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How To Run Fully-Virtualized Guests (HVM) With Xen 3.2 On Debian Lenny (x86_64)

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This guide explains how you can set up fully-virtualized guests (HVM) with Xen 3.2 on a Debian Lenny x86_64 host system. HVM stands for **H**ardware **V**irtual**M**achine; to set up such guests, you need a CPU that supports hardware virtualization (Intel VT or AMD-V). Hardware virtualization allows you to install unmodified guest systems (in contrast to paravirtualization where the guest kernel needs to be modified); that way you cannot only virtualize OpenSource operating systems like Linux and BSD, but also closed-source operating systems like Windows where you cannot modify the kernel.

To learn more about the different virtualization techniques, take a look at this VMware whitepaper:

http://www.vmware.com/files/pdf/VMware_paravirtualization.pdf.

This document comes without warranty of any kind! I do not issue any guarantee that this will work for you!

1 Preliminary Note

I'm assuming that you're using a Xen 3.2 system on Debian Lenny, set up according to chapter 2 of this tutorial: [Virtualization With Xen On Debian Lenny \(AMD64\)](#)

Please note that [full virtualization comes with a performance penalty compared to paravirtualization](#).

I'm using disk images in this guide for the storage of the virtual machines. I couldn't get HVM to work with real partitions or logical volumes (LVM) - the guest couldn't see the hard drive. I don't know if it's possible to use physical devices with HVM, I couldn't find anything about it on the web. Please drop me a line if you know if and how this can be done. Thanks!

You need a CPU that supports hardware virtualization to install HVM guests. This is how you find out if your CPU supports hardware virtualization (**after**

you have installed Xen!):

```
xm dmesg | grep -i hvm
```

If you get something back, then you're lucky; if the command prints nothing and just returns to the prompt, then your CPU does not support hardware virtualization.

On an AMD-V processor, the output looks as follows:

```
server1:~# xm dmesg | grep -i hvm
(XEN) HVM: SVM enabled
server1:~#
```

This is how you can find out if your CPU supports hardware virtualization **before** you install Xen:

```
egrep '(vmx|svm)' --color=always /proc/cpuinfo
```

2 Installing The First HVM Guest

I want to create the guest `xen1.example.com` now. First, we need to create a hard drive image for it, e.g. as follows:

```
dd if=/dev/zero of=/home/xen1.example.com.img bs=1024k count=4000
```

(This creates an image of approx. 4GB in size. If you want a bigger image, just increase the `count` switch.)

We can install the guest either from a CD/DVD inserted into the CD drive, or from an ISO image that you downloaded. You can also create an ISO image from a CD/DVD like this (in this example I create an ISO image of an Ubuntu 8.10 Server AMD64 CD):

```
dd if=/dev/cdrom of=/home/ubuntu8_10_server_amd64.iso
```

Next we create the file `/etc/xen/xen1.example.com.cfg`:

```
vi /etc/xen/xen1.example.com.cfg
```

```
import os, re
arch = os.uname()[4]

kernel = "/usr/lib/xen-default/boot/hvmloader"

builder='hvm'

memory = 512
shadow_memory = 8
name = "xen1.example.com"
vif = [ 'type=ioemu, bridge=eth0' ]
disk = [ 'file:/home/xen1.example.com.img,xvda,w', 'file:/home/ubuntu8_10_server_amd64.iso,xvdc:cdrom,r' ]
#disk = [ 'file:/home/xen1.example.com.img,xvda,w', 'phy:/dev/cdrom,xvdc:cdrom,r' ]
device_model = '/usr/lib/xen-default/bin/qemu-dm'
# boot on floppy (a), hard disk (c) or CD-ROM (d)
# default: hard disk, cd-rom, floppy
boot="dc"

sdl=0
vnc=1
vnclisten="0.0.0.0"
vncconsole=1
vncpasswd='howtoforge'
stdvga=0
serial='pty'
usbdevice='tablet'
```

```
on_poweroff = 'destroy'
on_reboot   = 'restart'
on_crash    = 'restart'
```

(Please use the first *disk* line if you want to install from an ISO image and the second one if you want to install from a CD or DVD.)

boot="dc" makes that the virtual machine will first boot from CD/DVD or an ISO image and then from the hard disk, if there's no CD. It's important the the CD drive is the first boot device when you power on the virtual machine for the first time.

vnc=1 makes that we will be able to connect to the guest using a VNC client. *vnclisten="0.0.0.0"* makes the host listen for VNC connections on all interfaces (the default is to listen on localhost only which makes remote VNC connections impossible). In the *vncpasswd* line you can set a password for VNC connections; if you don't want a password, just use *vncpasswd=' '*.

