

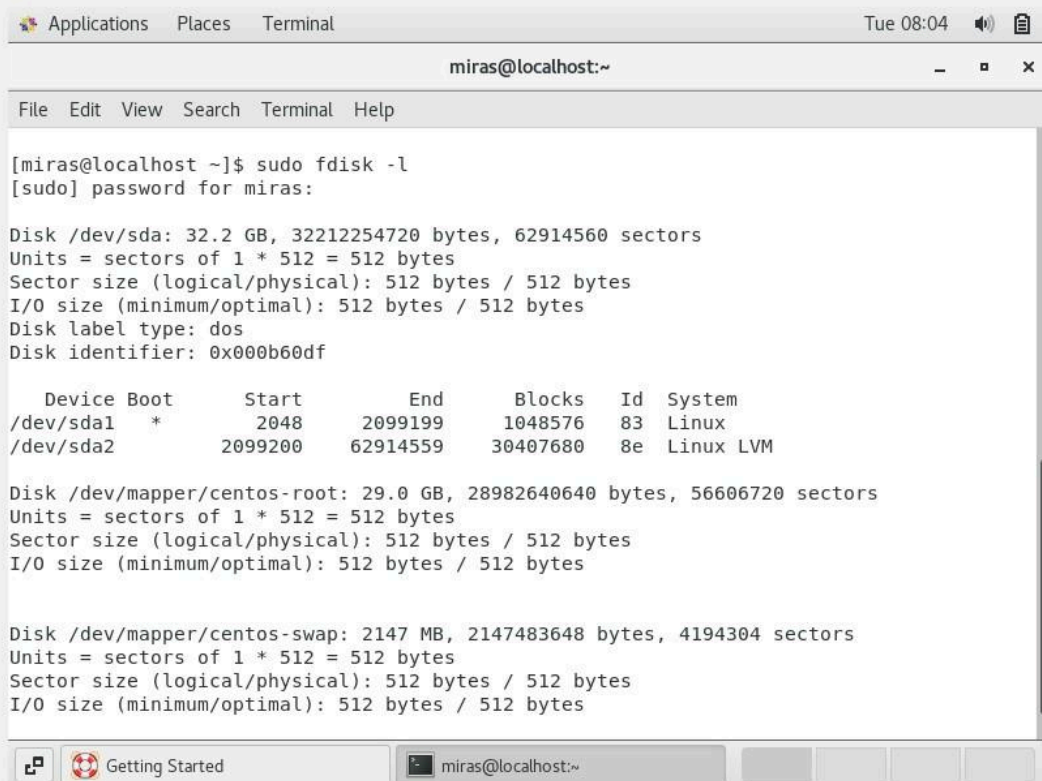
Berikov Miras

Linux Assignment 3

Chapter 13. Basic Storage Partitioning

1) Identify the Disk

`fdisk -l`



```
[miras@localhost ~]$ sudo fdisk -l
[sudo] password for miras:

Disk /dev/sda: 32.2 GB, 32212254720 bytes, 62914560 sectors
Units = sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk label type: dos
Disk identifier: 0x000b60df

   Device Boot      Start         End      Blocks   Id  System
/dev/sda1  *        2048       2099199       1048576    83   Linux
/dev/sda2                2099200       62914559       30407680    8e   Linux LVM

Disk /dev/mapper/centos-root: 29.0 GB, 28982640640 bytes, 56606720 sectors
Units = sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes

Disk /dev/mapper/centos-swap: 2147 MB, 2147483648 bytes, 4194304 sectors
Units = sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
```

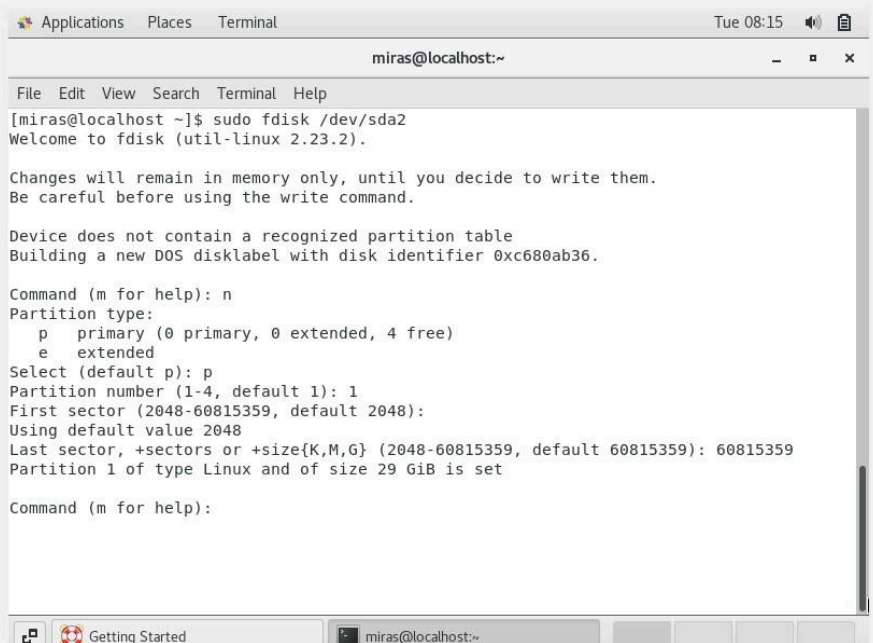
2) Select a Partitioning Tool - fdisk

3) Launch the Partitioning Tool

`fdisk /dev/sda2`

4) Create Partitions

Typing “n” and then choosing defaults to create a partition



```
[miras@localhost ~]$ sudo fdisk /dev/sda2
Welcome to fdisk (util-linux 2.23.2).

Changes will remain in memory only, until you decide to write them.
Be careful before using the write command.

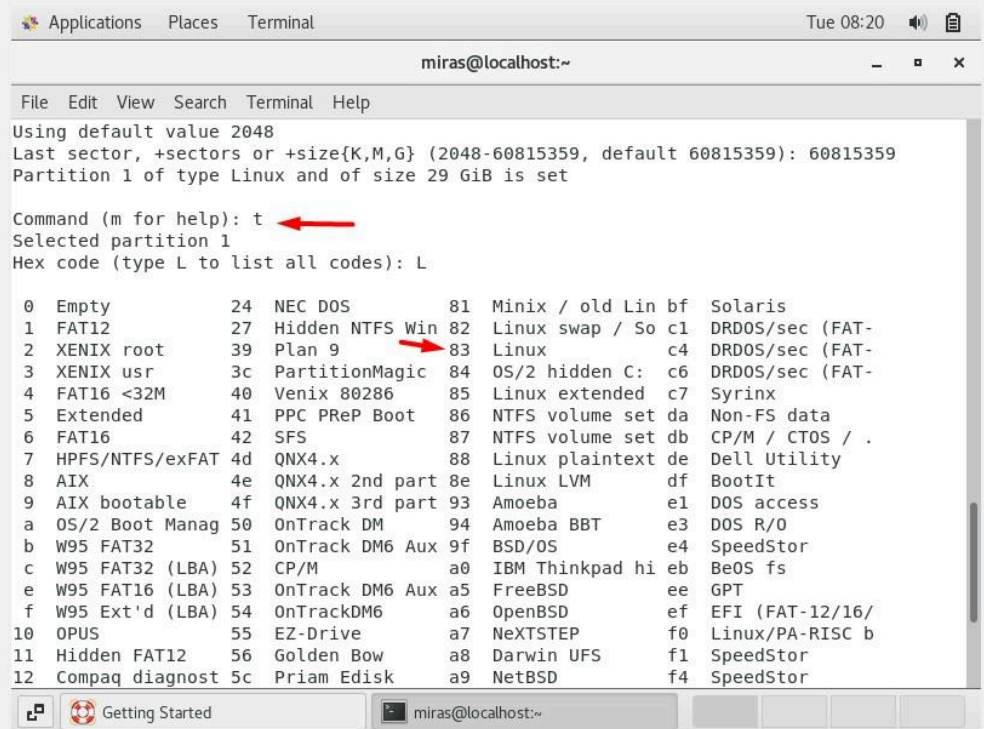
Device does not contain a recognized partition table
Building a new DOS disklabel with disk identifier 0xc680ab36.

Command (m for help): n
Partition type:
   p   primary (0 primary, 0 extended, 4 free)
   e   extended
Select (default p): p
Partition number (1-4, default 1): 1
First sector (2048-60815359, default 2048):
Using default value 2048
Last sector, +sectors or +size[K,M,G] (2048-60815359, default 60815359): 60815359
Partition 1 of type Linux and of size 29 GiB is set

Command (m for help):
```

