

How to dual boot Arch Linux with Windows

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Introduction and Required Materials

This guide is designed to help an experienced computer user dual boot Arch Linux alongside an existing Windows installation. Arch Linux is more difficult to install but more rewarding in use than other Linux distributions. Apart from being highly customizable, it features a rolling release update system which eliminates the hassle of upgrading to major releases. Arch Linux also features a broad Arch User Repository (AUR), which contains over 55,000 user maintained packages at the time of writing. A blank USB flash drive or CD/DVD and 20 to 30 GB of free hard drive space is required for installation.

Making the Arch Linux installation disk

Download the disk image from <https://www.archlinux.org/download/>

- > Use an HTTP Direct Download link under *United States* for maximum download speed
- > Download archlinux-XXXX.XX.XX-dual.iso from the file server

Either use Win32 Disk Imager to write the iso to a flash drive or burn the image to a blank CD/DVD.

Partitioning the disk from Windows

In Windows, open Disk Management by searching for it in the start menu. Right click on your primary partition (usually C:) and select "Shrink Volume...". To have a 20 GB Linux partition, shrink it by 20000 MB (adjust this size to fit your needs, but 20-30 GB is good for learning about Arch Linux. Right click on the newly made partition and assign it a drive letter. Format it as NTFS for now.

Booting into the Arch Linux installation disk

Boot your computer off of the flash drive or CD you made earlier. Select Arch Linux x86_64 from the boot menu. If your computer does not support 64 bit instruction, select the i686 image instead.

Connecting to the internet

Connect to the internet over Ethernet

Arch Linux automatically connects to DHCP Ethernet networks. Test the connection with the following command:

```
# ping -c 3 google.com
```

Connect to the internet over Wi-Fi

In most cases, wireless network devices are automatically detected and loaded. To select a network, run `wifi-menu`:

```
# wifi-menu
```

- > Select your wireless network from the list and authenticate

Ping `google.com` to verify internet connectivity:

```
# ping -c 3 google.com
```

Partitioning the hard drive

View available hard drive partitions

To view all partitions on the hard drive, for reference, run the following command:

```
# lsblk
```

The output of `lsblk` should list all hard drives and partitions, along with other information. The primary hard drive is listed as `sda`, and inclusive partitions are listed as `sda1`, `sda2`, etc. Other hard drives are named `sdb`, `sdc`, `sdd`, etc. After partitioning the disk from windows, you should see `sda1` (the Windows boot partition), `sda2` (the primary Windows partition), and `sda3` (the partition you previously created to install Linux on).

Note: The partition table does not need to be adjusted because it was already modified in Windows. If the partition table *did* need adjustment or if you were installing Arch Linux on a blank hard drive, use the command `fdisk /dev/sda` to modify it.

Create the filesystem

Locate the partition you wish to install Arch Linux to in the output of `lsblk`. This should be `/dev/sda3`.

Format the partition to `ext4` by running the following command:

```
# mkfs.ext4 /dev/sda3
```

Mount the partition

In order to use the partition, it must be mounted:

```
# mount /dev/sda3 /mnt
```

Installing the base system

To install and set up the base system, you must install the required packages to the partition you previously formatted (which can be found at `/mnt`). After this, you will set up disk identification labels so the disks and partitions can be found by the operating system.

