



Introduction to Xen(2)

Kun Suo

UCCS

Schedule



- Monday: Introduction
- Tuesday: Xen
- Wednesday: Xen
- Thursday: Docker
- Friday: Conclusion/homework solution

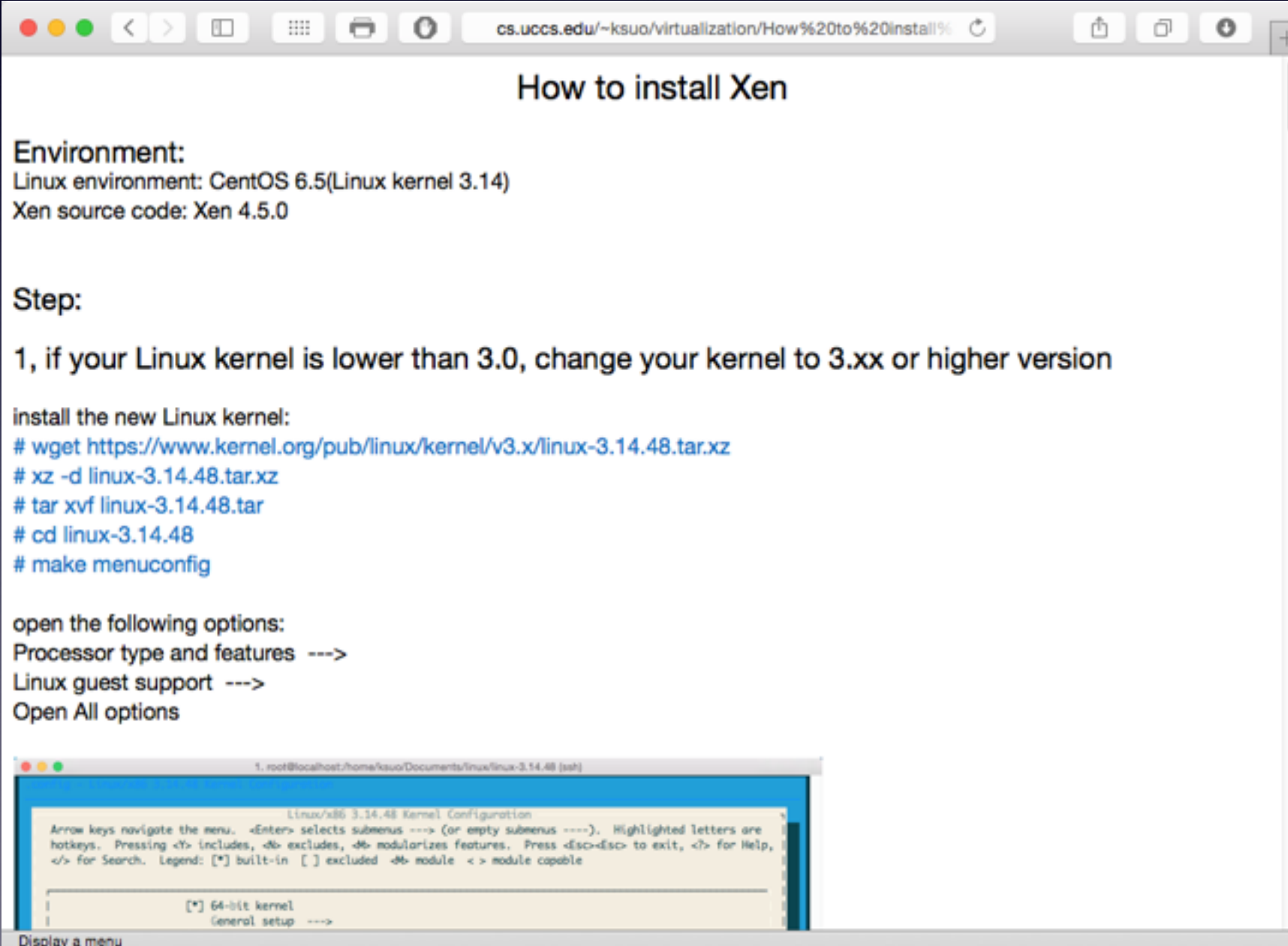
Topic Today

- How to install Xen ?
- How to build VMs on Xen ?
- How Xen connects to the outside ?

How to install Xen ?

How to install Xen ?

<http://cs.uccs.edu/~ksuo/virtualization/>



The screenshot shows a web browser window with the address bar displaying `cs.uccs.edu/~ksuo/virtualization/How%20to%20install%`. The page title is "How to install Xen".

Environment:
Linux environment: CentOS 6.5(Linux kernel 3.14)
Xen source code: Xen 4.5.0

Step:

1, if your Linux kernel is lower than 3.0, change your kernel to 3.xx or higher version

install the new Linux kernel:

```
# wget https://www.kernel.org/pub/linux/kernel/v3.x/linux-3.14.48.tar.xz
# xz -d linux-3.14.48.tar.xz
# tar xvf linux-3.14.48.tar
# cd linux-3.14.48
# make menuconfig
```

open the following options:
Processor type and features --->
Linux guest support --->
Open All options

An inset window shows the "Linux/x86 3.14.48 Kernel Configuration" menu. It displays options like "[*] 64-bit kernel" and "General setup --->". A legend at the bottom explains the symbols: "[*] built-in", "[] excluded", "<M> module", and "<> module capable".

How to build VMs on Xen ?

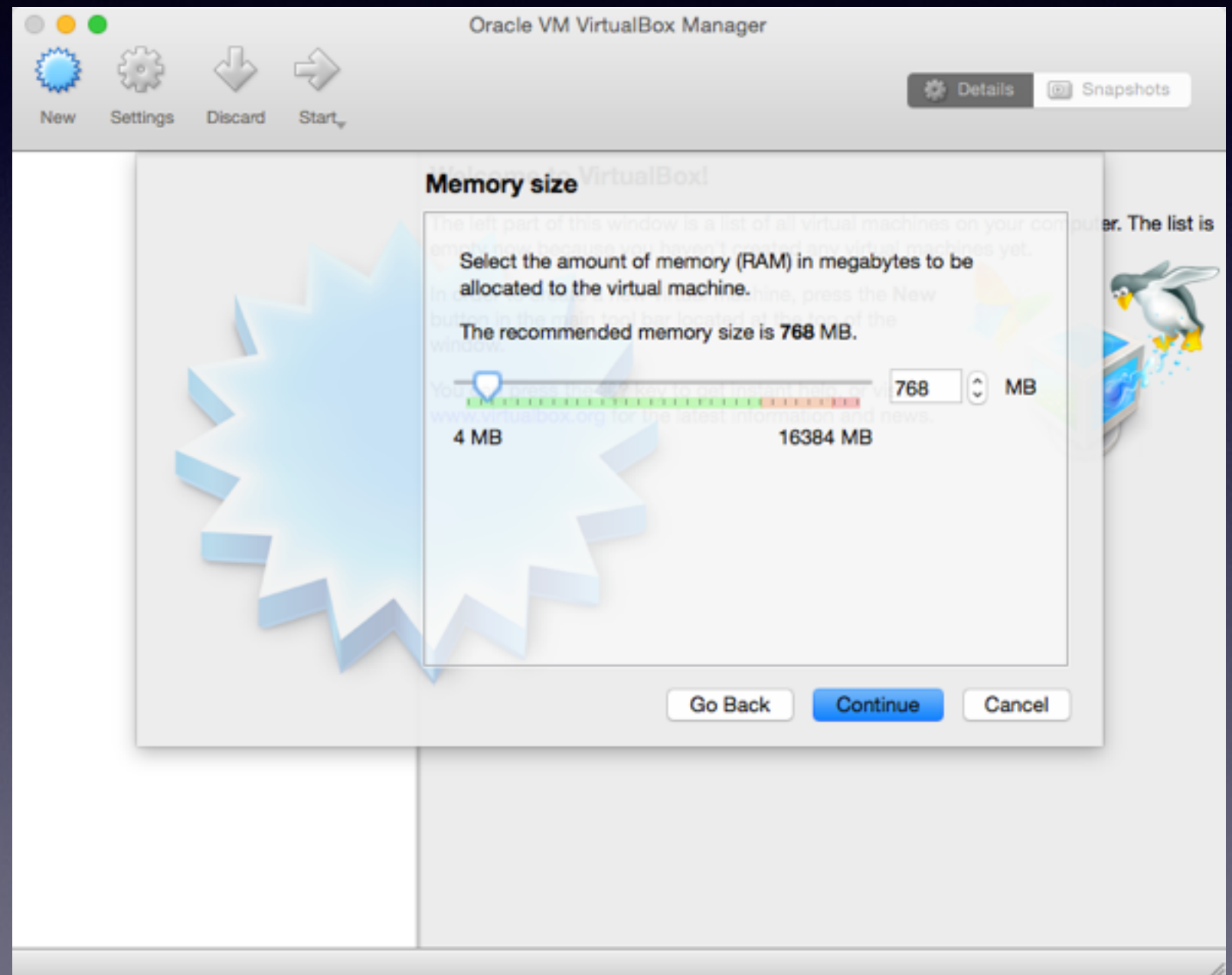
How to build VMs on Xen ?

