Gowamr1
Virtualisation IN720 2018
Assignment 3: Xen

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Set up a volume for a guest image

First you want to find the name of our volume group.
Enter the command
vgs

```
user@teami:~$
user@teami:~$ sudo vgs
[sudo] password for user:
  VG       #PV #LV #SN Attr   VSize   VFree
  teami-vg   1   9   2 wz--n- 279.22g 248.66g
user@teami:~$
```

then create a new volume for our guest
Enter the command

```
sudo lvcreate -L 10G -n guest_volume /dev/<name of volume group (VG) from last command>
```

This creates a volume named guest_volume

Obtain files necessary for running a Linux installer

We need to download the netboot installer for Ubuntu 14.04
Make a directory to hold the downloaded files

```
mkdir -p /var/lib/xen/images/ubuntu-netboot/trusty
```

then make that new directory the working directory

```
cd /var/lib/xen/images/ubuntu-netboot/trusty
```

Download Kernels.

First one (remember this command is just one line).
After the command is entered, something will download.

```
wget http://ucmirror.canterbury.ac.nz/ubuntu/dists/trusty/main/installer-amd64/current/images/netboot/xen/vmlinuz
```

Second (again, one command and there will be a download)

```
wget http://ucmirror.canterbury.ac.nz/ubuntu/dists/trusty/main/installer-amd64/current/images/netboot/xen/initrd.gz
```

```
user@teami:/etc/xen$ sudo wget http://ucmirror.canterbury.ac.nz/ubuntu/dists/trusty/main/installer
-amd64/current/images/netboot/xen/vmlinuz
--2018-11-14 16:01:03--  http://ucmirror.canterbury.ac.nz/ubuntu/dists/trusty/main/installer-amd64
/current/images/netboot/xen/vmlinuz
Resolving ucmirror.canterbury.ac.nz (ucmirror.canterbury.ac.nz)... 132.181.7.179
Connecting to ucmirror.canterbury.ac.nz (ucmirror.canterbury.ac.nz)|132.181.7.179|:80... connected
.
HTTP request sent, awaiting response... 200 OK
Length: 5778968 (5.5M) [text/plain]
Saving to: 'vmlinuz'

100%[===================================================>] 5,778,968   10.9MB/s   in 0.5s

2018-11-14 16:01:04 (10.9 MB/s) - 'vmlinuz' saved [5778968/5778968]

user@teami:/etc/xen$ sudo wget http://ucmirror.canterbury.ac.nz/ubuntu/dists/trusty/main/installer
-amd64/current/images/netboot/xen/initrd.gz
--2018-11-14 16:01:27--  http://ucmirror.canterbury.ac.nz/ubuntu/dists/trusty/main/installer-amd64
/current/images/netboot/xen/initrd.gz
Resolving ucmirror.canterbury.ac.nz (ucmirror.canterbury.ac.nz)... 132.181.7.179
Connecting to ucmirror.canterbury.ac.nz (ucmirror.canterbury.ac.nz)|132.181.7.179|:80... connected
.
HTTP request sent, awaiting response... 200 OK
Length: 21256771 (20M) [application/x-gzip]
Saving to: 'initrd.gz'

100%[===================================================>] 21,256,771  11.1MB/s   in 1.8s

2018-11-14 16:01:29 (11.1 MB/s) - 'initrd.gz' saved [21256771/21256771]

user@teami:/etc/xen$
```

Make Config File

We now need to make a config file for Xen to inform it how our VM should be set up. We can use files already made from the Xen installation
Change current directory to /etc/xen

```
cd /etc/xen
```

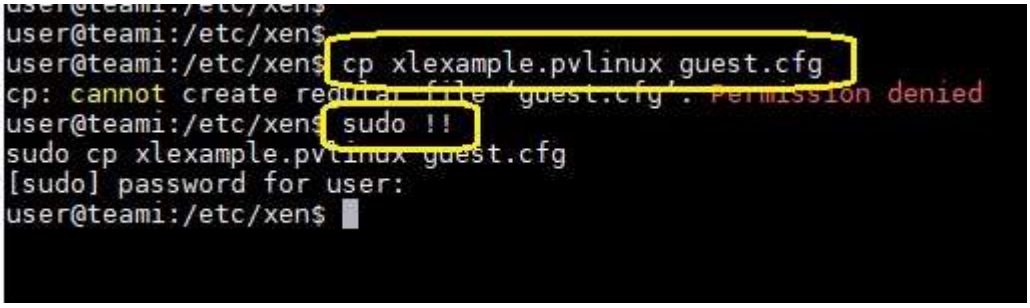
then copy a configuration file and rename the copy something that relates to our guest name.

```
sudo cp xlexample.pvlinux guest.cfg
```

