Survivability Enhancements

The Survivability Enhancements feature on the Nano CUBE is used to:

- Monitor the WAN status periodically from the Nano CUBE.
- Route calls and handle line-seize subscriptions locally when the WAN link is down.
- Synchronize the registrations with the server when the WAN link is up.

Finding Feature Information

Your software release may not support all the features documented in this module. For the latest caveats and feature information, see Bug Search Tool and the release notes for your platform and software release. To find information about the features documented in this module, and to see a list of the releases in which each feature is supported, see the feature information table.

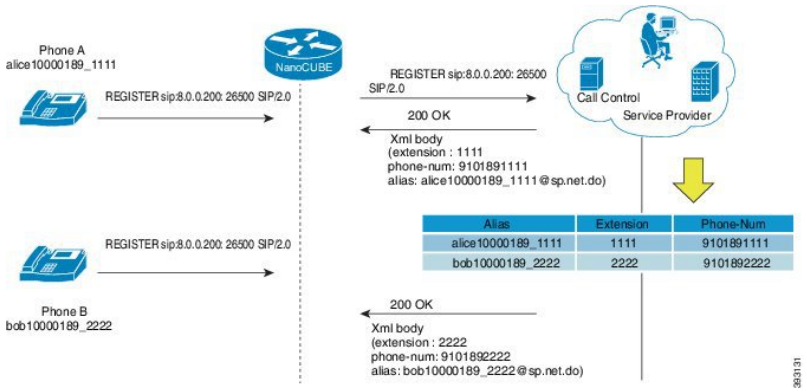
Use Cisco Feature Navigator to find information about platform support and Cisco software image support. To access Cisco Feature Navigator, go to www.cisco.com/go/cfn. An account on Cisco.com is not required.

Information About Survivability Enhancements

Registration through Alias Mapping

The following illustration shows how a phone (with alias mapping) registers to the service provider via Nano CUBE

Figure 1: SIP Phone Registration



The AOR sent in the REGISTER is an alias which is mapped to an extension and/or phone number by the service provider. The service provider returns the mapping details in the 200 OK response sent to the REGISTER. Nano CUBE provides the ability to cache the alias mapping details in its call routing database. When a call is made from the phone, the Request-URI of the INVITE contains the dialed number (short extension or phone number).

If WAN is up, Nano CUBE will always route the INVITE sent from the phone to the service provider without looking up at the alias mapping cache.

If WAN or the service provider is down, that is, in survivability mode, Nano CUBE will route the INVITE locally by looking up at the alias mapping cache.

Alias Mapping—Supported Methods

1 When the service provider returns the mapping details in the 200 OK message of the REGISTER in the following predefined format:

Alias	Extension	Phone
alice10000189_1111	1111	10000189

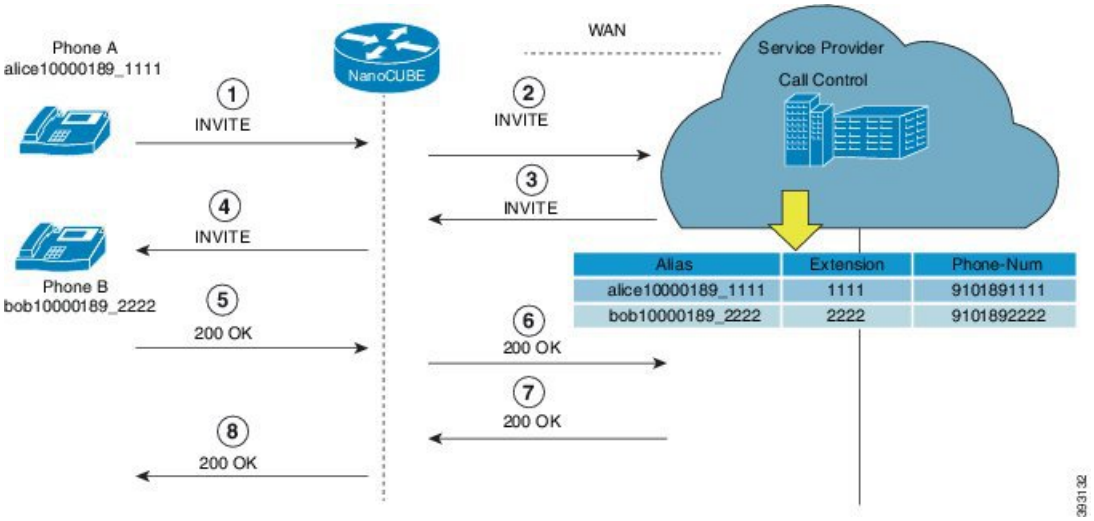
2 The short extension or phone number is embedded in the AOR of the REGISTER. For example, AOR is alice10000189_1111 and the short extension is 1111.

