



Cisco BTS 10200 Softswitch CFNR Feature Module

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This document describes the Call Forward Not Reachable (CFNR) feature for Release 6.0.x of the Cisco BTS 10200 Softswitch and explains how to use it.

Understanding the CFNR Feature

This feature forwards an incoming call when the subscriber (for whom the call is intended) is unreachable. The unreachable condition can occur if the gateway serving the subscriber line is down, or if any intermediate network element serving the subscriber line is down.

The system treats the subscriber line to be unreachable if any one of the following conditions is true:

- The Media Gateway Control Protocol (MGCP) or Network-based call signaling (NCS) termination or media gateway (MGW) is administratively or operationally out of service (OOS).
- The BTS 10200 call-setup process has timed out after retransmitting create connection (CRCX) messages to the MGCP or NCS MGW without achieving a successful call setup.
- A SIP subscriber Addressed Of Record (AOR) used in SIP is administratively or operationally out of service (OOS).



Note

In previous releases, the unreachable feature was provisionable through a special trigger on the Call Forward Busy feature. CFNR allows the unreachable feature to be provisioned and assigned independently from the CFB feature.

CFNR is supported for the following categories of subscriber, provisioned with the category parameter in the Subscriber table:

- Individual
- Centrex main subscriber
- Centrex individual



Americas Headquarters:
Cisco Systems, Inc., 170 West Tasman Drive, San Jose, CA 95134-1706 USA

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- Centrex multiline hunt group (MLHG) main subscriber
- MLHG main subscriber
- MLHG individual
- MLHG preferential individual

The service provider can provision the CFNR feature to be active immediately on the customer line, or to be activated by the individual subscriber using the handset. The user activates the CFNR feature on the local phone, and enters the forward-to phone number where the user wishes to have the calls forwarded. This forward-to dialed Number (DN) is referred to as the B-number. The allowed types of B-numbers are listed in [Table 1](#).

Table 1 **Allowed Types of B-numbers**

Subscriber Type	Allowed B-number
POTS	DN, without extensions
Centrex	Public access code + external DN, without extensions
	An extension within the business group

The following conditions apply to the CFNR feature:

- The CFNR feature can be provided to NCS, SIP, Centrex, and MLHG subscribers.
- The CFNR feature is in the deactivated mode unless activated by the service provider or subscriber.
- Call forwarding hop scenarios are restricted to a maximum of five hops. The call is completed on the provisioned maximum number of hops.
- Multiple call forwarding (MCF) is a provisionable option that allows multiple incoming calls to be forwarded by the subscriber at the same time. If a subscriber already has CFNR invoked, additional calls to the subscriber are forwarded by CFNR based on the MCF flag. If the MCF flag is turned off, only one CFNR invocation is allowed.



Note

A specific trigger, T_NOT_REACHABLE, must be provisioned for the CFNR feature to enable the call forwarding on unreachable condition.

The CFNR feature is composed of three associated features, which are described in the sections that follow:

- [CFNR Variable Activation, page 3](#)
- [CFNR Variable Deactivation, page 5](#)
- [CFNR Invocation, page 5](#)

Additional information about this feature is covered in the following sections:

- [Invalid User Actions, page 6](#)
- [CFNR Feature Interactions, page 6](#)
- [Provisioning, page 8](#)

CFNR Variable Activation

This section discusses how the service provider can customize the CFNR Variable Activation (CFNRVA), and the CFNRVA procedures available to the handset user.

Blocking Call Forwarding to Certain Types of DNs

The service provider can block call forwarding to certain types of DNs by provisioning the nature of dial (NOD) parameter for the call-forwarding features (CFU, CFB, CFNA, CFC, and CFNR) in the NOD Restrict List (nod-restrict-list) table. For example, if you provision NOD=TOLL-FREE and NOD=EMG in the nod-restrict-list table for CFNR, the system does not allow call forwarding to DNs of those types.