If you find a command doesn't work because of Permission denied, it is because sudo is needed in front of it. Just type

```
sudo !!
```

It reruns the last command with sudo at the front



Now we edit the file so Xen can run our VM

```
sudo vim guest.cfg
```

Press i to insert text.

- Set name to guestvm
- Set kernel to /var/lib/xen/images/ubuntu-netboot/trusty/vmlinuz (note that this kernel is from the file we downloaded earlier)
- Set ramdisk to /var/lib/xen/images/ubuntu-netboot/trusty/initrd.gz (also from the file we downloaded earlier)
- Set memory to 1024
- Set vcpus to 1
- Set disk to /dev/<name of volume group>/guest_volume,raw,xvda,rw

```
# ======================================================================
# Example PV Linux guest configuration
# ======================================================================
#
# This is a fairly minimal example of what is required for a
# Paravirtualised Linux guest. For a more complete guide see xl.cfg(5)

# Guest name
name = "guestvm"

# 128-bit UUID for the domain as a hexadecimal number.
# Use "uuidgen" to generate one if required.
# The default behavior is to generate a new UUID each time the guest is started.
#uuid = "XXXXXXXX-XXXX-XXXX-XXXX-XXXXXXXXXXXX"

# Kernel image to boot
kernel = "/var/lib/xen/images/ubuntu-netboot/trusty/vmlinuz"

# Ramdisk (optional)
ramdisk = "/var/lib/xen/images/ubuntu-netboot/trusty/initrd.gz"

# Kernel command line options
extra = "root=/dev/xvda1"

# Initial memory allocation (MB)
memory = 1024

# Maximum memory (MB)
# If this is greater than `memory' then the slack will start ballooned
# (this assumes guest kernel support for ballooning)
#maxmem = 512

# Number of VCPUS
vcpus = 1

# Network devices
# A list of 'vifspec' entries as described in
# docs/misc/xl-network-configuration.markdown
vif = [ '' ]

# Disk Devices
# A list of `diskspec' entries as described in
# docs/misc/xl-disk-configuration.txt
disk = [ '/dev/teami-vg/guest_volume,raw,xvda,rw' ]

~
```

Once these modifications have been done, press ESC, then :wq. This saves the changes and closes Vim.

Boot a guest running the installer and carry out the installation

Now that our config file is set up, we need to run the VM.

```
sudo xl create -c /etc/xen/guest.cfg
```

Notice that the second part of that command is pointing to the config file we just copied and edited.

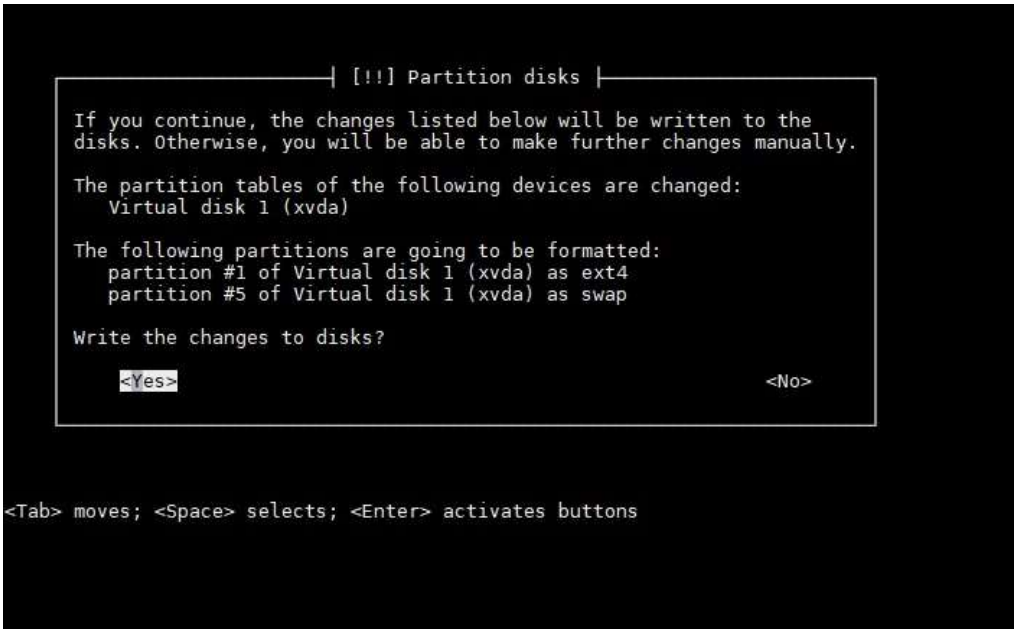
This creates our guest and opens up to its console.
From this point you will see a normal Ubuntu installation dialogue. This is pretty standard, keep everything to the default. Country set as New Zealand, detect keyboard, etc.