Install base packages

Prior to installing packages, a package mirror must be selected. To do this, edit the `mirrorlist` file using `nano` comment out (using `#`) the server locations until you come to one close to you:

```
# nano /etc/pacman.d/mirrorlist
```

```
GNU nano 2.4.0 File: /etc/pacman.d/mirrorlist Modified
#Server = http://archlinux.my-universe.com/$repo/os/$arch
## Score: 0.4, Netherlands
#Server = http://ftp.nluug.nl/os/Linux/distr/archlinux/$repo/os/$arch
## Score: 0.4, France
#Server = http://arch.tamcore.eu/$repo/os/$arch
## Score: 0.4, Germany
#Server = http://mirror.js-webcoding.de/pub/archlinux/$repo/os/$arch
## Score: 0.4, Norway
#Server = http://os-sharing.org/archlinux/$repo/os/$arch
## Score: 0.6, France
#Server = http://mirror.lightcone.eu/archlinux/$repo/os/$arch
## Score: 0.7, Ukraine
#Server = http://archlinux.bln-ua.net/$repo/os/$arch
## Score: 0.7, United States
Server = http://lug.mtu.edu/archlinux/$repo/os/$arch
## Score: 0.7, United States
Server = http://mirror.us.leaseweb.net/archlinux/$repo/os/$arch
## Score: 0.8, Germany
Server = http://mirror.gnomus.de/$repo/os/$arch
## Score: 0.8, Italy

^G Get Help ^O Write Out ^W Where Is ^K Cut Text ^J Justify ^C Cur Pos
^X Exit ^R Read File ^\ Replace ^U Uncut Text ^T To Spell ^_ Go To Line
```

Figure 1: Comment out mirrors that are far from your location

When the modifications are done, press `ctrl + o` to save (write out) the file and `ctrl + x` to close it.

Note: The package manager, `pacman`, looks through the `mirrorlist` from top to bottom until it finds a location it can download packages from. Because of this, you do not need to comment out mirror locations below the location you wish to use.

You are now ready to use the `pacstrap` command to install base packages to `/mnt`:

```
# pacstrap -i /mnt base base-devel
```

After the package lists are updated, select yes by typing 'y' and pressing enter at the prompts. Select all default packages by pressing enter for both `base` and `base-devel`. The packages will now download and install.

When the installation process completes, update disk identification information using `genfstab`:

```
# genfstab -U -p /mnt >> /mnt/etc/fstab
```

Use `nano` to view the `fstab` and check to see if the command worked properly. If it looks similar to that in Figure 2, it worked:

```
# nano /mnt/etc/fstab
```

```
GNU nano 2.4.0 File: /mnt/etc/fstab
#
# /etc/fstab: static file system information
#
# <file system> <dir> <type> <options> <dump> <pass>
# /dev/sda1
UUID=66eb4e0e-a948-49ab-8d6b-d08adffb1605 / ext4 $

```

[Read 7 lines]

```
^G Get Help ^O Write Out ^W Where Is ^K Cut Text ^J Justify ^C Cur Pos
^X Exit ^R Read File ^_ Replace ^U Uncut Text ^T To Spell ^_ Go To Line
```

Figure 2: Fstab file after proper generation using genfstab

If your fstab does not look similar to this (it is okay if it contains more information, but not if it contains less), consult wiki.archlinux.org for solutions.

Configuring the system

Now that the basic system is installed, it must be configured to function properly on your computer.

Chroot into the base system

To begin configuring the system, you must virtually remote into the partition it is installed to. This process is called chrooting:

```
# arch-chroot /mnt /bin/bash
```

Generate the system locale

The system language is defined in the locale. For systems running in the U.S.A., uncomment the line containing “en_US.UTF-8 UTF-8” in locale.gen:

```
# nano /etc/locale.gen
```

```
GNU nano 2.4.0 File: /etc/locale.gen
#en_IN UTF-8
#en_NG UTF-8
#en_NZ.UTF-8 UTF-8
#en_NZ ISO-8859-1
#en_PH.UTF-8 UTF-8
#en_PH ISO-8859-1
#en_SG.UTF-8 UTF-8
#en_SG ISO-8859-1
en_US.UTF-8 UTF-8
#en_US ISO-8859-1
#en_ZA.UTF-8 UTF-8
#en_ZA ISO-8859-1
#en_ZM UTF-8
#en_ZW.UTF-8 UTF-8
#en_ZW ISO-8859-1
#es_AR.UTF-8 UTF-8
#es_AR ISO-8859-1
#es_BO.UTF-8 UTF-8
#es_BO ISO-8859-1
#es_CL.UTF-8 UTF-8
^G Get Help ^O Write Out ^W Where Is ^K Cut Text ^J Justify ^C Cur Pos
^X Exit ^R Read File ^\ Replace ^U Uncut Text ^T To Spell ^_ Go To Line
```

