SANS

www.sans.org

SECURITY 504
HACKER TECHNIQUES,
EXPLOITS AND
INCIDENT HANDLING

504.6

Hacker Tools Workshop

The right security training for your staff, at the right time, in the right location.

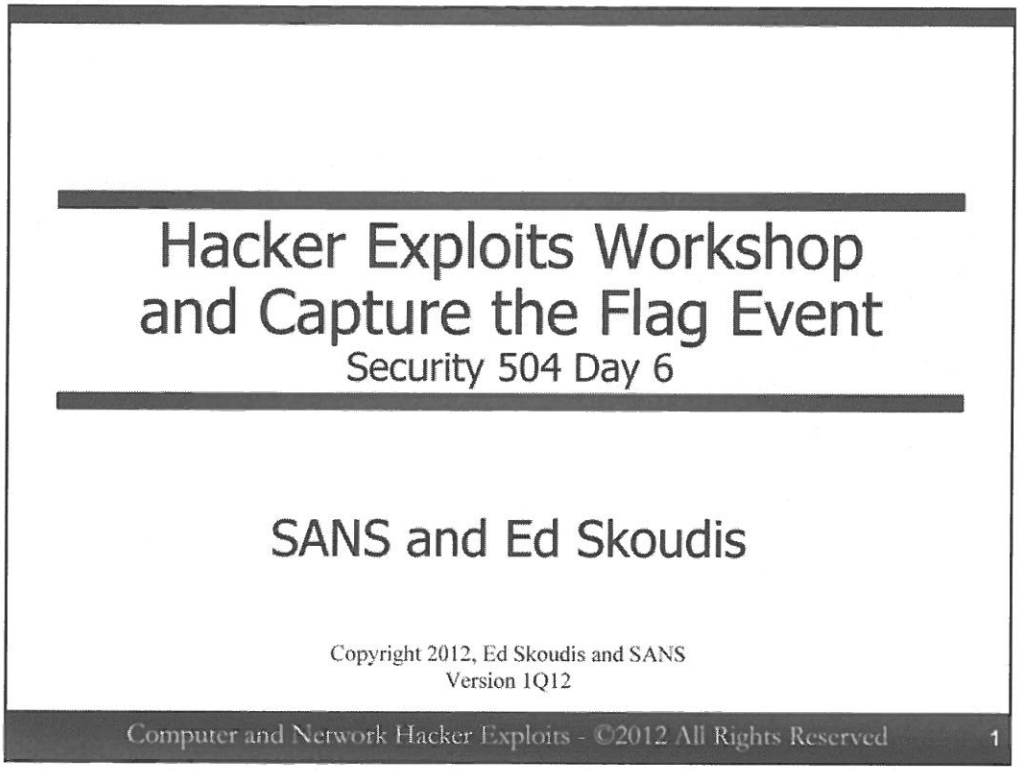
Copyright © 2012, The SANS Institute. All rights reserved. The entire contents of this publication are the property of the SANS Institute.

IMPORTANT-READ CAREFULLY:

This Courseware License Agreement ("CLA") is a legal agreement between you (either an individual or a single entity; henceforth User) and the SANS Institute for the personal, non-transferable use of this courseware. User agrees that the CLA is the complete and exclusive statement of agreement between The SANS Institute and you and that this CLA supersedes any oral or written proposal, agreement or other communication relating to the subject matter of this CLA. If any provision of this CLA is declared unenforceable in any jurisdiction, then such provision shall be deemed to be severable from this CLA and shall not affect the remainder thereof. An amendment or addendum to this CLA may accompany this courseware. BY ACCEPTING THIS COURSEWARE YOU AGREE TO BE BOUND BY THE TERMS OF THIS CLA. IF YOU DO NOT AGREE YOU MAY RETURN IT TO THE SANS INSTITUTE FOR A FULL REFUND, IF APPLICABLE. The SANS Institute hereby grants User a non-exclusive license to use the material contained in this courseware subject to the terms of this agreement. User may not copy, reproduce, re-publish, distribute, display, modify or create derivative works based upon all or any portion of this publication in any medium whether printed, electronic or otherwise, for any purpose without the express written consent of the SANS Institute. Additionally, user may not sell, rent, lease, trade, or otherwise transfer the courseware in any way, shape, or form without the express written consent of the SANS Institute.

