

information technology & management

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**INTRO TO OPEN SOURCE**

ILLINOIS INSTITUTE OF TECHNOLOGY

# Installing Linux & Basic Usage

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Information Technology & Management  
Programs

**School of Applied Technology**

# Objectives

- ◆ Prepare for and install Fedora Linux using best practices
- ◆ Outline the structure of the Linux interface
- ◆ Enter basic shell commands and find command documentation
- ◆ Properly shut down the Linux operating system

# Preparing for Linux Installation

- ◆ All OSs require a minimum set of hardware components to function properly
  - Can be obtained from manual or file in DVD of OS, or from vendor website
- ◆ Each individual hardware component should be checked against the Hardware Compatibility List (HCL) found on the vendor's Web site

# Preparing for Linux Installation

- ◆ You can check your hardware compatibility with the following sites
  - <http://www.fsf.org/resources/hw>
  - <http://www.linux-drivers.org/>

# Preparing for Linux Installation

- ◆ Fedora minimum requirements:
  - 6GB free disk space
  - 2GB RAM
- ◆ Fedora recommended requirements
  - More than 6GB
  - 2GB+
  - One processor core/thread for virtualization
- ◆ The better the CPU/more RAM and dedicated GPU will run much better

# Preparing for Linux Installation

- ◆ Identify configuration settings for the Linux operating system
  - Computer's host name
  - Network configuration parameters
  - Specific software packages to be installed
- ◆ Create pre-installation checklist to document hardware and software information

# Sample Preinstallation Checklist

Hardware or Software Item	Description
<b>CPU (Type &amp; MHz)</b>	Intel Core i9-7900X @ 3.30GHz
<b>RAM (MB)</b>	32GB
<b>Keyboard model &amp; layout</b>	Corsair Gaming K70 LUX RGB Mechanical Keyboard
<b>Mouse model &amp; device</b>	Logitech G502 Proteus Spectrum
<b>Hard disk type (Primary Master, etc.)</b>	Primary Master
<b>Hard disk size (GB)</b>	1TB
<b>Hostname</b>	itmo456.iit.edu
<b>Network Card Internet Protocol Configuration (IP Address, Netmask, Gateway, DNS Servers, DHCP)</b>	DHCP: not used IP Address: 192.168.6.188 Netmask: 255.255.255.0 Gateway: 192.168.6.1 DNS Servers: 200.10.2.1, 200.10.82.79
<b>Packages to install</b>	Gnome desktop      Squid      Apache Samba                  GIMP      Emacs
<b>Video card make and model</b>	Acer XG270HU 27" 1ms 144HZ
<b>Video card RAM (MB)</b>	8GB
<b>Monitor make &amp; model</b>	Samsung Synchmaster 551s

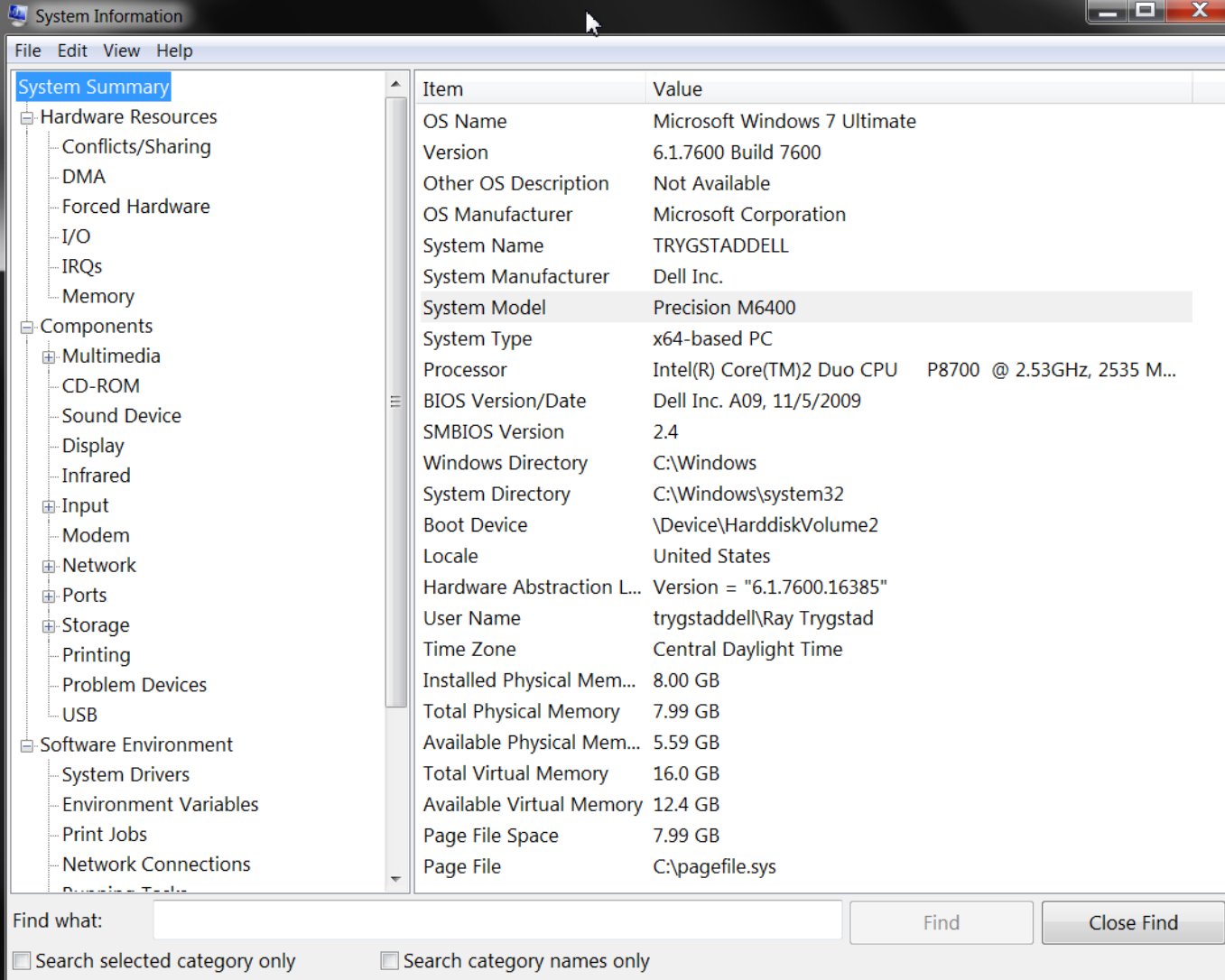
# Gathering Hardware Information

- ◆ Tools and resources to check hardware against a preinstallation checklist:
  - Computer manuals
  - Windows System Information tool (if Windows already installed)
  - Windows Device Manager (if Windows already installed)



# Gathering Hardware Information

**The  
Windows  
System  
Information  
tool – Win 7**



The screenshot displays the Windows System Information window. The left pane shows a tree view with 'System Summary' selected. The right pane lists various system details in a table format.

Item	Value
OS Name	Microsoft Windows 7 Ultimate
Version	6.1.7600 Build 7600
Other OS Description	Not Available
OS Manufacturer	Microsoft Corporation
System Name	TRYGSTADDELL
System Manufacturer	Dell Inc.
System Model	Precision M6400
System Type	x64-based PC
Processor	Intel(R) Core(TM)2 Duo CPU P8700 @ 2.53GHz, 2535 M...
BIOS Version/Date	Dell Inc. A09, 11/5/2009
SMBIOS Version	2.4
Windows Directory	C:\Windows
System Directory	C:\Windows\system32
Boot Device	\Device\HarddiskVolume2
Locale	United States
Hardware Abstraction L...	Version = "6.1.7600.16385"
User Name	trygstaddell\Ray Trygstad
Time Zone	Central Daylight Time
Installed Physical Mem...	8.00 GB
Total Physical Memory	7.99 GB
Available Physical Mem...	5.59 GB
Total Virtual Memory	16.0 GB
Available Virtual Memory	12.4 GB
Page File Space	7.99 GB
Page File	C:\pagefile.sys

Find what:  Find Close Find

☐ Search selected category only ☐ Search category names only

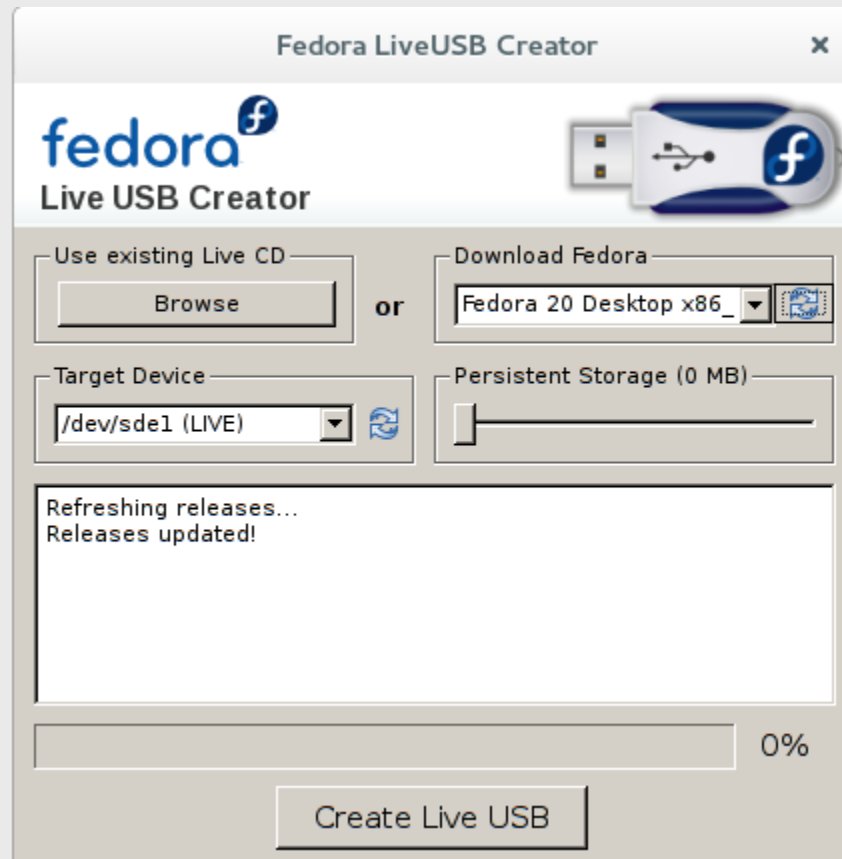
# Understanding Installation Media

- ◆ The most common source for Linux packages and installation program is DVD media
  - To install from DVD, place the Linux DVD in the DVD drive and turn on the computer
- ◆ Most Linux distributions provide a Web site from which you can download DVD images (called ISO images)
  - Can be written to a blank writable DVD using disc burning software

# Understanding Installation Media

- ◆ Many Linux Web sites also allow you to download a bootable live media DVD image
  - A fully functional graphical Linux OS is loaded into RAM
  - Allows you to test the OS on your computer to ensure all hardware drivers were detected properly
- ◆ If computer does not have a DVD drive
  - Install Linux by imaging the DVD or live media DVD image to a USB flash drive

# Understanding Installation Media



Fedora LiveUSB Creator

# Virtualization Software

- ◆ Virtualization software
  - Used to run an OS within an existing OS concurrently
- ◆ Virtualization software products available:
  - Microsoft Hyper-V
  - VMWare
  - Oracle VM VirtualBox

# Virtualization Software

- ◆ Virtual machine (VM guest)
  - Each OS that is run within virtualization software
- ◆ Virtual machine host (VM host)
  - The underlying OS running the virtualization software

# Understanding Installation Media

- ◆ To install Linux as a VM
  - Download the standard DVD or live media DVD ISO image to a directory on your VM host
  - Open virtualization software and choose to create a new virtual machine
  - Specify the location of the appropriate ISO image
  - Virtualization software will boot from the ISO image directly

# Performing the Installation

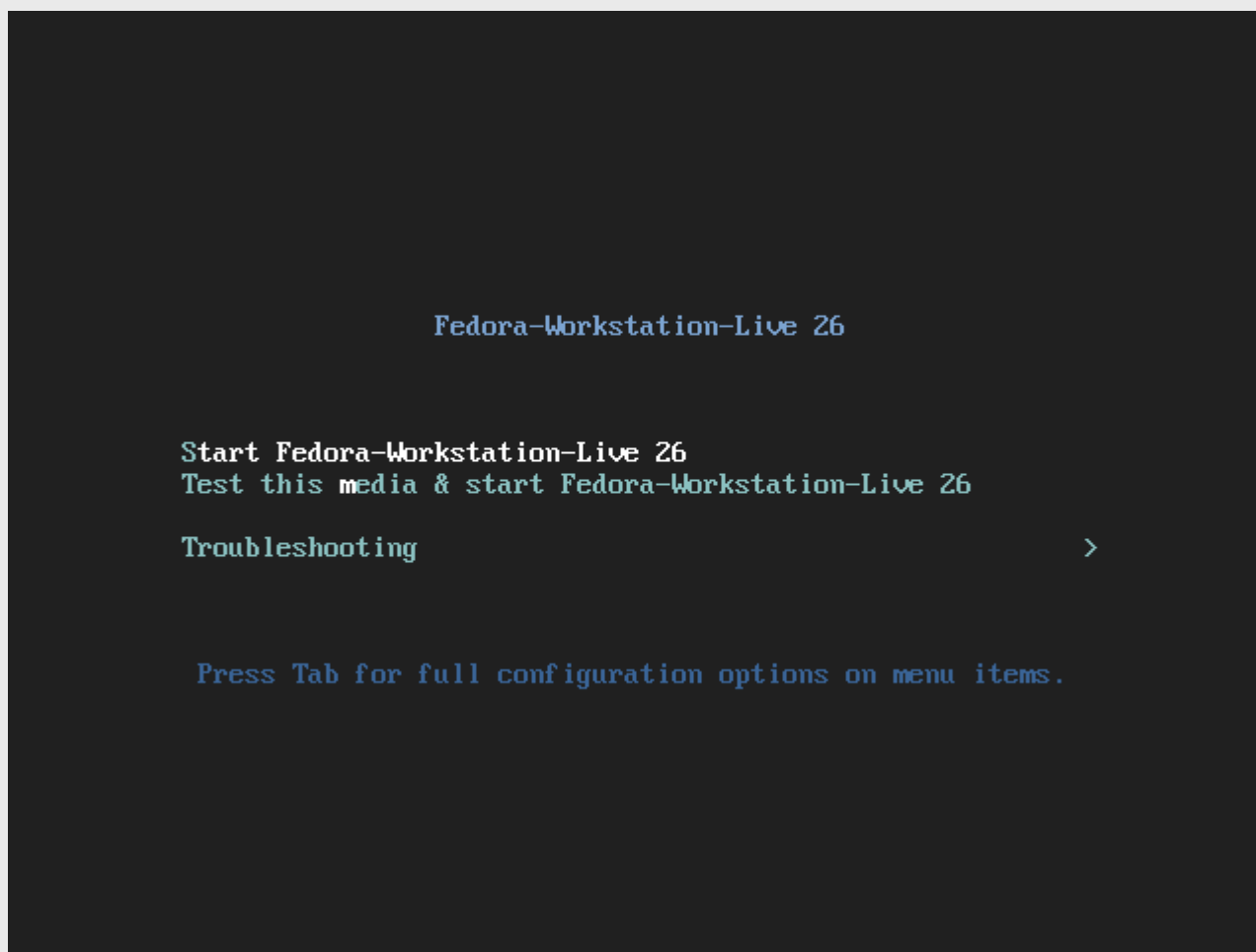
- ◆ The installation program for Fedora Linux involves the following general stages:
  - Starting the installation
  - Choosing an installation language as well as localization and system options
  - Configuring disk partitions and filesystems
  - Configuring user accounts



# Starting the Installation

- ◆ Boot from Fedora Linux DVD
- ◆ You will be prompted to:
  - Start the installation
  - Perform troubleshooting actions
- ◆ If you select the troubleshooting option, you will be presented with four additional options
  - *Start Fedora Live in basic graphics mode*
  - *Test this media & start Fedora Live*
  - *Run a memory test*
  - *Boot from local drive*

