Quick answers to common problems

Elastix Unified Communications Server Cookbook

More than 140 real-life, hands-on recipes and tips to install, deploy, administer, and maintain any VoIP/Unified Communications solution based on Elastix

Gerardo Barajas Puente

[PACKT] PUBLISHING open source* community experience distilled

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About the Reviewers

Elvin E. Casem has provided creative, innovative, and state-of-the-art web solutions and IT services. He works as an IT consultant and university instructor at Don Mariano Marcos Memorial State University. He is the CEO of Evenly Ten Web Solutions, with extensive experience in computer applications and programming management, IT systems and infrastructure, cloud computing, web development, resource management, and customer relationship management. Elvin has worked with various information and communication technology companies, such as the IT Group, Inc. and Click Dolphin LLP. He also implements Google Apps for Education for universities and campuses in Region I, the Philippines. Elvin's clients over the last 8 years include The Asset Quest LLP, Eton Properties, Pilipinas Shell, MeadJohnson Philippines, ABS-CBN Investor Relations, and Stores Specialist, among others. He has made many presentations for students and professionals.

I would like to thank God for giving me the strength and knowledge to complete this book review, my family for always supporting me, Christianne Lynnette for being an inspiration and always believing in me, and Packt Publishing for trusting me to be in this reviewing team. Thank you so much!

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Bernard L. Samontanes has 18 years of experience in the ICT industry and has taken up multiple roles from Manila to Riyadh. He possesses a mixed skill set that spans technical support, software engineering, and systems and network administration, security, and infrastructure management. He started programming using Turbo Pascal and then used Turbo C/C++. He has been interested in database application development using FoxPro, Visual Dbase, and Visual Basic. At present, Bernard enjoys coding using C#, MySQL, and PHP for his software development projects, which are mainly in POS, unified messaging solutions (e-mail, IVR, SMS, MMS, and GPRS), and Asterisk integrations.

Bernard is currently employed as the infrastructure manager (POS) for Int'ltec SkyBand, where he oversees network and software development for POS projects. He has also implemented Elastix for POS call center operations and is planning to roll out a full Asterisk-based automated attendant and IVR for the entire company.

I would like to thank my wife, Amelia, who provides support and never-ending understanding during my hectic schedule reviewing this book. To my daughter, Anna, and son, Aizek, who keep me enlighten whenever they need my attention for their school activities.

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Table of Contents

Preface

The main objective of this book is to give you all the necessary tools to configure and support an Elastix Unified Communications Server. We will look at these tools through Cookbook recipes, just follow the steps to get an Elastix System up and running.

Although a good Linux and Asterisk background is required, this book is structured to help you grow from a beginner to an advanced user.

We would like to consider this book as introductory documentation for the journey to becoming a guru in the field of unified communications.

Introduction to the Elastix Unified Communications Server

There is a revolution going on in the field of telecommunication these days. The world is getting smaller, the bandwidth is growing, and the protocols are becoming increasingly standardized, open, and stable.

In 1999, Mark Spencer began a very important project, Asterisk PBX. The advantages of open source licensing allowed this project to grow and develop features that were unachievable with traditional telephony devices at very competitive prices.

Nowadays, enterprises are not just looking for telephone solutions (PBX) anymore. They are looking for integral, complete, and "out-of-the box" solutions that allow them be as productive as possible. They want to keep their coworkers connected, reachable, and available at all times. If a CTO calls any coworker and the call cannot be answered because the person is at the lobby receiving a customer, it will be routed to that coworker's cell phone, which happens to have a SIP client registered to the PBX using the wireless LAN of the building.

The cost of such a call is almost 0 USD, and even if that coworker does not answer their cell phone, the call can be sent to a voicemail. The voicemail system can send the voice message as an e-mail, and when this person arrives in the office, the message waiting indicator LED on their phone tells them that they have a voice message.

What this book covers

Chapter 1, *Installing Elastix*, covers basic recipes for installing Elastix.

Chapter 2, *Basic PBX Configuration*, demonstrates the processes for creating extensions, configuring telephony cards, setting an IVR, and controlling incoming and outgoing calls in a simple way.

Chapter 3, *Understanding Inbound Call Control*, explains how to get deeper into the IP-PBX features to give the installed solution.

Chapter 4, *Knowing Internal PBX Options and Configurations*, contains recipes used to configure the language of the recordings (or phrases) the Elastix Unified Communications Server displays, create conference bridges, restrict calls, add miscellaneous destinations and applications, and so on.

