# Get CentOS 8

CentOS 8 matches the department's servers, including the rlogin cluster, so that is what you should install.

That's where we will evaluate all of your assignments.

When downloading an ISO for CentOS, be aware that the file is fairly large...

Be sure you've gotten all of it...

**Disclaimer:** the following notes illustrate one session installing CentOS 8 on VirtualBox 6.1.12, running on Windows 10 Enterprise, on a particular underlying hardware system.

YMMV. Mine certainly has...

ieneral Sec	curity Details Previous Versions
	CentOS-8.2.2004-x86_64-dvd1.iso
Type of file:	Disc Image File (.iso)
Opens with:	Windows Explorer Change
Location:	C:\Users\William D McQuain\Downloads
Size:	7.66 GB (8,231,321,600 bytes)
Size on disk:	7.66 GB (8,231,321,600 bytes)
Created:	Friday, July 24, 2020, 10:06:07 PM
Modified:	Friday, July 24, 2020, 10:20:54 PM
Accessed:	Today, August 14, 2020, 7 hours ago
Attributes:	Read-only Hidden Advanced
Security:	This file came from another computer Unblock and might be blocked to help protect Unblock this computer.

#### **Computer Organization**

## Get CentOS

### Go to centos.org, and use the Download link.



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### **Computer Organization**

# Get CentOS 8



### CentOS Linux

8 (2004)	7 (20	03)	6.10			
ISO		Packa	ages	Other	s	
x86_64		RPMs		Cloud Vagra	Container nt	s
ARM64 (aar	ch64)	RPMs		Cloud Vagra	Container nt	s
IBM Power (ppc64le)		RPMs		Cloud Vagra	Container nt	s
Release No	tes F	elease	e Ema	ail D	ocumenta	tion
End-of-life						
31 May 2029						

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### **Computer Organization**

# Installing CentOS 8

The following notes assume that you have:

- installed VirtualBox
- created an empty VM

If you are preparing a USB flash drive for a dual-boot approach instead, you need to:

- prepare a bootable installation flash drive (or DVD) from the CentOS 8 ISO
- boot your computer from that installation medium
- very carefully choose your second flash drive for the installation\*
- follow the remaining slides to perform the installation
- skip the VirtualBox-specific slides

\* If you choose your primary hard drive instead, you will destroy your host OS!

### Select the VM and click Start.

VirtualBox will recognize the empty system and prompt you to select an installation disk.



### **Computer Organization**

# Working with the VM

If you click your mouse within the window where CentOS is being installed:

- VirtualBox will capture your mouse and keyboard
- you can release them by pressing the Host key
- on Windows systems, that's the right-hand Control key (right-Ctrl)
- on Mac systems, that's the left Command key

The mouse and keyboard might auto-release on modern systems.

Once you've installed the Guest Additions in your CentOS VM, they will.

# **Beginning the CentOS Installation**

Select Add		Find the CentOS 8 Is	so 🖯
Optical Disk Selector Medium	? ×	<ul> <li>Please choose a virtual optical disk file</li> <li>← → ∨ ↑ </li> <li>→ This PC &gt; Downloads</li> </ul>	× v ひ Search Downloads ア
Add Create Refresh Name Virtual Size   Search By Name		Organize Vew folder  Organize Vew folder  Name Last week (1) Use the folder  Name Last	Date modified       Type       Size         8/7/2020 12:33 PM       File folder         7/24/2020 10:20 PM       Disc Image File       8,038,400         7/31/2019 4:58 PM       Disc Image File       4,714,650         All virtual optical disk files (*.dr virtual op
	Optical Disk Selector       Medium       Add       Create       Refresh       Name       V       Not Attached       CentOS-8.2.2004-x86_64-dvd1.iso 7.	? × irtual Size 67 GB	Click Open
	< Search By Name ▼	Choose Leave Empty Cancel	

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### **Computer Organization**

#### ©2013-2020 WD McQuain

CentOS 8 Setup 7

# Running the Installation Code

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#### **Computer Organization**

# **Running the Installation Code**

Some basic settings need to be established.