Except User and Password. I suggest *user* and *P@ssw0rd* for User and Password. It is up to you but make sure you remember what you have set.

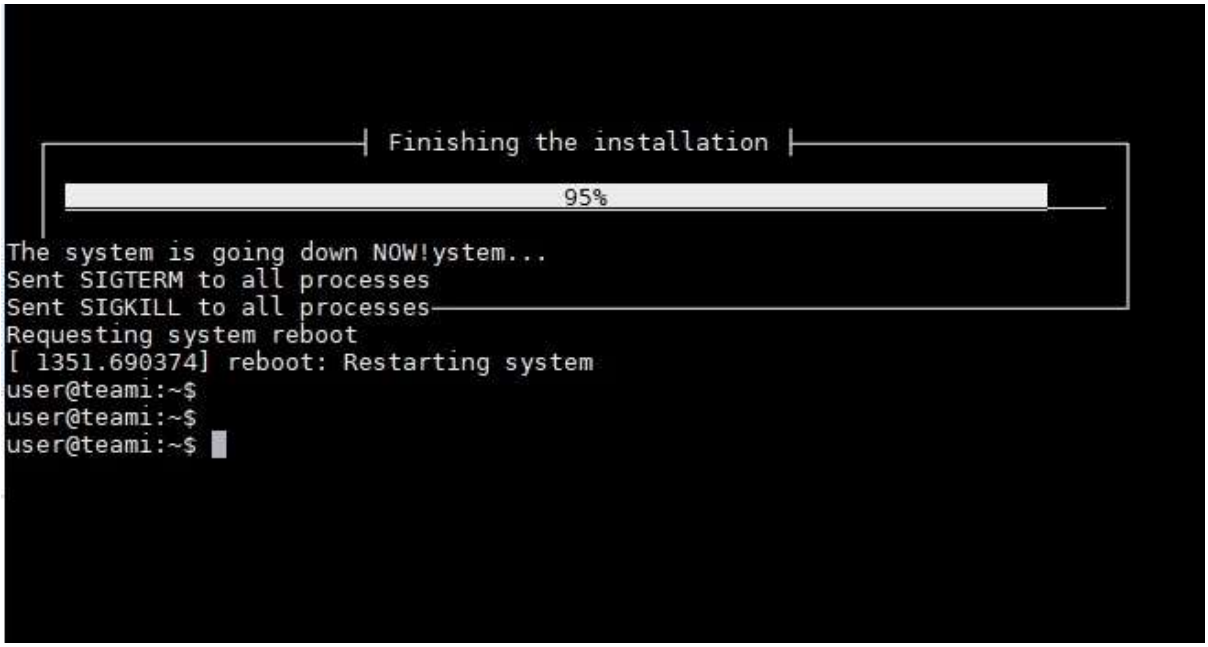
There are a couple of other things you will have to set:

Hostname – guest-host (note: you cannot have '_' in the name)

Partitions – use the entire disk



Once this has finished, the installer will reboot and you will be back in the Dom0 console.



