



CMP3214 Computer Communication Networks

Lecture 4



Network Training Emulator



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Network Training Emulator



- Originally IMUNES IP network emulator / simulator
 - University of Zagreb
 - Ericsson Nikola Tesla product testing
- CORE, fork of IMUNES
 - Network Technology research group, Boeing
 - US Naval Research Laboratory.
- NTE, fork of CORE
 - NetLabs!UG

Virtualisation





Install VirtualBox



- GNU/Linux
 - \$ sudo apt-get update
 - \$ sudo apt-get install virtualbox-5.1

• Apple OS X

http://download.virtualbox.org/virtualbox/5.1.16/VirtualBox-5.1.16-113841-OSX.dmg

Microsoft Windows

http://download.virtualbox.org/virtualbox/5.1.16/VirtualBox-5.1.16-113841-Win.exe

Getting the netLabs!UG NTE





Version 8.7





X-Window architecture

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- Is a portable, network-transparent window system used in many computing platforms.
- X11 is the graphical system most widely used on Unix-like systems.
- X11 had a rough start, but the 1990's saw XFree86 emerge as the reference implementation because it was free software, portable, and maintained by a collaborative community.
- The rate of evolution slowed down plus a very controversial license change, led to the X.org fork in 2004.
- This is the current reference implementation, and Debian Wheezy uses X.org version 7.7.
- Note: From this version, X no longer creates /etc/X11/xorg.conf configuration file.





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- Computer runs X Server (X).
- Applications are sent to the X Server defined in the \$DISPLAY variable.
- On a single machine the display is sent from the X Client to the X Server on that machine, thus the \$DISPLAY Variable is :0.0 by default.







- Client machine runs an X Server and an xterminal, connects to the remote Server.
- On the Server the client changes the \$DISPLAY variable to point to the X Server on the client machine.
- When the xclock is called it is run on the Server computer but the display is on the Client computer.





nte@NTE-i386:~\$ X -version X.Org X Server 1.16.4 Release Date: 2014-12-20 X Protocol Version 11, Revision 0 Build Operating System: Linux 3.2.0-4-amd64 i686 Debian Current Operating System: Linux NTE-i386 3.16.0-4-586 #1 Debian 3.16.7ckt20-1+deb8u3 (2016-01-17) i686 Kernel command line: BOOT IMAGE=/boot/vmlinuz-3.16.0-4-586 root=UUID=e48f8a14-f3cd-49a4-a064-ecf61b919ccf ro quiet Build Date: 11 February 2015 01:14:26AM xorg-server 2:1.16.4-1 (http://www.debian.org/support) Current version of pixman: 0.32.6 Before reporting problems, check http://wiki.x.org to make sure that you have the latest version.



• SSH supports X11 forwarding with the -X option



Xming



 Windows users require an Xserver like Xming. http://www.straightrunning.com/XmingNotes/

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Import Appliance





Version 8.7



File > Import Appliance

Import Virtual Appliance	×
Appliance to import	
VirtualBox currently supports importing appliances saved in the O Virtualization Format (OVF). To continue, select the file to import below.	Open
/home/nte/NTE_v2.0/NTE_v2.0-i386.ova	
Expert Mode < Back Next > Cano	cel

Select the <u>NTE_v2.0-i386</u>.ova and click Next >.

Installing NTE VM on VirtualBox



Import Virtual Applia	nce	×
Appliance settings		
These are the virtual machines suggested settings of the impo change many of the properties and disable others using the ch	contained in the appliance and the rted VirtualBox machines. You can shown by double-clicking on the item neck boxes below.	s
Description	Configuration	
Virtual System 1		
😪 Name	NTE_v2.0-i386_1	
📃 Guest OS Type	🔞 Debian (32-bit)	U
CPU	1	
RAM	2048 MB	
OVD	×	
USB Controller	×	•
<u>R</u> einitialize the MAC addres	s of all network cards	
Restore Defaults < E	ack Import Cancel	

Check the tickbox for "*Reinitialise the MAC address of all network cards*" Select Import.

