This is just a demonstration of how to use partitions and file systems on a disk. Your actual homework tasks may be significantly different than the parameters and commands used in these slides.

This is just a demonstration of how to use partitions and file systems on a disk. Your actual homework tasks may be significantly different than the parameters and commands used in these slides.

cgl2012@desdemona:$ echo "READ THE REQUIREMENTS CAREFULLY."
READ THE REQUIREMENTS CAREFULLY.
cgl2012@desdemona:$
cgl2012@desdemona:~$ echo "Creating a virtual machine with a disk large enough to do some exercises."
Creating a virtual machine with a disk large enough to do some exercises.
cgl2012@desdemona:~$ Monad
cgl2012@desdemona:-$ ctn createvm disk.dsutux.us 1024 8 2005
/qemu/bin/qemu-new-image cgl2012-disk.dsutux.us 8 /qemu/images;
Formatting '/qemu/images/cgl2012-cgl2012-disk.dsutux.us.img', fmt=raw size=34592
User cgl2012 has created the machine disk.dsutux.us : 325 with 1024 memory

User cgl2012 has created the machine disk.dsutux.us : 325 with 1024 memory
cgl2012@desdemona:~$ echo "Later, I'll reduce the RAM for this system, after installation has completed."
Later, I'll reduce the RAM for this system, after installation has completed.
cgl2012@desdemona:~$
Before installation, I'm going to configure DNS for this system.
cgl@ns1:/$ sudo emacs /etc/bind/db.dsutux.us
; A (Address) records
;
ns1 IN A 144.38.214.130
ns2 IN A 144.38.214.131
mail IN A 144.38.214.132
www IN A 144.38.214.133
users IN A 144.38.214.134
resources IN A 144.38.214.135
disk IN A 144.38.214.136

; A CNAME (Canonical Name) record is an alias to an entry that has an A record. This is often done for auxiliary names to existing systems.
tarzan IN CNAME www
jane IN CNAME www
korak IN CNAME www
borta IN CNAME www
numa IN CNAME www
tantor IN CNAME www
; for updated information.
; Retry - How often the secondary (slave) name servers should retry
; the refresh, if the refresh is unsuccessful.
; Expire - How long secondary (slave) name servers should keep and serve
; this zone information before it is discarded.
; Minimum/TTL - How long negative hits should be stored. This is for caching
; lookup servers that ask our authoritative server for
; non-existent RR. This tells how long to cache the
; negative response.
@ IN SOA ns1.dsutux.us. root.ns1.dsutux.us. ( 2014093003 ; Serial
3600 ; Refresh 300 ; Retry 241920 ; Expire 60 ) ; Negative cache TTL

; NS (Name Server) records
@
IN NS ns1.dsutux.us.
@ IN NS ns2.dsutux.us.

---
Read-Only mode enabled
cgl@ns1:/$ echo "Yes, reverse too."
Yes, reverse too.
cgl@ns1:/$
cgl@ns1:/$ sudo emacs /etc/bind/db.128-159.214.38.144.in-addr.arpa
241920 ; Expire
60 ) ; Negative cache TTL

; NS (Name Server) records
;
@ IN NS     ns1.dsutux.us.
@ IN NS     ns2.dsutux.us.

; PTR (Pointer) records
;
130 IN PTR  ns1.dsutux.us.
131 IN PTR  ns2.dsutux.us.
132 IN PTR  mail.dsutux.us.
133 IN PTR  www.dsutux.us.
134 IN PTR  users.dsutux.us.
135 IN PTR  resources.dsutux.us.
136 IN PTR  disk.dsutux.us.
for updated information.

- How often the secondary (slave) name servers should retry the refresh, if the refresh is unsuccessful.

- How long secondary (slave) name servers should keep and serve this zone information before it is discarded.

- How long negative hits should be stored. This is for caching lookup servers that ask our authoritative server for non-existent RR. This tells how long to cache the negative response.

@ IN SOA ns1.dsutux.us. root.ns1.dsutux.us. (
  2014093002 ; Serial
  3600 ; Refresh
  300 ; Retry
  241920 ; Expire
  60 ) ; Negative cache TTL

; NS (Name Server) records
;
@ IN NS ns1.dsutux.us.
@ IN NS ns2.dsutux.us.
cgl@ns1:/$ sudo service bind9 restart
* Stopping domain name service... bind9
waiting for pid 12890 to die

[ OK ]
[ OK ]

* Starting domain name service... bind9

cgl@ns1:/$
cgl@ns1:/$ dig @144.38.1.2 disk.dsutux.us

; >>> Dig 9.9.5-3-Ubuntu <<< @144.38.1.2 disk.dsutux.us
; (1 server found)
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 41952
;; flags: qr rd ra; QUERY: 1, ANSWER: 1, AUTHORITY: 2, ADDITIONAL: 1

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 4096
;; QUESTION SECTION:
disk.dsutux.us. IN A

;; ANSWER SECTION:
disk.dsutux.us. 3600 IN A 144.38.214.136

;; AUTHORITY SECTION:
dsutux.us. 3600 IN NS ns2.dsutux.us.
dsutux.us. 3600 IN NS ns1.dsutux.us.

;; Query time: 38 msec
;; SERVER: 144.38.1.2#53(144.38.1.2)
;; WHEN: Tue Sep 30 18:41:30 MDT 2014
cgl@ns1:/$ echo "Great. Now I don't have to worry about that later."
Great. Now I don't have to worry about that later.
cgl@ns1:/$
cgl2012@desdemona:~$ citv bootvm disk.dsutux.us d trusty_net 
/usr/bin/ssh -q desdemona "/qemu/bin/qemu-boot 325 'cgl2012-disk.dsutux.us' 1024 '52:54:00:08:01:44' '' 'trusty_net' 'd' 1 1 2005 '/qemu/images';"
User(cgl2012) has booted machine(disk.dsutux.us) on server(desdemona:325) with 1024 memory.
cgl2012@desdemona:~$
Installer boot menu

Install
Command-line install
Advanced options
Help

Press ENTER to boot or TAB to edit a menu entry
cgl2012@desdemona:~$ echo "Not all installation screens are captured. Only those that are different from other installations."
Not all installation screens are captured. Only those that are different from other installations.
cgl2012@desdemona:~$
The IP address is unique to your computer and may be:

* four numbers separated by periods (IPv4);
* blocks of hexadecimal characters separated by colons (IPv6).

You can also optionally append a CIDR netmask (such as "/24").

If you don't know what to use here, consult your network administrator.

**IP address:**

```
144.38.214.136
```

<Go Back>    <Continue>
[!!!] Configure the network

The netmask is used to determine which machines are local to your network. Consult your network administrator if you do not know the value. The netmask should be entered as four numbers separated by periods.

Netmask:

255.255.255.224

<Go Back>  <Continue>
The gateway is an IP address (four numbers separated by periods) that indicates the gateway router, also known as the default router. All traffic that goes outside your LAN (for instance, to the Internet) is sent through this router. In rare circumstances, you may have no router; in that case, you can leave this blank. If you don't know the proper answer to this question, consult your network administrator.

Gateway:

144.38.214.129

<Go Back>  <Continue>
The name servers are used to look up host names on the network. Please enter the IP addresses (not host names) of up to 3 name servers, separated by spaces. Do not use commas. The first name server in the list will be the first to be queried. If you don't want to use any name server, just leave this field blank.

Name server addresses:

144.38.214.130 144.38.214.131 144.38.192.2

<Go Back> <Continue>
[!] Configure the network

Please enter the hostname for this system.

The hostname is a single word that identifies your system to the network. If you don't know what your hostname should be, consult your network administrator. If you are setting up your own home network, you can make something up here.

Hostname:

disk

<Go Back>  <Continue>
The domain name is the part of your Internet address to the right of your host name. It is often something that ends in .com, .net, .edu, or .org. If you are setting up a home network, you can make something up, but make sure you use the same domain name on all your computers.

Domain name:

dsutux.us

<Go Back>  <Continue>
The installer can guide you through partitioning a disk (using different standard schemes) or, if you prefer, you can do it manually. With guided partitioning you will still have a chance later to review and customise the results.

If you choose guided partitioning for an entire disk, you will next be asked which disk should be used.

Partitioning method:

- Guided - use entire disk
- Guided - use entire disk and set up LVM
- Guided - use entire disk and set up encrypted LVM
- Manual

<Go Back>
This is an overview of your currently configured partitions and mount points. Select a partition to modify its settings (file system, mount point, etc.), a free space to create partitions, or a device to initialize its partition table.

Guided partitioning
Configure iSCSI volumes

SCSI1 (0,0,0) (sda) - 8.6 GB ATE QEMU HARRDISK

Undo changes to partitions
Finish partitioning and write changes to disk

<Go Back>
You have selected an entire device to partition. If you proceed with creating a new partition table on the device, then all current partitions will be removed.

Note that you will be able to undo this operation later if you wish.

Create new empty partition table on this device?