# Starting the Installation

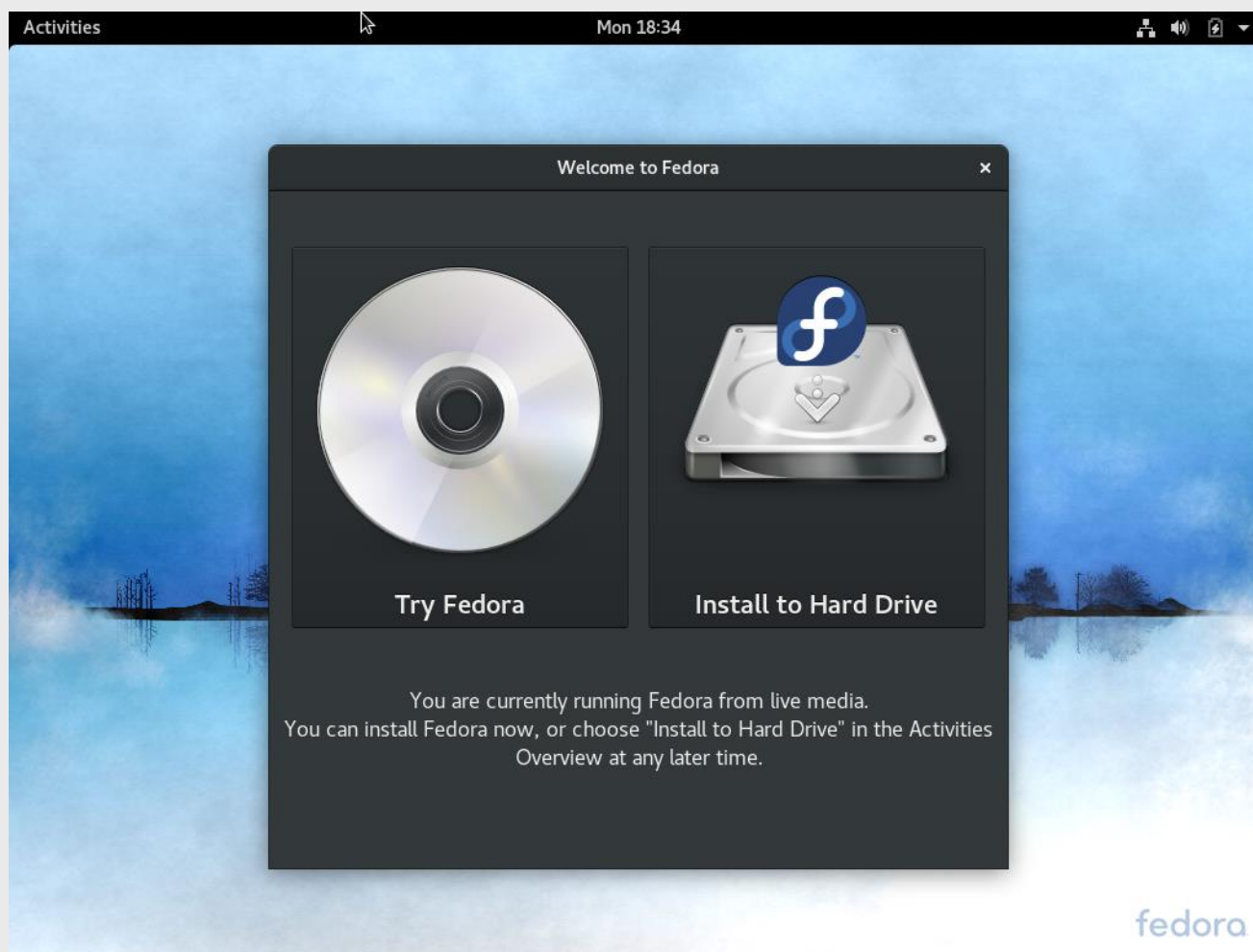


Beginning a Fedora installation

# Starting the Installation

- ◆ In most cases, the troubleshooting options are not necessary when installing Fedora Linux
- ◆ Simply choose *Start Fedora Live* to start a live Fedora system
  - Once loaded, you will be presented with a welcome screen that prompts you to install Fedora Linux on permanent storage
- ◆ If you choose *Install to Hard Drive*, the Fedora installation program will start

# Starting the Installation



# Installation Language & System Options

- ◆ You will be prompted to choose installation language
- ◆ Keyboard model and layout automatically detected
- ◆ Network interface is set to obtain network configuration automatically using the DHCP protocol
- ◆ Date and time are automatically obtained from the Internet
  - If your network has Internet connectivity

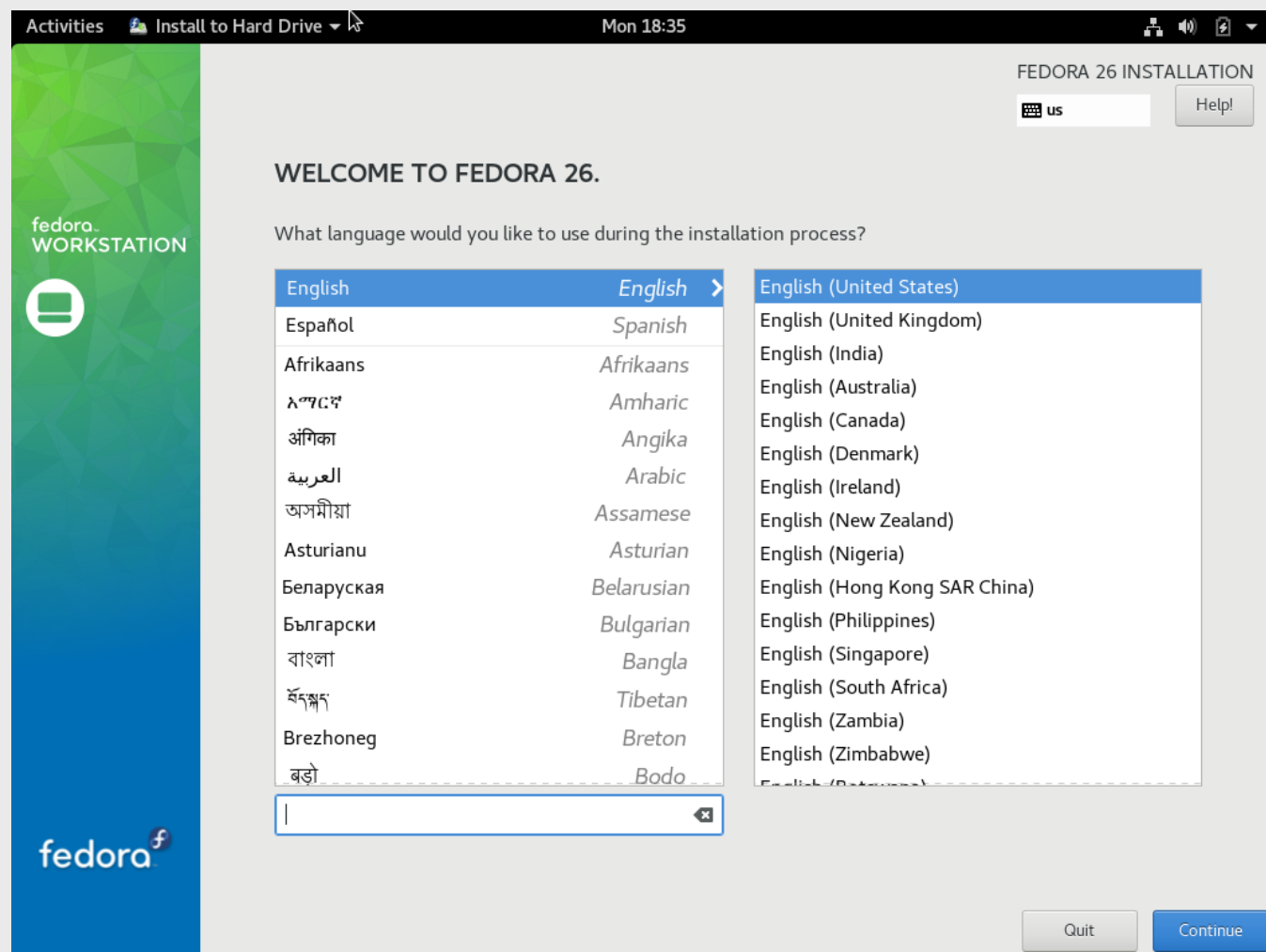
# Choosing Language and Keyboard

- ◆ Allowed to choose installation language
- ◆ Choose keyboard configuration
  - Keyboard model and layout automatically detected

# Choosing Storage Type

- ◆ Select types of storage devices used to host the Linux OS
  - For internal or locally attached hard drive installation, select Basic Storage Devices
  - For installation on SAN, select Specialized Storage Devices

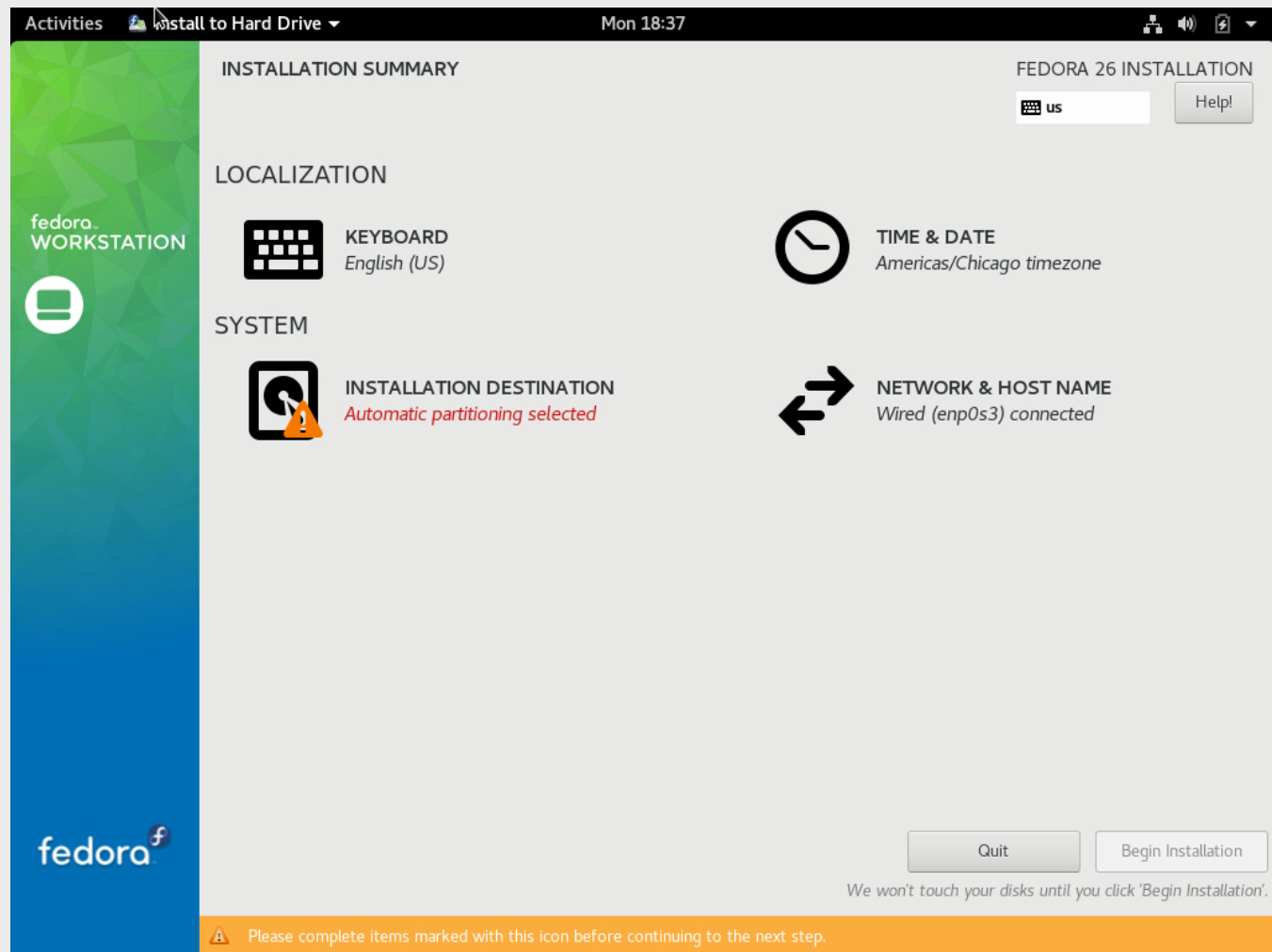
# Choosing Language & Keyboard



Selecting an installation language



# Installation Language & Options



Main Fedora installation menu

# Installation Language & Options

- ◆ You must manually select an installation destination before installation can continue
  - Select a permanent storage device that will contain the Linux OS
  - For internal or locally attached hard drive installation, select **Local Standard Disks**
  - For installation on SAN or DASD, select **Specialized & Network Disks**

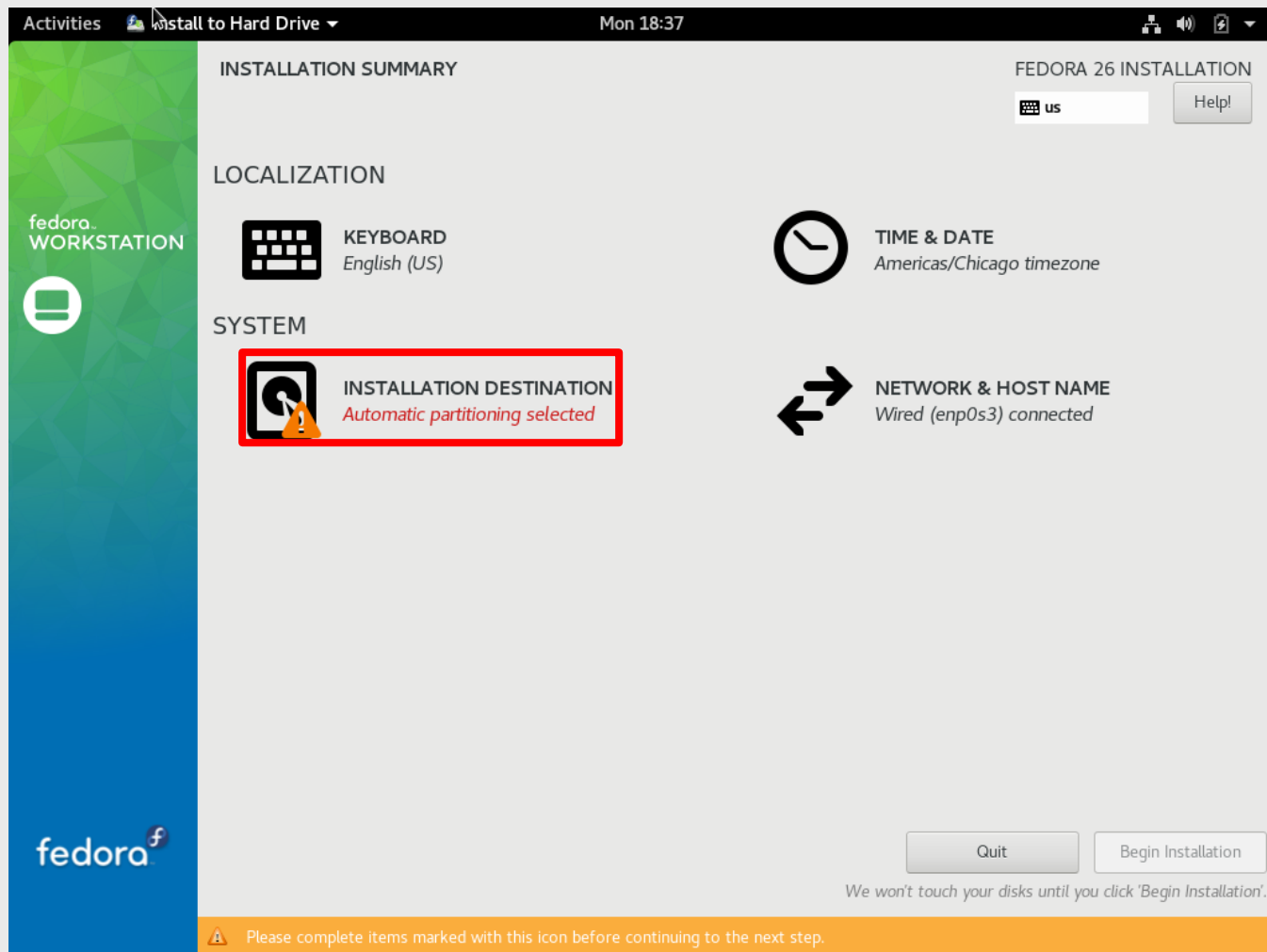
# Installation Language & Options

- ◆ Most common storage devices for storing Linux OS are hard disks
  - Parallel Advanced Technology Attachment (PATA)
  - Serial Advanced Technology Attachment (SATA)
  - Small Computer Systems Interface (SCSI)