#### **Computer Organization**

### Installation Destination

### This will be the virtual harddrive you just created... take the defaults.

🔁 CentOS8_F2020 [Running] - Oracle VM VirtualBox	– 🗆 ×
File Machine View Input Devices Help	
INSTALLATION DESTINATION	CENTOS LINUX 8 INSTALLATION
Device Selection	
Select the device(s) you'd like to install to. They will be "Begin Installation" button.	left untouched until you click on the main menu's
Local Standard Disks	*
64 GiB	
ATA VBOX HARDDISK sda / 64 GiB free	
Specialized & Network Disks	Disks left unselected here will not be touched.
Add a disk	
	Disks left unselected here will not be touched.
Storage Configuration	<i>G</i> <sup>−</sup>
I would like to make additional space available.	
Full disk summary and boot loader	1 disk selected; 64 GiB capacity; 64 GiB free Refresh
	😰 💿 💯 를 🖉 🛄 🚍 🕼 🕐 💽 Right Ctrl 🔐

### **Computer Organization**

## Software Selection

### Be sure to choose Workstation and to install the Development Tools.

I also chose:

- GNOME desktop
- Office Suite
- Remote Desktop

CentOS8_F2020 [Running] - Oracle VM VirtualBox	- 🗆 X
SOFTWARE SELECTION	CENTOS LINUX 8 INSTALLATION
Base Environment	Additional software for Selected Environment
<ul> <li>Server with GUI         <ul> <li>An integrated, easy-to-manage server with a graphical interface.</li> <li>Server                 An integrated, easy-to-manage server.</li> <li>Minimal Install                 Basic functionality.</li> </ul> </li> <li>Workstation                 Workstation                 Workstation is a user-friendly desktop system for laptops and PCs.</li>                 Custom Operating System                 Basic building block for a custom CentOS system.                 Virtualization Host                 Minimal virtualization host. </ul>	<ul> <li>GNOME Applications         <ul> <li>A set of commonly used GNOME Applications.</li> <li>Headless Management</li></ul></li></ul>

Make other choices as you like... more packages can be installed later.

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### **Computer Organization**

# Initiate Installation

### Fire up the installation routine...



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#### **Computer Organization**

### root Account Setup



## **User Account Setup**



#### **Computer Organization**

## Prepare to Reboot

Eventually you should see the completion screen (it takes awhile, depending on how many software packages you chose, the speed of your machine, etc).



BEFORE you restart the virtual machine...

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# Prepare to Reboot

Before restarting the VM, you need to eject the CentOS 8 ISO:

Don't close the VM...

In VirtualBox Manager:

- goto Settings
- goto Storage
- select the optical drive
- · click as shown
- Remove Disk from Virtual Drive



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#### **Computer Organization**

# Reboot

### Now, choose Reboot...



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### License Screen

### The restart will bring you to the license screens:



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#### **Computer Organization**

# Login Screen

### The restart will now bring you to the login screen:



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#### **Computer Organization**

# **Initial Options**

### CentOS starts with some basic language and keyboard configuration:

		Welcome		Next						
k	W	/elcome!		CentOS8	F2020 [Run	ning] - Oracle VM VirtualBox		_		
	(			File Machin	e View I	nput Devices Help				
	Deutsch	Deutschland		Application	ns Places	gnome-initial-setup		Aug 14 1	.2:52	u(1)
	English 🖌	United States		Previous		Typing				
	Español	España								
	Français	France				Typing			k	
	Русский	Российская Федерация				Select your keyboard layout or an in	put method.			
	العربية	مصر				Cameroon Multilingual (Dvorak)	Preview			
	日本語	日本				Comerces Multilingual (OW/EDTV)	Droview			
	汉语	中国					Preview			
						English (Australian)	Preview			
Sector Se	setup		」 □₽₽0 ⊘₽			English (Cameroon)	Preview			
						English (Canada)	Preview			
						English (US)	✓ Preview			
						1				
										_

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#### **Computer Organization**

