versions.

To configure an embedded Cassandra cluster, follow all the steps from the above procedure but replace the Step-11 configuration with the following:

1. Edit the file ***Cassandra storage location*/etc/Cassandra.yaml**:
   - Verify that the file contains these properties and values, and update as needed (do not change any other values):
     - `cluster_name: 'FeatureServerCluster'` (or whatever name you supplied as the Cassandra cluster name during installation)
     - `data_file_directories: `*`Cassandra storage location`*`/storage/data`
     - `commitlog_directory: `*`Cassandra storage location`*`/storage/commitlog`
     - `endpoint_snitch: PropertyFileSnitch/GossipingPropertyFileSnitch`
     - `listen_address: `*`IP address or FQDN of the instance that you are configuring`*
     - `saved_caches_directory: `*`Cassandra storage location`*`/storage/saved_caches`
     - `storage_port: 7000` (set each Cassandra node to 7000)
     - `-seeds: `*`master Feature Server IP address or FQDN`*
       Cassandra nodes use the seed node list to find each other and learn the topology of the

ring.

2. For `PropertyFileSnitch`, in Feature Server home/resources folder, create or edit the **cassandra-topology.properties** file and add the following, where the data center names are the names you specified in the **replicationOptions** configuration option earlier:
   - `#Cassandra Node IP=Data Center:Rack`
   - `IP or FQDN of the FS1 host=data center 1 name:RAC1`
   - `IP or FQDN of the FS2 host=data center 1 name:RAC2`
3. For `GossipingPropertyFileSnitch`, in the Feature Server home/resources folder, create or edit the **cassandra-rackdc.properties** file in each node and add data center and rack information specific to that node, where the data center names are the names you specified in the **replicationOptions** configuration option earlier:
   - `dc=name of data center to which the specific node belongs`
   - `rack=name of rack to which the specific node belongs`

Multisite (multiple DCs)

You can deploy Feature Server in a multisite (multi-switch) environment, using one or multiple data centers:

- Use a single data center if your sites are co-located.
- Use multiple data centers, one for each site, if your sites are in different physical locations.

Multisite configurations require a minimum of four Feature Server instances, two for each site. In multi-data center mode, each site contains its own data center.

To deploy SIP Feature Server in a multisite, multiple-data center environment:

1. Ensure that you have met all the installation prerequisites for SIP Feature Server. If you assign port numbers, ensure that you do not use any of the reserved ports.
2. Configure the SIP Feature Server applications: In Genesys Administrator, use the supplied template (**Templates > GenesysSIPFeatureServer_812.apd**) to create an application. Note the Application object name, which the application installer requires.
3. Create a Host for the target machine.
4. If this is the first Feature Server instance you are deploying:
   - Designate it to handle the initial synchronization of data from Configuration Server to all Feature Servers in a tenant.In the **Cluster > Options** tab of the Feature Server `Application` in Genesys Administrator, set `master` to `true`. See Configuration options.
   - In the **Cassandra > Options** tab:
     - set **replicationOptions** to *`data center 1 name`*=2,*`data center 2 name`*=2 (remember these data center names to use in the `cassandra-topology.properties` file you create or edit below)
     - set **replicationStrategyClassName** to `NetworkTopologyStrategy`
5. For new deployments,

1. set **connection-type** to `cql` in the **Cassandra** section.
    1. If you use Cassandra prior to 4.X or you are deploying Feature Server in an environment that has Embedded Cassandra and your Cassandra version isn't listening on port 9042, you might need to set the value to `thrift`.
2. set **nodes** in the **Cassandra** section with a list of Cassandra cluster node(s) that works with the newly deployed instance of Feature Server.
3. set **cassandra-counter** to `false` in the **VoicemailServer** section. SIP Feature Server uses Cassandra counters to maintain the MWI count for the mailboxes. The Cassandra counters are not stable and may result in inconsistency in the MWI count. When **cassandra-counter** is set to `false`, Feature Server maintains consistency in the MWI count at all times.

6. On **one** other Feature Server instance on each site, in the **Cluster** section of the Feature Server `Application`, set `master` to `false` and `confsync` to `true`. On **all** other instances, set `master` to `false` and `confsync` to `false`.
   Important: Ensure that you designate only one Feature Server instance as the master.
7. In the Feature Server Connections tab, add the SIP Server to the Feature Server. Ensure that the PortID is the default SIP Server port.
8. Ensure that your Configuration Server history log settings are large enough to accommodate all configuration changes that occur whenever you simultaneously shut down your master Feature Server and your confsync-enabled Feature Server (note that such shutdowns are not recommended; try to leave at least one confsync-enabled server running at all times). In the **[history-log]** section of the Configuration Server application object:
   - set **expiration** to at least the maximum number of days you expect your servers to be offline
   - set **max-records** to the maximum number of configuration records you expect your servers to handle during the offline period

   For option details, see Configuration Server Configuration Options.
9. Review the current known issues and recommendations for this release.
10. To install Feature Server, run `install.sh` (Linux) or `setup.exe` (Windows) from the product DVD. Follow the installer prompts, using the default values except for:
    - Set the deployment mode to `Standalone`.
    - Supply the Cassandra cluster name (use the same name for all Cassandra instances in the Cassandra cluster).

    > **Important**
    >
    > Depending on the version of Feature Server you use, you might have to provide a Cassandra storage location that is not part of the installation directory and Seeds (the IP address of the master Feature Server). Setting these options initialize the embedded Cassandra used in previous releases. Skip this step if you plan to use external Cassandra with the latest version of Feature Server.

11. Set the **startCassandra** parameter (`com.genesyslab.common.application.cassandraServer`) to `false` in **<Feature Server installed directory>\launcher.xml** (or launcher_64.xml on linux).
12. Set up the co-located/external Cassandra cluster by referring the following articles:
    - Deploy co-located/external Cassandra cluster
    - Configure SIP Feature Server for co-located/external Cassandra cluster.

13. If this is the master Feature Server, disable the server firewall.
14. Repeat the above steps for each Feature Server instance you want to create, keeping in mind the differences between the master instance and the other instances.
15. In an environment with more than two Feature Server instances, you must create an FQDN that includes the IP addresses of all the **N** Feature Server instances (the total number of instances minus 1), then set up a DNS server (your choice) to distribute the workload if the first instance goes down.
    For example, if 172.24.128.34, 172.24.128.35, and 172.24.128.36 are the IP addresses of three instances, you create the FQDN with any of the two instances: `FQDN1 = fs.genesys.com`, which resolves to 172.24.128.34 and 172.24.128.35. You use the IP address of the "extra" instance as the *FS(n+1) IP address*, and the *FQDN1* value, during the Configure voicemail and Implement device management procedures.
16. To enable a Transport Layer Security autodetect (upgradable) connection, configure an autodetection port. See Introduction to Genesys Transport Layer Security in Genesys 8.1 Security Deployment Guide.
17. If you are planning to use the **Dialplan** functionality, provide the **process-launcher** option in the **python** section pointing to a Python 3.X executable.
18. Set the remaining Feature Server configuration options.

Appendix

Use the following configuration if you're using an Embedded Cassandra cluster in your SIP Feature Server deployment. However, note that this cluster mode is being deprecated beginning with version 8.1.203.xx and will no longer be supported in future versions.

To configure an embedded Cassandra cluster, follow all the steps from the above procedure but replace the Step-11 configuration with the following:

1. Edit the file ***Cassandra storage location*/etc/Cassandra.yaml**:
   - Verify that the file contains these properties and values, and update as needed (do not change any other values):
     - `cluster_name: 'FeatureServerCluster'` (or whatever name you supplied as the Cassandra cluster name during installation)
     - `data_file_directories: `*`Cassandra storage location`*`/storage/data`
     - `commitlog_directory: `*`Cassandra storage location`*`/storage/commitlog`
     - `endpoint_snitch: PropertyFileSnitch/GossipingPropertyFileSnitch`
     - `listen_address: `*`IP address or FQDN of the instance that you are configuring`*
     - `saved_caches_directory: `*`Cassandra storage location`*`/storage/saved_caches`
     - `storage_port: 7000` (set each Cassandra node to 7000)
     - `-seeds: `*`master Feature Server IP address or FQDN`*
       Cassandra nodes use the seed node list to find each other and learn the topology of the ring.
2. For `PropertyFileSnitch`, in the folder ***Feature Server home*/resources**, create or edit a file called `cassandra-topology.properties` and add the following, where the data center names are the names you specified in the **replicationOptions** configuration option above:
   - `# Cassandra Node IP=Data Center:Rack`

- *IP or FQDN of the FS1 host=data center 1 name*:RAC1
- *IP or FQDN of the FS2 host=data center 1 name*:RAC2
- *IP or FQDN of the FS3 host=data center 2 name*:RAC1
- *IP or FQDN of the FS4 host=data center 2 name*:RAC2
- # default for unknown nodes
- default=*data center 1 name*:RAC1

3. For GossipingPropertyFileSnitch, in the Feature Server home/resources folder, create or edit the **cassandra-rackdc.properties** file in each node and add data center and rack information specific to that node, where the data center names are the names you specified in the **replicationOptions** configuration option earlier:
   - dc=name of data center to which the specific node belongs
   - rack=name of rack to which the specific node belongs

Business Continuity

Though you can achieve some degree of Business Continuity by deploying Feature Server in single-data center mode, the recommended deployment uses multiple data centers, which provides disaster recovery. All Business Continuity deployments must contain at least two Feature Server instances per site.

To deploy SIP Feature Server in Business Continuity mode:

1. Ensure that you have met all the installation prerequisites for SIP Feature Server. If you assign port numbers, ensure that you do not use any of the reserved ports.
2. Configure the SIP Feature Server applications: In Genesys Administrator, use the supplied template (**Templates > GenesysSIPFeatureServer_812.apd**) to create an application. Note the Application object name, which the application installer requires.
3. Create a Host for the target machine.
4. If this is the first Feature Server instance you are deploying:
   - Designate it to handle the initial synchronization of data from Configuration Server to all Feature Servers in a tenant. In the **Cluster > Options** tab of the Feature Server Application in Genesys Administrator, set master to true. See Configuration options.
   - In the **Cassandra > Options** tab:
     - set **replicationOptions** to *data center 1 name*=2,*data center 2 name*=2 (remember these data center names to use in the cassandra-topology.properties file you create or edit below)
     - set **replicationStrategyClassName** to NetworkTopologyStrategy
5. For new deployments,
   1. set **connection-type** to cql in the **Cassandra** section.
      1. If you use Cassandra prior to 4.X or you are deploying Feature Server in an environment that has Embedded Cassandra and your Cassandra version isn't listening on port 9042, you might need to set the value to thrift.

2. set **nodes** in the **Cassandra** section with a list of Cassandra cluster node(s) that works with the newly deployed instance of Feature Server.
3. set **cassandra-counter** to `false` in the **VoicemailServer** section. SIP Feature Server uses Cassandra counters to maintain the MWI count for the mailboxes. The Cassandra counters are not stable and may result in inconsistency in the MWI count. When **cassandra-counter** is set to `false`, Feature Server maintains consistency in the MWI count at all times.

6. On **one** other Feature Server instance on each site, in the **Cluster** section of the Feature Server `Application`, set `master` to `false` and `confsync` to `true`. On **all** other instances, set `master` to `false` and `confsync` to `false`.
   Important: Ensure that you designate only one Feature Server instance as the master.
7. In the Feature Server Connections tab, add the SIP Server to the Feature Server. Ensure that the PortID is the default SIP Server port.
8. Ensure that your Configuration Server history log settings are large enough to accommodate all configuration changes that occur whenever you simultaneously shut down your master Feature Server and your confsync-enabled Feature Server (note that such shutdowns are not recommended; try to leave at least one confsync-enabled server running at all times). In the **[history-log]** section of the Configuration Server application object:
   - set **expiration** to at least the maximum number of days you expect your servers to be offline
   - set **max-records** to the maximum number of configuration records you expect your servers to handle during the offline period

   For option details, see Configuration Server Configuration Options.
9. Review the current known issues and recommendations for this release.
10. To install Feature Server, run `install.sh` (Linux) or `setup.exe` (Windows) from the product DVD. Follow the installer prompts, using the default values except for:
    - Set the deployment mode to `Standalone`.
    - Supply the Cassandra cluster name (use the same name for all Cassandra instances in the Cassandra cluster).
    - Supply a Cassandra storage location, but do **not** use the installation directory.

    > **Important**
    >
    > Depending on the version of Feature Server you use, you might have to provide a Cassandra storage location that is not part of the installation directory and Seeds (the IP address of the master Feature Server). Setting these options initialize the embedded Cassandra used in previous releases. Skip this step if you plan to use external Cassandra with the latest version of Feature Server.

11. Set the **startCassandra** parameter (`com.genesyslab.common.application.cassandraServer`) to `false` in **<Feature Server installed directory>\launcher.xml** (or launcher_64.xml on linux).
12. Set up the co-located/external Cassandra cluster by referring the following articles:
    - Deploy co-located/external Cassandra cluster
    - Configure SIP Feature Server for co-located/external Cassandra cluster
13. If this is the master Feature Server, disable the server firewall.
14. Repeat the above steps for each Feature Server instance you want to create, keeping in mind the

differences between the master instance and the other instances.

15. In an environment with more than two Feature Server instances, you must create an FQDN that includes the IP addresses of all the **N** Feature Server instances (the total number of instances minus 1), then set up a DNS server (your choice) to distribute the workload if the first instance goes down.
    For example, if 172.24.128.34, 172.24.128.35, and 172.24.128.36 are the IP addresses of three instances, you create the FQDN with any of the two instances: `FQDN1 = fs.genesys.com`, which resolves to 172.24.128.34 and 172.24.128.35. You use the IP address of the "extra" instance as the *FS(n+1) IP address*, and the *FQDN1* value, during the Configure voicemail and Implement device management procedures.
16. To enable a Transport Layer Security autodetect (upgradable) connection, configure an autodetection port. See Introduction to Genesys Transport Layer Security in Genesys 8.1 Security Deployment Guide.
17. If you are planning to use the **Dialplan** functionality, provide the **process-launcher** option in the **python** section pointing to a Python 3.X executable.
18. Set the remaining Feature Server configuration options.

Appendix

Use the following configuration if you're using an Embedded Cassandra cluster in your SIP Feature Server deployment. However, note that this cluster mode is being deprecated beginning with version 8.1.203.xx and will no longer be supported in future versions.

To configure an embedded Cassandra cluster, follow all the steps from the above procedure but replace the Step-11 configuration with the following:

1. Edit the file ***Cassandra storage location*/etc/Cassandra.yaml**:
   - Verify that the file contains these properties and values, and update as needed (do not change any other values):
     - `cluster_name: 'FeatureServerCluster'` (or whatever name you supplied as the Cassandra cluster name during installation)
     - `data_file_directories: Cassandra storage location/storage/data`
     - `commitlog_directory: Cassandra storage location/storage/commitlog`
     - `endpoint_snitch: PropertyFileSnitch/GossipingPropertyFileSnitch`
     - `listen_address: IP address or FQDN of the instance that you are configuring`
     - `saved_caches_directory: Cassandra storage location/storage/saved_caches`
     - `storage_port: 7000` (set each Cassandra node to 7000)
     - `-seeds: master Feature Server IP address or FQDN`
       Cassandra nodes use the seed node list to find each other and learn the topology of the ring.
2. For `PropertyFileSnitch`, in the folder ***Feature Server home*/resources**, create or edit a file called `cassandra-topology.properties` and add the following, where the data center names are the names you specified in the **replicationOptions** configuration option above:
   - `# Cassandra Node IP=Data Center:Rack`
   - `IP or FQDN of the FS1 host=data center 1 name:RAC1`
   - `IP or FQDN of the FS2 host=data center 1 name:RAC2`

- *IP or FQDN of the FS3 host=data center 2 name*:RAC1
- *IP or FQDN of the FS4 host=data center 2 name*:RAC2
- # default for unknown nodes
- default=*data center 1 name*:RAC1
- For GossipingPropertyFileSnitch, in the Feature Server home/resources folder, create or edit the **cassandra-rackdc.properties** file in each node and add data center and rack information specific to that node, where the data center names are the names you specified in the **replicationOptions** configuration option earlier:
- dc=name of data center to which the specific node belongs
- rack=name of rack to which the specific node belongs

Deploying Cassandra

The Apache Cassandra database is an open source NoSQL database, which is easily scalable and provides high availability without compromising performance.

> **Important**
>
> Instructions provided in this chapter are complimentary to installation guidelines of the Cassandra database. If you are using a commercial version then you must follow the instructions given in official Cassandra documentation. If you're using the community version, you can follow the steps described here.
> To use Cassandra 4.X, you must install SIP Feature Server version 8.1.203 or later.

Ensure that you have a minimum of two nodes per data center and the clocks on all Cassandra nodes are synchronized.

Prerequisites to use Cassandra

1. The external Cassandra cluster deployed can be co-located/shared with other Genesys components. However, the SIP Feature Server keyspaces (global and regional) should not be shared with other components.
2. The minimum disk space required for SIP Feature Server keyspaces can be computed using the disk sizing tool mentioned in the Hardware and software prerequisites page.
3. While sharing Cassandra with multiple components, disk requirement is computed by summing the minimum required space from all components.

Selecting a Seed node

Seed node is a comma-delimited list of IP addresses used by gossip for bootstrapping new nodes joining a cluster. In multiple data-center clusters, the seed list must include at least one node from each data center (replication group). More than a single seed node per data center is recommended for fault tolerance. Otherwise, gossip has to communicate with another data center when bootstrapping a node. Making every node a seed node is not recommended because of increased maintenance and reduced gossip performance. Gossip optimization is not critical, but Genesys recommends that you use a small seed list. Usually, the first node installed in each data center is considered as a seed node. For more information on seed nodes and gossip, see Internode communications (gossip).