Afterwards, we can power on our guest:

```
xm create /etc/xen/xen1.example.com.cfg
```

If you run

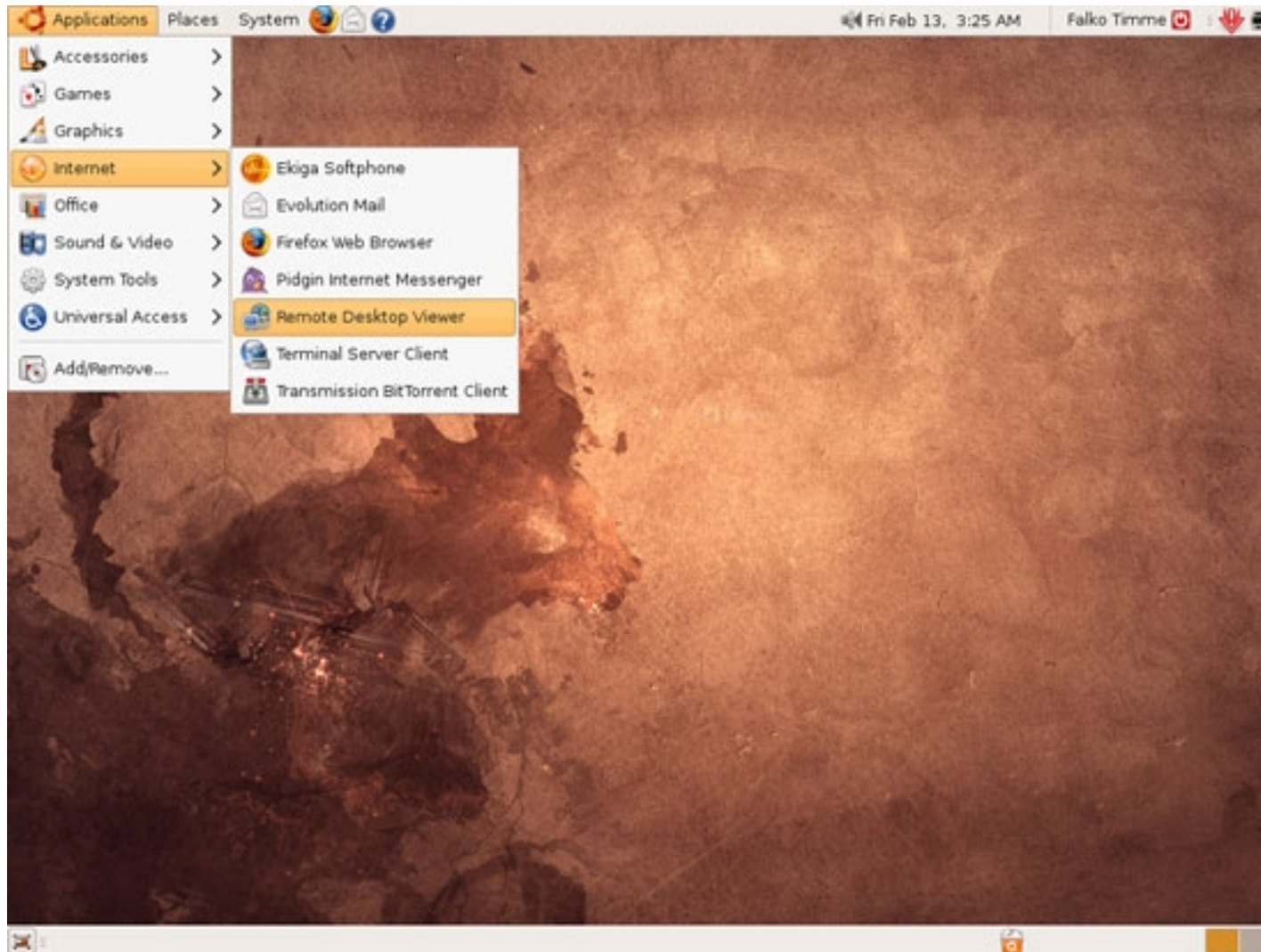
```
netstat -tap
```

you will notice that the host is now listening on port 5900 (VNC):