Chapter 5, *Setting up the E-mail Service*, assists you to set up the Elastix Unified Communications Server as an e-mail server.

Chapter 6, *Elastix Fax System*, explains that although the use of faxes is decreasing, there are situations (especially in communication with banks or government offices) in which it is necessary to send and receive faxes. This chapter is dedicated to this feature.

Chapter 7, *Using the Call Center Module*, shows one of Palo Santo's best contributions to the world of open source telephony, which is an open source call center module. In this chapter, you will be guided through the process of installing and configuring this feature.

Chapter 8, *Going Deeper into Unified Communications*, tells you how you can learn more about Unified Communications. This chapter includes recipes for configuring instant messaging, integration with a CRM and Outlook, video calls, and so on.

Chapter 9, *Networking with Elastix*, proves that one of Elastix's strengths is connecting remote sites and extensions by integrating the dialplan.

Chapter 10, *Knowing the State of Your Elastix System and Troubleshooting*, tells us when debugging and troubleshooting any situation in our system is necessary. The topics of billing and reporting are also discussed.

Chapter 11, *Securing Your Elastix System*, shows us that any IP device the Elastix Unified Communications Server can be targeted to be attacked in many ways, from denial-of-service attacks to telephone frauds, and when creating a backup of our solution, this chapter is helpful.

Chapter 12, *Implementing Advanced Dialplan Functions*, shows advanced features that are not included by default in our Elastix system and are very attractive to some enterprise levels, such as an IVR that retrieves information from a database.

Finally, we will discuss some important topics in the appendices, as follows:

Appendix A, *Description and Use of the Most Well-known Free-PBX Modules*, tells us about the contributions of third-party modules to the FreePBX community.

Appendix B, *Addon Market Module*, covers more of the programs certified by Palo Santo Solutions.

Appendix C, *Asterisk Essential Commands*, shows the most used commands available in Asterisk's command-line interface.

Appendix D, *Asterisk Gateway Interface Programming*, gives more in-depth information on the commands and information passed between Asterisk and any AGI.

Appendix E, *Helpful Linux Commands*, lists the most used Linux Commands for managing an Elastix Unified Communications system.

What you need for this book

To take full advantage of Elastix's features, it is desirable to have some knowledge of Linux, networking, and Asterisk. It is also important to know certain concepts of telephony, and be able to edit configuration files.

Who this book is for

This book is intended for those who would like to start learning the configuration steps to have a fully operational Elastix Unified Communication system. If you are a beginner in the VoIP industry, this book is ideal for you. If you are an intermediate or advanced Elastix user, this book is intended to motivate you to explore new boundaries in the world of VoIP.

Sections

In this book, you will find several headings that appear frequently (Getting ready, How to do it, How it works, There's more, and See also).

To give clear instructions on how to complete a recipe, we use these sections:

Getting ready

This section tells you what to expect in the recipe, and describes how to set up any software or any preliminary settings required for the recipe.

How to do it...

This section contains the steps required to follow the recipe.

How it works...

This section usually consists of a detailed explanation of what happened in the previous section.

There's more...

This section consists of additional information about the recipe in order to make you more knowledgeable about the recipe.

See also

This section provides helpful links to other useful information for the recipe.

Conventions

In this book, you will find a number of text styles that distinguish between different kinds of information. Here are some examples of these styles and an explanation of their meaning.

Code words in text, database table names, folder names, filenames, file extensions, pathnames, dummy URLs, user input, and Twitter handles are shown as follows: "We can include other contexts through the use of the `include` directive."

A block of code is set as follows:

```
nat=yes
externip=<your fixed external IP> or
externhost=<mydomain.com>
localnet=192.168.1.0/255.255.255.0
externrefresh=10
```

New terms and **important words** are shown in bold. Words that you see on the screen, for example, in menus or dialog boxes, appear in the text like this: "Click on the **Set to configure the device** button."

Warnings or important notes appear in a box like this.

Tips and tricks appear like this.

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1
Installing Elastix

The topics covered in this chapter are:

- Installing Elastix Unified Communications Server software
- Inserting the CD-ROM in the desired server or host
- Choosing the system language
- Choosing the keyboard type
- Partitioning the hard disk
- Configuring the network interfaces
- Selecting a proper time zone
- Entering the password for the user root
- Logging into the system for the first time

Introduction to Elastix Unified Communications System

There is a revolution going on in the telecommunications field these days. The world is getting smaller, bandwidth is growing, and protocols are getting increasingly standardised, open, and stable.