Perform post installation finalisation of the guest image

Modify Config

Before we can use our guest we need to modify our config file again.

```
sudo vim /etc/xen/guest.cgf
```

Comment out, using #, the kernel and ramdisk lines (the ones we edited in the last step).
At the bottom of the file, add this line
bootloader = "/usr/lib/xen-4.4/bin/pygrub"

```
# =====================================================================
# Example PV Linux guest configuration
# =====================================================================
#
# This is a fairly minimal example of what is required for a
# Paravirtualised Linux guest. For a more complete guide see xl.cfg(5)

# Guest name
name = "guestvm"

# 128-bit UUID for the domain as a hexadecimal number.
# Use "uuidgen" to generate one if required.
# The default behavior is to generate a new UUID each time the guest is started.
#uuid = "XXXXXXXX-XXXX-XXXX-XXXX-XXXXXXXXXXXX"

# Kernel image to boot
#kernel = "/var/lib/xen/images/ubuntu-netboot/trusty/vmlinuz"

# Ramdisk (optional)
#ramdisk = "/var/lib/xen/images/ubuntu-netboot/trusty/initrd.gz"

# Kernel command line options
extra = "root=/dev/xvda1"

# Initial memory allocation (MB)
memory = 1024

# Maximum memory (MB)
# If this is greater than `memory' then the slack will start ballooned
# (this assumes guest kernel support for ballooning)
#maxmem = 512

# Number of VCPUS
vcpus = 1

# Network devices
# A list of 'vifspec' entries as described in
# docs/misc/xl-network-configuration.markdown
vif = [ '' ]

# Disk Devices
# A list of `diskspec' entries as described in
# docs/misc/xl-disk-configuration.txt
disk = [ '/dev/teami-vg/guest_volume,raw,xvda,rw' ]

bootloader = "/usr/lib/xen-4.4/bin/pygrub"
~
~
```

Press ESC, then :wq.

We have just told our VM to stop using the installer's kernel and start using the Xen's pygrub bootloader.

Restart VM

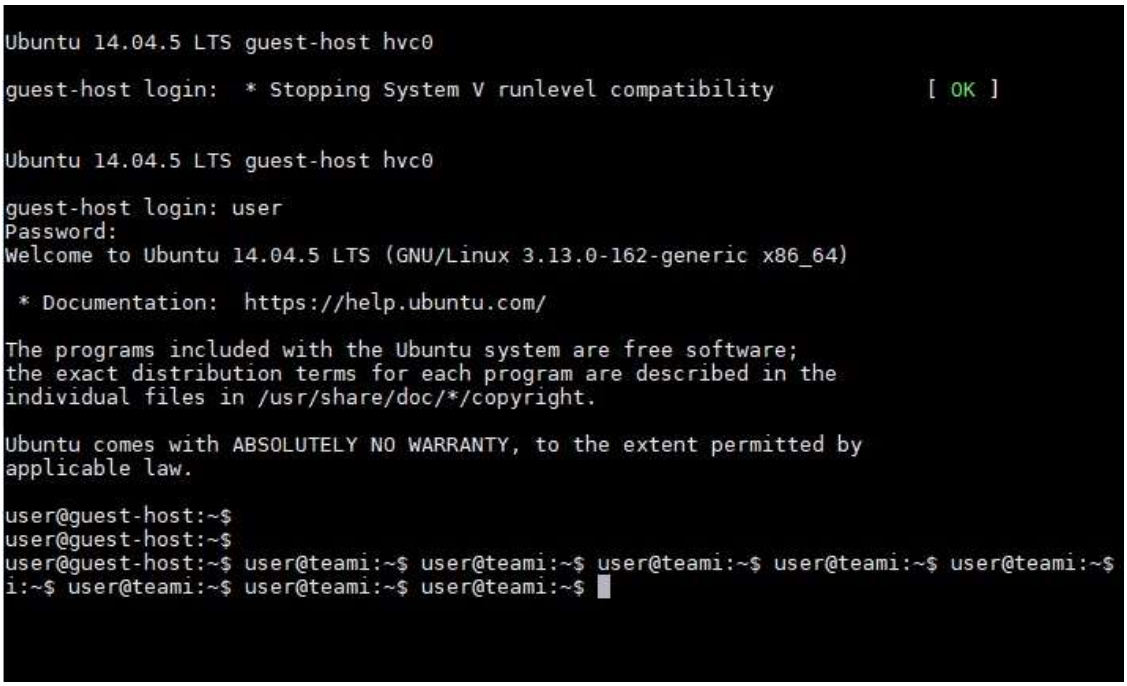
Now we need to stop our VM and start it again.

```
sudo xl shutdown guestvm
sudo xl create -c /etc/xen/guest.cfg
```

The screen may stop displaying text after about 30 seconds. Just press Enter a few times and the command prompt should show up.

