



# Zoom Phone Nomadic Emergency Services

## Best Practices Guide

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Version 1.2

Last update: 17 Nov 2021

**zoom**

# Table of Contents

<b>Introduction:</b> .....	<b>3</b>
<b>Regulatory Requirements:</b> .....	<b>4</b>
Complying with Kari's Law: No Prefixes.....	4
Complying with Kari's Law: Emergency Notifications.....	5
Complying with RAY BAUM'S Act: Dispatchable Addresses.....	6
<b>Emergency Call Handling Options</b> .....	<b>7</b>
Scope .....	7
Emergency call routing -- PSAP and Safety Team: .....	7
Emergency Call Handling for Extension only users and phones: .....	8
Emergency Number Pool.....	8
Receptionist or Call Queue.....	8
Caller Location.....	8
<b>Deploying a Nomadic Emergency Services Solution</b> .....	<b>9</b>
Nomadic Solution Overview .....	9
Emergency call routing -- Zoom Native or BYOC.....	10
Defining Company Locations.....	11
Bootstrap Mode .....	14
Personal Locations.....	15
Enabling Users and Devices to Report Network Data .....	16
Location Sharing with Zoom Application .....	16
Detecting and Reporting Network Switch Data .....	18
Ongoing Management.....	19

# 1. Introduction

This guide is intended to enable Zoom Phone customers to successfully deploy and maintain a safe and robust emergency services solution for today's work environments. This includes abilities to notify and empower internal safety teams, and to support a hybrid in-office & work-from-home mobile workforce. The capabilities to create such a solution are built right into your Zoom Phone service; this guide will help you make the most of these powerful tools.

In this guide we will describe best practices for enabling the emergency calling features built into Zoom Phone. This will quickly lead us to evaluating options for emergency call handling and routing, as well as choices for emergency event notifications and capabilities for enabling an internal safety response team.

Then we'll move on to creating a nomadic emergency services solution--we can loosely define "nomadic" in this context to mean "the system detects where you are right now and automatically reports the correct location to public safety" should you place an emergency services call. The public safety infrastructure for participating in this solution varies throughout the world and also by underlying carrier, so we'll look at this task from the perspective of Zoom Phone "native" services in the US & Canada, for Bring Your Own Carrier options, and for markets and sites outside US & Canada.

The figure below provides an overview of the components of the Zoom Phone emergency services solution that we'll discuss throughout this guide:



## 2. Regulatory Requirements

Zoom Phone customers in the United States need to be aware of regulatory requirements outlined in the figure below. For customers elsewhere, don't skip this section! We promise the capabilities we'll describe here will be quite useful to you, too. Note: this discussion of regulatory requirements is not intended as legal advice. We encourage all customers to seek counsel on what their requirements are under applicable law in the jurisdictions in which they are using Zoom Phone."

Let's start with Kari's Law. As noted in the figure below, there are two key requirements for complying with Kari's Law: don't require a user to input any sort of prefix or postfix when calling 911, and you must notify designated personnel in your organization when an emergency call has been placed from within your multi-line phone system.

### Regulatory Considerations

#### Kari's Law

- You cannot require a user to input a prefix before calling 911 (e.g. no dialing 8 or 9 first)
- You must notify designated personnel if an emergency call has been placed from within a multi-line phone system
- Compliance effective on 16 Feb 2020
- Zoom's baseline solution is compliant with Kari's Law

#### Ray Baum's Act

- You must include street address + granular information (building number, floor number, etc.) in the "dispatchable location" information provided to public safety at time of a 911 call
- The FCC has said that service providers must provide automated dispatchable location information if technically feasible
- Compliance effective 6 Jan 2021 for fixed line systems and 6 Jan 2022 for non-fixed systems
- Zoom's Nomadic 911 solution enables compliance with Ray Baum's Act.

### 2.1 Complying with Kari's Law: No Prefixes

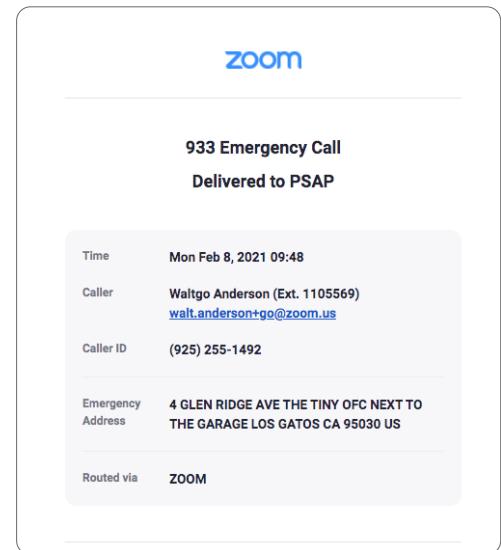
Zoom Phone complies with the no-prefix requirement in Kari's Law by default: regardless of your other potential dial-plan intricacies, dialing "911" (or any defined emergency services number for your country) will always be considered and routed as an emergency call.

**Note:** in the US/Canada, dialing 933 is treated similar to an emergency call--however, this call reaches an emergency testing service. It is offered to customers that use Zoom services for routing emergency calls, and it does not engage actual public safety resources; instead it reaches an automated voice response system that validates your emergency calling service and reports your calling number and the location you are calling from.

## 2.2 Complying with Kari's Law: Emergency Notifications

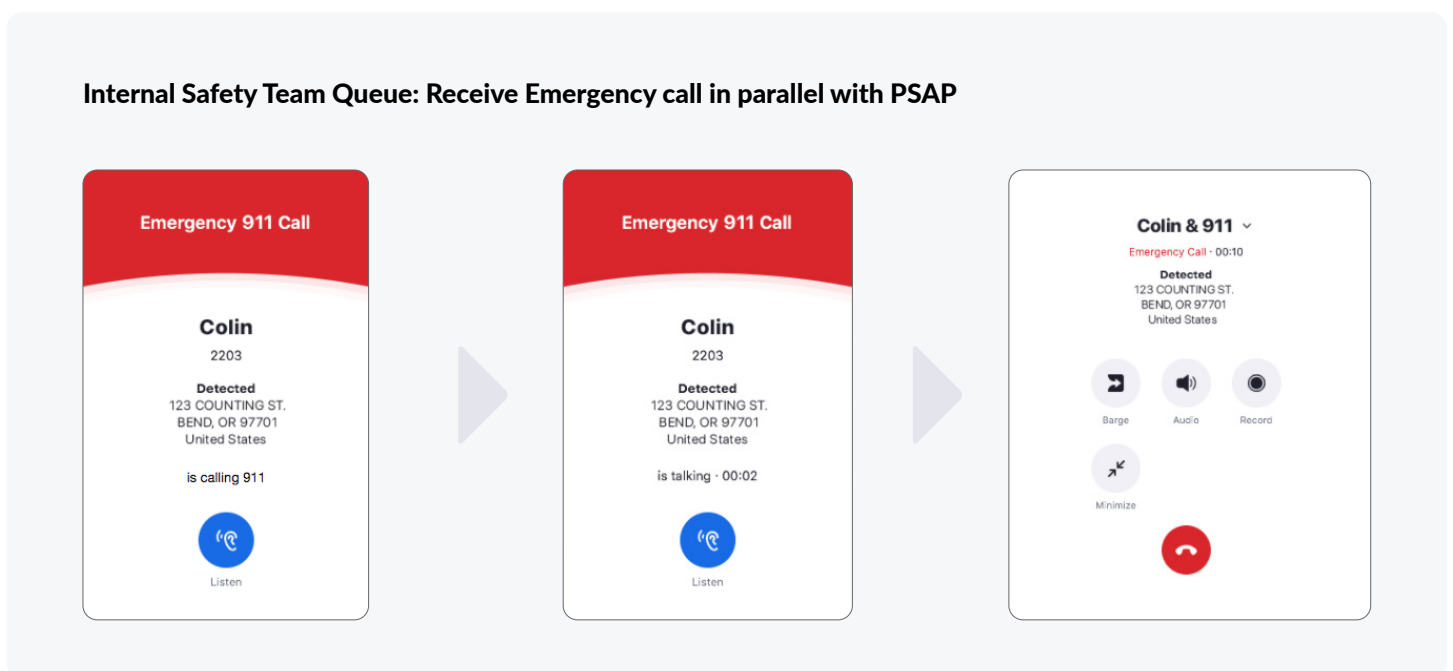
For emergency notifications, Zoom Phone provides several options that can be combined to best meet your needs:

**Email:** At the account level (for customers that do not deploy multiple Zoom Phone sites) or at each site level (for those that deploy multi-site,) you can configure an email distribution list for receiving emergency call alerts. The email alert looks like this:



**Internal Safety Response Team:** The internal safety response team is a Zoom Phone call queue that can receive, record, monitor, and even participate in emergency calls. It can be configured separately for each Zoom Phone site. When an emergency call is placed, the call can be routed in parallel to public safety and this queue--both destinations ring at the same time. Members of the queue receive a detailed incoming emergency call alert with who is calling, from what number, and the caller's detected or default location. Queue members can monitor (listen in) to the call, and even barge into the call if needed to help coordinate the response.