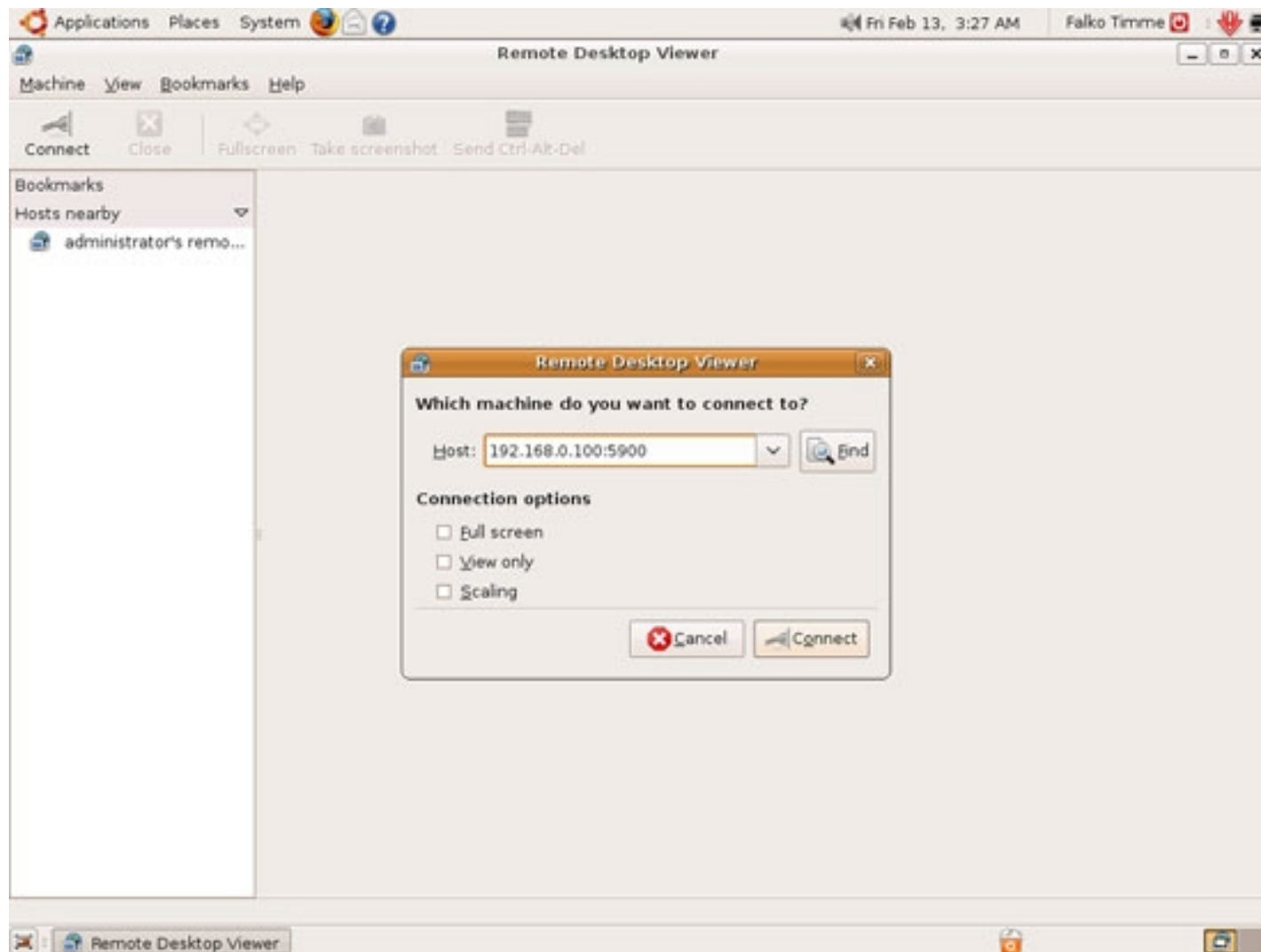
```
server1:/etc/xen# netstat -tap
Active Internet connections (servers and established)
Proto Recv-Q Send-Q Local Address           Foreign Address         State       PID/Program name
tcp        0      0 *:5900                  *:*                     LISTEN      24492/qemu-dm
tcp        0      0 *:42991                 *:*                     LISTEN      2293/rpc.statd
tcp        0      0 *:sunrpc                 *:*                     LISTEN      2282/portmap
tcp        0      0 *:ssh                    *:*                     LISTEN      2987/sshd
```

```
tcp      0      0 localhost.localdom:smtp *.*      LISTEN      2803/exim4
tcp      0      0 server1.example.com:ssh 192.168.0.2:4399 ESTABLISHED 4134/2
tcp6     0      0 [::]:ssh             [::]:*      LISTEN      2987/sshd
server1:/etc/xen#
```