5) Set Partition Types

typing “t” and entering hex code 83 for linux type

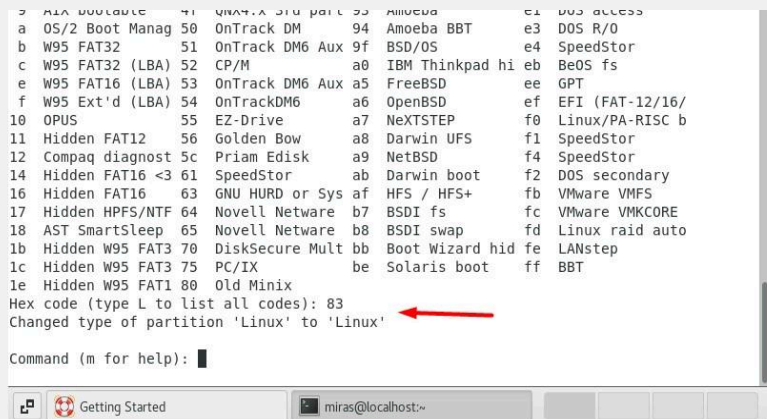


The terminal window shows the following sequence of commands and output:

```
Using default value 2048
Last sector, +sectors or +size{K,M,G} (2048-60815359, default 60815359): 60815359
Partition 1 of type Linux and of size 29 GiB is set

Command (m for help): t
Selected partition 1
Hex code (type L to list all codes): L
```

Hex Code	Partition Type
0	Empty
1	FAT12
2	XENIX root
3	XENIX usr
4	FAT16 <32M
5	Extended
6	FAT16
7	HPFS/NTFS/exFAT
8	AIX
9	AIX bootable
a	OS/2 Boot Manag
b	W95 FAT32
c	W95 FAT32 (LBA)
e	W95 FAT16 (LBA)
f	W95 Ext'd (LBA)
10	OPUS
11	Hidden FAT12
12	Compaq diagnost
24	NEC DOS
27	Hidden NTFS Win
39	Plan 9
3c	PartitionMagic
40	Venix 80286
41	PPC PREP Boot
42	SFS
4d	QNX4.x
4e	QNX4.x 2nd part
4f	QNX4.x 3rd part
50	OnTrack DM
51	OnTrack DM6 Aux
52	CP/M
53	OnTrack DM6 Aux
54	OnTrackDM6
55	EZ-Drive
56	Golden Bow
5c	Priam Edisk
81	Minix / old Lin
82	Linux swap / So
83	Linux
84	OS/2 hidden C:
85	Linux extended
86	NTFS volume set
87	NTFS volume set
88	Linux plaintext
8e	Linux LVM
93	Amoeba
94	Amoeba BBT
9f	BSD/OS
a0	IBM Thinkpad hi
a5	FreeBSD
a6	OpenBSD
a7	NeXTSTEP
a8	Darwin UFS
a9	NetBSD
bf	Solaris
c1	DRDOS/sec (FAT-
c4	DRDOS/sec (FAT-
c6	DRDOS/sec (FAT-
c7	Syrinx
da	Non-FS data
db	CP/M / CTOS / .
de	Dell Utility
df	BootIt
e1	DOS access
e3	DOS R/O
e4	SpeedStor
eb	BeOS fs
ee	GPT
ef	EFI (FAT-12/16/
f0	Linux/PA-RISC b
f1	SpeedStor
f4	SpeedStor



The terminal window shows the following sequence of commands and output:

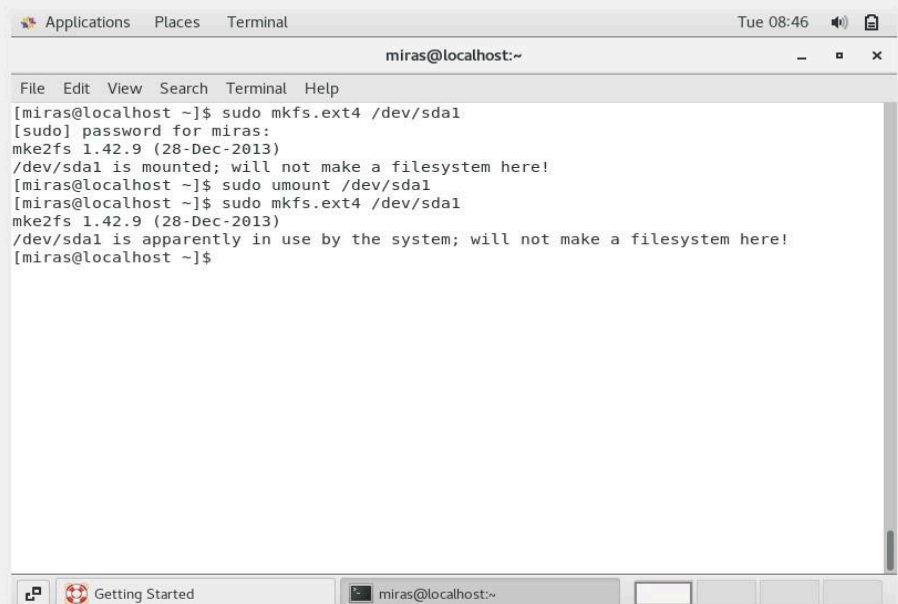
```
Hex code (type L to list all codes): 83
Changed type of partition 'Linux' to 'Linux'

Command (m for help):
```

6) Format Partitions

mkfs.ext4 /dev/sda1

umount /dev/sda1



The terminal window shows the following sequence of commands and output:

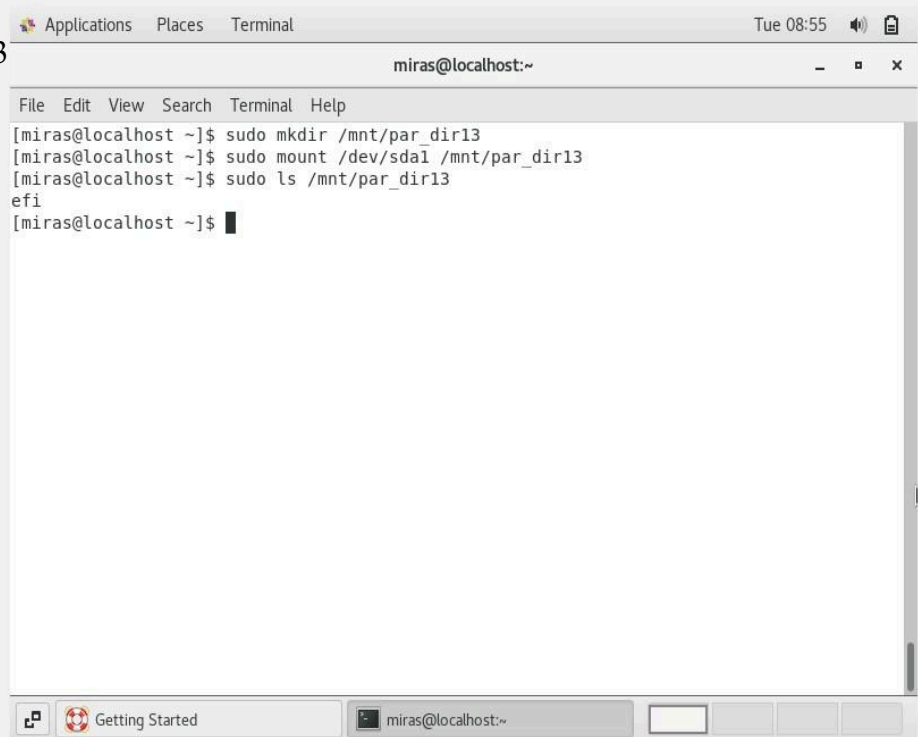
```
[miras@localhost ~]$ sudo mkfs.ext4 /dev/sda1
[sudo] password for miras:
mke2fs 1.42.9 (28-Dec-2013)
/dev/sda1 is mounted; will not make a filesystem here!
[miras@localhost ~]$ sudo umount /dev/sda1
[miras@localhost ~]$ sudo mkfs.ext4 /dev/sda1
mke2fs 1.42.9 (28-Dec-2013)
/dev/sda1 is apparently in use by the system; will not make a filesystem here!
[miras@localhost ~]$
```

7) Mount Partitions

```
sudo mkdir /mnt/par_dir13
```

```
sudo mount /dev/sda1 /mnt/par_dir13
```

```
sudo ls /mnt/part_dir13
```



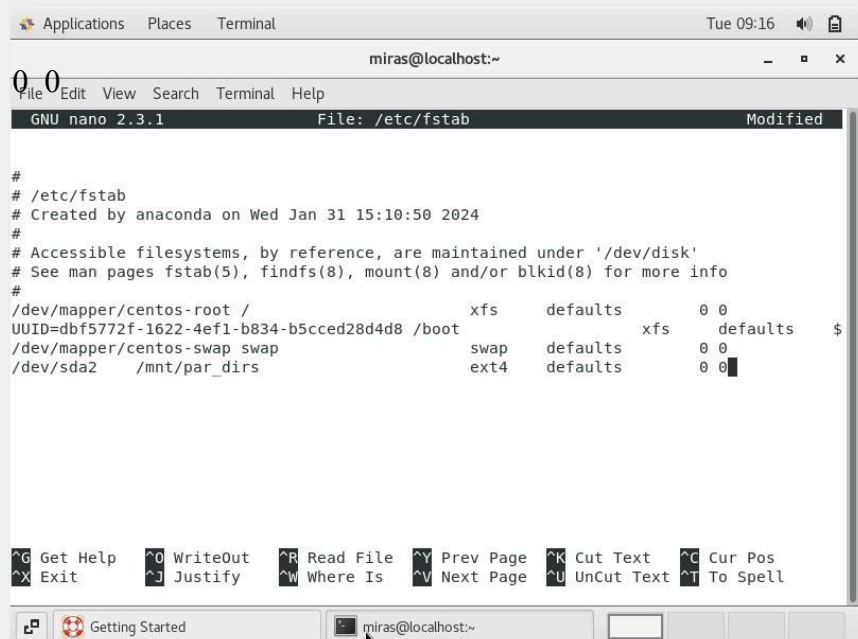
```
Applications  Places  Terminal  Tue 08:55  [m] [v] [x]
miras@localhost:~
File Edit View Search Terminal Help
[miras@localhost ~]$ sudo mkdir /mnt/par_dir13
[miras@localhost ~]$ sudo mount /dev/sda1 /mnt/par_dir13
[miras@localhost ~]$ sudo ls /mnt/par_dir13
efi
[miras@localhost ~]$
```

8) Configure Automatic Mounting

```
sudo mkdir /mnt/par_dirs
```

```
sudo nano /etc/fstab
```

```
/dev/sda2 /mnt/par_dirs ext4 defaults 0 0
```



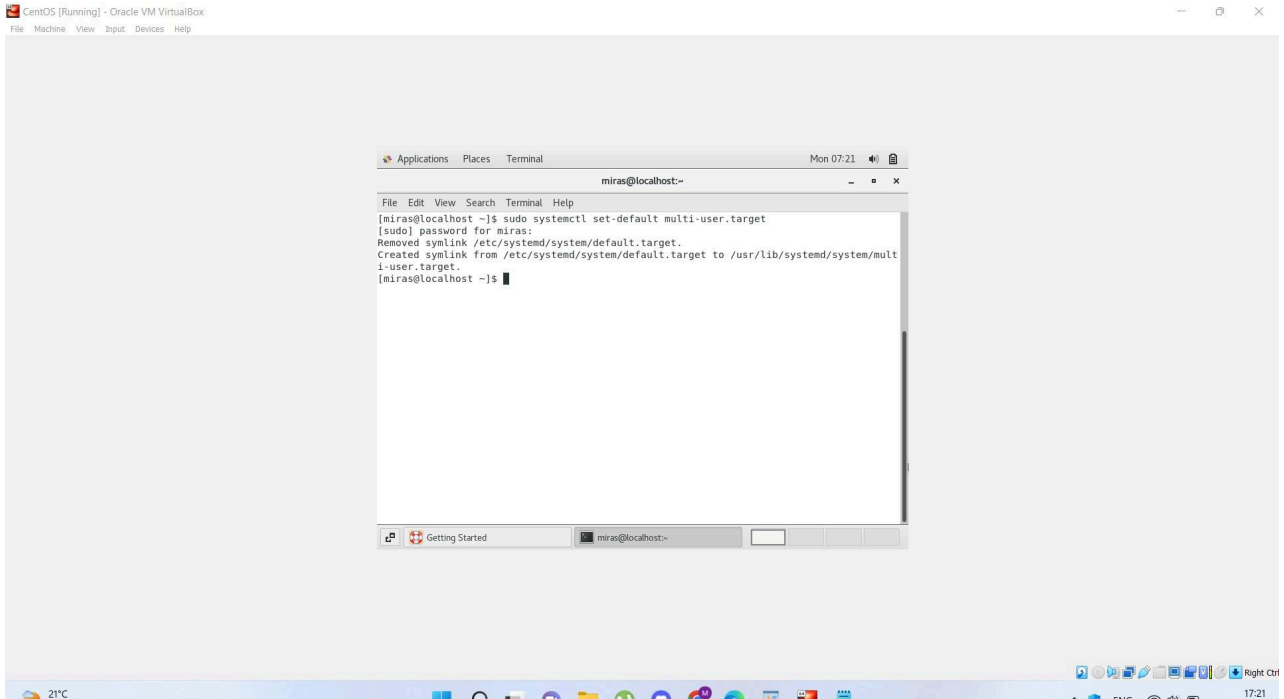
```
Applications  Places  Terminal  Tue 09:16  [m] [v] [x]
miras@localhost:~
File Edit View Search Terminal Help
GNU nano 2.3.1 File: /etc/fstab Modified
#
# /etc/fstab
# Created by anaconda on Wed Jan 31 15:10:50 2024
#
# Accessible filesystems, by reference, are maintained under '/dev/disk'
# See man pages fstab(5), findfs(8), mount(8) and/or blkid(8) for more info
#
/dev/mapper/centos-root / xfs defaults 0 0
UUID=dbf5772f-1622-4ef1-b834-b5cced28d4d8 /boot xfs defaults $
/dev/mapper/centos-swap swap defaults 0 0
/dev/sda2 /mnt/par_dirs ext4 defaults 0 0
^G Get Help ^O WriteOut ^R Read File ^Y Prev Page ^K Cut Text ^C Cur Pos
^X Exit ^J Justify ^W Where Is ^V Next Page ^U UnCut Text ^T To Spell
```