Deploying Cassandra

The following steps show how to deploy each Cassandra node in the co-located/external Cassandra cluster:

1. Download the latest version in Apache Cassandra 2.2, 3.x, or 4.x from either the Cassandra archive

index page or from the Downloading Cassandra page.

2. Extract the downloaded zip file to any desired directory (Cassandra installed directory).
3. Edit the **<Cassandra installed directory>\conf\cassandra.yaml** file and configure the parameters:
   - `cluster_name` : `FeatureServerCluster`
   - `start_rpc` : `true`
   - `listen_address` : IP or FQDN of the node
   - `rpc_address` : IP or FQDN of the node
   - `seeds` : comma separated IP or FQDN of the seed nodes
   - `storage_port` : 7000 (default value)
   - `ssl_storage_port` : 7001 (default value)
   - `native_transport_port`: 9042 (default value)
   - `endpoint_snitch` : `PropertyFileSnitch`
4. Edit the **<Cassandra installed directory>\conf\cassandra-topology.properties** file and configure the data centers as follows:
   - The following example shows a single data center with two Cassandra nodes:
     - `Cassandra node 1 IP or FQDN 1=data center 1 name:RAC1`
     - `Cassandra node 2 IP or FQDN 2=data center 1 name:RAC2`
   - The following example shows a multi data center with four Cassandra nodes with two nodes per data centre:
     - `Cassandra node 1 IP or FQDN 1=data center 1 name:RAC1`
     - `Cassandra node 2 IP or FQDN 2=data center 1 name:RAC2`
     - `Cassandra node 3 IP or FQDN 3=data center 2 name:RAC1`
     - `Cassandra node 4 IP or FQDN 4=data center 2 name:RAC2`

> **Important**
>
> If you want to connect SIP Feature Server to Cassandra 2.2.X or 3.X using the legacy **thrift** protocol, enable the port **rpc_port 9160** during your Cassandra installation.

Configuring Cassandra logging

By default, the Cassandra logs are generated under **<Cassandra installed directory>\logs**. To change the log file directory:

- On Linux, edit the **<Cassandra installed directory>\bin\cassandra** file and update the parameter:
  - `-Dcassandra.logdir=$CASSANDRA_HOME/logs`
- On Windows, edit the **<Cassandra installed directory>\bin\cassandra.bat** file and update the parameter:

- `Dcassandra.logdir="%CASSANDRA_HOME%\logs`

To configure Cassandra logging, see Configuring logging.

Configuring Cassandra Authentication and Authorization

1. On each Cassandra node, edit the **<Cassandra installed directory>\conf\cassandra.yaml** file and set the follwoing parameters and restart the nodes:
   - `authenticator` :`PasswordAuthenticator`
   - `authorizer` :`CassandraAuthorizer`
2. On the Master Cassandra node, navigate to **<Cassandra installed directory>\bin** and run the CQL client as follows:
   - On Linux
     - `./cqlsh <IP or FQDN of the Cassandra node configured in Cassandra.yaml> <CQL Port>`
   - On Windows
     - `cqlsh <IP or FQDN of the Cassandra node configured in Cassandra.yaml> <CQL Port>`
   - By default, the CQL Port is 9042.
3. Increase the replication factor of the “system_auth”(Pre-defined keyspace in Cassandra 2.2 or higher) keyspace by using the CQL query:
   - `alter keyspace system_auth with replication = {'class': 'NetworkTopologyStrategy', <replication factor>};`
     For example, if Cassandra cluster is configured with two Data centers (DC1 & DC2) and each data center is configured with two nodes, then set the replication factor of `system_auth` keyspace as `DC1:2, DC2:2` by using the cql query as follows:
     - `alter keyspace system_auth with replication = {'class': 'NetworkTopologyStrategy', 'DC1': 2, 'DC2': 2};`
4. Create a user using the following cql query:
   - create user <user_name> with password <password>;
5. Create a role by using the following cql query:
   - create role <role_name>;
6. SIP Feature Server must be authorized to create and access keyspace, hence grant all permissions to the role name
   - grant all permissions on all keyspaces to <role_name>;
7. Grant access to the created user.
   - grant <role_name> to <user_name>;
8. If the Cassandra cluster is used for any other Genesys components, revoke the access rights after master SIP Feature Server is started for the first time, and grant all permissions only to the SIP Feature Server keyspace (sipfs) by using the following query:
   - revoke all permissions on all keyspaces from <role_name>;

- grant all permissions on keyspace sipfs to <role_name>;

9. If regional keyspace is created, then grant permissions to regional keyspace as well.
   - grant all permissions on keyspace <regional keyspace name> to <role_name>;

Configuring Cassandra SSL

The following steps show how to enable secure connection (SSL) for each Cassandra node:

1. Generate server certificates and keystore. For more information on certificate generation and installation, see Genesys Security Deployment Guide.
2. Copy the keystore file generated during certificate installation to the **<Cassandra Installed directory>\bin**.
3. Update the **Client-to-node** option in the **Cassandra.yaml** file as follows:

```
client_encryption_options
        enabled: true

        optional: false

        keystore: <keystore_name>

        keystore_password: <keystore_password>
```

4. Update the **node-to-node** option in the **Cassandra.yaml** file as follows:

```
internode_encryption: all
        keystore: <keystore name>

        keystore_password: <keystore_password>

        truststore: <truststore name>

        truststore_password: <truststore_password>

        require_client_auth: true|false

        protocol: (Default: TLS)
```

5. Restart Cassandra node.

Monitoring Cassandra

Linux

Configuring Cassandra as a Service

1. Create the /etc/init.d/cassandra startup script.
2. Edit the contents of the file:

```
#!/bin/sh
 #
```

```
# chkconfig: - 80 45
# description: Starts and stops Cassandra
# update daemon path to point to the cassandra executable
DAEMON=<Cassandra installed directory>/bin/cassandra
start() {
        echo -n "Starting Cassandra... "
        $DAEMON -p /var/run/cassandra.pid
        echo "OK"
        return 0
}
stop() {
        echo -n "Stopping Cassandra... "
        kill $(cat /var/run/cassandra.pid)
        echo "OK"
        return 0
}
case "$1" in
  start)
        start
        ;;
  stop)
        stop
        ;;
  restart)
        stop
        start
        ;;
  *)
        echo $"Usage: $0 {start|stop|restart}"
        exit 1
esac
exit $?
```

3. Make the file executable:

   ```
   sudo chmod +x /etc/init.d/cassandra
   ```

4. Add the new service to the list:

   ```
   sudo chkconfig --add cassandra
   ```

5. Now you can manage the service from the command line:

   ```
   sudo /etc/init.d/cassandra start
    sudo /etc/init.d/cassandra stop
   ```

Start/Stop Cassandra

Start the seed node and then start the rest of the Cassandra nodes sequentially:

```
Start: sudo service cassandra start
Stop: sudo service cassandra stop
```

Verifying Cassandra

After you have deployed Cassandra Cluster, you may want to verify that all the nodes can communicate with each other. To do this, execute the following command on any Cassandra host:

```
cd <Cassandra installed directory>/bin
./nodetool status
```

Windows

Monitoring Cassandra as a service

Currently this is supported if Cassandra is deployed in a windows machine. First we need configure Cassandra to run as a service and then configure the service as third party application in GA to control using SCI.

Configuring Cassandra as a Service

1. Download the latest apache commons daemon from Apache Commons Project Distributions.
2. Extract the commons daemon in **<Cassandra installed directory>\bin**.
3. Rename the extracted folder as daemon.
4. Add `<Cassandra installed directory>` as `CASSANDRA_HOME` in windows environment variable.
5. Edit the **cassandra.yaml** file in **<Cassandra installed directory>\conf** and uncomment the `data_file_directories`, `commitlog_directory`, `saved_cache_directory` and set the absolute paths.
6. Edit **cassandra.bat** in **<Cassandra installed directory>\bin** and replace the value for the `PATH_PRUNSRV` as follows:
   - for 32 bit windows, set `PATH_PRUNSRV=%CASSANDRA_HOME%\bin\daemon\`
   - for 64 bit windows, set `PATH_PRUNSRV=%CASSANDRA_HOME%\bin\daemon\amd64\`
7. Change the service name for `SERVICE_JVM` as required in **cassandra.bat**.
   - For example, setting `SERVICE_JVM="cassandra_228"` creates the windows service in the `cassandra_228` name.
8. With administrator privileges, run **cassandra.bat install** from command prompt.

This creates a Windows Service.

Configure Cassandra Service in GA

1. Create a new application object with application template **ThirdPartyServer**.
2. Under Server Info, provide the host in which the Cassandra node is running.
3. Under Start Info, provide the working directory as:

- for 32 bit windows, set `<Cassandra installed directory>\bin\daemon\`
- for 64 bit windows, set `<Cassandra installed directory>\bin\daemon\amd64\`

4. Under Start info, provide the command line as:
   - `prunsrv.exe`
5. Under Start info, provide the command line arguments as:
   - `//RS//<service name>`
6. In the **Annex** tab, create a new section called **start_stop**.
7. In the **start_stop** section, create an option **start_command** with value `net start <cassandra service>`.
8. In the **start_stop** section, create an option **stop_command** with value `net stop <cassandra service>`.

Now, monitor (start/stop) Cassandra from SCI.

Start/Stop Cassandra

Start the seed node first, followed by rest of the Cassandra nodes sequentially.

- Use SCI to start/stop the Cassandra nodes as mentioned in the Monitoring Cassandra as a service on Windows section earlier.

Verifying Cassandra

After you have deployed the Cassandra Cluster, you can verify that all the nodes communicate with each other. To do this, run the following command on any Cassandra host:

```
cd <Cassandra installed directory>\bin
nodetool status
```

Deactivate the Embedded Cassandra modules

As you upgrade to the external/co-located Cassandra cluster from version 8.1.203 and later, you may consider deactivating the embedded Cassandra module that you used in the previous versions of SIP Feature Server. This article describes the procedures to deactivate the embedded Cassandra modules.

Deactivating the Thrift protocol module for version 8.1.203 and later

If you have upgraded SIP Feature Server to version 8.1.203 and set it to use the CQL protocol to access your external Cassandra cluster, you might want to deactivate the library that provides connectivity over the obsolete Thrift protocol.

To deactivate the Thrift protocol module,

1. Locate the **start.ini** file in the path: **<FS installation folder>/start.ini**.
2. Open the file with a text editor and remove the line **`--module=fs-thrift`**.
3. Save the file.
4. Restart SIP Feature Server if it is running.
5. After restart, remove the installation files from the **<FS installation folder>/lib/fs-thrift** folder.
   Note that this step requires you to disable and remove the Embedded Cassandra module also. Refer the procedure in the next section.

Deactivating Embedded Cassandra module for version 8.1.203 and later

If you have upgraded SIP Feature Server to version 8.1.203 and later and used external Cassandra in your deployment, you can deactivate the Embedded Cassandra module from the deployment. Note that deactivating the Embedded Cassandra module is recommended but it is an optional step.

To deactivate the Embedded Cassandra module:

1. Locate the **start.ini** file in the path: **<FS installation folder>/start.ini**.
2. Open the file with a text editor and remove the line **--module=fs-cass11**.
3. Save the file.

4. Restart SIP Feature Server if it is running.
5. After restart, remove the installation files from the **<FS installation folder>/lib/fs-cass11** folder.

Configure SIP Feature Server to work with the Cassandra cluster

Perform the following steps on each SIP Feature Server instance:

1. During installation, ensure that you select the Cassandra cluster type as **External Cassandra**. If you didn't select this type of installation or if you want to verify the current mode, verify the following:
   - Make sure the value of the parameter **startServer (com.genesyslab.common.application.cassandraServer)** is set to `false` in **<Feature Server installed directory>\launcher.xml** (or **launcher_64.xml** on Linux).
   - Make sure that you set **connection-type** in the **Cassandra** section to a value (`cql` or `thrift`) according to the protocol you are planning to use.
2. In the **SIP Feature Server application > [Cassandra]** section, configure the options as follows:
   - `nodes=IPAddress` of all the Cassandra nodes that are available in that data center.
   - `keyspace=<keyspace_name>` Keyspace name for SIP Feature Server application. The default is `sipfs`.
   - `nodeFailureTolerance=replication_factor` Value of its data center-1.
     For example, if DC1 is the data center where SIP Feature Server is connected and the replication factor is `DC1=3,DC2=3`, then configure `nodeFailureTolerance=2`.
3. If Authentication is enabled in Cassandra, then configure the following options in the **[Cassandra]** section under SIP Feature Server application:
   - `username=<cassandra_username>`
   - `password=<Cassandra_password>`
4. If Cassandra TLS encryption is enabled on the CQL port, then perform the following steps:
   - Set the **cassandra_encryption** parameter (**com.genesyslab.voicemail.application.cassandraEncryption**) to `true` in **<Feature Server installed directory>\launcher.xml** (or **launcher_64.xml** on Linux).
   - Set Feature Server to trust all remote Cassandra server certificates by default.
     - If you want to verify the remote server certificate, configure the option **trusted-ca** in the **Cassandra** section of the Feature Server application object. The value should be the path to a file with trusted certificate authority you want to use to verify the remote server certificate. Note that the file must be in the PEM format and it is stored in a local folder that is accessible by Feature Server process(es).
   - Set Feature Server to skip validation of remote Cassandra server's hostname that matches with the subject of the certificate returned by that server by default.
     - If you want to enforce strict validation, configure the **verify-host** option to `true` in the **Cassandra** section.

Important

If you want to use TLS encryption when connecting to legacy Cassandra deployments that uses the Thrift protocol, then, instead of configuring the above options, create a truststore under **<SIP Feature Server installed directory>/etc** and import the public key certificates of the Cassandra nodes. Then, edit the **<SIP Feature Server installed directory>/launcher.xml** file (or **launcher_64.xml** for Linux) and set **javax.net.ssl.trustStore** to `./etc/<path of the truststore file>`, and **javax.net.ssl.trustStorePassword** to `<truststore password>`

.

Implement the Feature Server GAX Plugin

To install and configure the SIP Feature Server Genesys Administration Extension (GAX) plugin:

1. Log into GAX as an administrator (*GAX IP address*:*port*/gax).
2. Upload the plugin. Follow the steps in Uploading Installation Packages, using the *Installation Package Upload (template uploaded separately)* method. In the **Installation Package Selection** window, choose these files:
   - Upload a package: `install.zip`
   - Upload an XML template: `fs-gax-plugin.xml`
   - Upload an APD template: `fs-gax-plugin.apd`
3. Install the plugin. Follow the steps in Deploying Installation Packages, selecting the package you uploaded in the previous step.
4. Restart GAX.
5. Ensure that your GAX server and Feature Servers are synchronized within one second of each other.
6. Identify your Feature Server instances. In the GAX application object, under the section **fs-gax-plugin** (or **fs**, but only if **fs** already exists), add an option named `fs_urls`, as needed. Set the option values to a comma-separated list of Feature Server instances, identified by URL. You can use either IP addresses or FQDNs (but not both). Use the format `http://hostname:port/fs`. For example:
   `fs_urls = http://10.10.192.01:8080/fs, http://10.10.192.02:8080/fs`

   or

   `fs_urls = http://fs1:8080/fs, http://fs2:8080/fs`
7. Log into GAX as an administrator. Follow the steps in Roles to create a new role called, for example, `FS_Access`. Add your users or an access group to the role and assign them the *Access to Genesys SIP Feature Server* privilege.
8. To enable other users to access Feature Server as Administrators, assign the role privilege `Administrative Access to SIP Feature Server` to individual users or to access groups.
9. Add your users to the Users access group. See Access Groups.
10. To verify access, log out of GAX and log back in as one of the users (or access group member) that you just provisioned.
11. If you are updating a Feature Server 8.1.200.88 environment that uses the Feature Server dial plan to Feature Server 8.1.201.xx or later, you must run a migration script.

Implement device management

Device management implementation requires installation of the DM GAX plug-in, initial configuration, and setup of required and optional features such as logging and IVR provisioning.

To implement device management:

1. Log into GAX as an administrator (*GAX IP address*:*port*/gax).
2. Upload the plug-in. Follow the steps in Uploading Installation Packages, using the *Installation Package Upload (template uploaded separately)* method. In the **Installation Package Selection** window, choose these files:
   - Create the package `install.zip` from the contents of the **ip** folder
   - Upload the `install.zip` package
   - Upload the XML template: `dm-gax-plugin.xml`
   - Upload the APD template: `dm-gax-plugin.apd`
3. Install the plug-in. Follow the steps in Deploying Installation Packages, selecting the package you uploaded in the previous step.
4. Restart GAX.
5. Ensure that your GAX server and Feature Servers are synchronized within one second of each other.
6. Create an FQDN, called FQDN2, that includes the IP addresses of all the Feature Server instances (note that this FQDN is different from the one you created in Configure SIP Feature Server applications). Then configure a DNS server (your choice) to provide cyclic distribution of IP addresses for the FQDN.
   For example, if 172.24.128.34, 172.24.128.35, and 172.24.128.36 are the IP addresses of three instances, you create the FQDN with all three instances: `FQDN2 = fs1.genesys.com`, which resolves to 172.24.128.34, 172.24.128.35, and 172.24.128.36.
7. Identify your Feature Server instances. In the GAX application object, under the section **[dm-gax-plugin]**, add an option named `fs_urls`, as needed. Set the option values to a comma-separated list of Feature Server instances, identified by URL. Use the format `http://`*`FQDN or FS1 IP address`*`:`*`port`*`/fs`.
   Important: The order of the first two Features Server instances must be the opposite of the order of the first two Feature Server instances you identified under **[fs-gax-plugin]** or **[fs]**.