# **Initial Options**

### You may setup access to online accounts... or not...

CentOS8_F20	20 [Running] - Oracle VM VirtualBox	- 0	×			
File Machine	View Input Devices Help					
🏶 Applications	Places gnome-initial-setup	Aug 14 12:53	40)			
Previous	Online Accounts		<u>S</u> kip			
	Connect Your Online Accounts Connect your accounts to easily access your email, online calendar, contacts, documents and photos.	S CentOS8	_F2020 [Running] - Oracle	e VM VirtualBox	- 0	×
		Applicatio	ne view input Device	es Help itial-setup	Aug 14 12:53	40) F
	Google	Brovious		Privace		Novt
	000 Nextcloud	<u><u>r</u>ievious</u>		riivacy		INEXL
	Microsoft			<u>الله</u>		
	Facebook					C3
				Privacy	٨	
	Accounts can be added and removed at any time from the Settin	ıgs applicati	Location Servi	ces	OFF	
	initial-setup		Allows applica indication is sh	tions to determine your geographical locatio own when location services are in use.	n. An	
	2014		Uses Mozilla L	ocation Service: Privacy Policy		
You ma privacy	y configure some settings		Privacy control	s can be changed at any time from the Setti	ngs application.	
		🗗 🔀 gna	ome-initial-setup			
						Pight Ctrl



### **Computer Organization**

# Completing Basic Setup

### Eventually you will reach completion:

CentOS8_F2020 [Running] - Oracle VM VirtualBox	_		>	<
File Machine View Input Devices Help				
🏶 Applications Places gnome-initial-setup	Aug 14	12:53	<b>4</b> 0)	۶
Ready to Go				
You're ready to go!				
Start Using CentOS Linux				

### **Computer Organization**

# **GNOME** Help

### On first startup, you'll be offered help for the Linux environment:



Ignore this or explore it, as you like... it's all available at any time.

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# Starting the Network



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### Make the Network Automatic



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The VirtualBox Guest Additions provide additional functionality for your VM.

Guest Additions (should) enable the following features:

- auto-capture and auto-release for the mouse and keyboard
- the ability to rescale the VM display by just resizing its window
- the ability to create a directory on the host OS that is accessible to the VM
- drag and drop between host and VM
- shared clipboard between host and VM

Another note: if you run the system updater or install other software on your VM, you may have to reinstall the Guest Additions.

## Install the Guest Additions

Note: many important CentOS features will not be available until this is done!

Unfortunately, I needed to install some additional software first...

Go to Applications/System Tools (or possibly Favorites), and start a Terminal session:



### **Computer Organization**

#782 wmcquain: ~> s Password:	u	You need	<mark>to be</mark> root	to install or upd	ate a package
[root@centos8 ~]# yu Last metadata expirat Dependencies resolve	m install elfu ion check: 0 ed.	utils-libelf-devel 0:01:03 ago on Fri	4 Aug 2020 0	1:01:43 PM EDT.	
Package	Architectu	re Version	Repository	Size	
Installing: elfutils-libelf-devel Installing dependenci	x86_64 es:	0.178-7.el8	BaseOS	58 k	Execute this command
zlib-devel	x86_64	1.2.11-13.el8	BaseOS	57 k	
Total download size: 1 Installed size: 171 k Is this ok [y/N]: y Downloading Package (1/2): elfutils-libelf-dev (2/2): zlib-devel-1.2.17	115 k es: /el-0.178-7.e 1-13.el8.x86	el8.x86_64.rpm _64.rpm 1	193 kB/s   58 k 89 kB/s   57 kE	 B 00:00 B 00:00 B 00:00	
Installed: elfutils-libelf-devel-0.	.178-7.el8.x	36_64 zlib-dev	/el-1.2.11-13.el	8.x86_64	
Complete! [root@localhost wmco	quain]# exit				

## Install the Missing Libraries

From the Devices menu in the VirtualBox Manage, insert the Guest Additions CD:



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### Install the Guest Additions

The installation will start, and may take awhile...

...do not close the window until you get a message that it's done.



This WILL fail if you haven't installed the libraries described earlier.

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# **New Options**

You can now resize the VirtualBox window and the display should adjust.

This may be a good time to adjust your display resolution.



At this point, I sometimes encounter problems... which are often resolved by performing several restarts of the VM... however, the vast number of different video cards makes this a bit twitchy...

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## **New Options**

The mouse and keyboard capture feature should now be automatic.

No more Right-Crtl to release them (in most cases).

You now have the ability to create a shared folder with your host OS.

That will be described shortly...

# Shutdown CentOS



It is VITAL to always shutdown correctly... improper shutdowns may render the VM unbootable!

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### **Computer Organization**

# Back it Up!!

### I recommend making a total backup of your virtual machine right now!

This gives you an emergency, pristine VM when things go wrong...