if cloned

- (1) build a config file
 - (2) install virtual machine
 - (3) use this virtual machine
- ~~—(1) build a config file—~~
 - ~~—(2) install virtual machine—~~
 - (3) clone and use this virtual machine

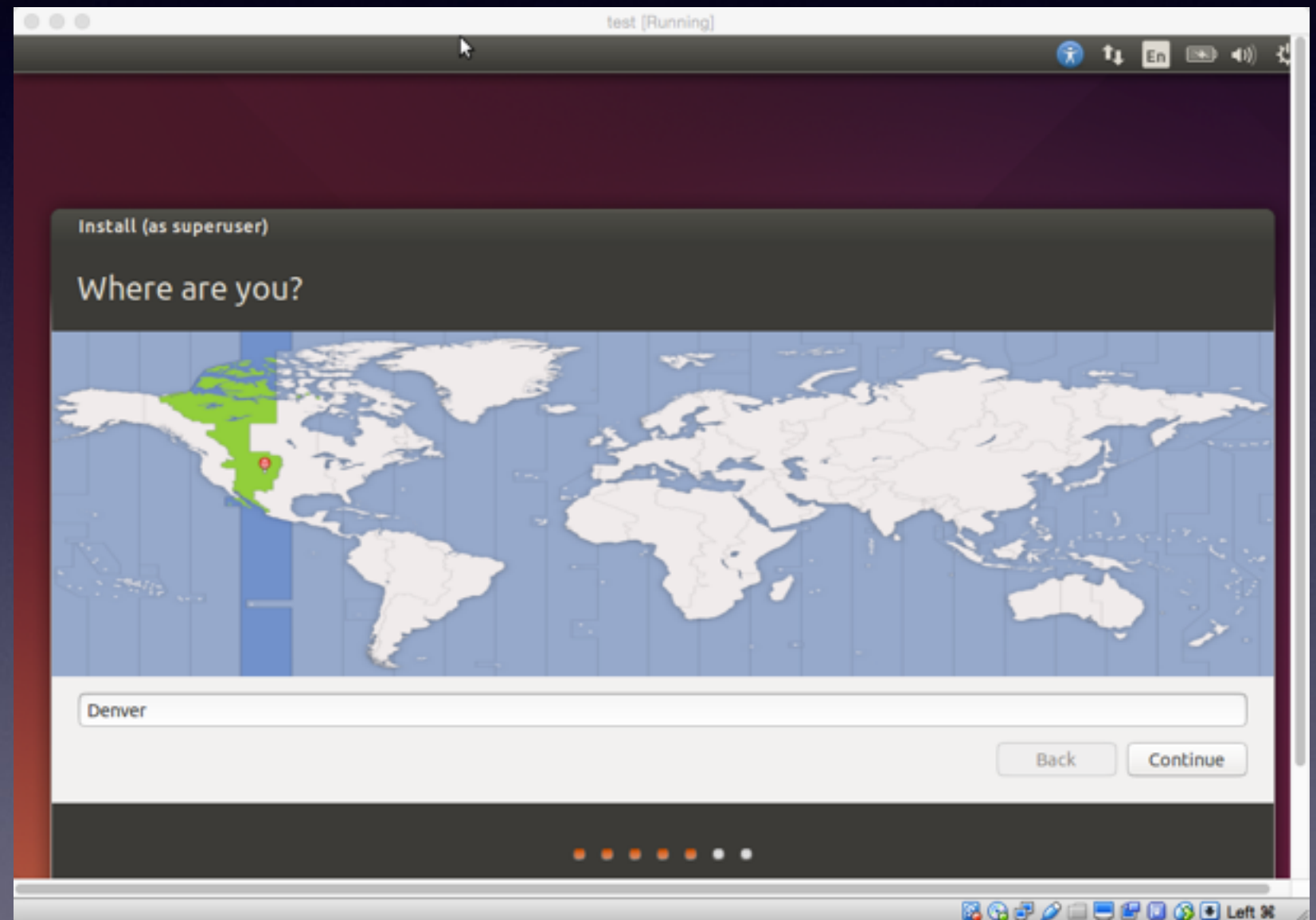
How to build VMs on Xen ?

- build a config file



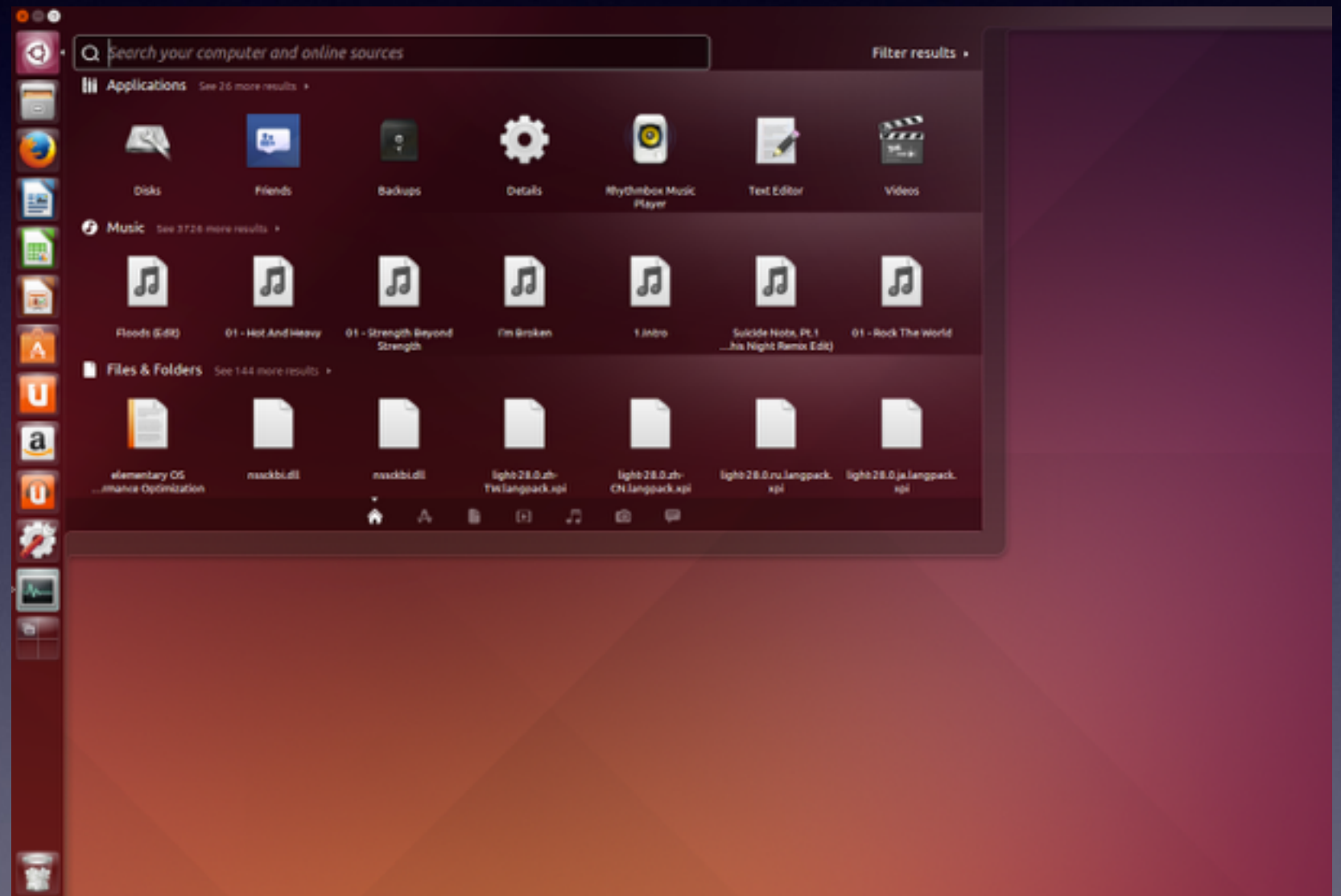
How to build VMs on Xen ?