   For example:

   [dm-gax-plugin]: `fs_urls = http://`*`10.10.192.02:8080`*`/fs`, `http://`*`10.10.192.01:8080`*`/fs`

   [fs-gax-plugin]/[fs]: `fs_urls = http://`*`10.10.192.01:8080`*`/fs`, `http://`*`10.10.192.02:8080`*`/fs`
8. Grant your users access.
   - In GAX, go to **Configuration > Accounts > Roles** and create a new role.
   - Add users that need access to device management.
   - Under **Assigned Privileges > SIP Device Management**, check **Access to Genesys SIP Device Management**.
9. Set the device management configuration options. In Genesys Administrator, in the Feature Server

Application object, under the **[dm]** section:

- set **Active** to `true`.
- set **fs_url** to the FQDN and port of the Feature Server that controls the deployment, in the format *`FQDN2:port/fs`*, where *`FQDN2`* is the FQDN you created in step 6 above.

  For details, see Configuration options.

10. Restart the master Feature Server.
11. To collect the logging data from devices, you must set up a syslog server. Genesys recommends the NXLOG server. To configure your log server:
    - Install the NXLOG server, downloadable from http://sourceforge.net/projects/nxlog-ce/files/.
    - Download the file nxlog.zip and copy the enclosed **nxlog.conf** file to ***nxlog installation directory*\conf**, replacing the existing file.
    - Create these directories in the nxlog installation directory:
      - **\log_deposit** (must be a network shared directory)
      - **\log_backup**

      In the case of devices behind SBC/Firewall, the syslog server must be deployed in the same network as the phones and DMs cannot be used for viewing the syslogs. Also, the IP Address that is displayed in the DM UI for the phones may not be accurate.
12. Configure DHCP for phone provisioning. Set the value of the DHCP option (66/160) to: `URL: [http:https:]//`*`FQDN2`*`:`*`port`*`/fs/dm/prov`, where *`FQDN2`* is the FQDN you created in step 6 above.
    - **Note:** For Audiocodes phones that run on firmware 2.0.2.x or below, the DHCP option (66/160) should be set to `URL: [http:https:]//FQDN2:port/fs/dm/prov/`.
13. Set up Transport Layer Security (TLS) using the Genesys Security Deployment Guide. To upload the custom-generated server certificates, follow the instructions in Secure Sockets Layer (SSL) (which applies to Feature Server as well as Genesys Web Engagement).
14. For devices behind an SBC, create a trunk with the following options under the **SIP Switch > TServer** section:
    - **contact** = *`SBC address`*
    - **oos-options-max-forwards** = `1`
    - **oosp-transfer-enabled** = `true`
15. In GA, create a Trunk Group DN named `gcti_provisioning` under the SIP Server switch. Set one configuration option under the **TServer** section:
    - **sip-from-pass-through** = `true`
16. Optionally, set up IVR provisioning, which enables an administrator to use an IVR system to assign an extension to a device.
    - Under the same Switch object, create a Trunk DN object (Trunk_IVR Number). On the Annex tab, in the TServer section, create these options:
      - **contact** = *`Resource Manager IP:Port`*
      - **prefix** = the prefix of the number to be dialed to access the IVR system. For example, if the IVR number is 888 then prefix can be 8 or 88 or 888.

- Create a resource group of type **gateway** between SIP Server and the GVP Resource Manager.
- Create a resource group of type **Media control platform** between Media Control Platform and Resource Manager.
- Create an IVR profile using **Define New IVR Profile**. Add the following options:
  - **service-type** = `voicexml`
  - **initial-page-url** = `[http: https:]//`*`Feature Server2 IP address:8080`*`/fs/dm/ivr` (this value uses the first non-master Feature Server IP address)
    FS(n+1) IP address is the IP address of the "extra" Feature Server instance that is not included in *FQDN1*.
  - **alternatevoicexml** = `[http: https:]//`*`FQDN1 or Feature Server1 IP address:8080`*`/fs/dm/ivr` (this value uses either an FQDN or the master Feature Server IP address)
    FQDN1 is the FQDN you created while configuring Feature Server applications, if your environment includes more than two Feature Server instances per SIP switch.
- Create a DID group and add the IVR profile created in the previous step.
- Add a DID with the same value as the IVR number that you set under **Administration > SIP Device Management > Settings** in Genesys Administrator Extension.

17. To enable SIP Authentication for a device, add the following option in the **[TServer]** section on the extension DN assigned to the device:
    - **authenticate-requests** = Comma-separated list of the following SIP requests:
      - `register` Enables an authentication procedure on DN registration.
      - `invite` Authenticates incoming invite requests from the DN.
    - **password** = Any alphanumeric value.
18. You can configure a device that is not listed in the Supported models. From the following list, add the options with the appropriate device name to the **[dm]** section of Feature Server application. Use a comma-seperated list if you are adding more than one device:
    - `polycom`
    - `yealink`
    - `genesys`
    - `audiocodes`

    For example, to add the Polycom SoundStation IP 7000 to the existing support of Polycom SoundStation IP 6000:
    `polycom = SSIP_7000,SSIP_6000`

TLS Configuration

Create Certificate and Keystores

Create Java truststore and keystore objects in the path: **<SIP Feature Server installed directory>/etc**.

- Your keystore typically contains certificates that Feature Server uses on its listening port(s) along with the private key.
- Your truststore might contain additional trusted certificate authorities required by Feature Server to validate certificates when connecting to remote servers via TLS.

Follow the documentation instructions of your operating system and Java version that you use in your environment to make your keystore and truststore.

The following example command allows you to create a **pks12 keystore** using certificates and keys in the **pem** format that will hold self-signed certificate and a key, and protected by **password** string using the Java keytool and OpenSSL executables on the Linux platform:

```
cat ../certs/priv_key.pem ../certs/cert.pem ../certs/ca.pem >certstore.pem
openssl pkcs12 -export -in certstore.pem -name 'fs-selfsigned' -noiter -nomaciter -out
keystore.pkcs12 -passout pass:password || { echo "failed cert  conversion to pkcs12
keystore"; extit 1; }
keytool -list -keystore keystore.pkcs12 -storepass password
```

Enable SIP Feature Server secure listening ports

SIP Feature Server uses Jetty application server internally to manage HTTP/HTTPS interface with other Genesys applications. This section describes steps to configure the underlying Jetty server to use the TLS listening port.

> **Important**
> SIP Feature Server's Dial plan module listening port does not support secure mode.

HTTPS configuration

This section provides information on HTTPS configuration. The HTTPS configuration settings such as settings in **start.ini**, **TrustStore and keystore configuration paths**, and **Generate obfuscated passwords** differ for SIP Feature Server 8.1.204 and earlier versions. These changes are noted in the headers of respective sections.

Configuration of start.ini for SIP Feature Server 8.1.204 and later

Remove the '#' symbol in the **start.ini** file to enable the HTTPS and SSL parameters listed as follows:

- Enable HTTPS module
  `--modules=https`
- Enable SSL module
  `--modules=ssl`
- Configure https port
  `jetty.ssl.port=8443`
- Configure HTTPS idle timeout
  `jetty.ssl.idleTimeout=30000`

Configuration of start.ini for SIP Feature Server 8.1.203 and earlier

Remove the '#' symbol or add the following lines to the end of the **start.ini** file to enable the HTTPS and SSL parameters:

- Enable HTTPS module
  `--module=https`
- Configure https port
  `https.port=8443`
- Configure HTTPS idle timeout
  `https.timeout=30000`
- Enable SSL module
  `--module=ssl`

Configuration of jetty-ssl-context.xml

In the **jetty-ssl-context.xml** file, you can configure protocols acceptable by Feature Server on its HTTPS port, for example:

```
<Set name="IncludeProtocols">
  <Array type="java.lang.String">
    <Item>TLSv1.2</Item>
  </Array>
</Set>
<Set name="ExcludeProtocols">
  <Array type="java.lang.String">
    <Item>TLSv1.1</Item>
    <Item>SSLv3</Item>
  </Array>
</Set>
```

> **Important**
>
> When TLS is enabled in SIP Feature Server, configure the SIP Feature Server host

certificates in the GAX truststore.

Truststore and keystore configuration paths for SIP Feature Server 8.1.204 and later

Jetty defines main configuration rules for truststore and keystore paths in the **jetty-ssl-context.xml** file. By default, it defines the path as relative to **<FS Installation directory>**. The default values of Truststore and Keystore path parameters in **jetty-ssl-context.xml** are as follows:

- ```
  <Set name="KeyStorePath">
    <Call name="resolvePath" class="org.eclipse.jetty.xml.XmlConfiguration">
      <Arg><Property name="jetty.base" default="."/></Arg>
      <Arg><Property name="jetty.sslContext.keyStorePath" deprecated="jetty.keystore"
  default="etc/keystore" /></Arg>
    </Call>
  </Set>
  ```

- ```
  <Set name="TrustStorePath">
    <Call name="resolvePath" class="org.eclipse.jetty.xml.XmlConfiguration">
      <Arg><Property name="jetty.base" default="."/></Arg>
      <Arg><Property name="jetty.sslContext.trustStorePath"
  deprecated="jetty.sslContext.trustStoreAbsolutePath,jetty.truststore" default="etc/
  keystore"/></Arg>
    </Call>
  </Set>
  ```

You can define absolute paths in **start.ini** by using **jetty.sslContext.keyStorePath** and **jetty.sslContext.trustStorePath** variables. In this case, the **jetty-ssl-context.xml** file must be modified as follows:

- `<Set name="KeyStorePath"><Property name="jetty.sslContext.keyStorePath"/></Set>`
- `<Set name="TrustStorePath"><Property name="jetty.sslContext.trustStorePath"/></Set>`

Important

The keystore file must not be removed from the **<FS Installation directory>/etc/** folder.

Configuring the following keystore and truststore configuration in the **start.ini** file will override the configuration in the **jetty-ssl-context.xml** file.

- Setup path to keystore (relative to **<FS Installation directory>** by default):

  ```
  jetty.sslContext.keyStorePath=etc/keystore
  ```

- Setup path truststore (relative to **<FS Installation directory>** by default):

```
jetty.sslContext.keyStorePassword=OBF:1vny1zlo1x8e1vnw1vn61x8g1zlu1vn4
```

- Set the obfuscated passwords for keystore (For more details, see the **Generate Obfuscated passwords** topic in this section.):

```
jetty.sslContext.keyStorePassword=OBF:1vny1zlo1x8e1vnw1vn61x8g1zlu1vn4
jetty.sslContext.keyManagerPassword=OBF:1u2u1wml1z7s1z7a1wnl1u2g
jetty.sslContext.trustStorePassword=OBF:1vny1zlo1x8e1vnw1vn61x8g1zlu1vn4
```

Truststore and keystore configuration paths for SIP Feature Server 8.1.203 and earlier

Jetty defines main configuration rules for truststore and keystore paths in the **jetty-ssl-context.xml** file. By default, it defines the path as relative to <FS Installation directory>. The default values of Truststore and Keystore path parameters in **jetty-ssl-context.xml** are as follows:

- <Set name="KeyStorePath"><Property name="jetty.base" default="." />/<Property name="jetty.keystore" default="etc/keystore"/></Set>
- <Set name="TrustStorePath"><Property name="jetty.base" default="." />/<Property name="jetty.truststore" default="etc/keystore"/></Set>

You can define absolute paths in start.ini by using "jetty.keystore" and "jetty.truststore" variables. In this case, jetty-ssl-context.xml file must be modified as follows:

- <Set name="KeyStorePath"><Property name="jetty.keystore"/></Set>
- <Set name="TrustStorePath"><Property name="jetty.truststore"/></Set>

> **Important**
> The keystore file must not be removed from the <FS Installation directory>/etc/ folder.

Configuring the following keystore and truststore configuration in the **start.ini** file will override the configuration in the **jetty-ssl-context.xml** file.

- Setup path to keystore (relative to <FS Installation directory> by default):
  ```
  jetty.keystore=etc/keystore
  ```
- Setup path truststore (relative to <FS Installation directory> by default):
  ```
  jetty.truststore=etc/keystore
  ```
- Set the obfuscated passwords for keystore (For more details, see **Generate Obfuscated passwords** topic in this section.):
  ```
  jetty.keystore.password=OBF:1vny1zlo1x8e1vnw1vn61x8g1zlu1vn4

  jetty.keymanager.password=OBF:1u2u1wml1z7s1z7a1wnl1u2g

  jetty.truststore.password=OBF:1vny1zlo1x8e1vnw1vn61x8g1zlu1vn4
  ```

Generate obfuscated passwords for SIP Feature Server 8.1.204 and later

1. Navigate to <FS Installation directory> in Linux Shell or Windows Command prompt.

2. Run the following command to run the Jetty's password utility to obfuscate your passwords:
   ```
   java -cp lib/jetty-http-xxx.jar:lib/jetty-util-
   xxx.jar org.eclipse.jetty.util.security.Password your_Password
   ```

- Where -xxx signifies the version of Jetty that you have installed.
- On Linux, use a colon (:) instead of a semi-colon (;) to separate the two JAR names.

  For example:
  ```
  {FS Installation directory}>java -cp lib/jetty-http-12.0.8.jar;lib/jetty-
  util-12.0.8.jar org.eclipse.jetty.util.security.Password 123456 123456
  OBF:19iy19j019j219j419j619j8
  MD5:e10adc3949ba59abbe56e057f20f883e
  ```

Generate obfuscated passwords for SIP Feature Server 8.1.203 and earlier

1. Navigate to <FS Installation directory> in Linux Shell or Windows Command prompt.
2. Run the following command to run the Jetty's password utility to obfuscate your passwords:
   ```
   java -cp lib/jetty-http-xxx.jar:lib/jetty-util-
   xxx.jar org.eclipse.jetty.util.security.Password your_Password
   ```

- Where -xxx signifies the version of Jetty that you have installed.
- On Linux, use a colon (:) instead of a semi-colon (;) to separate the two JAR names.

  For example:
  ```
  {FS Installation directory}>java -cp lib/jetty-http-9.2.10.v20150310.jar;lib/
  jetty-util-9.2.10.v20150310.jar org.eclipse.jetty.http.security.Password 123456
  123456
  OBF:19iy19j019j219j419j619j8
  MD5:e10adc3949ba59abbe56e057f20f883e
  ```

Configuration of jetty-ssl.xml

In order for the HTTPS connection to select the port as per the configuration, enable the following configuration in the **jetty-ssl.xml** file:

```
<Set name="host"><Property name="jetty.ssl.host" deprecated="jetty.host" /></Set>
<Set name="port"><Property name="jetty.ssl.port" deprecated="ssl.port" default="8443" /></Set>
```

Configuration of TLS connections to backend servers

If you want SIP Feature Server to make secure connections with Genesys backend servers (such as Configuration Server and SIP Server), make sure you configure the following:

- In the **<SIP Feature Server installed directory>/launcher.xml** file (or **launcher_64.xml** for Linux), set the parameter **ssl_encryption** (com.genesyslab.voicemail.application.encryption) to `true`. If you use this option then ensure that Feature Server application object is configured with connections to other Genesys backend servers pointing to their secure ports.
- You can future limit TLS handshake protocol, used by Feature Server, when communicating with remote

servers, by specifying the parameter **ssl_versions** (jdk.tls.client.protocols) with the value of protocol in the **<SIP Feature Server installed directory>/launcher.xml** file (or **launcher_64.xml** for Linux). For example, you can set the value as TLSv1.2. **Note:** Genesys does not recommend you to force specific handshake protocol. You can rely on auto-negotiation of TLS protocol that will select highest possible version of transport layer protocol between Feature Server and remote backend server(s).

- In the **<SIP Feature Server installed directory>/launcher.xml** file (or **launcher_64.xml** file for Linux), configure keystore type(s), path(s), and passwords (if in use) prepared as described in Create certificate and key stores. Use the following parameters to configure these values:
  - **cert_store_file**
  - **cert_store_type**
  - **key_store_file**
  - **key_store_type**

Start SIP Feature Server

To start and verify SIP Feature Server:

> **Warning**
> Do not start Feature Server until you have checked that the configuration options are correct in the defined **Cluster** and **Cassandra** sections, specifically **replicationStrategyClassName** and **replicationOptions**. See Cassandra options.

1. Ensure that the **<SIP Feature Server installed directory>/launcher.xml** file (or **launcher_64.xml** for linux) has a correct HTTP listening port for Feature Server as specified in the parameter **http_port**. By default, the value is set to **jetty.http.port=8080**. You can change only the port number part of the value.
    - If you're using SIP Feature Server version 8.1.203 and earlier, the default value is **jetty.port=8080**.
2. Use Genesys Administrator, not the command line, to start SIP Feature Server. If you are running more than one Feature Server, start the Master first.
3. In Genesys Administrator, verify that the Feature Server is running.
4. Verify that the GAX interface is running by logging in as the Default administrator (in other words, the Default user in Configuration Server):
   `GAX IP address:port/gax`
5. At this point, only the Default administrator can log into the Feature Server GAX interface. To enable other users to log in as administrators, assign the Administrator role to them.

> **Important**
> If you are deploying SIP Feature Server with Embedded Cassandra, make sure that **Cassandra.yaml** has **endpoint_snitch:** `PropertyFileSnitch` if **replicationStrategyClassName** is set to `NetworkTopologyStrategy` and the **resources/cassandra-topology.properties** file has accurate entries describing the Feature Server Cassandra ring topology before you attempt to start.