Chapter 12. System Initialization, Message Logging, and System Tuning

1) System Initialization (init/systemd)

Configure the default runlevel or target for system boot.

```
sudo systemctl set-default multi-user.target
```



Create a custom systemd service unit file for a specific application or task

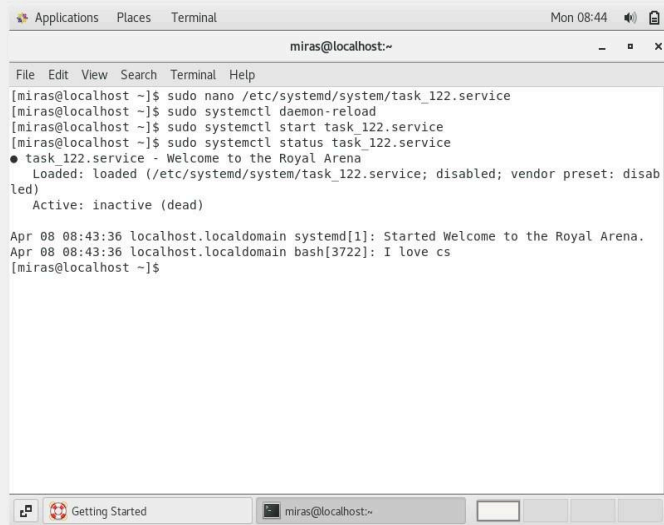
```
sudo nano /etc/systemd/system/task_122.service
```



sudo systemctl daemon-reload

sudo systemctl start task_122.service

sudo systemctl status task_122.service



```
Applications  Places  Terminal  Mon 08:44
miras@localhost:~
File Edit View Search Terminal Help
[miras@localhost ~]$ sudo nano /etc/systemd/system/task_122.service
[miras@localhost ~]$ sudo systemctl daemon-reload
[miras@localhost ~]$ sudo systemctl start task_122.service
[miras@localhost ~]$ sudo systemctl status task_122.service
● task_122.service - Welcome to the Royal Arena
   Loaded: loaded (/etc/systemd/system/task_122.service; disabled; vendor preset: disabled)
   Active: inactive (dead)

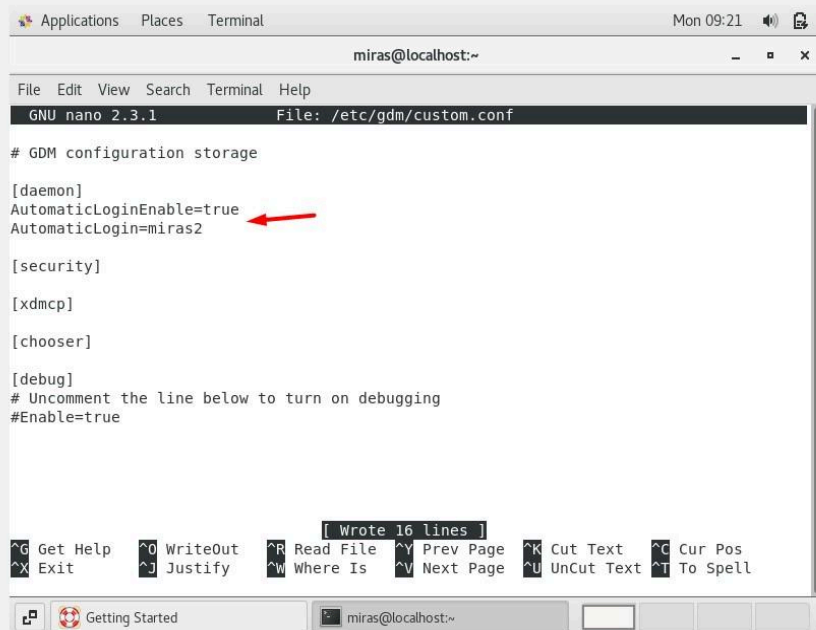
Apr 08 08:43:36 localhost.localdomain systemd[1]: Started Welcome to the Royal Arena.
Apr 08 08:43:36 localhost.localdomain bash[3722]: I love cs
[miras@localhost ~]$
```

Set up automatic login for a specific user at system startup

sudo nano /etc/gdm/custom.conf

AutomaticLoginEnable=true

AutomaticLogin=miras2



```
Applications  Places  Terminal  Mon 09:21
miras@localhost:~
File Edit View Search Terminal Help
GNU nano 2.3.1 File: /etc/gdm/custom.conf

# GDM configuration storage

[daemon]
AutomaticLoginEnable=true
AutomaticLogin=miras2
[security]

[xdmcp]

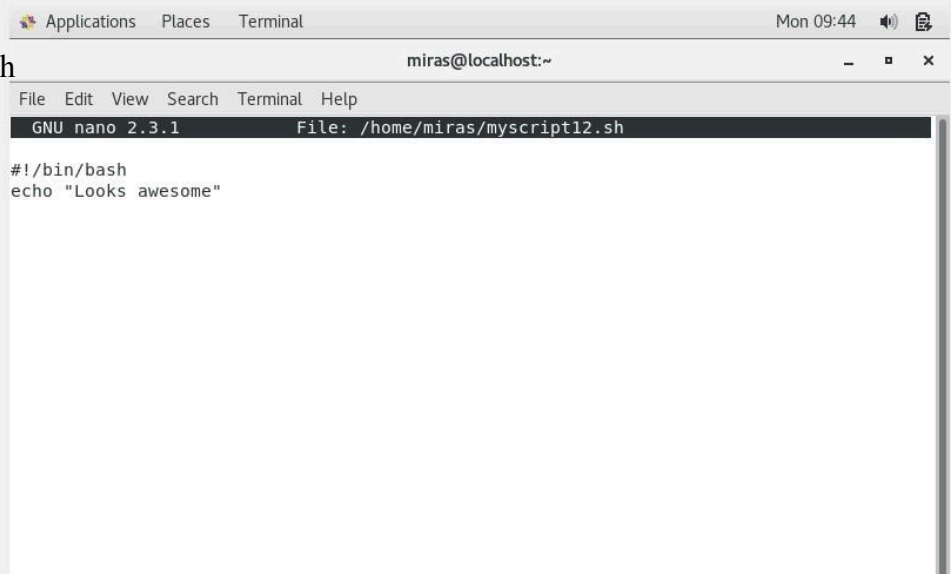
[chooser]

[debug]
# Uncomment the line below to turn on debugging
#Enable=true

[ Wrote 16 lines ]
^G Get Help  ^O WriteOut  ^R Read File  ^Y Prev Page  ^K Cut Text   ^C Cur Pos
^X Exit      ^J Justify   ^W Where Is   ^V Next Page  ^U UnCut Text ^T To Spell
```

