



Clear Ballot

ClearVote 2.3

ClearDesign Build Procedures

ClearDesign Build Procedures

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Table of contents

Preface	5
Chapter 1. Overview	6
1.1 VMs required for the build procedure	6
1.2 Phases of the build procedure	6
Chapter 2. Setting up the build environment	7
2.1 Recommended host operating system	7
2.2 Downloading the ISO for the operating system	7
2.3 Downloading and installing VirtualBox	7
2.4 Creating and setting up the VM for Ubuntu 18.04.5	8
Chapter 3. Copying the source code	11
Chapter 4. Downloading the third-party libraries	12
4.1 Creating the download VM	12
4.2 Downloading the files	12
Chapter 5. Building the ClearDesign system	14
5.1 Creating the ClearDesign Build VM	14
5.2 Setting up the ClearDesign Build VM	14
5.3 Building the ClearDesign system	15

Preface

This section defines the purpose of this document.

About this document

This document describes how to build the ClearDesign system.

Scope of this document

This document contains the following chapters:

- Chapter 1. Overview
- Chapter 2. Setting up the build environment
- Chapter 3. Copying the source code
- Chapter 4. Downloading the third-party libraries
- Chapter 5. Building the ClearDesign system

Intended audience

The document is for state and federal election officials and their voting system test laboratories. This document is part of the Technical Data Package (TDP) required to certify the ClearVote system for use. Clear Ballot personnel also use this document to support election officials and staff.

References to ClearVote products

A ClearVote® system can comprise the ClearAccess®, ClearCast®, ClearCount®, and ClearDesign® products. Jurisdictions are not required to purchase all products. You can ignore references to any ClearVote products that are not part of your voting system. Also ignore implementation options that are not relevant to your policies and procedures.

Chapter 1. Overview

The ClearDesign system uses a client-server model that includes one DesignServer and one or more DesignStations. The DesignServer runs the Ubuntu Linux operating system and contains all the files that make up the ClearDesign system. The DesignStations run the Windows operating system and the Google Chrome browser.

The output of the build procedure is a file that has the following format:

ClearDesign-X.X.X.zip

where X.X.X is the version number.

The zip file includes the installation file for the ClearDesign server application and the install-setup directory, which contains the files for installing the support libraries on the server.

1.1 VMs required for the build procedure

The build procedure uses Ubuntu Linux operating system to create the ClearDesign system. To simplify archiving of the build environment, the build procedure uses virtual machines (VMs) created by the VirtualBox application. These VMs enable archiving the complete build environment as a single file. Because the build procedure requires multiple VMs, you create one VM and then clone it each time a new VM is needed.

The ClearDesign build procedure requires the following VMs:

- An Ubuntu VM
- An Internet-connected download VM
- A trusted build VM

1.2 Phases of the build procedure

The ClearDesign build procedure has the following phases:

1. Setting up the build environment
2. Copying the source code to the USB drive that will be used throughout the build procedure
3. Downloading the third-party libraries and tools used by the ClearDesign system and the build procedure
4. Setting up the build machine
5. Building the ClearDesign system

After you set up the build machine, you can reuse it to rebuild the same version of the ClearDesign system.

Chapter 2. Setting up the build environment

This chapter describes how to set up the build environment.

2.1 Recommended host operating system

The recommended operating system is Windows 10 for the host computer where you set up the VMs for the build procedure.

2.2 Downloading the ISO for the operating system

On an Internet-connected computer, download the Ubuntu ISO from the Ubuntu download site at:

<http://cdimage.ubuntu.com/releases/18.04.5/release/ubuntu-18.04.5-server-amd64.iso>

2.3 Downloading and installing VirtualBox

VirtualBox is a free, open-source, third-party application for creating and managing VMs. This document describes how to use VirtualBox to set up the VMs and their attributes.

Using a 64-bit host computer, install VirtualBox from:

<https://www.virtualbox.org/wiki/Downloads>

Note: In addition to VirtualBox, download and install the VirtualBox Extension Pack so that USB 3.0 features function correctly.

2.4 Creating and setting up the VM for Ubuntu 18.04.5

To set up the VM:

1. Run VirtualBox and create a VM with the parameters listed in Table 2-1.

Table 2-1. Parameters for creating a VM for Ubuntu 18.04.5

Parameter	Description
Name	Ubuntu 18.04.5
Machine folder	Leave as the default.
Type	Linux
Version	Ubuntu (64 bit)
Memory Size	2048 MB
Hard disk	Create a virtual hard disk now.
Hard disk file type	VDI (VirtualBox Disk Image)
Storage on physical hard disk	Dynamically allocated
File location and Size	1. Leave the location as the default. 2. Set the size to 20 GB.

2. Select the following to install Ubuntu on the virtual machine:
 - a. In Virtual Box, select the machine that you just created.
 - b. Right-click and select **Settings**.
 - c. When the Settings dialog appears, select **USB** on the left side and select **USB 3.0 (xHCI) Controller**.
 - d. Press **OK** to close the Settings dialog.
 - e. Press **Start (Normal Start)** to begin the installation process.
 - f. When the Select Startup Disk dialog appears, select the **Choose virtual optical disk file** icon.
 - g. When the Optical Disk Selector dialog appears, choose **Add** and navigate to the Ubuntu ISO that you previously downloaded.
 - h. Press **Open**, and when the chooser dialog closes, press **Choose**.
 - i. Press **Start** to continue installing Ubuntu.

- Follow the prompts on the screen to install Ubuntu on the virtual machine. Use the settings in Table 2-2.