<Go Back>  <Yes>  <No>
This is an overview of your currently configured partitions and mount points. Select a partition to modify its settings (file system, mount point, etc.), a free space to create partitions, or a device to initialize its partition table.

Guided partitioning
Configure software RAID
Configure the Logical Volume Manager
Configure encrypted volumes
Configure iSCSI volumes

SCSI1 (0,0,0) (sda) - 8.6 GB ATA QEMU HARDDISK
pri/log  8.6 GB  FREE SPACE

Undo changes to partitions
Finish partitioning and write changes to disk

<Go Back>
[!!!] Partition disks

How to use this free space:

- Create a new partition
- Automatically partition the free space
- Show Cylinder/Head/Sector information

<Go Back>
The maximum size for this partition is 8.6 GB.

Hint: "max" can be used as a shortcut to specify the maximum size, or enter a percentage (e.g. "20%") to use that percentage of the maximum size.

New partition size:

3GB

<Go Back>  <Continue>
Type for the new partition:

Primary
Logical

<Go Back>
Partition disks

Please choose whether you want the new partition to be created at the beginning or at the end of the available space.

Location for the new partition:

Begin
End

<Go Back>
You are editing partition #1 of SCSI1 (0,0,0) (sda). No existing file system was detected in this partition.

Partition settings:

Use as: Ext4 journaling file system

Mount point: /
Mount options: defaults
Label: none
Reserved blocks: 5%
Typical usage: standard
Bootable flag: off

Copy data from another partition
Delete the partition
Done setting up the partition

<Go Back>
This is an overview of your currently configured partitions and mount points. Select a partition to modify its settings (file system, mount point, etc.), a free space to create partitions, or a device to initialize its partition table.

Guided partitioning
Configure software RAID
Configure the Logical Volume Manager
Configure encrypted volumes
Configure iSCSI volumes

SCSI1 (0,0,0) (sda) - 8.6 GB ATA QEMU HARDDISK

<table>
<thead>
<tr>
<th>Partition</th>
<th>Size</th>
<th>Type</th>
<th>Mount Point</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1</td>
<td>3.0 GB</td>
<td>f</td>
<td>ext4</td>
</tr>
<tr>
<td>pri/log</td>
<td>5.6 GB</td>
<td></td>
<td>FREE SPACE</td>
</tr>
</tbody>
</table>

Undo changes to partitions
Finish partitioning and write changes to disk

<Go Back>
How to use this free space:

- Create a new partition
- Automatically partition the free space
- Show Cylinder/Head/Sector information

<Go Back>
[!!] Partition disks

The maximum size for this partition is 5.6 GB.

Hint: "max" can be used as a shortcut to specify the maximum size, or enter a percentage (e.g. "20%") to use that percentage of the maximum size.

New partition size:

256M

<Go Back>  <Continue>
[!] Partition disks

Type for the new partition:

Primary
Logical

<Go Back>
Please choose whether you want the new partition to be created at the beginning or at the end of the available space.

Location for the new partition:

- Beginning
- End

<Go Back>
You are editing partition #2 of SCSI1 (0,0,0) (sda). No existing file system was detected in this partition.

Partition settings:

Use as: Ext4 journaling file system

Mount point: /home
Mount options: defaults
Label: none
Reserved blocks: 5%
Typical usage: standard
Bootable flag: off

Copy data from another partition
Delete the partition
Done setting up the partition

<Go Back>
How to use this partition:

- Ext4 journaling file system
- Ext3 journaling file system
- Ext2 file system
- btrfs journaling file system
- JFS journaling file system
- XFS journaling file system
- FAT16 file system
- FAT32 file system

**swap area**

- physical volume for encryption
- physical volume for RAID
- physical volume for LVM

Do not use the partition

<Go Back>
You are editing partition #2 of SCSI1 (0,0,0) (sda). No existing file system was detected in this partition.

Partition settings:

Use as: swap area

Bootable flag: off

Copy data from another partition
Delete the partition
Done setting up the partition

<Go Back>
This is an overview of your currently configured partitions and mount points. Select a partition to modify its settings (file system, mount point, etc.), a free space to create partitions, or a device to initialize its partition table.

Guided partitioning
Configure software RAID
Configure the Logical Volume Manager
Configure encrypted volumes
Configure iSCSI volumes

SCSI1 (0,0,0) (sda) - 8.6 GB ATA QEMU HARDDISK
  #1  primary  3.0 GB  f  ext4 /
  #2  primary  255.9 MB  f  swap  swap
  pri/log  5.3 GB  FREE SPACE

Undo changes to partitions
Finish partitioning and write changes to disk

<Go Back>
If you continue, the changes listed below will be written to the disks. Otherwise, you will be able to make further changes manually.

The partition tables of the following devices are changed:
  SCSi1 (0,0,0) (sda)

The following partitions are going to be formatted:
  partition #1 of SCSi1 (0,0,0) (sda) as ext4
  partition #2 of SCSi1 (0,0,0) (sda) as swap

Write the changes to disks?

<Yes> <No>
cgl2012@desdemona:~$ citv updateRAM disk.dsutux.us 256
Updated the RAM for disk.dsutux.us to 256Mbyte.
cgl2012@desdemona:~$
The sfdisk tool allows you to examine the DOS partition table of a disk. (Just be careful to use it correctly. It can change the table.)
cgl@disk:/$ ls -l /dev/sd*
brw-rw---- 1 root    disk 8, 0 Sep 30 19:04  /dev/sda
brw-rw---- 1 root    disk 8, 1 Sep 30 19:04  /dev/sda1
brw-rw---- 1 root    disk 8, 2 Sep 30 19:04  /dev/sda2

cgl@disk:/$
cgl@disk:/$ sudo sfdisk -l /dev/sda

Disk /dev/sda: 1044 cylinders, 255 heads, 63 sectors/track
Units = cylinders of 8225280 bytes, blocks of 1024 bytes, counting from 0

<table>
<thead>
<tr>
<th>Device</th>
<th>Boot</th>
<th>Start</th>
<th>End</th>
<th>#cyls</th>
<th>#blocks</th>
<th>Id</th>
<th>System</th>
</tr>
</thead>
<tbody>
<tr>
<td>/dev/sda1</td>
<td>*</td>
<td>0+</td>
<td>364-</td>
<td>365-</td>
<td>2928640</td>
<td>83</td>
<td>Linux</td>
</tr>
<tr>
<td>/dev/sda2</td>
<td></td>
<td>364+</td>
<td>395-</td>
<td>32-</td>
<td>249856</td>
<td>82</td>
<td>Linux swap / Solaris</td>
</tr>
<tr>
<td>/dev/sda3</td>
<td>0</td>
<td>-</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>Empty</td>
</tr>
<tr>
<td>/dev/sda4</td>
<td>0</td>
<td>-</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>Empty</td>
</tr>
</tbody>
</table>

cgl@disk:/$
We'll use the parted program to actually make changes to the partition table.

We'll use the parted program to actually make changes to the partition table.
cgl@disk:/$
cgl@disk:/$ echo "We'll add a primary partition. Then, an extended partition with the rest of the space. Finally, several logical partitions inside the extended partition."
We'll add a primary partition. Then, an extended partition with the rest of the space. Finally, several logical partitions inside the extended partition.
cgl@disk:/$
cgl@disk:/$ sudo parted /dev/sda
cgl@disk:/$ sudo parted /dev/sda
GNU Parted 2.3
Using /dev/sda
Welcome to GNU Parted! Type 'help' to view a list of commands.
(parted)
cgl@disk:/$ sudo parted /dev/sda
GNU Parted 2.3
Using /dev/sda
Welcome to GNU Parted! Type 'help' to view a list of commands.
(parted) print free
Model: ATA QEMU HARDDISK (scsi)
Disk /dev/sda: 8590MB
Sector size (logical/physical): 512B/512B
Partition Table: msdos

<table>
<thead>
<tr>
<th>Number</th>
<th>Start</th>
<th>End</th>
<th>Size</th>
<th>Type</th>
<th>File system</th>
<th>Flags</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1049kB</td>
<td>3000MB</td>
<td>2999MB</td>
<td>primary</td>
<td>ext4</td>
<td>boot</td>
</tr>
<tr>
<td>2</td>
<td>3000MB</td>
<td>3256MB</td>
<td>256MB</td>
<td>primary</td>
<td>linux-swap(v1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3256MB</td>
<td>8590MB</td>
<td>5334MB</td>
<td></td>
<td>Free Space</td>
<td></td>
</tr>
</tbody>
</table>

(parted)
<table>
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<tr>
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<th>File system</th>
<th>Flags</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>32.3kB</td>
<td>1049kB</td>
<td>1016kB</td>
<td>Free</td>
<td>Space</td>
<td></td>
</tr>
<tr>
<td>1</td>
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<td>Space</td>
<td></td>
</tr>
</tbody>
</table>

(parted) help mkpart

mkpart PART-TYPE [FS-TYPE] START END     make a partition

PART-TYPE is one of: primary, logical, extended
FS-TYPE is one of: zfs, btrfs, ext4, ext3, ext2, fat32, fat16, hfsx, hfs+, hfs, jfs, swsuspe, linux-swap(v1), linux-swap(v0), ntfs, reiserfs, freebsd-ufs, hp-ufs, sun-ufs, xfs, apfs2, apfs1, asfs, amufs5, amufs4, amufs3, amufs2, amufs1, amufs0, amufs, affs7, affs6, affs5, affs4, affs3, affs2, affs1, affs0, linux-swap, linux-swap(new), linux-swap(old)
START and END are disk locations, such as 4GB or 10%. Negative values count from the end of the disk. For example, -1s specifies exactly the last sector.