Configure SIP Server for Feature Server

To configure the SIP Server application and SIP switch DNs:

1. On the SIP switch that is associated with the SIP Server, create a DN of type `VoIP Service` (`VOIPDN` = 9999, for example) to point to the Resource Manager IP address and port, and configure these options in the **Annex > TServer** section:
   - `contact` = *`Resource Manager IP:Port`*
   - `service-type` = `voicemail`
2. To use the Feature Server GAX interface to configure and administer your dial plan: on the SIP switch that is associated with the SIP Server, create a `VoIP Service` DN named `fs-dialplan` and configure these options:
   - `service-type` = extended
     Important: Ensure that you add the final slash character (/) to the end of each of the following URLs. The below-mentioned port indicates the dial plan port of SIP Feature Server.
   - `url` = `http://`*`FS Node`*`:`*`port/`*

     For n+1 High Availability (HA), add the following parameters:
   - `url-1` = `http://`*`FS Node2`*`:`*`port/`*
   - `url-2` = `http://`*`FS Node3`*`:`*`port/`*
   - `url-`*`n`* = `http://`*`FS Node_N`*`:`*`port/`*

     Important: The dial plan URL of SIP Feature Server must be configured only on a VOIP Service DN that was created on the Switch controlled by the SIP Server that is connected to that particular SIP Feature Server.
3. To use your existing SIP Server dial plan to administer your dial plan, create a DN of type `VoIP Service` named `standalone-dialplan`. Specify one or more dial plan rules. See the Dial-Plan Rule section in the Framework 8.1 SIP Server Deployment Guide. The following example directs all calls to `2001` to be forwarded to voicemail; `9999` refers to the voicemail VoIP DN configured on the switch. If you use a different number, change the dial plan accordingly.
   - `service-type` = `dial-plan`
   - `rulename` = `"2001=>2001;onbusy=9999;ondnd=9999;ontimeout=9999;timeout=1"`
4. In the SIP Server `Application` object, on the **Options > TServer** tab, configure these options:
   - `dial-plan` = `fs-dialplan` (the name of the VoIP Service DN created above)
   - `mwi-implicit-notify` = `true`
   - `subscription-event-allowed` = `"*"`
5. On the SIP switch that is associated with the SIP Server, create a **DN** of the type **Extension**, and in the **Options > TServer** section under the **Annex** tab, configure these options:
   - `contact` = `"*"`
   - `gvm_mailbox` = *`mailbox ID`*

Find Me Follow Me

To enable Find Me Follow Me:

1. Create a DN of type `Trunk Group`. In the **TServer** section, add the option:
   - `contact` = "*`Resource Manager IP address:port`*"
2. On the SIP switch that is associated with the SIP Server, in the **Options > TServer** section, create a DN of type `VoIP Service` and configure these options:
   - `contact` = *`Resource Manager IP address:port`*
   - `service-type` = `msml`
3. Copy the file **fmfm-confirmation-prompt-0.wav** from ***Feature Server folder*\resources\fmfm** on the Feature Server host to ***MCP folder*/users** on the MCP host.
4. Set the Find Me Follow Me SIP Server options.
5. Use the IVR Profile Wizard to create a default IVR Profile. In the section **gvp-general**, add an option **default-application** with any IVR profile as the value.

Calling Profile for VOIP DN with service type softswitch

You can assign a calling profile to VoIP Service DNs with type `softswitch` to enable one dial plan for all remote agents. This feature enables agents to use several soft switches and different rules can be applied in each case. To assign a calling profile to VOIP DN with service type softswitch, configure the following options:

- Prerequisite: SIP Server version `8.1.102.59` or above.

1. Create a VoIP DN with the service type `softswitch`:
   In the TServer section, set (or add) the following options:

   contact = <remote agent's IP>:< Port>

   prefix = <prefix of extension DN for remote agent>
2. Create an Extension DN for the remote agent:
   In the TServer section, set (or add) the option:

   contact = "" (null)

For more information on this topic, see the Configuring Softswitches section in the SIP Server Deployment Guide.

Configure voicemail

To configure Feature Server for voicemail and group voicemail:

Voicemail

1. In Genesys Administrator, in the `rm` section of the `Options` tab of the Resource Manager (RM) application, set `sip-header-for-dnis` to `request-uri`.
2. Create a resource group of type `gateway` between SIP Server and RM.
3. Create a resource group of type `Media control platform` between MCP and RM.
4. Create an IVR profile using `Define New IVR Profile` and create the following options:
   - `service-type`,value `voicexml`
   - `initial-page-url`, value `[http: https:]//`*`FQDN1 or FS1 IP address`*`:`*`port`*`/fs`
     FQDN1 is the FQDN you created while configuring Feature Server applications, if your environment includes more than two Feature Server instances per SIP switch.
   - `alternatevoicexml`,value `[http: https:]//`*`FS(n+1) IP address`*`:`*`port`*`/fs`
     FS(n+1) IP address is the IP address of the "extra" Feature Server instance that is not included in *FQDN1*.
5. Create a DID group and add the IVR profile created in the step above:
   - Add a DID with the same value as the one set for the VoIP DN option in the previous step. The recommended option and value are `service-type` and `voicexml`.
6. To configure external voicemail deposit, configure a URS strategy that considers the DN/Agent dial-plan settings for business calls that land at a route point. In a TRouteCall to SIP Server, the strategy must respond to the value `full` with `UseDialPlan`.
7. Configure a URS strategy to retrieve an individual or group voicemail. This strategy must respond with a TRouteCall to the `P-Alcatel-CSBU` header.
   For example, on this routing point the strategy should generate the following TRouteCall:

```
message RequestRouteCall

AttributeThisDN '1519'

AttributeConnID 010a02020db9f03c

AttributeOtherDN 'gcti::voicemail'

AttributeLocation ''

AttributeExtensions [152] 00 04 00 00..

'SIP_HEADERS' 'P-Alcatel-CSBU'

'P-Alcatel-CSBU' 'call_condition=localdirect;categparty=internal;rd=unconditional'

AttributeDNIS '1519'

AttributeRouteType 1 (RouteTypeDefault)
```

Group voicemail

1. To configure group voicemail deposit and retrieval, log into GAX as an administrator (*GAX IP address*:*port*/gax).
2. Under **Configuration > Configuration Manager**, create a new agent group named Agent_Group_1. You can also use a virtual agent group, but **only** a virtual agent group based on skill expressions.
3. Create an option:
   - Section: T-Server
   - Name: gvm_mailbox
   - Value: 2200 (the mailbox number)
4. Add agents to the Agent_Group_1 group.
5. Search for any user added to the Agent_Group_1 group. Verify that the group mailbox is associated with that user.
6. Create a routing point (for example, 5000).
7. Configure a URS strategy to deposit a group voicemail when none of the agent group members answer the call. This strategy must respond with TRouteCall to gcti::voicemail.
   - Configure the UseDialPlan Extensions attribute with its value set to false.
   - Configure the gvm_mailbox with its value set to the group mailbox number.

     These configurations ensure that SIP Server does not use the SIP Feature Server dial plan and builds an INVITE to the mailbox number provided by the strategy.
8. Load the routing point with the above strategy.
9. Make a call to the route point loaded with this strategy. If no agent in the group answers, after the timeout the call reaches the group mailbox (2200).

Dial plan processing

For voicemail deposit using the URS strategy, the destination of TRouteCall needs to be provided as a special voicemail forwarding number “gcti::voicemail”. If you want to use the regular forwarding number (9999, for example) instead of gcti::voicemail then the number conversion dial plan (dial-plan-rule-1=9999=>gcti::voicemail) does not work by default. The following needs to be configured to support a regular forwarding number.

When a call is routed to any destination using TRouteCall (business calls), then the SIP Server dial plan functionality is not activated. This dial plan restriction is configurable through an AttributeExtension of TRouteCall: UseDialPlan = partial. The possible values of the UseDialPlan extension are: UseDialPlan = false/partial/full/agentid (default=false for internal dial plan functionality).

- If false, the call is routed directly to the target mentioned in the TRouteCall.
- If partial, and the SIP Server dial plan is in effect, SIP Server performs number translation and authorization check on the target processes; if the SIP Feature Server dial plan is in effect, Feature Server performs the number translation and authorization check on the target processes.

- If `full`, and the SIP Server dial plan is in effect, SIP Server performs number translation, authorization, and call forwarding; if the SIP Feature Server dial plan is in effect, Feature Server performs number translation, authorization, and call forwarding.
- If `agentid`, Feature Server returns the agent ID of the agent and does not apply digit translation and destination rules. If the agent ID is not available, then Feature Server does not include the **agent-id** field in the XS response, and digits translation and destination rules are not applied.

Configure Regional Voicemail Storage

If any portion of your data center deployment lies in a geographic area where data is required to remain within that area, then you must configure regional restrictions on voicemail storage.

You can now comply with those restrictions by using replication options for regional voicemail keyspaces. With these options, Feature Server can specify that data storage and replication occur in data centers located in a particular region.

> **Important**
> Do not use voicemail while you make these changes, to avoid errors.

`Cassandra-topology.properties` file configuration

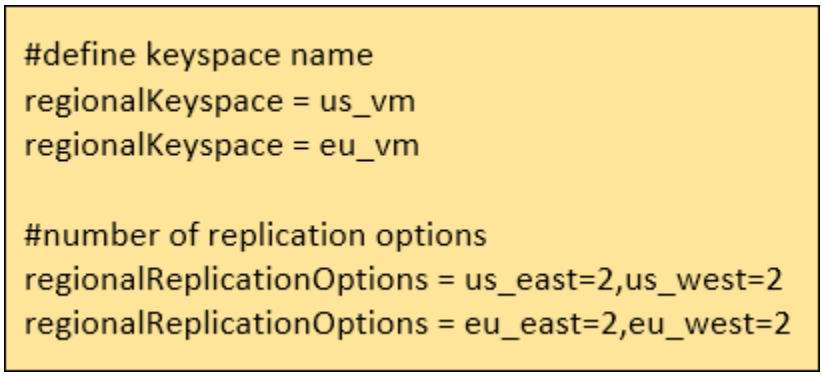
```
# Cassandra Node IP=Data Center:Rack
#Data Center One
999.999.99.99=us_west:RAC1
999.999.99.98=us_west:RAC2
#Data Center Two
999.999.99.97=us_east:RAC1
999.999.99.96=us_east:RAC2
#Data Center Three
999.999.99.95=eu_east:RAC1
999.999.99.94=eu_east:RAC2
#Data Center Four
999.999.99.93=eu_west:RAC1
999.999.99.92=eu_west:RAC2
# default for unknown nodes
default=us_west:RAC1
```

We'll continue to use us_east and us_west from the Add a New Data Center example, (illustrated at left) and add two more for Europe: eu_east and eu_west. In this configuration:

- Voicemail messages that were processed in the U.S. data centers must be stored in the U.S., and those received in the European data centers must be stored in Europe.

- All voicemail messages must be accessible from any Feature Server nodes in the cluster, regardless of where the messages are physically stored.

This example satisfies the regional voicemail storage requirement by using separate and dedicated Cassandra keyspaces for storing voicemail messages. Your role is to configure the necessary replication options for those special keyspaces. You can follow these instructions, but substitute your installation's specifics (such as key space names) for the names used here.



The example continues. The general (global) keyspace contains these replication options:

```
us_east=2, us_west=2, eu_east=2, eu_west=2
```

Read below how to implement them.

- **regionalKeyspace** defines the keyspace name.
  Add these regional keyspace definitions to the TServer/Cassandra section in all Feature Servers of a region, to create two new regional keyspaces: us_vm (which will hold voicemails for us_east and us_west) and eu_vm (which will hold voicemails for eu_east and eu_west):
  ```
  regionalKeyspace = us_vm

  and

  regionalKeyspace = eu_vm
  ```
- **regionalReplicationOptions** defines the number of replication options.
  Add these replication option definitions to the TServer/Cassandra section of the master Feature Server and the confSync Feature Server of each region, to configure the number of replication options:
  ```
  regionalReplicationOptions = us_east=2,us_west=2

  and

  regionalReplicationOptions = eu_east=2,eu_west=2
  ```

> **Important**
>
> You must set **regionalKeyspace** and **regionalReplicationOptions** when all the feature servers of a region are up and running, or before the first start of the feature servers.

- **replicationStrategyClassName** defines the replication strategy.
  Specify this option in TServer/Cassandra section of Confsync Feature Servers of each region before their first start, to set the replication strategy:
  `replicationStrategyClassName = NetworkTopologyStrategy`

Now, voicemail that is stored at particular location should be accessible from any Feature Server in a Cassandra cluster when all the Feature Servers in a particular region are down; then the voicemails stored in that region are not accessible by any Feature Server.

Configuration options

Set these configuration options in Genesys Administrator, in the `Options` tab of the SIP Feature Server Application object (or the GAX Application object, as noted).

Cassandra section

Option	Values (default value in bold)	
connection-pool-limit	**15**, or any positive number	Limits the numb limiting feature i This value must be h **request-rate-gax**. maximum 15 connec **Note:** Only SIP Featu
connection-type	**thrift** (or empty) for THRIFT or `cql` for CQL, values are not case-sensitive.	When set to `CQL` Cassandra using embedded Cassa Feature Server. Y (`com.genesysla` **launcher/_64.x** embedded Cassa Takes effect after res
logFile	**cassandra.log**	The log file nam
logLevel	**error**, none, debug, info, warning, critical	The log level; ap
maxFileSize	**20000000**	The threshold, in to dial plan logs.
maxFileCount	**2**	The number of lo
replicationStrategyClassName	**SimpleStrategy**, NetworkTopologyStrategy	Specifies the str • `SimpleStrat` the number data. This is recommende • `NetworkTopo` the values en **topology.pr** Cassandra no in single and
replicationOptions	**replication_factor=2**, replication_factor=3, replication_factor=4, ... (or) *data center 1 name=number of replication nodes, data*	Specifies the nu depending on th • When **replica**

Option	Values (default value in bold)	
	center 2 name=number of replication nodes, ...	any of the fir nodes used i • When **replica** NetworkTopo to specify the used in the r
readConsistencyLevel and writeConsistencyLevel	**CL_ONE**	Do not change th number of nodes
regionalKeyspace	**None**	Defines the keys regional keyspac regionalKeyspace=u regionalKeyspace=e
regionalReplicationOptions	**None**	Defines the num configure the nu regionalReplicationO eu_east=2, eu_west
retry-max-attempts	**None**, <positive integer value>	Defines the max retry a failed Cas **Note:** For Cassandra interval in the **retry**
retry-sleep-ms	**None**, <positive integer value>	Defines the inter retry a failed Cas To be configured in r **Note:** This option m Cassandra to retry a
nodes	**None**, Comma-separated Cassandra node IP address or FQDN that are local to its data center	Mandatory if Fea Cassandra cluste Server applicatio
keyspace	**sipfs**, <keyspace name (alpha numeric value)>	Defines the keys By default, sipfs to any desired a external Cassand
username	**None**, <cassandra username>	Configure this op external Cassand
password	**None**, <cassandra password>	Configure this op external Cassand
nodeFailureTolerance	**None**, [replication_factor of its data center – 1].	Specifies that th the configured n center. This option must be replication_factor les example, if a data ce

Option	Values (default value in bold)	
		configure this option Cassandra cluster.
trusted-ca	**Default is empty** (no certificate validation), Absolute or relative path (from Feature Server installation folder) to the PEM file that has trusted authority certificate to validate remote Cassandra server when establishing the TLS connection.	Specifies whethe connections are and its Dialplan wouldn't occur e set incorrectly, F If you want to use th **cassandra_encrypt** (`com.genesyslab.v` **launcher/_64.xml**)
verify-host	**false**, true	Specifies whethe FQDN of host be is enabled for Ca values provided If the FQDNs doesn't is not set or **cassan** does not give any re

Cluster section

Option	Values (default value in bold)	
master	**false**, true	When set to `tru` Feature Server a synchronization (such as people, Configuration Se data occurs rega import of Tenant Feature Server o **Important:** Des master.
confsync	**false**, true	When set to `tru` Server, this optio the synchronizat with Configuratio server is not ope time synchroniza regardless of thi effect immediate
disable-initial-import	Valid values: **false**, true	Set to `false` to e data upon startu To prevent another i initial import trigger Configuring to false data and switch data rare scenarios, Cass

Option	Values (default value in bold)	
		inconsistent. This ma available in the Cass Server would re-imp duplication. To preve to true after first sta trigger in the subsec
reimport-on-conf-history-log-error	**false**, true	If set to true, in t application, ther automatically tri
reimport-on-conf-history-log-error-max-attempts	**5**, Positive integer value	This limits the nu occur due to per history log inform Server. This option is availab later versions.

dialplan section

Except for `active`, which indicates whether you are using the Feature Server dial plan or the SIP Server dial plan, these options apply only if you are using the Feature Server dial plan.

