Linux Commands Manual

** This guide is intended for Training Purposes only*

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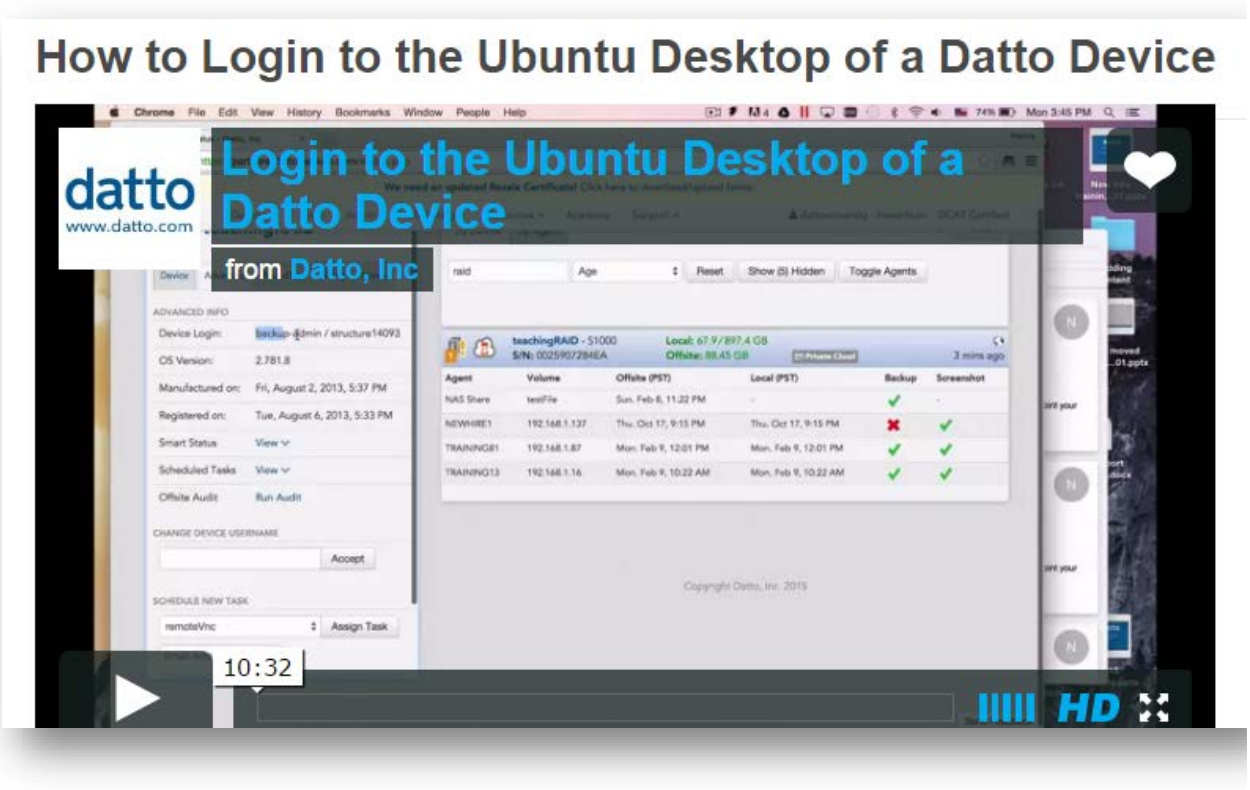
Getting Started with Linux

In this lesson, you will learn:

- Why Datto uses Linux
- How to navigate through the Linux Operating system
  - Keeping in mind how Windows does things…
- Commands that are used to Troubleshoot like our Datto Techs
- Basic building blocks for understanding how a Datto Device Works!

VNC – To get started!



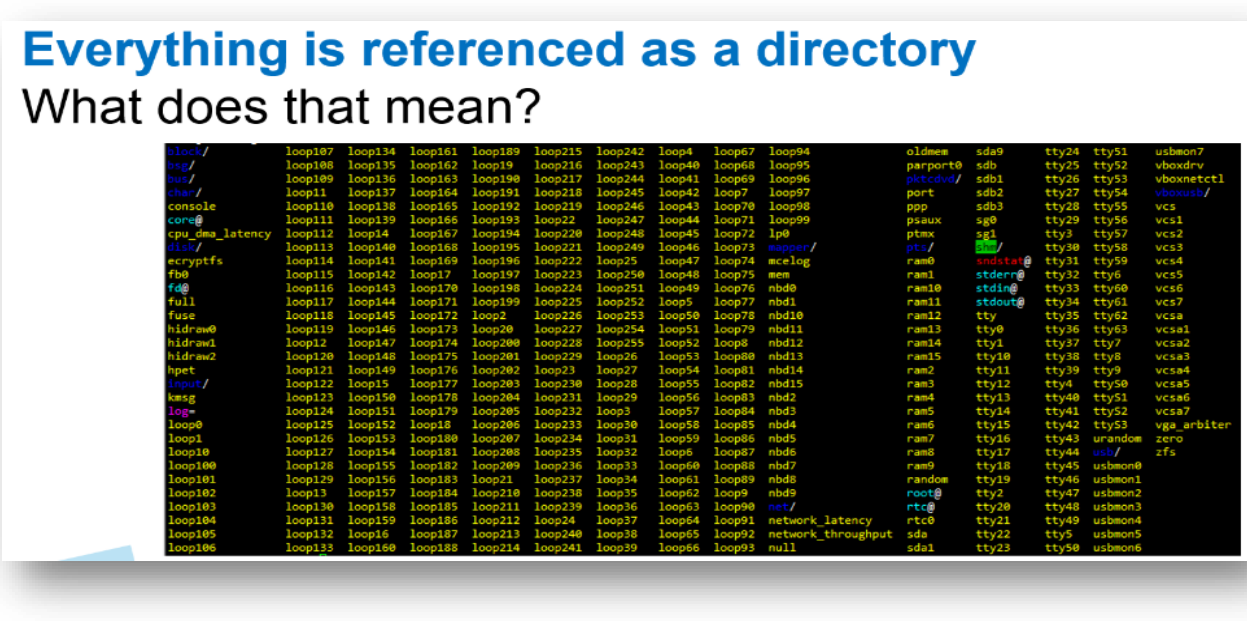
Login to the Partner Portal to get you to a Terminal (Command Prompt) of a Datto Device.

Once you are at the command prompt, we can begin our training on Linux and other key topics to help you in your support of your Datto Devices.

Let's learn more by reviewing the Datto Academy video and/or steps on "How to Login to the Ubuntu Desktop"

Step	Action
1	**IMPORTANT PREPARATION STEPS:** You will need to login to the Partner Portal (Partners.dattobackup.com), using the **Training PSWDS** document provided. *For class, follow this step with the credentials that the instructor provides.*
2	Next, go to Datto Academy and How to Login to the Ubuntu Desktop of a Datto Device, click below: https://academy.dattobackup.com/content/login-ubuntu-desktop-datto-device Review the Video and/or the instructions as you scroll on this page. *For class, follow this step.*

Why Datto Uses Linux?



Why Datto uses Linux?

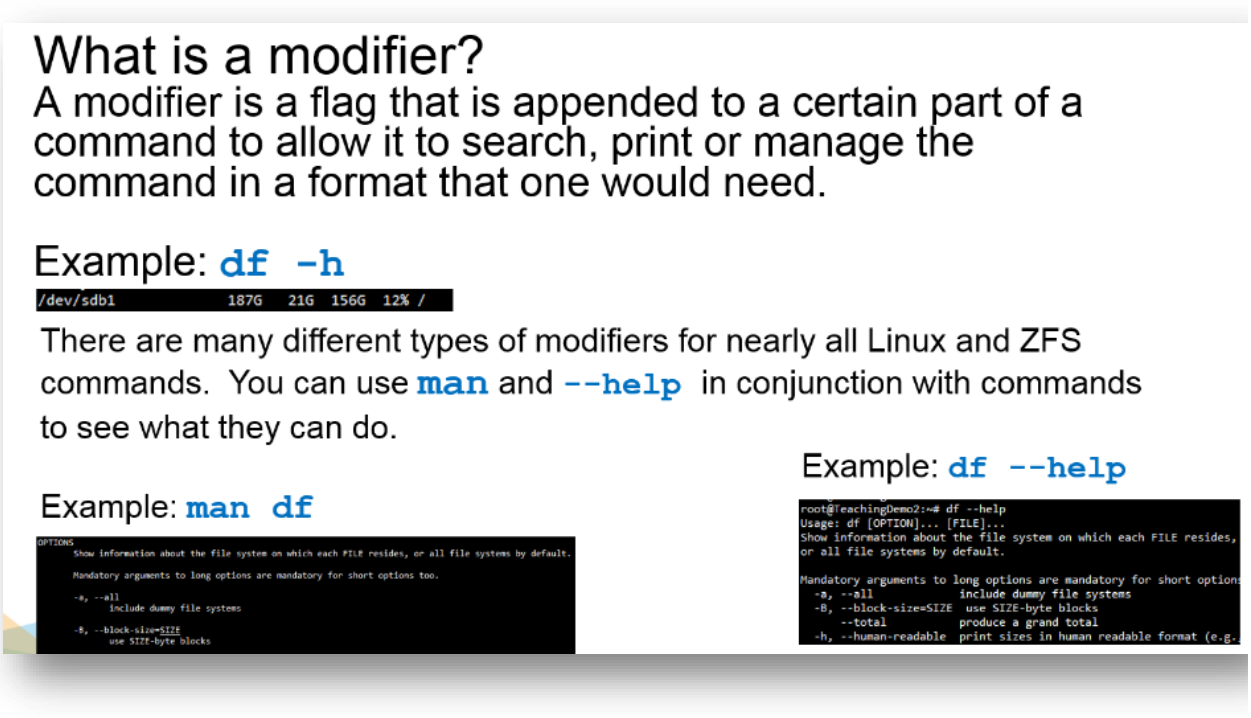
Datto uses Linux because everything is referenced as a directory so that we can pass information from one File and Directory to another. Meaning if data for example that you see in this image, exists in RAM 12 (RAM chip) we can take any info that exists from that hardware and put it anywhere we need through using standard input and standard output (STDIN and STDOUT).