It was in 1999 when Mark Spencer began a very important project: **Asterisk PBX**. The advantages of open source licensing allowed this project to develop features unachievable using traditional telephony devices, at very competitive prices.

Nowadays, enterprises are not merely looking for telephonic solutions (PBX) anymore; they are looking for integrated, complete, and *out-of-the box* solutions that allow them be as productive as possible. They want to keep their co-workers connected, reachable, and available at all times. If a CTO calls any coworker and the call is not answered, because the person was at the lobby receiving a customer, it will be routed to this coworker's cellular phone, which happens to have a **Session Initiation Protocol** (**SIP**) client registered to the PBX using the wireless LAN of the building.

The cost of this call is almost $0. However, if this coworker does not answer his cell phone, this call can be forwarded to a voicemail. The **Voicemail System** can send the voice message to an e-mail and when this person arrives at the office, he will have the "message waiting" indicator LED on his phone notifying him that he has a voice message.

Elastix's brief history

We all know that Asterisk runs on Linux and has gained so much attention that it has made system administrators, integrators, developers, and tech-savvy individuals see a big opportunity in business, but sometimes their knowledge of Linux is limited. This has led to projects such as **FreePBX**, **Trixbox**, **AsteriskNOW**, **Elastix**, and **PBX in a Flash** that fulfill the need to configure and administer Asterisk PBX without being a Linux expert.

However, Edgar and José Landívar of Palosanto Solutions went far beyond this. In March 2006, they released the first version of **Elastix**. This first version was only a visual reporting tool, and by December 2006, Elastix was officially released as a Unified Communications suite using Linux CentOS as the operating system.

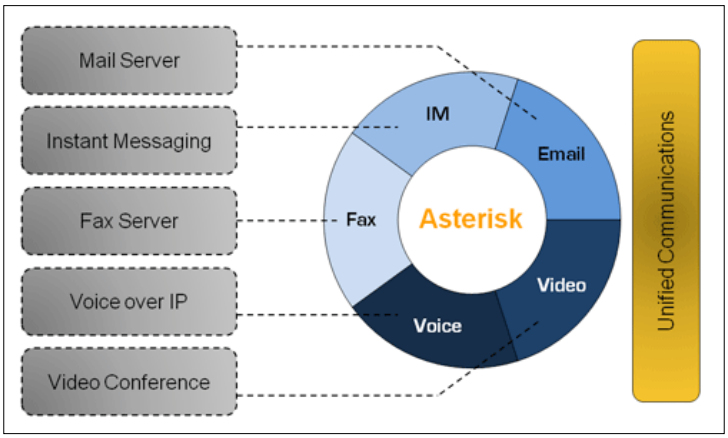
The project began to gain attention because all the communications software was completely integrated and available with the PBX engine. There was no need to recompile the fax system, for example. You just had to configure it. There was no need to recompile the drivers for a **public switched telephone network** (**PSTN**) card. You only had to install it physically on your server (or PC), Web-GUI would detect the card, and you would be able to configure it as well.

In many Latin American countries, digital E1 telephony lines use a very old and limited protocol called **Multi-Frequency Compelled R2** (MFC/R2 or just R2). In order to make this kind of telephony lines and cards support MFC/R2 for Asterisk, there is a module from an abstraction layer called **Unicall** (by Steve Underwood) that must be downloaded and compiled; after this patch, Asterisk has to be recompiled. This situation was very stressful for many aficionados. However, thanks to Palosanto Solution's view, since the first release of Elastix, this library has been compiled and installed. Users just needed to configure all the parameters to have their R2 E1 lines work with Asterisk.

Later, with the help of Moisés Silva (the creator of the Openr2:MFC/R2 signaling library), the support for MFC/R2 protocol was much easier. Providing support for the Spanish language gave Elastix a big advantage over other open source telephony distributions. This innovative "vision" has made this project very important these days in the open source telephony solutions community. Today, Palosanto Solutions have achieved a long list of awards and more than one million downloads.

What is Elastix?

Elastix is an **open source unified communications platform** that uses Community Enterprise Operating System Linux(**CentOS**) as the operating system. The best way to describe Elastix is with the following diagram:



As you can see, the elements involved in Elastix's architecture allow any user or enterprise to use the PBX as a gateway to the PSTN, and incorporate many other tools, programs, and elements to communicate in a more efficient way.