Starting NTE VM on VirtualBox





Right click on VM, Select Network

Settings NTE VM on VirtualBox

🦲 General	Network
🛒 System	Adapter 1 Adapter 2 Adapter 3 Adapter 4
Display	
😥 Storage	
Þ Audio	Attached to: Bridged Adapter 👻
Network	Name: wlan0 •
Serial Ports	Advanced
🏈 USB	
Shared Folders	
🚺 User Interface	
Help	<u>C</u> ancel <u>O</u> K

Change Attached to: Bridged Adapter





Running NTE



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Running NTE VM on VirtualBox





Username: nte Password: nte

Running NTE VM natively in VirtualBox



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Double click on NTE icon.

Running NTE VM over SSH X11 forwarding





Get IP address with ip addr list.



\$ ssh -X nte@192.168.10.6 The authenticity of host '192.168.10.6 (192.168.10.6)' can't be established. ECDSA key fingerprint is dd:bd:74:25:ed:4b:ea:9f:05:e4:ae:ac:3f:46:21:a4. Are you sure you want to continue connecting (yes/no)? yes Warning: Permanently added '192.168.10.6' (ECDSA) to the list of known hosts. nte@192.168.10.6's password: nte

The programs included with the Debian GNU/Linux system are free software; the exact distribution terms for each program are described in the individual files in /usr/share/doc/*/copyright.

Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent permitted by applicable law. Last login: Fri Feb 19 15:56:56 2016 from 192.168.10.2 nte@NTE-i386:~\$

nte@NTE-i386:~\$ core-gui Connecting to "core-daemon" (127.0.0.1:4038)...connected.

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\$ vboxmanage startvm NTE_v2.0-i386 --type headless
Waiting for VM "NTE_v2.0-i386" to power on...
VM "NTE_v2.0-i386" has been successfully started.

\$ vboxmanage showvminfo NTE_v2.0-i386 | grep State
State: running (since 2016-02-19T15:46:35.817000000)

\$ vboxmanage showvminfo NTE_v2.0-i386 --details | grep 'NIC 1' NIC 1: MAC: 0800279D3BDA, Attachment: Bridged Interface 'wlan0', Cable connected: on, Trace: off (file: none), Type: 82540EM, Reported speed: 0 Mbps, Boot priority: 0, Promisc Policy: deny, Bandwidth group: none

\$ arp Address HWtype HWaddress Flags Mask Iface 192.168.10.4 ether 08:00:27:9d:3b:da C wlan0 smile-admin.localdomain ether f4:63:49:19:e4:82 C wlan0 192.168.10.5 (incomplete) wlan0

0800279D3BDA --> 08:00:27:9d:3b:da --> 192.168.10.4



• Capture BOOTP (DHCP) response.

ob@e550:~\$ sudo tshark -i eth0 -0 bootp | grep "Your (client) IP address:"
Capturing on 'wlan0'
116 Your (client) IP address: 0.0.0.0
119 Your (client) IP address: 0.0.0.0
Your (client) IP address: 192.168.88.12





\$ ssh -X nte@192.168.10.6
nte@192.168.10.6's password: nte

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nte@NTE-i386:~\$ core-gui

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\$ vboxmanage list runningvms
"NTE v2.0-i386" {dc2471a1-0a44-40df-afd7-0dd38774baea}

\$ vboxmanage controlvm NTE_v2.0-i386 poweroff
0%...10%...20%...30%...40%...50%...60%...70%...80%...90%...100%





\$ ssh -X nte@192.168.10.6
nt@192.168.10.6's password: nte

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Building a simple network

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Simple network







Session started





Access devices





Observer tool





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- I	Pv4 MF	C entries	5						114			
1	Pv6 MF	C entries	5									
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1	PSec p	olicies	2									
	locker	logs										
0	OSPFv3	MDR lev	el 🗄									
F	PIM nei	ahbors										
F	dit	J				÷			÷			
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	{n3}	n3 (route	er): etł	h0:10.0	.0.1/24 eth	1:10.0.1	.1/24 <207.	0, 48.0>		zoom 100%	CPU 2% (2)	1689M free

Two node tool







Plot tool





Traffic flows



Tools -> Traffic...

Widgets -> Configure Throughput...



Viewing throughput





Lab exercise









Thank You

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