An inbound sip profile can be applied to the REGISTER which extracts the extension part from the AOR and adds a X-CISCO-EXTENSION header.

Nano CUBE when WAN is UP

The following illustration provides an example as to how a typical phone makes a call to another local phone registered in the same server when WAN or the registrar server is up in a typical hosted deployment. The circled numbers in the image indicate the numerical order in which the sequence occurs.

Figure 2: WAN Link is UP - Nano CUBE Deployment



The call flow scenario is as follows: Phone A initiates a call to the Phone B registered to the same server.

1. Phone A sends an initial INVITE request to Phone B to participate in a call session via Nano CUBE.
2. Nano CUBE sends this INVITE to the service provider.
3. The service provider in turn sends the INVITE to Nano CUBE. Since the WAN link is up, the service provider maps details of the user from the register server and provides details of the user, for example, alias of the user, short extension number, and phone number.
4. Nano CUBE sends INVITE with all the above mentioned information to Phone B.
5. Phone B sends a 200 OK response to Nano CUBE for the received INVITE.
6. Nano CUBE sends a 200 OK answer to the service provider.
7. The service provider responds to Nano CUBE with a 200 OK answer.
8. A final 200 OK response is sent to Phone A by Nano CUBE and the call is established between Phone A and Phone B.

Example: Normal Mode (WAN is Up in P2P Mode)

```
CUBE# show sip-ua registration passthrough status

CallId    DirectoryNum   peer     mode   In-Exp      reg-I   Out-Exp   survival
=======   =========      =====    ====   ========    ====    ====      =========
21        NCPhone1006    1        p2p    135 /144     1       144        normal
================================================================================
```

Example: Normal Mode (WAN is Up in E2E Mode)

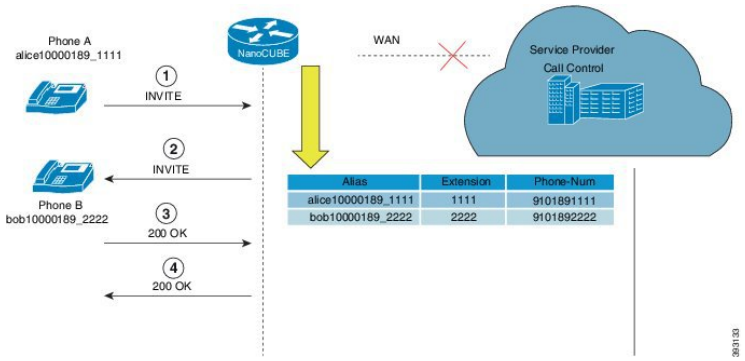
```
CUBE# show sip-ua registration passthrough status

CallId      DirectoryNum   peer   mode     In-Exp      reg-I    Out-Exp  survival
=======     ============   ====   =====    =====       =====    =======  ========
14574       NCPhone1006    301    e2e      117 /120     --      120      normal
================================================================================
```

Nano CUBE Survivability when WAN is Down

In survivability mode, Nano CUBE provides end-to end telephony services when access to the centralized servers is interrupted because of a WAN outage or other factors, like the server being down.

The following illustration shows how a call is established between two end points when WAN link is down during survivability by directly dialing into an extension.

Figure 3: Nano CUBE Survivability when WAN is Down



Earlier, when WAN was down, User A could only contact User B using either the alias or the user-id of User B, and not using their extensions or phone numbers.

Now, in the event the WAN link or registration server is down, when a local call is made, INVITE is sent to Nano CUBE. Nano CUBE maps the details of the user like extension number and phone-number stored during registration. Local phones can now be reached on their short extensions or phone numbers by similar phones subscribed to the server through the same Nano CUBE.