# Installation Language & Options

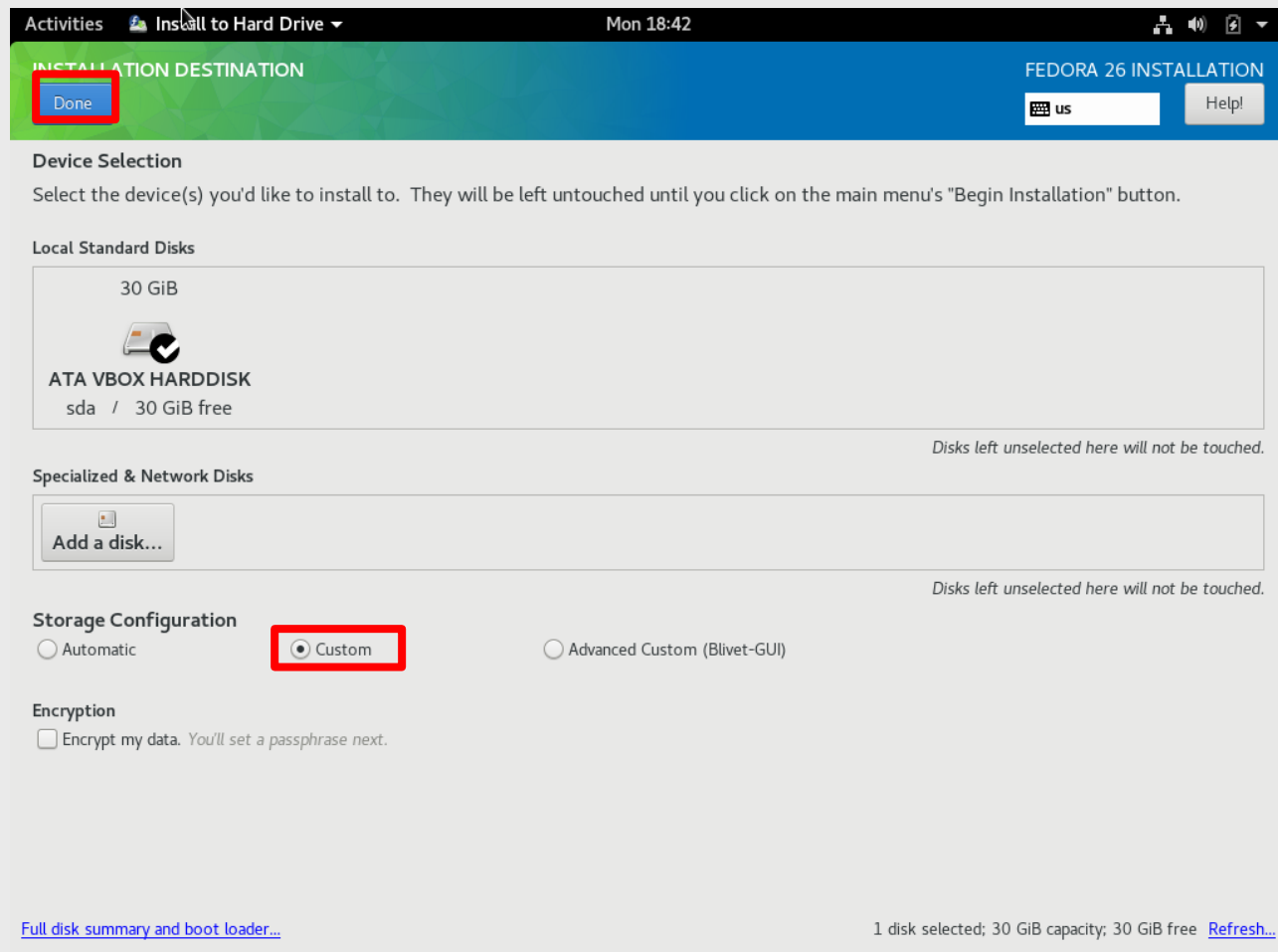
- ◆ Click on Installation Destination icon
  - You will see a list of all permanent storage devices in your system
  - If you have multiple disk devices, select the disk that will be used to contain Linux
- ◆ You can also install Linux on an external Storage Area Network (SAN), Direct Access Storage Device (DASD), or firmware Redundant Array of Inexpensive Disks (RAID) device

# Configuring Storage Devices



Initial drive detection/setup

# Configuring Storage Devices



Initial drive configuration

# Configuring Storage Devices

- ◆ Each hard disk is divided into partitions
  - Partitions are formatted with filesystems
    - Filesystem is a structure that specifies how data should reside on the hard disk
  - Maximum four primary partitions
  - Extended partition can be divided into logical drives
- ◆ Master Boot Record (MBR): a table of all partition information for a certain hard disk or SSD

# Configuring Storage Devices

Description	Linux Name	Windows Name
First primary SATA disk	sda	
First primary partition on the primary master SATA HDD	sda1	C:
Second primary partition on the primary master SATA HDD	sda2	D:
Third primary partition on the primary master SATA HDD	sda3	E:
Fourth primary partition on the primary master SATA HDD (EXTENDED)	sda4	F:
First logical drive in the extended partition on the primary master SATA HDD	sda5	G:
Second logical drive in the extended partition on the primary master SATA HDD	sda6	H:
Third logical drive in the extended partition on the primary master SATA HDD	sda7	I:

Example of a partitioning scheme for a primary master  
SATA hard disk



# Configuring Storage Devices

- ◆ Filesystems can be accessed by Linux if attached (mounted) to a certain directory
- ◆ Fedora installation program can automatically create partitions
  - Generally a good practice to manually partition
- ◆ Linux typically requires only two partitions
  - Partition mounted to the root directory
  - Partition for virtual memory (swap memory)
    - Area on hard disk used to store information normally residing in physical memory (RAM)
  - These are minimum required, not ideal

# Configuring Storage Devices

Directory	Description	Recommended Size
/	Root (primary) partition; contains all directories not present on other filesystems	Depends on size & number of other filesystems present, but is typically 10GB or more
/boot	Contains the Linux kernel and boot files	500MB
/home	Default location for user home directories	200MB per user
/usr	System commands and utilities	Depends on the packages installed—typically 20GB or more
/usr/local	Location for most additional programs	Depends on packages installed—typically 20GB or more
/opt	An alternate location for additional programs (Solaris-style)	Depends on the packages installed—typically 20GB or more
/var	Contains log files and spools	Depends on whether the Linux system is used as a print server (which contains a large spool). For print servers 10GB or more is typical. For other systems 2GB or more is usually sufficient.
/tmp	Holds temporary files created by programs	500MB

# Configuring Storage Devices

- ◆ Different types of filesystems
  - Ext2: Used on most Linux computers
  - Ext3: Performs journaling
  - Ext4: Performs journaling w/checksums
    - Backward compatible with ext3 and ext2
    - Supports 64-bit storage limits
    - Fedora default
- ◆ Journaling: keeps track of the information written to the hard drive in a data structure known as a journal, typically a circular log

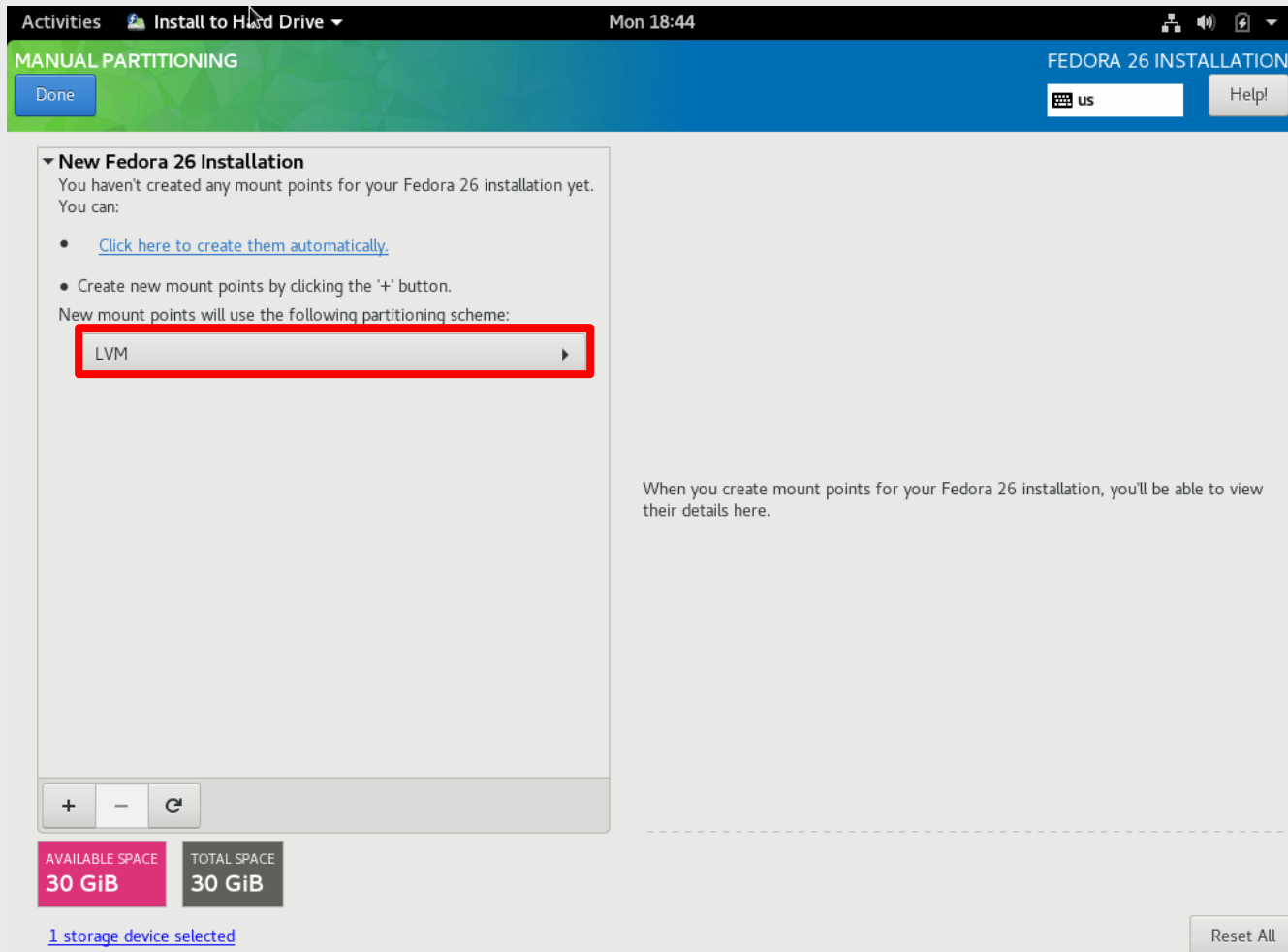
# Configuring Storage Devices

- ◆ Once an installation destination has been selected, the installation program will prompt you to choose:
  - The partitioning scheme
  - Whether the number and type of disk partitions should be configured automatically
  - If partition contents should be automatically encrypted

# Configuring Storage Devices

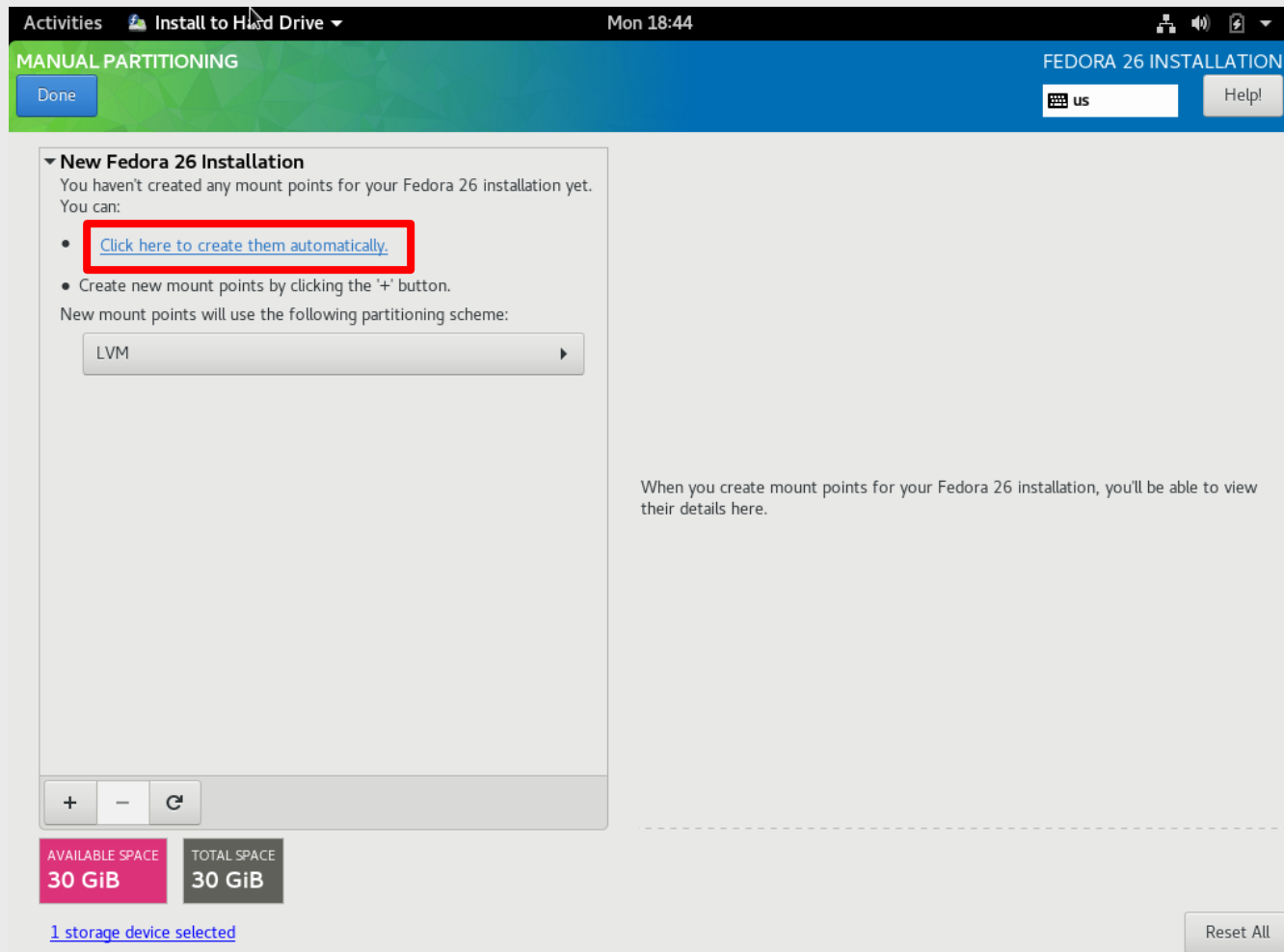
- ◆ Instead of standard partitions, you can choose a partition scheme that creates logical volumes:
  - Using the Logical Volume Manager (LVM)
  - Easy to expand/reduce volumes while disks are online – no reboots
  - Much easier to manage vs standard partitions

# Configuring Storage Devices



Selecting disk partitioning options (LVM)

# Configuring Storage Devices



Partitions can be created automatically

# Configuring Storage Devices

The screenshot shows the 'MANUAL PARTITIONING' screen for a new Fedora 26 installation. The interface is divided into two main sections. On the left, a list of partitions is shown under the heading 'New Fedora 26 Installation'. The partitions are: SYSTEM (/boot, sda1, 1024 MiB), / (fedora-root, 26 GiB), and swap (fedora-swap, 3 GiB). The '/' partition is selected. Below this list are buttons for adding (+), removing (-), and refreshing (circular arrow) partitions. At the bottom left, a summary shows 'AVAILABLE SPACE 1023 KiB' and 'TOTAL SPACE 30 GiB', with a note '1 storage device selected'. On the right, the configuration details for the selected 'fedora-root' partition are shown. These include: Mount Point (/), Device(s) (ATA VBOX HARDDISK (sda)), Desired Capacity (26 GiB), Device Type (LVM), File System (ext4), Volume Group (fedora), and Name (root). There are 'Modify...' buttons for Device(s), Volume Group, and Name. A 'Reformat' checkbox is checked. At the bottom right, there is an 'Update Settings' button and a note: 'Note: The settings you make on this screen will not be applied until you click on the main menu's 'Begin Installation' button.' A 'Reset All' button is also present at the very bottom right.

Activities Install to Hard Drive Mon 18:54

MANUAL PARTITIONING Done FEDORA 26 INSTALLATION Help!

▼ New Fedora 26 Installation

SYSTEM  
/boot sda1 1024 MiB  
/ fedora-root 26 GiB  
swap fedora-swap 3 GiB

+ - ↻

AVAILABLE SPACE 1023 KiB TOTAL SPACE 30 GiB

[1 storage device selected](#)

fedora-root

Mount Point: / Device(s): ATA VBOX HARDDISK (sda)  
Desired Capacity: 26 GiB

Device Type: LVM ☐ Encrypt Volume Group: fedora (0 B free)  
File System: ext4 ☒ Reformat

Label: Name: root

Update Settings

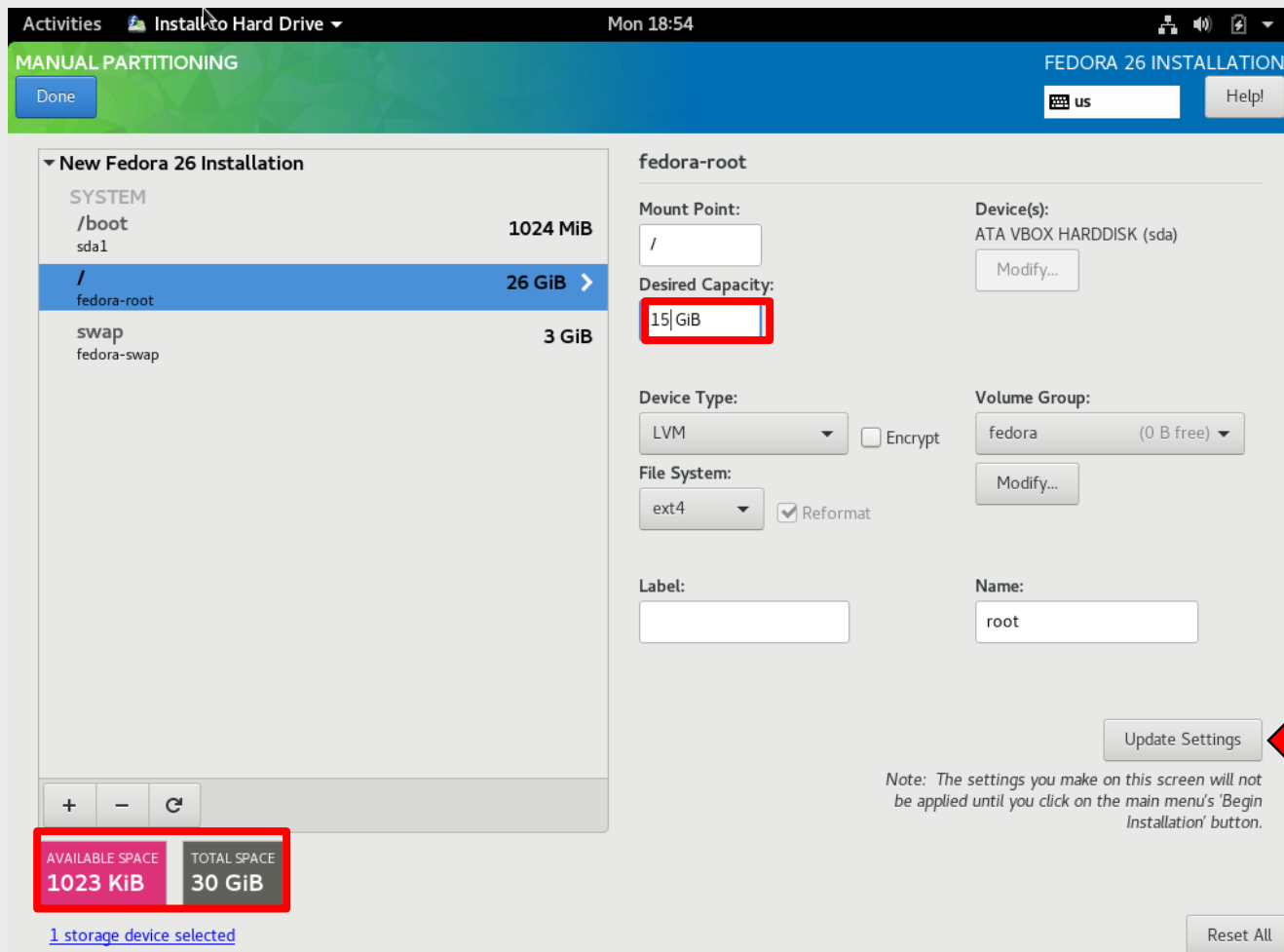
Note: The settings you make on this screen will not be applied until you click on the main menu's 'Begin Installation' button.