Figure 3: Uncomment the correct locale in locale.gen

Now generate the locale using this configuration:

```
# locale-gen
```

Define this locale configuration in locale.conf and export it:

```
# echo LANG=en_US.UTF-8 > /etc/locale.conf
# export LANG=en_US.UTF-8
```

Note: The single right-carrot command of “echo a > b” copies the contents of a into b, erasing all that may have been in b already. In general, to append the contents of a command into a file, use a double carrot: “echo a >> b”

Set the time zone

To configure the time zone, you must make a symbolic link at /etc/localtime which points to the location on disk of your current time zone. Available time zones are located at /usr/share/zoneinfo/Zone/SubZone. If you are located in North-East U.S.A., you may wish to create a link to the New_York directory:

```
# ln -s /usr/share/zoneinfo/America/New_York /etc/localtime
```

If you get a “failed to create symbolic link” error, try using “ln -sf” instead to force the command.

Note: To list all the contents of a folder, use the “ls” command. For example, to view all subzones within the America directory, use the command “ls /usr/share/zoneinfo/America”
Also, when typing long folder names, press tab after typing the first few characters to automatically complete the name.

Configure the hardware clock

The hardware clock must be set to use the UTC or localtime standard. Windows uses localtime, but localtime is known to induce problems in Arch Linux. Instead, configure the system to use UTC:

```
# hwclock --systohc --utc
```

To synchronize the clock between Windows and Linux, it is recommended to configure Windows to use UTC: [https://wiki.archlinux.org/index.php/Time#UTC in Windows](https://wiki.archlinux.org/index.php/Time#UTC_in_Windows)

Set the hostname

The hostname is the computer’s identification name. It is recommended to set the hostname to something unique for easier identification over the network. For the purpose of this tutorial, the hostname “ellie” will be used:

```
# echo ellie > /etc/hostname
```

Add the same hostname to the hosts file:

```
# nano /etc/hosts
```

```
GNU nano 2.4.0 File: /etc/hosts
#
# /etc/hosts: static lookup table for host names
#
#<ip-address> <hostname.domain.org> <hostname>
127.0.0.1 localhost.localdomain ellie
::1 localhost.localdomain ellie_
# End of file

[ Wrote 9 lines ]
^G Get Help ^O Write Out ^W Where Is ^K Cut Text ^J Justify ^C Cur Pos
^X Exit ^R Read File ^\ Replace ^U Uncut Text ^T To Spell ^_ Go To Line
```

Figure 4: Adjust the hosts file to match the hostname in /etc/hostname

Configure the wired network

If you are using a wireless network, skip to the next section.

Use `ip link` to view all available network interfaces:

```
# ip link
```

Ignoring the “lo” interface, the wired interface is usually named `enp0s3` or `eth0`. For the purpose of this tutorial, `enp0s3` will be used.

To enable the network interface, run the following command (replace `enp0s3` with your interface):

```
# systemctl enable dhcpd@enp0s3.service
```

Configure the wireless network

Use `ip link` to view all available network interfaces:

```
# ip link
```

If your wireless card is not listed, use `lspci` to list all pci devices and find your wireless chipset. Use the Arch Wiki to determine how to install the firmware for your chipset:

```
# lspci
```

Assuming a wireless network interface is available (usually under the names `wlp3s0` or `wlan0`), install the following packages required for connecting to a wireless network using `pacman`:

```
# pacman -S iw wpa_supplicant dialog
```

To connect automatically to known networks, install `wpa_actiond` and enable the `netctl-auto` service (replace `wlan0` with your wireless interface name):

```
# pacman -S wpa_actiond
# systemctl enable netctl-auto@wlan0.service
```

Create a ramdisk environment

Linux boots from an initial ramdisk environment. To create it, run the following command:

```
# mkinitcpio -p linux
```

Set the root password

The root password will be required for installing packages and modifying the system later on. Set it with the following command:

```
# passwd
```

Create a user account

Add a user and set the password, substituting “joshua” with your account name:

```
# useradd -m -g users -G wheel,storage,power -s /bin/bash joshua
# passwd joshua
```

Install sudo to be able to run commands with super user privileges while using your account:

```
# pacman -S sudo
```

Note: The “pacman -S” command installs packages. Using the “-Syyu” argument will update your system. The “-Rns” argument completely removes packages from your system. The “-Ss” argument allows you to search the package database for keywords.

