

## 911 Services for Cisco Virtual Office Users

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Cisco Virtual Office and Cisco Emergency Responder do not include the capability to automatically locate remote devices not on the customer's premises. If an emergency call is placed from one of these devices, the call may be delivered to an inappropriate emergency service responder or with an incorrect location. You may be able to support user-provided off-premises locations and deliver emergency calls to the appropriate emergency service responder by using Cisco Virtual Office with Cisco Emergency Responder, and you will also need third-party emergency call delivery with location services that interoperate with Cisco Virtual Office and Cisco Emergency Responder. If you choose to use a third-party service to augment the capability of Cisco Virtual Office and Cisco Emergency Responder, you must work directly with the third-party service provider; Cisco does not provide any such services. It is your responsibility to evaluate and test the third-party services; Cisco assumes no responsibility or liability whatsoever with respect to any such third-party services. It is your responsibility to notify the remote worker of the extent and limitations of your support for emergency calls from off-premises locations and to reinforce the user's responsibility. It is also your responsibility before using an off-premises device to provide your correct and current location data. If you place an emergency call from an off-premises device without providing your location, your emergency call may be delivered to an inappropriate emergency service responder or with an incorrect location.

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### Challenge

The 911 emergency number is a single telephone number you can call nationwide in the United States and Canada to report medical, fire, and police emergencies. Calls made by dialing 911 are routed over dedicated networks to the appropriate public safety answering point (PSAP) for the caller's location. PSAPs are the first-tier call center for emergency calls that dispatch or connect to medical, fire, or police resources as necessary.

The Enhanced 911 (E911) wired system adds location-based services to basic 911 services:

- Selective routing is provided by the E911 selective router feature, which routes emergency calls to the correct PSAP for the location of the caller.
- Automatic location information (ALI) for the point of interconnection provided by the carrier is delivered to PSAP operators.
- Private switch ALI (PS-ALI) provides caller-specific location information to PSAP operators about callers behind a private branch exchange (PBX).

Traditionally, 911 and E911 services could not meet the needs of teleworkers and off-premises user due to the following restrictions:

- In voice-over-IP (VoIP) environments, moves, additions, and changes can be accomplished without administrative action, and that flexibility is one of the reasons that users migrate to VoIP services. However, moves, additions, and changes are cumbersome processes for 911 services and require several steps: an administrator must update the PBX, update the PS-ALI database in the enterprise, and manually send a file to the PSAP, which then must update its ALI database. This manual process can require a business day or more to accomplish, thereby increasing both cost and risk.
- Providing E911 services for Cisco® Virtual Office and branch-office users presents an additional challenge. One of the primary requirements for an E911 service is tracking the location of the user; however, until now no mechanism has been available to track the location from which calls were initiated because teleworkers usually have the same direct inward dialing (DID) extension at the data center and branch and home office. Furthermore, teleworkers may shift their permanent addresses and take their routers to new locations or work remotely using their laptop computers. Also, the number of internal DID extensions in a branch office is usually higher than the actual number of lines purchased from the service provider. Hence, the number sent to the PSAP operator may not map to the address information one to one.