'mkpart' makes a partition without creating a new file system on the partition. FS-TYPE may be specified to set an appropriate partition ID.
32.3kB 1049kB 1016kB    Free Space
1  1049kB 3000MB 2999MB  primary  ext4    boot
2  3000MB 3256MB 256MB  primary  linux-swap(v1)
3  3256MB  8590MB 5334MB    Free Space

(parted) help mkpart
mkpart PART-TYPE [FS-TYPE] START END    make a partition

PART-TYPE is one of: primary, logical, extended
FS-TYPE is one of: zfs, btrfs, ext4, ext3, ext2, fat32, fat16, hfsx, hfs+, hfs, jfs, swsusp, linux-swap(v1), linux-swap(v0), ntfs, reiserfs, freebsd-ufs, hp-ufs, sun-ufs, xfs, apfs2, apfs1, asfs, amufs5, amufs4, amufs3, amufs2, amufs1, amufs0, amufs, affs7, affs6, affs5, affs4, affs3, affs2, affs1, affs0, linux-swap, linux-swap(new), linux-swap(old)
START and END are disk locations, such as 4GB or 10%. Negative values count from the end of the disk. For example, -1s specifies exactly the last sector.

'mkpart' makes a partition without creating a new file system on the partition. FS-TYPE may be specified to set an appropriate partition ID.

(parted) mkpart primary 3256MB 4256MB
(parted)
affs3, affs2, affs1, affs0, linux-swap, linux-swap(new),
linux-swap(old)
START and END are disk locations, such as 4GB or 10%. Negative values
count from the end of the disk. For example, -1s specifies exactly the
last sector.

'mkpart' makes a partition without creating a new file system on the
partition. FS-TYPE may be specified to set an appropriate partition
ID.

(parted) mkpart primary 3256MB 4256MB
(parted) print free
Model: ATA QEMU HARDDISK (scsi)
Disk /dev/sda: 8590MB
Sector size (logical/physical): 512B/512B
Partition Table: msdos

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<td>3256MB</td>
<td>256MB</td>
<td>primary</td>
<td>linux-swap(v1)</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>3256MB</td>
<td>4256MB</td>
<td>1000MB</td>
<td>primary</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>4256MB</td>
<td>8590MB</td>
<td>4334MB</td>
<td>Free</td>
<td>Space</td>
<td></td>
</tr>
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linux-swap(old)
START and END are disk locations, such as 4GB or 10%. Negative values count from the end of the disk. For example, -1s specifies exactly the last sector.

'mkpart' makes a partition without creating a new file system on the partition. FS-TYPE may be specified to set an appropriate partition ID.

(parted) mkpart primary 3256MB 4256MB
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Model: ATA QEMU HARDDISK (scsi)
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<td></td>
</tr>
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<td></td>
<td>3256MB</td>
<td>4256MB</td>
<td>1000MB</td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

(parted) mkpart extended 4256MB 8590MB
(parted)
<table>
<thead>
<tr>
<th>Number</th>
<th>Start</th>
<th>End</th>
<th>Size</th>
<th>Type</th>
<th>File system</th>
<th>Flags</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>32.3kB</td>
<td>1049kB</td>
<td>1016kB</td>
<td>Free Space</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>1049kB</td>
<td>3000MB</td>
<td>2999MB</td>
<td>primary</td>
<td>ext4</td>
<td>boot</td>
</tr>
<tr>
<td>2</td>
<td>3000MB</td>
<td>3256MB</td>
<td>256MB</td>
<td>primary</td>
<td>linux-swap(v1)</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>3256MB</td>
<td>4256MB</td>
<td>1000MB</td>
<td>primary</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>4256MB</td>
<td>8590MB</td>
<td>4334MB</td>
<td>extended</td>
<td></td>
<td>lba</td>
</tr>
</tbody>
</table>

(parted) mkpart extended 4256MB 8590MB
(parted) print free

Model: ATA QEMU HARDDISK (scsi)
Disk /dev/sda: 8590MB
Sector size (logical/physical): 512B/512B
Partition Table: msdos

<table>
<thead>
<tr>
<th>Number</th>
<th>Start</th>
<th>End</th>
<th>Size</th>
<th>Type</th>
<th>File system</th>
<th>Flags</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>32.3kB</td>
<td>1049kB</td>
<td>1016kB</td>
<td>Free Space</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>1049kB</td>
<td>3000MB</td>
<td>2999MB</td>
<td>primary</td>
<td>ext4</td>
<td>boot</td>
</tr>
<tr>
<td>2</td>
<td>3000MB</td>
<td>3256MB</td>
<td>256MB</td>
<td>primary</td>
<td>linux-swap(v1)</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>3256MB</td>
<td>4256MB</td>
<td>1000MB</td>
<td>primary</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>4256MB</td>
<td>8590MB</td>
<td>4334MB</td>
<td>extended</td>
<td></td>
<td>lba</td>
</tr>
</tbody>
</table>

(parted)
cgl@disk:/$ echo "Just to see how sfdisk views these changes."
Just to see how sfdisk views these changes.
cgl@disk:/$
cgl@disk:/$ sudo sfdisk -l /dev/sda

Disk /dev/sda: 1044 cylinders, 255 heads, 63 sectors/track
Warning: extended partition does not start at a cylinder boundary.
DOS and Linux will interpret the contents differently.
Units = cylinders of 8225280 bytes, blocks of 1024 bytes, counting from 0

<table>
<thead>
<tr>
<th>Device</th>
<th>Boot</th>
<th>Start</th>
<th>End</th>
<th>#cyls</th>
<th>#blocks</th>
<th>Id</th>
<th>System</th>
</tr>
</thead>
<tbody>
<tr>
<td>/dev/sda1</td>
<td>*</td>
<td>0+</td>
<td>364-</td>
<td>365-</td>
<td>2928640</td>
<td>83</td>
<td>Linux</td>
</tr>
<tr>
<td>/dev/sda2</td>
<td>364+</td>
<td>395-</td>
<td>32-</td>
<td>249856</td>
<td></td>
<td>82</td>
<td>Linux swap / Solaris</td>
</tr>
<tr>
<td>/dev/sda3</td>
<td>395+</td>
<td>517-</td>
<td>122-</td>
<td>976896</td>
<td></td>
<td>83</td>
<td>Linux</td>
</tr>
<tr>
<td>/dev/sda4</td>
<td>517+</td>
<td>1044-</td>
<td>527-</td>
<td>4232192</td>
<td></td>
<td>f</td>
<td>W95 Ext'd (LBA)</td>
</tr>
</tbody>
</table>

cgl@disk:/$
cgl@disk:/$ sudo parted /dev/sda

GNU Parted 2.3
Using /dev/sda
Welcome to GNU Parted! Type 'help' to view a list of commands.
(parted) print free
Model: ATA QEMU HARDDISK (scsi)
Disk /dev/sda: 8590MB
Sector size (logical/physical): 512B/512B
Partition Table: msdos

Number  Start  End    Size    Type  File system   Flags
       32.3kB  1049kB 1016kB  Free Space
1      1049kB  3000kB 2999kB  primary  ext4   boot
2      3000kB  3256kB 256MB   primary  linux-swap(v1)
3      3256kB  4256kB 1000MB  primary
4      4256kB  8590kB 4334MB  extended lba
4256MB 8590kB 4334MB  Free Space

(parted) mkpart logical 4256MB 4356MB
Warning: The resulting partition is not properly aligned for best performance.
Ignore/Cancel? c
(parted) mkpart logical 4257MB 4357MB
(parted)
3  3256MB 4256MB 1000MB primary
4  4256MB 8590MB 4334MB extended
   4256MB 8590MB 4334MB Free Space

(parted) mkpart logical 4256MB 4356MB
Warning: The resulting partition is not properly aligned for best performance.
Ignore/Cancel? c
(parted) mkpart logical 4257MB 4357MB
(parted) print free
Model: ATA QEMU HARDDISK (scsi)
Disk /dev/sda: 8590MB
Sector size (logical/physical): 512B/512B
Partition Table: msdos