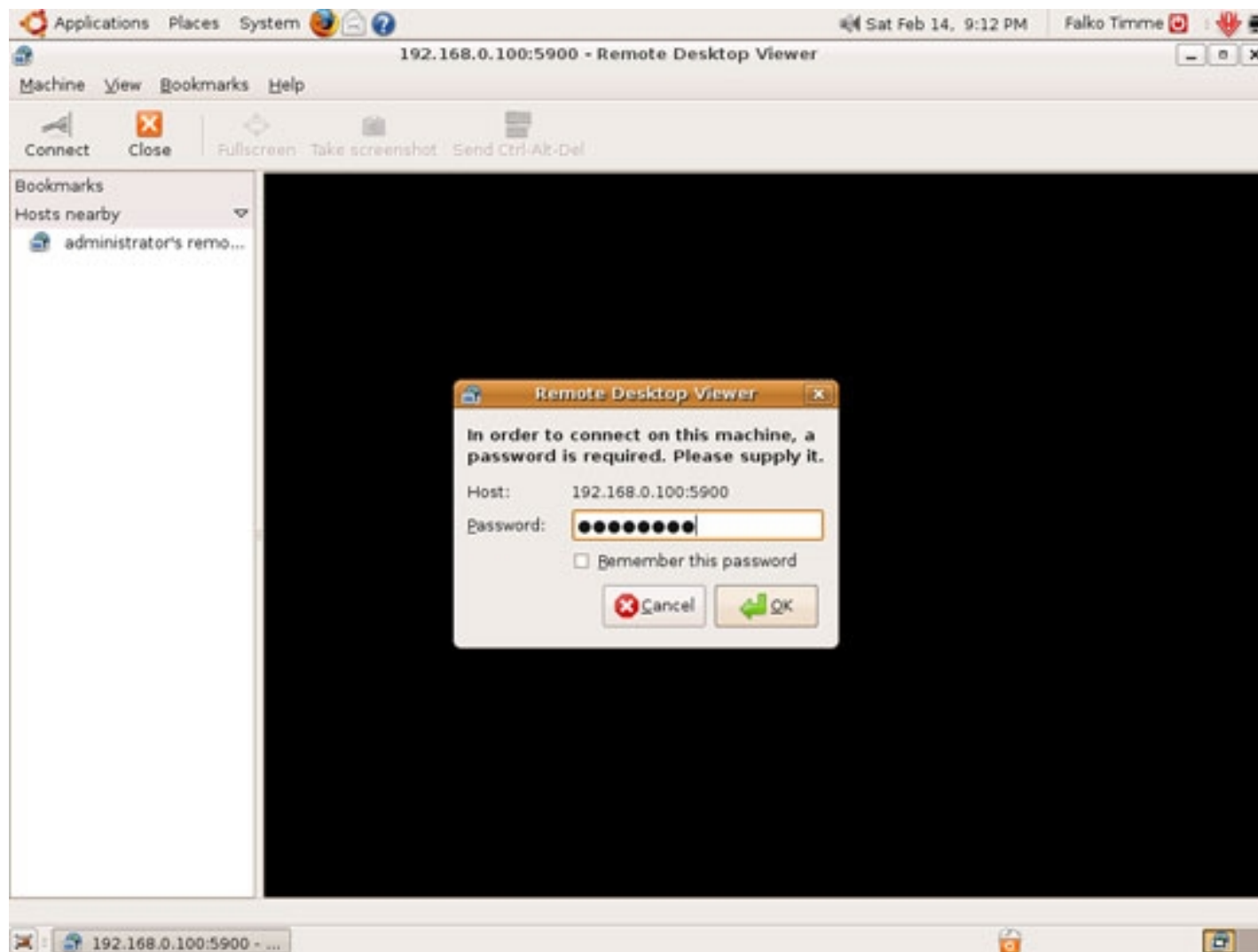
We can now connect to our guest on that port with a VNC client. On Windows, you can install [TightVNC](#); on Ubuntu, there's already a VNC client under *Applications > Internet > Remote Desktop Viewer*:



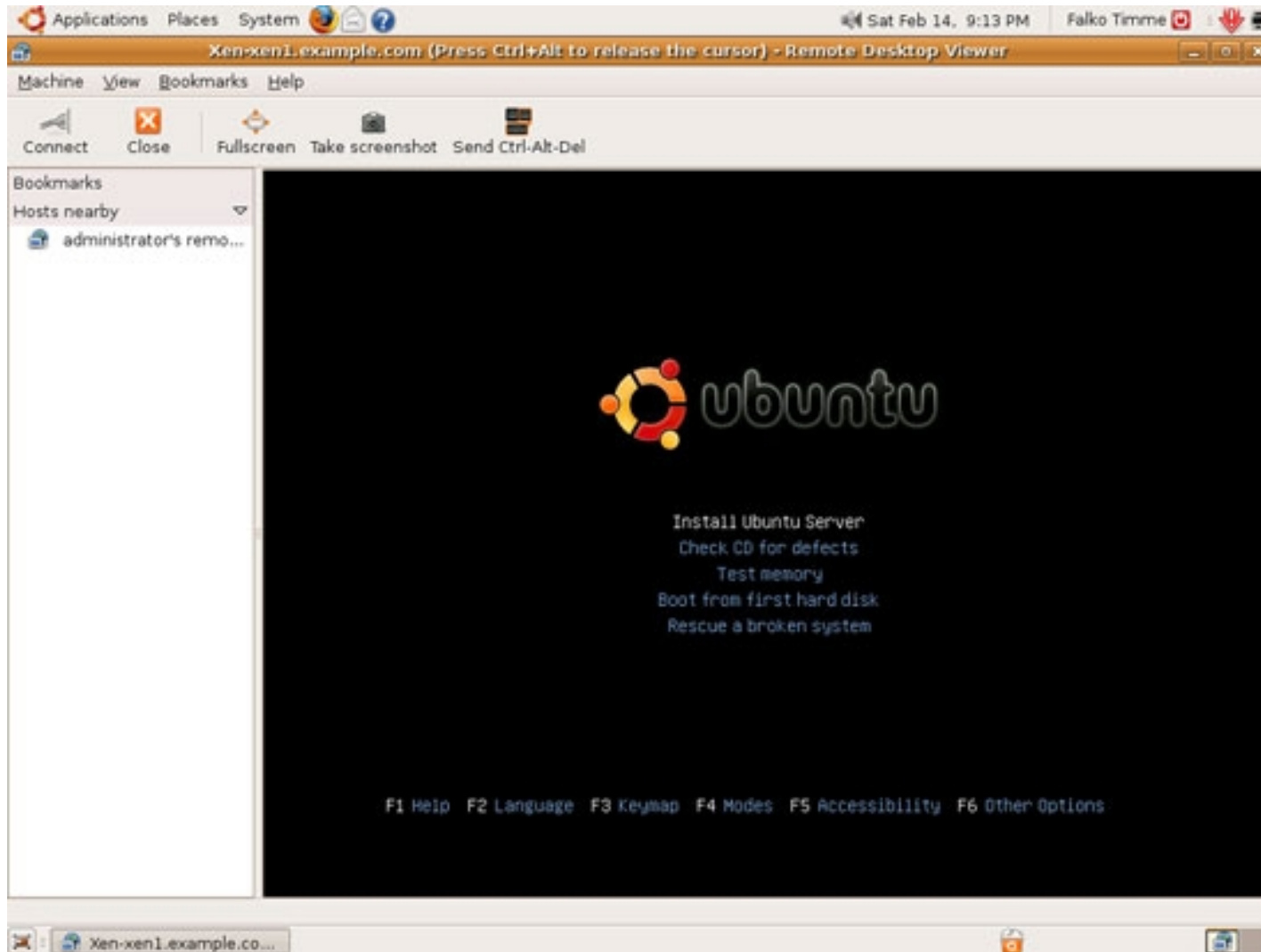
Click on the *Connect* button and then type in the IP of the Xen host followed by the port number (e.g. `192.168.0.100:5900`):