Notes:

- Linux is the base OS for all Datto units (Ubuntu 10.04 LTS or 12.04)
- All Datto Devices' OS single or RAIDed HDDs, SSDs or gumstick SSDs
- Most regular (non-ShadowSnap) functionality can be accessed with Ubuntu Linux commands

Step	Action
1	Everything is referenced as a Directory. Review the picture above. *For class, review this page.*
2	On the next pages, you will see commands and learn about modifiers and Switches. *For class, review this step.*

Modifiers/Switches – What they are and how to get help



What is a modifier?

A modifier is a flag that is appended to a certain part of a command to allow it to search, print or manage the command in a format that one would need.

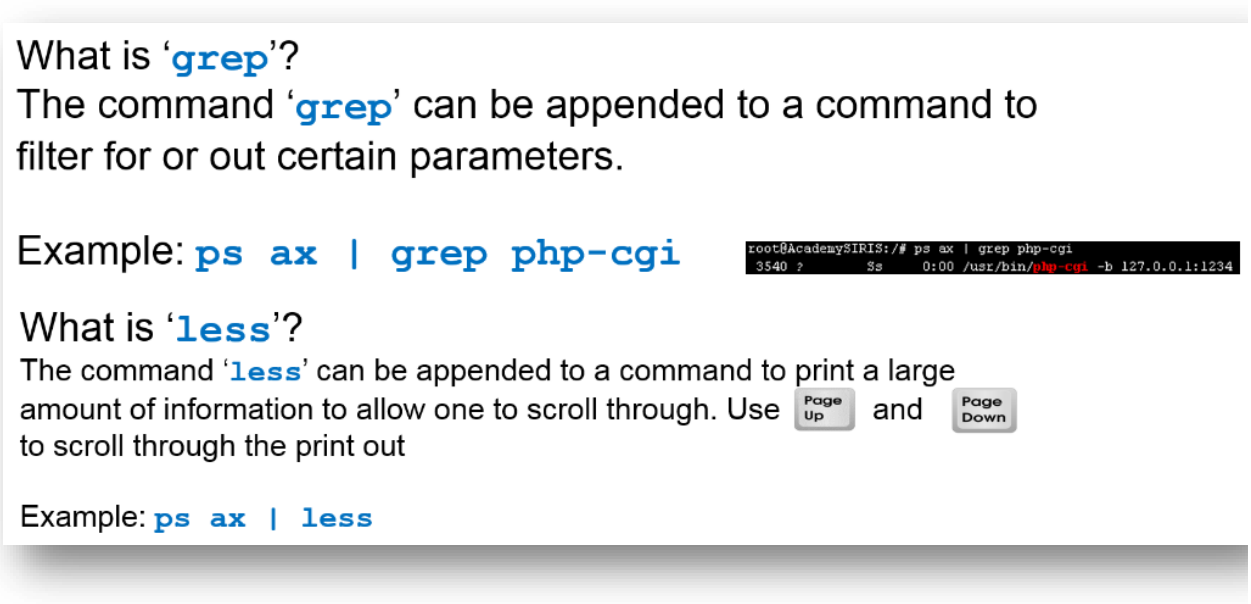
Tips:

- We will be teaching you a select few modifiers because there are many different types of modifiers for nearly all Linux and ZFS commands.
- You can use man and --help in conjunction with commands to see what they can do.

Step	Action
1	At your command prompt, type: **df** *For class, follow this step and note the results.*
2	Now at your command prompt type: **df –h** *For class, try this step. What are the differences in these two commands (one without a modifier and one with)? Go to the next step/next page to learn more.*

3	If you need help on any command add the modifiers, man or --help, for example type each below: **df --help** **man df** ***Note**: for the man command press Q or press CTRL C when done to return to your command prompt* *For class, Review or try this step.*

Modifiers/Switches – grep appended to command to filter for…



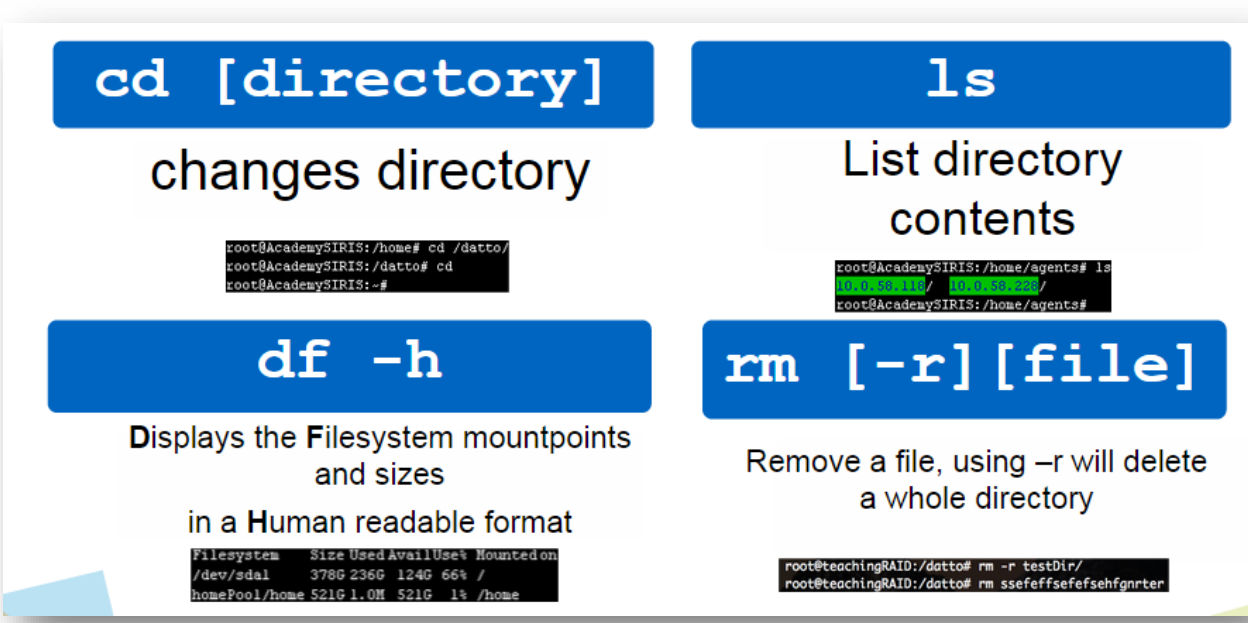
What is 'grep'?
The command 'grep' can be appended to a command to filter for or out certain parameters.

grep is a program onto itself and has a number of modifiers and switches that can be helpful to print out what you are looking for to clearly review the results (for an easy to read format)

What is 'less'?
The command 'less' can be appended to a command to print a large amount of information to allow one to scroll through. Use Page Up and Page Down to scroll through the print out.

Step	Action
1	To learn more about the command **grep**, try as seen below Type: **ps ax | grep php-cgi** *For class, review or try this step.*
2	To learn more about the command **less** type: **ps ax | less** *For class, try this step and review the results.*

Linux Basic Commands and Functions – cd, ls, df -h



Linux Basic Commands and Functions

Review these basic commands in order to understand the future activities within our course and help with troubleshooting.