<table>
<thead>
<tr>
<th>Number</th>
<th>Start</th>
<th>End</th>
<th>Size</th>
<th>Type</th>
<th>File system</th>
<th>Flags</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3000MB</td>
<td>3256MB</td>
<td>256MB</td>
<td>primary</td>
<td>linux-swap(v1)</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>3256MB</td>
<td>4256MB</td>
<td>1000MB</td>
<td>primary</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>4256MB</td>
<td>8590MB</td>
<td>4334MB</td>
<td>extended</td>
<td>lba</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>4257MB</td>
<td>4357MB</td>
<td>99.6MB</td>
<td>logical</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>4357MB</td>
<td>8590MB</td>
<td>4233MB</td>
<td>Free Space</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(parted)
4  4256MB  8590MB  4334MB  extended  lba
4256MB  8590MB  4334MB  Free Space

(parted) mkpart logical 4256MB 4356MB
Warning: The resulting partition is not properly aligned for best performance.
Ignore/Cancel? c
(parted) mkpart logical 4257MB 4357MB
(parted) print free
Model: ATA QEMU HARD_DISK (scsi)
Disk /dev/sda: 8590MB
Sector size (logical/physical): 512B/512B
Partition Table: msdos

<table>
<thead>
<tr>
<th>Number</th>
<th>Start</th>
<th>End</th>
<th>Size</th>
<th>Type</th>
<th>File system</th>
<th>Flags</th>
</tr>
</thead>
<tbody>
<tr>
<td>32.3kB</td>
<td>1049kB</td>
<td>1016kB</td>
<td>Free Space</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>1</td>
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<td>2999MB</td>
<td>primary</td>
<td>ext4</td>
<td>boot</td>
</tr>
<tr>
<td>2</td>
<td>3000MB</td>
<td>3256MB</td>
<td>256MB</td>
<td>primary</td>
<td>linux-swap(v1)</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>3256MB</td>
<td>4256MB</td>
<td>1000MB</td>
<td>primary</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>4256MB</td>
<td>8590MB</td>
<td>4334MB</td>
<td>extended</td>
<td>lba</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>4257MB</td>
<td>4357MB</td>
<td>99.6MB</td>
<td>logical</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4357MB</td>
<td>8590MB</td>
<td>4233MB</td>
<td>Free Space</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(parted) mkpart logical 4357MB 4457MB
(parted)
<table>
<thead>
<tr>
<th>Number</th>
<th>Start</th>
<th>End</th>
<th>Size</th>
<th>Type</th>
<th>File system</th>
<th>Flags</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>3000MB</td>
<td>3256MB</td>
<td>256MB</td>
<td>primary</td>
<td>linux-swap(v1)</td>
<td></td>
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<tr>
<td>3</td>
<td>3256MB</td>
<td>4256MB</td>
<td>1000MB</td>
<td>primary</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>4256MB</td>
<td>8590MB</td>
<td>4334MB</td>
<td>extended</td>
<td></td>
<td>lba</td>
</tr>
<tr>
<td>5</td>
<td>4257MB</td>
<td>4357MB</td>
<td>99.6MB</td>
<td>logical</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4357MB</td>
<td>8590MB</td>
<td>4233MB</td>
<td></td>
<td>Free Space</td>
<td></td>
</tr>
</tbody>
</table>

(parted) mkpart logical 4357MB 4457MB
(parted) print free
Model: ATA QEMU HARDDISK (scsi)
Disk /dev/sda: 8590MB
Sector size (logical/physical): 512B/512B
Partition Table: msdos
4357MB  8590MB  4233MB  Free Space

(parted) mkpart logical 4357MB 4457MB
(parted) print free
Model: ATA QEMU HARDDISK (scsi)
Disk /dev/sda: 8590MB
Sector size (logical/physical): 512B/512B
Partition Table: msdos

<table>
<thead>
<tr>
<th>Number</th>
<th>Start</th>
<th>End</th>
<th>Size</th>
<th>Type</th>
<th>File system</th>
<th>Flags</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1049kB</td>
<td>3000MB</td>
<td>2999MB</td>
<td>primary</td>
<td>ext4</td>
<td>boot</td>
</tr>
<tr>
<td>2</td>
<td>3000MB</td>
<td>3256MB</td>
<td>256MB</td>
<td>primary</td>
<td>linux-swap(v1)</td>
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<td>3</td>
<td>3256MB</td>
<td>4256MB</td>
<td>1000MB</td>
<td>primary</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>4256MB</td>
<td>8590MB</td>
<td>4334MB</td>
<td>extended</td>
<td>lba</td>
<td></td>
</tr>
<tr>
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<td>4257MB</td>
<td>4357MB</td>
<td>99.6MB</td>
<td>logical</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>4358MB</td>
<td>4457MB</td>
<td>99.6MB</td>
<td>logical</td>
<td></td>
<td></td>
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<tr>
<td>7</td>
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<td>8590MB</td>
<td>4132MB</td>
<td>Free Space</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(parted) mkpart logical 4457MB 4557MB
Warning: The resulting partition is not properly aligned for best performance.
Ignore/Cancel? c
(parted) mkpart logical 4458MB 4558MB
(parted)
Warning: The resulting partition is not properly aligned for best performance. Ignore/Cancel? c

Model: ATA QEMU HARDDISK (scsi)
Disk /dev/sda: 8590MB
Sector size (logical/physical): 512B/512B
Partition Table: msdos

<table>
<thead>
<tr>
<th>Number</th>
<th>Start</th>
<th>End</th>
<th>Size</th>
<th>Type</th>
<th>File system</th>
<th>Flags</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>32.3kB</td>
<td>1049kB</td>
<td>1016kB</td>
<td>primary</td>
<td>ext4</td>
<td>boot</td>
</tr>
<tr>
<td>2</td>
<td>1049kB</td>
<td>3000MB</td>
<td>2999MB</td>
<td>primary</td>
<td>linux-swap(v1)</td>
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<td>3</td>
<td>3000MB</td>
<td>3256MB</td>
<td>256MB</td>
<td>primary</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>3256MB</td>
<td>4256MB</td>
<td>1000MB</td>
<td>primary</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>4256MB</td>
<td>8590MB</td>
<td>4334MB</td>
<td>extended</td>
<td></td>
<td>lba</td>
</tr>
<tr>
<td>6</td>
<td>4257MB</td>
<td>4357MB</td>
<td>99.6MB</td>
<td>logical</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>4358MB</td>
<td>4457MB</td>
<td>99.6MB</td>
<td>logical</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Ignore/Cancel? c
(parted) mkpart logical 4458MB 4558MB
(parted) print free
Model: ATA QEMU HARDDISK (scsi)
Disk /dev/sda: 8590MB
Sector size (logical/physical): 512B/512B
Partition Table: msdos

<table>
<thead>
<tr>
<th>Number</th>
<th>Start</th>
<th>End</th>
<th>Size</th>
<th>Type</th>
<th>File system</th>
<th>Flags</th>
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</thead>
<tbody>
<tr>
<td>0</td>
<td>32.3kB</td>
<td>1049kB</td>
<td>1016kB</td>
<td>Free Space</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>1049kB</td>
<td>3000MB</td>
<td>2999MB</td>
<td>primary</td>
<td>ext4</td>
<td>boot</td>
</tr>
<tr>
<td>2</td>
<td>3000MB</td>
<td>3256MB</td>
<td>256MB</td>
<td>primary</td>
<td>linux-swap(v1)</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>3256MB</td>
<td>4256MB</td>
<td>1000MB</td>
<td>primary</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>4256MB</td>
<td>8590MB</td>
<td>4334MB</td>
<td>extended</td>
<td>lba</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>4257MB</td>
<td>4357MB</td>
<td>99.6MB</td>
<td>logical</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>4358MB</td>
<td>4457MB</td>
<td>99.6MB</td>
<td>logical</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>4457MB</td>
<td>4458MB</td>
<td>605kB</td>
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<td>Free Space</td>
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<td>4459MB</td>
<td>4558MB</td>
<td>99.6MB</td>
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<td>8590MB</td>
<td>4032MB</td>
<td></td>
<td>Free Space</td>
<td></td>
</tr>
</tbody>
</table>

(parted) quit
Information: You may need to update /etc/fstab.