### **Computer Organization**

# Exporting a Virtual Machine

### The process creates a single file backup of your entire VM.

	?	$\times$
← Export Virtual Appliance		
Appliance settings		
Please choose a format to evolut the virtual appliance to		
The <b>Open Virtualization Format</b> supports only <b>ovf</b> or <b>ova</b> extensions. If you use the <b>ovf</b> extension, several files will be written separately. If you extension, all the files will be combined into one Open Virtualization Format archive.	use the <b>ova</b>	
The Oracle Cloud Infrastructure format supports exporting to remote cloud servers only. Main virtual disk of each selected machine will be uploa server.	ided to remo	te
Format: Open Virtualization Format 1.0		•
Please choose a filename to export the virtual appliance to. Besides that you can specify a certain amount of options which affects the size and conte archive.	ent of resultir	ig
Eile: C:\Users\William D McQuain\Documents\CentOS8_F2020.ova		
MAC Address Policy: Include only NAT network adapter MAC addresses		-
Additionally: 🗹 Write Manifest file		
Include ISO image files		
Next	Ca	ncel

I suggest tagging the name with the date you made the backup... and keeping more than one backup around.

I suggest copying the backup file to another device for safe keeping.

You can:

- use Import Appliance to reload this if your VM is damaged later
- copy this to another computer and import it to a VirtualBox installation there

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### **Computer Organization**

# Exporting a Virtual Machine

The default settings will suffice, but I usually add a Description.

	? ×
← Export Virtual Appliance	
Virtual system settings	
This is the descriptive information which will be added to the virtual appliance. You can change it by double clicking on individual lines.	
Virtual System 1	
Ref Centoss_F2020	
Product-URL	
Vendor	
Vendor-URL	
🗩 Version	
Secription Base CentOS 8 VM on ASUS laptop	
Dicense	
	Exporting Appliance: Export appliance 'C:\Users\William D McQu × Exporting to disk image 'CentOS8_F2020_base-disk001.vmdk' (2/4) 15% × 9 minutes remaining Front
Rescrie Derodics	
Back	It Up!!

# Software Updates

I recommend running a general software update at this point.

Go to the Application/System Tools menu and pick Software...



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#### **Computer Organization**

# Software Updates

Restart after the upd	ates complete			
Restart & Install Upda The system will automaticall seconds.	tes y restart and install updates in 50	Power Off The system wi	ll power off automatically in 4	40 seconds.
Cancel	Restart & Install	Cancel	Restart	Power Off
And I recommend	making another full t	backup of your ∖	/M at this poin	t.
This is a better starting	ng option if things go	wrong later.		

If everything seems to still work: Back It Up Again!!

## **Shared Folders**

The most efficient way to transfer files between your VM and the host OS is to set up a shared folder that both OSes can see.

Pick the folder you want to share; I'll use D:\vm\_share on my Windows 10 host.

In the VirtualBox Manager, click on Shared Folders and select the Add Folder button, then enter the path to the shared folder and make it permanent:

🧾 General	Shared Folders	
System Display Storage Audio	Shared Eolders       Name     Path     Auto-mount     Access       Machine Folders     Image: Constraint of the second sec	► 🧐 Add Share ? ×
Network     Serial Ports     USB     Shared Folder:     User Interface		Folder Path: D:\vm_share Folder Name: vm_share Read-only Auto-mount
	OK Cancel	Mount point: /media/vm_share
	For the mount point, specify it's in the directory /media	OK Cancel

**Computer Organization** 

## **Shared Folders**

Back in your CentOS VM, you need to add yourself to a Linux group.

Become root and do this (with YOUR username):

						wmcqu	ain@lo	calhos	st:/h	ome	/wmc	quai	n			-	•	;	×
File	Edit	View	Search	Termin	al	Help													
[wmc Pass [roo	quain( word: t@loc	@loca alhos	lhost t wmcq	~]\$ su uain]#	us	ermod -a	a-Gv	vboxs	sf w	vmcqu	uain								

If the auto-mount feature doesn't seem to be working, become root execute:

mount.vboxsf share /media/vm share

Of course, substitute the folder name you chose for vm\_share.