Reset All

Default partitions

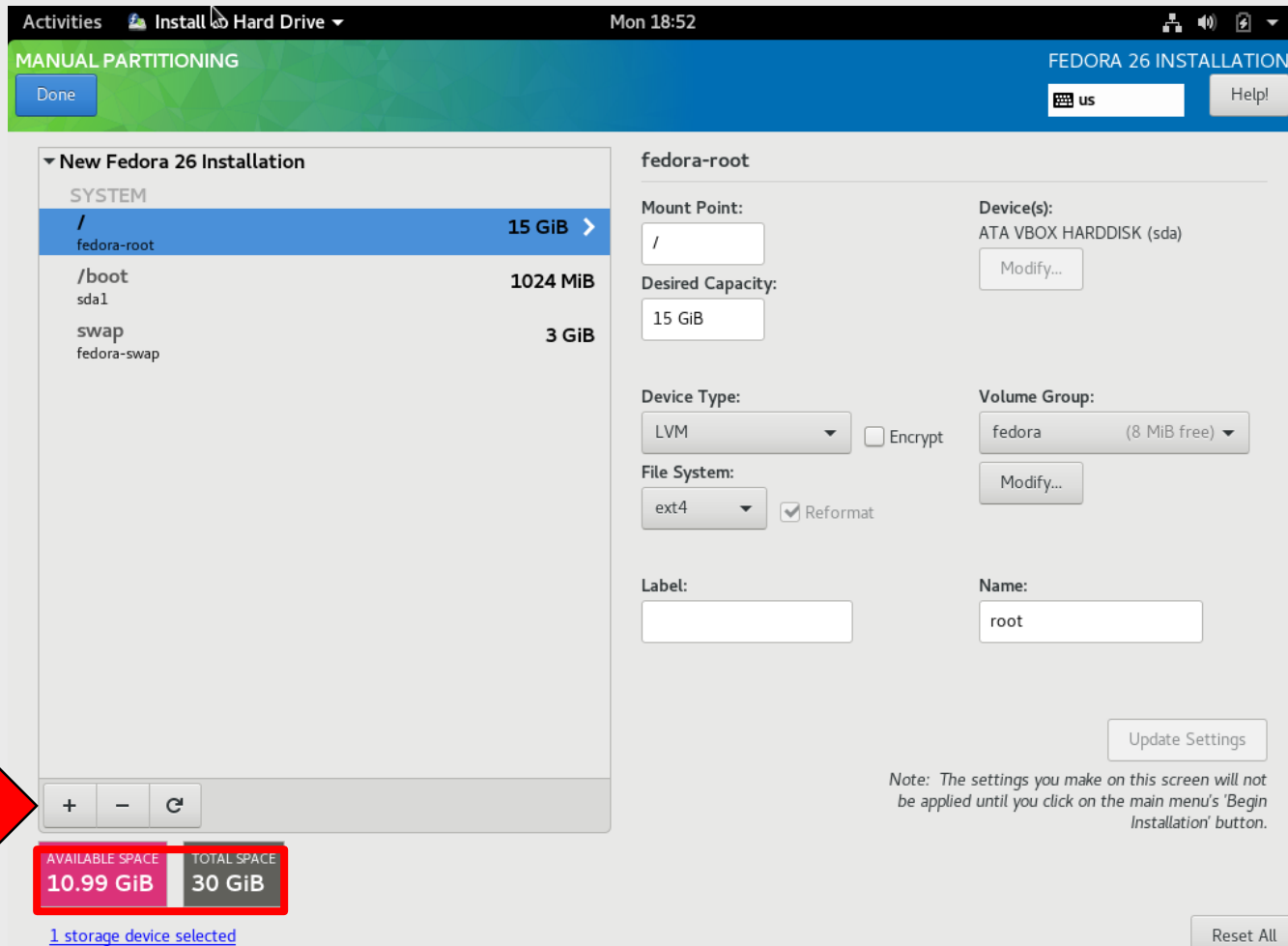


# Configuring Storage Devices



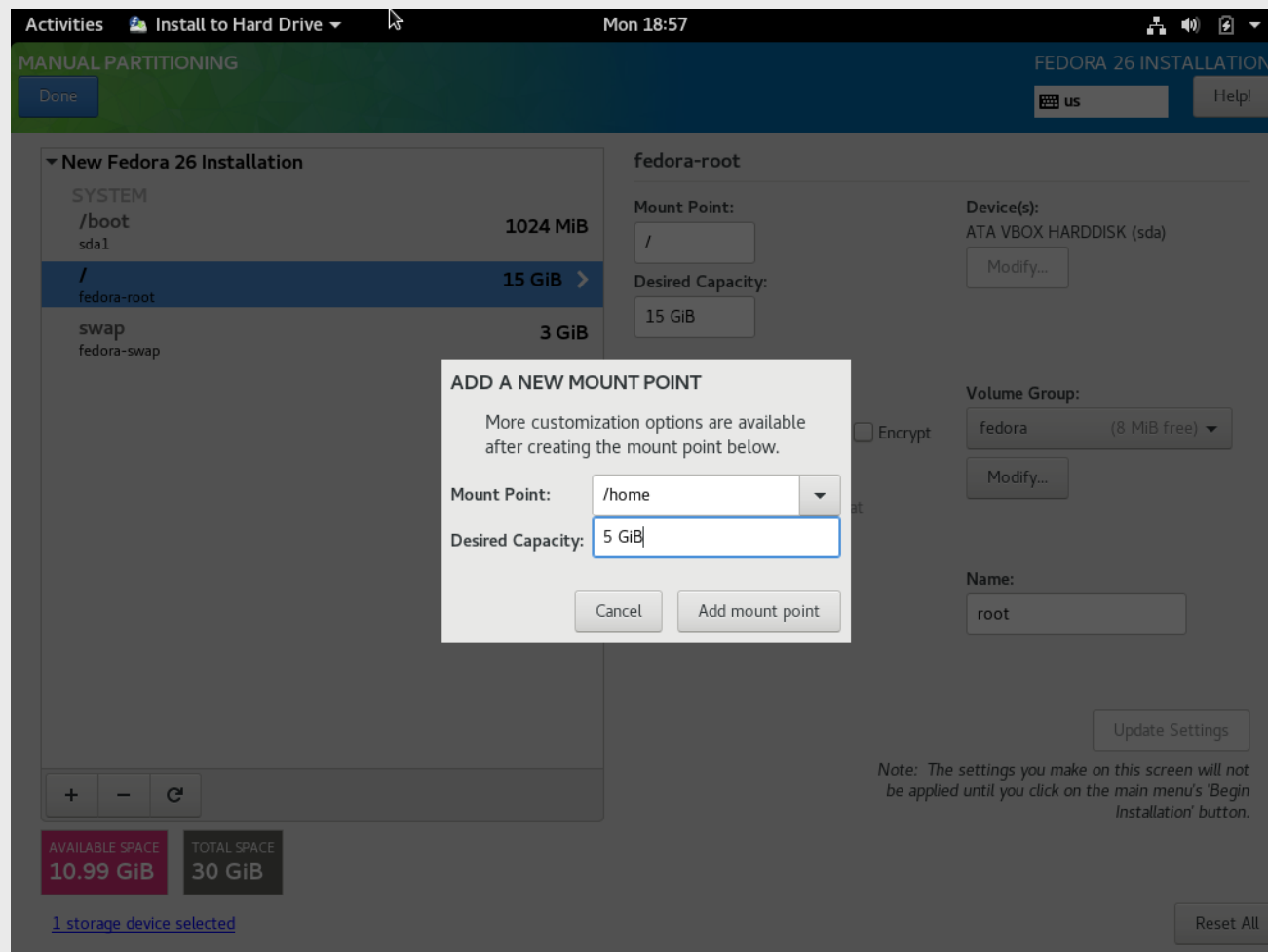
Reducing partition capacity

# Configuring Storage Devices



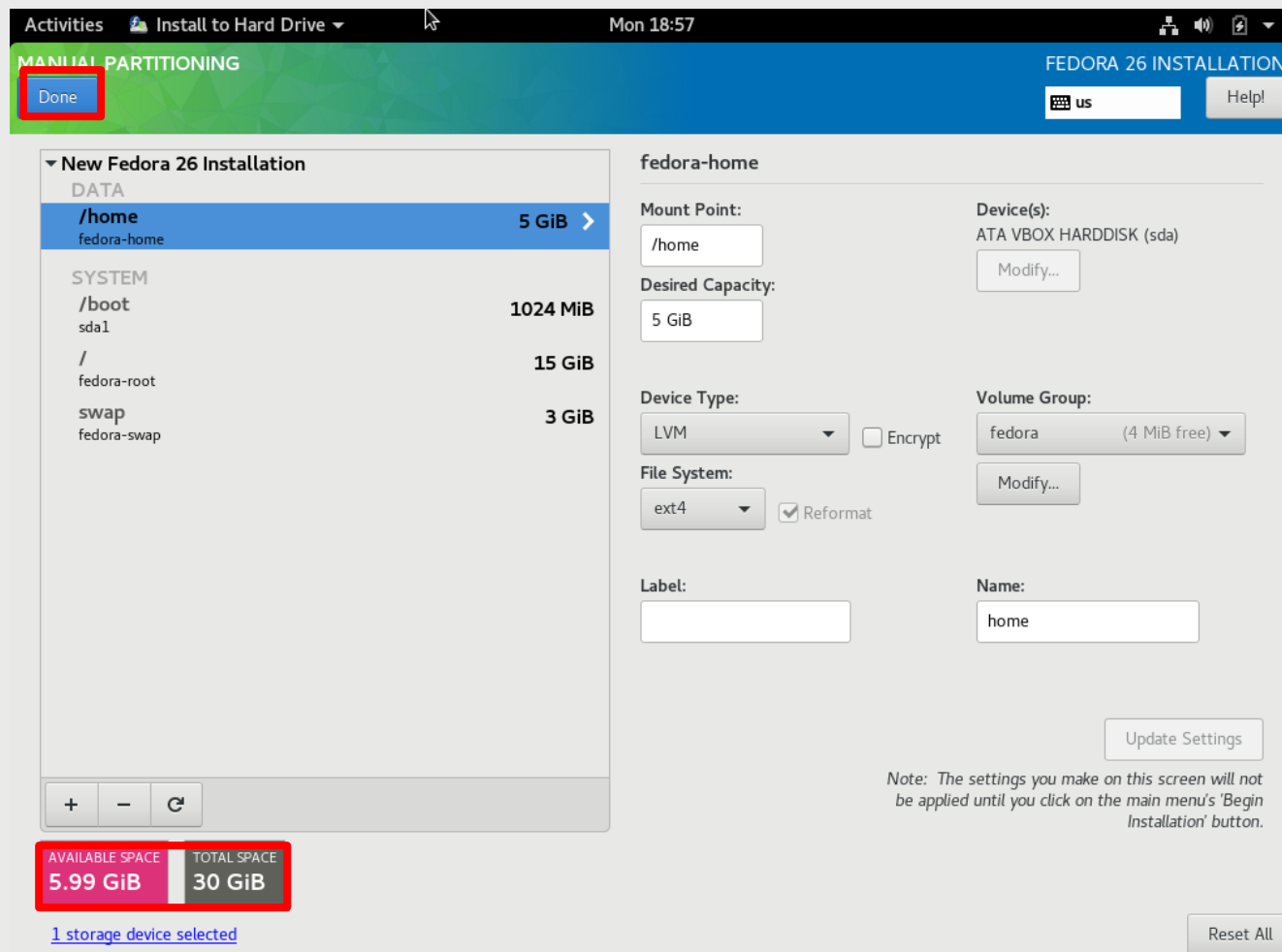
Adding an additional partition

# Configuring Storage Devices



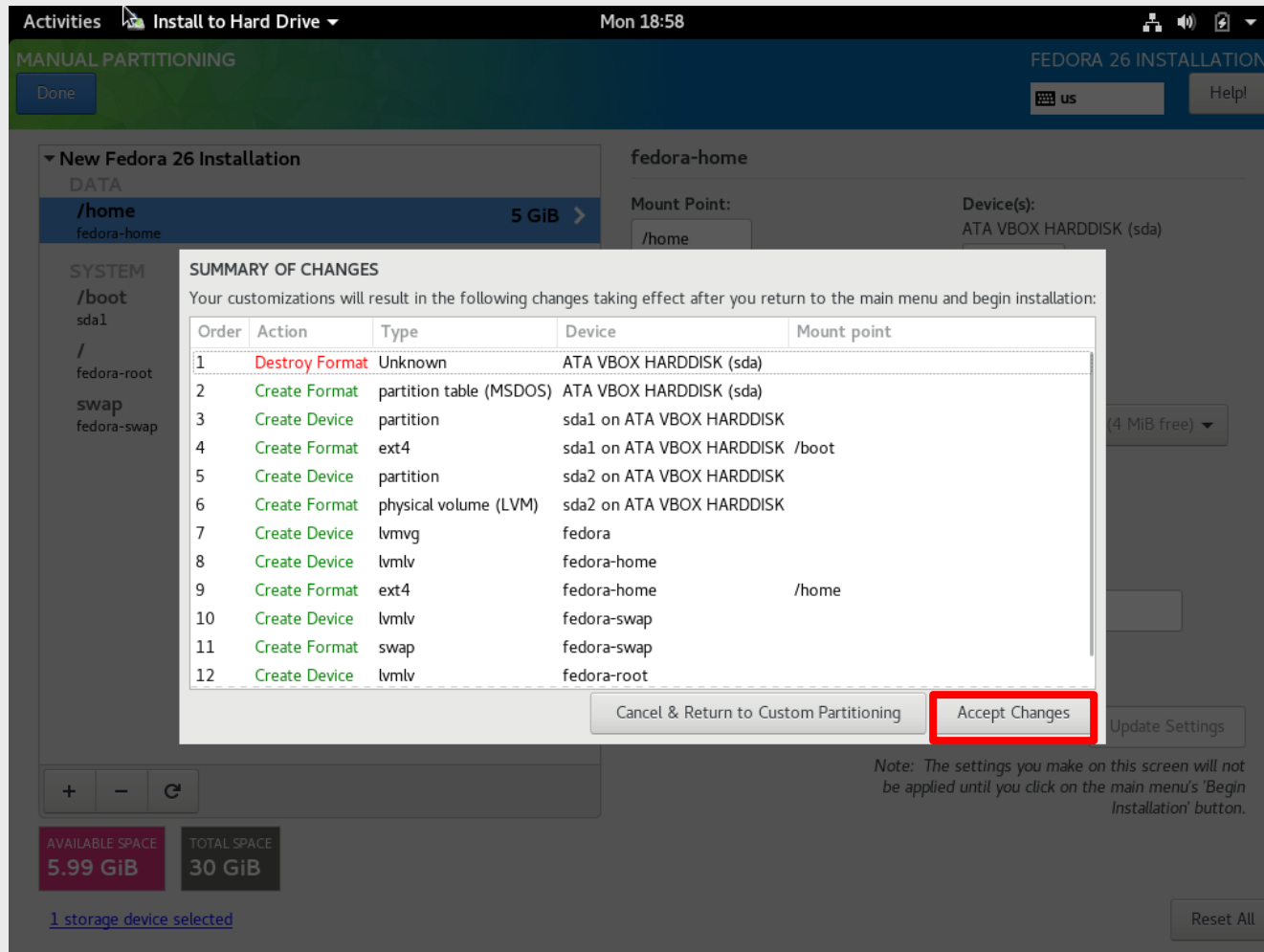
Select mount point and capacity

# Configuring Storage Devices



Leaving free space for later

# Configuring Storage Devices

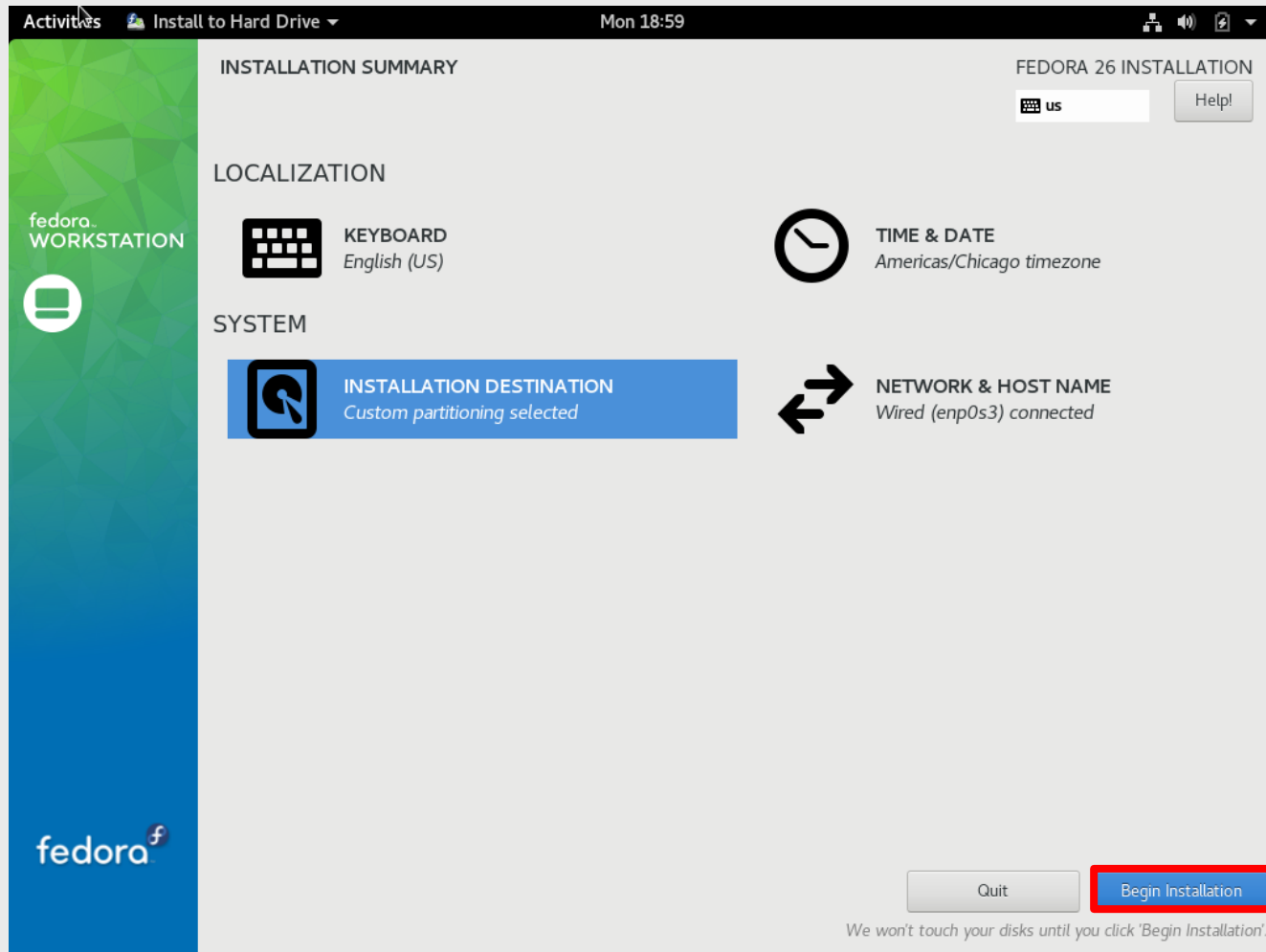


Accept the changes we have made

# Configuring User Accounts

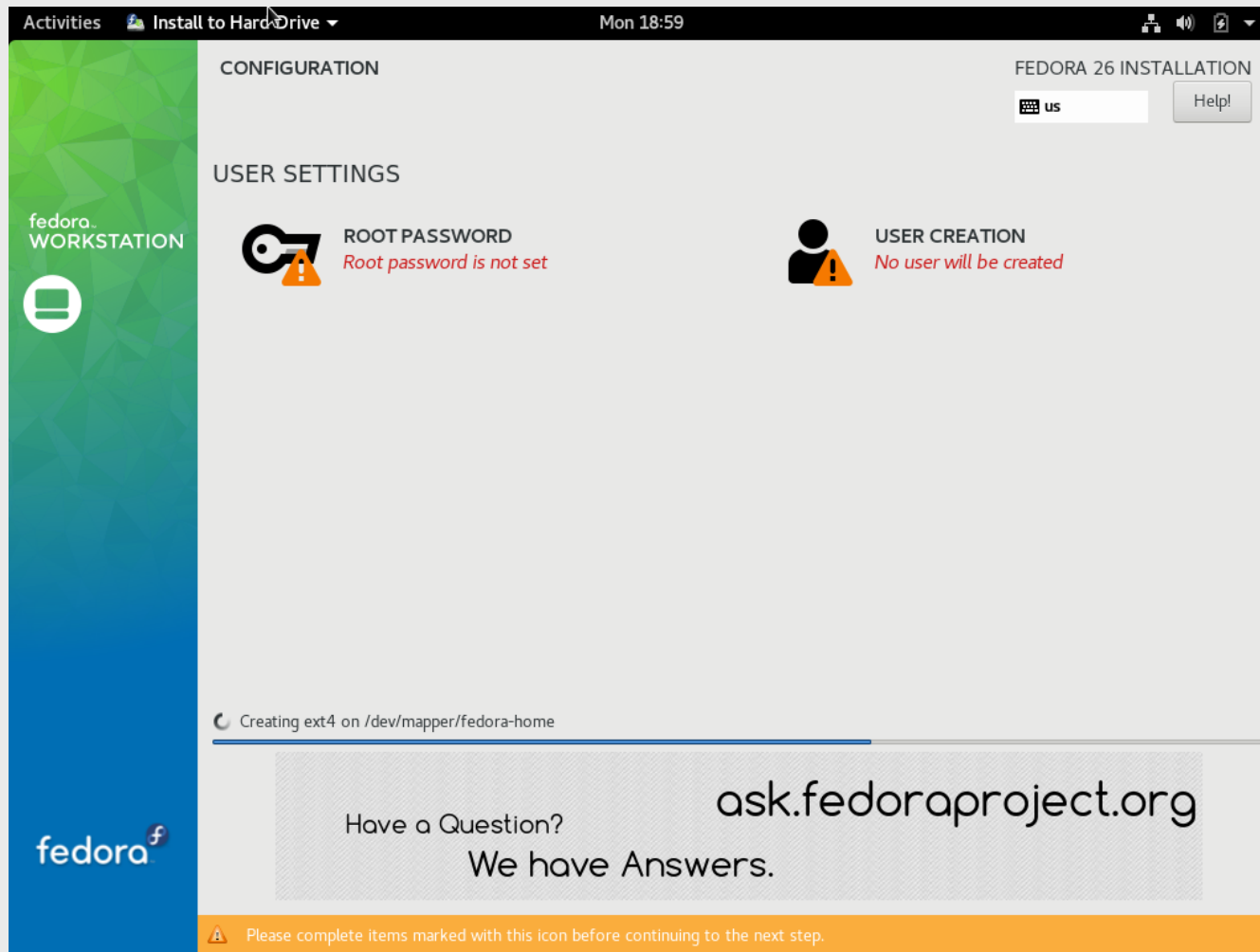
- ◆ Authentication: Users log in via valid user name and password
- ◆ Configure two user accounts
  - Administrator account (root): full rights to system
  - Regular user account
- ◆ The installation program prompts you to configure the password for the root user
  - As well as create a new user account
- ◆ Next, click the *Quit* button to exit the installation program

# Beginning the Installation



Begin the installation

# Configuring User Accounts



Setup root password and create user account



# Configuring User Accounts

The screenshot shows the 'ROOT PASSWORD' screen in the Fedora 26 installation process. The window title is 'FEDORA 26 INSTALLATION'. The top bar includes 'Activities', 'Install to Hard Drive', and the time 'Mon 19:00'. A 'Done' button is in the top left, and a 'Help!' button is in