Allow your user to use the sudo command by allowing all members of the group “wheel” to use it in the sudo config file. Uncomment the line containing “%wheel ALL=(ALL) ALL”:

```
# EDITOR=nano visudo
```

```
GNU nano 2.4.0 File: /etc/sudoers.tmp
## Runas alias specification
##
##
## User privilege specification
##
root ALL=(ALL) ALL

## Uncomment to allow members of group wheel to execute any command
%wheel ALL=(ALL) ALL

## Same thing without a password
# %wheel ALL=(ALL) NOPASSWD: ALL

## Uncomment to allow members of group sudo to execute any command
# %sudo ALL=(ALL) ALL

## Uncomment to allow any user to run sudo if they know the password
## of the user they are running the command as (root by default).
# Defaults targetpw # Ask for the password of the target user
[ Wrote 91 lines ]
^G Get Help ^O Write Out ^W Where Is ^K Cut Text ^J Justify ^C Cur Pos
^X Exit ^R Read File ^\ Replace ^U Uncut Text ^T To Spell ^_ Go To Line
```

Figure 5: Uncomment “%wheel ALL=(ALL) ALL” to allow your user to use the sudo command

Configure the pacman package manager

Adding new repositories requires modifying pacman.conf. Modify this file to enable the multilib repository:

```
# nano /etc/pacman.conf
```

```
GNU nano 2.4.0 File: /etc/pacman.conf
Include = /etc/pacman.d/mirrorlist

#[community-testing]
#Include = /etc/pacman.d/mirrorlist

[community]
Include = /etc/pacman.d/mirrorlist

# If you want to run 32 bit applications on your x86_64 system,
# enable the multilib repositories as required here.

#[multilib-testing]
#Include = /etc/pacman.d/mirrorlist

[multilib]
Include = /etc/pacman.d/mirrorlist

# An example of a custom package repository. See the pacman manpage for
# tips on creating your own repositories.
#[custom]

[ Wrote 99 lines ]
^G Get Help ^O Write Out ^W Where Is ^K Cut Text ^J Justify ^C Cur Pos
^X Exit ^R Read File ^\ Replace ^U Uncut Text ^T To Spell ^_ Go To Line
```

Figure 6: Uncomment the multilib lines to enable that repository in pacman.conf

Refresh the repository list by running the following command:

```
# pacman -Sy
```

Installing the bootloader

The bootloader must be installed for your computer to know how to boot Linux. There are two types of computer motherboards that each look for a different type of bootloader. If your computer is older or you are using legacy boot in the BIOS, use the BIOS system bootloader method, else use the UEFI system method. This guide will review how to install GRUB for BIOS systems. If you have a UEFI system or encounter errors, consult the Arch Linux Beginners' Guide:

https://wiki.archlinux.org/index.php/Beginners%27_guide#Install_and_configure_a_bootloader

Install the bootloader for BIOS systems

Install GRUB, a reliable, old, and well tested bootloader:

```
# pacman -S grub os-prober
```

Install the bootloader to your hard drive:

```
# grub-install --target=i386-pc --recheck /dev/sda
```

Generate grub.cfg:

```
# grub-mkconfig -o /boot/grub/grub.cfg
```

Reboot into your new installation using your user account

Type the following command to exit from the chroot environment:

```
# exit
```

Now reboot your computer, select Arch Linux from the boot menu, and log into your new user account:

```
# reboot
```

Installing a graphical user interface

Before installing a fully functional graphical user interface, a few more things need to be configured.