## Solution

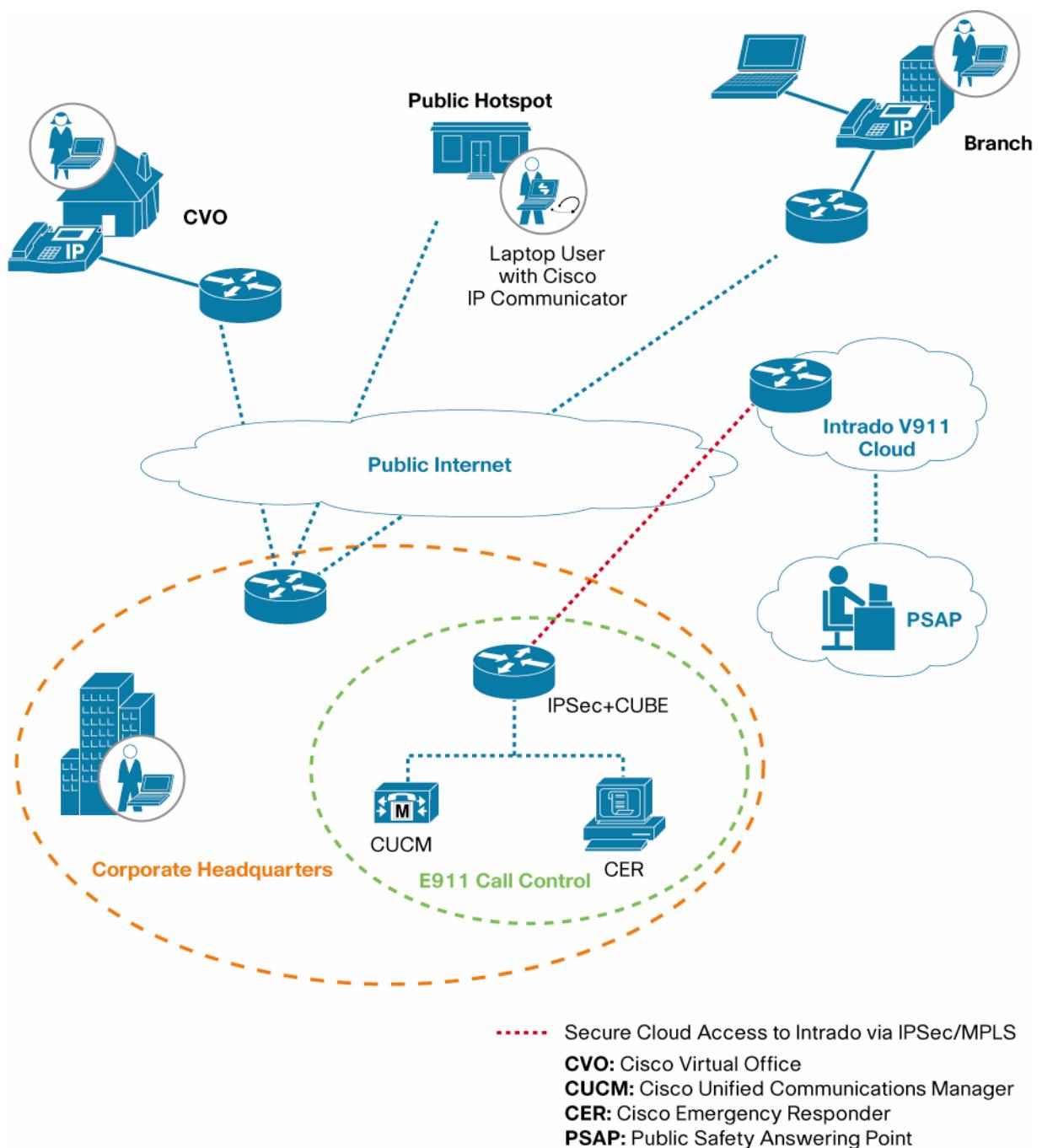
Cisco Virtual Office and branch offices can now support E911 services and meet the challenges associated with E911 services. The prerequisites are a Cisco Virtual Office or branch-office infrastructure and the Cisco Unified Communications Manager, Cisco Emergency Responder, and Cisco Unified Border Element (CUBE).

### What Happens When a Cisco Virtual Office User Makes a VoIP 911 Call

The Intrado VoIP 9-1-1 (V9-1-1) for Enterprise Service provides local routing and emergency-service response for Intrado customers. Cisco Emergency Responder works in conjunction with Intrado to provide emergency services to phones that are located on the corporate network (on premises) and phones that are located away from the corporate network (off premises). Cisco Emergency Responder provides an interface that allows you to enter and synchronize location information directly with Intrado's database. Cisco Emergency Responder provides location information for emergency calls for both on-premises phones and Cisco Virtual Office teleworker phones and works with Intrado, Cisco Unified Communications Manager, and Cisco Unified Border Element to complete emergency calls (Figure 1).

Users with off-premises phones cannot make emergency calls until the users enter their locations and associate this information with their directory numbers. After the location information has been verified, emergency calls placed from off-premises phones can be completed. For Cisco Virtual Office, this process needs to be completed only once initially, and then every time a user moves to a new home-office location. However, these changes do not need to be reported to the administrator of the enterprise and can be directly updated for delivery to the PSAP database through the Intrado services. In other words, users can configure multiple off-premises Cisco Virtual Office user locations for each directory number, but only one off-premises Cisco Virtual Office user location is active at any given time. This rule also applies to shared lines; if two off-premises phones share a directory number, the user can associate only one location with the number.