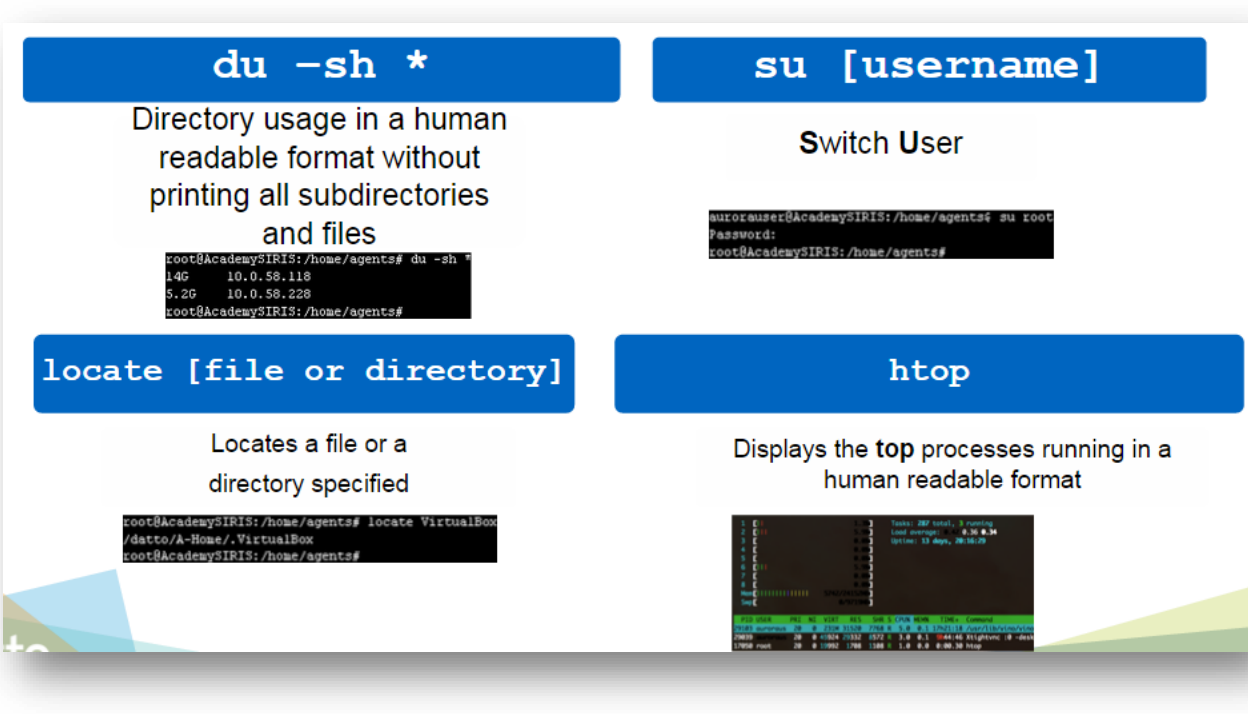
cd [directory] changes directory

ls List directory commands and review of modifiers and switches like –lash (listing all attributes including archived/hidden files with size and in a human readable format)

df –h Displays the Filesystem mountpoints and sizes in a human readable format

Step	Action
1	To learn more about df and the filesystem mountpoints and sizes in human readable format try as seen below: Type: **df –h** *For class, follow this step.*
2	To learn more about directory usage type: Type: **ls** Type**: ls -lash** *For class, try these steps to see the difference and what each provides in terms of information about files and directories.*

Linux Basic Commands and Functions – du –sh, su, htop



Linux Basic Commands and Functions

Why do we use du and not ls in certain situations? Sometimes you don't care what files and directories are listed within a parent directory but you DO CARE about the storage used. So do use: **du –sh *** gives you directory usage in a human readable format viewed with size. -s displays directory usage without printing all subdirectories and files (looking at all directories within a parent).

su for troubleshooting this ensures that you can get to the root user, troubleshoot permissions and more.

Step	Action
1	To get better size information about a directory use the du command, try: Type: **du –sh *** *For class, try this step. Note there is a space after h and before the *.*
2	To learn more about switching the user try these commands: Type: **su aurorauser** Type: **exit** (to return to the command prompt and root user) *For class, try this step.*

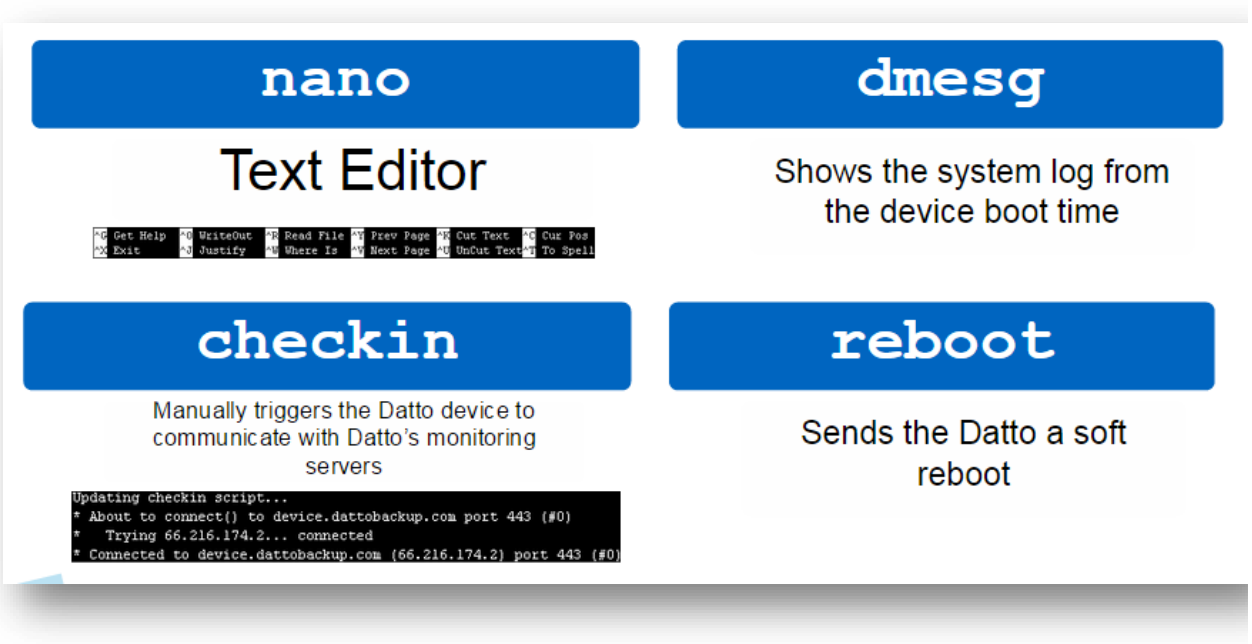
su [username] Switch User
locate finds files or directories based on your requirements. **locate [file or directory]** Locates a file or a directory specified

htop is used to see if a device is overloaded with work/processes.

htop displays the top processes running in human readable format

3	To learn more about locate, grep and less to find the files you need, type each of these in order below and review each carefully. Type: **locate** *[add your file or directory here]* *Example: locate datto* *Type:* **Locate datto | grep vmdk** Type**: Locate datto | grep –i vmdk** Type**: Locate datto | grep –v vmdk | less** *Press Q to quit to return to the command prompt (after the last command)* *For class, try this steps.*

Linux Basic Commands/Functions – nano, dmesg, checkin, reboot



Linux Basic Commands and Functions Below are some of the more common commands you can use:

nano Text Editor
Tip: If you aren't sure of your edits, upon exit choose "No" to avoid saving any changes.

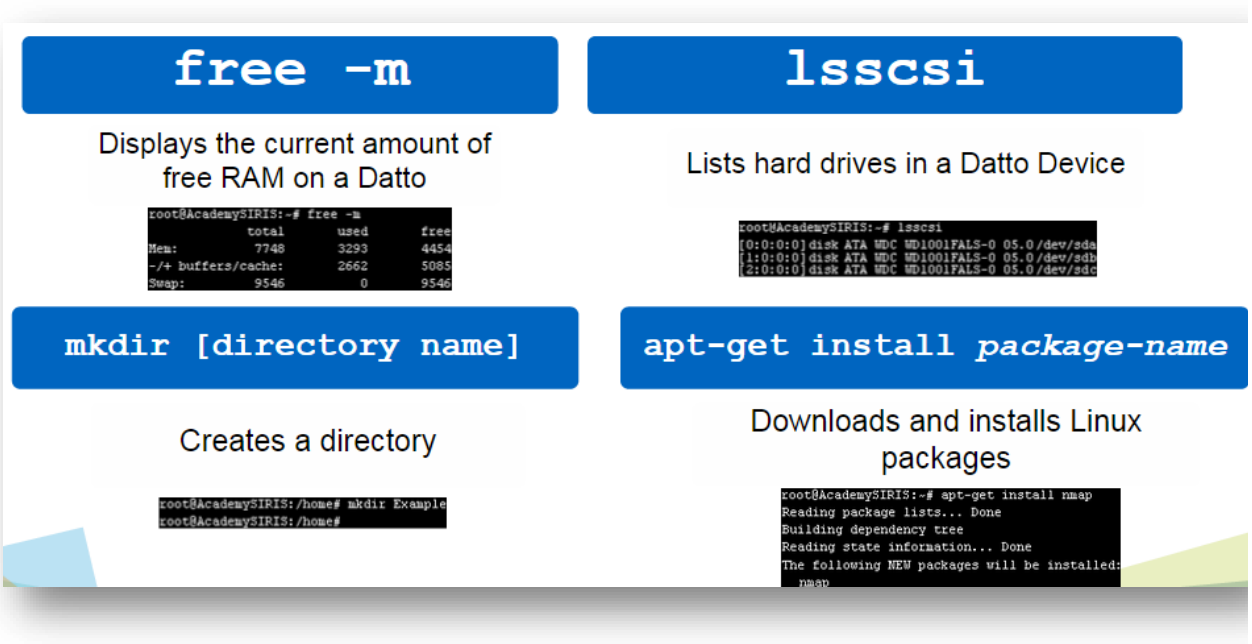
dmesg Shows recent system logs

checkin Manually triggers the Datto Device to communicate with Datto's monitoring servers through port 22, 80, 123, 443 to device.dattobackup.com

reboot Sends the Datto a soft reboot – **DO NOT RUN THIS COMMAND ON YOUR TRAINING DEVICE!**