Reconnect to wireless internet, if necessary

Using wifi-menu with super user privileges, connect to the internet again:

```
# sudo wifi-menu
```

Set up audio

Begin by installing alsa:

```
# sudo pacman -S alsa-utils
```

Use the alsamixer command to configure your audio devices. Unmute the master channels by pressing the m key when that channel is selected. Use the arrow keys to adjust volume and change channel selection:

```
# alsamixer
```

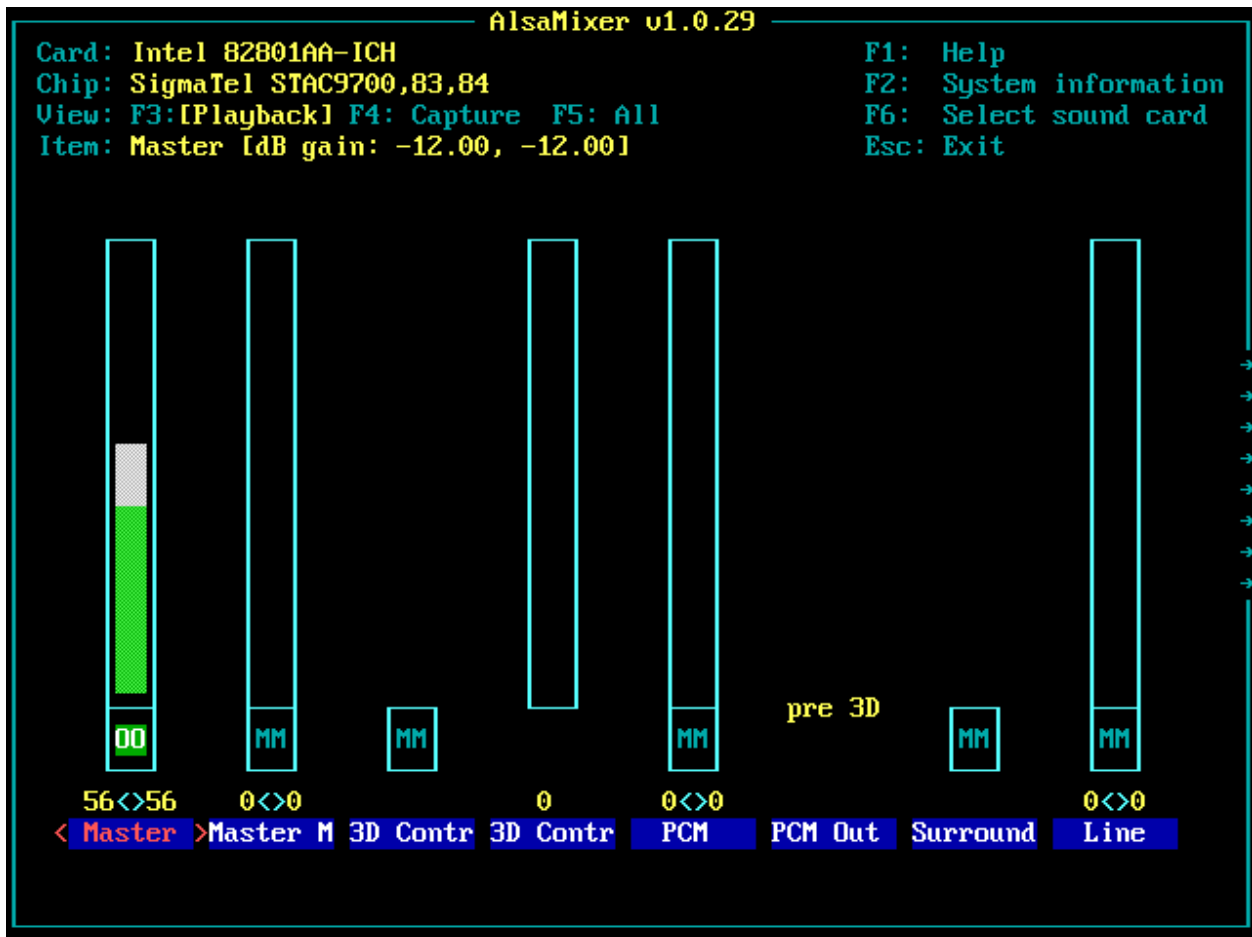


Figure 7: adjust audio channel volumes using alsamixer

Test your sound settings with the speaker-test command. Change the 2 to the number of speakers your sound system has:

```
# speaker-test -c 2
```