It is possible to register multiple contacts for a single AOR; however, if multiple contacts are registered for a single subscriber, the Nano CUBE uses only the topmost registered contact to deliver the call to that subscriber. For this reason, multiple contacts are not supported.

Example: Survivability Mode in P2P (regsync mode) when WAN is Down

```
CUBE# show sip-ua registration passthrough status

CallId   DirectoryNum    peer    mode    In-Exp     reg-I  Out-Exp   survival
=======  ========= ============  =====   =========  =====  =======   ========
38       NCPhone1008     1       p2p     3595 /3600   1      3600      regsync
================================================================================
```

Example: Survivability Mode in E2E (local fallback mode) when WAN is Down

```
CUBE# show sip-ua registration passthrough status

CallId   DirectoryNum    peer    mode   In-Exp   reg-I  Out-Exp  survival
=======  ============    ======  ====   =======  =====  =======  ========
70       NCPhone1006     1       e2e    35 /70    --     0       locfall
==========================================================================


CallId   DirectoryNum    peer    mode   In-Exp   reg-I  Out-Exp  survival
=======  ============    ======  ====   =======  =====  =======  ========
513      NCPhone1008     1       e2e    40 /70    --     0       locfall
```

Different Modes of Survivability Enhancements

The survivability feature addresses the following issues:

1. When a WAN link or registrar server comes up, it needs to wait till each SIP phone sends the REGISTER message to the server, so that outside phones can reach that phone.
2. If the phone register timer setting is too large, the outside phone needs to wait that much time to reach that phone, after a link flap.
3. If the phone register timer setting is too small, it will flood the WAN link.
4. When the WAN link or registrar server is down, local calls cannot be made.

There are two ways to address these issues:

- Local fallback
- Registration synchronization

Local Fallback

- Nano CUBE does not need to configure credentials, as the phones will trigger registration. Although Nano CUBE receives REGISTER messages for each phone every 5 minutes; for example, it will throttle and send REGISTER messages every 1 hour to the registrar server, avoiding high WAN bandwidth usage. This will address the issues 1, 2, and 3.
- In normal operation when the WAN link or registrar server is up, the phone's primary server URL is the registrar server (E2E) registration.
- "OPTIONS ping" is used to monitor the registrar server link status. When the detected link is down, Nano CUBE will reply with a 500 message and when the phone receives this message, it will send the REGISTER message to Nano CUBE, which is the secondary server (P2P registration). Nano CUBE will reply with a 200 OK message to P2P registration when the link is down. The dial-peer will keep dynamic registrar session target and the local call will not fail. This will address issue 4.

Registration Synchronization

- If you configure the phones to send REGISTER messages every 1 hour (to help alleviate the WAN link), the NanoCUBE uses the credentials configured to respond to registrar server authentication challenge. This addresses issue 3.
- When the WAN link or registration server is down (detected by OPTIONS ping), the NanoCUBE keeps the registration database of the SIP phones previously registered successfully, and it does not send REGISTER messages out; NanoCUBE replies with a 200 OK message and dial-peer will keep the dynamic registrar session target. The local call will not fail, addressing issue 4.
- When the registrar link is up after link flap, the NanoCUBE sends REGISTER message for each phone that was earlier successfully registered to the registrar server. This is throttled to avoid bulk REGISTER messages flooding WAN link as well as the registrar. This addresses issues 1 and 2.

How to Configure Survivability Enhancements

Configuring Local Fallback or Registration Synchronization Globally

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **voice service voip**
4. **sip**
5. **registration passthrough local-fallback** *tag*
6. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.

	Command or Action	Purpose
Step 3	**voice service voip** **Example:** `Device(config)# voice service voip`	Enters voice service VoIP configuration mode.
Step 4	**sip** **Example:** `Device(conf-voi-serv)# sip`	Enters voice service SIP configuration mode.
Step 5	**registration passthrough local-fallback** *tag* **Example:** `Device(conf-serv-sip)# registration passthrough local-fallback 10`	Configures SIP registration passthrough for local fallback mode; this will locally respond to REGISTER in p2p mode when WAN is down. The *tag* is the WAN link or registrar server dial-peer tag. • To configure the registration sync mode, you can use the **registration passthrough reg-sync** *tag* command. Use the **static** keyword to set the phone URL to p2p registration.
Step 6	**end** **Example:** `Device(conf-serv-sip)# end`	Returns to privileged EXEC mode.