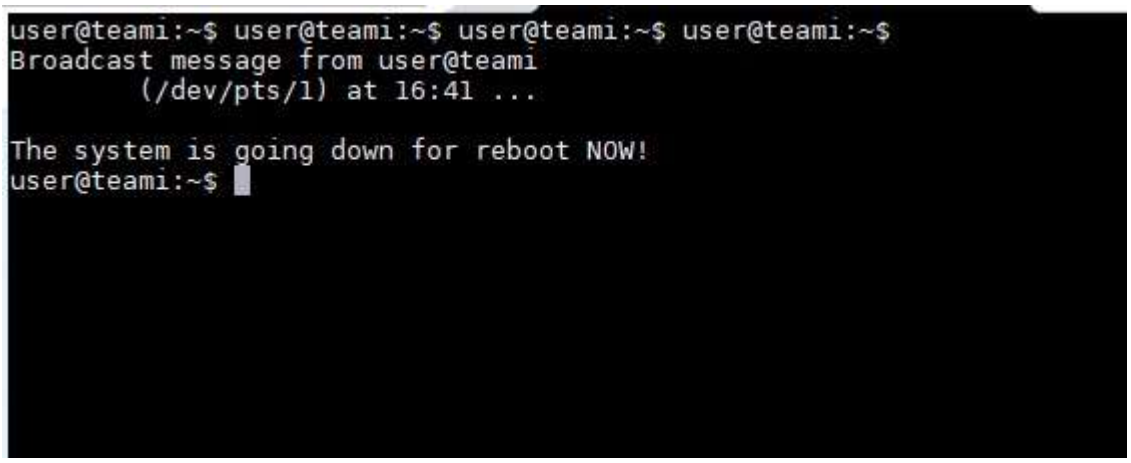
This will boot in to our new VM. Log in with the credentials you set during the installation.

If you want to leave the VM, just press and hold ctrl and] although this may cause your command prompt to go weird.



You can still type but nothing shows. Just type

```
sudo reboot
```



And your system will reboot. It may take a couple of minutes after the boot.

Make sure the VM is all up to date.

```
sudo apt update
sudo adt dist-upgrade
```

Now your VM is all up to date! This is important because all the clones will be copied from this VM. It will save you individually updating all the clones after making them.

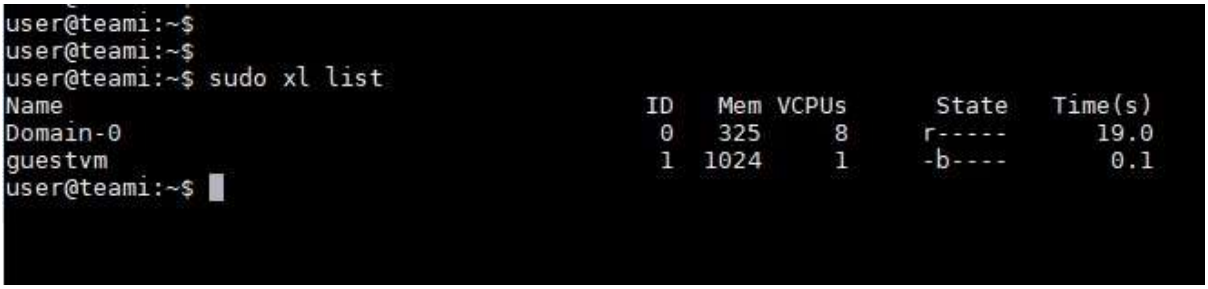
Prepare volumes for cloned guests

It can be rather laborious to do the past few steps every time we want to make a new guest. We will now explore a way to use what we have already done to make new guests each time.

Stop VM

Make sure that the guest me made earlier is not running.
We will check this by showing a list of all VMs currently running.

```
sudo xl list
```



```
user@teami:~$
user@teami:~$
user@teami:~$ sudo xl list
Name                                        ID   Mem VCPUs      State   Time(s)
Domain-0                                     0   325     8     r-----      19.0
guestvm                                      1  1024     1     -b----       0.1
user@teami:~$
```

If you see guestvm in that list, you should remove it by stopping it

```
sudo xl shutdown guestvm
```

Check the VMs list again

```
sudo xl list
```

You should only see Dom0 in the list.