Table 2-2. Settings for installing Ubuntu

Parameter	Setting
Language	English
Install	Ubuntu Server
Select a language	English
Select your location	United States
Detect keyboard	No
Configure keyboard - County of Origin	English (US)
Configure keyboard - Keyboard layout	English (US)
Configure the network - Hostname	CBGBuild
Set up users and passwords - Full name for the new user	ClearBallot
Set up users and passwords - User name for your account	cbg
Set up users and passwords - Choose a password for the new user	build
Set up users and passwords - Re-enter password to verify	build
Set up users and passwords - Use weak password	Yes
Configure Clock	Select time zone.
Partition disks - Partitioning method	Guided - use the entire disk and set up LVM.
Partition disks - Select disk to partition	Press Enter .
Partition disks - Write the changes to disks and configure LVM	Yes
Partition disks - Amount of volume to group to use for guided partitioning	Press Enter .
Partition disks - Write changes to disk	Yes

Table 2-2. Settings for installing Ubuntu (continued)

Parameter	Setting
Enter name of proxy server	Press Enter .
Configuring tasks - How do you want to manage upgrades to this system	No automatic updates
Software Selection - Choose software to install	Press Enter .
Install the GRUB boot loader	Yes
Finish the installation	Press Enter .

Chapter 3. Copying the source code

The USB drive stores all the source files and third-party libraries that are used to build ClearDesign.

Using a USB drive that is formatted to FAT32, follow these steps:

1. Create a directory called **CBGBuild** on the USB drive.
2. Copy the following source directories to the CBGBuild directory on the USB drive:
 - openssl-fips
 - apache2-fips
 - src-ems

Chapter 4. Downloading the third-party libraries

This chapter describes how to download all the third-party libraries used to build ClearDesign and used by ClearDesign.

These third-party libraries include:

- JavaScript
- Python
- Ubuntu
- Supporting programs such as MySQL and Apache

The download process uses a VirtualBox VM that is connected to the Internet.

4.1 Creating the download VM

To create the download VM, use the Windows 10 host computer that you set up in Chapter 2 to run VirtualBox. Follow these steps:

1. Start VirtualBox.
2. Right-click the machine name **Ubuntu 18.04.5** and select **Clone**.
 - a. Set the name to **ClearDesign Download**.
 - b. Leave the default values in all other fields and click **Next**.
 - c. Leave as **Full Clone** and click **Clone**.

4.2 Downloading the files

To download the files, do the following:

1. Insert the USB drive created in Chapter 3 into a port on the Windows host computer.
2. Start the ClearDesign Download VM created in the previous section by double-clicking it in the VirtualBox application.
3. Attach the USB drive to the ClearDesign Download VM by selecting the **Devices** menu item and then **USB**.
4. From the list of USB devices, select the USB drive to attach.
5. Log in to the ClearDesign Download VM by entering the username and password that you set up in Chapter 2.

6. At the Ubuntu command prompt, enter the following:

a. Mount the USB drive:

```
sudo mount /dev/sdb1 /media/cdrom
```

b. Change to the CBGBuild directory on the USB drive:

```
cd /media/cdrom/CBGBuild
```

c. Download the files:

```
sudo src-ems/setup/download.sh
```

d. When the download has finished, unmount the USB drive:

```
cd ~
```

```
sudo umount /dev/sdb1
```

e. Shut down the ClearDesign Download VM and close the window:

```
shutdown now
```

Chapter 5. Building the ClearDesign system

This chapter describes how to set up the build VM and then build the ClearDesign system. The build process uses a VM that is not connected to the Internet.

5.1 Creating the ClearDesign Build VM

To set up the build VM, follow these steps on the Windows 10 computer that you set up to run VirtualBox in Chapter 2:

1. Start VirtualBox
2. Clone the VM named Ubuntu 18.04.5 by right-clicking the machine name and selecting **Clone**.
 - a. Set the name to **ClearDesign Build**.
 - b. Leave the default values in all other fields as default and press **Next**.
 - c. Leave as **Full Clone** and press **Clone**.
 - d. When the new machine has been created, right-click it and select **Settings**.
 - e. Select the **Network** on the left side.
 - f. Change the **Attached to** value to Host-only Adapter.

5.2 Setting up the ClearDesign Build VM

To setup the build machine, do the following:

1. Plug the USB drive created in Chapter 3 into a port on the Windows host computer.
2. Start the ClearDesign Build VM created in the previous section by double clicking it in the VirtualBox application.
3. Attach the USB drive to the ClearDesign Build VM by selecting the **Devices** menu item, then select USB.
4. From the list of USB devices select the USB drive to attach.
5. Log in to the ClearDesign Build VM by entering the username (cbg) and password (build) that you set up in Chapter 2.

6. From the Ubuntu command prompt, enter the following:

- a. Mount the USB drive:

```
sudo mount /dev/sdb1 /media/cdrom
```

- b. Change to the CBGBuild directory on the mounted USB drive:

```
cd /media/cdrom/CBGBuild
```

- c. Setup the VM:

```
sudo src-ems/setup/setup.sh
```

5.3 Building the ClearDesign system

To build the ClearDesign system, do the following:

1. If you are not already logged in to the ClearDesign Build VM, follow steps 1 through 5b in the previous section.

2. Build the ClearDesign system by entering:

```
src-ems/setup/build.sh
```

3. Verify that the following files are in the CBGBuild directory:

- ClearDesign-X.X.X.zip

where X.X.X is the version number of ClearDesign

- install-setup directory

The installation process for ClearDesign uses these files.

4. When the build has finished, unmount the USB drive:

```
cd ~
```

```
sudo umount /dev/sdb1
```

5. Shut down the VM and close the Window:

```
shutdown now
```