the top right. The main text reads: 'The root account is used for administering the system. Enter a password for the root user.' Below this, there are two password input fields. The first is labeled 'Root Password:' and the second is labeled 'Confirm:'. Both fields show a strength indicator bar and the word 'Strong'. The 'Root Password' field has a strength indicator bar that is mostly green, and the 'Confirm' field has a strength indicator bar that is mostly green.

Create root password

# Configuring User Accounts

Activities Install to Hard Drive Mon 19:01

**CREATE USER** FEDORA 26 INSTALLATION

Done

Full name Sean Hughes-Durkin

User name sean

Tip: Keep your user name shorter than 32 characters and do not use spaces.

☐ Make this user administrator

☒ Require a password to use this account

Password .....

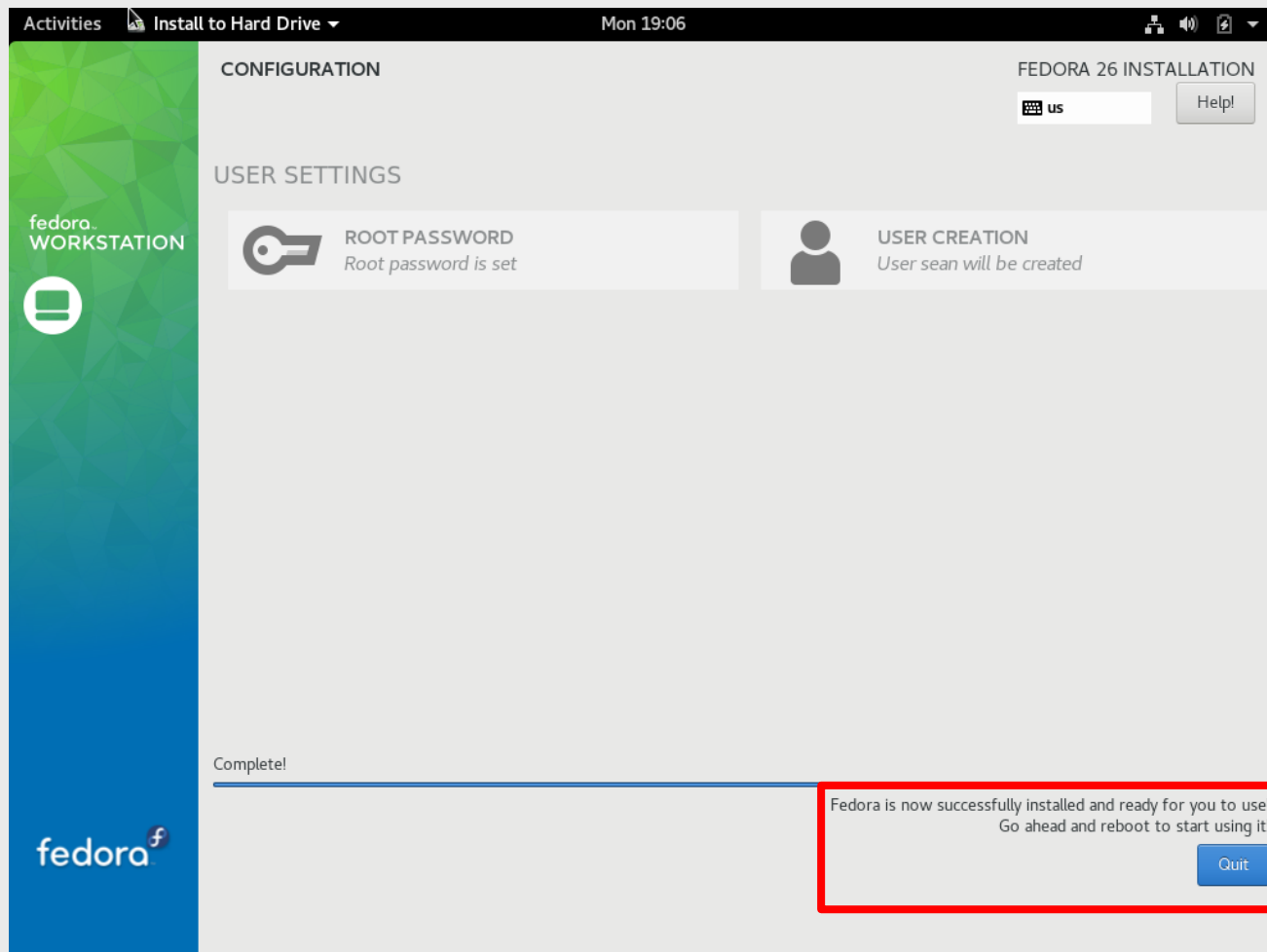
Strong

Confirm password .....

Advanced...

Create user account and password

# Completing the Installation

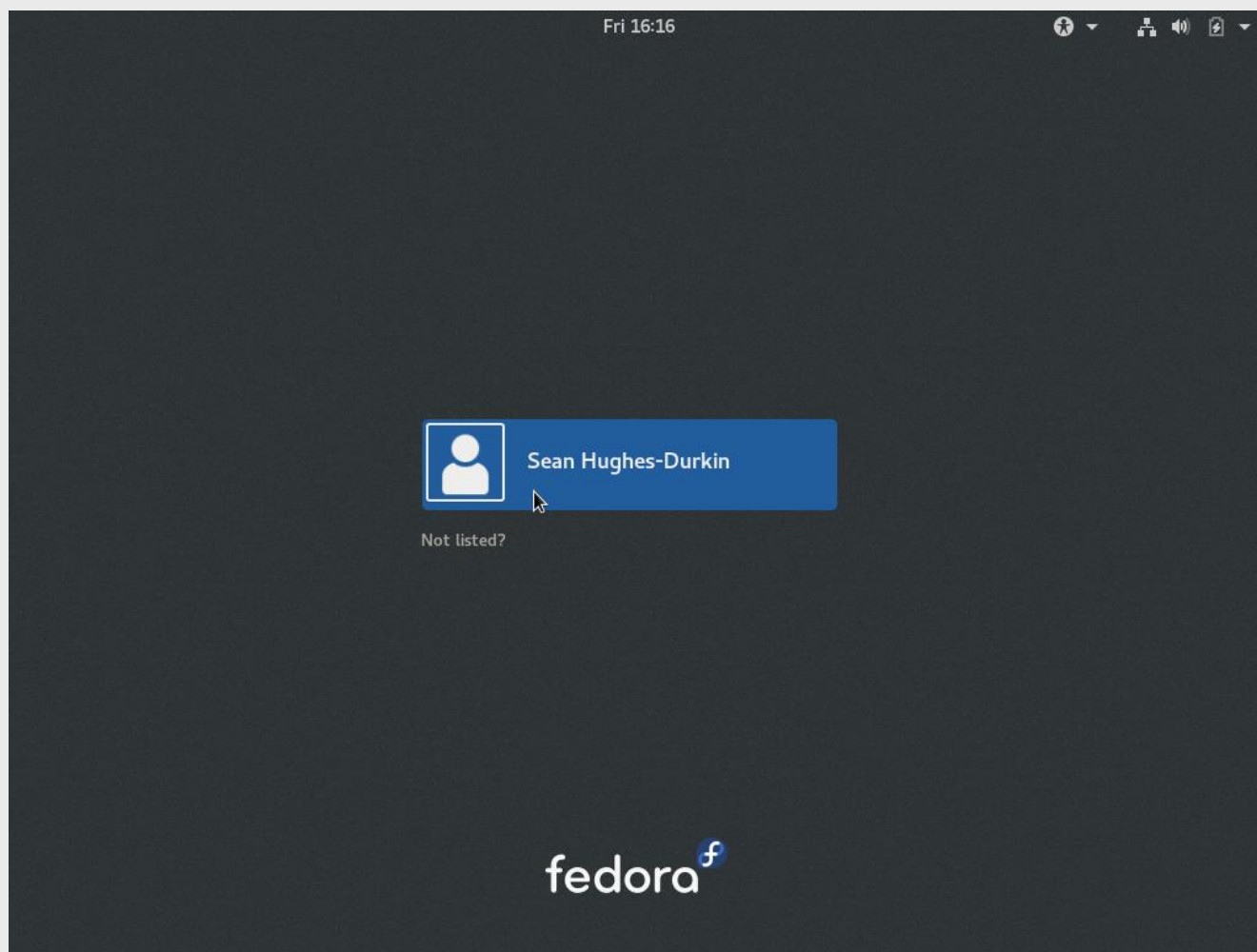


Installation complete

# Completing the Firstboot Wizard

- ◆ Complete the installation
  - License agreement
  - User accounts and authentication
  - Set date and time
- ◆ Log in with user account for daily tasks

# Completing the Firstboot Wizard



Select your name to login

# Completing the Firstboot Wizard




Enter password to sign in

# Completing the Firstboot Wizard

The Firstboot  
Wizard

Welcome

Next



Welcome!