**Figure 1.** Cisco Virtual Office, Branch-Office, and Laptop Computer User with V911 Services from Intrado



### High-Level Call Flow

- Emergency call reaches the Cisco Virtual Office infrastructure to the Cisco Integrated Services Routers Generation 2 (ISR G2) or Cisco ASR Aggregation Services Routers VPN headend deployed using Cisco Virtual Office.
- Call is sent to the Cisco Unified Communications Manager for initial signaling.
- Cisco Unified Communications Manager routes the call to Cisco Emergency Responder.
- Cisco Emergency Responder sends the call back to Cisco Unified Communications Manager after mapping the emergency location identification number (ELIN) to the location for on-premises locations. If the call is

from an off-premises location as in the case of Cisco Virtual Office, the off-premises user address location is chosen.

- Cisco Unified Communications Manager sends the call to Cisco Unified Border Element through the Session Initiation Protocol (SIP) trunk.
- Cisco Unified Border Element sends the call to an Intrado gateway.
- Intrado receives the 10-digit ELIN for on-premises locations or the actual calling party number for the off-premises calling party and fetches the ALI data for the caller from this calling party number to determine which PSAP should receive the call.
- Intrado completes the call to the PSAP and delivers the corresponding ALI data using the PSAP ALI database.

### Solution Components

Along with the existing Cisco Virtual Office infrastructure, the following components are used to support off-premises 911 services:

- **Cisco Unified Border Element (CUBE)**
  - **Software version:** Cisco IOS® Software Release 15.1.2T or later
  - **Hardware platforms:** Cisco Unified Border Element on Cisco ISR G2 (Cisco 2900 and 3900 Series ISRs).
  - **License:** Feature license required (For more information about licensing, visit [http://www.cisco.com/en/US/prod/collateral/voicesw/ps6790/gatecont/ps5640/product\\_data\\_sheet09186a0801da698.html](http://www.cisco.com/en/US/prod/collateral/voicesw/ps6790/gatecont/ps5640/product_data_sheet09186a0801da698.html).)
- **Cisco Emergency Responder**
  - **Software version:** Cisco Emergency Responder 7.1 or later
  - **Hardware platforms:** Refer to the release-specific data sheet at [http://www.cisco.com/en/US/prod/collateral/voicesw/ps6789/ps7046/ps842/data\\_sheet\\_c78-574744.html](http://www.cisco.com/en/US/prod/collateral/voicesw/ps6789/ps7046/ps842/data_sheet_c78-574744.html).
- **Cisco Unified Communications Manager**
  - **Software version:** Cisco Unified Communications Manager 7.1 or later
  - **Hardware platforms:** Refer to the release-specific data sheet at [http://www.cisco.com/en/US/products/sw/voicesw/ps556/products\\_data\\_sheets\\_list.html](http://www.cisco.com/en/US/products/sw/voicesw/ps556/products_data_sheets_list.html).
- **Services from Intrado**
  - Intrado is the service provider that supports off-premises Cisco Virtual Office users. Enterprise's should contact Intrado directly and negotiate the cost of the associated services.

### Administrator Steps

After all the equipment listed here is ready and has the relevant software and licenses, the administrator needs to perform the following steps:

- Step 1. Configure the Cisco Unified Communications Manager to support Cisco Emergency Responder and Emergency call handling. See [http://www.cisco.com/en/US/docs/voice\\_ip\\_comm/cer/8\\_0/English/administration/guide/CERAG\\_80.html](http://www.cisco.com/en/US/docs/voice_ip_comm/cer/8_0/English/administration/guide/CERAG_80.html).
- Step 2. Configure the Cisco Emergency Responder to support 911 calls. See [http://www.cisco.com/en/US/docs/voice\\_ip\\_comm/cer/8\\_0/English/administration/guide/CERAG\\_80.html](http://www.cisco.com/en/US/docs/voice_ip_comm/cer/8_0/English/administration/guide/CERAG_80.html).

Step 3. Configure Cisco Unified Communications Manager and Cisco Unified Border Element. Refer to this document.

Step 4. Configure Intrado V9-1-1 support for off-premises Cisco Virtual Office users using Cisco Emergency Responder. Refer to this document.

## Configuration

This section discusses Administrator Steps 3 and 4.