- install virtual machine



How to build VMs on Xen ?

- use this virtual machine



How to build VMs on Xen ?

- (1) build a config file
- (2) install virtual machine
- (3) use this virtual machine

How to build VMs on Xen ?

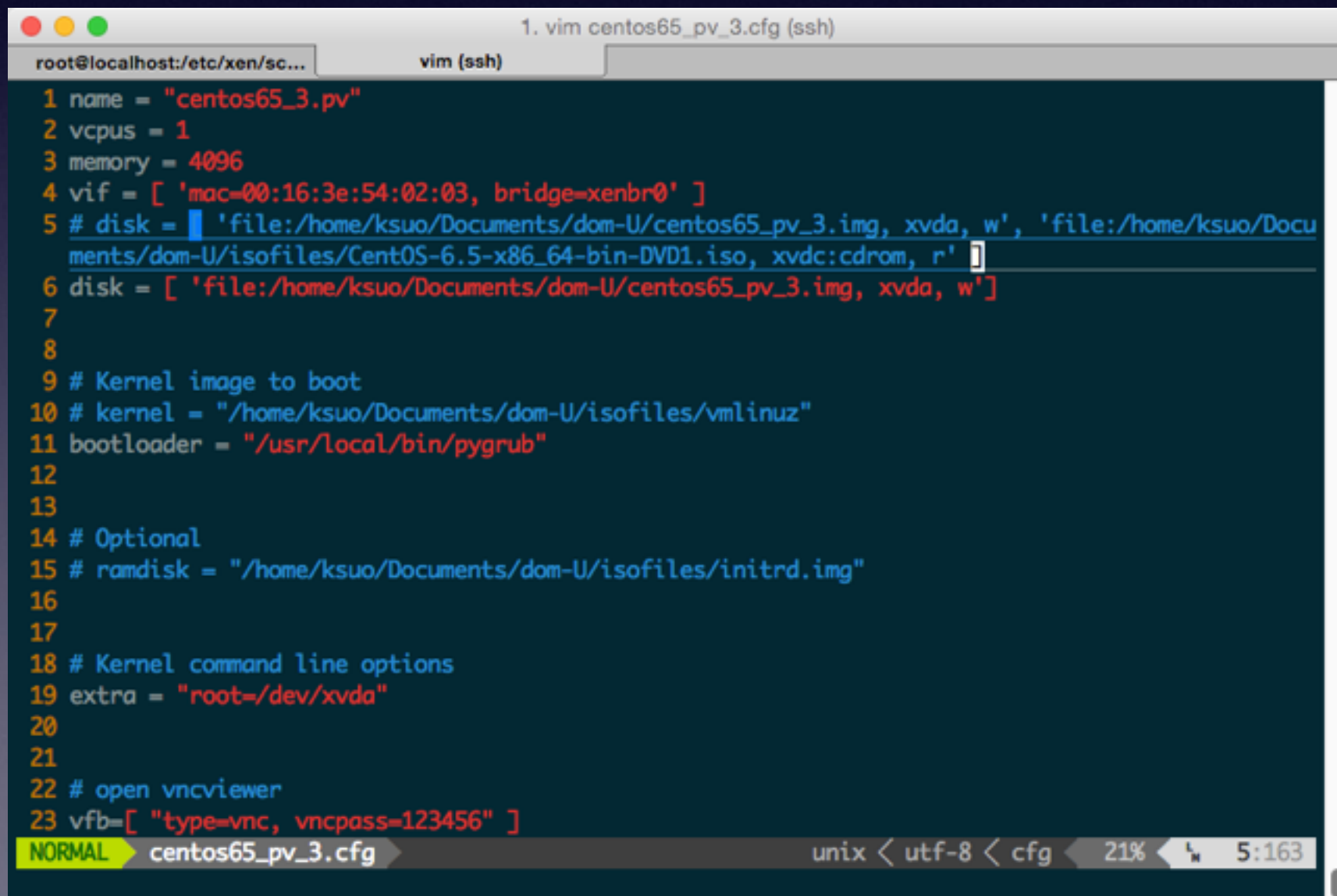
- Poor Performance
- Scope for Improvement
- Optimal Performance

P = Paravirtualized
VS = Software Virtualized (QEMU)
VH = Hardware Virtualized

Shortcut	Mode	With				
HVM / Fully Virtualized	HVM		VS	VS	VS	VH
HVM + PV drivers	HVM	PV Drivers	P	VS	VS	VH
PVHVM	HVM	PVHVM Drivers	P	P	VS	VH
PV	PV		P	P	P	P

How to build VMs on Xen ?

- (1) build a config file



```
1. vim centos65_pv_3.cfg (ssh)
root@localhost:/etc/xen/sc... vim (ssh)
1 name = "centos65_3.pv"
2 vcpus = 1
3 memory = 4096
4 vif = [ 'mac=00:16:3e:54:02:03, bridge=xenbr0' ]
5 # disk = [ 'file:/home/ksuo/Documents/dom-U/centos65_pv_3.img, xvda, w', 'file:/home/ksuo/Docu
ments/dom-U/isofiles/CentOS-6.5-x86_64-bin-DVD1.iso, xvdc:cdrom, r' ]
6 disk = [ 'file:/home/ksuo/Documents/dom-U/centos65_pv_3.img, xvda, w' ]
7
8
9 # Kernel image to boot
10 # kernel = "/home/ksuo/Documents/dom-U/isofiles/vmlinuz"
11 bootloader = "/usr/local/bin/pygrub"
12
13
14 # Optional
15 # ramdisk = "/home/ksuo/Documents/dom-U/isofiles/initrd.img"
16
17
18 # Kernel command line options
19 extra = "root=/dev/xvda"
20
21
22 # open vncviewer
23 vfb=[ "type=vnc, vncpass=123456" ]
NORMAL centos65_pv_3.cfg unix < utf-8 < cfg 21% 5:163
```