Configuring Local Fallback or Registration Synchronization on a Dial Peer

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **dial-peer voice** *tag* **voip**
4. **voice-class sip registration passthrough local-fallback** *tag*
5. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable**	Enables privileged EXEC mode.

	Command or Action	Purpose
	Example: `Device> enable`	• Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**dial-peer voice** *tag* **voip** **Example:** `Device(config)# dial-peer voice 4 voip`	Enters dial peer VoIP configuration mode.
Step 4	**voice-class sip registration passthrough local-fallback** *tag* **Example:** `Device(config-dial-peer)# voice-class sip registration passthrough local-fallback 10`	Configures SIP registration passthrough for local fallback mode; this will locally respond to REGISTER in p2p mode when WAN is down. The *tag* is the WAN link or registrar server dial-peer tag. • To configure the registration sync mode, you can use the **voice-class sip registration passthrough reg-sync** *tag* command.
Step 5	**end** **Example:** `Device(conf-serv-sip)# end`	Returns to privileged EXEC mode.

Configuring OPTIONS Ping

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **dial-peer voice** *tag* **voip**
4. **voice-class sip options-keepalive up-interval** *value* **down-interval** *value*
5. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**dial-peer voice** *tag* **voip** **Example:** `Device(config)# dial-peer voice 3 voip`	Enters dial peer configuration mode.
Step 4	**voice-class sip options-keepalive up-interval** *value* **down-interval** *value* **Example:** `Device(config-dial-peer)# voice-class sip options-keepalive up-interval 120 down-interval 120`	Configures OPTIONS keepalive timer interval for DOWN and UP endpoints.
Step 5	**end** **Example:** `Device(config-dial-peer)# end`	Returns to privileged EXEC mode.

Configuring Registration Timer

Perform the following task to configure the registration timer in the NanoCUBE rather than on all SIP phones.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **voice service voip**
4. **sip**
5. **registrar server expires max** *value* **min** *value*
6. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**voice service voip** **Example:** `Device(config)# voice service voip`	Enters voice service VoIP configuration mode.
Step 4	**sip** **Example:** `Device(conf-voi-serv)# sip`	Enters voice service SIP configuration mode.
Step 5	**registrar server expires max** *value* **min** *value* **Example:** `Device(conf-serv-sip)# registrar server expires max 300 min 200`	Configures the maximum and minimum time (in seconds) for the registration expiry in NanoCUBE. • If the phone sends expiry time as 600 seconds, then the NanoCUBE will reply with 200 OK message and expiry time 300 seconds, and the phone will resend with expiry 300.
Step 6	**end** **Example:** `Device(conf-serv-sip)# end`	Returns to privileged EXEC mode.

Configuring the REGISTER Message Throttling in Nano CUBE

Perform the following task to throttle the REGISTER message in Nano CUBE.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **voice service voip**
4. **sip**
5. **registration passthrough rate-limit expires** *value* **local-fallback** *tag*
6. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**voice service voip** **Example:** `Device(config)# voice service voip`	Enters voice service VoIP configuration mode.
Step 4	**sip** **Example:** `Device(conf-voi-serv)# sip`	Enters voice service SIP configuration mode.
Step 5	**registration passthrough rate-limit expires** *value* **local-fallback** *tag* **Example:** `Device(conf-serv-sip)# registration passthrough rate-limit expires 3600 local-fallback 3`	Configures the SIP registration passthrough rate-limit expiry value for local-fallback (e2e). Although Nano CUBE receives the REGISTER message every 5 minutes (300 seconds), it will send only one register message every one hour. • Under dial peer configuration mode, you can use the **voice-class sip registration passthrough rate-limit expires** *value* **reg-sync** *dial-peer-tag* command.

	Command or Action	Purpose
Step 6	**end** **Example:** `Device(conf-serv-sip)# end`	Returns to privileged EXEC mode.

Configuring the Class of Restrictions (COR) List

Perform the following task to configure the COR list to allow the local call to go through the registrar.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **dial-peer voice** *tag* **voip**
4. **corlist incoming** *dial-peer*
5. **corlist outgoing** *dial-peer*
6. **description** *string*
7. **destination-pattern** *number*
8. **session protocol sipv2**
9. **session target registrar**
10. **voice-class sip registration passthrough local-fallback** *tag*
11. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.