Step	Action
1	To learn more about a text editor: Type: **nano testFile** **Enter text into the file** **Press: CTRL X and then ENTER to return to command prompt** *For class, follow this step.*
2	We will review where you can see a history of these logs later in the course. For now to see recent system logs: Type: **dmesg** You can also pipe the results to grep to filter the results listed, try typing: dmesg | grep –v bmc-config *For class, try this step and review the results.*

Linux Basic Commands and Functions – free –m, lsscsi, mkdir…



Linux Basic Commands and Functions

free –m Displays the current amount of free RAM on Linux machine in MB

lsscsi Lists hard drives that can be seen by a Linux machine. This is a great too to see if a RoundTrip USB is able to be seen by Linux

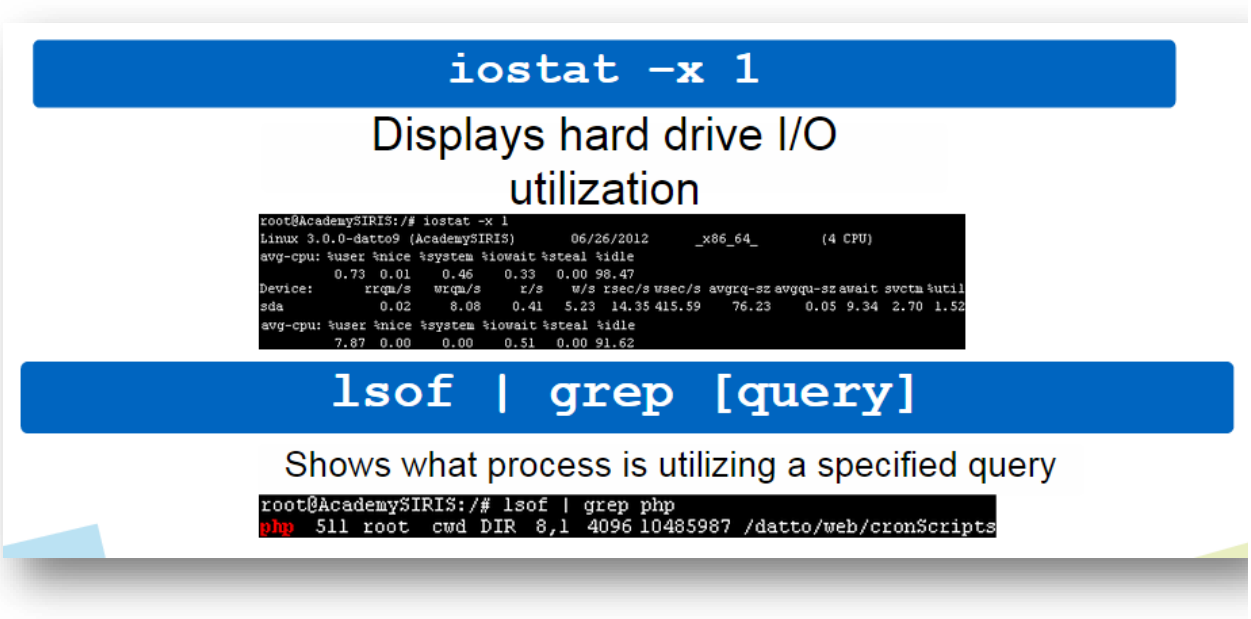
Tip: This command is extremely helpful for roundtrips**.**

mkdir [directory name] Creates a directory and mkdir –p [directory name] to create parent directory specified in the directory name seen in brackets.

apt-get install [package-name] Downloads and installs Linux packages and updates the [package name] specified in the command

Step	Action
1	To learn more about displaying the current amount of free RAM on a Linux machine: Type: **free –m** *For class, follow this step.*
2	To view the hard drives list in a Datto device type: Type: **lsscsi** *What if lsscsi doesn't list my device?* - *plug the cable in the back of the device* - *use a different USB cable* - *there is no other Linux magic to do here, it is probably a hardware problem* *For class, Review or try this step.*

Linux Basic Commands and Functions – iostat, lsof



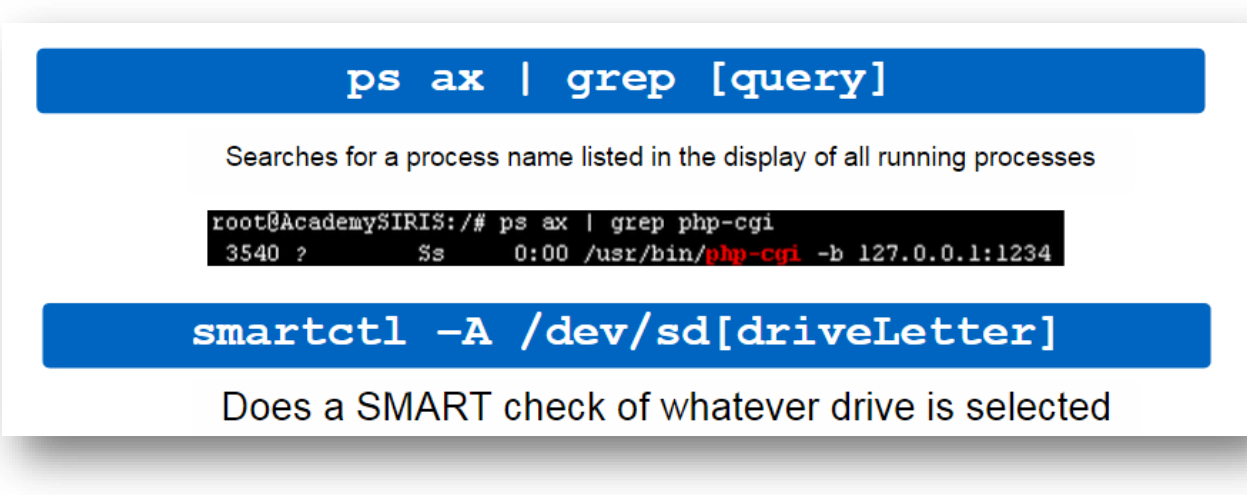
Linux Basic Commands and Functions

iostat –x 1
Displays hard drive I/O utilization and Datto uses this to find disks that are over utilized in the utilization column and point them to a disk that may be having issues.
Tip: -x 1 specifies the number of seconds between refresh

lsof | grep [query]
Shows what process is utilizing a specified query. Datto tends to use this command to find files/dirs in use that cannot be removed or unmounted.

Step	Action
1	To learn more about hard drive I/O utilization: Type: **iostat –x 1** Press **CTRL C** to end and return to the command prompt *For class, follow this step.*
2	To learn more about a process using a specified query: Type: **lsof** Type: **lsof | grep *php-cgi*** *For class, Review or try this step.*

Linux Basic Commands and Functions – ps ax | grep, smartctl -a



Linux Basic Commands and Functions

ps ax | grep [query]
Searches for a process name listed in the display of all running processes. If there is a process running that takes up too much I/O you can kill the process after looking for it in the process list.

smartctl –a /dev/sd[driveLetter]
Does a SMART check of whatever drive is selected. Datto automatically reports this info to you via email or RMM or PSA.

Tip: "-a" lists ALL attributes, while "-A" provides pre-failure errors only.