**Caution**

If you want to block call-forwarding to an emergency (EMG) DN, such as 911, you must provision NOD=EMG for the call-forwarding features (CFU, CFB, CFNA, CFC, and CFNR) in the NOD-RESTRICT-LIST. This is necessary to comply with the rule in Telcordia document GR-580, which says that 911 should not be a permitted “forward to” number.

CFNRVA Customization Options

The behavior of CFNRVA can be customized using the following provisionable options:

- Second stage dial tone (SDT)—The SDT flag controls the delivery of a dial tone after the subscriber enters the VSC for activation of CFNR. The permitted values for this flag are
 - NO_TONE —If the value is set to NO_TONE, no tone is played.
 - DIAL_TONE —If the value is set to DIAL_TONE, the dial tone is played.
 - STUTTER_DIAL_TONE —If the value is set to STUTTER_DIAL_TONE, a stutter dial tone is played.
 - CONFIRMATION_TONE —If the value is set to CONFIRMATION_TONE, a confirmation is played, followed by the dial tone.
 - CONFIRMATION_DIAL_TONE —If the value is set to CONFIRMATION_DIAL_TONE, a confirmation tone is played.

**Note**

For SIP phone subscribers, the SDT parameter has no effect. The SDT option is available through the dial plan in the SIP phone.

- Final stage dial tone (FDT)—The FDT flag controls the system response to a successful activation or deactivation of CFNR by the subscriber. If FDT is not provisioned, the system provides a success announcement. The permitted values for this flag are the same as for the SDT flag.

**Note**

For SIP phone subscribers, only the success announcements are provided. The confirmation tone and dial tone will not be provided, even if the FDT flag is set.

- Multiple call forwarding (MCF)—When provisioned as Y, MCF allows multiple incoming calls to be forwarded by the subscriber at the same time. If a subscriber already has CFNR invoked, additional calls to the subscriber are forwarded by CFNR based on the MCF flag. If the MCF flag is set to N, only one CFNR invocation is allowed.

- International call forwarding (INTL)—When the INTL flag is set to N, forwarding to an international number is not allowed. When INTL is set to Y, the system checks for other restrictions on international calls, and allows forwarding if there are no other restrictions provisioned for the call type and calling number. (Other provisionable restrictions on international calling can be based on the nature of dial (NOD) and the subscriber feature data.)

CFNRVA Handset Procedures

CFNR can be activated by the service provider or by the individual user. The procedures are as follows:

- CFNR can be activated permanently at subscription time by the service provider. The service provider provisions the forward-to DN as requested by the subscriber. When the phone is off hook, calls made to the subscriber's line are forwarded to the single forward-to number that was provisioned.
- CFNR can be activated by the user by means of the following procedure.
 - The user lifts the handset and listens for dial tone.
 - The user presses the VSC applicable to CFNR activation. The VSC values are provisionable by the service provider.
 - If provisioned for SDT, and if CFNR can be activated, the system returns the provisioned dial tone.
 - The user enters the B-number (local, long distance, or international) where calls are to be forwarded. For Centrex subscribers, the B-number can be an extension number and access to POTS.
 - The user receives an appropriate error announcement if the forward-to number is invalid or restricted (as described in the [“Blocking Call Forwarding to Certain Types of DNs”](#) section on page 3), or if the feature cannot be activated.
 - If FDT is provisioned, the user hears a confirmation tone for 1 second, followed by the provisioned dial tone, indicating that activation was successful. If FDT is not provisioned, the user hears a success announcement.



Note

See the [“CFNRVA Customization Options”](#) section on page 3 for details of SDT and FDT.

- CFNR is now activated, and it stays active until it is deactivated with the appropriate deactivation VSC, or is overridden by the service provider through use of a CLI command.



Note

For SIP endpoints, the system does not return the SDT and FDT dial tones. The SIP subscriber continues handset provisioning without waiting for dial tones. The system does not validate the B-number for SIP subscribers.



Note

The system does not send a courtesy call to the forwarded-to line unless it is provisioned.

CFNR Variable Deactivation

CFNR variable can be deactivated (CFNRVD) by the service provider by means of a CLI command. Alternatively, CFNR can be deactivated by means of the following procedure.