If you've specified a VNC password in the configuration file of the guest, you are now prompted for that password:



Afterwards, you should see the installer of the operating system that you want to install. Just follow the wizard as if it was a physical system:



Most installers require you to reboot at the end of the installation and remove the installation media; this is not possible if you have specified an ISO image in the guest

configuration file, and even if you use a CD - the reboot of the guest happens so fast that you cannot remove the CD before the guest boots again. This means the guest will boot from the CD or ISO file and start the installer again.

If that happens, stop the guest...

```
xm destroy xen1.example.com
```

... and edit the guest configuration file:

```
vi /etc/xen/xen1.example.com.cfg
```

Remove the CD drive from the boot line...

```
[...]  
boot="c"  
[...]
```

... and boot the guest again:

```
xm create /etc/xen/xen1.example.com.cfg
```

This time it should boot from its hard drive. Of course, you can now use VNC again to connect to the guest.

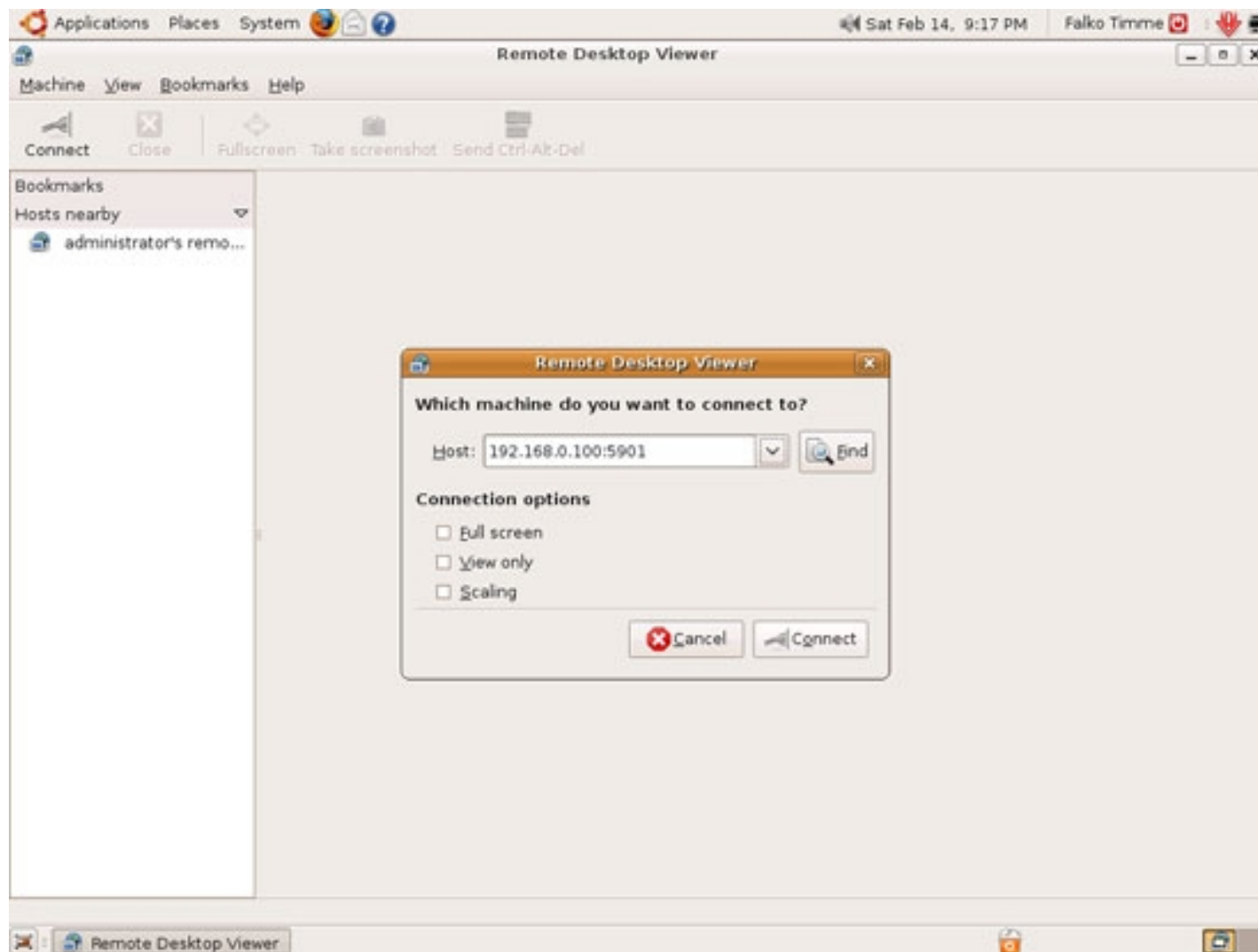
3 Using VNC When There Are Multiple Guests