Option	Values (default value in bold)	
active	**true**, false	Determines whe displays the Fea option to false d plan and hides d Feature Server A applications. Val
cassandraPoolSize	**15** and above, or any positive number	Specifies the SIP Cassandra pool s operations. You r for the changes
default-dn	**None**, any valid DN	Specifies the DN Feature Server is Applicable only f cluster.
dialplanEnhancement	**false**, true	When set to `tru` performance mo heartbeat, healt improvements o **Important** This option is supp 8.1.202.33 and late Feature Server erro Server 8.1.103.79
heartbeatFailInterval	**60**	The timeout, in s

Option	Values (default value in bold)	
		queries from Fea the previous req
heartbeatOkInterval	**300**	The timeout, in s queries from Fea the previous req
logFile	**none**, <dial plan script working directory>, <another directory>	The log file locat applies only to d
logHandler	**RotatingFileHandler**, DialPlanRotatingFileHandler	When set to Dial file is generated *logfile_name*.YY When set to Rotating the format *logfile_na*
logLevel	**none**, debug, info, warning, error, critical	The log level; ap
log-python-stdout-capture	**false**, true	When Cassandra set to CQL, then captures the erro sub-process of F main Feature Se process terminat
maxFileSize	**1000000**	The threshold, in is created; applie
maxFileCount	**2**	The number of b applies only to d
port	**8800**, <other valid http port>	The port specific the Feature Serv
profileRefreshInterval	**300**	SIP Feature Serv and partitions in the timer configu (Valid values can Important This option is supp 8.1.202.33 and late

dm section

Option	Values (default value in bold)	
Active	**false**, true	When set to true manage devices
fs_url	*IP address:port*/fs, *FQDN:port*/fs, **none**	Specifies the add processes Firmw management. In resolves to the I Server instances example, `http:/`

Option	Values (default value in bold)	
		fs. When this op attempts to dete and port will be Restart required
audiocodes/genesys/polycom/yealink	**None**, comma separated value of the device model names to be supported	Device Managen phone models th but only if the co supported.
UA_Pattern_[audiocodes/genesys/polycom/yealink]	**None**, parameters with value specific to the phone model	Custom UA head phones with a di default supporte

dm-gax-plugin section

Set the dm-gax-plugin configuration options in the Options tab of the GAX Application object.

Option	Values (default value in bold)	
fs_urls	*IP address:port*/fs, *FQDN:port*/fs, **none**	Specifies the ad that control devi comma-separate Servers. For an N FQDNs of *N* serv separated by a c http://10.10.1 http://10.10.1 Restart required.

fs-gax-plugin section

Set the fs-gax-plugin configuration options in the Options tab of the GAX Application object.

Option	Values (default value in bold)	
fs_urls	*IP address:port*/fs, *FQDN:port*/fs, **none**	Specifies the ad that control voic comma-separate Servers. For an N FQDNs of *N* serv separated by a c http://10.10.1 http://10.10.1 Restart required.

gdpr section

Set this option in the gdpr section on the Options tab of the Master Feature Server application.

Option	Values (default value in bold)	
gdpr-directory	An absolute path to the directory with read and write access	The forget-me ta from this directo forget-me task w

Log section

Feature Server uses standard Genesys logging, with the following exceptions to the default values. For details of all logging options, see Common Configuration Options log section.

Option	Values (default value in bold)	
internal	**Error**, Info, Debug	The PSDK loggin same log file.
verbose	**trace**, all, debug, interaction, standard, none	The verbose logg

Monitoring section

Option	Values (default value in bold)	
active	**true**, false	Determines whe environment sta to true, the optio environment mo monitoring inter disk space, set t using environme
corrupted-messages-threshold	**None**, <positive integer value>	Specifies the thr corrupted messa
logFile	**monitoring.log**, *string*.log	The log file nam application direc logs.
logLevel	**info**, debug, warning, error, critical	The log level; ap
maxFileSize	**1000000**	The threshold, in is created; appli
maxFileCount	**2**	The number of lo only to monitorin
monitoring-request-interval	**60000** (one minute), 10000 (ten seconds) and above	The frequency w requests monito
prometheus-monitoring	**false**, true	When set to `tru` Server to captur

Option	Values (default value in bold)	
		monitored using change requires
request-rate-gax	**50**, zero, or any positive number	The number of r Feature Server c and **dm-gax-plu** When the value is co applied. **Note:** Only SIP Featu support this option. 8.1.202.40, the defa
request-rate-vm	**50**, zero, or any positive number	The number of r Feature Server c Platform (MCP) c access. When the value is co applied. **Note:** Only SIP Featu support this option. 8.1.202.40, the defa
request-rate-dm	**100**, zero, or any positive number	The number of r Feature Server c requests from IP Balancing (ELB) When the value is co applied. **Note:** Only SIP Featu support this option. 8.1.202.40, the defa

python section

Option	Values (default value in bold)	
process-launcher	**python** or **empty**, Absolute file path or an executable name (if can be found using Operating System's PATH , as applicable to FS process) to start the standalone python process installed on the system.	When Cassandra set to CQL, the D Scheduler script using external p helps to specify python 3.X exec execution of Dia scripts is perform interpreter (pyth

security section

Option	Values (default value in bold)	
security-headers-enabled	**true**, false	When set to `tru` to all API calls in

SMTP section

Set these options, used in email notifications of voicemail, in the `SMTP` section on the `Options` tab of the SIP Feature Server Application object.

Option	Values (default value in bold)	
Host	*Server host name*	The name of the to use to genera voicemail.
channel	**SMTP**, TLS, SSL	The connection uses. TLS and SS password.
port	*port number*	The port numbe depending on th
username	*valid username*	The username re SMTP server whe or SSL security.
password	*valid password*	The password fo
trusted	**false**, true	When set to `tru` the specified SM server validation installation of ce

TServer section

Set these options, used in Find Me Follow Me, in the `TServer` section on the `Options` tab of the SIP Server (**not** SIP Feature Server) Application object.

Option	Values (default value in bold)	
fmfm-prompt-file	A valid filename	Specifies the file prompt. Must ma ***MCP folder*/use** Platform server `confirmation-p`
fmfm-confirmation-digit	**0**-9	Specifies the dig confirmation. Th number in the re a different digit,

Option	Values (default value in bold)	
		and place the fil folder on the Me
fmfm-confirmation-timeout	An integer between 5 and 60; the default value is **10**	Specifies the tim with no input), in includes playing and time for the **Note:** A call is consi up, the entered digit **confirmation-digit** input at all.
fmfm-trunk-group	A valid Trunk Group DN name	Specifies the Tru generated, when to Media Server. that represents I that DN to play r calls to FMFM de
msml-support	**true**, false	When set to `tru` required to use F

VoicemailServer section (Application object)

Set these options in the `VoicemailServer` section on the `Options` tab of the SIP Feature Server Application object.

Option	Values (default value in bold)	
access-first-prompt-delay-ms	**0**, zero or any positive integer no greater than 6000 (6000 ms = 6 seconds).	Enables delay in first prompt duri will be limited to milliseconds, the next largest valu For example, 800 ms rounded to 600 ms, Overrides the value
advance-audio-control	**true**, false	Displays advanc rewind, pause, a application user. switch level.
cassandra-counter	**true**, false	When set to `tru` is used for calcu When set to `fal` methodology to messages count **Note**: This option is 8.1.202.19 and later deployments, this op after upgrading all th

Option	Values (default value in bold)	
		8.1.202.19 and later
disable	true, **false**	When set to `tru` be disabled for b managing mailb can be still provi disabled.
disable-general-deposit-prompt	**false**, true	When set to `tru` prompt, `Please the tone and p` during voicemail
enable-default-password	**false**, true	Indicates whethe default passwor set to `false`, SIP IDs to be used a `true`, administra passwords to all password can be once, after which passwords. Default passwords a to `false`. When **use** not take effect.
group-optout-use-default	**false**, true	When set to `tru` voicemail-optout optout prompt. V any optout prom have an Optout
language	**<server locale>**, de, en-AU, en-GB, en-US, es, es-MX, fr, it, ja, pt-BR, ru, zh-CN, ko	The language us overrides the lan and overridden b mailbox: **Note:** The group ma is accessed. • When access personal mai • When access accessed thr application-le • When access language is u • When deposit the group ma
locale	**en-US**, other locale strings	Specifies the def User Interface (T
max-concurrent-sessions	Numeric Value	This option restr voicemail access

Option	Values (default value in bold)	
		option is not con restriction for th which takes effe This option will b **login** option is s
play-disclaimer	**false**, true	When set to `tru` recorded disclair Overrides the va
play-review-on-deposit	**true**, false	Specifies whethe (TUI) will play th confirm press 1, rerecord press 3 When set to `true`, th When set to `false`, t continues as if the c **Note:** You can set th set on both levels, th precedence.
prompt-delay-ms	**0**, zero or any positive integer in multiples of 600 ms and not greater than 6000 ms (6000 ms = 6 seconds).	Enables delay by multiples of 600 first prompt duri milliseconds, the next largest valu example, 800 m is rounded to 60 **Note:** For the **home** in **access-first-pro**
security-account-lockout-duration	**10**, zero or any positive integer	Specifies the tim Feature Server w that has been lo entries; the user login attempts. A only an administ
security-max-login-attempt-count	**4**, any positive integer	Specifies the ma while accessing locked after 4 fa
security-password-enhanced-validation	**false**, true	When set to `tru` their passwords example) and se in mailbox passw using their mailb
security-password-check-internal-call	**true**, false	Specifies whethe played when a u from an internal
security-password-length-min	**4**, any positive integer	Specifies the mi digits. Increasing users to reset th minimum.

Option	Values (default value in bold)	
skip-optout-prompt	**false**, true	When set to `tru` prompt, "*To inte* *options, press 0* voicemail depos
skip-confirm-ouptout-prompt	**false**, true	When set to `tru` prompt, "*To cont* *press 1, To leave* voicemail depos
suspending-state-timeout	**-1**, any integer greater than 0	Maximum time, Server will be in for ongoing voic By default (when the configured), Feature sessions are comple shutdown of the voic maintenance or a so ensures the following • Ongoing TUI before shutd • New TUI voic an alternate • New web UI alternate Fea
time-zone	**<server time zone>**, any valid time zone (see http://joda-time.sourceforge.net/timezones.html)	Specifies the def messages (appli overrides any va when the time z to a value other
user-login	**false**, true	Indicates whethe through a comm
voice-can-deposit-during-extended-absence	**true**, false	When set to `tru` after the absenc
voice-enrollment-enabled	**true**, false	When set to `tru` enrollment.
voice-greeting-extended-max-duration	**24**, any positive integer	Specifies the len for the user to re after the period confirm their rec
voice-greeting-personal-max-duration	**12**, any positive integer	Specifies the len for the user to re after the period confirm their rec
voice-message-max-duration	**10**, any positive integer	Specifies, in sec length.
voice-message-priority-enabled	**false**, true	Enables callers t they are leaving When set to `tru` selection menu t

Option	Values (default value in bold)	
		urgent delivery. are all sent with
voice-mailbox-message-count	**10**, any positive integer	Specifies the ma messages per m
voice-mwi	**true**, false	If set to false, FS handling voicem
voicemail-optout-destination	**empty (means that the feature is disabled)**, any phone number or routing point	When set, enabl voicemail to the moment during optout-destinatio but overridden w the Mailboxes se Provisioning mai
voicemail-quorum	**false**, true	Obsolete. The va
vxml-access-fetch-timeout	**60**, any positive integer	This parameter c

VoicemailServer section (Switch)

Set these options in the `VoicemailServer` section on the `Options` tab of the SIP Switch object, not in the Application object.

Option	Values (default value in bold)	
access-first-prompt-delay-ms	**0**, zero or any positive integer no greater than 6000 (6000 ms = 6 seconds).	Enables delay in first prompt duri will be limited to milliseconds, the next largest valu For example, 800 ms rounded to 600 ms, Overridden by the va
advance-audio-control	**true**, false	Displays advanc rewind, pause, a application user. the application l
language	**<server locale>**, de, en-AU, en-GB, en-US, es, es-MX, fr, it, ja, pt-BR, ru, zh-CN, ko	The language us overridden by th or mailbox level. **Note:** The group ma is accessed. • When access personal mai • When access accessed thr application-le

Option	Values (default value in bold)	
		• When access language is u • When deposit the group ma
play-disclaimer	**false**, true	When set to `tru` recorded disclair Overridden by th level, so to enab must also set thi application level
play-review-on-deposit	**true**, false	Specifies whethe (TUI) will play th confirm press 1, rerecord press 3 When set to `true`, th When set to `false`, t continues as if the c **Note:** You can set th If set on both levels, precedence.
time-zone	**<server time zone>**, any valid time zone (see http://joda-time.sourceforge.net/timezones.html)	Specifies the def messages (appli when the time z application is se default.
voicemail-optout-destination	**empty (means that the feature is disabled)**, any phone number or routing point	When set, enabl voicemail to the moment during a voicemail-optout has a value or w Mailboxes settin Provisioning mai

history-log section

Set these options in the `history-log` section on the `Options` tab of the Configuration Server application object.

Option	Values (default value in bold)	
active	**true**, false	When Feature Se reconnected, the Configuration Se period are writte

Option	Values (default value in bold)	
		upon reconnecti
expiration	**30**, 1-30	History log expir
max-records	**1000**, 1-1000	Maximum record history log.

ScheduledTasks section

Set these options in the `ScheduledTasks` section on the `Options` tab of the Master Feature Server application.

When SSL and Cassandra authentication is enabled, the following three additional parameters must be appended to the existing values for the **<script name>.cmd** option:

- **-u** <*username*>—The Cassandra username. Default value is "cassandra".
- **--pw** <*password*>—The Cassandra password. Default value is "cassandra".
- **--tls**—Enables SSL connection.

For example, if we consider **update-mailbox-counters** task, **update-mailbox-counters.cmd** must be set as "**refereshInvalidMailboxCounters.py -H localhost -p 9160 -o update-mailbox-counters.log -u cassandra –pw cassandra –tls**".

Option	Values (default value in bold)	
update-mailbox-counters.active	**false**, true	When set to true and will schedul in the `update-ma` option.
update-mailbox-counters.cmd	refereshInvalidMailboxCounters.py -H localhost -p 9160 -o update-mailbox-counters.log	Command line fo execution Command line forma **refereshInvalidMa** 9160 **-o** <*log file* where: • **refereshInv** name of the **/<*FS_instal* • **-H** `localhos` Cassandra h may be chan deployments • **-o** <*script l* filename and filename is s location is **/<**

Option	Values (default value in bold)	
		• **-v** enables ac • **-f all|<*numb*** changes inva missing, ther and no chang The word 'all which is the
update-mailbox-counters.schedule	0 0 6 ? * SUN	Schedule time fo configured in cro
delete-expired-messages.active	**false**, true	When set to true schedule the tas delete-expired-m
delete-expired-messages.cmd	removeExpiredMessages.py -H localhost -p 9160 -o delete-expired-messages.log	Command line fo execution. Command line forma `localhost` **-p** `9160` - where: • **removeExpi** the script file **/<*FS_instal*** • **-H** `localhos` Cassandra ho may be chan deployments • **-o** *<script l* filename and filename is s location is **/<** Important For each run, the s ***<script log file n***
delete-expired-messages.schedule	0 0 4 ? * SUN	Schedule time fo configured in cro
forget-me.active	**false**, true	When set to true and will schedul option forget-me
forget-me.cmd	forgetMe.py --dbhost <host> --dbport <port>	Command line fo Command line forma **dbport** *<port>* where: • **forgetMe.py** located in **/<** **util**.

Option	Values (default value in bold)	
		• **--dbhost** <*h* Feature Serv
forget-me.schedule	0 0 6 ? * *	Schedule time fo configured in cro
reimport.active	**false**, true	When set to true and will schedul in the reimport.s
reimport.schedule	Time in CRON format	Schedule time fo configured in CR

Upgrading SIP Feature Server

Use this procedure to upgrade from one version of SIP Feature Server 8.1.2 to another.

> **Important**
>
> While upgrading Feature Server, **launcher.xml** will not be updated and the options in **launcher.xml** remain unchanged.

> **Important**
>
> Beginning with SIP Feature Server version 8.1.203.XX, the **Embedded Cassandra cluster mode** is being deprecated and the feature will be completely removed in future versions. As part of this deprecation, the Embedded Cassandra cluster mode will be removed from the default installation in future versions. If your current deployment model uses the Embedded Cassandra cluster mode for SIP Feature Server, Genesys recommends you to migrate the deployment to other Cassandra modes.

Upgrading while Feature Server is running (recommended)

To upgrade a running Feature Server environment, stop and upgrade one Feature Server Cassandra cluster instance at a time, **beginning with the master Feature Server**.

1. On the Feature Server master node (which is also the Cassandra seeds node, in case you are running the embedded Cassandra cluster), back up all files in the **etc** folder, which includes the `cassandra.yaml` file.
2. Stop Feature Server.
3. Install Feature Server from the installation package. During the upgrade, the installer uses the values provided during a fresh installation.
4. Start Feature Server.
5. Repeat steps 2-4 for each Feature Server instance.
6. Upgrade or install and configure the Feature Server GAX Plug-in.
7. If you are updating a Feature Server 8.1.200.88 environment that also uses the Feature Server dial plan, you must run a migration script.
8. Optionally, create and assign voicemail profiles.

Upgrading while Feature Server is stopped

To upgrade a running Feature Server environment, upgrade one Feature Server Cassandra cluster instance at a time. Upgrade the master Feature Server last.

1. On the Feature Server master node (which is also the Cassandra seeds node, in case you are running the embedded Cassandra cluster), back up all files in the **etc** folder, which includes the `cassandra.yaml` file. Do **not** upgrade the master node until after you have upgraded all other nodes.
2. On a non-master node, install Feature Server from the installation package. During the upgrade, the installer uses the values provided during a fresh installation.
3. Start Feature Server.
4. Repeat steps 2-3 for each Feature Server instance.
5. Upgrade or install and configure the Feature Server GAX Plug-in.
6. If you are updating a Feature Server 8.1.200.88 environment that also uses the Feature Server dial plan, you must run a migration script.
7. Optionally, create and assign voicemail profiles.

Restore HTTPS configuration

The following procedure shows how to restore HTTPS configuration of Feature Server after an upgrade. This procedure is applicable only while upgrading Feature Server to version 8.1.201.92 or above.

1. After upgrading to version 8.1.201.93 or above, the Feature Server installation folder contains the following files retrieved from the folder containing the previous versions: **start.ini.bak** and **etc.bak** in both Windows and Linux operating systems. Previously, when upgrading Feature Server overwrote these files rather than retrieving existing files.
2. Compare and copy the difference in the values of **start.ini**, **start.ini.bak** and **etc/jetty-ssl.xml**, **etc.bak/jetty-ssl.xml** and apply the differences in **start.ini** and **etc/jetty-ssl.xml**.
3. Copy **etc.bak/keystore** to **etc/keystore** to restore the configuration.