For example, users can receive a fax in their e-mail account, or they can have remote extensions in order to integrate all office branches and use them as a single entity to reduce call costs.

Users can also start video calls and video conferences by using their own devices such as cell phones and tablets.

Features list

Elastix's main features can be grouped in general as IP-PBX, fax, e-mail, collaboration, and messaging features. The following sections list these features, among others.

General features

The following table lists Elastix's general features:

General Features	
Online embedded help	Centralized updates management
Voicemail	Web interface configuration
System resources monitor	Backup/restore support via web
Network configuration tool	Support for Skinny/ **Media Gateway Control Protocol** (**MGCP**) protocols
Server shutdown from the web GUI	Configurable server date, time, and time zone
Access control to the interface based on **Access control lists** (**ACL**)	Port knocking
Backs up on an FTP server	Elastix's marketplace
Heartbeat module	New dashboard
Elastix modules and RPMs	Elastix news applet
DHCP client list module	Hardware detector enhanced
Automatic backup restore	Telephony hardware information
Backup restore validation	Communication activity applet
DHCP assigned by MAC	Process status applet

IP-PBX main features

The following table lists Elastix's telephony features:

Telephony Features	
Call recording	Conference center with virtual rooms
Voicemail	SIP and **Inter-Asterisk eXchange** (**IAX**) codecs support, among others
Voicemail-to-e-mail functionality	Supported codecs: **Adaptive differential pulse-code modulation** (**ADPCM**), G.711 (A-Law & μ-Law), G.722, G.723.1 (pass through), G.726, G.728, G.729, GSM, and iLBC (optional) among others.

Telephony Features	
Flexible and configurable **Interactive voice response** (**IVR**)	Support for analog interfaces as **Foreign eXchange Subscriber** (**FXS**) / **Foreign eXchange Office** (**FXO**), (PSTN/POTS)
Voice synthesis support	Support for digital interfaces (E1/T1/J1) through PRI/BRI/R2 protocols
IP terminal batch configuration tool	Caller ID
Integrated echo canceler by software	Multiple trunk support
Endpoint configurator	Incoming and outgoing routes with support for dial pattern matching
Support for videophones	Support for follow-me
Hardware detection interface	Support for ring groups
DHCP server for dynamic IP	Support for paging and intercom
Web-based operator panel	Support for time conditions
Call parking	Support for PIN sets
Call detail record (**CDR**) report	Direct Inward System Access (DISA)
Billing and consumption report	Callback support
Channel usage reports	Support for Bluetooth interfaces through cellphones (chan_mobile)
Support for call queues	**Elastix Operator Panel** (**EOP**)
Distributed dialplan with Dundi	VoIP provider configuration
Support for softphones	Virtual conference rooms
PBX interconnection	Least cost routing

Fax features

The following table lists all the features related to fax:

Fax server based on HylaFAX	Fax-to-e-mail customization
Fax visor with downloaded PDFs	Access control for fax clients
Fax-to-e-mail application	Can be integrated with Winprint HylaFAX
SendFax module - fax sent through web interface	

Collaboration features

The following table lists the collaboration-related features:

PBX-integrated calendar with support for voice notifications	Web conference
Phonebook with click-to-dial capabilities	Calendar module
Integrated **Customer relationship management** (**CRM**) to VTiger CRM	Billing support with A2Billing
Extension roaming	

Instant messaging

The following table lists all the features related to instant messaging:

Openfire instant messaging server	User session reports
IM client-initiated calls	Jabber support
Web-based management for IM server	Plugin support
IM group support	**Lightweight Directory Access Protocol** (**LDAP**) support
Support for other IM gateways like MSN, Yahoo Messenger, GTalk, and ICQ	Server-to-server support

E-mail

The following points list all the e-mail related features:

- Mail server with multi-domain support
- Web-based management
- Support for mail relay
- Web-based email client
- Support for quotas
- Anti-spam support
- Based in Postfix for high email volume

Installing Elastix Unified Communications Server software

Elastix Unified Communications Server's operating system is CentOS Linux. To install it, we need a PC or server and a bootable CD-ROM with Elastix Unified Communications System. The most common installation process is via CD-ROM. However, it is possible to install Elastix by using a USB device or virtualization software. For the purposes of this book, we will be working with Elastix Stable Release 2.5.0, which can be downloaded from `www.elastix.org`.