### Configure Cisco Unified Communications Manager and Cisco Unified Border Element

Configuring the SIP Trunk on Cisco Unified Communications Manager

- **Cisco Unified Communications Manager 6.0:** Create a new SIP trunk and use default values for all the parameters. In addition, configure the following settings:
  - Select the check box to require a media termination point (MTP).
  - In the SIP information area, in the destination address field, provide the IP address of the Cisco Unified Border Element device.
  - Choose the MTP codec 711ulaw.
  - For the SIP trunk security profile, use a User Datagram Protocol (UDP)-based profile. (You will need to create a new security profile. Copy the Nonsecure profile and change the outgoing transport type to UDP.)
  - On the service parameters page, disable the SIP Rel1XX Enabled parameter.
- **Cisco Unified Communications Manager 7.0:** In addition to the settings configured for Cisco Unified Communications Manager 6.0, in the Call Routing Info area, enable Asserted-Identity and disable Remote-party-id.

Configuring Cisco Unified Border Element

The Cisco 2900 or 3900 Series routers used for Cisco Unified Border Element are also used for IPSec termination for the Intrado network.

#### Establishing the VPN Tunnel

Note that a preshared key (PSK) was used to connect to Intrado. Cisco IOS VPN also supports public key infrastructure (PKI). Confirm the VPN tunnel information with Intrado and deploy the VPN configurations accordingly. The parameters shown here are example only; enterprises need to verify these parameters with Intrado according to the agreement with Intrado.

```
#conf t
crypto isakmp policy policyName
encr aes
authentication pre-share
group 2
lifetime 28800
crypto isakmp key xxxx address yyyy

##xxxx is a preshared key obtained from Intrado for the ip address yyyy.

crypto ipsec transform-set setname esp-aes 128 esp-sha-hmac
crypto map mapname 1 ipsec-isakmp
set peer xxxx
set transform-set yyyy
```

```
set pfs group2
match address zzz
```

where,  
 xxxx - Intrado gateway IP address, yyyy - Name of the transform set added  
 zzzz - Name of the accesslist added.

```
interface FastEthernet 0/0
```

Set the ip address and the map for the interface using the commands -

```
#Ip address <x.x.x.x> <mask>
crypto map <mapname>
```

```
# Assign a route to intrado, route to your ISP is sufficient.
ip route <destip> <dest mask> <next hop ip addr>
```

```
# Create VPN match policy
access-list listid permit ip <srcip> <src mask> <dstip> <dstmask>
where,
src ip - CUBE ip addr
destip - addr of intrado SBC.
```

#Enabling SIP on the router:

```
#conf t
voice service voip
sip
```

#Adding dial-peers: Add 2 dial peers one each for Intrado primary and secondary hosts respectively.

```
#conf t
dial-peer voice tag voip
description outgoing-DialPlan
preference 1
destination-pattern 911
session protocol sipv2
session target ipv4:<intrado primary>
session transport udp
dtmf-relay rtp-nte
codec g711ulaw

dial-peer voice tag voip
description outgoing-DialPlan
preference 1
destination-pattern 911
session protocol sipv2
session target ipv4:<intrado secondary>
session transport udp
```

```
dtmf-relay rtp-nte
codec g711ulaw
```

## Configure Intrado V9-1-1 Support for Off-Premises Cisco Virtual Office Users Using Cisco Emergency Responder

After you have confirmed your emergency service support with Intrado, you must configure Cisco Emergency Responder to support the Intrado V9-1-1 for Enterprise Service. This section provides high-level steps for configuring Cisco Virtual Office off-premises support only. For complete details of Cisco Emergency Responder configurations, please refer to the Cisco Emergency Responder administrator guide at [http://www.cisco.com/en/US/products/sw/voicesw/ps842/prod\\_maintenance\\_guides\\_list.html](http://www.cisco.com/en/US/products/sw/voicesw/ps842/prod_maintenance_guides_list.html).

### Configuring Intrado Validation and Update Interface Settings

Before you can configure Intrado Validation and Update Interface (VUI) settings, you must have your account information and a certificate from Intrado.

To configure Intrado VUI settings, follow these steps:

- Step 1. Choose System > Intrado VUI Settings.
- Step 2. Click Upload Certificate. An Upload Certificate window opens. Use the Browse button to locate the Intrado certificate file; then select the file and click the Upload button.
- Step 3. Enter the certificate password and the VUI URL in the adjacent text boxes. Click Test and Validate.
- Step 4. Enter the account information:
  - VUI schema URL
  - Intrado account ID
  - Maximum number of VUI connections
- Step 5. Click Update.