## **Accessing Files**

The Gnome desktop has a file manager, that is similar to those in Windows and OS X. Go to Places/Home:



# **Accessing Remote Hosts**



# Accessing Remote Hosts

### CentOS 8 Setup 43

### After logging in to the remote host...



... now I have access to my home directory on rlogin.

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### **Computer Organization**

As you use your CentOS system, you'll probably discover new tools you'd like that are not included by default.

In most cases, if you know the name of the software package you'd like to install, you can do so by running the yum tool. yum has many options and you should skim its man page.

For instance, we can use yum to determine what version of a package is installed:

	wmcquain@localhost:~	÷	۰	×
File Edit View Search Termin	al Help			
[wmcquain@localhost ~]\$ yu Installed Packages gcc.x86_64 [wmcquain@localhost ~]\$	m list installed gcc 8.3.1-5.el8.0.2	@App	Stre	am
[wmcquain@localhost ~]\$				1

### We can use yum to install or update a package:

#### [wdm@Centos65 ~]\$ yum install tree

```
. . .
```

You need to be root to perform this command. [wdm@Centos65 ~]\$ su Password:

[wmcquain@localhost ~]\$ su Password: [root@localhost wmcquain]# yum install tree

```
Resolving Dependencies
```

Dependencies Resolved

```
Transaction Summary
```

Install 1 Package

Total download size: 46 k Installed size: 87 k Is this ok [y/d/N]: y You need to be root to install or update a package:

Now I am root ... bwa ha ha!

yum has determined what needs to be installed, shown me that info, and now wants confirmation...

### **Computer Organization**

### We can use yum to install or update a package:

Downloading packages: tree-1 6 0-10 el7 x86 64 rpm   46 kB	00.00.00	yum triggers the installation
Running transaction check	00.00.00	
Running transaction test Transaction test succeeded		
Running transaction		
Installing : tree-1.6.0-10.el7.x86_64	1/1	
Verifying : tree-1.6.0-10.el7.x86_64	1/1	
Installed:		
tree.x86_64 0:1.6.0-10.el7		
Completel		
[root@localhost wmcquain]# exit		Now I will cease to be root
		hat much privilege can be
		dangerous.

### I've noticed that CentOS 8 actually includes the tree command by default.

**Computer Organization** 

Sometimes yum cannot find a package:	
root@localhost wmcquain]# yum install gear Loaded plugins: fastestmirror, langpacks Loading mirror speeds from cached hostfile * base: mirror.es.its.nyu.edu * extras: mirror.team-cymru.com * updates: mirror.math.princeton.edu No package geany available. Error: Nothing to do	yum queries a collection of online repositories in this case it doesn't
	find the package I wanted.

It's possible to direct yum to search additional repositories...

### CentOS 8 Setup 48

## Adding a Repository

[root@localhost	[root@localhost wmcquain]# yum install epel-release									
Resolving Dependencies										
Dependencies I	Resolved									
Package	Arch	Version	Repository	Size						
Installing: epel-release	noarch	7-11	extras 1	l5 k						
Transaction Su	mmary									
Install 1 Packa	ge			Here I'm adding another common						
Total download Installed size: 2 Is this ok [v/d/N	size: 15 k 4 k 1: v			repository to those yum queries by default.						
Downloading pa	ackages:									

# **Installing Geany**

root@localhost wn  Dependencies Res	ncquain]# yu solved	Here, I'm installing a programmer's editor, geany.				
Package	Arch	Version	Repos	itory Size		
Installing: geany Installing for dependence	x86_64 ndencies:	1.31-3.el7	epel	2.5 M		
geany-ingeany	x86 64 1	31-3 el7 e	enel	1 0 M		
vte3	x86_64	0.36.5-1.el7	base	337 k		
Transaction Summ	nary					
Install 1 Package	(+2 Depend	ent packages	====== 6)			
Total download siz Installed size: 13 M Is this ok [y/d/N]: y	e: 3.8 M /					