Depending on the hardware specifications, we have to choose between a 32-bit and a 64-bit distribution. Considering that 32-bit operating systems cannot work with more than 4 GB RAM computers, it is always desirable to work with 64-bit operating systems in order to have a more stable and reliable system.

The minimum system requirements for a small office with 12 analog lines (or trunks) and perhaps 12 extensions are as follows:

- CPU Speed: 1 GHz
- RAM: 1 GB RAM
- Hard Disk: At least 80 GB

It is very important to create a very good design for any Unified Communications System from the beginning. It does not matter how many features your system may have (which involves the PBX part) or how amazing it is, if the voice quality is poor, the chances of replacing your system with another solution are very high.

The main elements to cover when designing a VoIP solution are as follows:

- Resources of the hardware on which the Elastix Unified Communications System will be installed
- Quality of service in the LAN/VLAN
- Number of simultaneous (or concurrent) calls expected
- Number and type of external lines and internal endpoints
- Transcoding, recording calls, conferencing, and queues, as they demand more resources than a regular two-way call
- Additional services such as an e-mail service and a DHCP service

Before installing Elastix Unified Communications Server, it is necessary to check whether the PC or the server has CD-ROM booting capabilities. If this booting option is not available, please try using a USB device or an external CD-ROM device.

In order to check the booting capabilities of a PC/server, we must access its **BIOS** (which stands for **Basic Input Output System** (**BIOS**) and follow its menu either to check it or enable it. This is usually done by pressing the *Delete*, *F1*, *F2*, or *Esc* key.

Inserting the CD and booting

After downloading the Elastix Unified Communications Server software, the file will be saved as an ISO image. It is mandatory to "burn" this image to a CD by using burning software and selecting the **BURN ISO IMAGE** or **BURN ISO** or **BURN IMAGE** option.

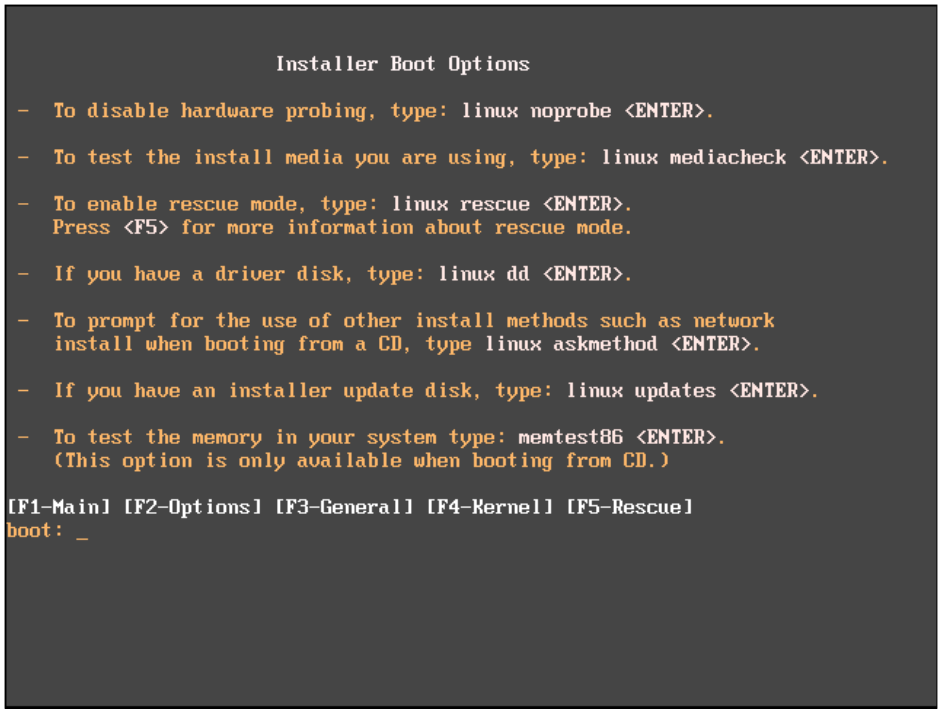
How to do it...