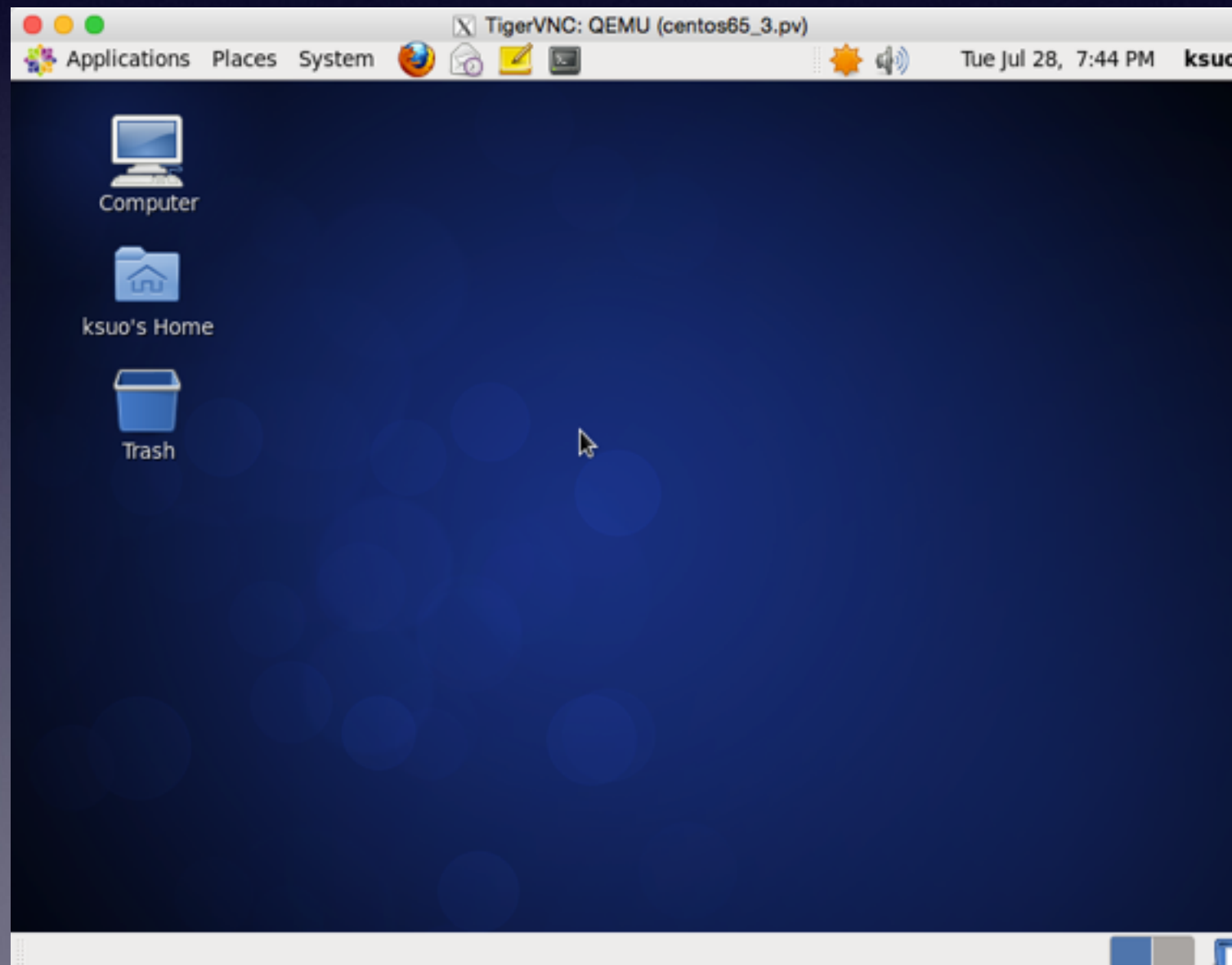

How to build VMs on Xen ?

- (2) install virtual machine



How to build VMs on Xen ?

- (3) use this virtual machine



Demo: install VM on Xen

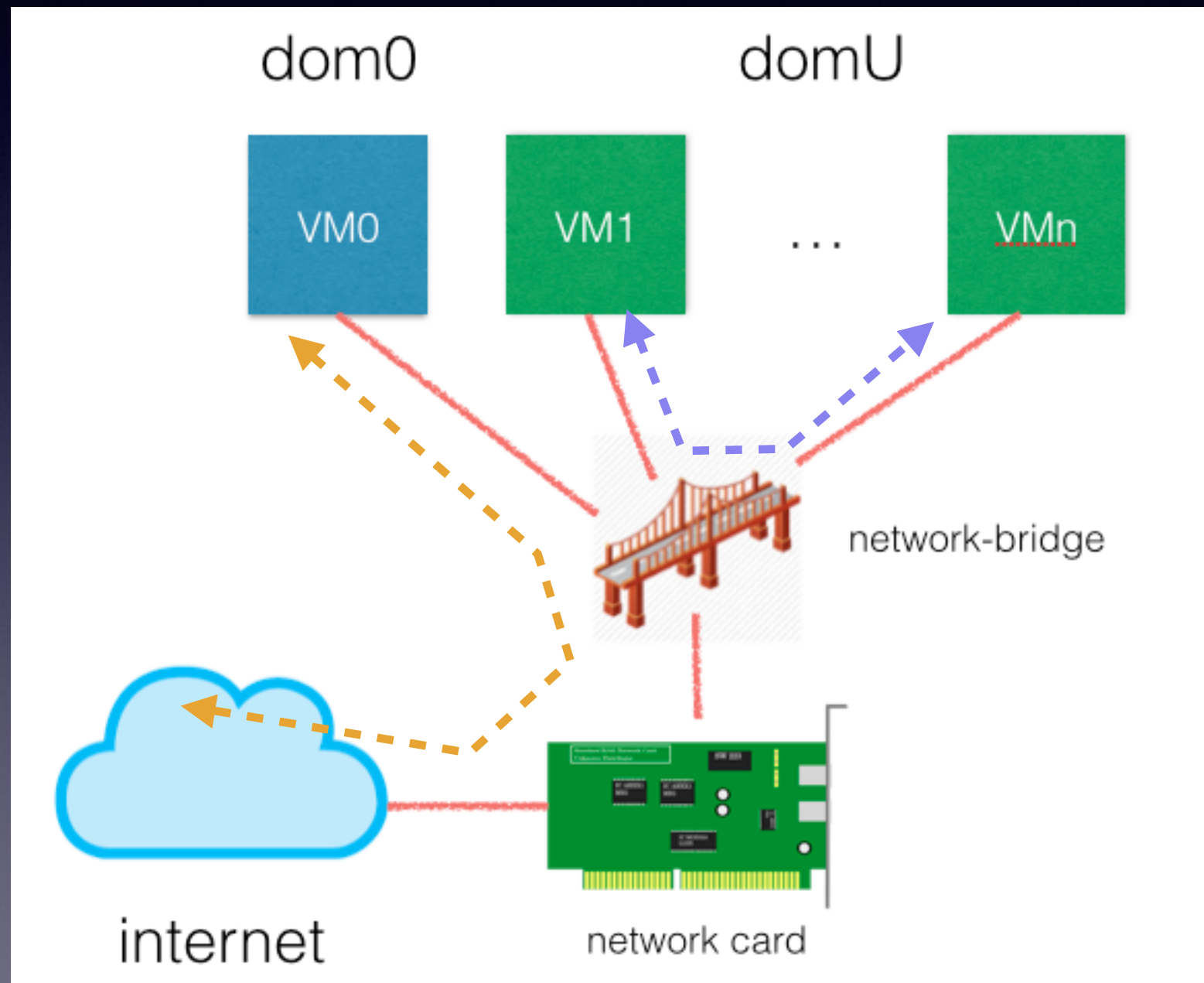
How Xen connects to outside ?

How Xen connect to outside ?

- Network-bridge (default)
- NAT
- Router

How Xen connect to outside ?