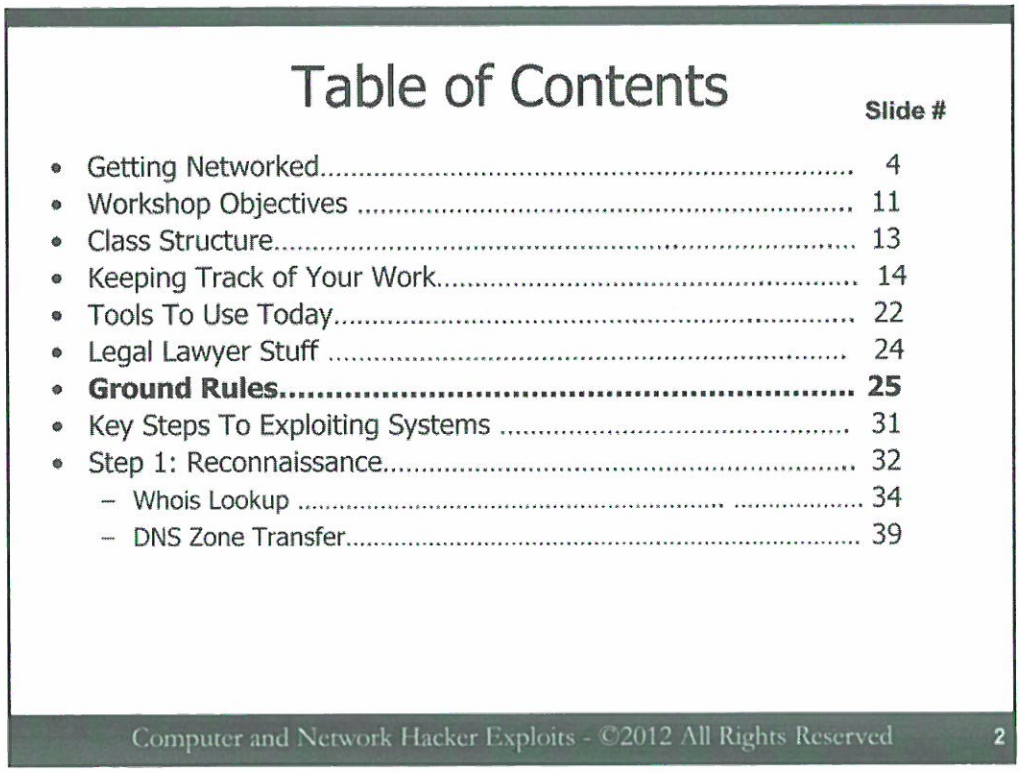
The SANS Institute reserves the right to terminate the above lease at any time. Upon termination of the lease, user is obligated to return all materials covered by the lease within a reasonable amount of time.

V2012_0210



Welcome to Computer and Network Hacker Exploits and Capture the Flag Event. Today, we are going to apply what we have learned in this class by getting hands-on experience with the tools and exploits. These exercises will underscore the importance of the defensive techniques we've discussed.