> ### Important
> After upgrading to Feature Server version 8.1.201.92, the backup of the **etc** folder and the **start.ini** file will be named as **start.ini.backup** (Windows), **start.ini.bak** (Linux), **etc.backup** (Windows), and **etc.bak** (Linux), respectively.

Post upgrade steps for version 8.1.203 and later

If you have upgraded SIP Feature Server to version 8.1.203 and later and used external Cassandra in

your deployment, you can deactivate the Embedded Cassandra module from the deployment. Note that deactivating the Embedded Cassandra module is recommended but it is an optional step.

To deactivate the Embedded Cassandra module:

1. Locate the **start.ini** file in the path: **<FS installation folder>/start.ini**.
2. Open the file with a text editor and remove the line **--module=fs-cass11**.
3. Save the file.
4. Restart SIP Feature Server if it is running.
5. After restart, remove the installation files from the **<FS installation folder>/lib/fs-cass11** folder.

Switching from Thrift to CQL protocol for Cassandra communication

If you have upgraded SIP Feature Server to version 8.1.203 and later and used external Cassandra in your deployment, you can switch over to use the new CQL communication protocol by referring the following procedure:

- Make sure the Cassandra cluster is configured to accept connections on the CQL port (9042).
- Make sure you have python3 interpreter available on all the SIP Feature Server host as per prerequisites.
- In all the SIP Feature Server application,
  - Configure the **connection-type=**`cql` option in the **Cassandra** section of the application object
  - Configure the **process-launcher** option in the **python** section pointing to the Python 3.x executable.
  - Restart the SIP Feature Server node.

Post switchover steps after transitioning from Thrift to CQL protocol

Complete the following steps after you switched over the communication protocol from Thrift to CQL. Note that this procedure is recommended but it is optional.

1. Deactivate the Thrift library by referring the procedure here.
2. Deactivate the embedded jython module by referring the following procedure. The embedded jython is used for execution of dialplan and maintenance scripts, which is now replaced with the native python interpreter.

> **Important**
>
> Before deactivating the embedded jython module, ensure the Python executor is configured in the application options under the **python** section.

1. Locate the **start.ini** file in the path: **<FS installation folder>/start.ini**.
2. Open the file with a text editor and remove the line **`--module=fs-jython`**.
3. Save the file.
4. Restart SIP Feature Server if it is running.
5. After restart, remove the installation files from the **<FS installation folder>/lib/fs-jython** folder.

Migrate data from Embedded to External Cassandra and between Cassandra versions

Cassandra versions 2.x and higher do not support backward compatibility with Cassandra versions 1.x. The data migration is required when upgrading Feature Server's Cassandra database backend from embedded Cassandra version 1.x to external versions 2.x and/or 3.x.

Feature Server release 8.1.202.02 includes the following Python scripts for migrating data from embedded Cassandra database to Cassandra versions 2.x or 3.x:

- **copyKeyspaceSchema.py**—Creates a keyspace and its column families in the destination Cassandra cluster.
- **copyKeyspaceColumnFamilies.py**—Copies content of source keyspace column families to the destination keyspace column families.

Cassandra 4.x migration If your current deployment environment uses Embedded Cassandra and you want to migrate to Cassandra 4.x, the scripts provided above are not compatible. Note that it is also not possible to directly migrate an embedded Cassandra to Cassandra 4.x.

If you want to move SIP Feature Server's database to Cassandra 4.x,

- Have your externally deployed Cassandra 2.x/3.x migrated to latest 3.11 per Cassandra's official recommendations or
- Migrate the embedded Cassandra to Cassandra 3.11 using the scripts provided in the previous section and
- Perform an in-place upgrade from Cassandra 3.11 to Cassandra 4.x. per Cassandra's official recommendations.

Prerequisites for data migration to external Cassandra

The following are the prerequisites for the data migration from versions 1.x to versions 2.x and/or 3.x.

- Destination Cassandra cluster must be deployed and all the nodes must be up and running.
- In terms of Feature Server deployment, the destination Cassandra cluster must be deployed in external mode.
- The destination Cassandra cluster must not have any Feature Servers assigned to it before the copying of data from the source Cassandra cluster is completed.
- SIP Feature Server must run in the **ReadOnly** mode to ensure proper data copy during migration with running Feature Servers. The **ReadOnly** mode must be turned on before deploying the Python migration scripts. Use the following configuration:

```
[Cassandra]readOnly=true
```

Migrating data from Embedded to External Cassandra

The following steps show how to migrate data from Cassandra v1.x to v2.x and v3.x

1. Deploy the Python scripts.
2. Run the Python scripts.
3. Connect Feature Server nodes to migrated Cassandra cluster.

Deactivate Embedded Cassandra module for version 8.1.203 and later by referring to the procedure here.

Deploy the Python scripts

1. Install Python 2.7.5 32-bit version and Pycassa libraries on the destination Cassandra host where the scripts must be run.
2. The Python scripts **copyKeyspaceSchema.py**, **copyKeyspaceColumnFamilies.py** and the sample json input file, **copyKeyspaceInput.json** are present in the Python utilities folder of Feature Server deployment: *FS installation path*/**Python/util/**. Copy these script files to a directory on the destination Cassandra host.
3. Navigate to the directory location and run the scripts.

For more details, refer to Python Scripts.

Run the Python scripts

Following is a sample **copyKeyspaceInput.json** input json file:

```
{"sourceHostPort": "FsNode01:9160",
"sourceHostUserName": "",
"sourceHostPassword": "",
"sourceHostTls": "false",
 "destinationHostPort": "CassNode01:9160",
 "destinationHostUserName": "",
 "destinationHostPassword": "",
 "destinationHostTls": "false",
 "replicationStrategyClassName": "NetworkTopologyStrategy",
 "replicationOptions": {"DC1":"2", "DC2":"2"},
 "sourceKeyspace": "sipfs",
 "destinationKeyspace": "sipfs",
 "excludedCFs": [ ],
 "includedCFs": [ ] }
```

Copy keyspace schema

The following steps show the procedure to copy the keyspace schema:

1. Verify that the input json file has the following parameters:

Parameters	Description	Sample	Mandatory
sourceHostPort	Host and the Thrift port of source Cassandra DB in the URL format: *host IP:port*	`FsNode01:9160`	Yes
destinationHostPort	Host and the Thrift port of destination Cassandra database in the URL format: *host IP:port*	`CassNode01:9160`	Yes
sourceKeyspace	Name of the source keyspace	`sipfs`	Yes
destinationKeyspace	Name of the destination keyspace	`sipfs`	Yes
replicationStrategyClassName	Replication Strategy Class Name	`NetworkTopologyStrategy`	Yes
replicationOptions	Replication Options for the destination keyspace Ensure to configure this value according to the **cassandra-toplogy.properties** file.	`{"DC1": "2", "DC2": "2"}`	Yes
sourceHostUserName	The username of source Cassandra.	`FSadmin`	Yes, if authentication is enabled in the source Cassandra Cluster.
sourceHostPassword	The password of source Cassandra.	`FSadmin`	Yes, if authentication is enabled in the source Cassandra Cluster.
sourceHostTls	Set this option to `true` when SSL is enabled for the source Cassandra connection.	`true`	Yes, if SSL is enabled for the source Cassandra.
destinationHostUserName	The username of destination Cassandra.	`FSadmin`	Yes, if authentication is enabled in the destination Cassandra Cluster.
destinationHostPassword	The password of destination Cassandra.	`FSadmin`	Yes, if authentication is enabled in the destination Cassandra Cluster.
destinationHostTls	Set this option to `true` when	`true`	Yes, if SSL is enabled for the

	SSL is enabled for the destination Cassandra connection.		destination Cassandra.

2. Run the **copyKeyspaceSchema.py** script.

Sample command line

```
python ./copyKeyspaceSchema.py -i ./copyKeyspaceInput.json -o
./copyKeyspaceSchema_`date +%y%m%d-%H:%M`.log
```

Copy keyspace column families

1. Verify that the input json file has the following parameters:

Parameters	Description	Sample	Mandatory
sourceHostPort	Host and the Thrift port of source Cassandra database in the URL format: *host IP:port*	`FsNode01:9160`	Yes
destinationHostPort	Host and the Thrift port of destination Cassandra database in the URL format: *host IP:port*	`CassNode01:9160`	Yes
sourceKeyspace	Name of the source keyspace	`sipfs`	Yes
destinationKeyspace	Name of the destination keyspace	`sipfs`	Yes
excludedCFs	List of comma-separated column family names to be excluded from copying while running the **copyKeyspaceColumnFamilies.py** script.	`message_bytes, device`	No
includedCFs	List of comma-separated column family names to be copied while running the **copyKeyspaceColumnFamilies.py** script.	`message_bytes, device`	No
sourceHostUserName	The username of source Cassandra.	`FSadmin`	Yes, if authentication is enabled in the source Cassandra Cluster.

sourceHostPassword	The password of source Cassandra.	FSadmin	Yes, if authentication is enabled in the source Cassandra Cluster.
sourceHostTls	Set this option to true when SSL is enabled for the source Cassandra connection.	true	Yes, if SSL is enabled for the source Cassandra.
destinationHostUserName	The username of destination Cassandra.	FSadmin	Yes, if authentication is enabled in the destination Cassandra Cluster.
destinationHostPassword	The password of destination Cassandra.	FSadmin	Yes, if authentication is enabled in the destination Cassandra Cluster.
destinationHostTls	Set this option to true when SSL is enabled for the destination Cassandra connection.	true	Yes, if SSL is enabled for the destination Cassandra.

If one or more source column families contain huge volumes of data, then run the **copyKeyspaceColumnFamilies.py** script to copy these column families separately from the rest of the source column families. Use the excludedCFs and includedCFs parameters to exclude or include a specific column family. When the includedCFs list is not empty, the excludedCFs parameter is ignored and only the column families in the includedCFs list are copied.

For example, provide the following json file as the input to the **copyKeyspaceColumnFamilies.py** script to copy the content of all column families except message_bytes column family.

```
{"sourceHostPort": "FsNode01:9160",
 "sourceHostUserName": "",
 "sourceHostPassword": "",
 "sourceHostTls": "false",
 "destinationHostPort": "CassNode01:9160",
 "destinationHostUserName": "",
 "destinationHostPassword": "",
 "destinationHostTls": "false",
 "replicationStrategyClassName": "NetworkTopologyStrategy",
 "replicationOptions": {"DC1": "2", "DC2": "2"},
 "sourceKeyspace": "sipfs",
 "destinationKeyspace": "sipfs",
```

```
 "excludedCFs": [ “message_bytes” ],
 "includedCFs": [ ] }
```

For example, provide the following json file as input to the **copyKeyspaceColumnFamilies.py** script to copy the content of only the message_bytes column family.

```
{"sourceHostPort": "FsNode01:9160"
"sourceHostUserName": "",
 "sourceHostPassword": "",
 "sourceHostTls": "false",
 "destinationHostPort": "CassNode01:9160",
 "destinationHostUserName": "",
 "destinationHostPassword": "",
 "destinationHostTls": "false",
 "replicationStrategyClassName": "NetworkTopologyStrategy",
 "replicationOptions": {"DC1": "2", "DC2": "2"},
 "sourceKeyspace": "sipfs",
 "destinationKeyspace": "sipfs",
 "excludedCFs": [],
 "includedCFs": [ “message_bytes” ] }
```

2. Run the **copyKeyspaceColumnFamilies.py** script.

Sample command line

```
python ./copyKeyspaceColumnFamilies.py -i ./copyKeyspaceInput.json -o
./copyKeyspaceContent_`date +%y%m%d-%H:%M`.log
```

> **Important**
>
> If there are regional keyspaces to be copied, all the keyspaces, the global keyspace and all regional keyspaces must be copied one after the other. To copy all keyspaces, the scripts must be run for each keyspace: the global keyspace and each regional keyspace.

Connecting Feature Server nodes to migrated Cassandra cluster

The following steps should be performed for every Feature Server node involved:

1. Disable the **ReadOnly** mode in Feature Server. Use the configuration: `[Cassandra]readOnly=false`
2. Stop Feature Server node.
3. Edit *<FS installation path>*`\launcher.xml` file and set the property `startCassandra` to **False**.

```
<parameter name="startCassandra"
 displayName="com.genesyslab.common.application.cassandraServer" hidden="true"
 mandatory="false">
 <description><![CDATA[ Start Cassandra Server]]></description>
 <valid-description><![CDATA[]]></valid-description>
 <effective-description/>
 <format type="string" default="false"/>
 <validation>
 </validation>
```

```
</parameter>
```

4. Update the **[Cassandra]** section of the Feature Server application as shown in the following table:

[Cassandra] section Option	Default Value	Feature Server Application Value	Mandatory
nodes	NA	Configure all the Cassandra nodes IP addresses that belong to the data center where Feature Server is installed.	Yes
nodeFailureTolerance		Replication factor of Feature Server data center is 1. If the regional keyspace is used, then the least value (keyspace, regional keyspace) replication_factor of its data center is 1. For example, if the DC1 contains 4 nodes and the replication_factor for the global keyspace is 3 and the regional keyspace is 2, then the value is 1.	No
keyspace	sipfs	Name of the 'global' keyspace This option must have the same value as the keyspace name parameter for the **copyKeyspaceSchema.py** script when copying the global keyspace.	No
replicationStrategyClassName	NA	This option must have the same value as the replication options parameters for the **copyKeyspaceSchema.py** script when copying both the global keyspace and the regional keyspace values.	Yes
replicationOptions	NA	This option must have the same value as the replication options parameters for the **copyKeyspaceSchema.py** script.	Yes
regionalKeyspace	sipfs_<region>	Name of the regional keyspace This option must have the same value as the	Mandatory if regional keyspace(s) is enabled.

		replication options parameters for the **copyKeyspaceSchema.py** script when copying the regional keyspace.	
regionalReplicationOptions	NA	This option must have the same value as the replication options parameters for the **copyKeyspaceSchema.py** script.	Mandatory if regional keyspace(s) is enabled.
username	cassandra	Cassandra Username	Mandatory if authentication is enabled in Cassandra Cluster.
password	cassandra	Cassandra Password	Mandatory if authentication is enabled in Cassandra Cluster.

5. Start Feature Server node.

Upgrading external Cassandra cluster to Cassandra 4.x

Prerequisites

1. Ensure that SIP Feature Server already works with the external Cassandra and the connection mode between Feature Server and external Cassandra was switched from the `Thrift` to `CQL` mode.
   Switching Feature Server's connection mode to **CQL** can be done by configuring the options mentioned in Provisioning of Cassandra Parameters.
2. Enable read-only mode of the SIP Feature Server application by setting the **readOnly** option to `true` in the Cassandra section of the application options.
3. Follow Cassandra's official recommendations to migrate your Cassandra 3.11 cluster to Cassandra 4.X. Genesys provides only a sample migration procedure that would help you to plan steps for your own specific deployment.

Sample migration procedure

Start the migration by upgrading the seed node first and then proceed with other nodes.

Pre-upgrade checks

1. Confirm that all nodes are up and normal by running the following command:

```
# nodetool status | grep -v UN      => Returns nodes that are not marked as UN (U-UP
 N-Normal)
```

```
Datacenter: datacenter1
=======================
Status=Up/Down
|/ State=Normal/Leaving/Joining/Moving
--  Address    Load       Tokens       Owns (effective)  Host ID
```

2. Confirm that you don't receive any unresolved errors after you run the following command:

```
sudo grep -e "WARN" -e "ERROR" <path to cassandra installed folder>/logs/
system.log     => Returns Warning and Error messages in cassandra system logs -
should not return any error
```

3. Confirm that gossip information is stable by running the following command:

```
# nodetool gossipinfo | grep STATUS | grep -v NORMAL      => Returns gossipinfo
status that are not Normal - should return empty
```

4. Confirm that there are no dropped messages by running the following command:

```
# nodetool tpstats | grep -A 12 Dropped
        Message type           Dropped
        READ                         0
        RANGE_SLICE                  0
        _TRACE                       0
        HINT                         0
        MUTATION                     0
        COUNTER_MUTATION             0
        BATCH_STORE                  0
        BATCH_REMOVE                 0
        REQUEST_RESPONSE             0
        PAGED_RANGE                  0
        READ_REPAIR                  0
```

5. Repair each node before upgrading by running the following command:

```
# nodetool repair -pr
```

   Running the above command does not give any results. However, the time it runs might be long depending on the size of data.