Network-bridge



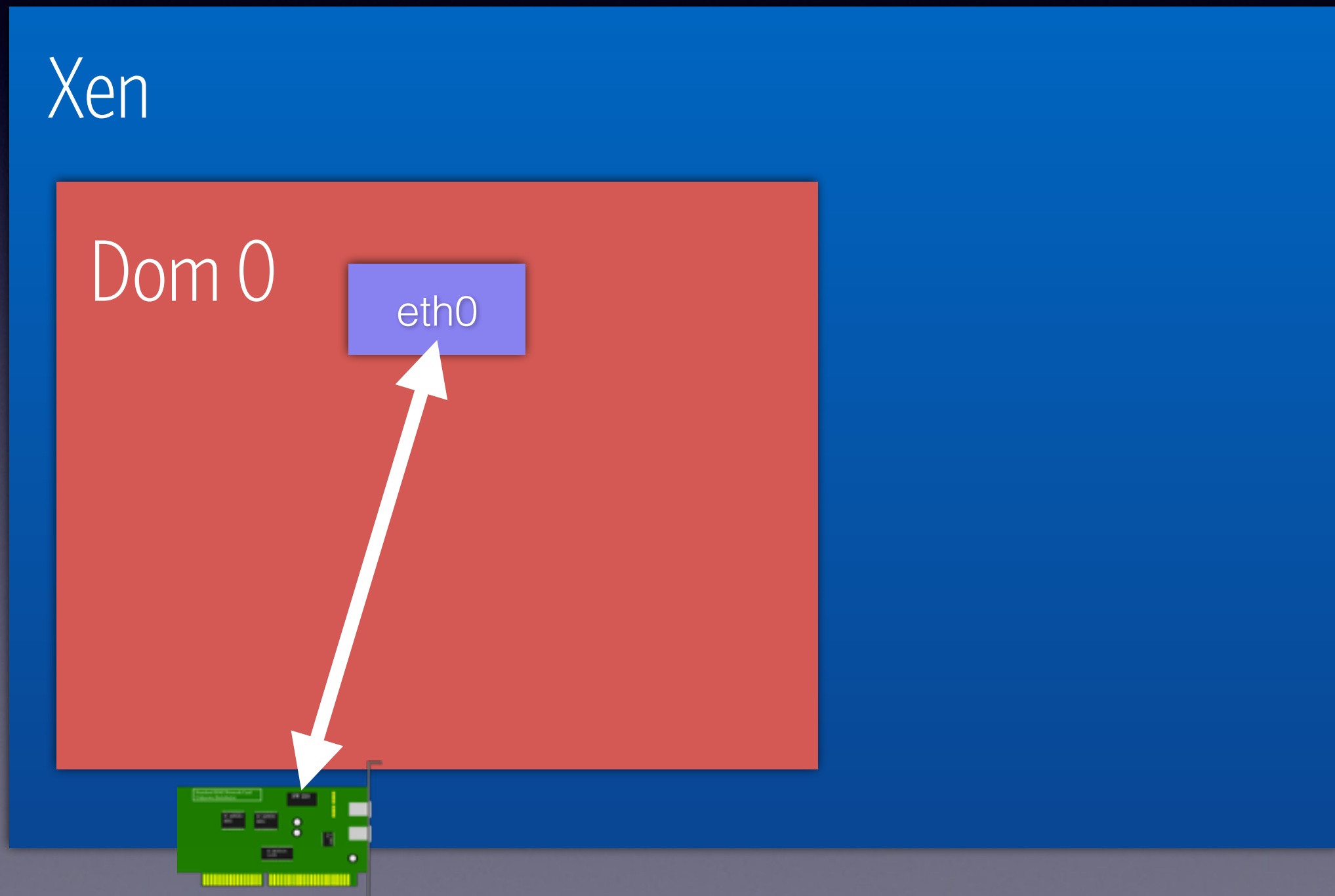
How Xen connect to outside ?

```
1. root@localhost:/etc/xen/scripts (ssh)
root@localhost:/etc/xen/sc... xl (ssh) vim (ssh)
[root@localhost scripts]# ifconfig
eth0      Link encap:Ethernet  HWaddr 00:50:56:94:12:EB
          inet6 addr: fe80::250:56ff:fe94:12eb/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:6766 errors:0 dropped:0 overruns:0 frame:0
          TX packets:1259 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:621553 (606.9 KiB)  TX bytes:235762 (230.2 KiB)

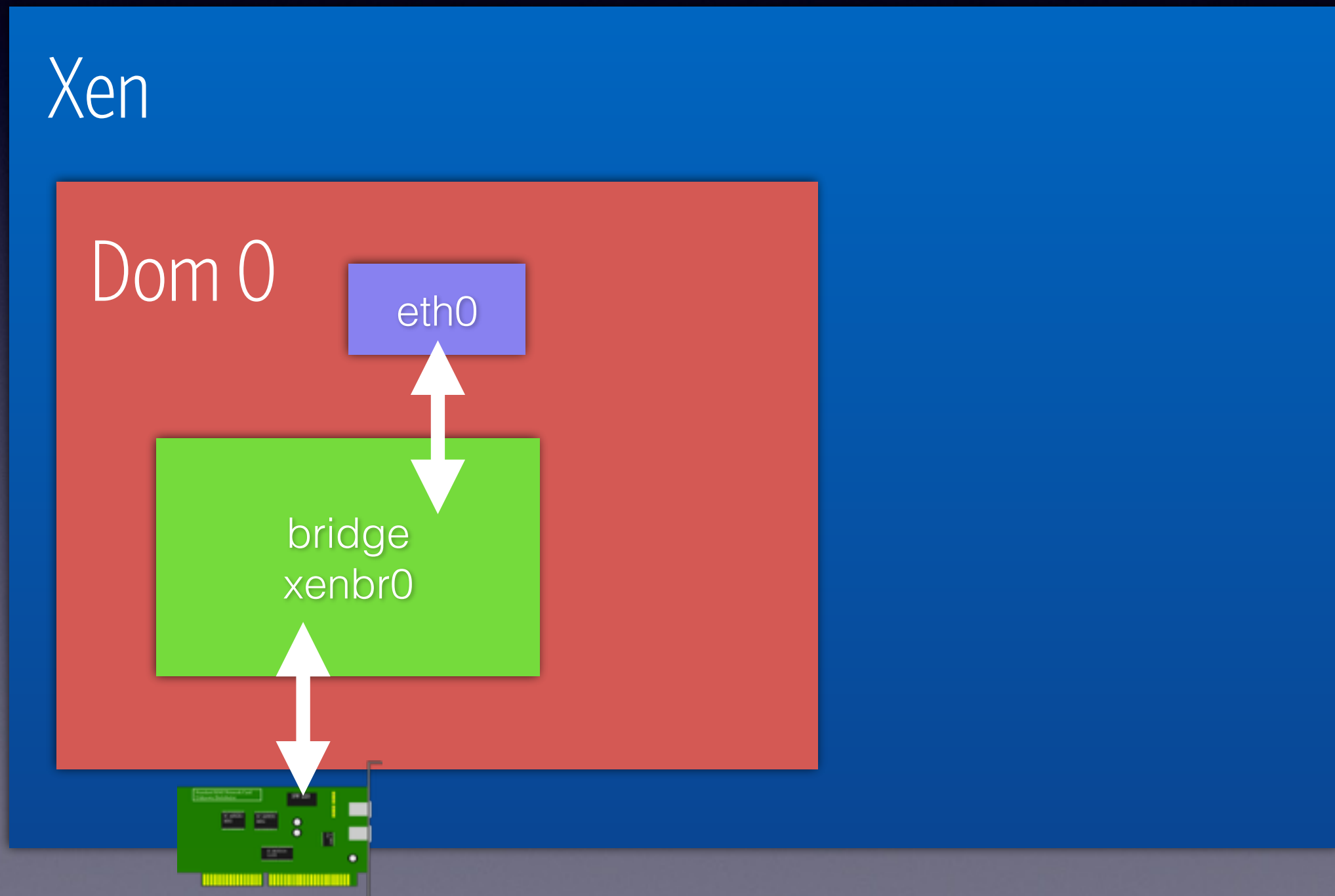
lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          inet6 addr: ::1/128 Scope:Host
          UP LOOPBACK RUNNING  MTU:65536  Metric:1
          RX packets:488 errors:0 dropped:0 overruns:0 frame:0
          TX packets:488 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:41308 (40.3 KiB)  TX bytes:41308 (40.3 KiB)

xenbr0    Link encap:Ethernet  HWaddr 00:50:56:94:12:EB
          inet addr:128.198.162.180  Bcast:128.198.162.255  Mask:255.255.255.0
          inet6 addr: fe80::250:56ff:fe94:12eb/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:6767 errors:0 dropped:0 overruns:0 frame:0
          TX packets:1256 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:526917 (514.5 KiB)  TX bytes:236420 (230.8 KiB)
```

How Xen connect to outside ?