cgl@disk:/$
cgl@disk:/$ echo "We could create more partitions to use the rest of the space."
We could create more partitions to use the rest of the space.
cgl@disk/$
```bash
cgl@disk:/$ sudo sfdisk -l /dev/sda

Disk /dev/sda: 1044 cylinders, 255 heads, 63 sectors/track
Warning: extended partition does not start at a cylinder boundary.
DOS and Linux will interpret the contents differently.
Units = cylinders of 8225280 bytes, blocks of 1024 bytes, counting from 0

<table>
<thead>
<tr>
<th>Device</th>
<th>Boot</th>
<th>Start</th>
<th>End</th>
<th>#cyls</th>
<th>#blocks</th>
<th>Id</th>
<th>System</th>
</tr>
</thead>
<tbody>
<tr>
<td>/dev/sda1</td>
<td>*</td>
<td>0+</td>
<td>364-</td>
<td>365-</td>
<td>2928640</td>
<td>83</td>
<td>Linux</td>
</tr>
<tr>
<td>/dev/sda2</td>
<td></td>
<td>364+</td>
<td>395-</td>
<td>32-</td>
<td>249856</td>
<td>82</td>
<td>Linux swap / Solaris</td>
</tr>
<tr>
<td>/dev/sda3</td>
<td></td>
<td>395+</td>
<td>517-</td>
<td>122-</td>
<td>976896</td>
<td>83</td>
<td>Linux</td>
</tr>
<tr>
<td>/dev/sda4</td>
<td></td>
<td>517+</td>
<td>1044-</td>
<td>527-</td>
<td>4232192</td>
<td>f</td>
<td>W95 Ext'd (LBA)</td>
</tr>
<tr>
<td>/dev/sda5</td>
<td></td>
<td>517+</td>
<td>529-</td>
<td>13-</td>
<td>97280</td>
<td>83</td>
<td>Linux</td>
</tr>
<tr>
<td>/dev/sda6</td>
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<td>529+</td>
<td>541-</td>
<td>13-</td>
<td>97280</td>
<td>83</td>
<td>Linux</td>
</tr>
<tr>
<td>/dev/sda7</td>
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<td>542+</td>
<td>554-</td>
<td>13-</td>
<td>97280</td>
<td>83</td>
<td>Linux</td>
</tr>
</tbody>
</table>
```

cgl@disk:/$ sudo sfdisk -u B -l /dev/sda

Disk /dev/sda: 1044 cylinders, 255 heads, 63 sectors/track
Warning: extended partition does not start at a cylinder boundary.
DOS and Linux will interpret the contents differently.
Units = blocks of 1024 bytes, counting from 0

<table>
<thead>
<tr>
<th>Device</th>
<th>Boot</th>
<th>Start</th>
<th>End</th>
<th>#blocks</th>
<th>Id</th>
<th>System</th>
</tr>
</thead>
<tbody>
<tr>
<td>/dev/sda1</td>
<td>*</td>
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<td>2928640</td>
<td>83</td>
<td>Linux</td>
</tr>
<tr>
<td>/dev/sda2</td>
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<td>2929664</td>
<td>3179519</td>
<td>249856</td>
<td>82</td>
<td>Linux swap / Solaris</td>
</tr>
<tr>
<td>/dev/sda3</td>
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<td>4156415</td>
<td>976896</td>
<td>83</td>
<td>Linux</td>
</tr>
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<td>/dev/sda4</td>
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<td>8388607</td>
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<td>f</td>
<td>W95 Ext'd (LBA)</td>
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<td>97280</td>
<td>83</td>
<td>Linux</td>
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</tbody>
</table>

cgl@disk:/$
cgl@disk:/$ ls -l /dev/sd*
brw-rw---- 1 root disk 8, 0 Sep 30 19:14 /dev/sda
brw-rw---- 1 root disk 8, 1 Sep 30 19:04 /dev/sda1
brw-rw---- 1 root disk 8, 2 Sep 30 19:04 /dev/sda2
brw-rw---- 1 root disk 8, 3 Sep 30 19:10 /dev/sda3
brw-rw---- 1 root disk 8, 4 Sep 30 19:14 /dev/sda4
brw-rw---- 1 root disk 8, 5 Sep 30 19:12 /dev/sda5
brw-rw---- 1 root disk 8, 6 Sep 30 19:13 /dev/sda6
brw-rw---- 1 root disk 8, 7 Sep 30 19:14 /dev/sda7
cgl@disk:/$
cgl@disk:/$ echo "Now we have partitions. Need to put file systems on them to use them."
Now we have partitions. Need to put file systems on them to use them.
cgl@disk/$
Several filesystem types are available.
cgl@disk:$ mkfs.
mkfs.bfs  mkfs.ext3  mkfs.fat  mkfs.ntfs
mkfs.cramfs mkfs.ext4  mkfs.minix  mkfs.vfat
mkfs.ext2  mkfs.ext4dev  mkfs.msdos

cgl@disk:$ mkfs.
cgl@disk:/$ echo "We choose ext4 for the first example."
We choose ext4 for the first example.
cgl@disk:/$
cgl@disk:/$ echo "Will make it on the /dev/sda5 partition."
Will make it on the /dev/sda5 partition.
cgl@disk:/$
cgl@disk:/$ sudo mkfs -t ext4 /dev/sda5
cgl@disk:/$ sudo mkfs -t ext4 /dev/sda5
mke2fs 1.42.9 (4-Feb-2014)
Discarding device blocks: done
Filesystem label=
OS type: Linux
Block size=1024 (log=0)
Fragment size=1024 (log=0)
Stride=0 blocks, Stripe width=0 blocks
24384 inodes, 97280 blocks
4864 blocks (5.00%) reserved for the super user
First data block=1
Maximum filesystem blocks=67371008
12 block groups
8192 blocks per group, 8192 fragments per group
2032 inodes per group
Superblock backups stored on blocks:
   8193, 24577, 40961, 57345, 73729
Allocating group tables: done
Writing inode tables: done
Creating journal (4096 blocks): done
Writing superblocks and filesystem accounting information: done

cgl@disk:/$
cgl@disk:/$ echo "File system created, but not available until mounted."
File system created, but not available until mounted.
cgl@disk:/$
cgl@disk:/$
cgl@disk:/$ df

<table>
<thead>
<tr>
<th>Filesystem</th>
<th>1K-blocks</th>
<th>Used</th>
<th>Available</th>
<th>Use%</th>
<th>Mounted on</th>
</tr>
</thead>
<tbody>
<tr>
<td>/dev/sda1</td>
<td>2817056</td>
<td>1055740</td>
<td>1598500</td>
<td>40%</td>
<td>/</td>
</tr>
<tr>
<td>none</td>
<td>4</td>
<td>0</td>
<td>4</td>
<td>0%</td>
<td>/sys/fs/cgroup</td>
</tr>
<tr>
<td>udev</td>
<td>111044</td>
<td>4</td>
<td>111040</td>
<td>1%</td>
<td>/dev</td>
</tr>
<tr>
<td>tmpfs</td>
<td>24380</td>
<td>360</td>
<td>24020</td>
<td>2%</td>
<td>/run</td>
</tr>
<tr>
<td>none</td>
<td>5120</td>
<td>0</td>
<td>5120</td>
<td>0%</td>
<td>/run/lock</td>
</tr>
<tr>
<td>none</td>
<td>121888</td>
<td>0</td>
<td>121888</td>
<td>0%</td>
<td>/run/shm</td>
</tr>
<tr>
<td>none</td>
<td>102400</td>
<td>0</td>
<td>102400</td>
<td>0%</td>
<td>/run/user</td>
</tr>
</tbody>
</table>

cgl@disk:/$
cgl@disk:/$ echo "Create a mount point"
Create a mount point
cgl@disk:/$  

cgl@disk:/$ sudo mkdir /demo

cgl@disk:/$ sudo mkdir /demo/it3100

cgl@disk:/$
cgl@disk:/$ sudo mount -t ext4 /dev/sda5 /demo/it3100

cgl@disk:/$
cgl@disk:/$ df

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<tr>
<th>Filesystem</th>
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<tbody>
<tr>
<td>/dev/sda1</td>
<td>2817056</td>
<td>1055764</td>
<td>1598476</td>
<td>40%</td>
<td>/</td>
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<tr>
<td>none</td>
<td>4</td>
<td>0</td>
<td>4</td>
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</tr>
<tr>
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<td>102400</td>
<td>0</td>
<td>102400</td>
<td>0%</td>
<td>/run/user</td>
</tr>
<tr>
<td>/dev/sda5</td>
<td>90099</td>
<td>1550</td>
<td>81740</td>
<td>2%</td>
<td>/demo/it3100</td>
</tr>
</tbody>
</table>

cgl@disk:/$
cgl@disk:/$ ls -la /demo/it3100/
total 17
drwxr-xr-x 3 root root 1024 Sep 30 19:18  
drwxr-xr-x 3 root root 4096 Sep 30 19:20 ..
drw------- 2 root root 12288 Sep 30 19:18 lost+found
cgl@disk:/$
Examine some properties of the filesystem.
cgl@disk:/$ sudo tune2fs -l /dev/sda5
cgl@disk:$ sudo tune2fs -l /dev/sda5
tune2fs 1.42.9 (4-Feb-2014)
Filesystem volume name: <none>
Last mounted on: <not available>
Filesystem UUID: 17496029-7134-459e-b53d-4a9825a4f8f1
Filesystem magic number: 0xEF53
Filesystem revision #: 1 (dynamic)
Filesystem features: has_journal ext_attr resize_inode dir_index filetype
nodelog_group_name invalid_xattr needs_recovery extent flex_bg sparse_super huge_file uninit_bg dir_nlink extra_isize
Filesystem flags: signed_directory_hash
Default mount options: user_xattr acl
Filesystem state: clean
Errors behavior: Continue
Filesystem OS type: Linux
Inode count: 24384
Block count: 97280
Reserved block count: 4864
Free blocks: 88549
Free inodes: 24373
First block: 1
Block size: 1024
Fragment size: 1024
Reserved GDT blocks: 256
Blocks per group: 8192
Fragments per group: 8192
Inodes per group: 2032
_inode blocks per group: 254
Flex block group size: 16
Filesystem created: Tue Sep 30 19:18:44 2014
Last mount time: Tue Sep 30 19:20:51 2014
Last write time: Tue Sep 30 19:20:51 2014
Mount count: 2
Maximum mount count: -1
Last checked: Tue Sep 30 19:18:44 2014
Check interval: 0 (<none>)
Lifetime writes: 7498 kB
Reserved blocks uid: 0 (user root)
Reserved blocks gid: 0 (group root)
First inode: 11
_inode size: 128
Journal inode: 8
Default directory hash: half_md4
Directory Hash Seed: ef18540a-c727-48f8-8719-a04969b04f0c
Journal backup: _inode blocks