Step	Action
1	To search for a process name listed in the display of all running processes: Type: **ps ax | grep php-cgi** *For class, follow this step.*
2	To do a SMART check of the selected drive type: Type: **smartctl –a /dev/sda** Type: **smartctl –A /dev/sda** *For class, Review or try this step.*

smartctl –A /dev/sd[driveLetter]

When you get a hardware alert email, run this command to learn more.

```
root@teachingRAID:~# smartctl -A /dev/sda
smartctl version 5.38 [x86_64-unknown-linux-gnu] Copyright (C) 2002-8 Bruce Allen
Home page is http://smartmontools.sourceforge.net/

=== START OF READ SMART DATA SECTION ===
SMART Attributes Data Structure revision number: 16
Vendor Specific SMART Attributes with Thresholds:
ID# ATTRIBUTE_NAME          FLAG     VALUE WORST THRESH TYPE      UPDATED  WHEN_FAILED RAW_VALUE
  1 Raw_Read_Error_Rate     0x002f   200   200   051    Pre-fail  Always       -       0
  3 Spin_Up_Time            0x0027   172   171   021    Pre-fail  Always       -       4400
  4 Start_Stop_Count        0x0032   100   100   000    Old_age   Always       -       33
  5 Reallocated_Sector_Ct   0x0033   200   200   140    Pre-fail  Always       -       0
  7 Seek_Error_Rate         0x002e   200   200   000    Old_age   Always       -       0
  9 Power_On_Hours          0x0032   090   090   000    Old_age   Always       -       7436
 10 Spin_Retry_Count        0x0032   100   253   000    Old_age   Always       -       0
 11 Calibration_Retry_Count 0x0032   100   253   000    Old_age   Always       -       0
 12 Power_Cycle_Count       0x0032   100   100   000    Old_age   Always       -       31
192 Power-Off_Retract_Count 0x0032   200   200   000    Old_age   Always       -       24
193 Load_Cycle_Count        0x0032   200   200   000    Old_age   Always       -       8
194 Temperature_Celsius     0x0022   119   104   000    Old_age   Always       -       28
196 Reallocated_Event_Count 0x0032   200   200   000    Old_age   Always       -       0
197 Current_Pending_Sector  0x0032   200   200   000    Old_age   Always       -       0
198 Offline_Uncorrectable   0x0030   200   200   000    Old_age   Offline      -       0
199 UDMA_CRC_Error_Count    0x0032   200   200   000    Old_age   Always       -       0
200 Multi_Zone_Error_Rate   0x0008   200   200   000    Old_age   Offline      -       0
```

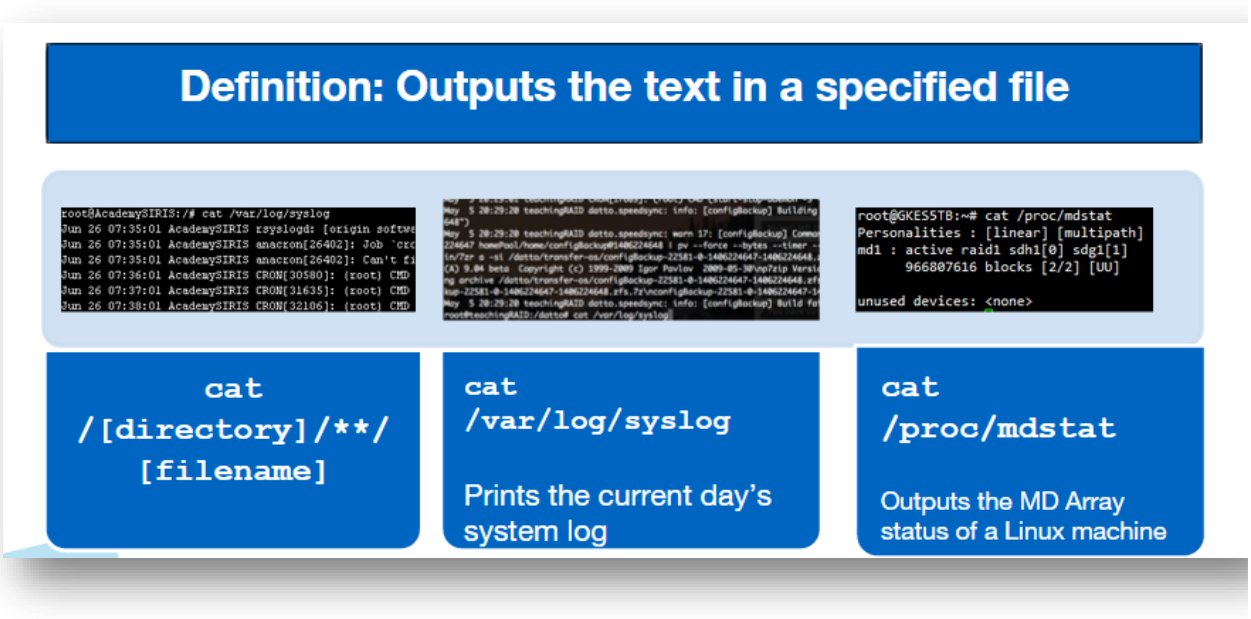
Remember smartctl –A /dev/sda does a SMART check of whatever drive is selected. Datto automatically reports this info to you via email or RMM or PSA. **Let's talk about reading the results of this command. What do the columns mean and how can they help you troubleshoot?**

- Raw_Read_Error_Rate – when a block of data is trying to be written and couldn't, the Raw Read value increments by 1. It doesn't mean the drive is failing, it means in this one instant it couldn't read that block of data, usually Datto likes to replace HD that show more than 100 Raw Read errors or a growing amount of errors.
- Reallocated_Sector_Ct – hard drive manufacturers make disks with areas for blocks to be re-written, when the drive finds a block that goes bad or is starting to go bad, it re-writes it to reallocated sector area. A growing number and/or over 30 means the drive should be replaced.
- Temperature_Celsius – hard drive manufacturers recommend no more than 50 degrees Celsius and if the drive does reach 50 degrees C the Datto will notify you!
- Reallocated_Event_Count - hard drive manufacturers make disks with areas for blocks to be re-written, when the drive finds a block that goes bad or is starting to go bad, it re-writes it to reallocated sector area. A growing number and/or over 30 means the drive should be replaced.
- Current_Pending_Sector – Before data gets written to a reallocated sector for a nano second it becomes a pending sector, but if the reallocated sector area is full, then it stays as a current pending sector because there is no area to write it into. A growing number and/or over 30 means the drive should be replaced.

- Offline_Uncorrectable – Simply the WORST! One or more, and you should have the disk replaced. A block becomes offline uncorrectable when the sector is completely dead.
- UDMA_CRC_Sector_Count – this value increments when a cyclical redundancy check (CRC) between the Motherboard and hard drive fails indicating the SATA cable is faulty. Have Datto send you a new cable.
- Multi_Zone_Error_Rate – Hard drive manufacturers recommend that you store drives horizontally, however for a time chassis manufacturers made high density chassis with vertically stored disks which was prone to these errors because of the vibrations generated from having more than 8 vertically stored drives. Datto changed the chassis they purchased to ensure drives were horizontally stored.

Note: with any error type, a growing number over time is bad.

Using cat on Datto Devices



Using cat on Datto Devices

cat /[directory]//[file name]**

cat /var/log/syslog Prints the current days system log

Tip: Datto Tech Support uses this log as well as kern.log to see what happened previous to a device lockup

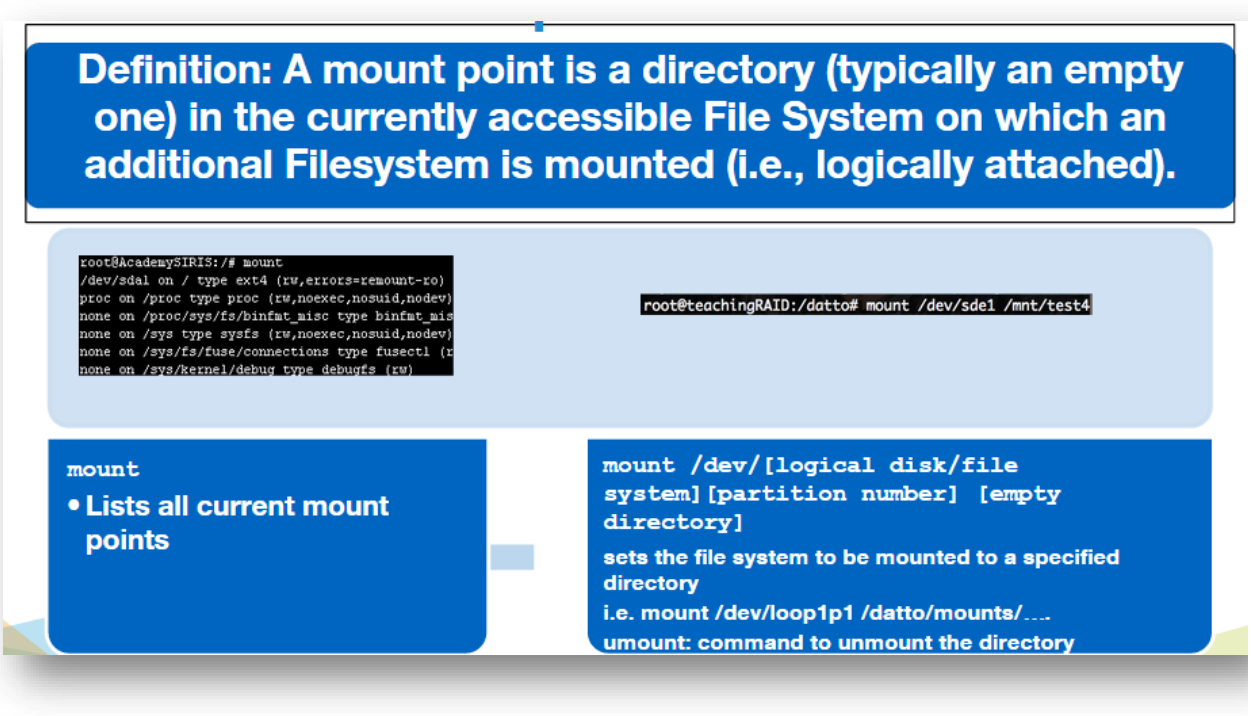
Tip: The 2 most helpful logs to see any device lockups are sys.log and kern.log

Tip: An automated log rotate process gzips older logs over time. Use zcat command to display gzipped files.

cat /proc/mdstat
Outputs the MD Array status of a Linux machine

Step	Action
1	To learn more about what the Linux machine did during the day: Type: **cat /var/log/syslog** Type: cat /var/log/syslog | grep –v bmc *For class, follow this step.*
2	To see the output of the MD Array status of a Linux machine type: Type: **cat /proc/mdstat** *For class, review or try this step.*

Mount and Mountpoints



A mount point is an empty directory in the currently accessible File System on which an additional File System is mounted (i.e., logically attached).