Make New Volumes

Now we are ready to make new volumes for our clones

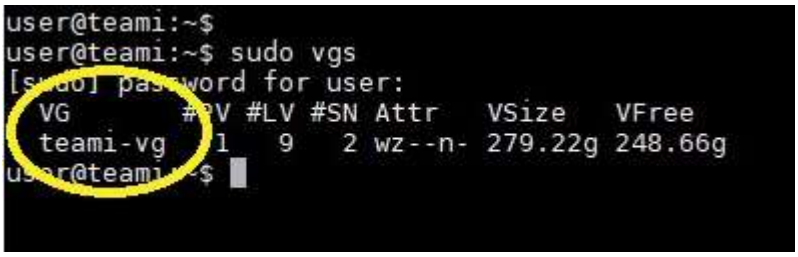
First we will take a snapshot of the system

```
modprobe dm-snapshot
```

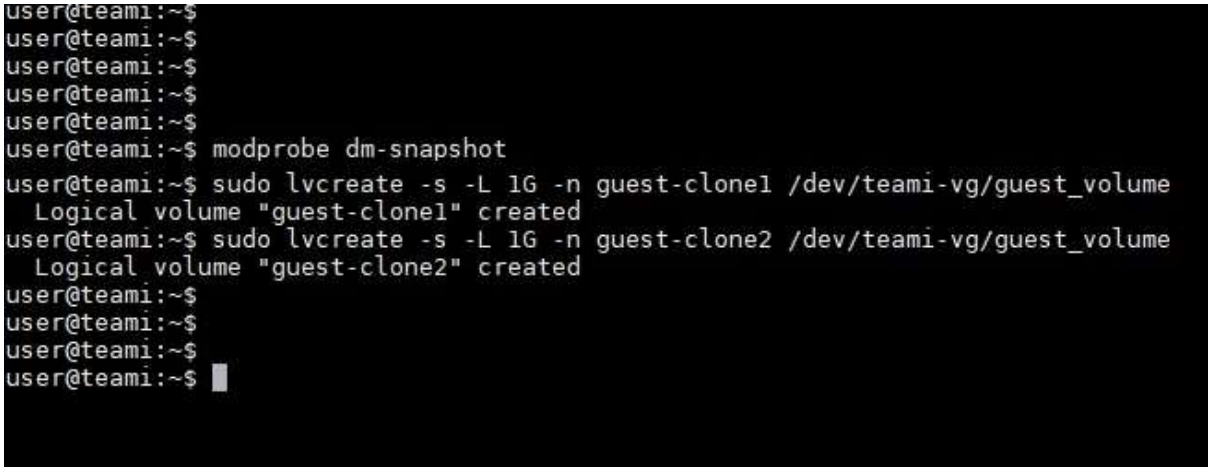
Now we will look back at the first chapter of this tutorial and use very similar commands.

You will need to remember your volume group.

```
sudo vgs
```




```
sudo lvcreate -s -L 1G -n clone1 /dev/< name of volume group>/guest_volume
sudo lvcreate -s -L 1G -n clone2 /dev/<name of volume group>/guest_volume
```



We have just created two volumes based on our original volume. The new volumes are only 1GB each because they each use the files from the original VM. The new volumes only need to store the difference.

Write Xen configuration files for the cloned guests

We need to have config files for both the new guests. We can copy the config file we made earlier and make some small modifications.

Make sure you are in the /etc/xen directory

```
cd /etc/xen
sudo cp guest.cfg guest-clone1.cfg
sudo cp guest.cfg guest-clone2.cfg
```

For each of the new config files we need to change some things.
The name in each config file needs to be unique. Example for clone1.cfg:
Set name – guest-clone1
Example for clone2.cfg
Set name – guest-clone2
We also need to change the starting memory for both config files
Set memory – 512
Set disk to the path of the clone volume /dev/<volume name>/guest-clone1,raw,xvda,rw