cgl@disk:/$
cgl@disk:/$ sudo umount /demo/it3100

cgl@disk:/$
<table>
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<tr>
<td>/dev/sda1</td>
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<td>1055756</td>
<td>1598484</td>
<td>40%</td>
<td>/</td>
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<tr>
<td>none</td>
<td>4</td>
<td>0</td>
<td>4</td>
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<td>none</td>
<td>121888</td>
<td>0</td>
<td>121888</td>
<td>0%</td>
<td>/run/ shm</td>
</tr>
<tr>
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<td>102400</td>
<td>0</td>
<td>102400</td>
<td>0%</td>
<td>/run/ user</td>
</tr>
</tbody>
</table>

cgl@disk:/$ df
cgl@disk:/$ echo "Want to make file system mount at boot time."
Want to make file system mount at boot time.
cgl@disk:/$
cgl@disk:/$ sudo emacs /etc/fstab
/etc/fstab: static file system information.

# Use 'blkid' to print the universally unique identifier for a
# device; this may be used with UUID= as a more robust way to name devices
# that works even if disks are added and removed. See fstab(5).

# <file system> <mount point> <type> <options> <dump> <pass>
# / was on /dev/sda1 during installation
UUID=bb38de13-1200-4788-a7bd-3975dc00bede / ext4 errors=remount
  t-<1>   0   1
# swap was on /dev/sda2 during installation
UUID=aed2311d-2cb3-4800-84d3-ca3246fc3e96 none swap sw
  0   0
/dev/fd0  /media/floppy0  auto  rw,user,noauto,exec,utf8  0   0
# /etc/fstab: static file system information.
#
# Use 'blkid' to print the universally unique identifier for a
# device; this may be used with UUID= as a more robust way to name devices
# that works even if disks are added and removed. See fstab(5).
#
# <file system> <mount point> <type> <options> <dump> <pass>
# / was on /dev/sda1 during installation
UID=bb38de13-1200-4788-a7bd-3975dc00bede /
   ext4 errors=remount	
t-rot
# swap was on /dev/sda2 during installation
UID=aed2311d-2cb3-4800-84d3-ca3246fc3e96 none
   swap sw
"/dev/fd0 /media/floppy0 auto rw,user,noauto,exec,utf8 0 0
# <file system> <mount point> <type> <options> <dump> <pass>
/dev/sda5 /demo/it3100 ext4 defaults 0 2
cgl@disk:/$ sudo mount /demo/it3100
cgl@disk:/$
cgl@disk:/$ df

<table>
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<tbody>
<tr>
<td>/dev/sda1</td>
<td>2817056</td>
<td>1167872</td>
<td>1486368</td>
<td>45%</td>
<td>/</td>
</tr>
<tr>
<td>none</td>
<td>4</td>
<td>0</td>
<td>4</td>
<td>0%</td>
<td>/sys/fs/cgroup</td>
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<td>1550</td>
<td>81740</td>
<td>2%</td>
<td>/demo/it3100</td>
</tr>
</tbody>
</table>
cgl@disk:/$ echo "Many options can be specified when creating an ext4 file system."
Many options can be specified when creating an ext4 file system.
cgl@disk:/$
cgl@disk:/$ man mkfs.ext4
NAME
mke2fs - create an ext2/ext3/ext4 filesystem

SYNOPSIS
mke2fs [ -c | -l filename ] [ -b block-size ] [ -D ] [ -f fragment-size ] [ -g blocks-per-group ] [ -G number-of-groups ] [ -i bytes-per-inode ] [ -I inode-size ] [ -j ] [ -J journal-options ] [ -N number-of-inodes ] [ -n ] [ -m reserved-blocks-percentage ] [ -o creator-os ] [ -O [^]feature[, ...] ] [ -q ] [ -r fs-revision-level ] [ -E extended-options ] [ -v ] [ -F ] [ -L volume-label ] [ -M last-mounted-directory ] [ -S ] [ -t fs-type ] [ -T usage-type ] [ -U UUID ] [ -V ] device [ blocks-count ]

mke2fs -0 journal_dev [ -b block-size ] [ -L volume-label ] [ -n ] [ -q ] [ -V ] external-journal [ blocks-count ]

DESCRIPTION
mke2fs is used to create an ext2, ext3, or ext4 filesystem, usually in a disk partition. device is the special file corresponding to the device (e.g. /dev/hdXX). blocks-count is the number of blocks on the device. If omitted, mke2fs automatically figures the file system size.
cgl@disk:/$ echo "Options can be specified at mount time as well."
Options can be specified at mount time as well.
cgl@disk:$  

cgl@disk:/$ man 5 fstab
NAME
fstab - static information about the filesystems

SYNOPSIS
/etc/fstab

DESCRIPTION
The file fstab contains descriptive information about the various file systems. fstab is only read by programs, and not written; it is the duty of the system administrator to properly create and maintain this file. Each filesystem is described on a separate line; fields on each line are separated by tabs or spaces. Lines starting with '#' are comments, blank lines are ignored. The order of records in fstab is important because fsck(8), mount(8), and umount(8) sequentially iterate through fstab doing their thing, though at boot time mountall(8) may process the file out-of-order when it believes it is safe to do so.

The first field (fs_spec).
This field describes the block special device or remote filesystem to be mounted.
cgl@disk:/$ echo "Now, we'll demonstrate a few features with the nearly universally accessible VFAT filesystem."
Now, we'll demonstrate a few features with the nearly universally accessible VFAT filesystem.
cgl@disk:/$
cgl@disk:/$ echo "We'll use /dev/sda6 and mount on /demo/it1100."
We'll use /dev/sda6 and mount on /demo/it1100.
cgl@disk:/$
cgl@disk:/$ sudo mkfs -t vfat /dev/sda6
mkfs.fat 3.0.26 (2014-03-07)
cgl@disk:/$
cgl@disk:/$ sudo mkdir /demo/it1100

cgl@disk:/$
cgl@disk:/$ sudo mount /dev/sda6 /demo/it1100
cgl@disk:/$
cgl@disk:/$ df

<table>
<thead>
<tr>
<th>Filesystem</th>
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<th>Available</th>
<th>Use%</th>
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</tr>
</thead>
<tbody>
<tr>
<td>/dev/sda1</td>
<td>2817056</td>
<td>1167876</td>
<td>1486364</td>
<td>45%</td>
<td>/</td>
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<tr>
<td>none</td>
<td>4</td>
<td>0</td>
<td>4</td>
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<tr>
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<td>0</td>
<td>5120</td>
<td>0%</td>
<td>/run/lock</td>
</tr>
<tr>
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<td>121888</td>
<td>0</td>
<td>121888</td>
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<td>/run/shm</td>
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<tr>
<td>none</td>
<td>102400</td>
<td>0</td>
<td>102400</td>
<td>0%</td>
<td>/run/user</td>
</tr>
<tr>
<td>/dev/sda5</td>
<td>90099</td>
<td>1550</td>
<td>81740</td>
<td>2%</td>
<td>/demo/it3100</td>
</tr>
<tr>
<td>/dev/sda6</td>
<td>97070</td>
<td>0</td>
<td>97070</td>
<td>0%</td>
<td>/demo/it1100</td>
</tr>
</tbody>
</table>

cgl@disk:/$
cgl@disk:/$ ls -la /demo/it1100/
total 20
-dwxr-xr-x 4 root root 4096 Sep 30 19:30 ..
cgl@disk:/$
cgl@disk:/$ sudo umount /demo/it1100

cgl@disk:/$
<table>
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</tr>
</tbody>
</table>
cgl@disk:/$ echo "Want to make this system mount at boot time."
Want to make this system mount at boot time.
cgl@disk:/$
cgl@disk:/$ sudo emacs /etc/fstab
# /etc/fstab: static file system information.
#
# Use 'blkid' to print the universally unique identifier for a
# device; this may be used with UUID= as a more robust way to name devices
# that works even if disks are added and removed. See fstab(5).
#
# <file system> <mount point>  <type>  <options>  <dump>  <pass>
# / was on /dev/sda1 during installation
UUID=bb38de13-1200-4788-a7bd-3975dc00bede  /  ext4  errors=remount
t-ro 0 1
# swap was on /dev/sda2 during installation
UUID=aed2311d-2cb3-4800-84d3-ca3246fc3e96  none  swap  sw
0 0
/dev/fd0  /media/floppy0  auto  rw,user,noauto,exec,utf8 0 0