- Link to help articles on Internal Safety Response Team: <https://support.zoom.us/hc/en-us/articles/360021062871-Setting-up-emergency-addresses-and-calling>
- The figure below shows an incoming emergency call to the internal safety team queue.





**Zoom Chat:** By deploying the Zoom “Emergency Notifications” chat bot, you can define one or more Zoom Chat groups to receive emergency call alerts. This application also provides the ability to post emergency messages to Zoom digital signage. For example, if an emergency call is placed from the third floor of a building, a call alert will be received by the designated Zoom Chat group indicating who called, from what number, when, and from where. Members of the chat group could then choose to post messages to Zoom digital signage--in this example, perhaps designating digital signage in the lobby of the building to advise emergency responders to proceed to the 3rd floor.

This application is named Emergency Call Notifications and is published here: <https://marketplace.zoom.us/>

**Web Hook:** Zoom APIs provide a web hook alert for emergency calls. This is useful for integrating with third-party event management platforms.

- See <https://marketplace.zoom.us/docs/api-reference/introduction> for details.

## 2.3 Complying with RAY BAUM’S Act: Dispatchable Addresses

RAY BAUM’S Act requires that you send a detailed “dispatchable” address to public safety. For customers utilizing Zoom Phone native calling services, Zoom enables you and your users to define detailed emergency addresses for each user, phone, and location. The ability to meet the “dispatchable address” requirement in RAY BAUM’S act generally boils down to including sufficient information in the address line 2 field. We’ll get into the “automated” part of delivering dispatchable location information later when we address nomadic services.

**Zoom Native:** In general, numbers procured or ported into Zoom native services will inherit the default site address, and then you can modify emergency address assignments for users and common area phones as needed. The goal is to set a good default address for everyone and every phone. You have the flexibility to decide whether or not your end users can manage their own emergency addresses; if you have a distributed and/or remote workforce, we recommend that you both enable and encourage users to manage their emergency addresses. In the US/Canada, even extension-only users can successfully manage their emergency addresses; see section 3.3. When an address is entered or updated, Zoom will validate that address before it can be saved. For US/Canada address changes, this is an automated process. For other countries, depending upon capabilities in the country, it may be automated or require a manual processing step that is carried out behind the scenes by our services team.

**Bring Your Own Carrier:** For customers utilizing Bring Your Own Carrier (BYOC) calling services, the address of record for a given phone number is maintained by your carrier, and you will need to work with your carrier for ongoing updates and modifications. Because a BYOC carrier owns the address mapping for your numbers, you should think of Zoom’s capabilities to input and manage user and phone emergency addresses as just a helper for enabling you to collect the desired “phone number to address mapping” that you will in turn need to implement and maintain with your BYOC carrier.

### Important:

The exception to this rule is for BYOC customers with US/Canada BYOC numbers that choose to use Zoom for routing emergency calls. When nomadic emergency services are enabled, this choice can be made at the account level or at the site level when using multi-site, and it is highly recommended that you utilize this service. In this case, you can use all Zoom provided emergency address management tools for users and phones in the US and Canada and don’t need to worry about continually updating addresses with your carrier. You can learn more about this option in section 4.2

For more information on Kari’s Law and RAY BAUM’S ACT, see <https://www.fcc.gov/mlts-911-requirements>.

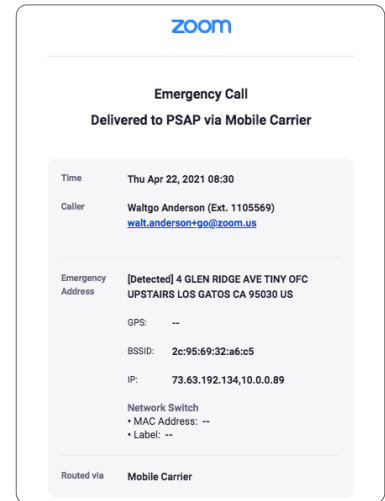
### 3. Emergency Call Handling Options

Next we have some decisions to make for emergency call handling and ensuring calls will indeed reach public safety responders:

#### 3.1 Scope

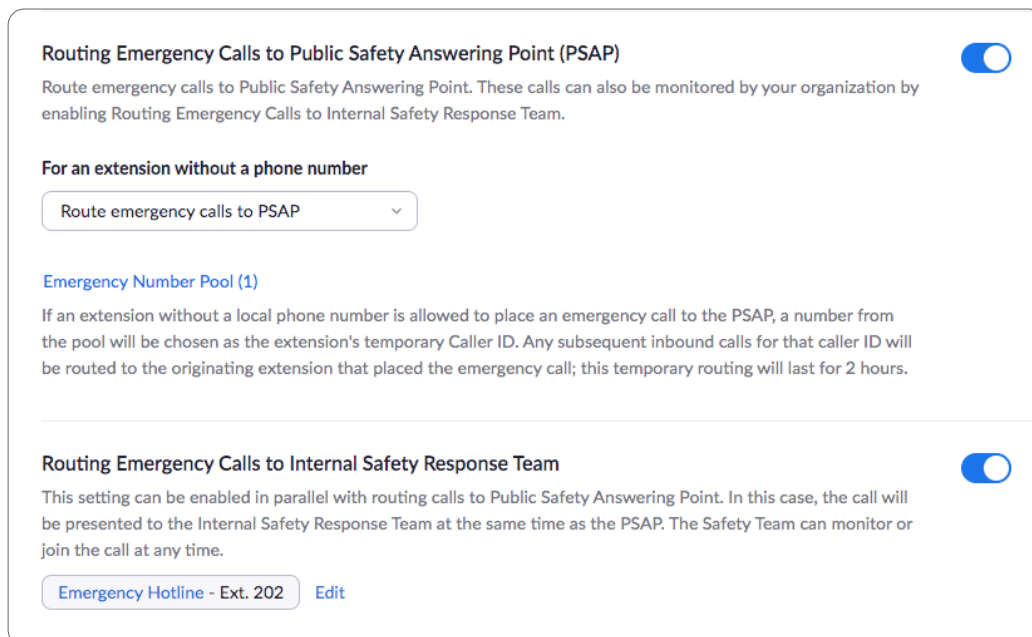
Throughout this document we are discussing emergency call handling for Zoom Phone endpoints. This is relevant to Zoom Phone desktop clients for Mac & Windows, iPad clients, IP Phones registered to the Zoom Phone service, and (eventually) VDI clients and (eventually) ZfH devices.

It is NOT relevant to Zoom Phone mobile clients for iOS and Android. Should an emergency call originate from the Zoom application on these devices, the Zoom application drops out of the way and lets the device's native cellular carrier handle the call. The Zoom application will send an emergency call notification email so that your safety team can know that a call was made by one of your folks, but otherwise Zoom does not participate in the emergency call at all.



#### 3.2 Emergency call routing -- PSAP and Safety Team

At the account level or site level when using multi-site, and at the individual extension level, you can decide whether emergency calls should route to Public Safety Answering Point(s), to your Internal Safety Response Team, to both at the same time, or to neither. The Internal Safety Response Team is a Zoom Phone call queue that can receive, record, monitor, and even participate in emergency calls that can be configured for each Zoom Phone site. If you are using an internal safety response team, best practice is to configure calls to route to public safety answering points AND to your internal safety team IN PARALLEL, as the law generally requires that you not impede or delay calls to public safety. In a production environment, emergency calls should always be enabled for routing to public safety, but we recognize that sometimes testing requirements or other special circumstances may necessitate alternative handling, so have provided flexibility.