If you have multiple guests running at the same time, the guests obviously cannot all use port *5900* at the same time. Therefore the second guest will use port *5901*, the third one port *5902*, and so on. You can check the VNC ports that are currently in use by running

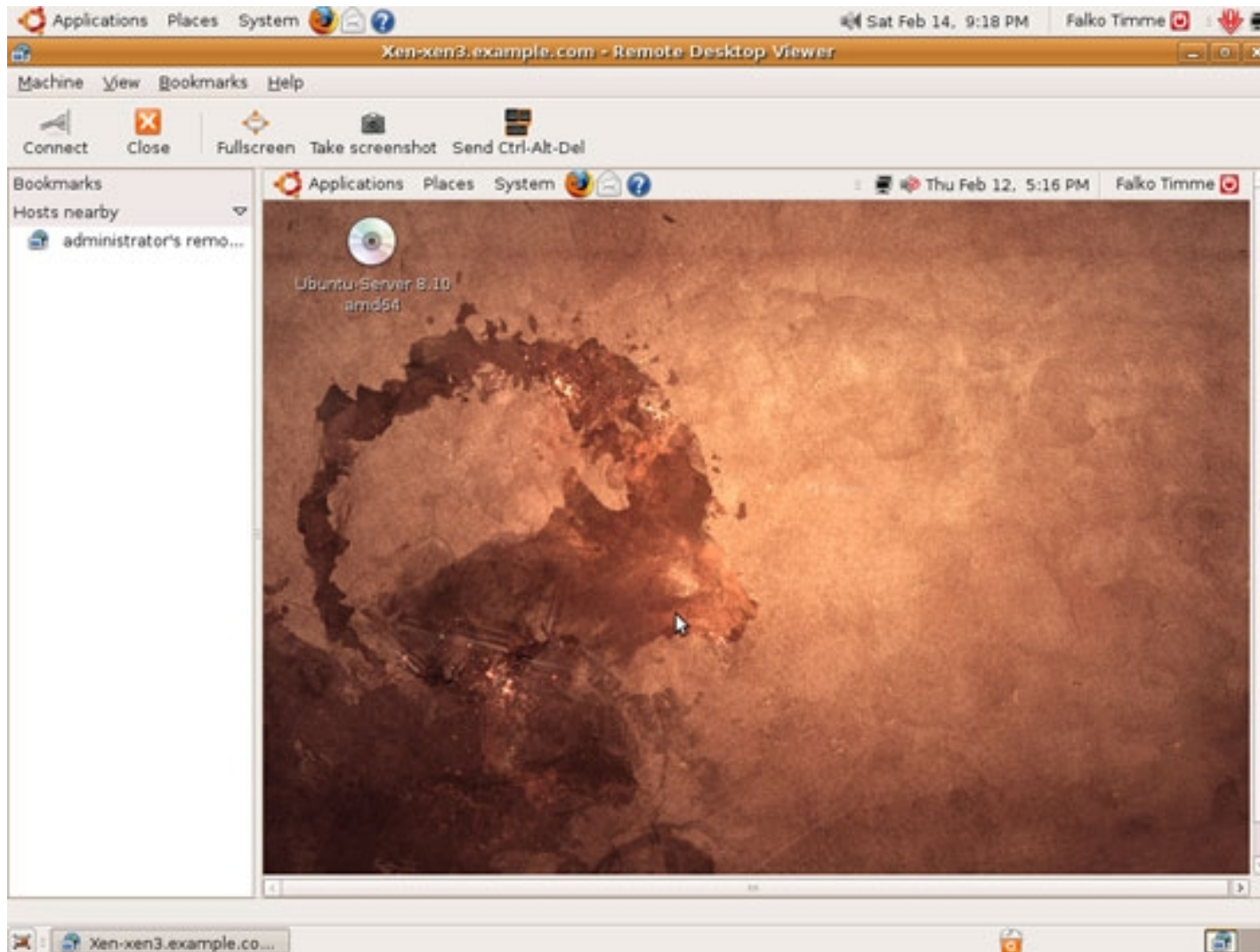
```
netstat -tap
```

```
server1:/etc/xen# netstat -tap
Active Internet connections (servers and established)
Proto Recv-Q Send-Q Local Address           Foreign Address         State       PID/Program name
tcp        0      0 *:5900                 *:*                     LISTEN      24492/qemu-dm
tcp        0      0 *:5901                 *:*                     LISTEN      24950/qemu-dm
tcp        0      0 *:5902                 *:*                     LISTEN      25295/qemu-dm
tcp        0      0 *:42991                *:*                     LISTEN      2293/rpc.statd
tcp        0      0 *:sunrpc                *:*                     LISTEN      2282/portmap
tcp        0      0 *:ssh                   *:*                     LISTEN      2987/sshd
tcp        0      0 localhost.localdom:smtp *:*                     LISTEN      2803/exim4
tcp        0      0 server1.example.co:5901 192.168.0.6:49936      ESTABLISHED 24950/qemu-dm
tcp        0      148 server1.example.com:ssh 192.168.0.2:4399      ESTABLISHED 4134/2
tcp6       0      0 [::]:ssh                [::]:*                 LISTEN      2987/sshd
server1:/etc/xen#
```