# <file system> <mount point>  <type>  <options>  <dump>  <pass>
/dev/sda5  /demo/it3100  ext4  defaults  0  2
/dev/sda6  /demo/it1100  vfat  defaults  0  0
cgl@disk:/$ sudo mount /dev/sda6

cgl@disk:/$
cgl@disk:/$ df

Filesystem  1K-blocks  Used  Available  Use%  Mounted on
/dev/sda1   2817056  1167876  1486364  45%  /
none         4        0        4    0%  /sys/fs/cgroup
udev         111044   4   111040   1%  /dev
tmpfs        24380   360  24020    2%  /run
none         5120     0     5120   0%  /run/lock
none         121888   0  121888    0%  /run/shm
none         102400  0   102400   0%  /run/user
/dev/sda5   900999  1550  81740    2%  /demo/it3100
/dev/sda6   97070   0   97070    0%  /demo/it1100
cgl@disk:$ echo "Options available for the creation of VFAT systems can be found in the man page."
Options available for the creation of VFAT systems can be found in the man page.
cgl@disk:$
cgl@disk:$ man mkfs.vfat
NAME

mkfs.fat - create an MS-DOS filesystem under Linux

SYNOPSIS


DESCRIPTION

mkfs.fat is used to create an MS-DOS filesystem under Linux on a device (usually a disk partition). device is the special file corresponding to the device (e.g. /dev/sdXX). block-count is the number of blocks on the device. If omitted, mkfs.fat automatically determines the filesystem size.

OPTIONS

-a Normally, for any filesystem except very small ones, mkfs.fat will align all the data structures to cluster size, to make sure that as
USING VFAT

To use the vfat filesystem, use the filesystem type 'vfat'. i.e.
    mount -t vfat /dev/fd0 /mnt

No special partition formatter is required. mkdosfs will work fine
if you want to format from within Linux.

VFAT MOUNT OPTIONS

    uid=###  -- Set the owner of all files on this filesystem.
                The default is the uid of current process.

    gid=###  -- Set the group of all files on this filesystem.
                The default is the gid of current process.

    umask=###  -- The permission mask (for files and directories, see
                  umask(1)).
                The default is the umask of current process.

    dmask=###  -- The permission mask for the directory.
                The default is the umask of current process.

    fmask=###  -- The permission mask for files.
cgl@disk:/$ echo "Now we'll use /dev/sda7, create an NTFS file system, and mount it on /demo/it3150"
Now we'll use /dev/sda7, create an NTFS file system, and mount it on /demo/it3150

cgl@disk:/$
cgl@disk:$ sudo mkfs -t ntfs /dev/sda7
Cluster size has been automatically set to 4096 bytes.
Initializing device with zeroes: 100% - Done.
Creating NTFS volume structures.
mkntfs completed successfully. Have a nice day.
cgl@disk:$
cgl@disk:/$ sudo mkdir /demo/it3150

cgl@disk:/$
cgl@disk:/$ sudo mount /dev/sda7 /demo/it3150
cgl@disk:/$
cgl@disk:/$ df

Filesystem  1K-blocks  Used  Available  Use% Mounted on
/dev/sda1  2817056  1167888  1486352  45% /
none       4        0        4  0%  /sys/fs/cgroup
udev      111044     4  111040   1%  /dev
tmpfs     24380     360   24020   2%  /run
none      5120       0     5120   0%  /run/lock
none  121888       0  121888   0%  /run/shm
none   102400       0 102400   0%  /run/user
/dev/sda5  90099    1550   81740   2%  /demo/it3100
/dev/sda6  97070       0   97070   0%  /demo/it1100
/dev/sda7  97276    2500  94776   3%  /demo/it3150

cgl@disk:/$
cgl@disk:$ ls -la /demo/it3150/
total 8
drwxrwxrwx 1 root root 4096 Sep 30 19:35  
drwxr-xr-x 5 root root 4096 Sep 30 19:35  ..
cgl@disk:$  

cgl@disk:/$ echo "You guessed it. Make this mount at boot time with /etc/fstab"

You guessed it. Make this mount at boot time with /etc/fstab
cgl@disk:/$
cgl@disk:/$ sudo emacs /etc/fstab
# /etc/fstab: static file system information.

# Use 'blkid' to print the universally unique identifier for a
# device; this may be used with UUID= as a more robust way to name devices
# that works even if disks are added and removed. See fstab(5).

#<file system> <mount point>  <type>    <options>    <dump>  <pass>
# was on /dev/sda1 during installation
UUID=bb38de13-1200-4788-a7bd-3975dc00bede / ext4 errors=remount\t-ro 0 1

# swap was on /dev/sda2 during installation
UUID=aed2311d-2cb3-4800-84d3-ca3246fc3e96 none swap sw 0 0
/dev/fd0 /media/floppy0 auto  rw,user,noauto,exec,utf8 0 0

#<file system> <mount point>  <type>    <options>    <dump>  <pass>
/dev/sda5 /demo/it3100 ext4 defaults 0 2
/dev/sda6 /demo/it1100 vfat defaults 0 0
/dev/sda7 /demo/it3150 ntfs defaults 0 0

UUU:-----F1       All L18      (Conf[Space])  -------------------------------
Wrote /etc/fstab
cgl@disk:/$ sudo mount /demo/it3150

cgl@disk:/$
cgl@disk:/$ df

<table>
<thead>
<tr>
<th>Filesystem</th>
<th>1K-blocks</th>
<th>Used</th>
<th>Available</th>
<th>Use%</th>
<th>Mounted on</th>
</tr>
</thead>
<tbody>
<tr>
<td>/dev/sda1</td>
<td>2817056</td>
<td>1167884</td>
<td>1486356</td>
<td>45%</td>
<td>/</td>
</tr>
<tr>
<td>none</td>
<td>4</td>
<td>0</td>
<td>4</td>
<td>0%</td>
<td>/sys/fs/cgroup</td>
</tr>
<tr>
<td>udev</td>
<td>111044</td>
<td>4</td>
<td>111040</td>
<td>1%</td>
<td>/dev</td>
</tr>
<tr>
<td>tmpfs</td>
<td>24380</td>
<td>360</td>
<td>24020</td>
<td>2%</td>
<td>/run</td>
</tr>
<tr>
<td>none</td>
<td>5120</td>
<td>0</td>
<td>5120</td>
<td>0%</td>
<td>/run/lock</td>
</tr>
<tr>
<td>none</td>
<td>121888</td>
<td>0</td>
<td>121888</td>
<td>0%</td>
<td>/run/shm</td>
</tr>
<tr>
<td>none</td>
<td>102400</td>
<td>0</td>
<td>102400</td>
<td>0%</td>
<td>/run/user</td>
</tr>
<tr>
<td>/dev/sda5</td>
<td>90099</td>
<td>1550</td>
<td>81740</td>
<td>2%</td>
<td>/demo/it3100</td>
</tr>
<tr>
<td>/dev/sda6</td>
<td>97070</td>
<td>0</td>
<td>97070</td>
<td>0%</td>
<td>/demo/it1100</td>
</tr>
<tr>
<td>/dev/sda7</td>
<td>97276</td>
<td>2500</td>
<td>94776</td>
<td>3%</td>
<td>/demo/it3150</td>
</tr>
</tbody>
</table>
cgl@disk:$ echo "Where do we find the options for creating an NTFS file system?"
Where do we find the options for creating an NTFS file system?
cgl@disk:$
cgl@disk:/ $ man mkfs.ntfs
NAME

mkntfs - create an NTFS file system

SYNOPSIS

mkntfs [options] device [number-of-sectors]

mkntfs [ -C ] [ -c cluster-size ] [ -F ] [ -f ] [ -H heads ] [ -h ] [ -I ] [ -L volume-label ] [ -l ] [ -n ] [ -p part-start-sect ] [ -Q ] [ -q ] [ -S sectors-per-track ] [ -s sector-size ] [ -T ] [ -U ] [ -V ] [ -v ] [ -z mft-zone-multiplier ] [ --debug ] device [ number-of-sectors ]

DESCRIPTION

mkntfs is used to create an NTFS file system on a device (usually a disk partition) or file. device is the special file corresponding to the device (e.g. /dev/hdXX). number-of-sectors is the number of sectors on the device. If omitted, mkntfs automagically figures the file system size.

OPTIONS

Below is a summary of all the options that mkntfs accepts. Nearly all
cgl@disk:/$ man mount.ntfs
OPTIONS

Below is a summary of the options that **ntfs-3g** accepts.

**uid=value** and **gid=value**
Set the owner and the group of files and directories. The values are numerical. The defaults are the uid and gid of the current process.