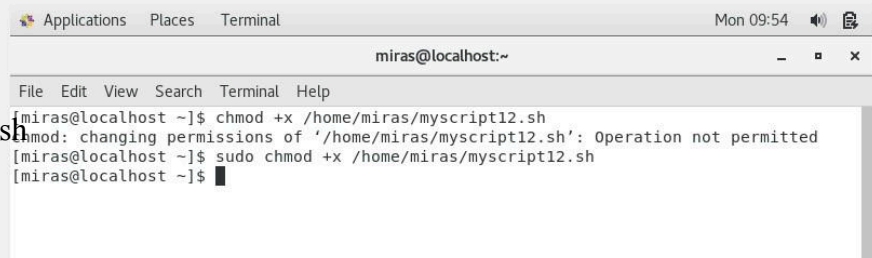
Configure the system to run a script or command at boot time using systemd

`sudo nano /home/miras/myscript12.sh`



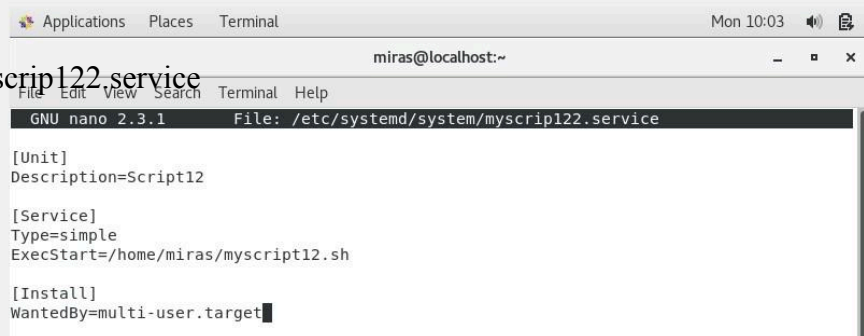
```
Applications  Places  Terminal  Mon 09:44  [icon]
miras@localhost:~
File Edit View Search Terminal Help
GNU nano 2.3.1 File: /home/miras/myscript12.sh
#!/bin/bash
echo "Looks awesome"
```

`sudo chmod +x /home/miras/myscript12.sh`



```
Applications  Places  Terminal  Mon 09:54  [icon]
miras@localhost:~
File Edit View Search Terminal Help
[miras@localhost ~]$ chmod +x /home/miras/myscript12.sh
chmod: changing permissions of '/home/miras/myscript12.sh': Operation not permitted
[miras@localhost ~]$ sudo chmod +x /home/miras/myscript12.sh
[miras@localhost ~]$
```

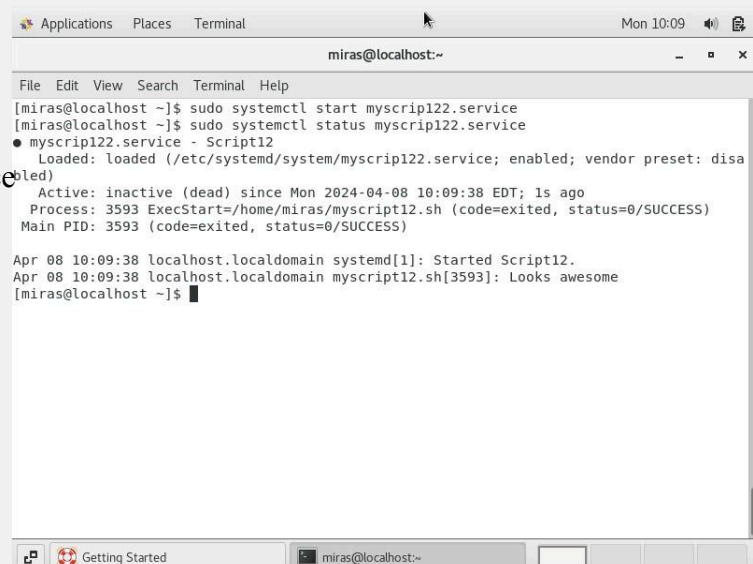
`sudo nano /etc/systemd/system/myscrip122.service`



```
Applications  Places  Terminal  Mon 10:03  [icon]
miras@localhost:~
File Edit View Search Terminal Help
GNU nano 2.3.1 File: /etc/systemd/system/myscrip122.service
[Unit]
Description=Script12
[Service]
Type=simple
ExecStart=/home/miras/myscript12.sh
[Install]
WantedBy=multi-user.target
```

`sudo systemctl start myscrip122.service`

`sudo systemctl status myscrip122.service`



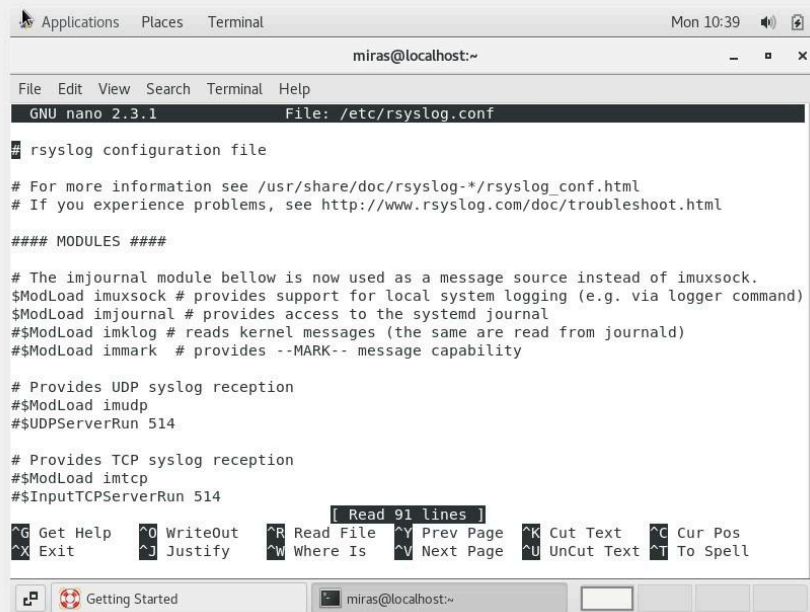
```
Applications  Places  Terminal  Mon 10:09  [icon]
miras@localhost:~
File Edit View Search Terminal Help
[miras@localhost ~]$ sudo systemctl start myscrip122.service
[miras@localhost ~]$ sudo systemctl status myscrip122.service
● myscrip122.service - Script12
   Loaded: loaded (/etc/systemd/system/myscrip122.service; enabled; vendor preset: disabled)
   Active: inactive (dead) since Mon 2024-04-08 10:09:38 EDT; 1s ago
     Process: 3593 ExecStart=/home/miras/myscript12.sh (code=exited, status=0/SUCCESS)
    Main PID: 3593 (code=exited, status=0/SUCCESS)

Apr 08 10:09:38 localhost.localdomain systemd[1]: Started Script12.
Apr 08 10:09:38 localhost.localdomain myscrip12.sh[3593]: Looks awesome
[miras@localhost ~]$
```


2) Message Logging (syslog/rsyslog)