### 3.3 Emergency Call Handling for Extension only users and phones

You must decide how users, rooms, and common area phones that do not have an assigned local phone number will be treated. These users can indeed be enabled to place emergency calls that are routed to public safety answering point(s). But when this is enabled, you must choose a mechanism for supplying an appropriate caller ID and enabling public safety to call-back.

#### 3.3.1 Emergency Number Pool

Best practice is to define an emergency number pool. The emergency number pool is composed of one or more phone numbers that need to be dedicated to this purpose. Should an extension-only user place an emergency call, that caller will be automatically assigned a number from the pool for use as outbound caller ID, and for the next ~2 hours, any inbound calls towards that phone number will be routed to the originating extension. The next person to place an emergency call grabs the next available number from the pool and so on; should the pool be exhausted (all numbers are simultaneously in use) the next emergency caller will re-use a number from the pool without negatively impacting a currently in-progress call, but the most recent caller to use a given number will become the call-back destination for that number.

Therefore you want to put a sufficient quantity of numbers into the pool; while the minimum technical quantity is 1 number, you need to consider “how many simultaneous 911 calls by extension-only users do you need to be able to fully support from a given site?” If you have less than a 100 extension-only users in the site, maybe only 1 or 2 pool numbers is enough. If you have many thousands of extension-only users in the site, you’ll want more.

The country code for numbers in the pool should match the country of the default emergency address of the site. It is generally best to ensure that a given Zoom Phone site is providing services for only one country. It is also best to never mix BYOC and Native numbers in the pool.

#### 3.3.2 Receptionist or Call Queue

An alternative approach is to utilize an auto-receptionist or call queue number for this outbound caller ID purpose. Call-backs to the number will reach the auto-receptionist or queue.

Customers should be quite careful about choosing this approach: if routing back to a receptionist or queue, that destination should be dedicated to this type of safety team purpose, not a general service that would be disrupted by emergency call-backs. The receptionist function would likely need to be maintained 24x7x365 by an internal safety team that is 100% cognizant of any emergency call; otherwise it’s generally best to enable callback routing to go to the originating extension.

#### 3.3.3 Caller Location

In either implementation strategy for caller ID and callback handling, we also need to think about the caller location (emergency address) information that can be communicated to public safety for these users. When using Zoom’s native calling plans & services for handling emergency calls in the US & Canada, the caller’s emergency address can be communicated independently from the outbound caller ID, so we don’t really need to worry too much about the ‘address of record’ for numbers in the pool in this case--instead, the individual caller’s configured or detected emergency address will be sent directly to the PSAP. So even remotely located, extension-only workers can leverage numbers in the pool--we just need to be sure that their emergency address as configured in Zoom is up to date (or a nomadic solution with detectable company or personal locations is in play, which we’ll discuss shortly.)

But elsewhere in the world and for BYOC numbers using BYOC carriers for emergency call handling, the public safety answering point (PSAP) relies upon the caller ID to determine the caller’s address: the PSAP effectively does a data lookup to determine the ‘address of public record’ associated with the received caller ID. So in these cases, we do care about the ‘address of record’ for numbers in the pool: it needs to make sense for the given originating caller, and the address can’t realistically be modified in real time. Usually a default site address is chosen for the address of record for numbers in the pool in these cases. It is further recommended that numbers in the pool be all of one type, e.g. they are all Zoom Native numbers, or all BYOC numbers--otherwise it gets particularly messy to maintain addresses of record. And in these situations, it generally is not feasible to accurately report address information for remotely located, extension-only workers: remote workers need a DID appropriate for their primary location.



### Routing Emergency Calls to Public Safety Answering Point (PSAP)

Route emergency calls to Public Safety Answering Point. These calls can also be monitored by your organization by enabling Routing Emergency Calls to Internal Safety Response Team.



#### For an extension without a phone number

Route emergency calls to PSAP

#### Emergency Number Pool (2)

If an extension without a local phone number is allowed to place an emergency call to the PSAP, a number from the pool will be chosen as the extension's temporary Caller ID. Any subsequent inbound calls for that caller ID will be routed to the originating extension that placed the emergency call; this temporary routing will last for 2 hours.

Also refer to: <https://support.zoom.us/hc/en-us/articles/360062110192-Routing-emergency-calls>

#### For an extension without a phone number

Route emergency calls to PSAP

#### Route emergency calls to PSAP

Calls will be presented to the PSAP at the same time as the internal safety response team if enabled Routing Emergency Calls to Internal Safety Response Team.

#### Don't route emergency calls to PSAP

Calls will be delivered to the internal safety response team if enabled Routing Emergency Calls to Internal Safety Response Team.

#### Emergency Number Pool

You need to check the site default emergency address that is used as the emergency address for the numbers in the pool:  
60 CRESCENT DR, PLEASANT HILL, California 94523, United States

Q Search

Assign Number

Remove

<input type="checkbox"/>	Number	Area	Number Type	Capability
<input type="checkbox"/>	(925) 217-0010	United States	Toll Number	Incoming & Outgoing
<input type="checkbox"/>	(925) 217-0111	United States	Toll Number	Incoming & Outgoing

Page Size

10

Total 2

Close

## 4. Deploying a Nomadic Emergency Services Solution

We can loosely define “nomadic” in this context to mean “the system detects where you are right now and automatically reports the correct location to public safety” should you place an emergency services call. More specifically, we can say that as Zoom Phone subscribers roam between predefined company and personal locations that are relevant to your user population, we detect the location they are in based on network connection data, and effectively report the emergency address associated with that location to public safety responders.

Deploying a nomadic emergency services solution includes these basic steps:

- Defining Company and Personal locations
- Enabling users and devices to report their network connection data
- Maintaining the deployment

Before we start, let's look in a bit more detail about how the solution works, as this will inform our thinking as we go along.

### 4.1 Nomadic Solution Overview

When a Zoom Phone client or IP phone makes an emergency call, it reports “my network data” to the Zoom Phone server. The server will then try to match that data to a pre-defined physical Company or Personal location. The Zoom Phone endpoints can report public and private IP addresses, and, when enabled, can report wireless access point MAC addresses (also called BSS\_ID) and network LAN switch data. When there's a match, we can report the established emergency address for the corresponding location to public safety and to internal safety response teams.

The address reporting part of this process is accomplished either by reporting the emergency address directly in call signaling--as is possible with Zoom Native services in the US/Canada, or by selecting and sending a caller ID (aka ELIN) that has been pre-established to align with the given location--as is required in the rest of the world and/or when utilizing BYOC carriers for handling emergencies.

Zoom's hierarchy for matching network data and reporting a corresponding location emergency address flows in this order:

1. Network switch MAC address & port data matches for company location
2. BSS\_ID matches for company or personal location
3. Public/Private IP address/subnet matches for company location. The service will look for a match amongst locations in my home site first.
4. Public IP address matches for company or personal location
5. If none of the above match, for a US/CA emergency call by a device that has GPS, report GPS coordinates which are then translated to an (approximate) physical address by our carrier.
6. If none of the above match and the device has no GPS capabilities, then:
  - For users in the US/Canada, Zoom will report the user's default emergency address if the user has selected, created, or confirmed an address. If the user has never done this (and is therefore still provisioned with some inherited site-level default address), the server will report the location as "Unknown". Reporting a location as unknown triggers a process with our carrier that will route the call to a nationwide emergency services clearinghouse service, which will verbally ascertain the caller's location before routing the call to the correct PSAP.
  - For common area phones in the US/Canada, Zoom will report the configured address of the device if it exists, otherwise will report the default site emergency address.
  - For users and phones outside the US/Canada, Zoom will report the originating caller ID to public safety/emergency services.

## 4.2 Emergency call routing -- Zoom Native or BYOC

At the account level or site level when using multi-site, if you are utilizing BYOC phone numbers in the US and Canada, you have the option to choose Zoom Native call handling for emergency calls when you enable Nomadic Emergency Services. With this option, your regular day to day calls will be routed via your BYOC carrier, but emergency calls will utilize Zoom's native service. There are no incremental charges or fees for BYOC customers that choose this option, and it is strongly recommended to do so. Zoom will soon remove this option and simplify the solution by requiring that all US/Canada 911 calls be routed by Zoom, regardless of whether nomadic emergency services are enabled or not.