**umask=value**
Set the bitmask of the file and directory permissions that are not present. The value is given in octal. The default value is 0 which means full access to everybody.

**fmask=value**
Set the bitmask of the file permissions that are not present. The value is given in octal. The default value is 0 which means full access to everybody.

**dmask=value**
Set the bitmask of the directory permissions that are not present. The value is given in octal. The default value is 0 which means full access to everybody.
So, `df` Displays currently mounted File systems.

What does du do?
cgl@disk:/$ sudo du -s /demo/it3100
13       /demo/it3100
cgl@disk:/$
cgl@disk:/$ sudo du -s /demo/it1100
16       /demo/it1100
cgl@disk:/$
cgl@disk:/$ sudo du -s /demo/it3150
4         /demo/it3150

cgl@disk:/$
cgl@disk:/$ echo "Now, how can we use the resource hog programs to test the storage capacity of the file systems?"
Now, how can we use the resource hog programs to test the storage capacity of the file systems?
cgl@disk:/$
cgl@disk:/tmp

cgl@disk:/tmp$ wget http://cit.dixie.edu/it/3100/examples/examples/y14m09d17-resources-hogs.tgz
--2014-09-30 19:44:37--  http://cit.dixie.edu/it/3100/examples/examples/y14m09d17-resources-hogs.tgz
Resolving cit.dixie.edu (cit.dixie.edu)... 144.38.192.200
Connecting to cit.dixie.edu (cit.dixie.edu)|144.38.192.200|:80... connected.
HTTP request sent, awaiting response... 200 OK
Length: 12490 (12K) [application/x-gzip]
Saving to: ‘y14m09d17-resources-hogs.tgz’

100%[==================================] 12,490 --.-K/s  in 0s

2014-09-30 19:44:37 (185 MB/s) - ‘y14m09d17-resources-hogs.tgz’ saved [12490/12490]

cgl@disk:/tmp$
cgl@disk:/tmp$ sudo tar -zxvf y14m09d17-resources-hogs.tgz -C /usr/local/bin/
cpuhog
diskhog
fileiohog
inodehog
memhog
README.txt
cgl@disk:/tmp$
cgl@disk:/tmp$ echo "Testing in ext4 file system. But, could do this in any file system."
Testing in ext4 file system. But, could do this in any file system.
cgl@disk:/tmp$
cgl@disk:/tmp$ cd /demo/it3100/
cgl@disk:/demo/it3100$
cgl@disk:/demo/it3100$ echo "Check that this is NOT the root file system. I don't want to fill that system up with demo data."
Check that this is NOT the root file system. I don't want to fill that system up with demo data.
cgl@disk:/demo/it3100$
cgl@disk:/demo/it3100$ df .
Filesystem  1K-blocks  Used  Available  Use%  Mounted on
/dev/sda5       90099   1550    81740    2%  /demo/it3100

cgl@disk:/demo/it3100$
cgl@disk:/demo/it3100$ echo "diskhog creates big files until there are no more data blocks available."
diskhog creates big files until there are no more data blocks available.
cgl@disk:/demo/it3100$
usage: diskhog [-f name]
   -f name : base of filenames
   -h      : display this message
cgl@disk:/demo/it3100$ sudo chown cgl:cgl .
cgl@disk:/demo/it3100$ ls -la
total 17
drw-r-xr-x 3 cgl cgl 1024 Sep 30 19:18 .
drw-r-xr-x 5 root root 4096 Sep 30 19:35 ..
drw------- 2 root root 12288 Sep 30 19:18 lost+found
cgl@disk:/demo/it3100$
cgl@disk:/demo/it3100$ diskhog -f slop
0000 - Error in write.cgl@disk:/demo/it3100$
cgl@disk:/demo/it3100$ ls -la
total 81722
drwxr-xr-x 3 cgl cgl 1024 Sep 30 19:48 .
drwxr-xr-x 5 root root 4096 Sep 30 19:35 ..
drwx------ 2 root root 12288 Sep 30 19:18 lost+found
-rwx------ 1 cgl cgl 83664896 Sep 30 19:48 sloop-0000
cgl@disk:/demo/it3100$
cgl@disk:/demo/it3100$ df .
Filesystem  1K-blocks Used Available Use% Mounted on /dev/sda 9 90099 83289 1 100% /demo/it3100
cgl@disk:/demo/it3100$ du -s .
du: cannot read directory './lost+found': Permission denied
81718 .
cgl@disk:/demo/it3100$
cgl@disk:/demo/it3100$ df .
Filesystem  1K-blocks  Used  Available  Use% Mounted on
/dev/sda5      90099   1550     81740   2% /demo/it3100

```bash
cgl@disk:/demo/it3100$ 
```
cgl@disk:/demo/it3100$ sudo diskhog -f slop
0000 - .Error in write.cgl@disk:/demo/it3100$
cgl@disk:/demo/it3100$ ls -la
total 86610
-rwxr-xr-x 3 cgl  cgl    1024 Sep 30 19:49 .
drwxr-xr-x 5 root root   4096 Sep 30 19:35 ..
drwx------ 2 root root  12288 Sep 30 19:18 lost+found
-rwx------ 1 root root  88670208 Sep 30 19:49 slop-0000

cgl@disk:/demo/it3100$
cgl@disk:/demo/it3100$
cgl@disk:/demo/it3100$ df .
Filesystem 1K-blocks Used Available Use% Mounted on
/dev/sda5     90099 88153      0 100% /demo/it3100
cgl@disk:/demo/it3100$
cgl@disk:/demo/it3100$
cgl@disk:/demo/it3100$ du -s .
du: cannot read directory './lost+found': Permission denied
86606 .
cgl@disk:/demo/it3100$
cgl@disk:/demo/it3100$ sudo rm slop-0000

cgl@disk:/demo/it3100$ echo "inodehog creates many small files, until there are no more inodes available."
inodehog creates many small files, until there are no more inodes available.
cgl@disk:/demo/it3100$
cgl@disk:/demo/it3100$ inodehog -h
usage: inodehog [-n name] [-s size] [-c files_per_dir]
  -c num : files per directory (default == 1024)
  -s num : size of files in KB (default == 1)
  -n file-name : base name for files (default == hog)
  -h     : display this message
cgl@disk:/demo/it3100$
cgl@disk:/demo/it3100$ inodehog -n slop
Failed to fopen slop-00023/slop-00797.
fopen failed: No space left on device
Created 24 directories and 24349 files.
cgl@disk:/demo/it3100$
cgl@disk:/demo/it3100$ ls
lost+found  slop-00004  slop-00009  slop-00014  slop-00019
slop-00000  slop-00005  slop-00010  slop-00015  slop-00020
slop-00001  slop-00006  slop-00011  slop-00016  slop-00021
slop-00002  slop-00007  slop-00012  slop-00017  slop-00022
slop-00003  slop-00008  slop-00013  slop-00018  slop-00023

cgl@disk:/demo/it3100$

cgl@disk:/demo/it3100$

cgl@disk:/demo/it3100$ df .
Filesystem  1K-blocks  Used  Available  Use%  Mounted on
/dev/sda5  90999  29672  53618  36%  /demo/it3100

cgl@disk:/demo/it3100$

cgl@disk:/demo/it3100$ du -s .
du: cannot read directory './lost+found': Permission denied
25097

cgl@disk:/demo/it3100$
cgl@disk:/demo/it3100$ sudo inodehog -n slop
Failed to fopen slop-00023/slopc-00797.
fopen failed:: No space left on device
Created 24 directories and 24349 files.
cgl@disk:/demo/it3100$
cgl@disk:/demo/it3100$ ls
lost+found  slop-00004  slop-00009  slop-00014  slop-00019
slop-00000  slop-00005  slop-00010  slop-00015  slop-00020
slop-00001  slop-00006  slop-00011  slop-00016  slop-00021
slop-00002  slop-00007  slop-00012  slop-00017  slop-00022
slop-00003  slop-00008  slop-00013  slop-00018  slop-00023
cgl@disk:/demo/it3100$
cgl@disk:/demo/it3100$
cgl@disk:/demo/it3100$ df .
Filesystem  1K-blocks  Used  Available  Use%  Mounted on
/dev/sda5     900999  26695  56595  33% /demo/it3100
cgl@disk:/demo/it3100$
cgl@disk:/demo/it3100$
cgl@disk:/demo/it3100$ du -s .
du: cannot read directory './lost+found': Permission denied
25097

cgl@disk:/demo/it3100$
cgl@disk:/demo/it3100$
cgl@disk:/demo/it3100$ sudo rm -rf slop*
cgl@disk:/demo/it3100$  ▒
cgl@disk:/demo/it3100$ echo "Remember. Be careful. If you fill up your root file system, the computer will stop working. If you remove files you didn't mean to, the computer will stop working."
Remember. Be careful. If you fill up your root file system, the computer will stop working. If you remove files you didn't mean to, the computer will stop working.
cgl@disk:/demo/it3100$