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**Computer Organization** 

# Additional Stuff: Geany

### geany is a programmer-oriented editor:

<b>1</b>	driver.c - /home/wdm/2506/CSet/code - Geany _ 🗆 🛛 🗙
File Edit Search View Documen	nt Project Build Tools Help
<u> </u>	
Symbols Documents	driver.c 🗶
✓ Iunctions ✓ CSet_Display [11] ✓ CSet_Display [126] Ø main [13]	<pre>1 #include <stdin.h> 2 #include <stdint.h> 3 #include <stdint.h> 4 #include <stdbool.h> 5 #include <stdbool.h> 6 #include <stdlib.h> 7 8 #include "TestCSet.h" 9 #include "TestCSet.h" 10 11 void CSet_Display(const CSet* const pSet, FILE* Out); 12 13 Dint main(int argc, char** argv) { 14 FILE* Log = NULL; 15 FILE* Log = NULL; 16 unsigned int Seed; 17 18 D if ( argc &gt; 1 ) { 19 Seed = (unsigned int) time( NULL ); 19 FILE* fp = fopen("Seed.txt", "w"); 20 FILE* fp = fopen("Seed.txt", "w"); 21 fprint(fp, "%d\n", Seed); 22 fclose(fp); 23 Log = fopen("profSummary.txt", "w"); 24 setProfMode(); 25 } 26 D else { 27 mm &gt;&gt;</stdlib.h></stdbool.h></stdbool.h></stdint.h></stdint.h></stdin.h></pre>
line: 1 / 141 col: 0 sel: 0 INS	S SP mode: Win (CRLF) encoding: UTF-8 filetype: C scope: unknown

It's my (current) favorite text editor for programming on Linux.

It's also available for Windows.

### **Computer Organization**

## **Useful Libraries**

By default, 64-bit Linux distros do not install some libraries that are needed in order to compile 32-bit binaries.

We may want that capability later on. The following worked for me:

root@localhost wmcquain]# yum install glibc-devel.i686 libgcc.i686

Others have reported success with:

root@localhost wmcquain]# yum install glibc-devel.i686 libgcc.i686 libstdc++-devel.i686 ncursesdevel.i686

• • •

# Configuring the Terminal

### The Terminal application provides some options for customization:

				wmcquain	@localhost:~				-	• ×					
File E	dit View S	Search T	erminal	Help						1					
wmc	Copy Copy as H <sup>-</sup>	SI TML													
	Paste	Sh	nift+Ctrl+	V					Pref	ferences -	- Profile	e "Unnamed	"		
	Select All				le	Global		Text	Colors	Scrolling	C	ommand	Compatibi	lity	
	Preference	es N			m	Cananal		Text Appea	arance						
		ΝS				General		Initial terr	minal size:	90	- +	columns	30 —	+ rows	Reset
						Shortcuts		Custo	om font:				iospace Regi		12
(						Profiles	+	Cell spac	ing:	1.00	- +	× width	1.00 —	+ × height	Reset
						Unnamed	<ul> <li>▼</li> </ul>	Allow blir	nking text:	Always					-
							Clone	ursor							
							Rename	Cursor sh	nape:	Block					•
					$\longrightarrow$		Set as defau	Cursor bl	linking:	Default					~
								Jound							
								✓ Termi	inal dell						
												Profile ID:	b1dcc9dd-5	262-4d8d-a863-c	897e6d979b
re, I	'm ren	amin	g the	e defaul	t	Help									Close
min	al Prof	file	J												

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### **Computer Organization**

# Configuring the Terminal

As you may have noticed, I prefer to reset the Terminal colors:

	Preferences - Profile "Standard"	_ ×
Global	Text Colors Black on light yellow Compatibility	
General	Text and Background Black on white Use colors from Gray on black	
Shortcuts	Built-in schemes: Green on black	
Profiles +	White on black	
Standard 😔 👻	Bold color: Tango dark	
	Solarized light Cursor color: Solarized dark	
	Highlight color: Custom	
	Transparent background	
	Palette	
	Built-in schemes: Tango	•
	Color palette:	
	✔ Show bold text in bright colors	
Help		Close

I also reset the default number of rows and columns... feel free to experiment.

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# Configuring the Terminal

	e Run command as a login shell .
	Preferences – Profile "Standard" _ ×
Global	Text Colors Scrolling <b>Command</b> Compatibility
General	Title
Shortcuts	When terminal commands set their own titles: Replace initial title
Profiles +	Command
Lecture	Run command as a login shell Run a custom command instead of my shell
Standard 📀 👻	Custom command:
	When command exits: Exit the terminal 👻
Help	Close

This makes sure that configuration changes in .bashrc and .bash\_profile take effect when you open a new terminal session.

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