How Xen connect to outside ?




```

em1      Link encap:Ethernet  HWaddr 74:86:7A:DC:7E:AC
        inet6 addr: fe80::7686:7aff:fedc:7eac/64 Scope:Link
        UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
        RX packets:169486 errors:0 dropped:0 overruns:0 frame:0
        TX packets:182206 errors:0 dropped:0 overruns:0 carrier:0
        collisions:0 txqueuelen:1000
        RX bytes:159315373 (151.9 MiB)  TX bytes:192678256 (183.7 MiB)
        Interrupt:16

lo       Link encap:Local Loopback
        inet addr:127.0.0.1  Mask:255.0.0.0
        inet6 addr: ::1/128 Scope:Host
        UP LOOPBACK RUNNING  MTU:65536  Metric:1
        RX packets:26074 errors:0 dropped:0 overruns:0 frame:0
        TX packets:26074 errors:0 dropped:0 overruns:0 carrier:0
        collisions:0 txqueuelen:0
        RX bytes:193926741 (184.9 MiB)  TX bytes:193926741 (184.9 MiB)

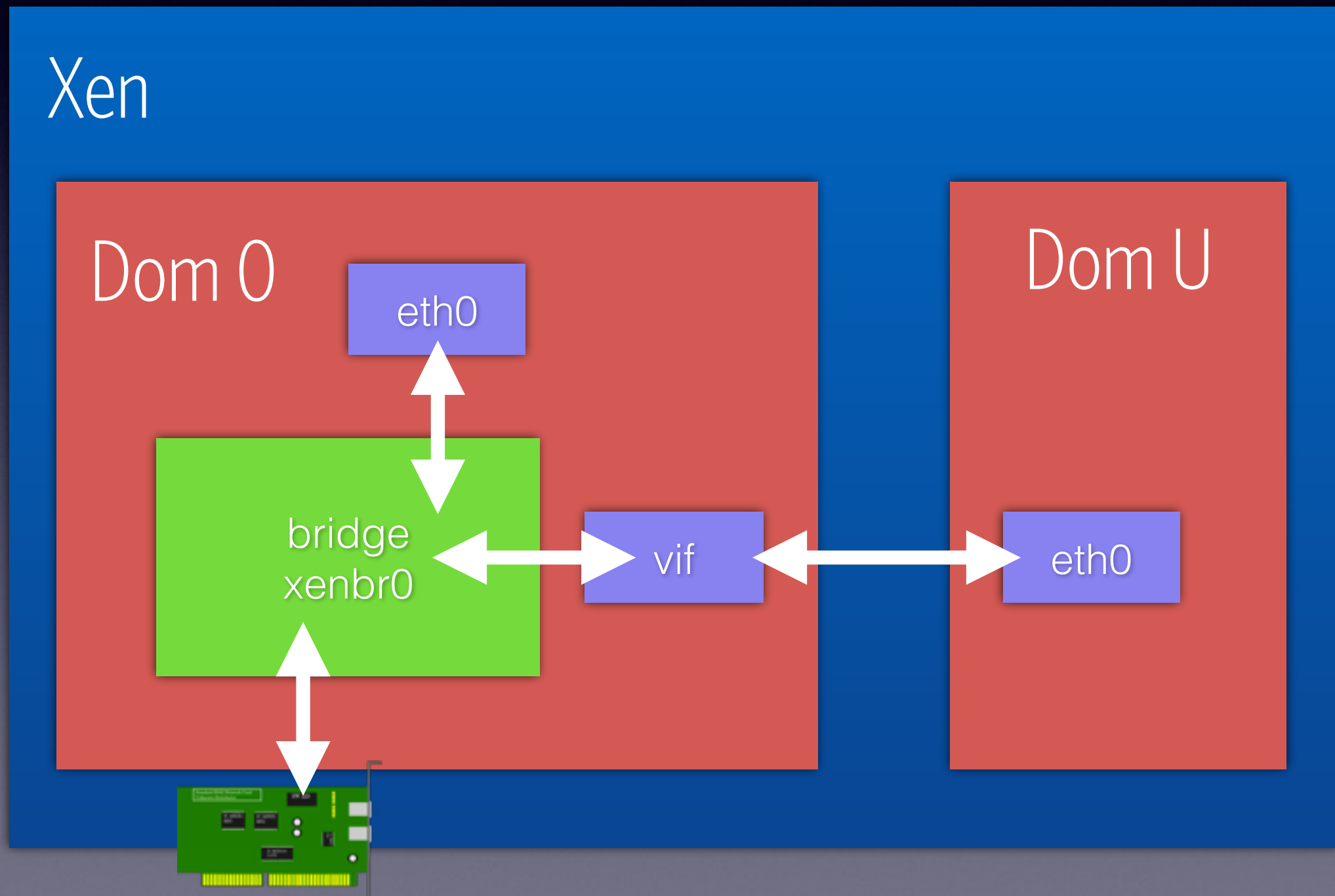
vif2.0   Link encap:Ethernet  HWaddr FE:FF:FF:FF:FF:FF
        inet6 addr: fe80::fcff:ffff:feff:ffff/64 Scope:Link
        UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
        RX packets:18973 errors:0 dropped:0 overruns:0 frame:0
        TX packets:31947 errors:0 dropped:0 overruns:0 carrier:0
        collisions:0 txqueuelen:32
        RX bytes:1047425 (1022.8 KiB)  TX bytes:65123995 (62.1 MiB)

xenbr0   Link encap:Ethernet  HWaddr 74:86:7A:DC:7E:AC
        inet addr:192.168.32.13  Bcast:192.168.32.255  Mask:255.255.255.0
        inet6 addr: fe80::7686:7aff:fedc:7eac/64 Scope:Link
        UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
        RX packets:109276 errors:0 dropped:0 overruns:0 frame:0
        TX packets:50045 errors:0 dropped:0 overruns:0 carrier:0
        collisions:0 txqueuelen:0
        RX bytes:90278372 (86.0 MiB)  TX bytes:183160229 (174.6 MiB)

```

Add a new VM

How Xen connect to outside ?



```
em1      Link encap:Ethernet  HWaddr 74:86:7A:DC:7E:AC
        inet6 addr: fe80::7686:7aff:fedc:7eac/64 Scope:Link
        UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
        RX packets:170120 errors:0 dropped:0 overruns:0 frame:0
        TX packets:182500 errors:0 dropped:0 overruns:0 carrier:0
        collisions:0 txqueuelen:1000
        RX bytes:159410543 (152.0 MiB)  TX bytes:192720388 (183.7 MiB)
        Interrupt:16

lo       Link encap:Local Loopback
        inet addr:127.0.0.1  Mask:255.0.0.0
        inet6 addr: ::1/128 Scope:Host
        UP LOOPBACK RUNNING  MTU:65536  Metric:1
        RX packets:26074 errors:0 dropped:0 overruns:0 frame:0
        TX packets:26074 errors:0 dropped:0 overruns:0 carrier:0
        collisions:0 txqueuelen:0
        RX bytes:193926741 (184.9 MiB)  TX bytes:193926741 (184.9 MiB)

vif2.0   Link encap:Ethernet  HWaddr FE:FF:FF:FF:FF:FF
        inet6 addr: fe80::fcff:ffff:feff:ffff/64 Scope:Link
        UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
        RX packets:18992 errors:0 dropped:0 overruns:0 frame:0
        TX packets:32302 errors:0 dropped:0 overruns:0 carrier:0
        collisions:0 txqueuelen:32
        RX bytes:1048557 (1023.9 KiB)  TX bytes:65191919 (62.1 MiB)

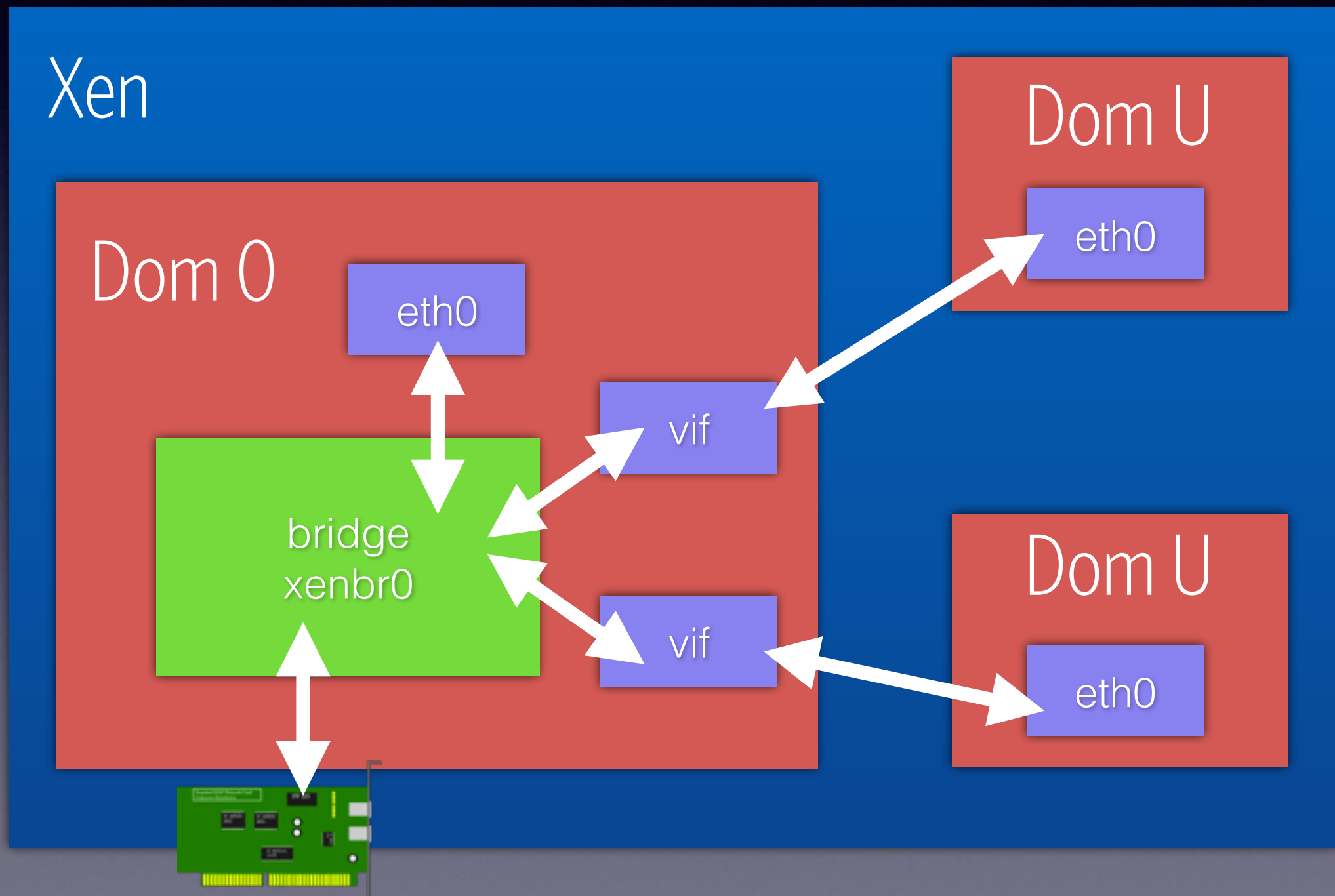
vif5.0   Link encap:Ethernet  HWaddr FE:FF:FF:FF:FF:FF
        inet6 addr: fe80::fcff:ffff:feff:ffff/64 Scope:Link
        UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
        RX packets:46 errors:0 dropped:0 overruns:0 frame:0
        TX packets:83 errors:0 dropped:0 overruns:0 carrier:0
        collisions:0 txqueuelen:32
        RX bytes:2754 (2.6 KiB)  TX bytes:13572 (13.2 KiB)

xenbr0   Link encap:Ethernet  HWaddr 74:86:7A:DC:7E:AC
        inet addr:192.168.32.13  Bcast:192.168.32.255  Mask:255.255.255.0
        inet6 addr: fe80::7686:7aff:fedc:7eac/64 Scope:Link
        UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
        RX packets:109880 errors:0 dropped:0 overruns:0 frame:0
        TX packets:50274 errors:0 dropped:0 overruns:0 carrier:0
        collisions:0 txqueuelen:0
        RX bytes:90357542 (86.1 MiB)  TX bytes:183196215 (174.7 MiB)
```