- The user lifts the handset and listens for dial tone.
- The user presses the VSC applicable to CFNR deactivation. The VSC values are provisionable by the service provider.
- If deactivation was successful, and if the FDT is provisioned, the user hears a confirmation tone for 1 second, followed by the provisioned dial tone. If FDT is not provisioned, the user hears a success announcement. (FDT is not provided to SIP subscribers.)

CFNR is now deactivated, and it stays deactivated until it is activated with the appropriate activation VSC or is overridden by the service provider through use of a CLI command.

**Note**

See the [“CFNRVA Customization Options” section on page 3](#) for details of the customized feature FDT.

CFNR Invocation

CFNR invocation is the actual procedure the system follows to forward the call.

CFNR can be invoked as follows:

- The user lifts the handset and listens for the dial tone.
- The user enters the B-number (local, long distance, or international number) where a call has to be made. For Centrex subscribers, the B-number can be an extension.
- If the subscriber (for whom the call is intended) is unreachable then CFNR gets invoked and the call gets forwarded to the forward-to number. The unreachable condition can occur if the gateway serving the subscriber line is down, or if any intermediate network element serving the subscriber line is down.

The system treats the subscriber line to be unreachable if any one of the following conditions is true:

- The Media Gateway Control Protocol (MGCP) or Network-based call signaling (NCS) termination or media gateway (MGW) is administratively or operationally out of service (OOS).
- The BTS 10200 call-setup process has timed out after retransmitting CRCX messages to the MGCP or NCS MGW without achieving a successful call setup.
- A SIP subscriber Address Of Record ((AOR) used in SIP is administratively or operationally out of service (OOS).

Invalid User Actions

The following user actions are invalid, and the system provides an appropriate error tone or announcement:

- The user enters an invalid directory number (DN) for the B-number.
- During CFNR activation, the user enters a B-number that is determined by the system to be a type blocked by provisioning in the NOD-RESTRICT-LIST table. For example, if the NOD for the B-number is set to EMG (emergency), but calls with NOD=EMG are blocked by provisioning in the NOD-RESTRICT-LIST table, the activation to that B-number is denied.
- The user tries to activate CFNR from a DN that has outgoing calls blocked by the OCB feature, or the user enters a B-number, but calls to that DN are blocked by OCB. For example, the call from the user's phone to the B-number would be a domestic long-distance call, but these calls are blocked by setting K=2 against the OCB feature in the SUBSCRIBER-FEATURE-DATA table.



Note The database tables (NOD-RESTRICT-LIST and SUBSCRIBER-FEATURE-DATA) mentioned in the above list are described in the Cisco BTS 10200 Softswitch CLI Database. For information on billing records, see the *Cisco BTS 10200 Softswitch Billing Reference Guide*. For information on measurements, see the *Cisco BTS 10200 Softswitch Operations and Maintenance Guide*.

- The user tries to activate CFNR from or to a DN for which calls are restricted by the COS feature.
- The user tries to activate CFNR when it has already been activated (the B-number is not overwritten).
- The user tries to activate CFNR to an international DN, but the service provider has blocked forwarding to international DNs. The service provider can block forwarding to international DNs using the international flag in the FEATURE table.
- The user tries to activate CFNR to his or her own extension or DN.

CFNR Feature Interactions

This section describes the interaction of other subscriber features with the CFNR feature.

CFB—If a subscriber line has both CFB and CFNR assigned and active, the CFNR feature takes precedence. If CFB is provisioned with the T_BUSY trigger but not the T_NOT_REACHABLE trigger, there is no interaction between CFB and CFNR. If CFB is provisioned with both triggers (T_BUSY and T_NOT_REACHABLE), the interactions are as listed in [Table 2](#).