### Configuring Intrado Route Patterns on Cisco Emergency Responder

Before any emergency calls can be completed by the Intrado V9-1-1 for Enterprise Service, you must configure the patterns for routing the call to Intrado. To create a route pattern for Intrado, follow these steps:

- Step 1. From Cisco Emergency Responder, choose System > Telephony Settings. The Telephony Settings page appears.
- Step 2. Under Intrado Route Pattern Settings, enter the Intrado route and translation pattern and click the Add button.
- Step 3. Configure the Intrado emergency response locations (ERLs).
  - You must first configure Intrado route patterns before you can add any Intrado ERLs. You can query and validate ALI data from Intrado by using the Intrado VUI. You must submit ALI data (telephone number update) to Intrado by using Intrado VUI before an emergency call can be successfully routed.
  - From Cisco Emergency Responder, choose ERL > Intrado ERL > Intrado ERL (Search and List). The Find Intrado ERL Data page appears.
  - Click the Add New ERL button. Cisco Emergency Responder opens the Add New ERL window. Fill in the ERL Information. Click ALI Details.

- Cisco Emergency Responder opens the ALI Information window. Enter the ALI Information. To look up an address in the Intrado Master Street Address Guide (MSAG) database, click Query from Intrado.
- When you are finished entering the ALI information, click Pre-validate from Intrado.
- Make the Add New ERL window the active window if it is not already; then click Insert. Cisco Emergency Responder saves the ERL and its ALI.

**Configuring Cisco Emergency Responder Location Management in Cisco Unified Communications Manager**  
 You must configure the Cisco Emergency Responder location management server on the Cisco Unified Communications Manager server before your users can use it to enter their off-premises locations. To enable Cisco Emergency location management in Cisco Unified Communications Manager, follow these steps:

- Step 1. From the Cisco Unified Communications Manager administration page, choose System > Application Server.
- Step 2. Click the Add New button.
- Step 3. From the Application Server Type drop-down box, choose Cisco Emergency Responder Location Management. Then click Next.
- Step 4. Enter a name that identifies the Cisco Emergency Responder off-premises application. The name is displayed in the navigation drop-down box on the User Option page and will be selected by the user to navigate to the Cisco Emergency Responder Off-Premises page.
- Step 5. Enter the URL for the Cisco Emergency Responder Off-Premises page. The URL takes the form of `http://cer_host/ofpuser`, where cer\_host is the name or IP address of the Cisco Emergency Responder publisher or Cisco Emergency Responder subscriber.
- Step 6. Click Save.

#### Configuring the AXL Application User

You must configure the AXL application user for Cisco ER on Cisco Unified CM, so that an off-Premises user can log in to the CER's off-premises user website. To configure the AXL application, follow these steps:

- Step 1. In Cisco Unified Communications Manager, choose UserManagement>Application User. Click the Add New button. Cisco Unified Communications Manager displays the Application User Configuration page.
- Step 2. Complete the following required fields:
  - User ID—Use a descriptive name such as “AXL Application User.”
  - Password—Enter a password for this user.
  - Confirm Password—Re-enter the password for this user.
- Step 3. Click Save.
- Step 4. In the Cisco Unified Communications Manager menu at the top, choose User Management>User Group. The user group search page appears.
- Step 5. At search criterion, enter *standard* and click FindThe list of user groups starting with the name standard appears.
- Step 6. Click the Standard CCM Admin Users link to display the User Group configuration page.
- Step 7. Click Add App Users to Group. The Find and List Application Users pop-up window appears.

- Step 8. Enter the User ID created in Step 2 as the search criterion and click Find. The list of Applications users appears.
- Step 9. Click the checkbox next to the user ID and click Add Selected. Cisco Unified Communications Manager adds the selected user to the Standard CCM Admin Users user group.
- Step 10. Choose User Management>User Group. The user group search page appears.
- Step 11. Enter *standard* as the search criterion and click Find. The list of user groups starting with the name Standard appears.
- Step 12. Click the Standard TabSync User group.
- Step 13. To add the user to the Standard TabSync User group and to, repeat steps 7 through 9.
- Step 14. Choose User Management>User Group. The user group search page appears.
- Step 15. Enter *standard* as the search criterion and click Find. The list of user groups starting with the name Standard appears.
- Step 16. Click the Standard RealtimeAndTraceCollection group.
- Step 17. Repeat steps 7 through 9 to add the user to the Standard RealtimeAndTraceCollection group.