1. Turn on the destination device (PC or Server).
2. Place the CD into the CD tray immediately after turning on the PC/server. If all goes well, we will see the following screen:

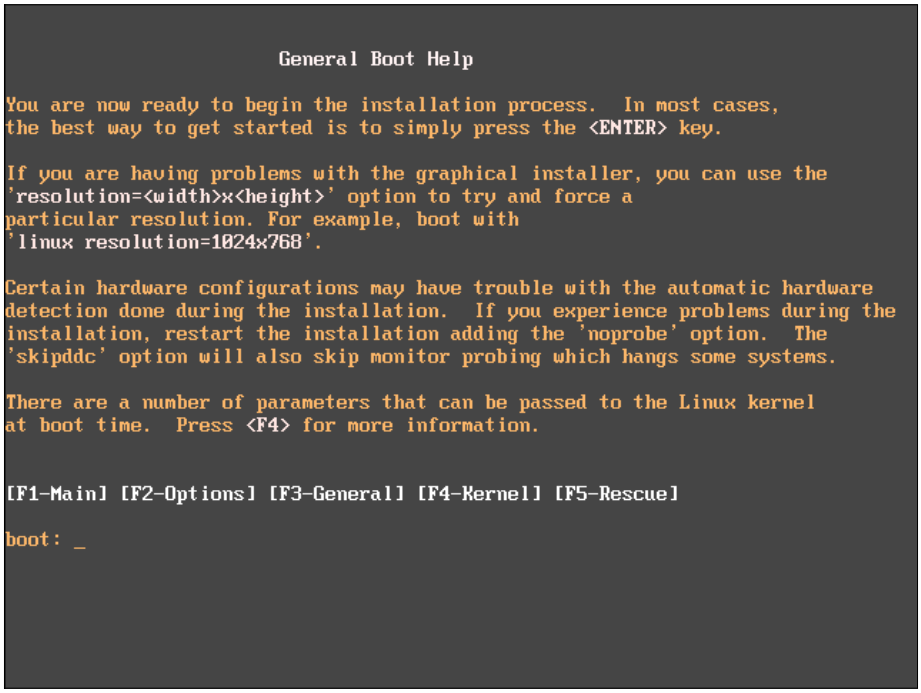
3. Press the *Enter* key at the boot prompt to start the installation process.

There is more...

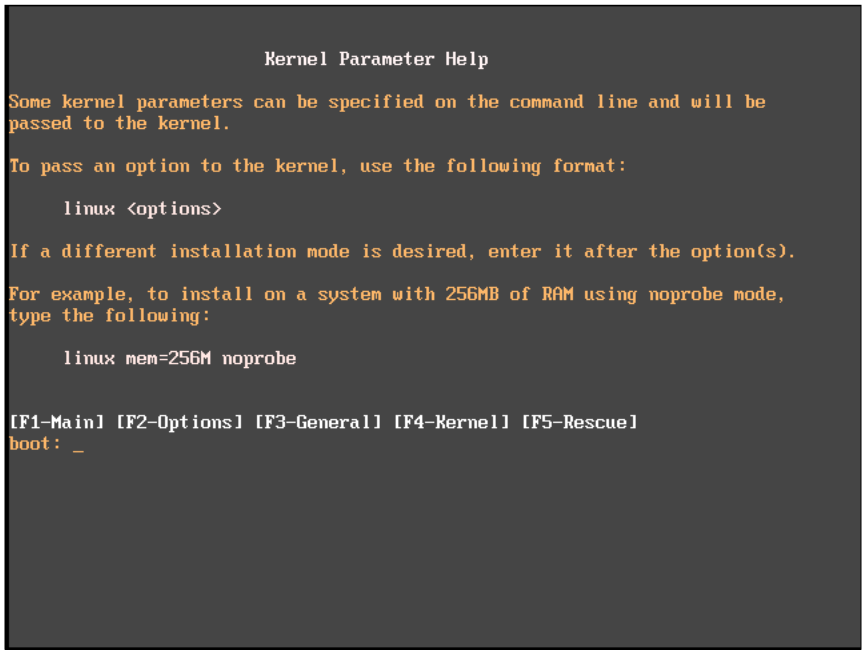
We can wait for 15 seconds or simply press the *Enter* key, and the installation process will start automatically. However, we will describe the options accessible with the *F1*, *F4*, *F3*, *F4*, and *F5* keys. The first option **F1-Main** will allow us to return to the **Main Booting Menu**. The **F2-Options** are the **Installer Boot Options**.



In this option, it is possible to select booting options such as to disable hardware probing (**linux noprobe**), enable rescue mode (**linux rescue**) and so on. To enable any of these booting options, we just type the desired option after the boot prompt and press *Enter*. Sometimes, when the **Advanced Programmable Interrupt Controller** (**APIC**) is present on newer motherboards and causes some problems during installation, it has been known to cause problems on older hardware. In order to avoid such issues, it is better to disable it. This can be done by typing `linux noapic` or `linux acpi=off`. This is useful on some older systems and is a requirement for using **advanced power management** (**APM**). This will disable the hyper-threading support of our processor. The **F3-General** option will display the **General Boot Help**.