Deutsch	Deutschland
English ✓	United States
Español	España
Français	France
Русский	Российская Федерация
العربية	مصر
日本語	日本
汉语	中国
⋮	


# Completing the Firstboot Wizard

Typing

Previous

Typing

Next



## Typing

Select your keyboard layout or an input method.

Cameroon Multilingual (Dvorak)	<a href="#">Preview</a>
Cameroon Multilingual (qwerty)	<a href="#">Preview</a>
English (Cameroon)	<a href="#">Preview</a>
English (Canada)	<a href="#">Preview</a>
English (Colemak)	<a href="#">Preview</a>
English (US)	<input checked="" type="checkbox"/> <a href="#">Preview</a>
⋮	



# Completing the Firstboot Wizard

Privacy

Previous

Privacy

Next

123

Privacy

Location Services

ON

Allows applications to determine your geographical location. An indication is shown when location services are in use.  
[Privacy Policy](#)

Automatic Problem Reporting

ON

Sending reports of technical problems helps us to improve Fedora. Reports are sent anonymously and are scrubbed of personal data.  
[Privacy Policy](#)

# Completing the Firstboot Wizard


LINUX & OPEN SOURCE

Skip to  
Start  
GNOME

Previous


Online Accounts


Skip





## Connect Your Online Accounts

Connect your accounts to easily access your email, online calendar, contacts, documents and photos.

Google

ownCloud

Microsoft Account

Facebook

# Completing the Firstboot Wizard

Start

GNOME

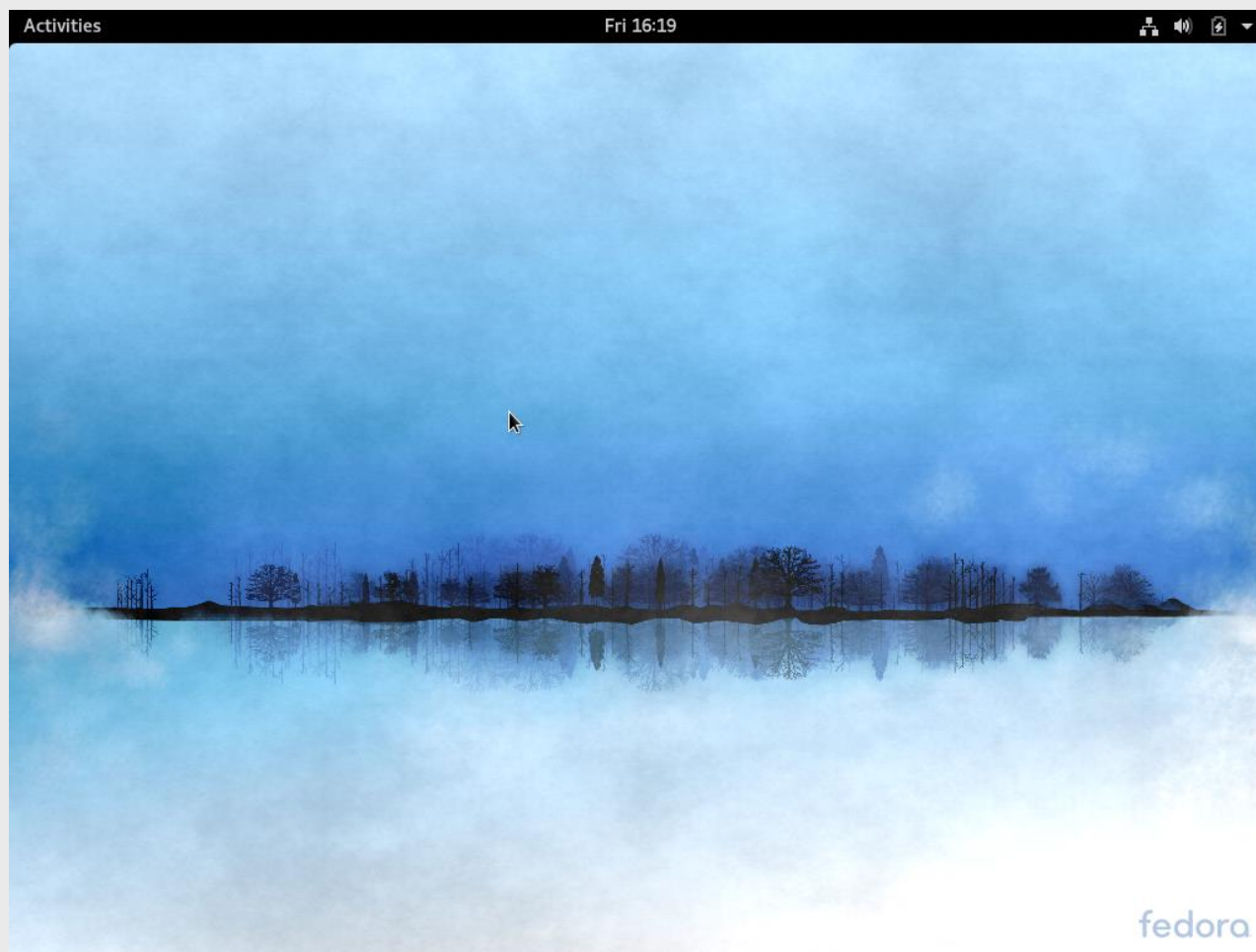
Ready to Go



You're ready to go!

Start using Fedora

# Completing the Firstboot Wizard



The GNOME desktop

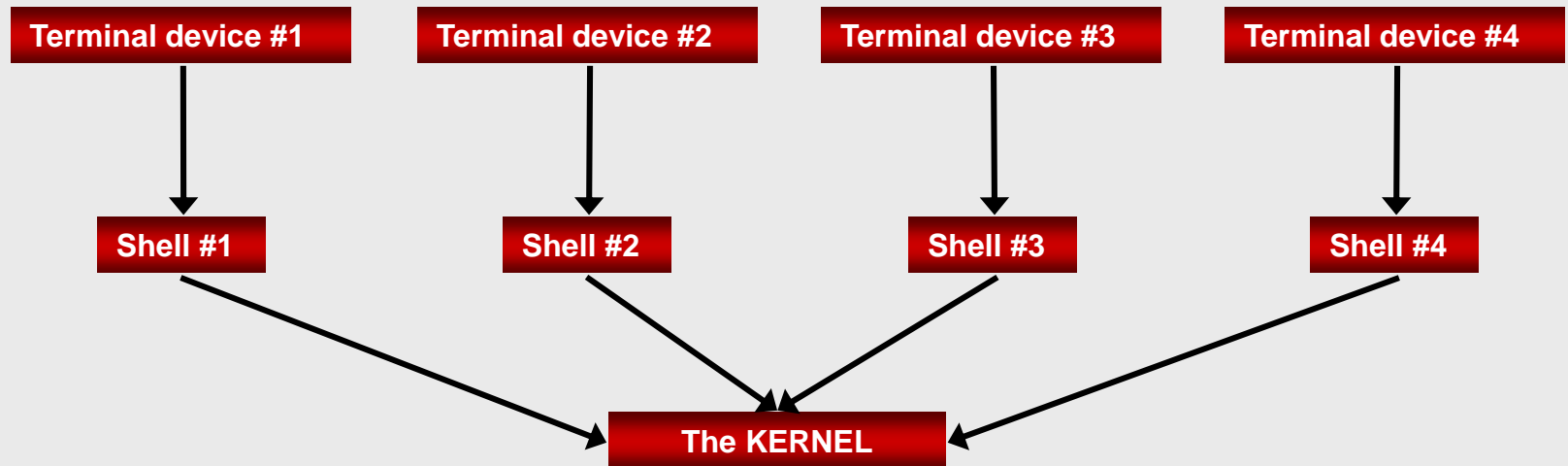
# Basic Linux Usage

- ◆ It is essential to understand:
  - The different types of user interface
  - Basic tasks, such as:
    - Command execution
    - Obtaining online help
    - Shutting down the Linux system

# Shells, Terminals & the Kernel

- ◆ Terminal
  - Channel that allows a certain user to log in and communicate with the shell via a user interface
- ◆ Shell
  - User interface accepts input from the user and passes input to the kernel for processing
  - Default Linux shell is the **BASH Shell (Bourne Again Shell)**
- ◆ Linux allows multiple terminals
  - Each terminal can utilize a different shell
  - For now, we will utilize the BASH shell in all terminals

# Shells, Terminals & the Kernel



Shells, terminals, and the kernel

# Shells, Terminals & the Kernel

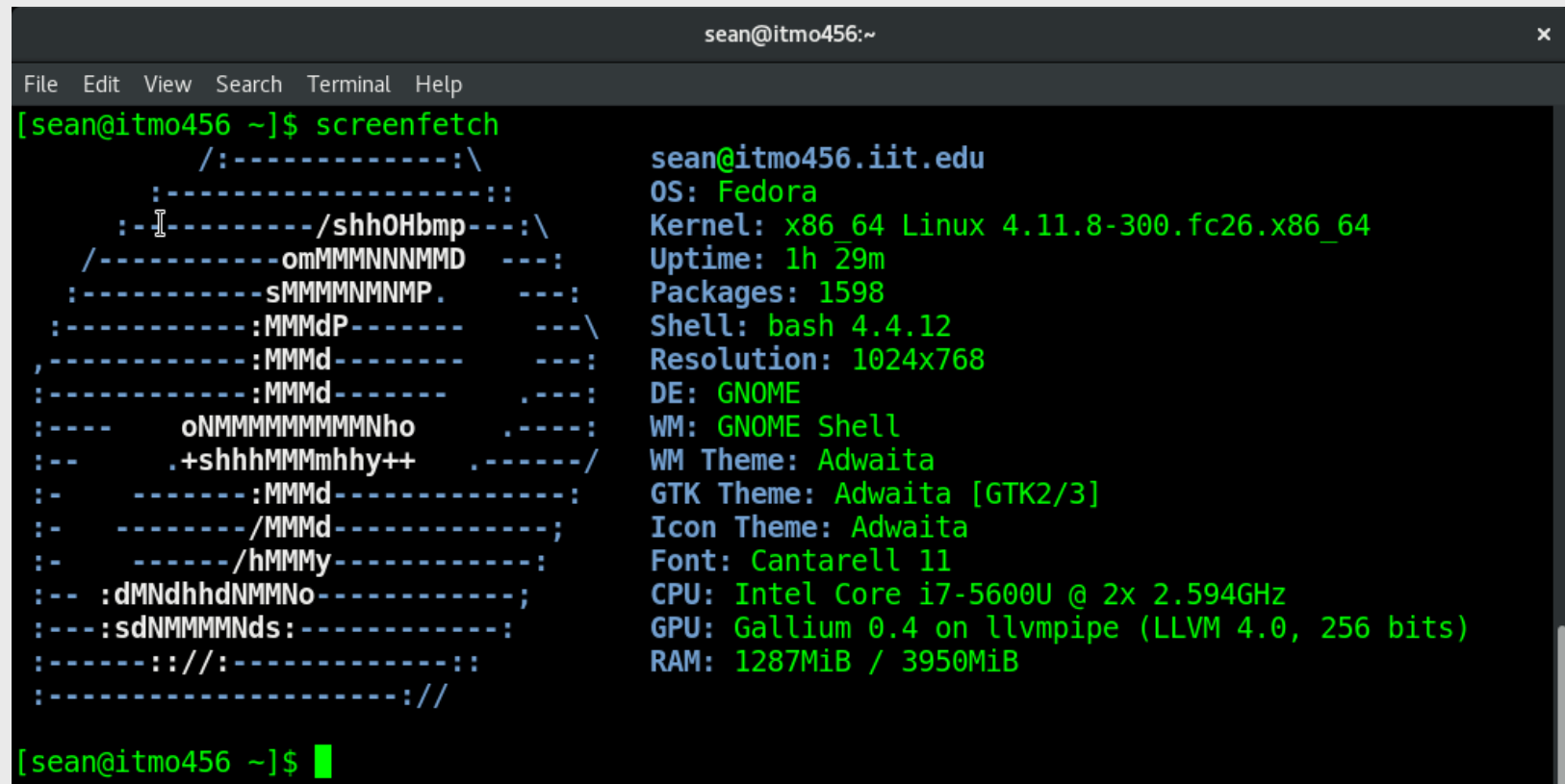
- ◆ Graphical Terminal Emulator
  - Start GUI environment on top of BASH shell OR
  - Switch to a graphical terminal
    - e.g., GNOME Display Manager (gdm)
- ◆ From the local server, use key combinations to change to separate command-line terminal
  - Such as **Ctrl+Alt+F2**
  - GUI terminal much more ideal to utilize



# Shells, Terminals & the Kernel

- ◆ Command-line terminal may be accessed from GUI environment
- ◆ Command prompt layout:
  - Username: sean
  - Hostname: itmo456
  - Current Directory: ~
  - Root user: #
  - Regular user: \$
  - Example: [sean@itmo456 ~] \$

# Shells, Terminals & the Kernel



```
sean@itmo456:~  
File Edit View Search Terminal Help  
[sean@itmo456 ~]$ screenfetch  
/:-----:\  
:-----:  
:-I-----/shh0Hbmp-----\  
/------omMMMMNNMMMD ---:  
:-----sMMMMNNMMP. ---:  
:-----:MMMdP----- ---\  
,-----:MMMd----- ---:  
:-----:MMMd----- .---:  
:-----oNMMMMMMMMMMNho .---:  
:- .+shhhMMmhhy++ .-----/  
:- -----:MMMd-----:  
:- -----/MMMd-----;  
:- -----/hMMMy-----:  
:- :dMNdhhdNMMNo-----;  
:- :sdNMMMMNds:-----:  
:-----://:-----:  
:-----://  
[sean@itmo456 ~]$  
sean@itmo456.iit.edu  
OS: Fedora  
Kernel: x86_64 Linux 4.11.8-300.fc26.x86_64  
Uptime: 1h 29m  
Packages: 1598  
Shell: bash 4.4.12  
Resolution: 1024x768  
DE: GNOME  
WM: GNOME Shell  
WM Theme: Adwaita  
GTK Theme: Adwaita [GTK2/3]  
Icon Theme: Adwaita  
Font: Cantarell 11  
CPU: Intel Core i7-5600U @ 2x 2.594GHz  
GPU: Gallium 0.4 on llvmpipe (LLVM 4.0, 256 bits)  
RAM: 1287MiB / 3950MiB
```

GNOME GUI Terminal utilizing the BASH shell

# Shells, Terminals & the Kernel

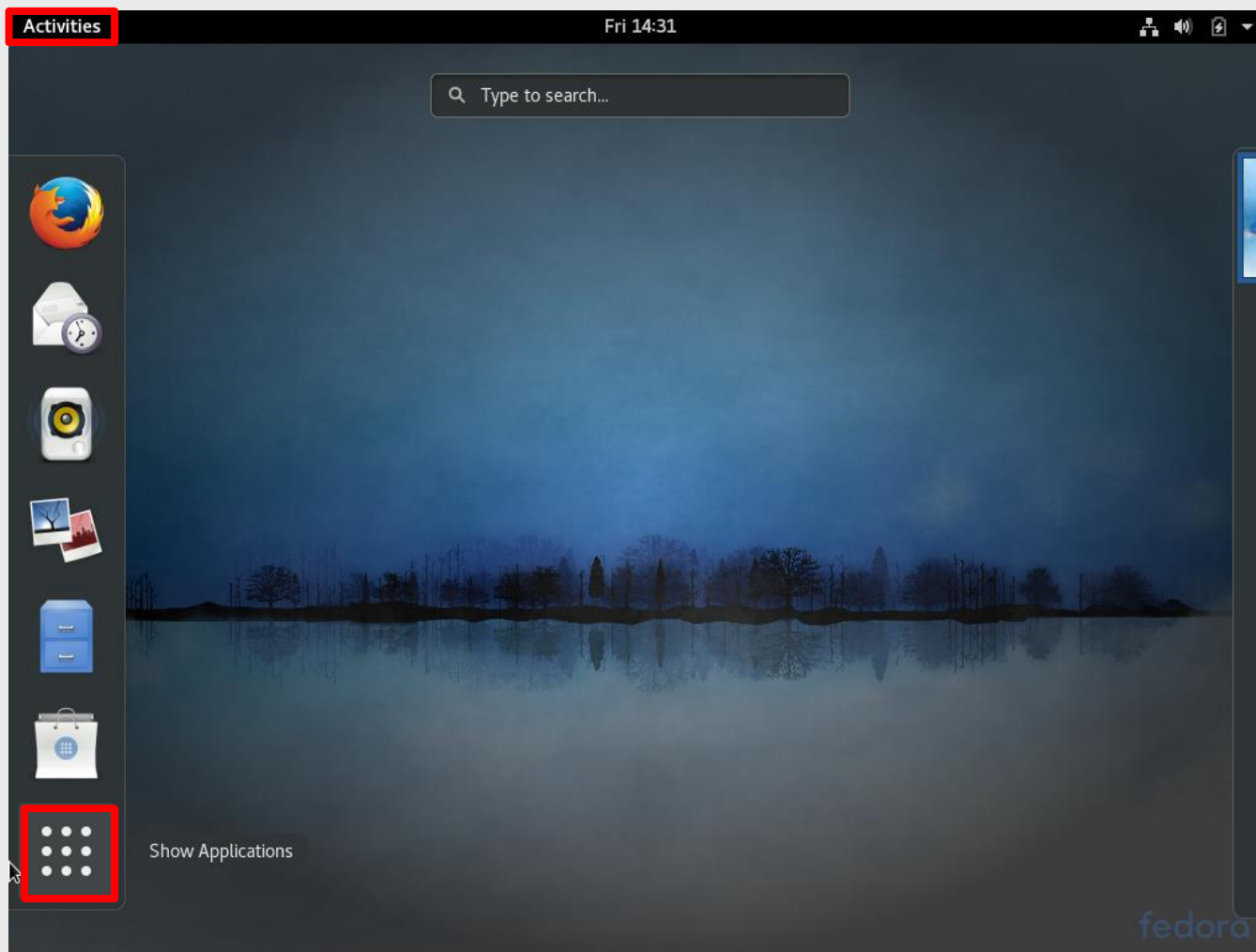
Terminal Name	Key Combination	Login Type
tty1*	[Ctrl]+[Alt]+F1	graphical
tty2*	[Ctrl]+[Alt]+F2	command-line
tty3*	[Ctrl]+[Alt]+F3	command-line
tty4*	[Ctrl]+[Alt]+F4	command-line
tty5*	[Ctrl]+[Alt]+F5	command-line
tty6*	[Ctrl]+[Alt]+F6	command-line