	Command or Action	Purpose
Step 3	**dial-peer voice** *tag* **voip** **Example:** `Device(config)# dial-peer voice 3 voip`	Enters dial peer configuration mode.
Step 4	**corlist incoming** *dial-peer* **Example:** `Device(config-dial-peer)# corlist incoming FromPhone`	Specifes the COR to be applied on an incoming dial peer (for incoming calls).
Step 5	**corlist outgoing** *dial-peer* **Example:** `Device(config-dial-peer)# corlist outgoing FromSP`	Specifes the COR to be applied for outgoing dial peer (for outgoing calls).
Step 6	**description** *string* **Example:** `Device(config-dial-peer)# description registration`	Adds a description to a dial peer.
Step 7	**destination-pattern** *number* **Example:** `Device(config-dial-peer)# destination-pattern 1111`	Specifies either the prefix or the full E.164 telephone number to be used for the dial peer.
Step 8	**session protocol sipv2** **Example:** `Device(config-dial-peer)# session protocol sipv2`	Specifies the session protocol for SIP calls between local and remote devices using the packet network.
Step 9	**session target registrar** **Example:** `Device(config-dial-peer)# session target registrar`	Specifies to route the call to the registrar end point for SIP dial peers.
Step 10	**voice-class sip registration passthrough local-fallback** *tag* **Example:** `Device(config-dial-peer)# voice-class sip registration passthrough local-fallback 5`	Configures SIP registration passthrough for local fallback mode.

	Command or Action	Purpose
Step 11	**end** **Example:** `Device(config-dial-peer)# end`	Returns to privileged EXEC mode.

Verifying Survivability Enhancements

Perform this task to verify the configurations for the survivability enhancements. The **show** commands can be entered in any order.

SUMMARY STEPS

1. **enable**
2. **show dial-peer voice summary**
3. **show sip-ua registration passthrough status**
4. **show sip-ua register status**
5. **show voip rtp connections**
6. **show call active voice compact**

DETAILED STEPS

Step 1 **enable**
Enables privileged EXEC mode.

Example:
`Device>` **enable**

Step 2 **show dial-peer voice summary**
Displays the summary information for each voice dial peer.

Example:
`Device#` **show dial-peer voice summary**

```
dial-peer hunt 0
             AD                                      PRE PASS                OUT
TAG    TYPE  MIN  OPER PREFIX    DEST-PATTERN      FER THRU SESS-TARGET    STAT PORT    KEEPALIVE
1      voip  up   up              1111...            0  syst registrar
2      voip  up   down            1......           0  syst ipv4:10.104.45.253            busyout
1000   voip  down down            9900...           0  syst ipv4:9.0.0.174:30601
101    voip  down down            1......           0  syst ipv4:10.104.45.31
102    voip  down down            11.....           0  syst ipv4:10.104.45.253
```

```
300    voip  down down           .T                0  syst
400    voip  down down           11110...          0  syst registrar
```

Step 3 **show sip-ua registration passthrough status**

Displays information about the SIP user agent registration passthrough status. In the sample output shown below, the parameter In-Exp shows the remaining expiry time and the survival field parameters can be regsync, locfall, or normal.

Example:

```
Device# show sip-ua registration passthrough status

CallId       Line         peer         mode In-Exp        reg-I Out-Exp survival
============ ============ ============ ==== ============= ===== ======= ========
5300         1111008      1            e2e  1041  /1200   ----- 1200    normal *
5305         1111002      1            e2e  2847  /3000   ----- 3000    normal *
5311         1111020      1            e2e  1070  /1200   ----- 1200    normal *
================================================================================
```

Step 4 **show sip-ua register status**

Displays information about the SIP user agent register status.

Example:

```
Device# show sip-ua register status

Line          peer  expires(sec) reg survival P-Associ-URI
========      ===== ============ === ========
11123         23     59          yes regsync
```

Step 5 **show voip rtp connections**

Displays Real-Time Transport Protocol (RTP) named event packets.