Configure syslog/rsyslog to log messages to a remote server

```
sudo nano /etc/rsyslog.conf
```



The screenshot shows a terminal window with the nano text editor open to the file `/etc/rsyslog.conf`. The editor's title bar indicates the user is `miras@localhost` and the file is `File: /etc/rsyslog.conf`. The configuration file content is as follows:

```
# rsyslog configuration file

# For more information see /usr/share/doc/rsyslog-*/rsyslog_conf.html
# If you experience problems, see http://www.rsyslog.com/doc/troubleshoot.html

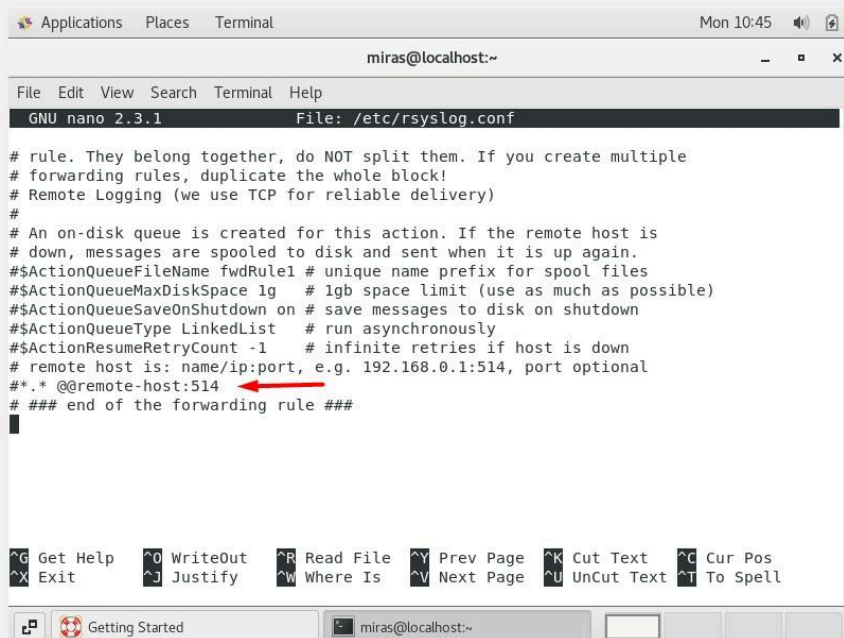
#### MODULES ####

# The imjournal module bellow is now used as a message source instead of imuxsock.
$ModLoad imuxsock # provides support for local system logging (e.g. via logger command)
$ModLoad imjournal # provides access to the systemd journal
#$ModLoad imklog # reads kernel messages (the same are read from journald)
#$ModLoad immark # provides --MARK-- message capability

# Provides UDP syslog reception
#$ModLoad imudp
#$UDPServerRun 514

# Provides TCP syslog reception
#$ModLoad imtcp
#$InputTCPServerRun 514
```

The bottom of the terminal window shows the nano editor's status bar with various keyboard shortcuts like `^G Get Help`, `^O WriteOut`, `^R Read File`, etc. A status bar at the very bottom of the terminal window shows `Getting Started` and the user `miras@localhost`.



This screenshot shows the same terminal window with the nano editor open to the `/etc/rsyslog.conf` file, but it is scrolled down to show the forwarding rule configuration. The configuration content is:

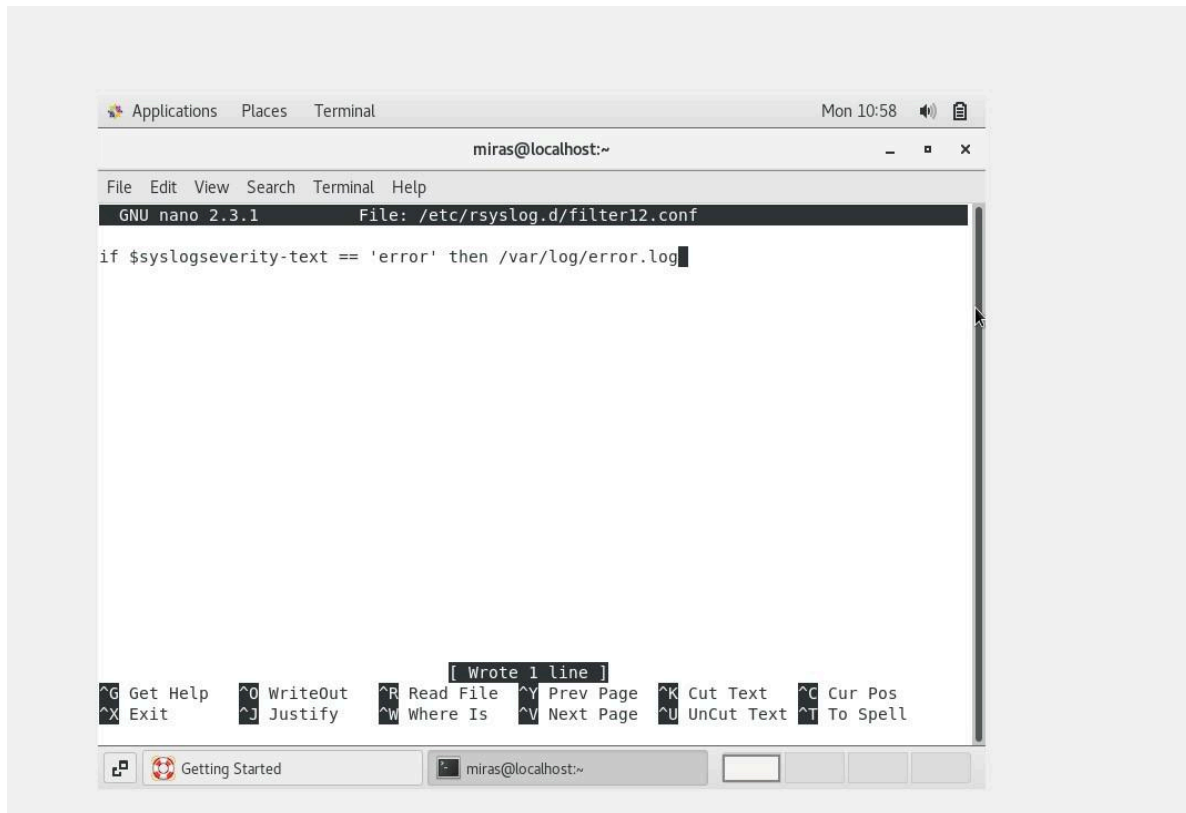
```
# rule. They belong together, do NOT split them. If you create multiple
# forwarding rules, duplicate the whole block!
# Remote Logging (we use TCP for reliable delivery)
#
# An on-disk queue is created for this action. If the remote host is
# down, messages are spooled to disk and sent when it is up again.
#$ActionQueueFileName fwdRule1 # unique name prefix for spool files
#$ActionQueueMaxDiskSpace 1g # 1gb space limit (use as much as possible)
#$ActionQueueSaveOnShutdown on # save messages to disk on shutdown
#$ActionQueueType LinkedList # run asynchronously
#$ActionResumeRetryCount -1 # infinite retries if host is down
# remote host is: name/ip:port, e.g. 192.168.0.1:514, port optional
#*. * @remote-host:514
# ### end of the forwarding rule ###
```

A red arrow points to the line `#*. * @remote-host:514`. The bottom of the terminal window shows the nano editor's status bar with keyboard shortcuts and the user `miras@localhost`.