**Target Carrier for routing emergency calls placed by BYOC numbers**

For Non-United States/Canada BYOC Numbers: BYOC Carrier

For United States and Canada BYOC Numbers:

The important underlying technical capability here is that when Zoom Native services are the carrier for emergency calls in the US & Canada, both the caller's "emergency address" and the caller's "caller ID" are communicated separately and independently in the emergency call signaling. The address portion is communicated via a protocol called PIDF-LO, and this works regardless of whether the caller ID included separately in the call represents a Zoom Native number or a BYOC number: either way, we're directly sending the configured or detected emergency address via PIDF-LO. But when a BYOC carrier is used for emergency calls, and for all Native and BYOC circumstances outside the US & Canada, we don't have the ability to include PIDF-LO signaling, and only the caller's "caller ID" can be included in the call signaling; this means that the receiving public safety answering point must do a database lookup in the public ANI/ALI database to determine the 'address of record' for that given caller ID.

The ability to directly communicate the caller's address in emergency call signaling independently of the caller ID has multiple practical benefits:

- When deploying nomadic emergency services, it removes the requirement to assign dedicated phone numbers (aka ELINs) to locations in the US & Canada. If you are a BYOC-enabled customer and do not select the option to use Zoom to route emergency calls for US & Canada BYOC numbers, you will be required to define ELINs for all of your US & Canada locations.
- It significantly simplifies address management for users in the US & Canada. You and your users can effectively define or update emergency addresses that are associated with a user, phone, or location in near real time via the capabilities built into Zoom clients and the Zoom administration portal--there is no need to update a public database.
- Zoom maintains public records for Zoom Native numbers, but Zoom doesn't (and can't) maintain public records for BYOC numbers--you have to manage that part with your carrier when using BYOC for emergency calls.

### 4.3 Defining Company Locations

Let's start by defining company locations. We need to begin by defining and/or aligning your Zoom Phone Sites into a location hierarchy. Within Zoom Phone, the concept of a Site is an important management construct: users and phones and phone numbers are assigned to sites, sites have dial plans and routing rules, and sites have configurable policies and settings--including how emergency services are managed. That said, we recommend that Zoom Phone Site(s) be primarily defined and organized by geography: if your user population is spread across multiple physical locations, we suggest that separate Zoom Phone sites be defined at the corresponding City or Campus level. If your population is spread across multiple countries, we strongly recommend separate sites for separate countries. For remote workers, it will usually be best to align them to the closest physical site if possible, and we'll deal with them more specifically in section 4.5 when we talk about Personal Locations.

Within a site, you must then define locations and sub locations for emergency calling. Often, first level locations in a Site are buildings, second level locations are floors, and 3rd level (if needed) can be wings or rooms or suites within a floor. A location needs two (or three) really important things:

- Dispatchable emergency address: Recalling regulatory requirements for RAY BAUM'S act as discussed previously, a location needs a "dispatchable" emergency address: it must be sufficiently detailed to provide street address, building number, floor, and when appropriate, a room/suite/wing within the floor must also be provided. **Generally this specificity can be captured via the Address Line 2, so each location or sub-location you create should have a sufficiently detailed and unique emergency address.** Note: Different states vary in the rules for how much physical space can be considered as part of one dispatchable location; for large buildings, you'll want to get this down to something less than many thousands of square feet! (Helpful link here: [https://www.west.com/legal-privacy/e911-regulations/?gclid=Cj0KCOjwI9GCBhDvARIsAFunhsk\\_d3wXhNr5FVOeRsUhOrGkWBm4-ousLomepy8K2F-ZI6WmcEm2gkaAtaWEALw\\_wcB#State\\_E911\\_Legislation](https://www.west.com/legal-privacy/e911-regulations/?gclid=Cj0KCOjwI9GCBhDvARIsAFunhsk_d3wXhNr5FVOeRsUhOrGkWBm4-ousLomepy8K2F-ZI6WmcEm2gkaAtaWEALw_wcB#State_E911_Legislation)) For locations inside the United States and Canada, the emergency address will effectively be inserted directly into the emergency call signaling when a Zoom Phone endpoint makes an emergency call from this location.

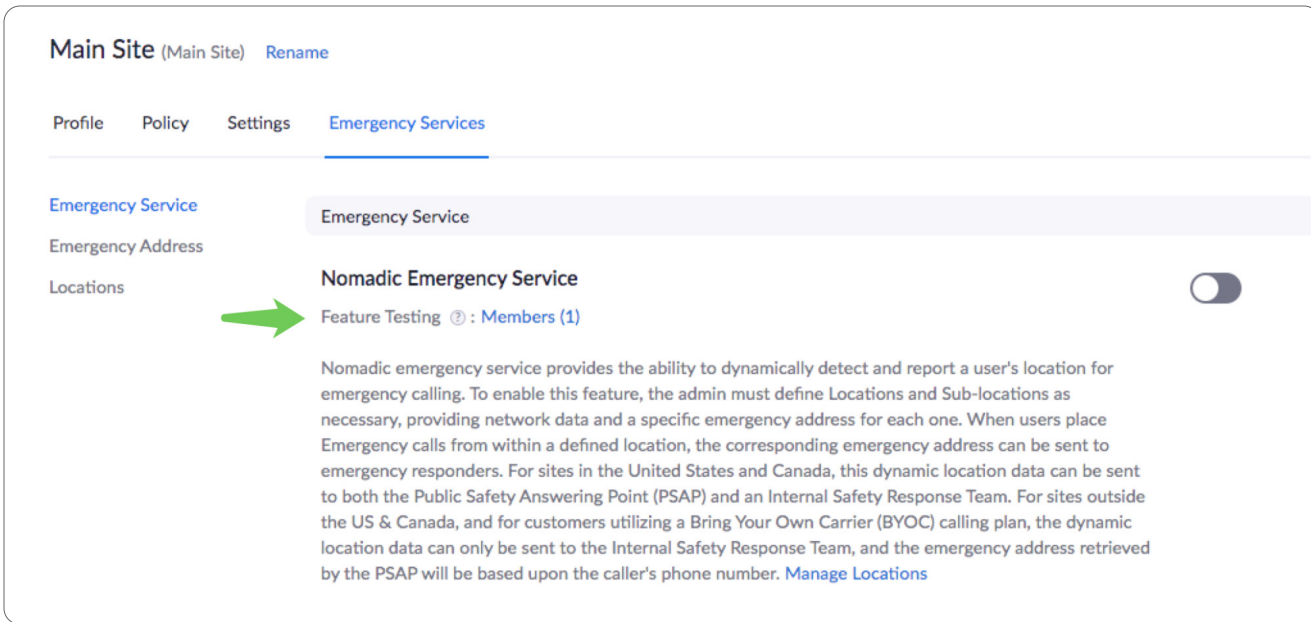
- ELIN: Not required in the US and Canada when Zoom Native services are used for handling emergency calls. But if the location is outside the United States & Canada and/or using a BYOC carrier for emergencies, it requires an ELIN. An ELIN (Emergency Location Identifying Number) is an industry name for a phone number that is configured to have a public address of record that matches the dispatchable emergency address of a specific location. When a Zoom Phone endpoint makes an emergency call from a defined and detected location that contains an ELIN, the endpoint will utilize the ELIN as its caller ID. When the call is received by a public safety answering point, a database lookup is performed by the PSAP to identify the address of record of the incoming caller ID, and thus establish the caller's Location. Should the PSAP need to call-back, inbound calls to the ELIN number can be routed to the originating Zoom Phone extension for at least 2 hours following an emergency call placed using the ELIN.
- Network data that is sufficiently unique to the location: When a Zoom client or IP phone makes an emergency call, it reports "my network data" to the Zoom Phone server. The Zoom Phone endpoints can report public and private IP addresses, when enabled can report wireless access point MAC addresses (also called BSS\_ID), and when enabled, can also report network switch MAC address, port number, and port label when endpoints are plugged into a network LAN port. (Refer to section 4.6 for more details about enabling Zoom clients to report this data.) So we need to define Company Locations by the possible values and/or ranges of network data that are specific to each location.
  - **Note:** While wireless access point MAC addresses (also called BSS\_ID) are unique values and thus are quite useful for identifying a specific location, IP addresses are not always quite so helpful--many customers have IP network address translations or subnets that are not sufficiently unique to distinguish a given building or floor of a building from another building or floor. In these cases we need to probe to the next level by examining the network infrastructure--if you know that phone clients or devices will be plugged into your LAN and you also know that wired IP subnets are not sufficiently unique to identify a location, we will need to look at the underlying network switches and correlate that network switch data to locations. This capability requires that LLDP protocol be allowed to run on your network; refer to section 4.6.2 for more details about enabling LLDP on your network.