Here is an example of guest-clone1.cfg

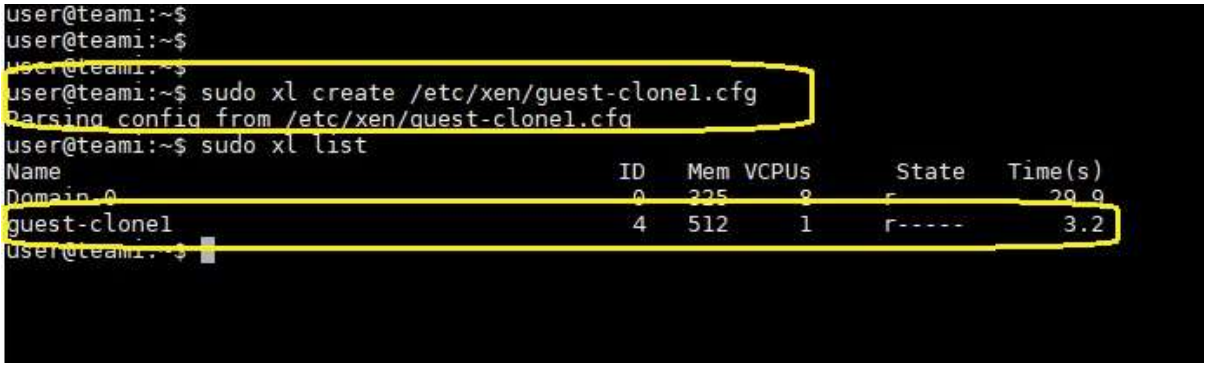
```
# =====================================================================
# Example PV Linux guest configuration
# =====================================================================
#
# This is a fairly minimal example of what is required for a
# Paravirtualised Linux guest. For a more complete guide see xl.cfg(5)

# Guest name
name = "guest-clone1"

# 128-bit UUID for the domain as a hexadecimal number.
# Use "uuidgen" to generate one if required.
# The default behavior is to generate a new UUID each time the guest is started.
#uuid = "XXXXXXXX-XXXX-XXXX-XXXX-XXXXXXXXXXXX"

# Kernel image to boot
#kernel = "/var/lib/xen/images/ubuntu-netboot/trusty/vmlinuz"

# Ramdisk (optional)
#ramdisk = "/var/lib/xen/images/ubuntu-netboot/trusty/initrd.gz"

# Kernel command line options
extra = "root=/dev/xvda1"

# Initial memory allocation (MB)
memory = 512

# Maximum memory (MB)
# If this is greater than `memory' then the slack will start ballooned
# (this assumes guest kernel support for ballooning)
#maxmem = 512

# Number of VCPUS
vcpus = 1

# Network devices
# A list of 'vifspec' entries as described in
# docs/misc/xl-network-configuration.markdown
vif = [ '' ]

# Disk Devices
# A list of `diskspec' entries as described in
# docs/misc/xl-disk-configuration.txt
disk = [ '/dev/teami-vg/guest-clone1,raw,xvda,rw' ]

bootloader = "/usr/lib/xen-4.4/bin/pygrub"

~
```

Create the guest domains

We're all set now to run our guest clones.

```
sudo xl create /etc/xen/guest-clone1.cfg
sudo xl create /etc/xen/guest-clone2.cfg
```

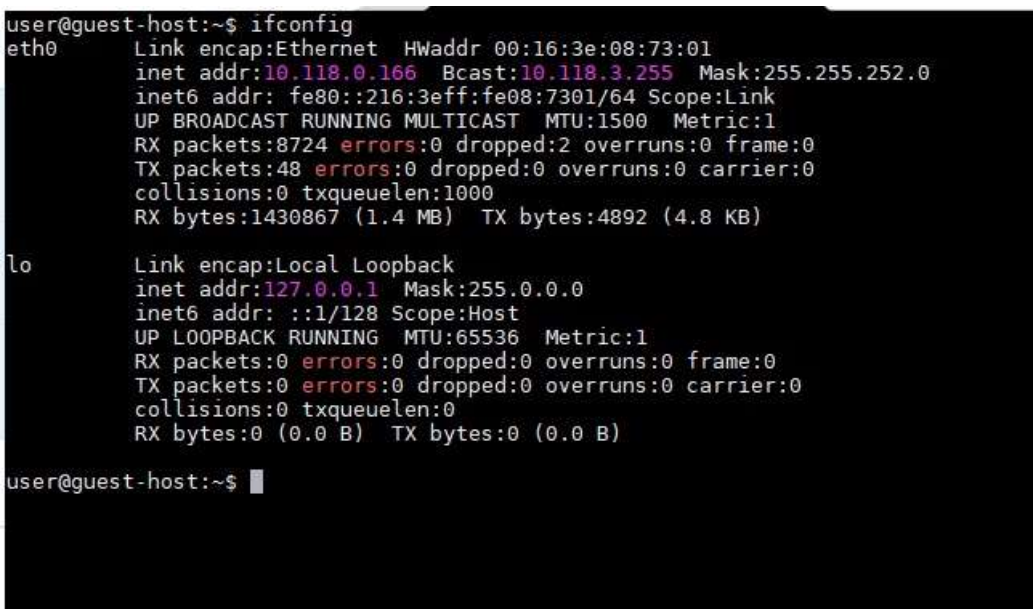
When we omit the '-c' from the xl create command, it makes the VM but doesn't boot to the console.