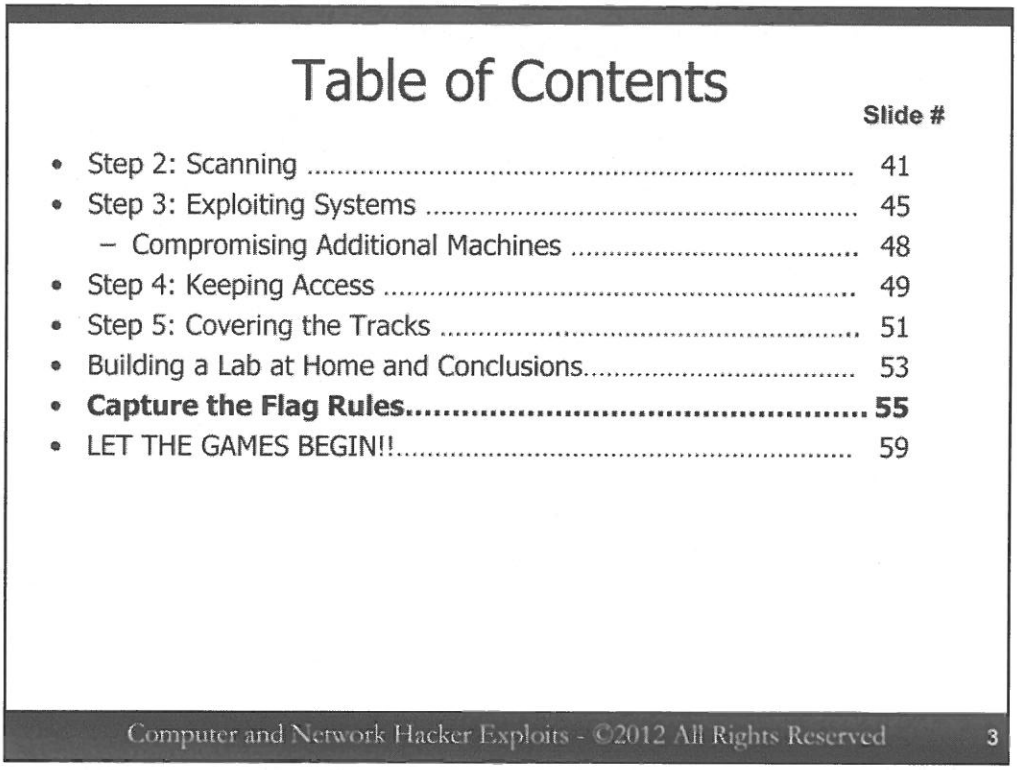
THIS CLASS ASSUMES THAT YOU HAVE ATTENDED SECURITY 504, DAYS 1, 2, 3, 4, and 5. YOU SHOULD BRING THE BOOKS FROM ALL OF THOSE CLASSES FOR REFERENCE FOR THIS CLASS.



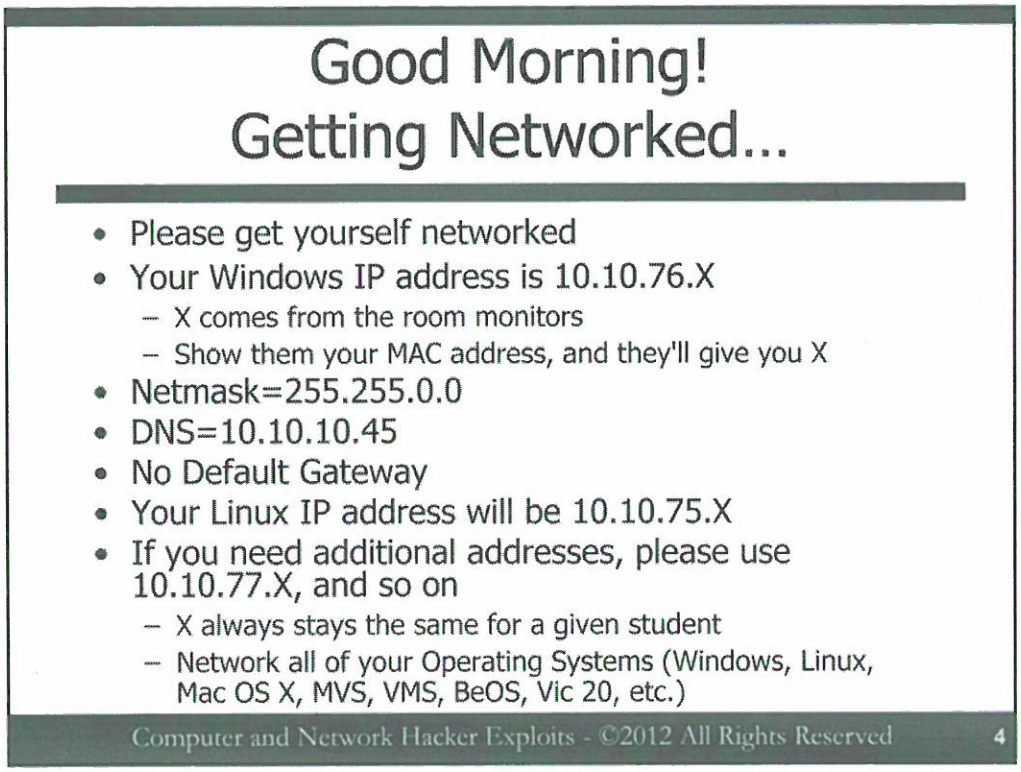
These slides are essentially a table of contents…. Use them for future reference, if you'd like.