**\*Terminal can be GUI or command-line due to utilizing the next available tty**

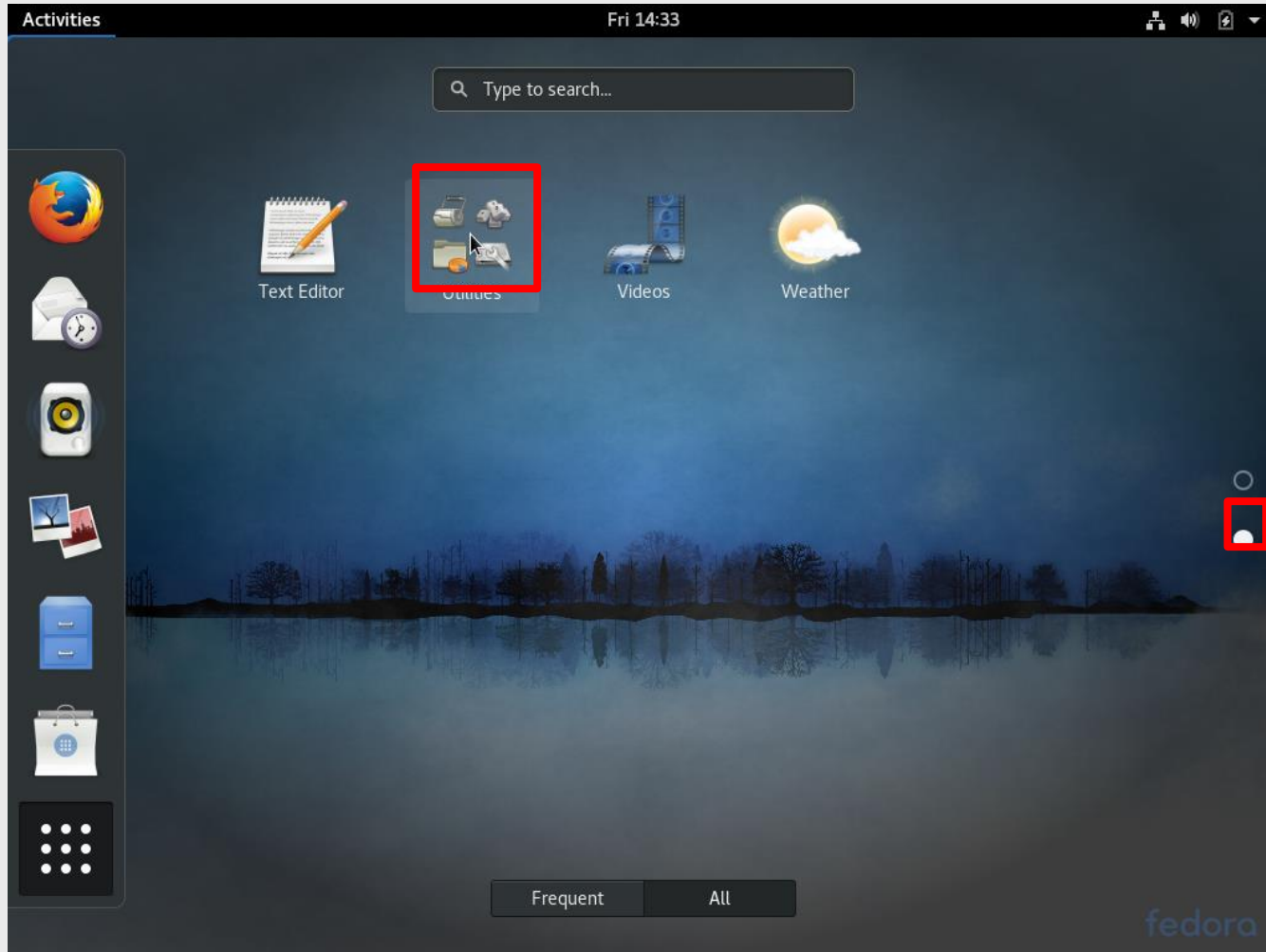
# Shells, Terminals & the Kernel

- ◆ The default GUI environment in Fedora Linux is GNOME
- ◆ Graphical command-line terminal may be accessed from GNOME by accessing the **Activities** menu in the upper left of the desktop
  - Navigate to **Show Applications** (3 dots x 3 dots bottom left), **Utilities**, **Terminal**
  - Utilize the search box for **terminal**

# Shells, Terminals & the Kernel



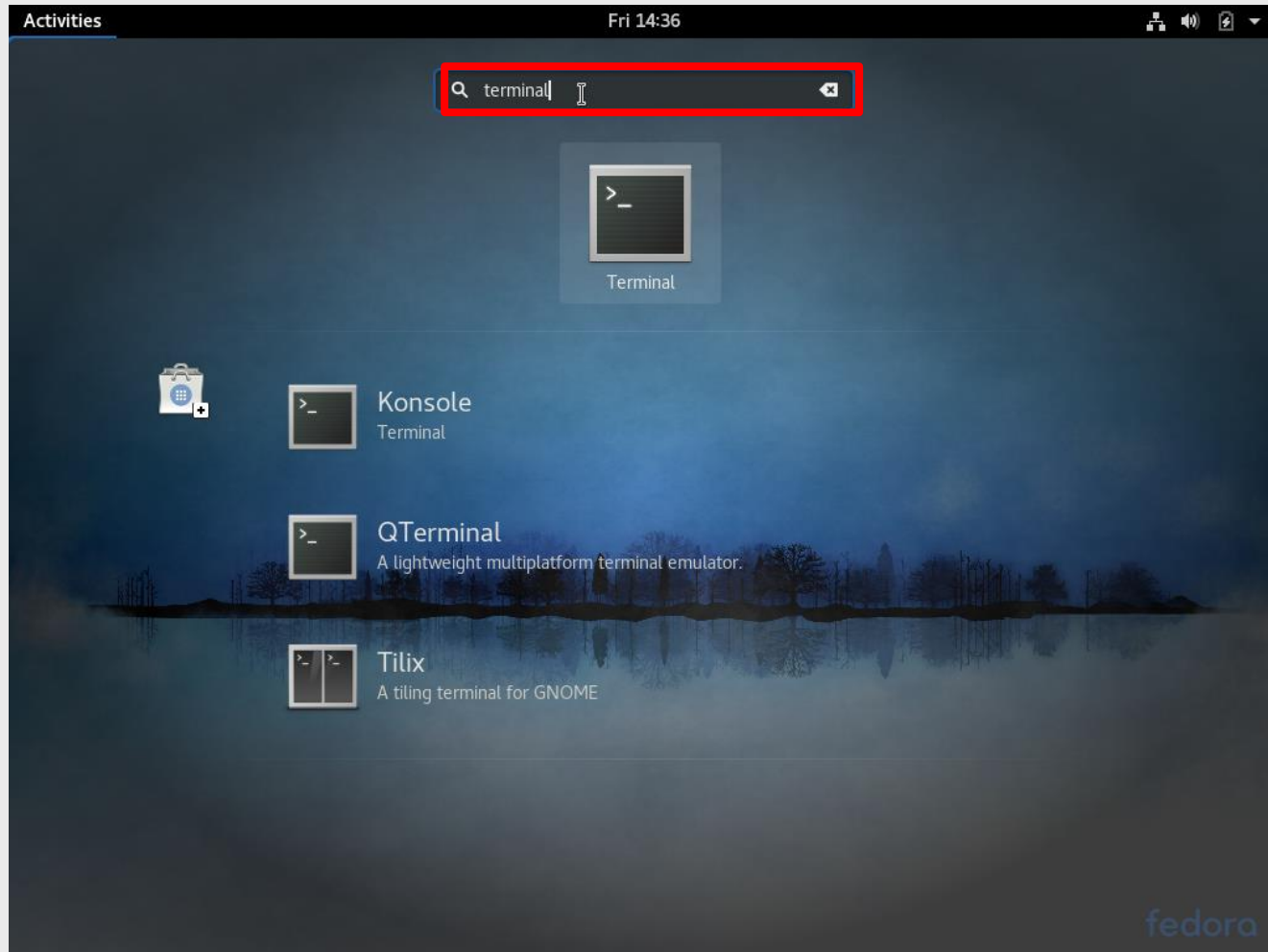
# Shells, Terminals & the Kernel



# Shells, Terminals & the Kernel



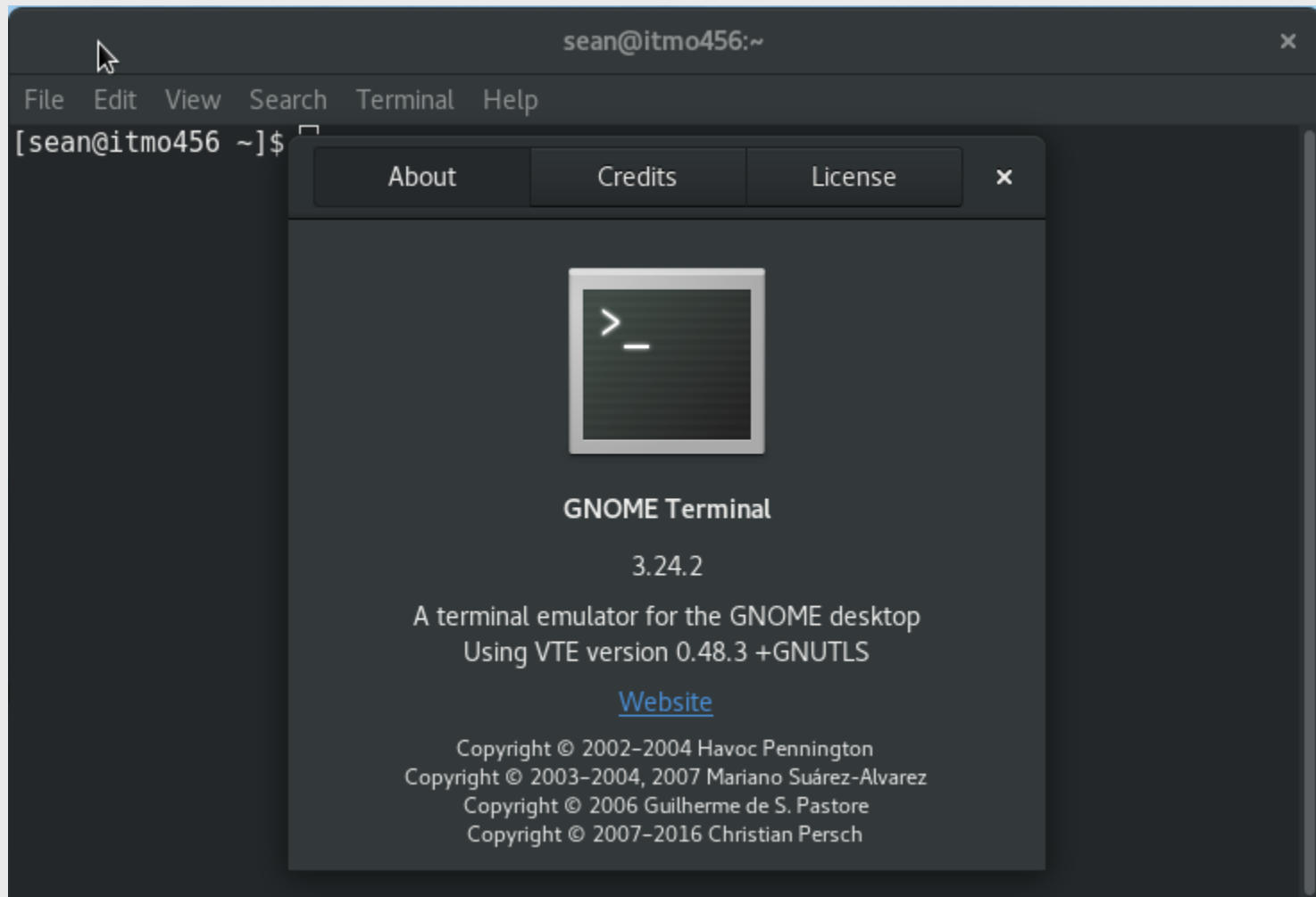
# Shells, Terminals & the Kernel





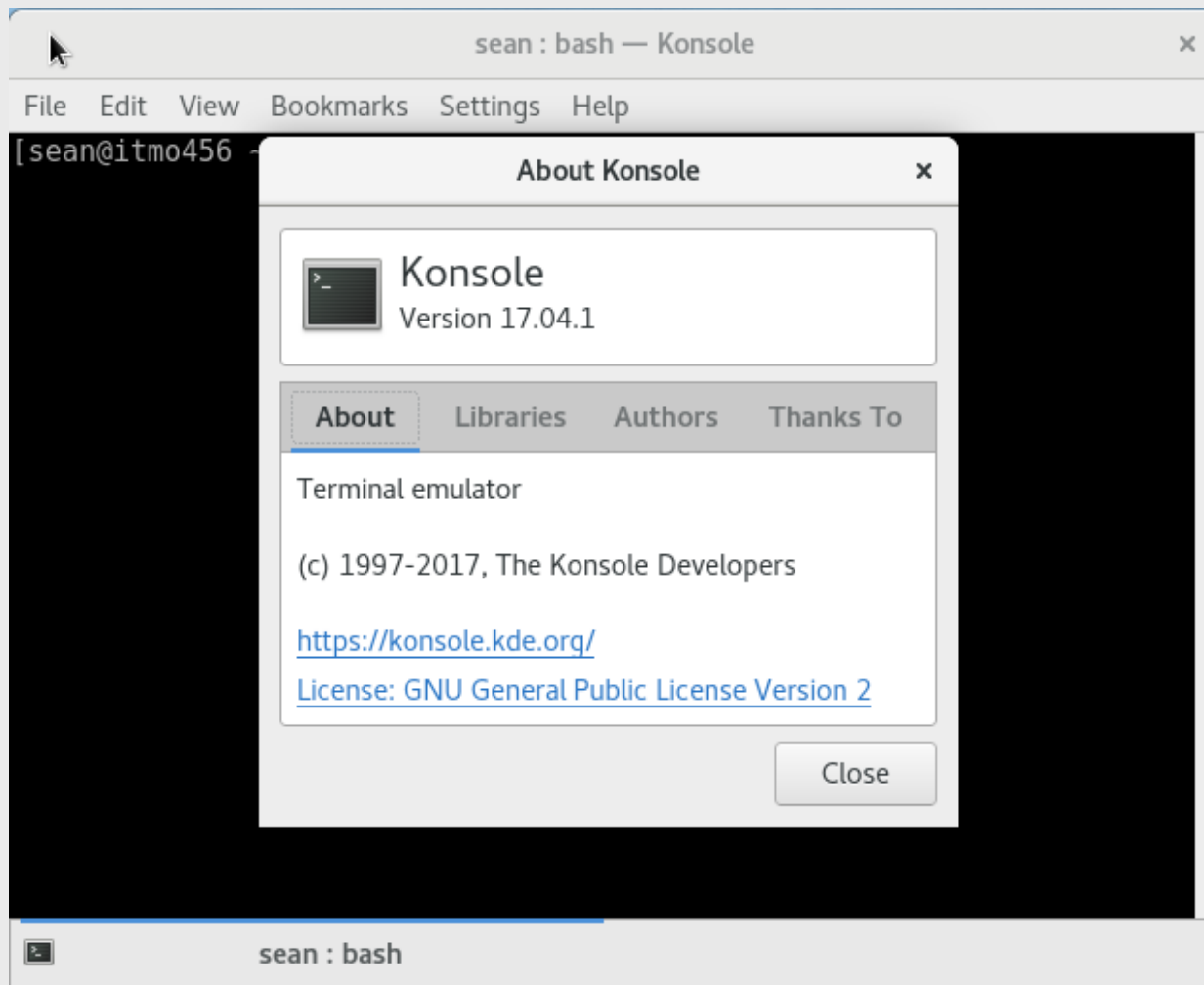
# Shells, Terminals & the Kernel

LINUX & OPEN SOURCE



A Gnome Terminal

# Shells, Terminals & the Kernel



A KDE Terminal

# Basic Shell Commands

## ◆ Commands

- Indicate name of program to execute
- Case sensitive

## ◆ Options

- Specific letters starting with “-” or words starting with “--” appearing after command
- Alter way command works; are optional