Install the xorg server

The xorg server hosts the X window system, which is what the desktop environment uses to display graphics on the screen. Install the base xorg packages with the following command:

```
# sudo pacman -S xorg-server xorg-xinit xorg-server-utils mesa
```

Install graphics drivers

The graphics driver package that your computer requires changes with hardware. See the following table to install the proper graphics driver for your system. If you booted using i686 Arch Linux in the first few steps, remove “lib32-” from the following commands (for example, lib32-nvidia-utils → nvidia-utils):

NVIDIA	<pre># sudo pacman -S nvidia lib32-nvidia-utils</pre>
Intel	<pre># sudo pacman -S xf86-video-intel lib32-mesa-libgl</pre>
ATI (AMD)	<pre># sudo pacman -S xf86-video-ati lib32-mesa-libgl</pre>

Install trackpad drivers

If you are using a laptop with a trackpad, install the synaptics driver:

```
# sudo pacman -S xf86-input-synaptics
```

Install and test the default X environment

Install the required system files to start the basic X environment:

```
# sudo pacman -S xorg-twm xorg-xclock xterm
```

Test the X environment:

```
# startx
```

If the X environment does not display, as shown in Figure 8, consult the Arch Linux xorg wiki page: https://wiki.archlinux.org/index.php/xorg#Driver_installation