Table 2 CFNR–CFB Feature Interaction¹

CFB Assigned	CFB Activated	CFNR Assigned	CFNR Activated	Condition Detected by the BTS 10200 on the Subscriber Line	Feature Invoked ²
Y or N	N	N	N	None. No feature invoked.	Neither
		Y	N	No. No feature invoked.	Neither
			Y	If endpoint is <i>unreachable</i> .	CFNR
				If endpoint is reachable but <i>busy</i> (off-hook). Does this go in here???	Neither

Table 2 CFNR–CFB Feature Interaction¹ (continued)

CFB Assigned	CFB Activated	CFNR Assigned	CFNR Activated	Condition Detected by the BTS 10200 on the Subscriber Line	Feature Invoked ²
Y	Y	N	N	If endpoint is <i>unreachable</i> .	CFB
				If endpoint is reachable but <i>busy</i> (off-hook).	CFB
		Y	N	If endpoint is <i>unreachable</i> .	Neither— Busy tone. ³
				If endpoint is reachable but <i>busy</i> (off-hook).	CFB
			Y	If endpoint is <i>unreachable</i> .	CFNR
				If endpoint is reachable but <i>busy</i> (off-hook).	CFB

1. This table is applicable if you have provisioned both CFB triggers (T_BUSY and T_NOT_REACHABLE).
2. If CFNR is invoked, the system forwards the call to the forward-to number (FDN1) provisioned for CFNR. If CFB is invoked, the system forwards the call to the FDN1 provisioned for CFB.
3. In this case, the system delivers a busy tone to the caller and does not forward the call. This treatment is based on the assumption that the subscriber has CFNR assigned but has intentionally deactivated CFNR and turned off the MGW or embedded multimedia terminal adapter (eMTA) on their premises. That is, the subscriber has intentionally made their MGW or eMTA unreachable and does not want calls forwarded.

MLHG—For an inbound call to the main subscriber of a MLHG (category = mlhg in the Subscriber table), if the main subscriber has a terminal assigned and that terminal is unreachable, and the subscriber has CFNR assigned and active, the BTS 10200 does not perform a hunt. The call receives CFNR treatment.

CLIP, CNAM, and CND (caller ID features)—When a call is forwarded, the forwarded-to party receives the DN of the calling party on the caller ID display.

OCB—The interaction of CFNR and OCB depends upon the sequence in which they are activated:

- If OCB is activated prior to CFNR activation—OCB screening is performed on each DN the user enters when attempting to activate CFNR. Successful CFNR activation depends on the existing OCB K-VALUE and the forward-to DN:

If the existing OCB K-VALUE is set to block calls to the forward-to DN, then the system does not allow CFNR activation. The user receives an error announcement.

If the OCB K-VALUE allows calls to this DN, then the CFNR activation process continues. Once the CFNR activation attempt to a specific DN is accepted by the system, it is applicable permanently regardless of any future OCB K-VALUE changes. That is, future changes to the OCB K-VALUE have no effect on CFNR invocation. CFB to this DN can be deactivated by the user in the normal manner (entering the appropriate VSC).

- If CFNR is activated prior to OCB activation—The user can activate the OCB feature, or change the OCB K-VALUE, regardless of the existing CFNR feature. However, invocation of OCB depends upon the type of call:
 - User-dialed calls: User-dialed calls can be blocked by OCB (depending on the K-VALUE).
 - Forwarded calls: CFNR remains active as originally set up by the user, therefore, calls forwarded by the CFNR feature *cannot* be blocked using OCB screening.

COS—If a call to a DN is restricted by COS screening, CFNR cannot be activated or invoked to that DN.

Provisioning

This section describes how to provision the CFNR feature.



Note

For information on [CFB provisioning](#), see the *Cisco BTS 10200 Softswitch Provisioning Guide*.