Filter and redirect specific log messages to separate log files

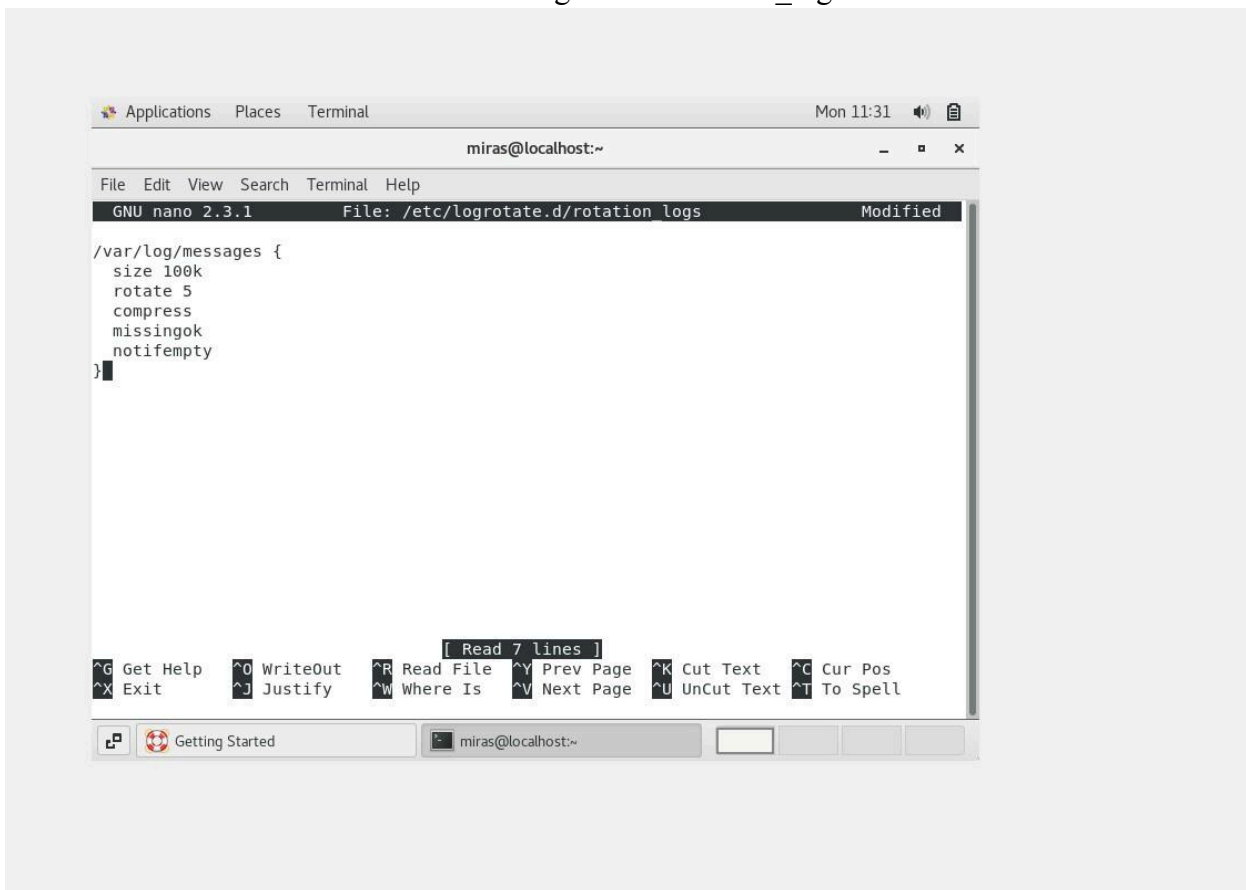
```
sudo nano /etc/rsyslog.d/filter12.conf
```

```
sudo systemctl restart rsyslog
```



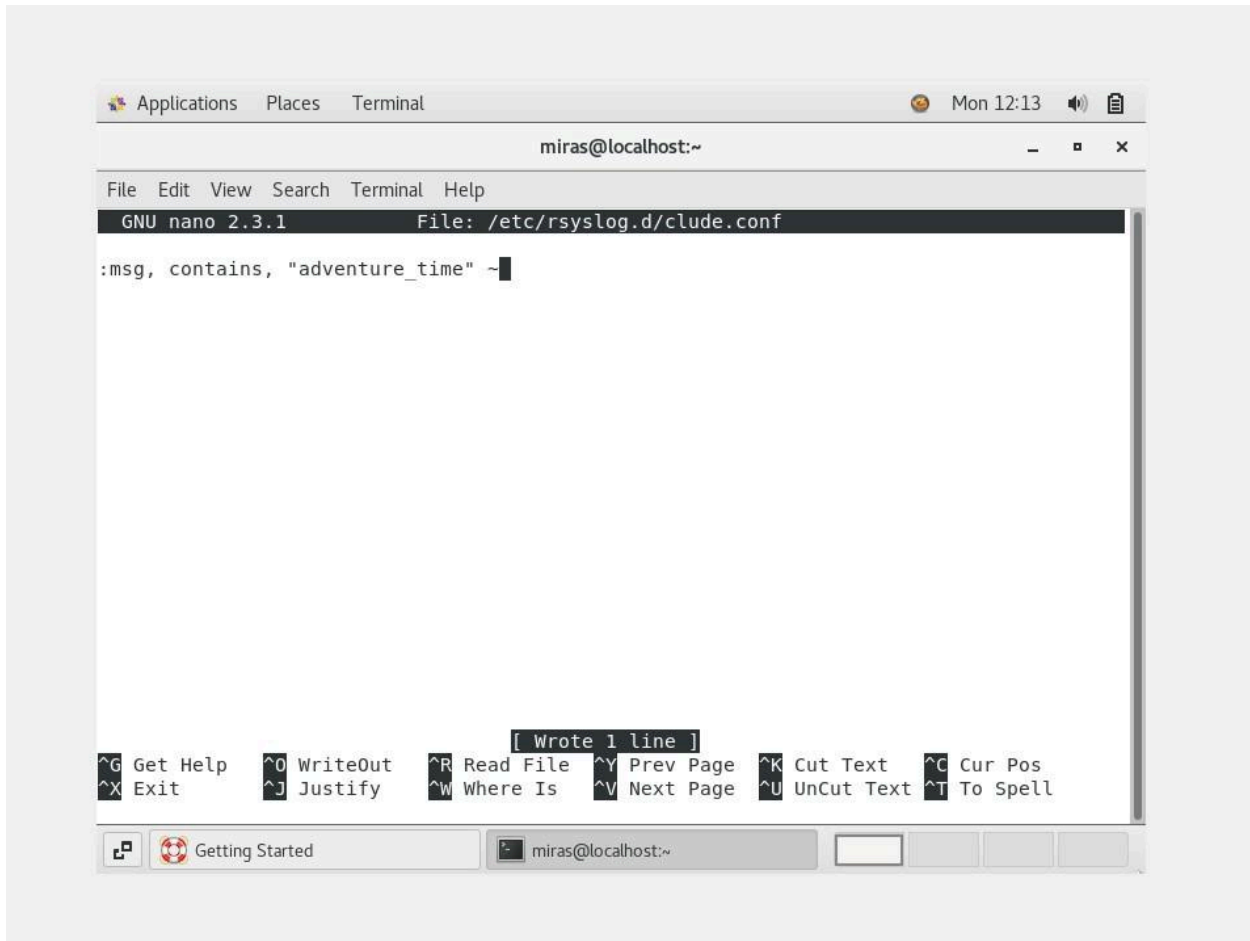
Set up log rotation to manage log file sizes and ensure proper log file maintenance

```
sudo nano /etc/logrotate.d/rotation_logs
```