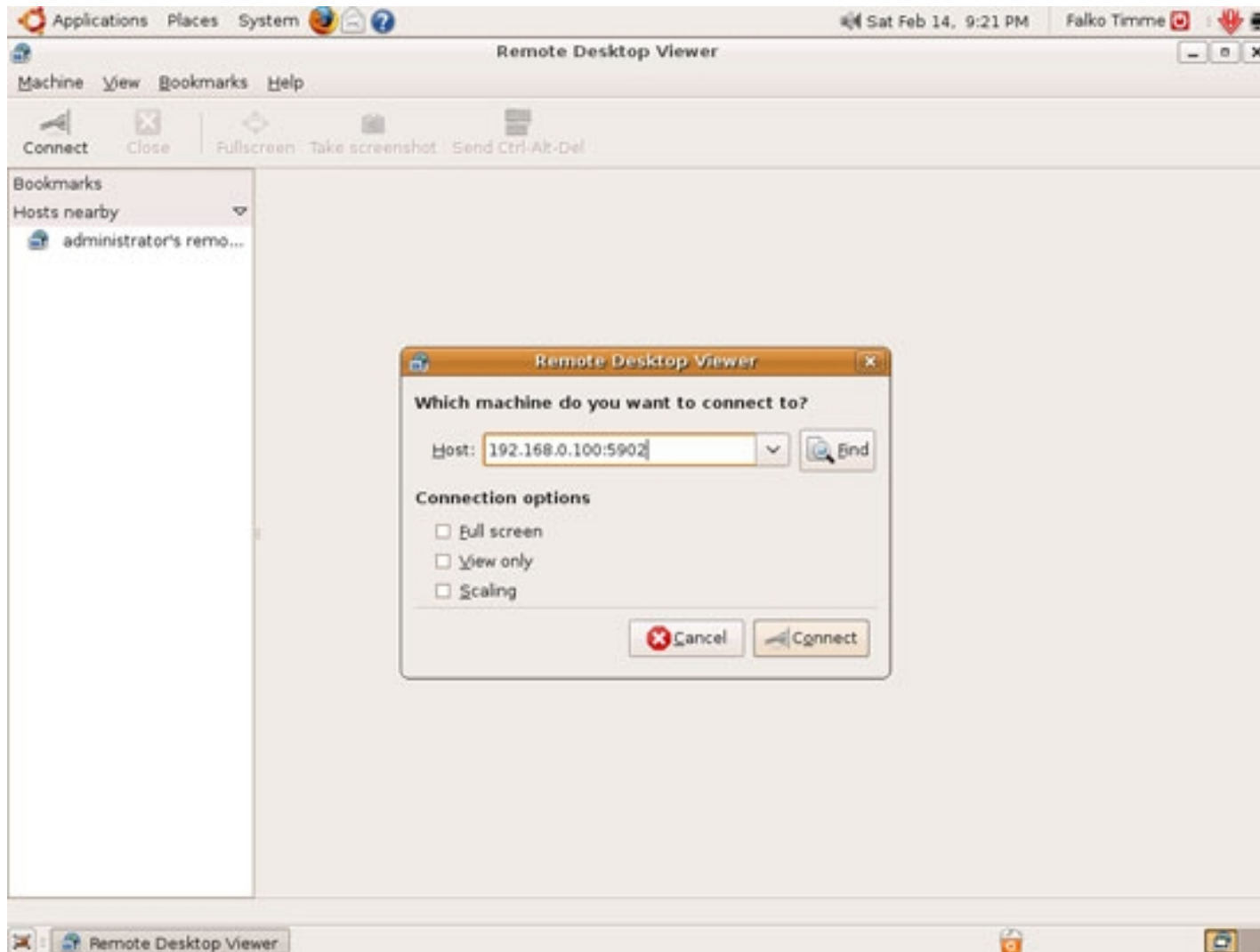
In your VNC viewer, you must specify the new port (e.g. `192.168.0.100:5901`):