It is generally best to start implementing the Zoom Nomadic e911 solution at one site, and to define your Company Locations in detail for this site. Start with buildings and floors, and consider your network topology. How are IP subnets organized? What granularity of wireless access point coverage do you have--what specific rooms or areas of the floor are covered? If needed, what network switches are relevant to this building and floor? We need to translate this network data into physical locations. You're probably going to want to build a spreadsheet like this one:

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	
1	zoomphone																	
2	Location Hierarchy				Network Topology				e911 Addresses									
3	Site Name	parent #	parent location name	location #	location display name	Wireless access point MAC addresses (BSS_ID) list	Public IP address	Private IP address: Wired & Wireless Subnets	LAN switch Identifiers:	Address Line 1	Address Line 2	City	State/Province/Territory	Country/Region	Postal Code	ELIN (required for locations outside US/CA)	VAT/NIF/CIF Number (needed for locations in Belgium, Netherlands, Portugal, Spain, Switzerland)	
4	San Jose	1	Headquarters Building 1	1.1	HQ Building 101 First Floor	12:34:56:78:9A:BC	25.125.25.12/25	175.26.25.0/23, 175.25.25.0/23, 10.11.0.0/21	MAC Address: "12-34-56-78-9A-BC", "Port Label": "ABC", "Port Range From": "x123", "Port Range To": "x456"	101 Main Street	First Floor	San Jose	CA	United States	95035	n/a		
5	San Jose	1	Headquarters Building 1	1.2	HQ Building 101 Second Floor					101 Main Street	Second Floor Suite 200	San Jose	CA	United States	95035	n/a		
6	San Jose	2	Headquarters Building 2	2.1	HQ Building 200 First Floor					200 Main Street	Suite 1000	San Jose	CA	United States	95035	n/a		
7	Atlanta	3	Atlanta	3.1	Atlanta Sales Office					123 Lincoln Way	1st floor suite 9	Atlanta	GA	United States	30305	n/a		
8																		

We suggest that you name your locations and sublocations in plain language and you must provide detailed emergency addresses with line 1 and line 2 for each location. Then define as much network data as you have for these locations: wireless access points MAC addresses (also called BSS\_ID), Public and Private IP subnets, & if you need it, network switch data.

The nomadic emergency services feature must be turned on in a given site before you can begin to manage the locations. We recommend that you enable the feature only for a small test team to start:



**Main Site** (Main Site) [Rename](#)

Profile Policy Settings **Emergency Services**

Emergency Service

Emergency Address

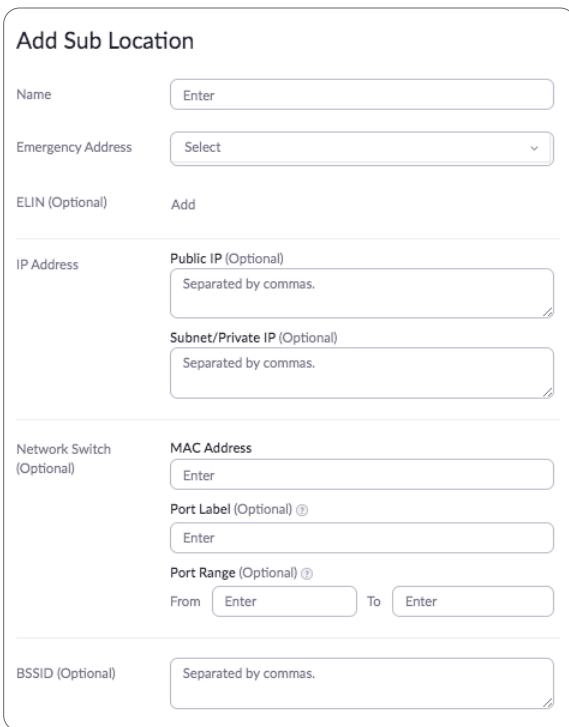
Locations

**Nomadic Emergency Service**

Feature Testing ⓘ : [Members \(1\)](#)

Nomadic emergency service provides the ability to dynamically detect and report a user's location for emergency calling. To enable this feature, the admin must define Locations and Sub-locations as necessary, providing network data and a specific emergency address for each one. When users place Emergency calls from within a defined location, the corresponding emergency address can be sent to emergency responders. For sites in the United States and Canada, this dynamic location data can be sent to both the Public Safety Answering Point (PSAP) and an Internal Safety Response Team. For sites outside the US & Canada, and for customers utilizing a Bring Your Own Carrier (BYOC) calling plan, the dynamic location data can only be sent to the Internal Safety Response Team, and the emergency address retrieved by the PSAP will be based upon the caller's phone number. [Manage Locations](#)

Locations can then be added to the Zoom portal in bulk via .csv file, or manually via the admin portal interface:



**Add Sub Location**

Name

Emergency Address

ELIN (Optional)

IP Address

Public IP (Optional)

Subnet/Private IP (Optional)

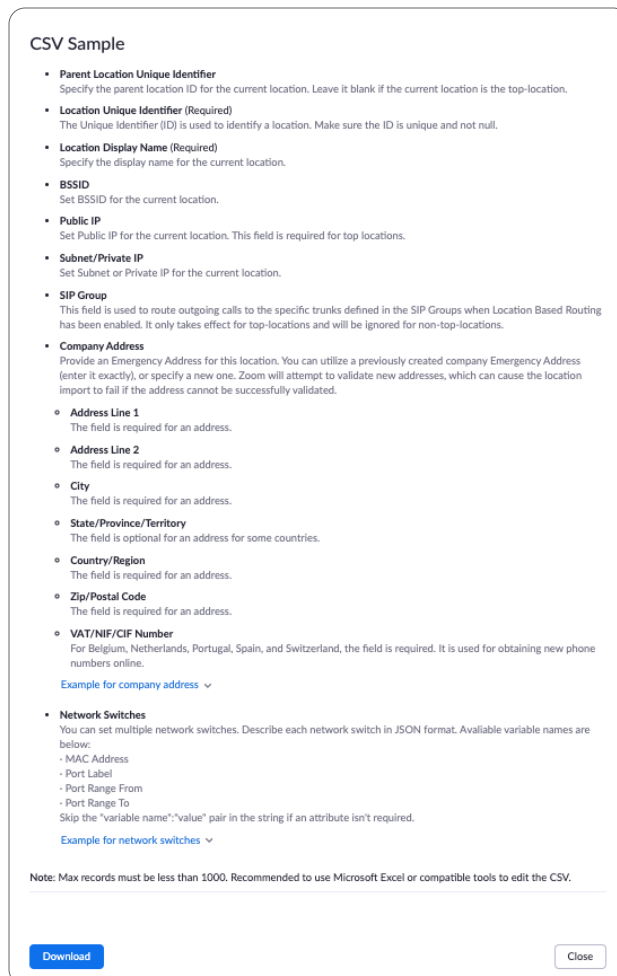
Network Switch (Optional)

MAC Address

Port Label (Optional) ⓘ

Port Range (Optional) ⓘ From  To

BSSID (Optional)