## ◆ Arguments

- Specify a command’s working parameters
- Can be optional

# Basic Shell Commands

command  
option added

argument added

```
[sean@localhost ~]$ ls
Desktop  Documents  Downloads  Music  Pictures  Public  Templates  Videos
[sean@localhost ~]$ ls -l
total 32
drwxr-xr-x. 2 sean sean 4096 Nov 29 18:35 Desktop
drwxr-xr-x. 2 sean sean 4096 Nov 29 18:35 Documents
drwxr-xr-x. 2 sean sean 4096 Nov 29 18:35 Downloads
drwxr-xr-x. 2 sean sean 4096 Nov 29 18:35 Music
drwxr-xr-x. 2 sean sean 4096 Nov 29 18:35 Pictures
drwxr-xr-x. 2 sean sean 4096 Nov 29 18:35 Public
drwxr-xr-x. 2 sean sean 4096 Nov 29 18:35 Templates
drwxr-xr-x. 2 sean sean 4096 Nov 29 18:35 Videos
[sean@localhost ~]$ ls -l /
total 62
lrwxrwxrwx. 1 root root 7 Dec 11 2013 bin -> usr/bin
dr-xr-xr-x. 6 root root 1024 Nov 30 12:18 boot
drwxr-xr-x. 20 root root 3300 Jan 17 12:47 dev
drwxr-xr-x. 143 root root 12288 Jan 17 12:47 etc
drwxr-xr-x. 3 root root 4096 Nov 29 18:34 home
lrwxrwxrwx. 1 root root 7 Dec 11 2013 lib -> usr/lib
lrwxrwxrwx. 1 root root 9 Dec 11 2013 lib64 -> usr/lib64
drwx----- 2 root root 16384 Dec 11 2013 lost+found
drwxr-xr-x. 2 root root 4096 Aug 7 2013 media
drwxr-xr-x. 3 root root 4096 Nov 29 18:34 mnt
drwxr-xr-x. 2 root root 4096 Aug 7 2013 opt
dr-xr-xr-x. 187 root root 0 Jan 17 12:48 proc
dr-xr-x--- 9 root root 4096 Jan 17 13:30 root
drwxr-xr-x. 43 root root 1140 Jan 17 13:05 run
lrwxrwxrwx. 1 root root 8 Dec 11 2013 sbin -> usr/sbin
drwxr-xr-x. 2 root root 4096 Aug 7 2013 srv
dr-xr-xr-x. 13 root root 0 Jan 17 12:48 sys
drwxrwxrwt. 13 root root 440 Jan 17 13:39 tmp
drwxr-xr-x. 12 root root 4096 Dec 11 2013 usr
drwxr-xr-x. 21 root root 4096 Jan 17 12:48 var
```

# Basic Shell Commands

Command	Description
<b>clear</b>	Clears the terminal screen
<b>reset</b>	Resets your terminal to default terminal settings
<b>who</b>	Displays currently logged-in users
<b>w</b>	Displays currently logged-in users and their tasks
<b>whoami</b>	Displays your login name
<b>id</b>	Displays the numbers associated with your user account and group names, commonly referred to as User IDs (UIDs) and Group ID (GIDs)
<b>date</b>	Displays the current date and time
<b>cal</b>	Displays the calendar for the current month
<b>exit</b>	Exits out of your current shell

Some common Linux commands

# Basic Shell Commands

```
[sean@localhost ~]$ who
sean      :0                2016-01-17 13:05 (:0)
sean      pts/0            2016-01-17 13:05 (:0)
[sean@localhost ~]$ w
 13:31:58 up 43 min,  2 users,  load average: 0.00, 0.01, 0.05
USER      TTY      LOGIN@   IDLE   JCPU   PCPU   WHAT
sean      :0        13:05    ?xdm?  54.79s  0.09s  gdm-session-worker [pam/gdm-pas
sean      pts/0     13:05    1.00s   0.05s   0.00s  w
[sean@localhost ~]$ whoami
sean
[sean@localhost ~]$ id
uid=1000(sean) gid=1000(sean) groups=1000(sean) context=unconfined_u:unconfined_
r:unconfined_t:s0-s0:c0.c1023
[sean@localhost ~]$ date
Sun Jan 17 13:32:29 CST 2016
[sean@localhost ~]$ cal
      January 2016
Su Mo Tu We Th Fr Sa
                1  2
 3  4  5  6  7  8  9
10 11 12 13 14 15 16
17 18 19 20 21 22 23
24 25 26 27 28 29 30
31
[sean@localhost ~]$
```

# Shell Metacharacters

## ◆ Metacharacters

- Key combinations that have special meaning
- One of the most commonly used metacharacters is the `$` character
  - Refers to a variable
- Avoid use of metacharacters when typing commands unless using their special functionality
- Single quotation marks `' '` protect metacharacters from being interpreted specially by the shell

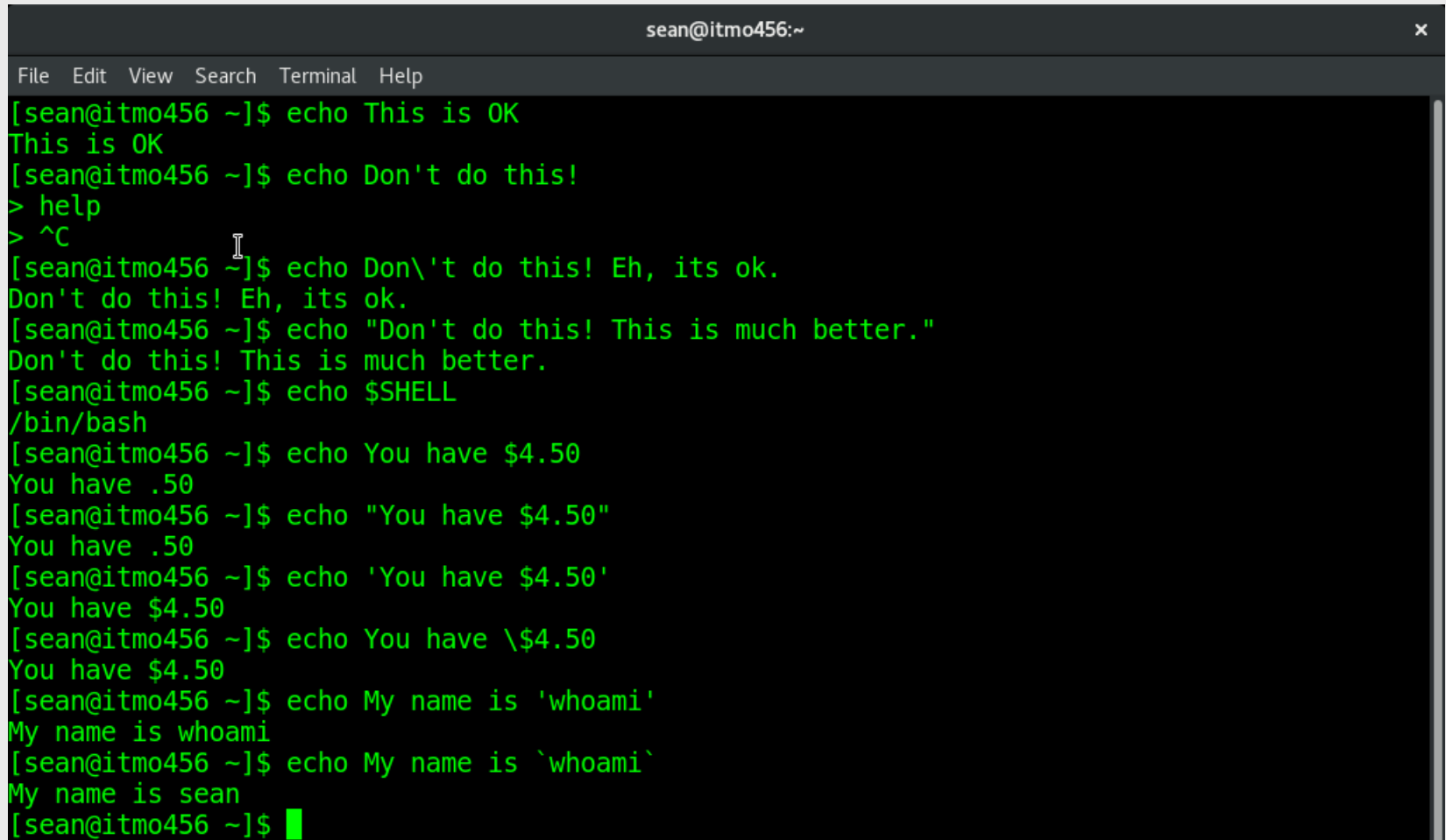
# Shell Metacharacters

Command	Description
\$	Shell variable
~	Special home directory variable
&	Background command execution
;	Command termination
< << >> >	Input/output redirection
	Command piping
*?[]	Shell wildcards
' " \	Metacharacter quotes
`	Command substitution
( ) { }	Command grouping

Common BASH Shell metacharacters



# Shell Metacharacters

A terminal window titled 'sean@itmo456:~' with a menu bar (File, Edit, View, Search, Terminal, Help). The terminal shows a series of commands and their outputs demonstrating various shell metacharacters. The commands include 'echo' with different quoting and escaping techniques, and '\$SHELL' to show the current shell is /bin/bash. The output shows how backslashes, double quotes, and single quotes are used to control the interpretation of special characters like spaces, dollar signs, and backticks.

```
sean@itmo456:~  
File Edit View Search Terminal Help  
[sean@itmo456 ~]$ echo This is OK  
This is OK  
[sean@itmo456 ~]$ echo Don't do this!  
> help  
> ^C  
[sean@itmo456 ~]$ echo Don\'t do this! Eh, its ok.  
Don't do this! Eh, its ok.  
[sean@itmo456 ~]$ echo "Don't do this! This is much better."  
Don't do this! This is much better.  
[sean@itmo456 ~]$ echo $SHELL  
/bin/bash  
[sean@itmo456 ~]$ echo You have $4.50  
You have .50  
[sean@itmo456 ~]$ echo "You have $4.50"  
You have .50  
[sean@itmo456 ~]$ echo 'You have $4.50'  
You have $4.50  
[sean@itmo456 ~]$ echo You have \$4.50  
You have $4.50  
[sean@itmo456 ~]$ echo My name is 'whoami'  
My name is whoami  
[sean@itmo456 ~]$ echo My name is `whoami`  
My name is sean  
[sean@itmo456 ~]$
```

# Getting Command Help

- ◆ Linux distributions often contain more than 1000 different Linux commands in common configurations
- ◆ Manual pages
  - Most common form of documentation for Linux commands; aka “man” pages
  - At command prompt, type **man** followed by **section** followed by a **command** name
  - Contain different sections
  - Keyword searchable
    - `man -k cron`
    - `apropos cron`

# Getting Command Help

Manual Page Section	Description
1	Commands any user may execute
2	Linux system calls
3	Library routines
4	Special device files
5	File formats
6	Games
7	Macro packages
8	Commands that only the root user may execute
9	Linux kernel routines
n	New commands not categorized yet

Manual page section numbers

# Getting Command Help

```
[sean@localhost ~]$ man -k cron
anacrontab (5)      - configuration file for Anacron
anacron (8)        - runs commands periodically
cron (8)           - daemon to execute scheduled commands
crond (8)          - daemon to execute scheduled commands
crontab (1)        - maintains crontab files for individual users
crontab (5)        - files used to schedule the execution of programs
crontabs (4)       - configuration and scripts for running periodical jobs
[sean@localhost ~]$ apropos cron
anacrontab (5)      - configuration file for Anacron
anacron (8)        - runs commands periodically
cron (8)           - daemon to execute scheduled commands
crond (8)          - daemon to execute scheduled commands
crontab (1)        - maintains crontab files for individual users
crontab (5)        - files used to schedule the execution of programs
crontabs (4)       - configuration and scripts for running periodical jobs
[sean@localhost ~]$ man cron
```

# Getting Command Help

```
CRON(8)                                System Administration                                CRON(8)

NAME
    crond - daemon to execute scheduled commands

SYNOPSIS
    crond [-c | -h | -i | -n | -p | -P | -s | -m<mailcommand>]
    crond -x [ext,sch,proc,pars,load,misc,test,bit]

DESCRIPTION
    Cron is started from /etc/rc.d/init.d or /etc/init.d when classical
    sysvinit scripts are used. In case systemd is enabled, then unit file
    is installed into /lib/systemd/system/crond.service and daemon is
    started by systemctl start crond.service command. It returns immedi-
    ately, thus, there is no need to need to start it with the '&' param-
    eter.

    Cron searches /var/spool/cron for crontab files which are named after
    accounts in /etc/passwd; The found crontabs are loaded into the memory.
    Cron also searches for /etc/anacrontab and any files in the /etc/cron.d
    directory, which have a different format (see crontab(5)). Cron exam-
    ines all stored crontabs and checks each job to see if it needs to be
    run in the current minute. When executing commands, any output is
    mailed to the owner of the crontab (or to the user specified in the
    Manual page cron(8) line 1 (press h for help or q to quit)
```

# Getting Command Help

## ◆ Info pages

- Set of local, easy-to-read command syntax documentation
- At command prompt, type **info** followed by a command name
- Originally intended to replace the man command in Linux

## ◆ Some commands do not have manual or info pages

- Usually functions that are built into the BASH shell

# Getting Command Help

```
File: *manpages*, Node: cron, Up: (dir)
```

```
CRON(8)
```

```
System Administration
```

```
CRON(8)
```

```
NAME
```

```
crond - daemon to execute scheduled commands
```

```
SYNOPSIS
```

```
crond [-c | -h | -i | -n | -p | -P | -s | -m<mailcommand>]
```

```
crond -x [ext,sch,proc,pars,load,misc,test,bit]
```

```
DESCRIPTION
```

Cron is started from /etc/rc.d/init.d or /etc/init.d when classical sysvinit scripts are used. In case systemd is enabled, then unit file is installed into /lib/systemd/system/crond.service and daemon is started by systemctl start crond.service command. It returns immediately, thus, there is no need to need to start it with the '&' parameter.

Cron searches /var/spool/cron for crontab files which are named after accounts in /etc/passwd; The found crontabs are loaded into the memory.

```
-----Info: (*manpages*)cron, 171 lines --Top-----
```

```
Welcome to Info version 5.1. Type h for help, m for menu item.
```

# The root user

- ◆ The system administrator account in Linux is named “root”
  - System-wide commands can only be issued by root
  - System-wide configurations can only be modified by root
  - Some systems allow root-level privileges using the **sudo** command



# The root user

- ◆ Best practice is log in as a regular user and become root by the **su** (substitute-user) command
  - **su** with no username specified sets the user as **root**
  - Must give the root password to become root using **su**
  - **root** can become any user using the command **su - username**

# Root in Ubuntu

- ◆ Ubuntu will not allow you to log in as the root user
- ◆ Root commands are issued from the command line using **sudo** which will ask you for your password
  - You can open a persistent root command-line session by entering **sudo su -** or **sudo -s** or **sudo -i**
- ◆ Fedora can be configured to use **sudo**

# Easy sudo setup

- ◆ Add your user to the **wheel** group as it is pre-configured to allow root level sudo access
- ◆ As the root user
  - `usermod -G wheel sean`
  - ie: `usermod -G group username`
- ◆ Now your user account can use sudo rather than becoming root

# Shutting Down the Linux System

- ◆ The OS handles writing data from computer memory to the disk drives
  - Simply turning off power to the computer might result in damaged user and system files
- ◆ Issue the **shutdown** command
  - Can halt or reboot your computer after a certain period of time
- ◆ To stop the shutdown
  - Press **Ctrl** and **c** keys and then issue the command **shutdown -c** to cancel the shutdown

# Shutting Down the Linux System

Command	Description
<code>shutdown -h +4m</code>	Halts your system in four minutes
<code>shutdown -r +4m</code>	Reboots your system in four minutes
<code>shutdown -h now</code>	Halts your system immediately
<code>shutdown -r now</code>	Reboots your system immediately
<code>shutdown -c</code>	Cancels a scheduled shutdown
<code>halt</code>	Halts your system immediately
<code>poweroff</code>	Halts your system immediately and powers down the computer
<code>reboot</code>	Reboots your system immediately

Commands to halt and reboot the Linux OS

# Summary

- ◆ Prior to installation
  - Verify hardware requirements using HCL
  - Create preinstallation checklist
- ◆ Most software information can be specified at installation
  - Network configuration and package selection should be carefully planned before installation
- ◆ You can obtain Linux installation media by downloading an ISO image from the Internet
  - Can be written to a DVD or USB flash drive

# Summary

- ◆ Installation prompts for language, boot loader, hard disk partitions, network configuration, firewall configuration, time zone, user accounts, authentication, and package selection
- ◆ Users must log in to a terminal and receive a shell before they are able to interact with the Linux system and kernel

# Summary

- ◆ From any type of terminal you can enter commands, options, and arguments at a shell prompt to perform system tasks, obtain command help, or shut down Linux
- ◆ Shells are case sensitive and understand a variety of special characters called shell metacharacters, which should be protected if their special meaning is not required



# The End...

## ◆ Questions?