Create Snapshot

Create a pre-upgrade snapshot backup by running the following command.

```
# nodetool snapshot --tag pre-upgrade
        Requested creating snapshot(s) for [all keyspaces] with snapshot name [pre-upgrade]
and options {skipFlush=false}
        Snapshot directory: pre-upgrade
```

Backup

1. Shut down Cassandra by running the following commands.

```
a. # nodetool drain            => No response expected. To restrict requests from
clients
b. # nodetool netstats         => To check drain status - Mode should be marked
DRAINED
        Mode: DRAINED
        Not sending any streams.
        Read Repair Statistics:
        Attempted: 0
```

```
Mismatch (Blocking): 0
Mismatch (Background): 0
Pool Name                    Active   Pending      Completed   Dropped
Large messages                  n/a         2              0         0
Small messages                  n/a         2              5         0
Gossip messages                 n/a         2            122         0
```

2. Stop Cassandra by running the following commands.

```
a. # sudo kill $(sudo lsof -t -i:7199)
b. # ps auwx | grep CassandraDaemon
```

3. Back up Cassandra configuration and data files by running the following commands.

```
    cd <path to cassandra installed folder> && tar czfv <user defined path>/cassandra-
config-backup.tgz ./conf
    Note: Below commands are needed to place data directory in common path, if not
already (time consumption depends on data size)
    cd <path to cassandra installed folder> && tar czfv <user defined
path>/cassandra-data-backup.tgz ./data/data
    cd <user defined path>/ && tar xzf cassandra-data-backup.tgz        => To
extract data files
```

Install and Configure the new Cassandra

1. Install the new Cassandra package by running the following commands:

```
  curl -OL https://archive.apache.org/dist/cassandra/4.x.x/apache-cassandra-4.x.x-
bin.tar.gz
    Note: Extract zip file and move to expected path
   tar xzf apache-cassandra-4.1.2-bin.tar.gz
   mv apache-cassandra-4.1.2 /<user defined path>
```

2. Configure user roles for Cassandra 4.x and its data directory.

```
 sudo chown -R <fs_admin_role>:<fs_admin_role> <path to cassandra 4.x installed
folder>          => Extracted folder of cassandra 4.x.x
  sudo chown -R <fs_admin_role>:<fs_admin_role> <user defined path>         =>
Extracted folder of backup data from older version
```

3. Update Cassandra configuration files of new version.

```
Copy the cassandra-topology.properties file from older to new version.
   cp <path to cassandra 3.x installed folder>/conf/cassandra-topology.properties
<path to cassandra 4.x installed folder>/conf

Update the conf/cassandra.yaml file in cassandra 4.x.x extracted folder with the
following options.
    cluster_name: <cluster_name> (default:FeatureServerCluster)
    num_tokens: 256
    data_file_directories: <user defined path>/data/data
    - seeds: "<seed_node_ip>"
    listen_address: <node_ip>
    rpc_address: (empty)
    endpoint_snitch: PropertyFileSnitch
```

Upgrade

1. Start Cassandra from Cassandra 4.x.x extracted folder by running the following command:

```
<path to cassandra 4.x installed folder>/conf/bin/cassandra -f
```

2. Verify if Cassandra latest version has started from logs.

```
sudo tail -n 50 -f <path to cassandra 4.x installed folder>/logs/system.log
 INFO  [main] 2024-04-18 10:05:32,432 SystemKeyspace.java:1729 - Detected
version upgrade from 3.11.16 to 4.1.2, snapshotting system
 keyspaces
 INFO  [main] 2024-04-18 10:05:37,489 StorageService.java:864 - Cassandra
version: 4.1.2
```

3. Check if all nodes are marked as `UN`, use the following command:

```
nodetool status
```

4. Monitor the thread pool status by running the following command. There should be no pending, blocked, or dropped messages.

```
watch -d nodetool tpstats
```

Update SST Tables (one node at a time)

1. Upgrade SSTables by running the following command:

```
nodetool upgradesstables        => should return empty
watch -d "nodetool compactionstats -H"        => pending tasks should be 0
     Every 2.0s: nodetool compactionstats -H
     pending tasks: 0
```

2. Confirm SSTables have been upgraded by checking the data folder copied to user defined path from older Cassandra.

```
All table files will be modified with 'nb-' prefix. Will return the files that are
not modified.
   sudo find <user defined path>/data/data -type f | grep -v "snapshots" | rev |
cut -d'/' -f1 | rev | grep -v "^nb\-"
      output:
      grep: warning: stray \ before -
      ballot.meta
```

Cleanup

Remove snapshot by running the following command.

```
nodetool clearsnapshot -t pre-upgrade
Requested clearing snapshot(s) for [all keyspaces] with snapshot name [pre-upgrade]
```

Upgrade other nodes

Repeat all the above steps for remaining nodes.

Reset and restart SIP Feature Server applications

In the Feature Server application options, set the **readOnly** option to `false` and restart the Feature Server applications one by one.

Validation

Verify if Cassandra latest version has started from logs. Use the following command:

```
     sudo tail -n 50 -f <path to cassandra 4.x installed folder>/logs/system.log
     INFO  [main] 2024-04-18 10:05:32,432 SystemKeyspace.java:1729 - Detected version upgrade
from 3.11.16 to 4.1.2, snapshotting system
     keyspaces
     INFO  [main] 2024-04-18 10:05:37,489 StorageService.java:864 - Cassandra version: 4.1.2

The Cassandra version can also be verified by using the following nodetool command:
<source lang = "bash">
     nodetool version
       ReleaseVersion: 4.1.2
```

In the Feature Server Cassandra logs, look for similar log information like the following to verify the Cassandra nodes connected to Feature Server:

```
2024-04-24 05:13:28,964 [pool-19-thread-1] - [INFO] New Cassandra host
usw1lbe-35-14-002.usw1.genhtcc.com/10.51.27.108:9042 added
2024-04-24 05:13:28,965 [pool-19-thread-1] - [INFO] New Cassandra host
usw1lbe-35-14-001.usw1.genhtcc.com/10.51.26.107:9042 added
```

In the Feature Server logs, look for similar log information like the following to verify the successful connection of Feature Server with upgraded Cassandra nodes and its functioning.

```
2024-04-24T05:13:26.971 Trc 09900  [INFO] Cassandra connection pool :
usw1lbe-35-14-001.usw1.genhtcc.com,usw1lbe-35-14-002.usw1.genhtcc.com.
...
2024-04-24T05:13:29.091 Trc 09900  [INFO] [Cassandra] cluster name
FeatureServerClusterVoicemail35-14
2024-04-24T05:13:29.130 Dbg 09900  [DEBUG] Syncing schema, keyspace: 'sipfs' ... CQL mode.
2024-04-24T05:13:29.141 Dbg 09900  [DEBUG] Syncing column families: cluster
usw1lbe-35-14-001.usw1.genhtcc.com,usw1lbe-35-14-002.usw1.genhtcc.com:9042 ... CQL mode.
2024-04-24T05:13:29.226 Dbg 09900  [DEBUG] Completed syncing schema, keyspace: sipfs ... CQL
mode.
2024-04-24T05:13:29.228 Dbg 09900  [DEBUG] Repository is activated
2024-04-24T05:13:29.236 Trc 09900  [INFO] Repository activated:
com.genesyslab.feature.component.system.FsSystemRepository, mode: online)
2024-04-24T05:13:29.281 Trc 09900  [INFO] Operational mode: 'Standalone'.
2024-04-24T05:13:29.282 Trc 09900  [INFO] Configuration server id: 'aa3244da-
fa51-4455-af52-a207086d7935'.
2024-04-24T05:13:29.283 Trc 09900  [INFO] Setting cluster node data...
2024-04-24T05:13:29.399 Trc 09900  [INFO] Cluster node data has been set.
2024-04-24T05:13:29.469 Trc 09900  [INFO] Set node switch data.
...
2024-04-24T05:15:02.312 Std 05061  Initialization completed
```

Appendix

This section of the guide describes additional information pertaining to SIP Feature Server deployment.

Appendix: Configure JMX port security when running Feature Server with Embedded Cassandra

Security configuration discussed in this article allows you to protect the JMX management port that is used by the embedded Cassandra module of Feature Servers to communicate with its host process and receive monitoring and management requests. Note that the JMX port is not a data access port.

Embedded Cassandra JMX Authentication

You can follow this procedure to activate the JMX anonymous authentication and view your FS Cassandra nodes status in the FS UI.

> **Important**
> This feature is not available for versions prior to 8.1.201.82.

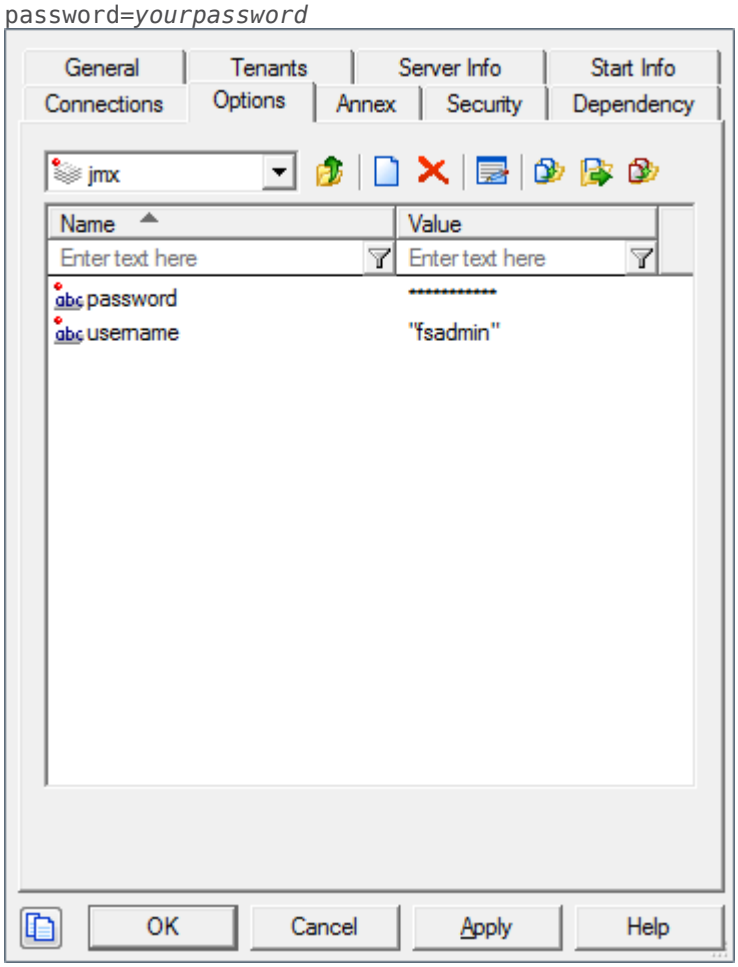
1. Edit the launcher.xml file and set the following parameters to true:
   `-Dcom.sun.management.jmxremote.authenticate=true`
2. Edit the parameter as follows:
   `-Dcom.sun.management.jmxremote.password.file=./etc/jmxremote.password`
3. Copy: `jmxremote.password.template`
   from: `/jdk_install_location/jre/lib/management/`
   to: `<FS Installation directory>/etc/`
   then rename it: `jmxremote.password`

   For OpenJDK 11,
   Copy: `jmxremote.password.template`
   from: `/jdk_install_location/jre/conf/management/`
   to: `<FS Installation directory>/etc/`
   then rename it: `jmxremote.password`
4. Edit the `<FS Installation directory>/etc/jmxremote.password` file to add the following username:
   `fsadmin` *`yourpassword`*

   For OpenJDK 11,
   Edit the `<FS Installation directory>/etc/jmxremote.password` file to add the following username:
   ```
   monitorRole yourpassword
   controlRole yourpassword
   fsadmin yourpassword
   ```
5. Change the ownership of `jmxremote.password` to the user you run FS with and change permission to read only.

For Linux,
```
chown fsadmin:fsadmin <FS Installation directory>/etc/jmxremote.password
chmod 400 <FS Installation directory>/etc/jmxremote.password
```
For Windows, see the Oracle documentation.

6. Enable read and write permission to the FS user in:
   `/jdk_install_location/lib/management/jmxremote.access` file by adding the following:
   `fsadmin readwrite`
   For OpenJDK 11:
   Edit `/jdk_install_location/conf/management/jmxremote.access` file by adding the following:
   `fsadmin readwrite`
7. Edit your FS configuration and create the following options in the **Options** tab:
   `Section jmx`
   `username=fsadmin`
   `password=`*`yourpassword`*



8. Start FS. You can see the status of the Cassandra nodes by using the Nodetool's ring command. For more details on ring command and it's usage, see Appendix: Performing maintenance operations on embedded Cassandra.

Cassandra JMX TLS

A Java Management Extensions (JMX) tool manages and monitors Cassandra. The JMX access must be protected to avoid any remote managing on the FS embedded Cassandra.

1. To protect JMX access, edit the launcher.xml file and modify the parameters as follows:
   ```
   -Dcom.sun.management.jmxremote.ssl.enabled.protocols=TLSv1.3
   -Dcom.sun.management.jmxremote.port=9192
   -Dcom.sun.management.jmxremote.ssl=true
   -Dcom.sun.management.jmxremote.authenticate=true
   -Dcom.sun.management.jmxremote.registry.ssl=true
   ```
2. Set up Transport Layer Security (TLS). For information on how to create a server certificate, see the Genesys Security Deployment Guide.
3. Create a keystore in <FS Installation directory>/etc/ and upload the custom-generated server certificates to the keystore. See the Oracle documentation.
   Note: If FS HTTPS is already enabled with a server certificate, the same keystore and certificate can also be used to secure the embedded Cassandra JMX port.
4. Edit and configure the following JVM options in launcher.xml.
   - `javax.net.ssl.trustStore = ./etc/keystore [path of the trust store file]`
   - `javax.net.ssl.trustStorePassword = <trust store password>`
   - `javax.net.ssl.keyStore =./etc/keystore [path of the keystore file]`
   - `javax.net.ssl.keyStorePassword  = <keystore password>`
5. Restart the FS to enable a secure JMX connection with the embedded Cassandra.

Appendix: Add new Datacenter when running Feature Server with Embedded Cassandra

If your Cassandra Cluster of Feature Servers *already meets the prerequisites*, then follow the steps to add a new data center to the cluster.

Prerequisites

> **Important**
> This is not a to-do list; these actions must have been completed before (or when) enabling your Cassandra Cluster. You cannot do them "now".

- All Feature Servers must be installed in Standalone mode with embedded Cassandra cluster.
- The Cassandra cluster must be using Network Topology Strategy.
  The `replicationStrategyClassName` option in the `TServer/Cassandra` section of the `master`, Feature Server must have been set to `NetworkTopologyStrategy` before the schema was created (before the first/initial start of the 'master' Feature Server).
- The Cassandra cluster must be using the `PropertyFileSnitch` type or the `GossipingPropertyFileSnitch` type of the endpoint snitch.
  You define this option in the `cassandra.yaml` configuration file(s) of all the Feature Servers in the cluster. See the Cassandra documentation for details.

Do this only when the new data center is created:

- Set one of the new data center's Feature Server nodes to `confSync`.

Using PropertyFileSnitch

`Cassandra-topology.properties` file configuration

```
# Cassandra Node IP=Data Center:Rack
#Data Center One
999.999.99.99=us_west:RAC1
999.999.99.98=us_west:RAC2
#Data Center Two
999.999.99.97=us_east:RAC1
999.999.99.96=us_east:RAC2
#Data Center Three
999.999.99.95=eu_east:RAC1
999.999.99.94=eu_east:RAC2
#Data Center Four
999.999.99.93=eu_west:RAC1
999.999.99.92=eu_west:RAC2
# default for unknown nodes
default=us_west:RAC1
```

1. Deploy new Feature Server nodes for the new data center. Use this process but ignore the instructions for single data centers.
2. Update Cassandra topology in the `cassandra-topology.properties` file on every Feature Server within the Cassandra Cluster that includes the new nodes.
   [+] Read instructions:

   In a Cassandra cluster, each Feature Server is a node, and each has an identical `cassandra-topology.properties` file that describes the network topology. When you created the Cassandra Cluster, you created this file and placed a duplicate in the `/resources/` directory of each Feature Server deployment.

   You must now update each of these files to enable the new data centers.

   The example below began as a single-node configuration. It defined only Data Center One. To configure a new data center, you simply add those same defining lines—modified to contain the correct data. The example below (modifications in red) now defines four data centers.

```
# Cassandra Node IP=Data Center:Rack
  # Data Center One
  999.999.99.99=us_west:RAC1
  999.999.99.98=us_west:RAC2
  <span style="color:red"># Data Center Two
  999.999.99.97=us_east:RAC1
  999.999.99.96=us_east:RAC2
  # Data Center Three
  999.999.99.95=eu_east:RAC1
  999.999.99.94=eu_east:RAC2
  # Data Center Four
  999.999.99.93=eu_west:RAC1
```

```
999.999.99.92=eu_west:RAC2 </span>
# default for unknown nodes
default=us_west:RAC1
```

-To finish your configuration, restart the Feature Servers in existing data center(s).

Read the Cassandra documentation for additional details.

---

3. Restart the existing Feature Server nodes.
4. Change the value of the endpoint_snitch type to `PropertyFileSnitch` in newly deployed Feature Servers, then start the new Feature Server nodes using these instructions.
5. Change the Cassandra cluster's keyspace replication options to accommodate the added new data center: specify the replication factor. Be certain that you understand the Cassandra Keyspace Properties documentation before undertaking this action.
6. The replication options change in the previous step automatically triggers the rebuild process for each new Feature Server/node.
   This process:
   - Runs automatically on all new nodes that you configured in step 2.
   - Streams data for the new nodes from existing nodes.

Using GossipingPropertyFileSnitch

cassandra-rackdc-properties file configuration for node1 in new datacenter (DC2)

```
# dc=dc name
# rack=rack name
dc=DC2
rack=RAC1
```

cassandra-rackdc-properties file configuration for node2 in new datacenter (DC2)

```
# dc=dc name
# rack=rack name
dc=DC2
rack=RAC2
```

1. Deploy new Feature Server nodes for the new data center.
2. Add `cassandra-rackdc.properties` files to the new Feature Server nodes with data center and rack information specific to that node as mentioned in the example below.
   Example: The figure depicts `cassandra-rackdc.properties` files for two Feature Server nodes in a new data center (DC2) to be placed in the Feature Server nodes.
3. Configure `endpoint_snitch` type to `GossipingPropertyFileSnitch` in the **cassandra.yaml** file on the newly deployed Feature Server nodes.
4. Modify the **replicationOptions** option to accommodate the newly added data center in the **[Cassandra]** section of the Feature Server application. Be certain that you understand the Cassandra Keyspace Properties documentation before undertaking this action.