Customize syslog/rsyslog settings to include or exclude specific log messages

```
sudo nano /etc/rsyslog.d/clude.conf  
sudo systemctl restart rsyslog
```

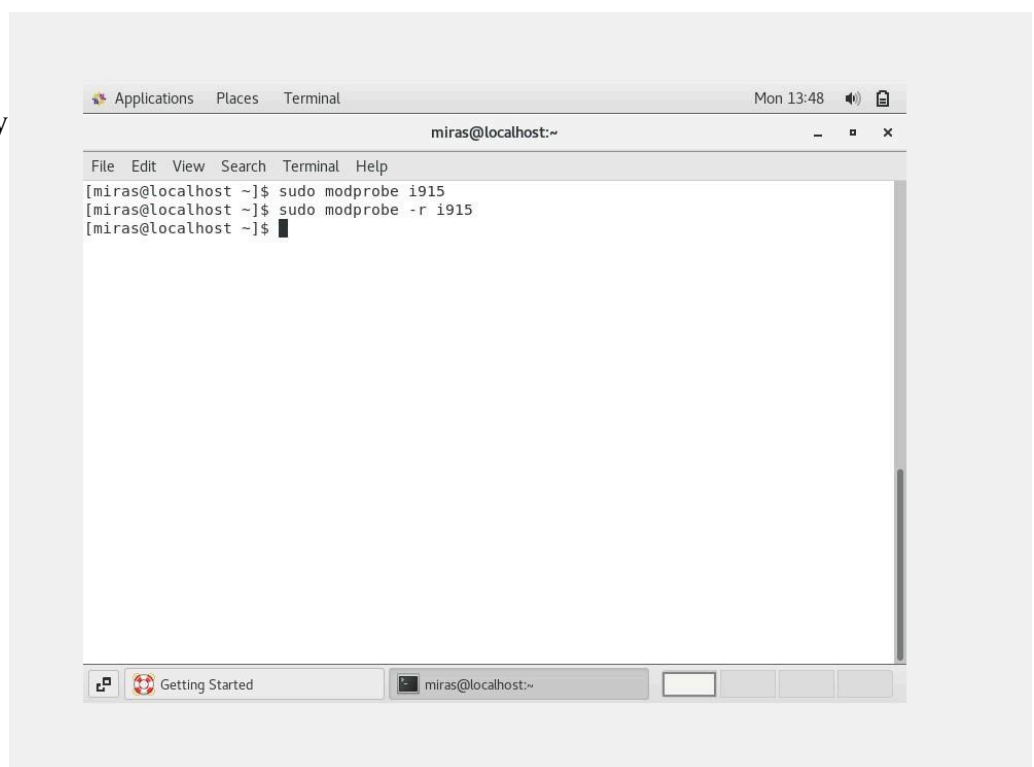


3) Kernel Module Management

Load/unload kernel modules manually

```
sudo modprobe i915
```

```
sudo modprobe -r i915
```



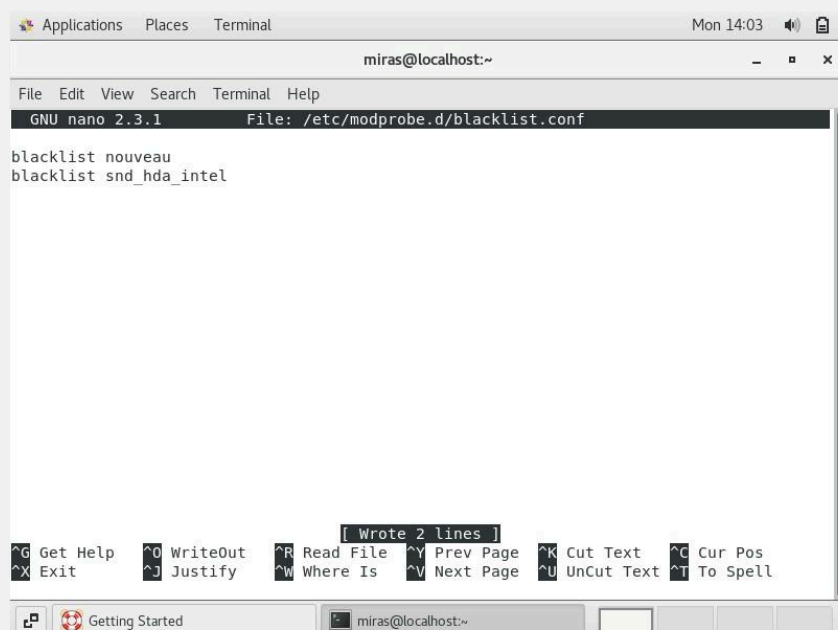
Configure kernel modules to load automatically at boot time

```
sudo nano /etc/modules
```



Blacklist kernel modules to prevent them from loading automatically

```
sudo nano /etc/modprobe.d/blacklist.conf  
blacklist nouveau ; blacklist snd_hda_intel
```



4) Resource Management (CPU, Memory, I/O)

Set CPU affinity for specific processes or groups of processes.

```
taskset -c 2 12345
```

Configure memory limits using cgroups or other mechanisms to control memory usage by specific processes

```
sudo yum install libcgroup-tools
```

```
sudo cgcreate -g memory:group12
```

```
sudo cgset -r memory.limit_in_bytes=1G group12
```

Tune I/O scheduler settings to optimize disk I/O performance for different workload types

```
sudo cgexec -g memory:group12 sleep 60
```

5) Network Tuning

Adjust network buffer sizes to optimize network performance

```
sudo sysctl -w net.core.rmem_default=262144  
sudo sysctl -w net.core.rmem_max=16777216  
sudo sysctl -w net.ipv4.tcp_rmem='4096 87380 16777216'  
sudo sysctl -p
```

Configure TCP/IP stack parameters, such as TCP window size or congestion control algorithms, to improve network throughput and latency

```
sudo sysctl -w net.ipv4.tcp_window_scaling=1  
sudo sysctl -w net.ipv4.tcp_congestion_control=cubic  
sudo sysctl -p
```

6) System Tuning

Optimize network settings for better performance, such as adjusting TCP/IP stack parameters

```
sudo sysctl -w net.core.{rmem_default,wmem_default}=262144  
sudo sysctl -w net.ipv4.tcp_{rmem_max,wmem_max}=262144  
sudo sysctl -w net.ipv4.tcp_{rmem,wmem}="4096 65536 262144"
```

Adjust file system parameters for improved disk I/O performance, such as adjusting the disk scheduler or file system mount options

```
echo "deadline" | sudo tee /sys/block/sdX/queue/scheduler
```

Configure kernel parameters to optimize memory usage, process scheduling, or other system behaviors.

```
sudo sysctl -w vm.swappiness=10
```

Monitor system performance using tools like `top`, `vmstat`, or `sar`, and make appropriate tuning adjustments based on the observed metrics

```
top
```

Implement security-related tuning, such as hardening the system against various types of attacks or vulnerabilities

```
sudo systemctl start firewalld  
sudo systemctl enable firewalld  
sudo firewall-cmd --add-service=ssh --permanent  
sudo firewall-cmd --reload
```