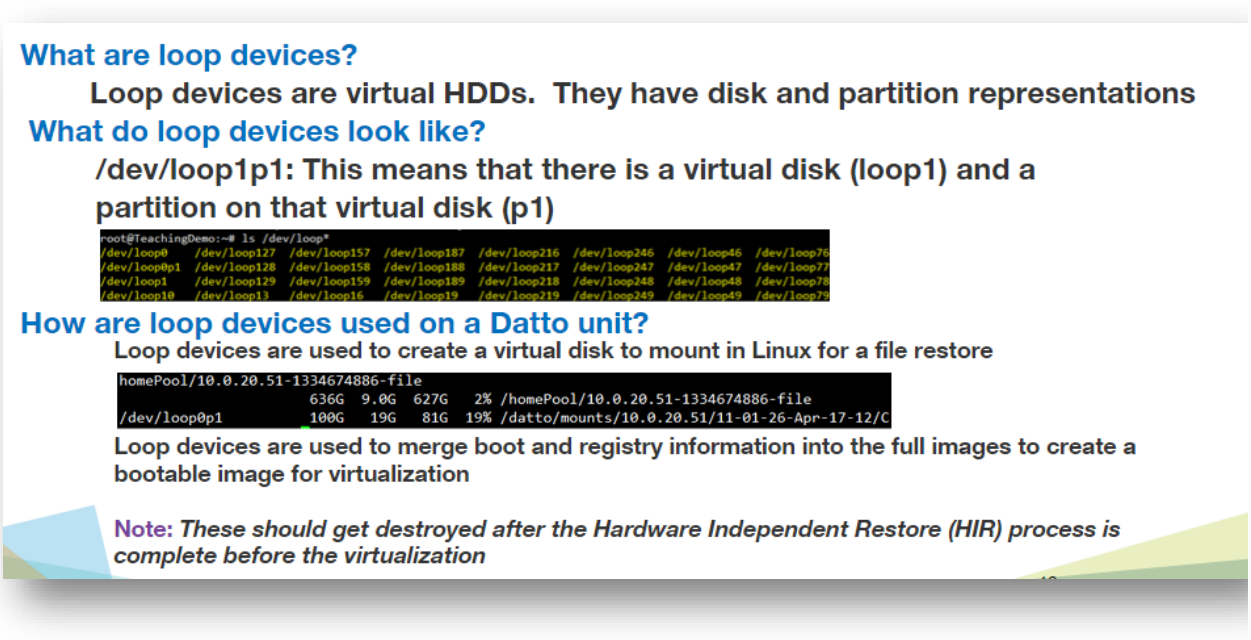
Mount Lists all current mount points and how they should be mounted.

mount /dev/[logical disk/file system][partition number] /directory sets the file system to be mounted to a specified directory
i.e. mount /dev/loop1p1 /datto/mounts/….

umount: command to unmount a filesystem from a directory

Step	Action
1	To learn more about listing all the mountpoints type: Type: **mount** *For class, follow this step.*

Loop Devices and Datto – what are loop devices?



Loop devices are virtual HDDs. They have disk and partition representations

What do loop devices look like?
/dev/loop1p1
This means that there is a virtual disk (loop1) and a partition on that virtual disk (p1)

How are loop devices used on a Datto unit?
-Loop devices are used to create a virtual disk to mount in Linux for a file restore
-Loop devices are used to merge the Dattos HIR processor into the Backup files to create a bootable image for virtualization.

Note: These should get destroyed after the HIR process is complete before the virtualization

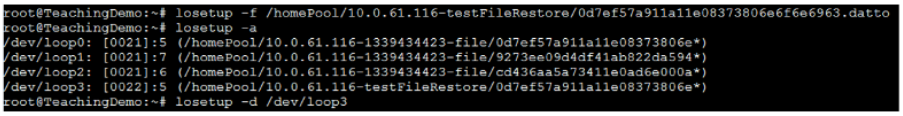
Step	Action
1	To learn more about loop devices review this page and tips on the left. *For class, follow this step.*

Loop Devices Commands - losetup

`losetup -f [/dir/to/file]`: Creates a block device on a file

`losetup -a`: Displays any running loop devices and what files are being used with them

`losetup -d /dev/loop[loopNumber]`: Disassociates a loop device from a .datto sparse image



Loop Devices Commands

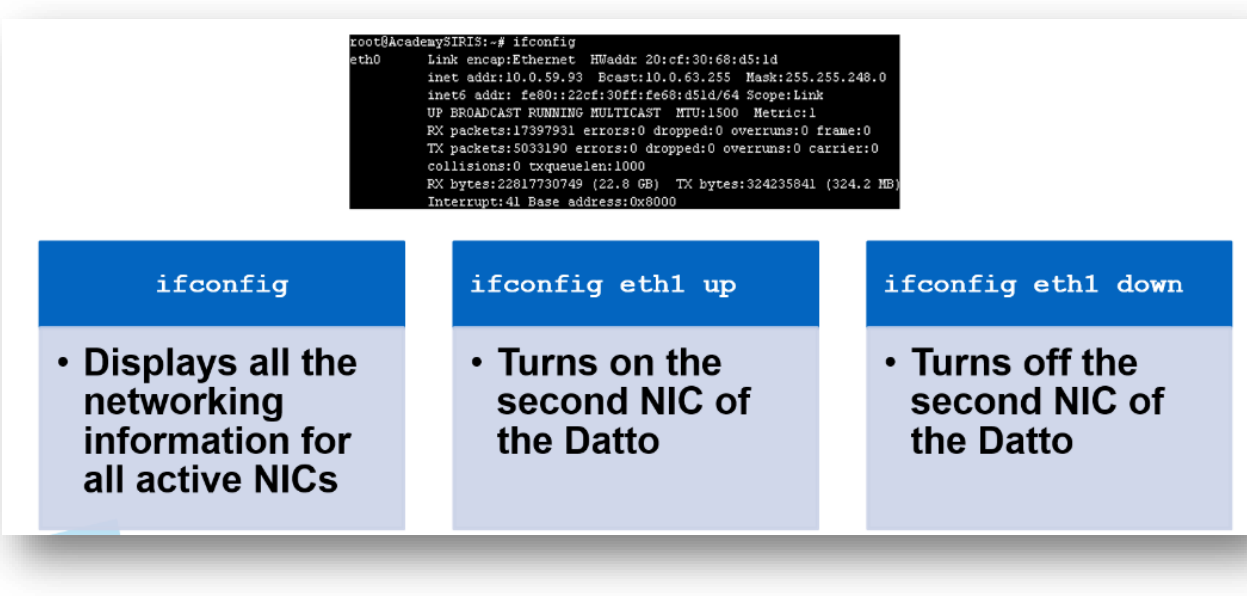
losetup [/dir/file]
Creates a block device on a file.

losetup –a
Displays any running loop devices and what files are being used with them

losetup –d /dev/loop[loopNumber]
Disassociates a loop device from a .datto sparse image – as long as it is not mounted

Step	Action
1	Review this page and the tips on the left. We will learn more when we do a manual file restore. *For class, review or follow this step.*

Linux Networking Commands/Functions – ifconfig



Linux Networking Commands and Functions

ifconfig
Displays all the networking information for all active NICs. Shows ipaddr, hwaddr, or mac packet traffic issues.