Important

When adding a new node to an existing Cassandra cluster:

- Add only one node at a time.
- New nodes must be in the same snitch as the existing nodes snitch. Genesys does not recommend using mixed snitch mode clusters.

Appendix: Sample deployments

You can use these sample deployments as a model for your chosen deployment option: single-site, multi-site, or Business Continuity.

Single-site deployment

Server configuration

A single-site server could contain the following characteristics:

- SIP Server switch with 2000 extensions.
- Two FS instances as an active-active HA pair, one instance (FS-VM) acting as primary for voicemail, dial plan, and provisioning, and another instance (FS-DM) acting as primary for device management.
- Two IVR profiles, one profile for voicemail and another for device management:
  - IVR profile for voicemail:
    initial-page-url = `http://FS-VM IP:port/fs`

    alternatevoicexml = `http://FS-DM IP:port/fs`
  - IVR profile for device management:
    initial-page-url = `http://FS-DM IP:port/fs/dm/ivr`

    alternatevoicexml = `http://FS-VM IP:port /fs/dm/ivr`
- GAX with FS GAX plugin and DM GAX plugin.
  For example:
  - [dm-gax-plugin]: **fs_urls** = `http://FS-DM IP:port/fs,http://FS-VM IP:port/fs`
  - [fs-gax-plugin]/[fs]: **fs_urls** = `http://FS-VM IP:port/fs,http://FS-DM IP:port/fs`
- DNS Server: FQDN (fs1.genesys.com) with the IP address of the two FS instances in DNS Server.
  For example: fs1.genesys.com, which resolves to IP of FS-DM, IP of FS-VM
- DHCP Server with the provisioning URL as option 66/160. The URL contains the FQDN that belongs to the two FS instances (`http://fs1.genesys.com:port/fs/dm/prov`).
- SIP Server with internal or Feature Server dial-plan
- Both the Feature Server applications include the option **fs_url** as `http://fs1.genesys.com/8080/fs`.
- In the SIP Switch:
  - a Trunk DN with contact = RM address and prefix = the prefix of the IVR number configured in Device Management settings
  - a Trunk Group DN with name `gcti_provisioning`
  - For devices behind an SBC, create a trunk with the following options under the **TServer** section:
    - **contact** = *SBC address*
    - **oos-options-max-forwards** = 1

    - **oosp-transfer-enabled** = `true`
- To enable SIP authentication for a device, add the following option in the **[TServer]** section on the extension DN assigned to the device:
    - **authenticate-requests** = `register,invite`
    - **password** = Any alphanumeric value.

For more information, see how to Enable SIP authentication for a device.

When Feature Server is deployed with co-located/external Cassandra cluster, then refer the configuration details here.

Zero-touch provisioning

1. Create a device for the IP Phone, assign a profile, and assign DN 1000 to the phone.
2. Connect the IP Phone to the LAN.
    - The phone sends a DHCP a request to get the IP Address.
    - DHCP Server responds to the request with the provisioning URL as option 66/160.
    - The phone sends a configuration file (**MAC.cfg**) request to the provisioning URL: `http://fs1.genesys.com/fs/dm/prov`
    - Feature Server responds with the appropriate configuration file which is already configured.
    - When it receives the configuration file, the phone reboots automatically and is configured with the extension 1000.
    - The phone sends a REGISTER message to SIP Server with DN 1000 and is ready to take calls.

IVR provisioning

1. Create a default device management profile.
2. Connect the IP Phone to the LAN.
    - The phone sends a DHCP request to get the IP Address.
    - DHCP Server responds IP address with provisioning URL as option 66/160
    - The phone sends the configuration file (**MAC.cfg**) request to the provisioning URL:`http://fs1.genesys.com/fs/dm/prov`.
    - Feature Server responds with the default configuration file.
    - The phone registers to SIP Server with the special number `gcti_provisioning`.
    - When the agent lifts the phone receiver, the phone automatically dials the IVR via SIP Server by using the IVR number.
    - The voice prompt requests the user to assign an extension, and after the extension number 1001 is entered, phone will be notified for getting updated configuration.
    - On phone request, Feature Server provides an updated configuration file and the phone is configured with extension 1001.

- The phone sends a REGISTER message to SIP Server with DN 1001 and is ready to take calls.

Multi-site deployment

Server configuration

A multi-site deployment could contain the following server characteristics:

- Two sites, **Site1** and **Site2**.
- Two SIP Switches, one for each site, with 2000 extensions in each switch.
- Four Feature Server instances installed as two active-active pairs, one active-active FS instance per switch:
  - **Site1: FS1-VM, FS1-DM**
  - **Site2: FS2-VM, FS2-DM**
- The DNS Server includes three FQDNs:
  - FQDN1 (fs1.genesys.com) contains the IP addresses of all the FS instances in the DNS Server: FS1-DM, FS1-VM, FS2-VM, and FS2-DM
  - FQDN2 (fs2.genesys.com) contains the IP addresses of the two Site1 FS instances in the DNS Server, in this order: FS1-VM, FS1-DM
  - FQDN3 (fs3.genesys.com) contains the IP addresses of the two Site2 FS instances in the DNS Server, in this order: FS2-DM, FS2-VM
- Three IVR profiles, two for voicemail (Site1 and Site2) and one for device management:
  - IVR profile for voicemail at Site1:
    initial-page-url = `http://fs2.genesys.com:port/fs`

    alternatevoicexml = `http://fs3.genesys.com:port/fs`
  - IVR profile for voicemail at Site2:
    initial-page-url = `http://fs3.genesys.com:port/fs`

    alternatevoicexml = `http://fs2.genesys.com:port/fs`
  - IVR profile for device management (for both sites):
    initial-page-url = `http://`*`FS1-DM IP`*`:port/fs`

    alternatevoicexml = `http://fs1.genesys.com:port/fs`
- GAX with FS GAX plugin and DM GAX plugin, and four FS instances:
  - [dm-gax-plugin]: fs_urls = `http://`*`FS1-DM IP`*`:port/fs,http://`*`FS1-VM IP`*`:port/fs, http://`*`FS2-DM IP`*`:port/fs,http://`*`FS2-VM IP`*`:port/fs`
  - [fs-gax-plugin]/[fs]: `fs_urls = http://`*`FS1-VM IP`*`:port/fs,http://`*`FS1-DM IP`*`:port/fs, http://`*`FS2-VM IP`*`:port/fs,http://`*`FS2-DM IP`*`:port/fs`
- One DHCP Server with the provisioning URL as option 66/160:
  `http://fs1.genesys.com:port/fs/dm/prov`

- Two SIP Servers, SIPS1 and SIPS2, use multi-site ISCC configuration.
- Feature Server application options, in the **dm** section:
  - Site1: option **fs_url** = `http://fs2.genesys.com:8080/fs` (FQDN2)
  - Site2: option **fs_url** = `http://fs3.genesys.com:8080/fs` (FQDN3)
- In each SIP Switch:
  - A Trunk DN with contact = RM address and prefix = the prefix of the IVR number configured in Device Management settings
  - A Trunk Group DN with name `gcti_provisioning`
  - For devices behind an SBC, create a trunk with the following options under the **TServer** section:
    - **contact** = *SBC address*
    - **oos-options-max-forwards** = 1
    - **oosp-transfer-enabled** = `true`
  - To enable SIP authentication for a device, add the following option in the **[TServer]** section on the extension DN assigned to the device:
    - **authenticate-requests** = `register,invite`
    - **password** = Any alphanumeric value.

For more information, see how to Enable SIP authentication for a device.

When Feature Server is deployed with co-located/external Cassandra cluster, then refer the configuration details here.

Zero-touch provisioning

1. Create a device for the IP Phone, assign a profile, and assign the DN 1000 to the phone.
2. Connect the IP Phone to the LAN.
   - The phone sends a DHCP request to get the IP Address from the DHCP Server.
   - The DHCP Server responds to the request with the provisioning URL `http://fs1.genesys.com:port/fs/dm/prov` as option 66/160.
   - The phone resolves `fs1.genesys.com` and selects a Feature Server node from Site 1 or Site 2.
   - The phone sends a device configuration file (**MAC.cfg**) request to the selected node with the provisioning URL: `http://fs1.genesys.com/fs/dm/prov`.
   - The selected node sends the provisioned configuration file to the phone.
   - The phone reboots automatically and is configured with the extension 1000 when it starts.
   - The phone sends a REGISTER message to SIPS1 with DN 1000 and is ready to take calls.

IVR provisioning

1. Create a default device management profile.

2. Complete the necessary configurations for IVR provisioning.
3. Connect the IP Phone to the LAN.
    - The phone sends a DHCP request to get the IP Address from the DHCP Server.
    - The DHCP Server responds to the request with the provisioning URL `http://fs1.genesys.com:port/fs/dm/prov` as option 66/160.
    - The phone resolves `fs1.genesys.com` and selects a Feature Server node from Site 1 or Site 2.
    - The phone sends a configuration file (**MAC.cfg**) request to the selected node with the provisioning URL: `http://fs1.genesys.com/fs/dm/prov`.
    - The selected node sends the default configuration file to the phone.
    - The phone registers to SIP Server with the special number `gcti_provisioning`.
    - When the agent lifts the phone receiver, the phone automatically uses the IVR number to dial IVR through SIP Server.
    - The voice prompt requests the user to assign an extension. When the user enters the extension number 2000, the phone is notified that it needs an updated configuration.
    - On the phone request, Feature Server provides an updated configuration file and the phone is configured with extension 2000.
    - The phone sends a REGISTER message to SIPS2 with DN 2000 and is ready to take calls.

Business Continuity deployment

Server configuration

A Business Continuity deployment could contain the following server characteristics:

- Two sites, **Site1** and **Site2**.
- Two SIP Switches, one for each site, with 2000 extensions in each switch.
- All extensions on both switches are synchronized.
- Four Feature Server instances installed as two active-active pairs, one active-active FS instance per switch:
    - **Site1: FS1-VM, FS1-DM**
    - **Site2: FS2-VM, FS2-DM**
- The DNS Server includes three FQDNs:
    - FQDN1 (fs1.genesys.com) contains the IP addresses of all the FS instances in the DNS Server: FS1-DM, FS1-VM, FS2-VM, and FS2-DM
    - FQDN2 (fs2.genesys.com) contains the IP addresses of the two Site1 FS instances in the DNS Server: FS1-VM, FS1-DM
    - FQDN3 (fs3.genesys.com) contains the IP addresses of the two Site2 FS instances in the DNS Server: FS2-VM, FS2-DM
- Business Continuity deployment supports IVR-based device provisioning. The deployment needs three IVR profiles: two for voicemail and one for device management.

  - IVR profile for voicemail at Site1:
    initial-page-url = `http://fs2.genesys.com:port/fs`

    alternatevoicexml = `http://fs3.genesys.com:port/fs`
  - IVR profile for voicemail at Site2:
    initial-page-url = `http://fs3.genesys.com:port/fs`

    alternatevoicexml = `http://fs2.genesys.com:port/fs`
  - IVR profile for device management (for both sites):
    initial-page-url = `http://fs2.genesys.com:port/fs/dm/ivr`

    alternatevoicexml = `http://fs3.genesys.com:port/fs/dm/ivr`
- GAX with FS GAX plugin and DM GAX plugin, and four FS instances:
  - [dm-gax-plugin]: fs_urls = `http://`*`FS1-DM IP`*`:port/fs,http://`*`FS1-VM IP`*`:port/fs, http://`*`FS2-DM IP`*`:port/fs,http://`*`FS2-VM IP`*`:port/fs`
  - [fs-gax-plugin]/[fs]: `fs_urls = http://`*`FS1-VM IP`*`:port/fs,http://`*`FS1-DM IP`*`:port/fs, http://`*`FS2-VM IP`*`:port/fs,http://`*`FS2-DM IP`*`:port/fs`
- DHCP Server with the provisioning URL as option 66/160. The URL contains the FQDN that belongs to the four FS instances (`http://fs1.genesys.com:port/fs/dm/prov`).
- Two SIP Servers, SIPS1 and SIPS2, use BC configuration.
- Feature Server application options, in the **dm** section:
  - Site1: option **fs_url** = `http://fs2.genesys.com:8080/fs` (FQDN2)
  - Site2: option **fs_url** = `http://fs3.genesys.com:8080/fs` (FQDN3)
- In each SIP Switch:
  - A Trunk DN with contact = RM address and prefix = the prefix of the IVR number configured in Device Management settings
  - A Trunk Group DN with name `gcti_provisioning`
  - For devices behind an SBC, create a trunk with the following options under the **SIP Switch > TServer** section:
    - **contact** = *SBC address*
  - **oos-options-max-forwards** = 1
  - **oosp-transfer-enabled** = `true`
  - To enable SIP authentication for a device, add the following option in the **[TServer]** section on the extension DN assigned to the device:
    - **authenticate-requests** = `register,invite`
    - **password** = Any alphanumeric value.

    For more information, see how to Enable SIP authentication for a device.
- Business Continuity deployment supports IVR-based device provisioning, for DNs that are associated with a Disaster Recovery profile. See BC Associations.

When Feature Server is deployed with co-located/external Cassandra cluster, then refer the

configuration details here.

Zero-touch provisioning

1. Create a device for the IP Phone, assign a profile, and assign DN 1000 to the phone.
2. Connect the IP Phone to the LAN.
    - The phone sends a DHCP request to get the IP Address.
    - DHCP Server responds to the request with provisioning URL as option 66/160.
    - The phone sends the configuration file (**MAC.cfg**) request to the provisioning URL: `http://fs1.genesys.com/fs/dm/prov`
    - FS responds with the appropriate configuration file, which is already configured.
    - The phone reboots automatically and is configured with the extension 1000 when it starts.
    - The phone sends a REGISTER message to both SIPS1 and SIPS2 with DN 1000 and is ready to take calls.

IVR provisioning

1. Create two Disaster recovery device management profiles with Preferred and Peer SIP server details for both Site 1 and Site 2.
2. Complete the necessary configurations for IVR provisioning.
3. Connect the IP Phone to the LAN.
    - The phone sends a DHCP request to get the IP Address from the DHCP Server.
    - The DHCP Server responds to the request with the provisioning URL `http://fs1.genesys.com:port/fs/dm/prov` as option 66/160.
    - The phone resolves `fs1.genesys.com` and selects a Feature Server node from Site 1 or Site 2.
    - The phone sends a configuration file (**MAC.cfg**) request to the selected node with the provisioning URL: `http://fs1.genesys.com/fs/dm/prov`.
    - The selected node sends the default configuration file to the phone.
    - The phone registers to both Preferred and Peer SIP Servers with the special number `gcti_provisioning`.
    - When the agent lifts the phone receiver, the phone automatically uses the IVR number to dial IVR through Preferred SIP Server.
    - The voice prompt requests the user to assign an extension. When the user enters the extension number 2000, the phone is notified that it needs an updated configuration.
    - On the phone request, Feature Server provides an updated configuration file and the phone is configured with extension 2000.
    - The phone sends a REGISTER message to both SIPS1 and SIPS2 with DN 2000 and is ready to take calls.

IVR provisioning when the preferred server is down

When the preferred server is down and an agent lifts the phone receiver, the phone automatically uses the IVR number to dial IVR through the Peer SIP Server. The workflow continues by using the Peer SIP server.

Sample deployments for a co-located/external Cassandra cluster

You can use these sample deployments as a model for your chosen deployment option: single data center or multi-data center.

Single data center

A single data center cluster server must contain a minimum of two Cassandra nodes such as Cassandra node 1 and Cassandra node 2.

1. Configure **<Cassandra installed directory>\conf\cassandra.yaml** as follows:
   - `cluster_name: FeatureServerCluster`
   - `start_rpc: true`
   - `listen_address: Cassandra node IP address/hostname`
   - `rpc_address: Cassandra node IP address/hostname`
   - `seeds: Cassandra node 1 IP address/hostname`
   - `storage_port : 7000 (default value)`
   - `ssl_storage_port : 7001 (default value)`
   - `native_transport_port : 9042 (default value)`
   - `rpc_port : 9061 (default value)`
   - `endpoint_snitch: PropertyFileSnitch`
2. Configure **<Cassandra installed directory>\conf\cassandra-topology.properties** as follows:
   - `Cassandra node 1 IP address/hostname=DC1:RAC1`
   - `Cassandra node 2 IP address/hostname=DC1:RAC2`

Multi-data center

Following is a sample deployment for a multi-data centre.

1. A multi data center cluster server must contain a minimum of two data centers:
   - `Data center 1 => Cassandra node 1, Cassandra node 2`
   - `Data center 2 => Cassandra node 3, Cassandra node 4`

2. Configure **<Cassandra installed directory>\conf\cassandra.yaml** as follows:
   - `cluster_name: FeatureServerCluster`
   - `start_rpc: true`
   - `listen_address: Cassandra node IP address/hostname`
   - `rpc_address: Cassandra node IP address/hostname`
   - `seeds: IP addresses/hostnames of Cassandra node 1, Cassandra node3`
   - `storage_port : 7000 (default value)`
   - `ssl_storage_port : 7001 (default value)`
   - `native_transport_port : 9042 (default value)`
   - `rpc_port : 9061 (default value)`
   - `endpoint_snitch: PropertyFileSnitch`
3. Configure the **<Cassandra installed directory>\conf\cassandra-topology.properties** as follows:
   - `Cassandra node 1 IP address/hostname=DC1:RAC1`
   - `Cassandra node 2 IP address/hostname=DC1:RAC2`
   - `Cassandra node 3 IP address/hostname=DC2:RAC1`
   - `Cassandra node 4 IP address/hostname=DC2:RAC2`