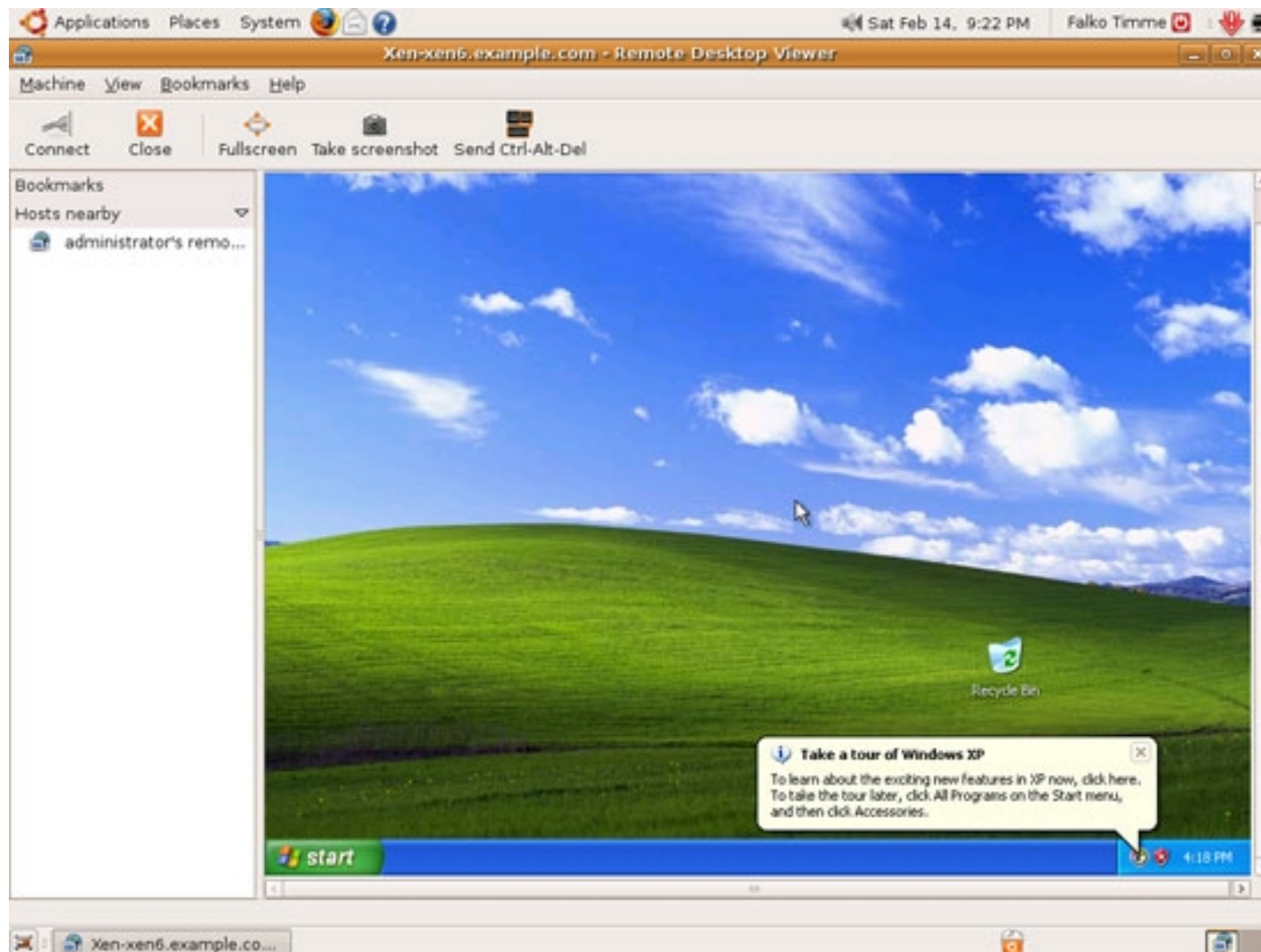


And voilÃ , here's the second guest, this time an Ubuntu 8.10 desktop:



And here's our third guest, a Windows XP desktop:





4 Troubleshooting

It might happen that you start a guest, but cannot connect to it using VNC, and `netstat -tap` shows no new VNC port. In the log file of the guest in

`/var/log/xen/qemu-dm-*.log` you might see something like this:

I/O request not ready: 0, ptr: 0, port: 0, data: 0, count: 0, size: 0

Shut down one or two of the other guests, and afterwards it should be possible to start this guest again.

5 Important Xen Commands

Here are the most important Xen commands:

`xm create -c /path/to/config` - Start a virtual machine.

`xm shutdown <name>` - Stop a virtual machine.

`xm destroy <name>` - Stop a virtual machine immediately without shutting it down. It's as if you switch off the power button.

`xm list` - List all running systems.

`xm help` - List of all commands.

6 Links

- Xen: <http://www.xen.org/>
- Debian: <http://www.debian.org>