#### Configuring AXL Authentication

To configure AXL authentication between Cisco Emergency Responder and Cisco Unified Communications Manager, follow these steps:

- Step 1. From Cisco Emergency Responder, choose Phone Tracking > Cisco Unified Communications Manager.
- Step 2. Under AXL Setting, enter the following information:
  - AXL username
  - AXL password
  - AXL port number
- Step 3. Click Insert.

#### Configuring Off-Premises ERLs

Unlike conventional ERLs, off-premises ERLs do not need ELIN or ALI information to be entered. The ERL for a phone is tracked by its IP subnet and the phone's MAC address assignment. You can assign off-premises ERLs only to IP subnets, unlocated phones, and manual phones. You cannot assign off-premises ERLs to switch ports.

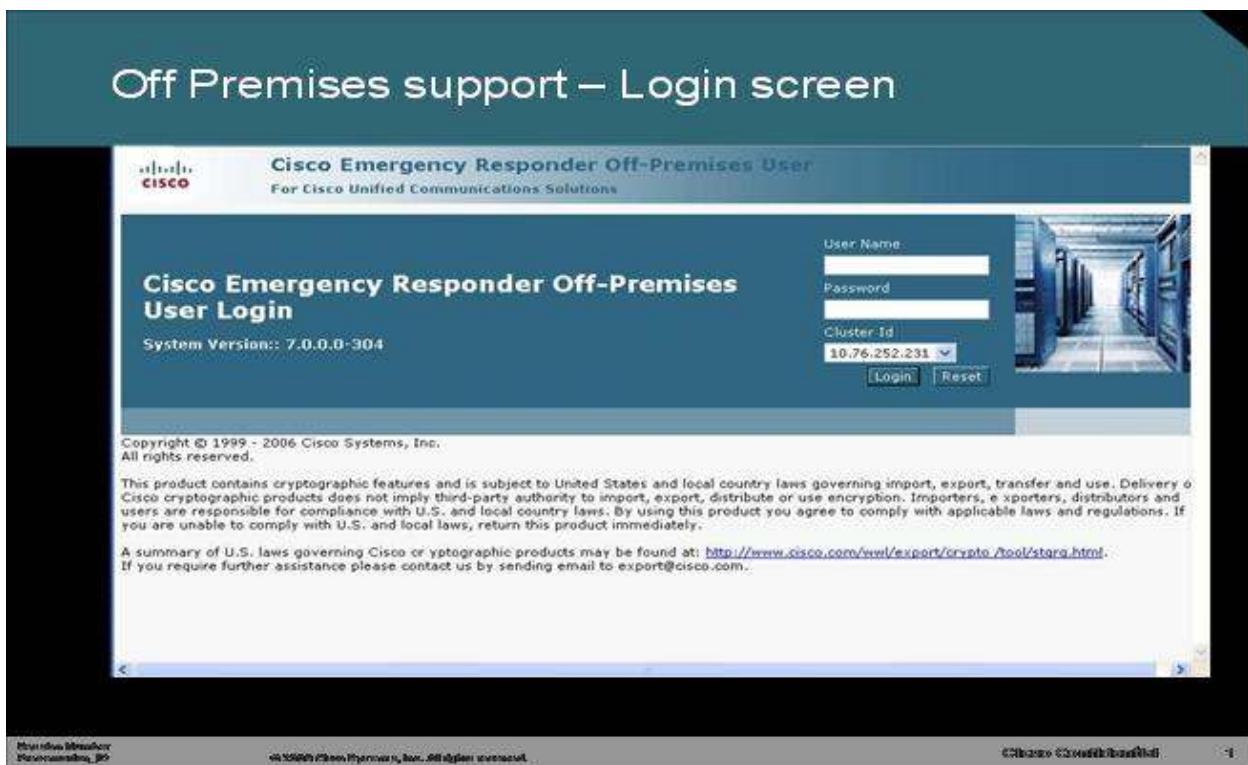
- Step 1. From Cisco Emergency Responder, choose ERL > Off-Premises ERL > Off-Premises ERL (Search and List).
- Step 2. Click the Add New ERL button.
- Step 3. Fill in the following information in the Add New ERL window.
  - ERL name
  - Description
  - Intrado route pattern and translation pattern
  - Onsite alerts
- Step 4. Click Insert.

- Step 5. Fill in the information in the Add New ERL window.
- Step 6. As discussed earlier in this document, you must add Intrado route patterns before you can add off-premises ERLs. Assign this off-premises ERL to the IP subnet. An off-premises ERL cannot be allocated to a switch port.