Example:

```
Device# show voip rtp connections

VoIP RTP Port Usage Information:
Max Ports Available: 8091, Ports Reserved: 101, Ports in Use: 2
Port range not configured, Min: 16384, Max: 32767

                                                                                Ports
Ports       Ports
Media-Address Range                                                           Available
Reserved    In-use

Default Address-Range                                                           8091
101         2

VoIP RTP active connections :
No. CallId     dstCallId  LocalRTP RmtRTP LocalIP                                RemoteIP
1     5324       5325       16410    16464  9.40.1.168                            9.40.1.173
2     5325       5324       16412    16528  9.40.1.168                            9.40.1.174
Found 2 active RTP connections
```

Step 6 **show call active voice compact**

Displays the compact version of the call information for voice calls in progress.

Example:

```
Device# show call active voice compact

<callID>  A/O FAX T<sec> Codec       type        Peer Address       IP R<ip>:<udp>
Total call-legs: 2
      5324 ANS     T9     g711ulaw    VOIP        P1111008       9.40.1.173:16464
      5325 ORG     T9     g711ulaw    VOIP        P1111020       9.40.1.174:16528
```

Configuration Examples for Survivability Enhancements

Example: Configuring Local Fallback Globally

```
Device> enable
Device# configure terminal
Device(config)# voice service voip
Device(conf-voi-serv)# sip
Device(conf-serv-sip)# registration passthrough local-fallback 10
Device(config-serv-sip)# end
```

Example: Configuring Local Fallback on a Dial Peer

```
Device> enable
Device# configure terminal
Device(config)# dial-peer voice 2 voip
Device(config-dial-peer)# voice-class sip registration passthrough local-fallback 10
Device(config-dial-peer)# end
```

Example: Configuring OPTIONS Ping

```
Device> enable
Device# configure terminal
Device(config)# dial-peer voice 3 voip
Device(config-dial-peer)# voice-class sip options-keepalive up-interval 120 down-interval
120
Device(config-dial-peer)# end
```

Example: Configuring the Registration Timer

```
Device> enable
Device# configure terminal
Device(config)# voice service voip
Device(conf-voi-serv)# sip
Device(conf-serv-sip)# registrar server expires max 300 min 200
Device(conf-serv-sip)# end
```

Example: Configuring REGISTER Message Throttling

```
Device> enable
Device# configure terminal
Device(config)# voice service voip
Device(conf-voi-serv)# sip
Device(conf-serv-sip)# registration passthrough rate-limit expires 3600 local-fallback 3
Device(conf-serv-sip)# end
```

Example: Configuring the COR List

```
Device> enable
Device# configure terminal
Device(config)# dial-peer voice 2 voip
Device(config-dial-peer)# corlist incoming FromPhone
Device(config-dial-peer)# corlist outgoing FromSP
Device(config-dial-peer)# description registration
Device(config-dial-peer)# destination-pattern 1111
Device(config-dial-peer)# session protocol sipv2
Device(config-dial-peer)# session target registrar
Device(config-dial-peer)# voice-class sip registration passthrough local-fallback 5
Device(config-dial-peer)# end
```

Feature Information for Survivability Enhancements

The following table provides release information about the feature or features described in this module. This table lists only the software release that introduced support for a given feature in a given software release train. Unless noted otherwise, subsequent releases of that software release train also support that feature.

Use Cisco Feature Navigator to find information about platform support and Cisco software image support. To access Cisco Feature Navigator, go to www.cisco.com/go/cfn. An account on Cisco.com is not required.

Table 1: Feature Information for Survivability Enhancements

Feature Name	Releases	Feature Information
Survivability Enhancements	15.3(3)M	When a WAN link goes down temporarily or the registrar server is down, local calls cannot be made and no calls can be routed to and from the phones. The Survivability Enhancements feature on the NanoCUBE is used to: • Monitor the WAN status periodically from the Nano CUBE. • Route calls and handle line-seize subscriptions locally when the WAN link is down. • Synchronize the registrations with the server when the WAN link is up.

Feature Name	Releases	Feature Information
Survivability Enhancements—Support for Extensions and Phone Numbers	Cisco IOS 15.6(2)T	From Cisco IOS 15.6(2)T onwards, when the WAN link or registration server is down, local phones can be reached on their short extensions or phone numbers by similar phones subscribed to the server through the same NANOCUBE.