The **F4-Kernel** provides **Kernel Parameter Help**. To pass an option to the kernel, we use the format: `linux <options>`.



The **F5-Rescue** option is used for rescuing an already-installed system.

Choosing the system's language

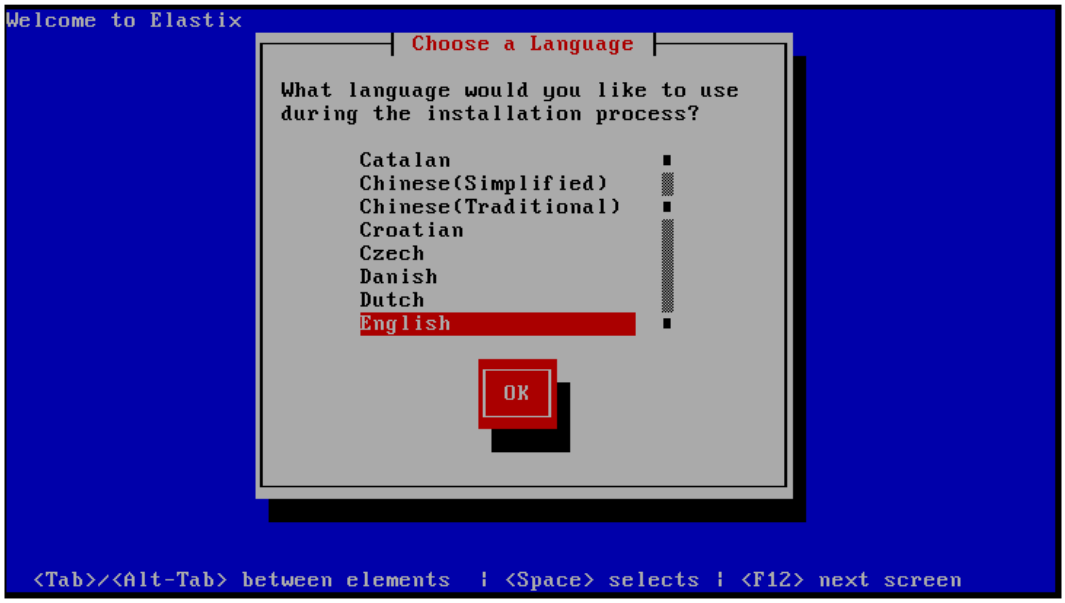
The next screen is the **Choose a Language** screen. On this screen, we choose the language that we will use during the installation process. As shown at the bottom of the screen, the *Tab* key allows us to jump between options. The *Spacebar* key will let us select any option with * and may work as the *Enter* key. The *F12* key will select the highlighted option and go to the following screen.

How to do it...

Here are the steps to select the system's installation language:

1. Select the language you would like to use by using the arrow keys from the keyboard.
2. Press *Tab* to move to the **OK** button.
3. Once the **OK** button is highlighted, press the *Spacebar* key or *Enter*.

These steps are shown in the following screen-shot:



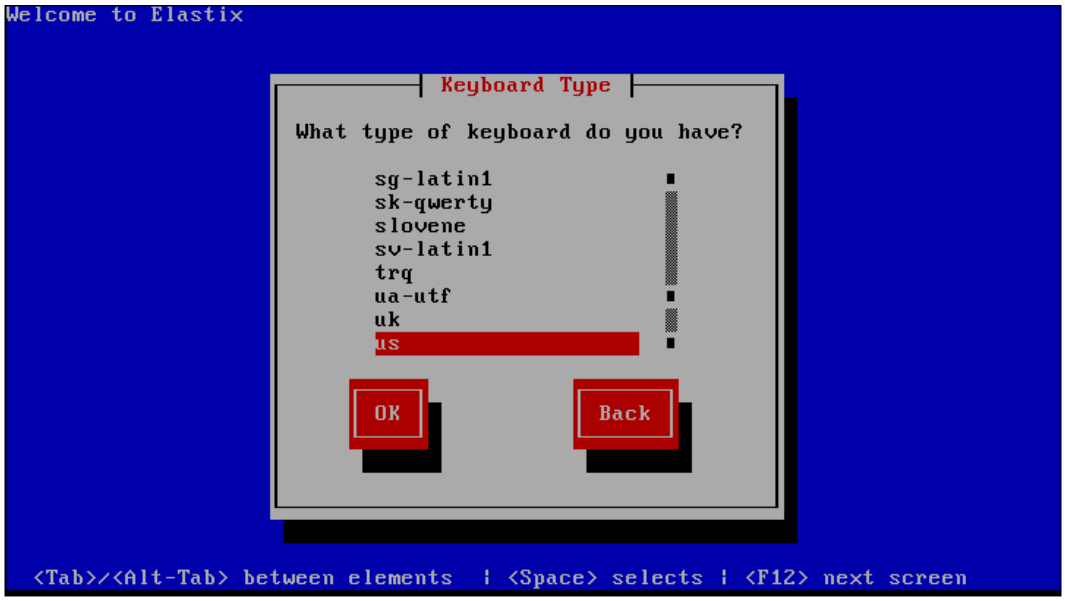
Choosing the keyboard type

The next screen is the **Keyboard Type** screen where we will select the type of keyboard we are using in this process.

How to do it...

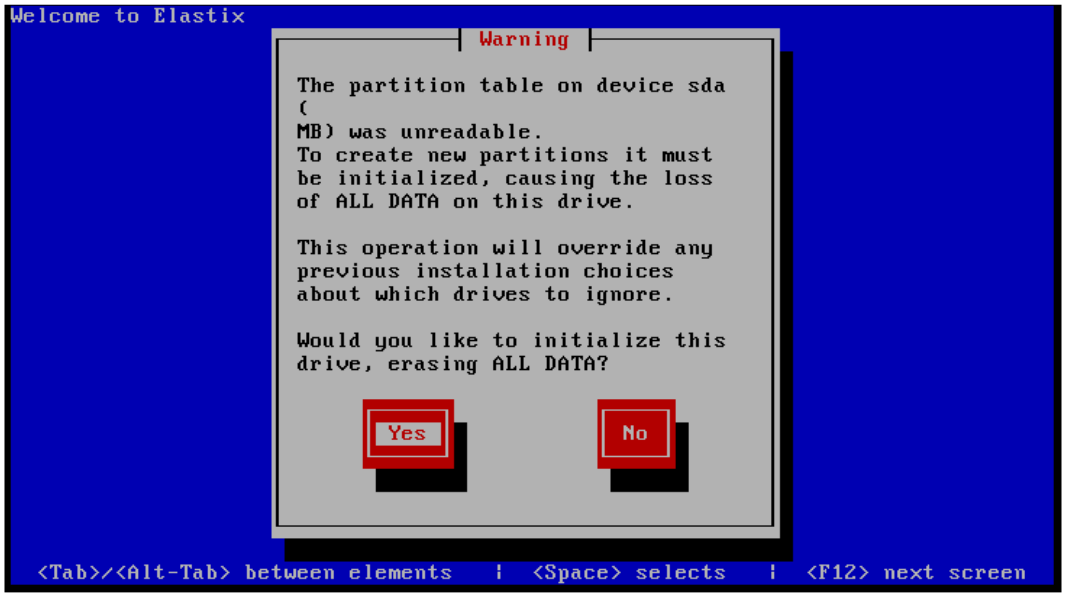
Here are the steps to choose the keyboard type:

1. Use the arrow keys and then press *Tab* highlighting the **OK** button.
2. Press the *Spacebar* key or *Enter*, as shown in the following image:



Partitioning the hard disk

After the previous step, the following screen may or may not appear; it depends on the hard disk status of the PC/server. If the hard disk has not being partitioned or does not have a valid partition table, it will indicate the need to initialize the disk. The **YES** option is already highlighted. Press *Enter* to proceed.



The next screen is the **Partitioning Type** screen. It displays the hard disk or disks detected by the installation script. If the PC/server has a RAID array of disks, the installation program will also display it on this screen as a single hard disk. The installation program was created to automatically partition the selected disk. To deploy an efficient Elastix Unified Communications Server installation, it is highly recommended to dedicate the entire hard disk space.

How to do it...

Here are the steps to partition a disk:

1. Use the arrow keys from the keyboard to move the selection up to **Remove all partitions on selected drives and create default layout.** as shown in the next screenshot. If we have multiple drives in our system, we need to make sure that it has chosen the correct drive.
2. Use *Tab* to move to the **OK** button.