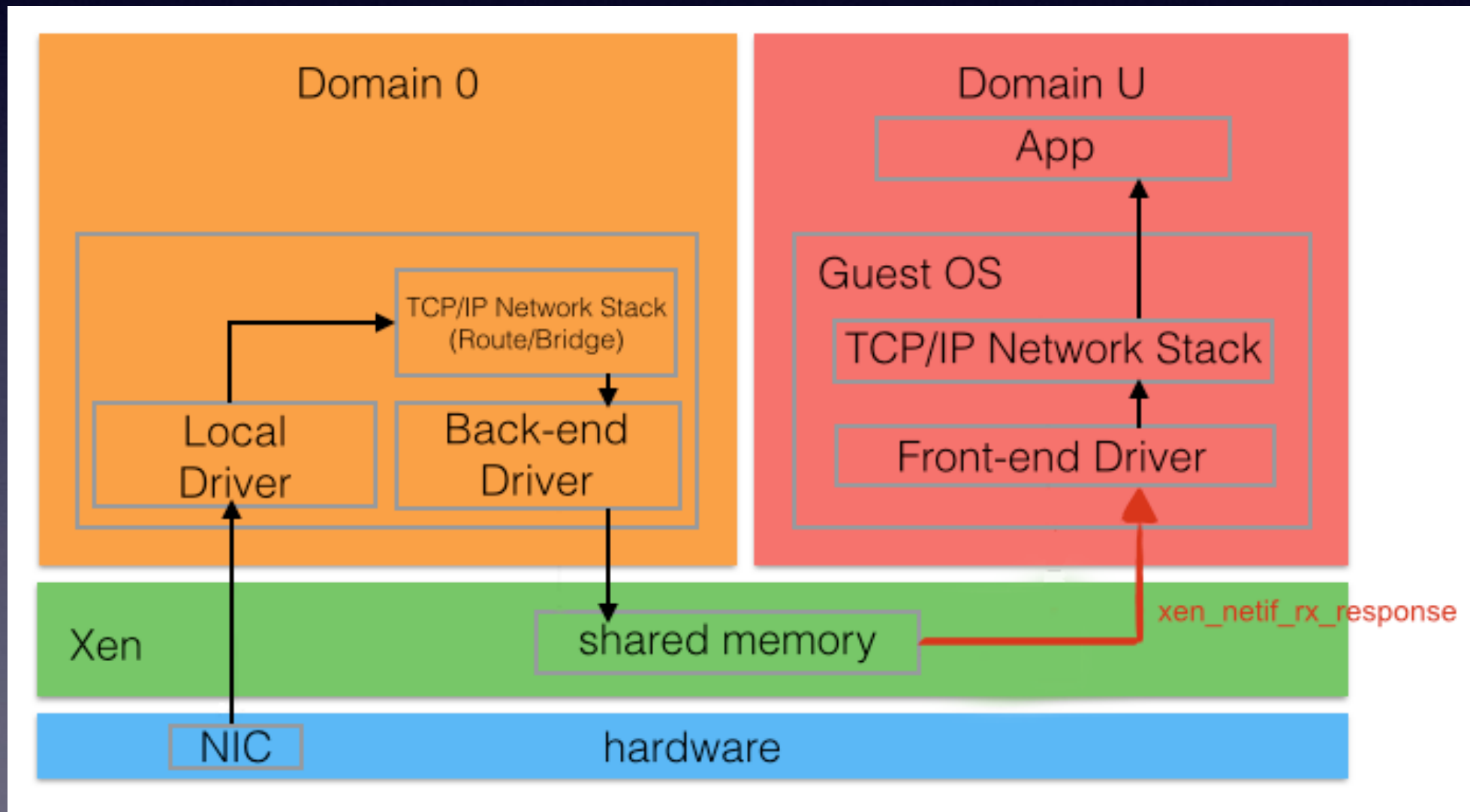
Add one more VM



How Xen connect to outside ?