**CSV Sample**

- Parent Location Unique Identifier**  
Specify the parent location ID for the current location. Leave it blank if the current location is the top-location.
- Location Unique Identifier (Required)**  
The Unique Identifier (ID) is used to identify a location. Make sure the ID is unique and not null.
- Location Display Name (Required)**  
Specify the display name for the current location.
- BSSID**  
Set BSSID for the current location.
- Public IP**  
Set Public IP for the current location. This field is required for top locations.
- Subnet/Private IP**  
Set Subnet or Private IP for the current location.
- SIP Group**  
This field is used to route outgoing calls to the specific trunks defined in the SIP Groups when Location Based Routing has been enabled. It only takes effect for top-locations and will be ignored for non-top-locations.
- Company Address**  
Provide an Emergency Address for this location. You can utilize a previously created company Emergency Address (enter it exactly), or specify a new one. Zoom will attempt to validate new addresses, which can cause the location import to fail if the address cannot be successfully validated.
  - Address Line 1**  
The field is required for an address.
  - Address Line 2**  
The field is required for an address.
  - City**  
The field is required for an address.
  - State/Province/Territory**  
The field is optional for an address for some countries.
  - Country/Region**  
The field is required for an address.
  - Zip/Postal Code**  
The field is required for an address.
  - VAT/NIF/CIF Number**  
For Belgium, Netherlands, Portugal, Spain, and Switzerland, the field is required. It is used for obtaining new phone numbers online.  
[Example for company address](#) ▾
- Network Switches**  
You can set multiple network switches. Describe each network switch in JSON format. Available variable names are below:
  - MAC Address
  - Port Label
  - Port Range From
  - Port Range ToSkip the "variable name": "value" pair in the string if an attribute isn't required.  
[Example for network switches](#) ▾

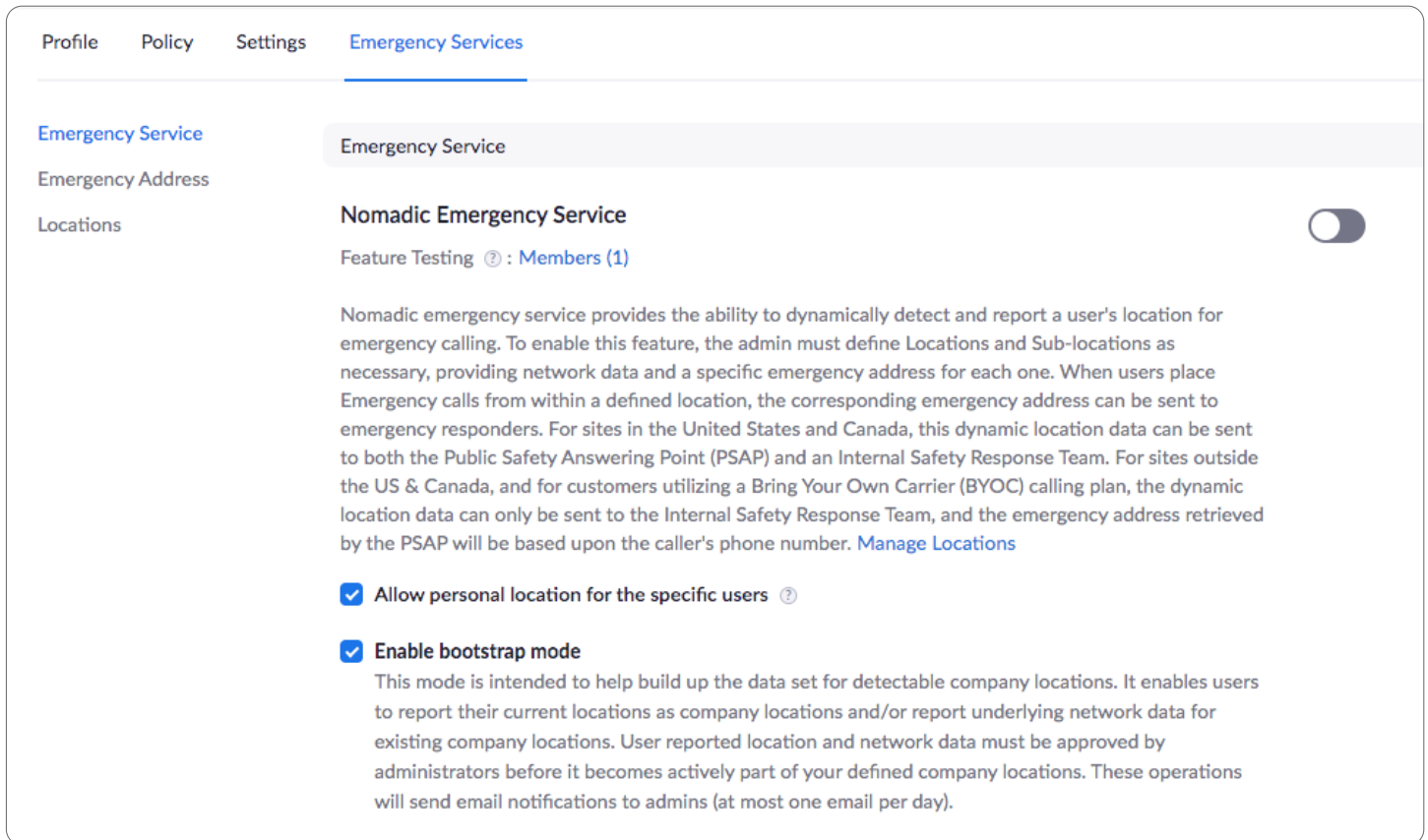
**Note:** Max records must be less than 1000. Recommended to use Microsoft Excel or compatible tools to edit the CSV.

[Download](#) [Close](#)



## 4.4 Bootstrap Mode

If you do not have complete network data for all your company locations, we have a tool that can help: Bootstrap Mode. To use it, you'll need to enable personal locations and Bootstrap Mode together for your test users:



The screenshot shows the 'Emergency Services' configuration page in the Zoom Admin Portal. The 'Nomadic Emergency Service' toggle is turned on. Below the toggle, there are two checked checkboxes:

- Allow personal location for the specific users** ?
- Enable bootstrap mode**  
This mode is intended to help build up the data set for detectable company locations. It enables users to report their current locations as company locations and/or report underlying network data for existing company locations. User reported location and network data must be approved by administrators before it becomes actively part of your defined company locations. These operations will send email notifications to admins (at most one email per day).

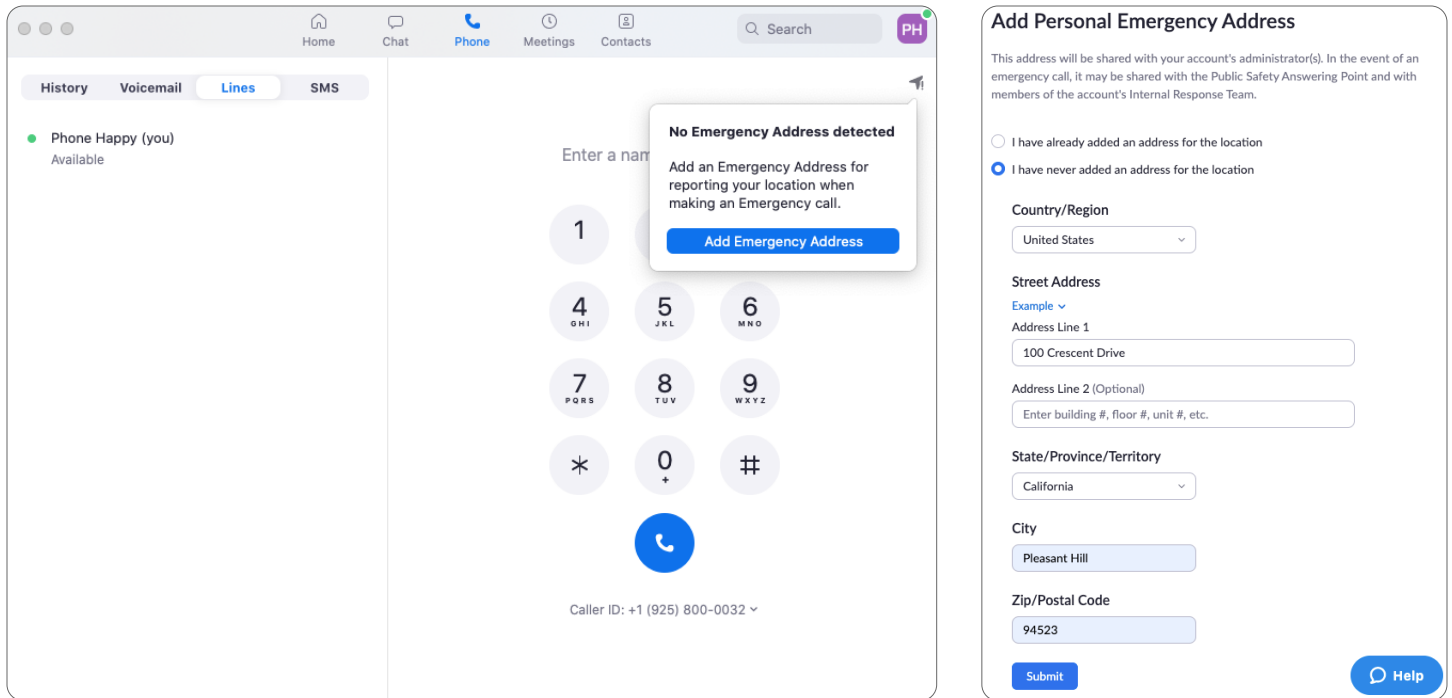
Bootstrap Mode provides a way for users to report locations and underlying network data to the administrator(s). When Bootstrap Mode and Personal Locations are enabled for your test users, each time their Zoom desktop or iPad client roams into an unknown location (i.e. each time it encounters network connection data that is not already associated with a defined location) the client will prompt the user to confirm or update their location. They can choose from an existing list of company locations (that may have no or only partial network data attached) or define a new company location. When users hit submit in this process, administrators will get an email alert indicating that new network data has been reported for a company location, and you can either approve or reject the data in the admin portal. There is also a setting to control who receives alerts when new data is reported in this process, it's called "Email Recipients for Emergency Services Data Maintenance" and you will find that setting under the Emergency Services Management for each site. Thus you can have your testers "walk the property" to confirm or effectively report network data for each company location, and your administration team can quickly update on the back end.