### End-User Steps

After the administrator has configured the off-premises ERLs, users can enter their location information for off-premises phones from the Cisco Unified Communications Manager User Option page.

- Step 1. The Cisco Virtual Office user opens the Off-Premises webpage.



- Step 2. The user in this example has one preferred address in database and has the option of adding a new location.

The screenshot shows a web-based application titled "Cisco Emergency Responder Off-Premises User". The main title bar includes the Cisco logo and the text "Cisco Emergency Responder Off-Premises User" and "For Cisco Unified Communications Solutions". The top right corner has links for "Welcome", "About", and "Logout". Below the title, there's a breadcrumb navigation "Lines > Location". A section titled "Configured Locations" displays a table with one row of data. The table columns are: House Number, House Number Suffix, Street Name, Street Suffix, Community Name, State, Zip Code, Location, Edit, and Delete. The data in the first row is: 100, 100 NORTH, ALY, JEROME, ID, 55555, and a placeholder for Location. There are "Add New Location" buttons both above and below the table. At the bottom of the page, there's a footer with the text "Rancho Dominguez, CA, USA" and "Cisco Confidential" along with a copyright notice.

- Step 3. The user adds a new off-premises or home-office location and queries the MSAG. Without any administrator intervention, MSAG can validate the user through the PSAP database in the Intrado cloud. If the user enters incorrect or random address information, an error is generated. Locations can be maintained for branch-office users, teleworkers, and laptop computer users.

The screenshot shows the "Add New Location" form within the same application. The title bar and top navigation are identical to the previous screenshot. The main content area is titled "Add New Location". It contains a "MSAG Query" button, a "Pre-validate" button, and a dropdown menu for "Show up to [1] records at a time (for MSAG Query results)". Below this, there's a section titled "Location details" with various input fields: House Number \*\*, Street Name \*\*\*, Street Suffix, Community Name \*\*, Zip Code \*, Longitude, Location, House Number Suffix, Prefix Directional, Post Directional, State \*\*\*, Zip Code Extension, Latitude, and County ID. At the bottom of the form, there's a legend for required items: a blue circle with an exclamation mark indicates required for updating ALI info only; a red circle with an exclamation mark indicates required for updating ALI info and MSAG Pre-validation; and a green circle with an exclamation mark indicates required for updating ALI info, MSAG Pre-validation, and MSAG Query. There are also "Save" and "Cancel" buttons. The footer is identical to the previous screenshot.

Step 4. The user associates himself or herself with the off-premises location. A user who is using only Cisco Virtual Office needs to do this only once as long as user remains in the same home office. If the user wants to use the service over VoIP on a laptop computer, the user will need to change the location on this webpage every time the user moves to a new location.

The screenshot shows a web-based application titled "Cisco Emergency Responder Off-Premises User". The main title bar includes the Cisco logo and the text "Cisco Emergency Responder Off-Premises User" and "For Cisco Unified Communications Solutions". The top navigation bar has links for "Welcome", "About", and "Logout". Below the title bar, there are tabs for "Lines" and "Location". The main content area is titled "Associating Off Premises locations". It displays a table with two rows of data:

Device	Lines	Device Status	Associated Location	Directory Number
SEP00137F68FBAD	23101, 23198, 23199, 13131	Unlocated	100, cs, st	8040623101
SEP00002194AD24	23102, 23197, 23196	Not Discovered	No locations configured	... Select DID ...

Below the table, there is a "Select location" dropdown menu containing "100, ss, ss, E, st" and an "Associate Location" button. At the bottom of the page, there are footer links for "Home", "Cisco Support", "Feedback", and "Logout".

## For More Information

- Cisco Virtual Office Deployment Guide:  
[http://www.cisco.com/en/US/solutions/collateral/ns340/ns517/ns430/ns855/deployment\\_guide\\_c22-493157.html](http://www.cisco.com/en/US/solutions/collateral/ns340/ns517/ns430/ns855/deployment_guide_c22-493157.html)
- Cisco Emergency Responder Administrator Guide:  
[http://www.cisco.com/en/US/docs/voice\\_ip\\_comm/cer/8\\_0/English/administration/guide/CERAG\\_80.html](http://www.cisco.com/en/US/docs/voice_ip_comm/cer/8_0/English/administration/guide/CERAG_80.html)



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