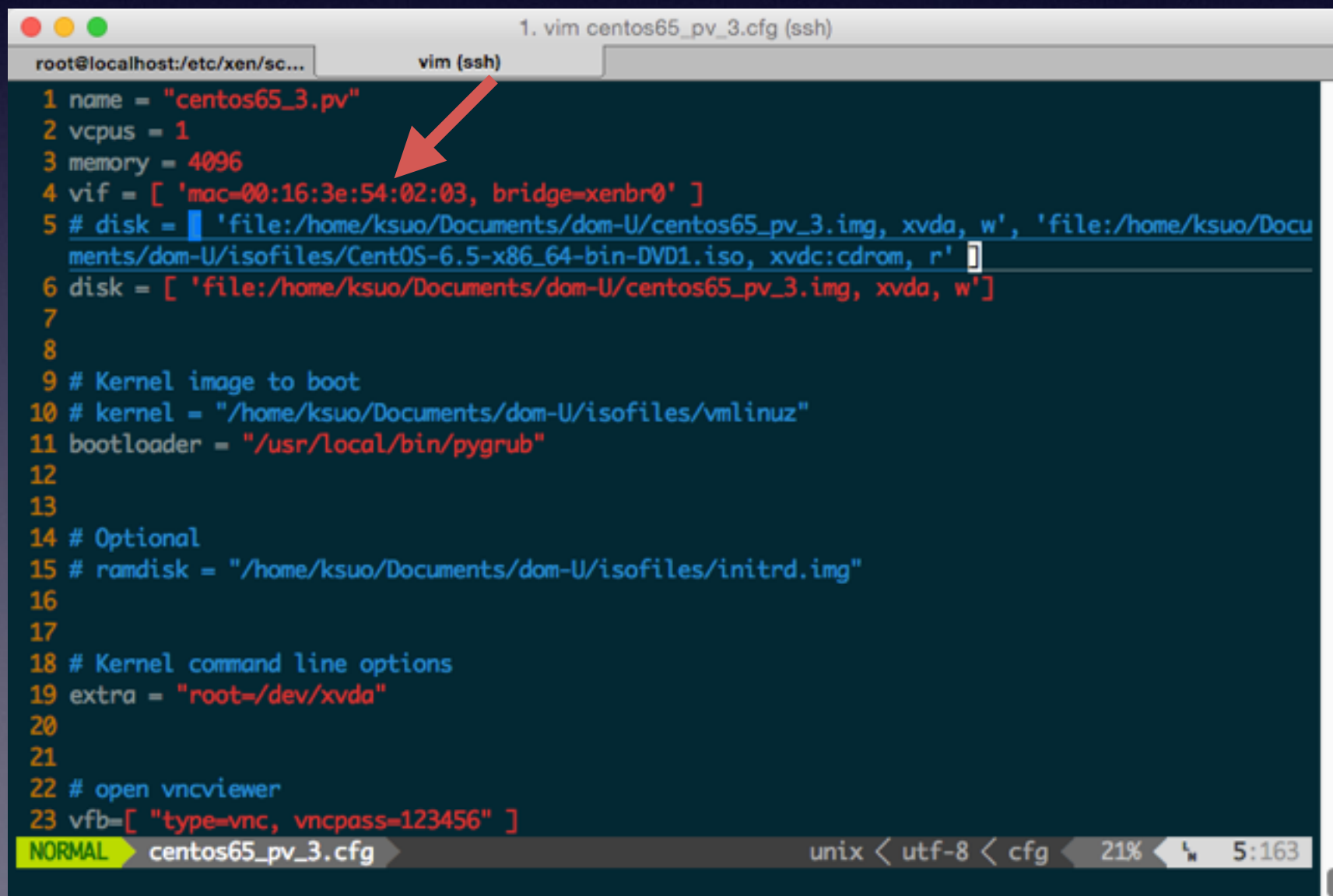
How Xen connect to outside ?



How Xen connect to outside ?

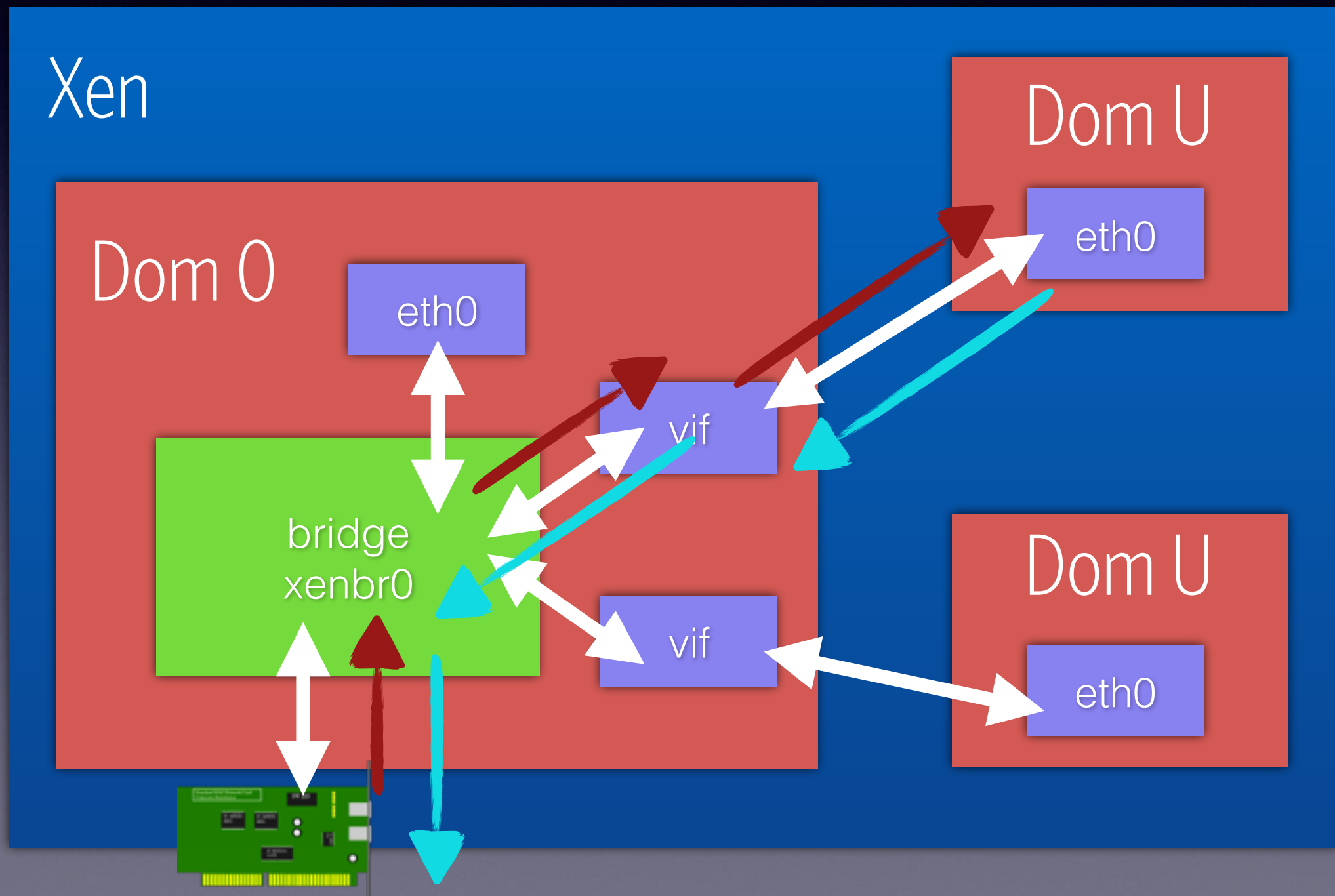
inside Dom U

```
vif = [ "key1 = value1", "key2 = value2" ]  
vif = [mac=00:16:3E:02:00:41,bridge=xenbr0' ]
```



```
1. vim centos65_pv_3.cfg (ssh)  
root@localhost:/etc/xen/sc... vim (ssh)  
1 name = "centos65_3.pv"  
2 vcpus = 1  
3 memory = 4096  
4 vif = [ 'mac=00:16:3e:54:02:03, bridge=xenbr0' ]  
5 # disk = 'file:/home/ksuo/Documents/dom-U/centos65_pv_3.img, xvda, w', 'file:/home/ksuo/Documents/dom-U/isofiles/CentOS-6.5-x86_64-bin-DVD1.iso, xvdc:cdrom, r'  
6 disk = [ 'file:/home/ksuo/Documents/dom-U/centos65_pv_3.img, xvda, w']  
7  
8  
9 # Kernel image to boot  
10 # kernel = "/home/ksuo/Documents/dom-U/isofiles/vmlinuz"  
11 bootloader = "/usr/local/bin/pygrub"  
12  
13  
14 # Optional  
15 # ramdisk = "/home/ksuo/Documents/dom-U/isofiles/initrd.img"  
16  
17  
18 # Kernel command line options  
19 extra = "root=/dev/xvda"  
20  
21  
22 # open vncviewer  
23 vfb=[ "type=vnc, vncpass=123456" ]  
NORMAL centos65_pv_3.cfg unix < utf-8 < cfg 21% 5:163
```


How Xen connect to outside ?



Conclusion of Xen

- What is Xen ?
- Xen history
- Xen design philosophy
- How Xen virtualize resources ?
- How to install Xen ?
- How to build VMs on Xen ?
- How Xen connects to the outside ?



Thank you