When you are first setting up your locations, it's probably wise to utilize Bootstrap Mode in combination with your 'feature testing' team. Later when company locations are very well defined, you can enable Bootstrap Mode as an ongoing test & data maintenance tool: if and when users report 'new' data for an existing company location via Bootstrap Mode, it probably means something has changed in your network and you'll need to make corresponding updates to your Zoom Phone locations.

## 4.5 Personal Locations

Personal Locations are a powerful tool designed to enable you to support a remote, mobile, or hybrid workforce where users may roam between company locations and external work areas such as home offices.

When Personal Locations are enabled, each time a user's Zoom Phone desktop or iPad client roams into an unknown location (i.e. each time it encounters network connection data that is not already associated with a defined location) the client will prompt the user to confirm or update their emergency address. They can choose from an existing personal location if they already have one, or define a new one. When defining a Personal Location the user will input a complete emergency address for the location, and the Zoom client will record the network data associated with this location (public IP address and BSS\_ID) so that it can be detected again later.



**Note:** We strongly recommend that personal locations be enabled for your users, especially if they are mobile and/or work remotely in the United States or Canada. If you have a hybrid environment where users are sometimes at home and sometimes in the office, you may want to wait to enable personal locations until you have your company locations very well defined so that users don't accidentally create duplicates of what will really become a company location.

**But please understand:** if Personal Locations are not enabled, the Zoom client will never prompt the user to update or confirm their emergency address when unknown network connection data is encountered, because there's very little they can really do about it.

As users create them, Personal Locations will appear as their own category of locations in your admin portal. You'll also be able to quickly see which users have or have not created a personal location on the location tracking dashboard--more on that later!

More important things to know about Personal Locations:

- **If users are in the United States or Canada and you're using Zoom as the carrier for emergency calling, green light and full speed ahead.** Users can create an effectively unlimited number of personal locations in pretty much real time. This is even true for users that are extension-only users. This works because the location information can be sent dynamically and independently from the caller ID in emergency call signaling.

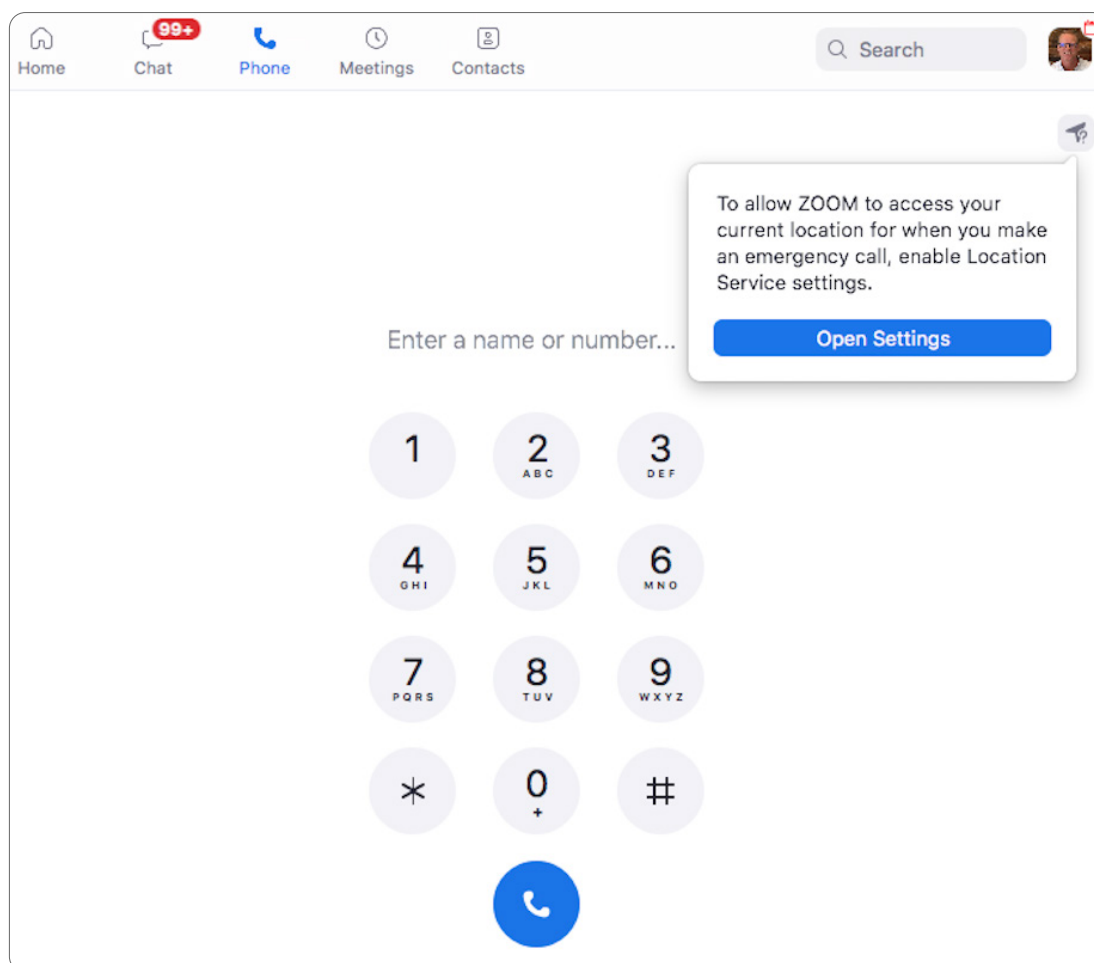
- **If users are outside the United States and Canada, yellow light and proceed with caution:** the number of personal locations a user can create should be limited to the number of DID(s) that are owned by that user, and there will be a delay before the location is fully functional. This is because the location information that can be sent to public safety is tied to the user's caller ID--the public safety answering point has to look-up the address of record for the incoming caller ID. In other words, we can think of a user's DID as the E911 for their personal location. Thus personal locations are not recommended at all for extension-only users outside the U.S. & Canada, because the phone number (caller ID) they communicate to public safety will come from the emergency number pool and the address of record for numbers in the pool will usually be your site default address. For users that do have one or more assigned DID(s), they can create a personal location for each DID--but behind the scenes, the address of record for the user's phone number will need to be updated to match the location and this takes time: for Zoom Native phone numbers, Zoom will conduct this address change/update process on your behalf; in some countries this is a manual process in which our service team works with local carriers to complete the updates. For Zoom BYOC phone numbers, it is your responsibility to work with your carrier(s) to complete the address change/update process.