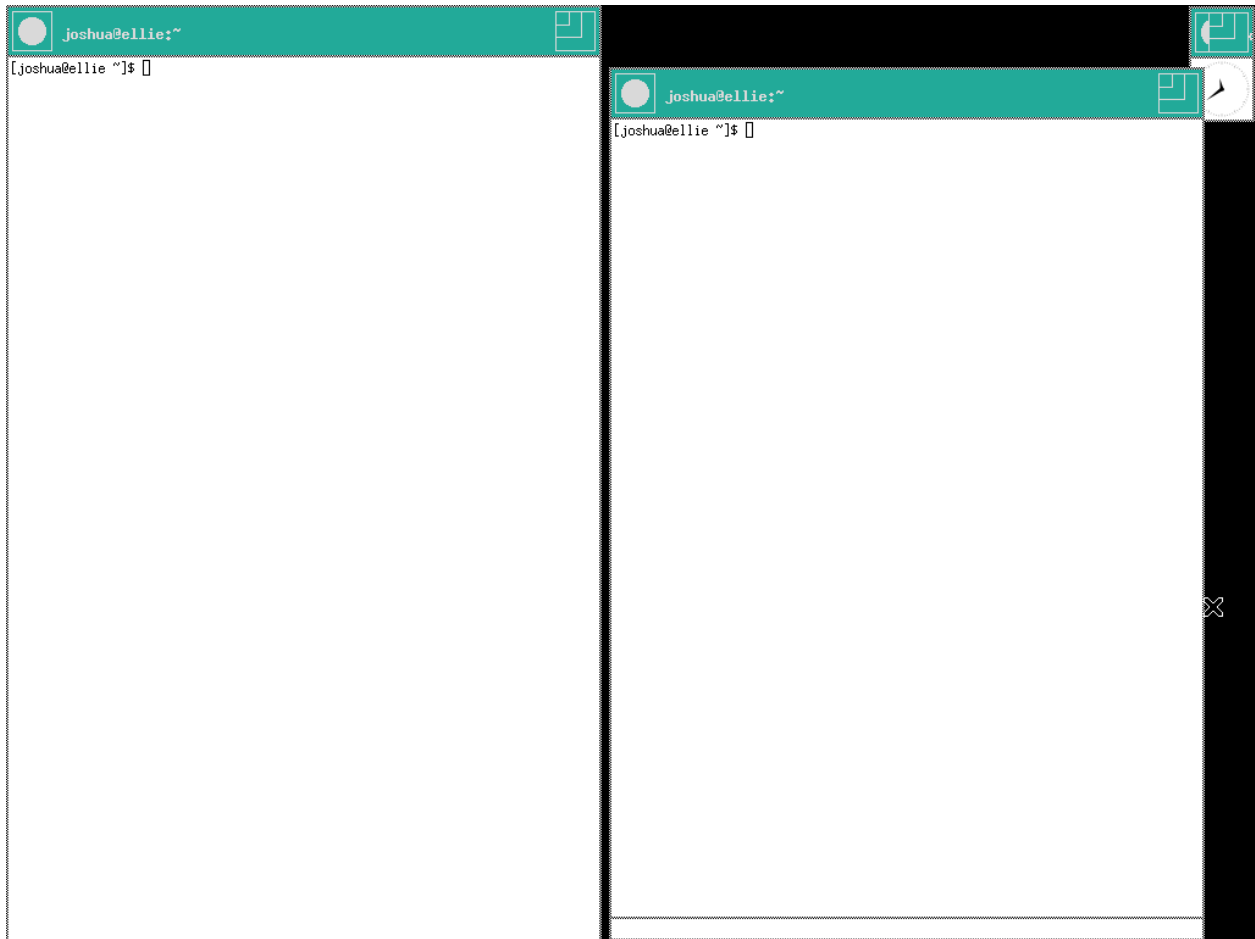


Figure 8: default xorg interface

Exit the X window environment by typing exit into the primary xterm window:

```
# exit
```

Install a basic font

Desktop environments benefit from having a basic font installed. A standard font is ttf-dejavu:

```
# sudo pacman -S ttf-dejavu
```

Choose and install a desktop environment

This is the fun part. There are many different desktop environments to choose from, and they all look and function differently. For example, GNOME and KDE are feature filled, but require decent systems to run. LXDE, on the other hand, is a simple, extremely lightweight desktop environment that can run on just about any hardware. Browse the Arch wiki page to find a desktop environment you like: https://wiki.archlinux.org/index.php/Desktop_environment

In this tutorial, the gnome desktop environment will be installed:

```
# sudo pacman -S gnome
```

To start gnome on boot, enable the service for its display manager, gdm:

```
# sudo systemctl enable gdm.service
```

Reboot into your new Arch Linux installation:

```
# sudo reboot
```

Updating and maintaining the installation

Arch Linux is a rolling release Linux distribution, meaning there are no major updates. Arch Linux will remain up to date indefinitely as long as it is maintained properly. Maintenance is simple, just run the update command every once in a while:

```
# sudo pacman -Syyu
```

Search for new packages such as firefox and chromium on archlinux.org. Arch Linux also features an Arch User Repository (AUR) which contains a large amount of community-contributed and maintained packages. To easily install packages from the AUR, install yaourt:

```
# curl -O https://aur.archlinux.org/packages/pa/package-  
query/package-query.tar.gz  
# tar zxvf package-query.tar.gz  
# cd package-query  
# makepkg -s  
# sudo pacman -U *.xz  
# cd ..  
# curl -O https://aur.archlinux.org/packages/ya/yaourt/  
yaourt.tar.gz  
# tar zxvf yaourt.tar.gz  
# cd yaourt  
# makepkg -si  
# sudo pacman -U *.xz
```

Yaourt can be used in the same way as pacman. For example, to install the git version of pianobar, a console based Pandora client, use the following command:

```
# yaourt -S pianobar-git
```

Do not use sudo with yaourt; it will notify you if it requires super user privileges.

Useful Guides

The Arch Linux Beginners' Guide is a very useful resource for addressing any problems you have come across:

https://wiki.archlinux.org/index.php/Beginners%27_guide