Basic functionality of the running guests

Some basic commands to check that the VM clone is working like a real machine:

ifconfig – This command shows NIC information (same as ipconfig for Windows)



top – Shows running processes (same as Task Manager for Windows)

```
top - 17:25:36 up 13 min,  1 user,  load average: 0.00, 0.01, 0.05
Tasks:  61 total,   1 running,  60 sleeping,   0 stopped,   0 zombie
%Cpu(s):  0.0 us,  0.0 sy,  0.0 ni,100.0 id,  0.0 wa,  0.0 hi,  0.0 si,  0.0 st
KiB Mem:    499536 total,   232132 used,   267404 free,     8692 buffers
KiB Swap:  1046524 total,        0 used,  1046524 free.   187892 cached Mem

  PID USER      PR  NI    VIRT    RES    SHR S %CPU %MEM     TIME+ COMMAND
    1 root      20   0   33384   2648   1456 S  0.0  0.5   0:01.47 init
    2 root      20   0       0      0      0 S  0.0  0.0   0:00.00 kthreadd
    3 root      20   0       0      0      0 S  0.0  0.0   0:00.00 ksoftirqd/0
    4 root      20   0       0      0      0 S  0.0  0.0   0:00.00 kworker/0:0
    5 root       0 -20       0      0      0 S  0.0  0.0   0:00.00 kworker/0:0H
    6 root      20   0       0      0      0 S  0.0  0.0   0:00.00 kworker/u2:0
    7 root      20   0       0      0      0 S  0.0  0.0   0:00.06 rcu_sched
    8 root      20   0       0      0      0 S  0.0  0.0   0:00.02 rcuos/0
    9 root      20   0       0      0      0 S  0.0  0.0   0:00.00 rcu_bh
   10 root      20   0       0      0      0 S  0.0  0.0   0:00.00 rcuob/0
   11 root      rt   0       0      0      0 S  0.0  0.0   0:00.00 migration/0
   12 root      rt   0       0      0      0 S  0.0  0.0   0:00.00 watchdog/0
   13 root       0 -20       0      0      0 S  0.0  0.0   0:00.00 khelper
   14 root      20   0       0      0      0 S  0.0  0.0   0:00.00 kdevtmpfs
   15 root       0 -20       0      0      0 S  0.0  0.0   0:00.00 netns
   16 root      20   0       0      0      0 S  0.0  0.0   0:00.00 xenwatch
   17 root      20   0       0      0      0 S  0.0  0.0   0:00.50 xenbus
```

ping – used to check if devices can talk to other devices on networks. In this example, I pinged Google, which is an external address. This shows that the VM clone has internet access

```
user@guest-host:~$
user@guest-host:~$
user@guest-host:~$ ping 8.8.8.8
PING 8.8.8.8 (8.8.8.8) 56(84) bytes of data.
64 bytes from 8.8.8.8: icmp_seq=2 ttl=117 time=54.1 ms
64 bytes from 8.8.8.8: icmp_seq=3 ttl=117 time=53.8 ms
64 bytes from 8.8.8.8: icmp_seq=4 ttl=117 time=53.9 ms
64 bytes from 8.8.8.8: icmp_seq=5 ttl=117 time=53.8 ms
^C
--- 8.8.8.8 ping statistics ---
5 packets transmitted, 4 received, 20% packet loss, time 4012ms
rtt min/avg/max/mdev = 53.867/53.959/54.132/0.194 ms
user@guest-host:~$
user@guest-host:~$
user@guest-host:~$
```