## 4.6 Enabling Users and Devices to Report Network Data

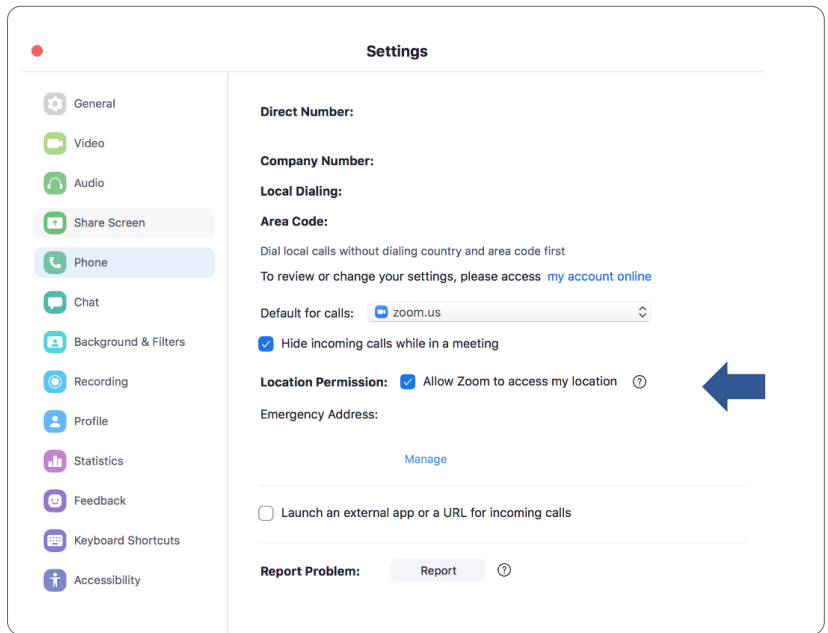
In order for our nomadic solution to function, we need Zoom clients to be able to successfully detect and report location data.

### 4.6.1 Location Sharing with Zoom Application

In order for Zoom clients to report their network data (IP addresses and BSS ID) for these purposes, location sharing with the Zoom application must be enabled at the operating system level for Mac, iPad, and Windows based clients. When the nomadic emergency services feature is enabled, Zoom clients will ask the users to enable location sharing with Zoom via an in-client pop-up:



This location sharing status is also manageable and shown in the client settings for Phone:



And you'll be able to track on the Zoom Phone dashboard which users have completed the process.

However, for Mac and iPad devices, Apple security requirements permit only a local user with administrative privileges to the device to enable location sharing with the Zoom application. We are not yet aware of any reliable means to remotely control this security setting for Apple users. So if your Mac users don't have admin privileges to their machines, you're going to have to enable location sharing with Zoom for them via a manual process. Sorry--but there is some hope: one of our more adventurous customers has shared the solution below that they were able to make work in their environment; Zoom can't guarantee it will work elsewhere at this point, so this is a 'give it your best shot' option:

Activating location services for zoom.us/other apps on mac using MDM.

1. Location Services need to be enabled. These commands can be placed at the beginning of the script that modifies the clients.plist. Have not tested on macOS BigSur.

```
sudo /usr/bin/defaults write /var/db/locationd/Library/Preferences/ByHost/com.apple.locationd LocationServicesEnabled -int 1
```

```
sudo -u _locationd /usr/bin/defaults -currentHost write com.apple.locationd LocationServicesEnabled -int 1
```
2. Configure settings desired for Apps in System Preferences>Security & Privacy>Privacy>Location Services. This will be the template moving forward and allow additions to the clients.plist xml.A screenshot of the macOS Security & Privacy settings window. The 'Privacy' tab is selected, and 'Location Services' is highlighted in the left sidebar. The main pane shows a list of applications with checkboxes for location services. The 'System Services' section is expanded, showing 'Location Services' as enabled. A warning message at the bottom states: 'Install on app that has used your location within the last 24 hours.' A 'Show Location Services & Privacy' button is at the bottom right.
3. Extract the /var/db/locationd/clients.plist and move to working directory (ex. ~/Desktop)

```
sudo cp /var/db/locationd/clients.plist /path to working directory
```

```
sudo plutil -convert xml1 /path to extracted clients.plist
```
4. Setup the bash script: Copy the contents of the extracted clients.plist xml and have bash script create new clients.plist and save to /var/tmp.
5. Change the permissions and owner of the file and move it to the correct folder.

## 4.6.2 Detecting and Reporting Network Switch Data

If your deployment needs to enable detecting and reporting network switch data, we potentially have work to do for Zoom clients and also for your network. Zoom clients leverage Link Layer Discovery Protocol (LLDP) to determine the network topology in a corporate network based on switch ports, so we have to enable the clients to detect LLDP and we have to enable your network to report LLDP.

Let's start with the clients: While supported IP phones and Windows-based Zoom Phone desktop clients can detect and report network switch data as long as they have the minimum version of firmware or Zoom client installed, reporting network switch data is a heavier lift for Mac OS based clients. For these clients, you'll need to enable an option in the admin portal, and carry out the task of downloading/installing a helper application.

**Enable network switch detection for Mac clients**

In order for Mac clients to detect a network change event when connected to your wired network, your organization will need to deploy the Location Helper supplementary package. The Location Helper allows Mac clients to report the network switch's MAC address, port number, and port label which enables Zoom to detect user location for emergency services. This installation requires local administrator privileges. [Download the Location Helper](#)

Select the option that matches your company policies

Users are prompted to download and install the package

If your users have administrative privileges to their machines, you can choose the option that will prompt users to download and install the option for themselves. If users do not have such privileges, you'll have to distribute the helper application to them.

**Note:** Reporting network switch data is supported for Zoom Phone on Windows clients, Mac clients, and Poly and Yealink IP Phones.

Now let's look at the network side. When making an emergency call, Zoom clients retrieve the **MAC address** of the switch from the "Chassis ID" type-length-value (TLV) and the **switch port number** or **interface ID** from the "PortID" type-length-value (TLV). This information is extracted from the LLDP data unit (LLDPDU) that is sent by the switch to the Zoom client that is plugged into the switch. During an emergency call, these parameters are sent to Zoom servers to be mapped to the emergency location that is configured by the administrator or discovered as part of Bootstrap Mode.

Preamble	Dest. MAC	Source MAC	Ethertype	Chassis ID TLV	PortID TLV	Time to live TLV	Optional TLVs	End of LLDPDU TLV	Frame check sequence
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To ensure a successful deployment of Nomadic emergency services with switchport based tracking, administrators are required to enable LLDP on the switch ports where Zoom clients will be connected.

- The network switch must be configured to "send" LLDP information towards the Zoom clients. Zoom clients do not send LLDP packets towards the network switch.
- LLDP configuration should include transmitting the mandatory TLVs, which are required by Zoom clients to track the location of the client



- Certain switch vendors may require LLDP-MED to be enabled on the switch ports to allow the mandatory TLVs required to be sent in the LLDPDU. It is recommended to refer to the vendor documentation for the configuration steps.
- LLDP timers should be set to a value that would allow Zoom clients to detect any network changes. A value of 30 seconds is recommended.

## 4.7 Ongoing Management

So here we are:

1. First we set up a static solution. We defined default addresses for company assets like common area phones, and we badgered (encouraged!) our user base to define their own personal emergency address.
2. Next we enabled nomadic services for a 'feature test' team. We collected our network data and defined company locations. And where relevant, our test team has "walked the property" to test and validate those locations with Bootstrap Mode enabled.
3. Next we enabled our broader population of user clients to detect and report their locations. As necessary, we've encouraged users to enable location sharing with the Zoom application (or did it for them.) If relevant we've also nagged the Mac users to download the location helper application for network switch detection (or did it for them.)
4. And where it makes sense, we've enabled them to create personal locations, and encouraged them to define a personal emergency address and location.

Now we need to measure and track our success. For which users and sites have we enabled nomadic emergency services? Who has set a default personal address vs. who is still sitting on the site default? Who has or has not successfully enabled location sharing with the Zoom application? Who has created a detectable personal location? Who is in a 'known/detected' location right now? The Zoom Phone location dashboard is designed to help us answer all these questions--for each question, we can drill in and see who's in, and who's not.