Feature Provisioning

-
- Step 1** Create a feature for CFNR-Activation:
- ```
add feature fname=CFNRVA; tdp1=COLLECTED_INFORMATION;
tid1=VERTICAL_SERVICE_CODE; ttype1=R; feature-server-id=FSPTC235; type1=INTL;
value1=N; description=CFNR V Activation; grp-feature=N;
```
- Step 2** Create a feature for CFNR-Deactivation:
- ```
add feature fname=CFNRVD; tdp1=COLLECTED_INFORMATION;
tid1=VERTICAL_SERVICE_CODE; ttype1=R; feature-server-id=FSPTC235; type1=INTL;
value1=N; description=CFNR V Deactivation; grp-feature=N;
```
- Step 3** Create a feature for CFNR. Include the associated CFNRVA and CFNRVD features:
- ```
add feature fname=CFNR; tdp1=T_EXCEPTION; tid1=T_NOT_REACHABLE; ttype1=R;
fname1=CFNRVA; fname2=CFNRVD; fname3=CFNRI; feature-server-id=FSPTC235;
description=Call Forward Not Reachable; grp-feature=N;
```
- Step 4** Add a VSC code for CFNR-A:
- ```
add vsc fname=CFNRVA; digit-string=*310;
```
- Step 5** Add a VSC code for CFNR-D:
- ```
add vsc fname=CFNRVD; digit-string=*311;
```
- Step 6** Add a service with these features:
- ```
add service id=1; fname1=CFNR;
```
- Step 7** Customize the multiple call forwarding capability as required:
- ```
change feature fname=CFNR; TYPE1=MCF; VALUE1=Y;
```
- Step 8** Customize for the second stage dial-tone:
- ```
change feature fname=CFNRVA; TYPE2=SDT; VALUE2=STUTTER-DIAL-TONE;
```
- Step 9** Customize for the final-stage dial-tone:
- ```
change feature fname=CFNRVA/CFNRVD; TYPE4=FDT; VALUE4=DIAL-TONE;
```
- Step 10** Add the applicable NODs to be restricted for the CFNR feature as mandated by your local requirements:
- ```
add nod-restrict-list fname=CFNR; nod=EMG;
add nod-restrict-list fname=CFNR; nod=FIRE;
add nod-restrict-list fname=CFNR; nod=AMBULANCE;
add nod-restrict-list fname=CFNR; nod=POLICE;
```

**Caution**

If you want to block call-forwarding to an emergency (EMG) DN, such as 911, you must provision NOD=EMG for the call-forwarding features (CFU, CFB, CFNA, CFC, and CFNR) in the NOD-RESTRICT-LIST. In this way you comply with the rule in Telcordia document GR-580, which says that 911 should not be a permitted forward-to number.

Subscriber Provisioning

Assign the service to the subscriber:

```
add subscriber-service-profile sub_id=subscriber_1; service-id=1;
```

Centrex Provisioning

For the CFNR feature, the Centrex user requires basic Centrex office provisioning and Centrex subscriber provisioning. The latter is similar to the provisioning done for a POTS subscriber. In addition, the following step is required.

Add a feature into the custom-dial-plan table for the Centrex group:

```
add/change custom-dial-plan ID=cdp1; DIGIT-STRING=*310; NOD=VSC; FNAME=CFNRVA;  
CAT-STRING=1111111111111111;
```

```
add custom-dial-plan ID=cdp1; DIGIT-STRING=*311; NOD=VSC; FNAME=CFNRVD;  
CAT-STRING=1111111111111111;
```

MLHG Provisioning

MLHG provisioning is similar to the subscriber provisioning as described above.

Provisioning Notes/Caveats

- Changing the second stage dial tone (SDT) option has no effect on the delivery of the second dial tone for SIP subscribers. This option is available through the dial plan in the SIP phone.
- Changing the final stage dial tone (FDT) option has no effect on the delivery of the final dial tone for SIP subscribers. For SIP phones, an announcement is always delivered because there is no option for the playing of a dial tone and the collecting of further digits.

Alternate Activation and Deactivation Method

This feature is deactivated by default when it is assigned to a subscriber. CFNR can alternately be activated and deactivated by the creation of an entry in the subscriber-feature-data table.

Step 1 Use a CLI command similar to the following to activate CFNR to a specific forward-to number:

```
add subscriber-feature-data sub-id=sub_1; active=Y; fname=CFNR; type1=FDN1;  
value1=4695551001;
```

Step 2 Use a CLI command similar to the following to deactivate CFNR:

```
add subscriber-feature-data sub-id=sub_1; active=N; fname=CFNR
```

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