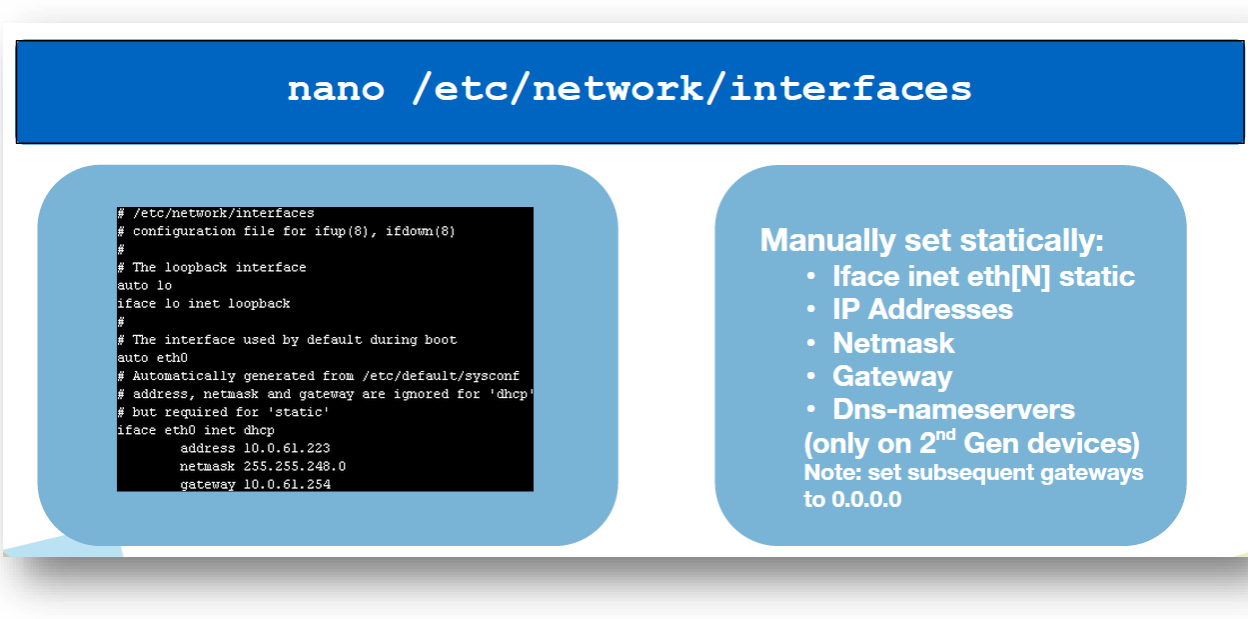
ifconfig eth1 up
Turns on the second NIC of the Datto

ifconfig eth1 down
Turns off the second NIC of the Datto

Tip: Internet traffic to Datto device is over eth0 – this needs to be up with internet access enabled.

Step	Action
1	To display all the networking information for all active NICs: Type: **ifconfig** *For class, review or follow this step.*
2	To turn on the second NIC of the Datto, type: **ifconfig eth1 up** *For class, review or try this step.*
3	Let's look for eth1: Type: **ifconfig** Type: **ifconfig eth1 down** *For class, review or try this step.*

Changing Network Settings – through the command file



he interfaces file is what the "Network" tab looks at:

Changing Network Settings

nano /etc/network/interfaces

Manually set:

- iface eth0 inet static
- IP Addresses
- Netmasks
- Gateways
- Dns-nameservers (only on 2nd Gen (i.e. 12.0.4) devices) Gen1 devices edit resolv.conf

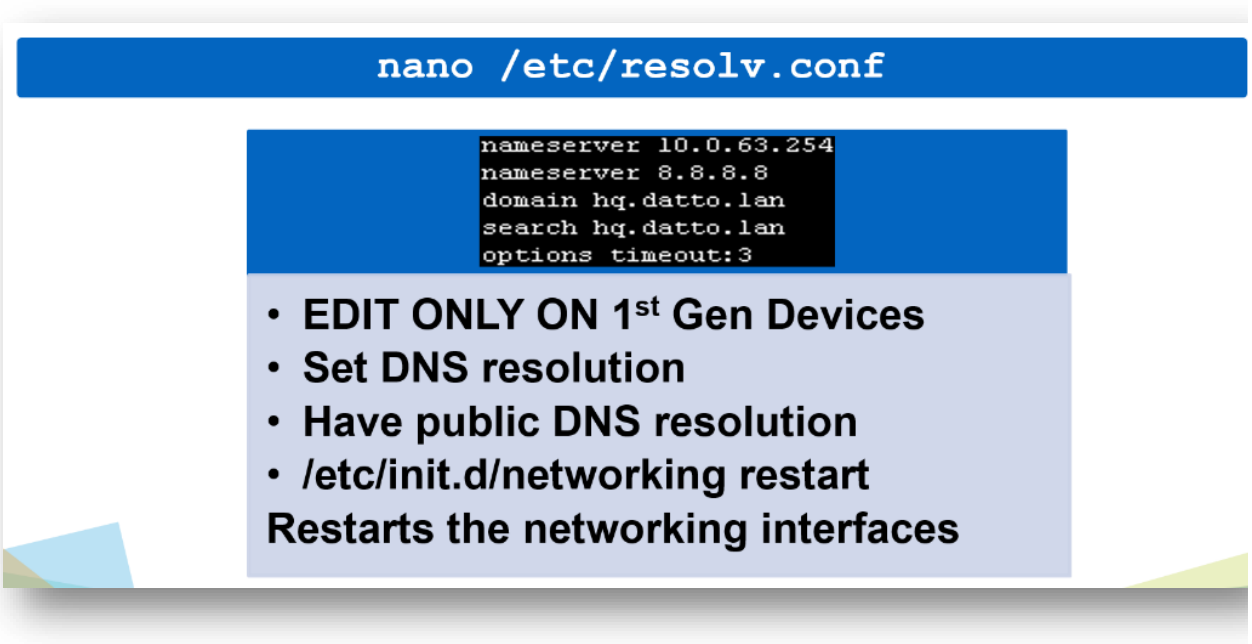
Note: set subsequent gateways to 0.0.0.0

- DHCP or Static

Tip: DHCP will always take precedence id DHCP is kept in the interfaces file for a specific "iface".

Step	Action
1	To learn about changing network settings review the example in the picture above. Type: **nano /etc/network/interfaces** Press**: CTRL X** Press**: Enter** This exits you back to the command prompt. *For class, follow this step.*

Changing Network Settings – nano



Changing Network Settings

nano /etc/resolv.conf

EDIT ONLY ON 1st Gen Devices, 2nd Gen Devices will re-write anything in here not set properly
Set DNS resolution
Have public DNS resolution
/etc/init.d/networking restart

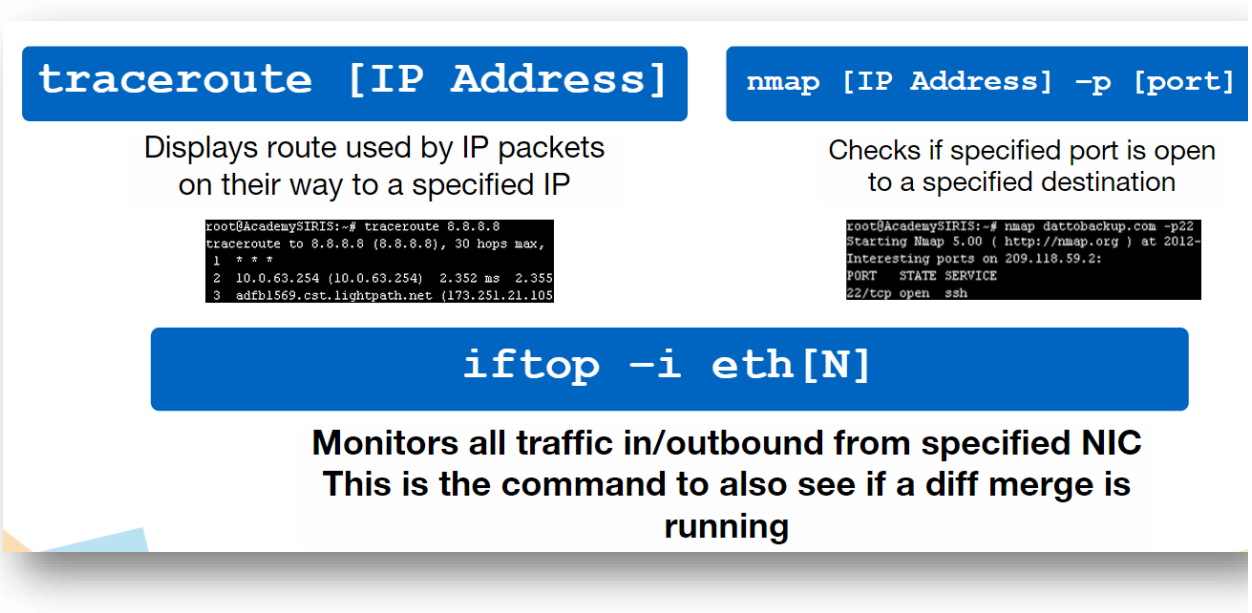
Tip: Use IP address always for nameserver, or FQDN if you have to. NEVER use hostname.

Tip: When you get the device, plug it in and it's not working. What to try next?

- try cable
- set interfaces files
- try to ping local computer or google, or device.dattobackup.com
- if ping works, try checkin command

Step	Action
1	Review the left column to learn some helpful tips. *For class, review this step.*

Other Networking Commands – traceroute, nmap, iftop



Other Networking Commands

traceroute [IP Address]

Displays route used by IP packets on their way to a specified IP like tracert in windows

Tip: Datto Tech Support uses this command to find out if someone is backing up an agent through the WAN. This is not recommended.

nmap [IP Address] –p [port]

Checks if specified port is open to a specified destination

Tip: For Datto devices, these 4 ports 22,80,443,123 need to be open for outbound access. Port 25566 is the ShadowProtect port and needs to be

Step	Action
1	To learn about changing network settings review the example in the picture above. Type: **traceroute google.com** *For class, follow this step.*
2	Type: **nmap device.dattobackup.com –p 22,80,443,123** **nmap dattoremote.com –p 2200-2250** *For class, follow this step.*

open bidirectionally between Datto and the Production Machine. Port 25567 is the Linux Agent port. Port 3260 is for unencrypted agents.

iftop –i eth0

Monitors all traffic in/outbound from specified NIC

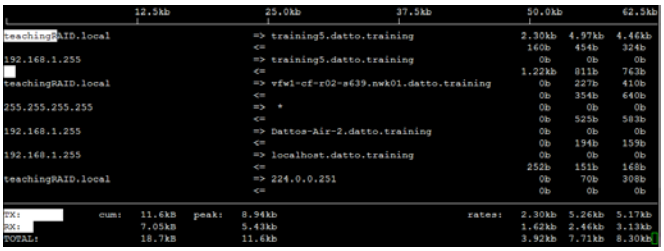
[source] → [destination]

[destination] → [source]

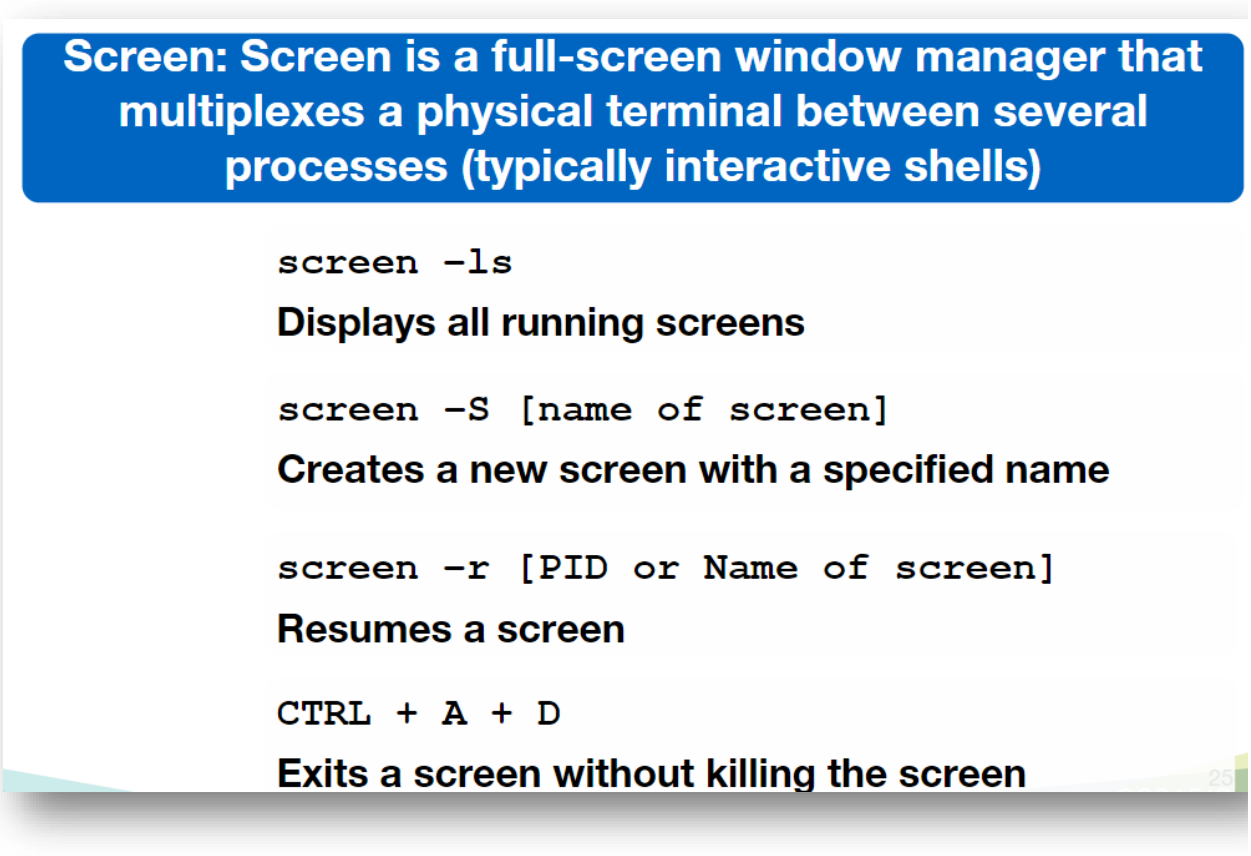
Note a differential merges traverses Production machine disks and only backs up the change

This is the command to also see if a diff merge is running

Tip: diffmerge can take a long time to complete.

3	Take a look at the notes in the left hand column to learn more about the specifics of the commands. Type: **iftop –i eth0**  *For class, follow this step.*

Linux Commands and Functions Continued - screen



Screen is a full-screen window manager that multiplexes a physical terminal between several processes (typically interactive shells)

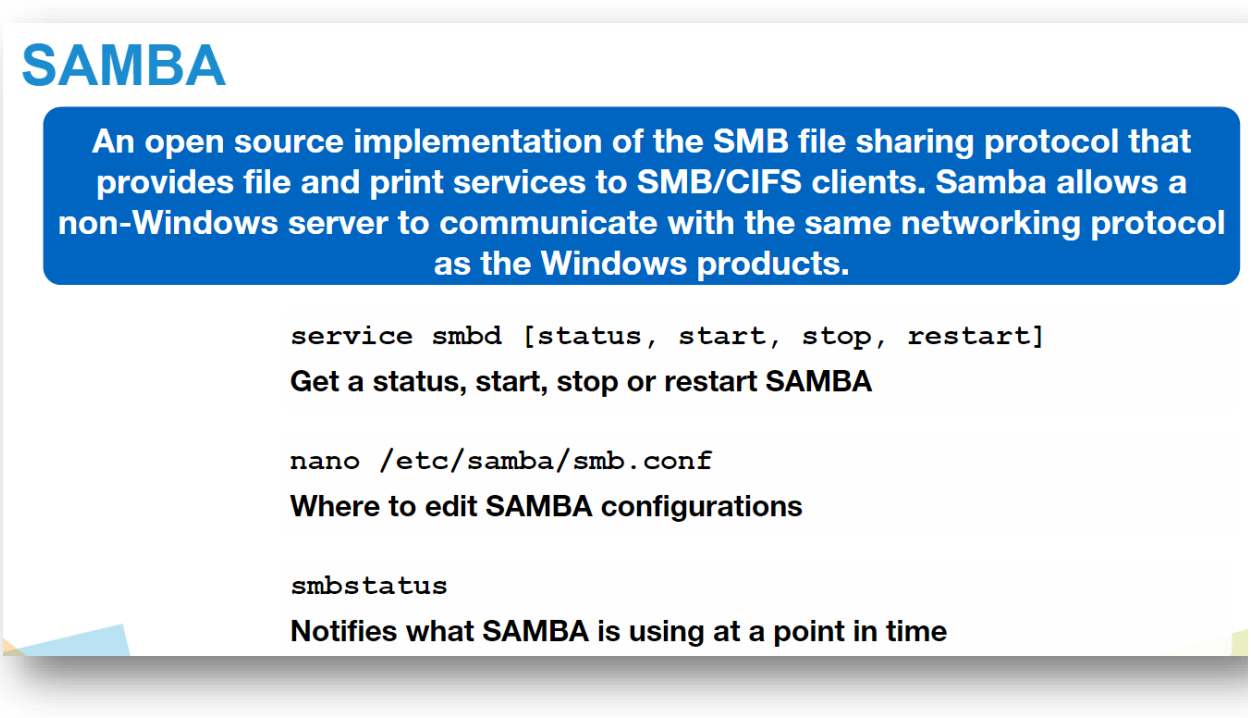
Datto uses screen for backups, offsite sync, etc.:
screen –ls
Displays all running screens
screen –S [name of screen]
Creates a new screen with a specified name
screen –r [PID or Name of screen]
Resumes a screen

Tip: You should always see usbBMRListen and heartbeat listed

CTRL + A + D
Exits a screen without killing the screen

Step	Action
1	To learn about screen, type the example below. Type: **screen –ls** *For class, review this step.*
2	To exit a screen without killing the screen, try this key combination. Simultaneously press: **CTRL + A + D** *For class, review this step.*

SAMBA



SAMBA
Basically, a protocol for Linux to communicate with other operating systems.

Datto uses SAMBA for file restores and unencrypted backups.
service smbd [status, start, stop, restart]
Get a status, start, stop or restart SAMBA like services.msc

nano /etc/samba/smb.conf
Where to edit SAMBA configurations

smbstatus
Notifies what SAMBA is using at a point in time

Step	Action
1	To learn SAMBA review the example in the picture above. Type: **service smbd status** *For class, follow this step.*
2	Allows you to edit the configuration file. Type: **nano /etc/samba/smb.conf** Press: **CTRL X** Press: **Enter** This exits you back to the command prompt. *For class, follow this step.*