THE MOST IMPORTANT SECTION IN TODAY'S BOOK IS THE ONE SPELLING OUT THE GROUND RULES. MAKE SURE YOU FOLLOW THE GROUND RULES!

Ignoring the ground rules could subject you to ejection from the class and the conference! That would be very, very unfortunate, so do yourself a favor: FOLLOW THESE SIMPLE AND REASONABLE GROUND RULES!



These slides are essentially a table of contents…. Use it for future reference, if you'd like.



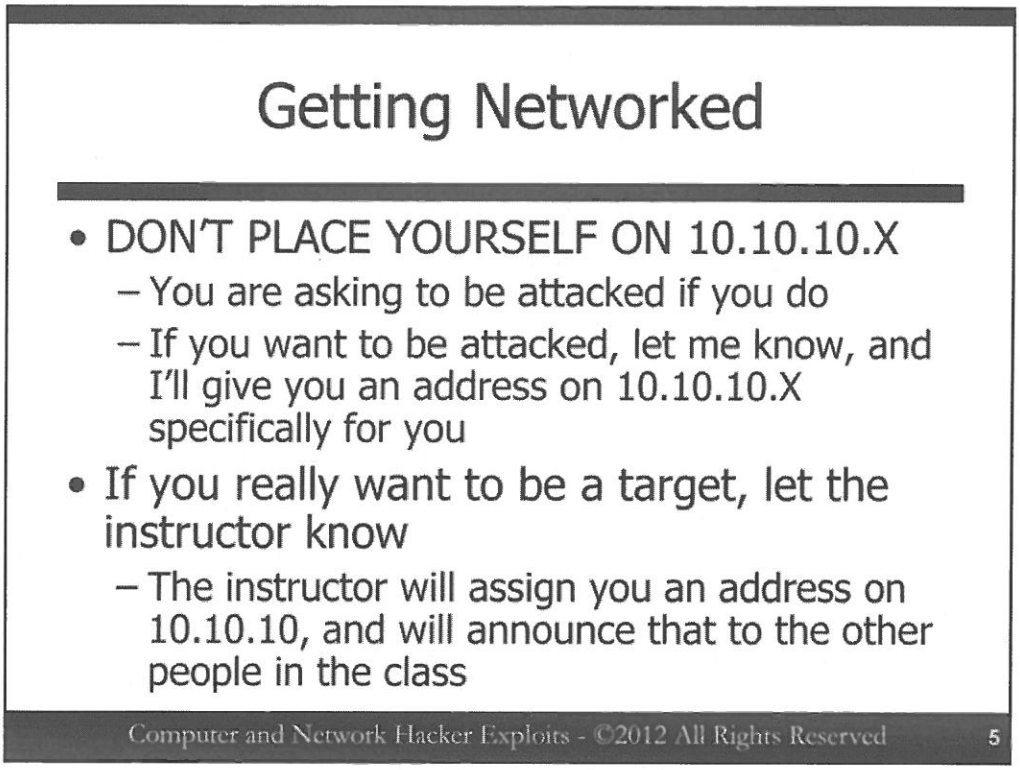
Please get yourself networked.

--> You should be able to ping 10.10.10.45.

If you can ping it from all of your OSs, you are ready to go.

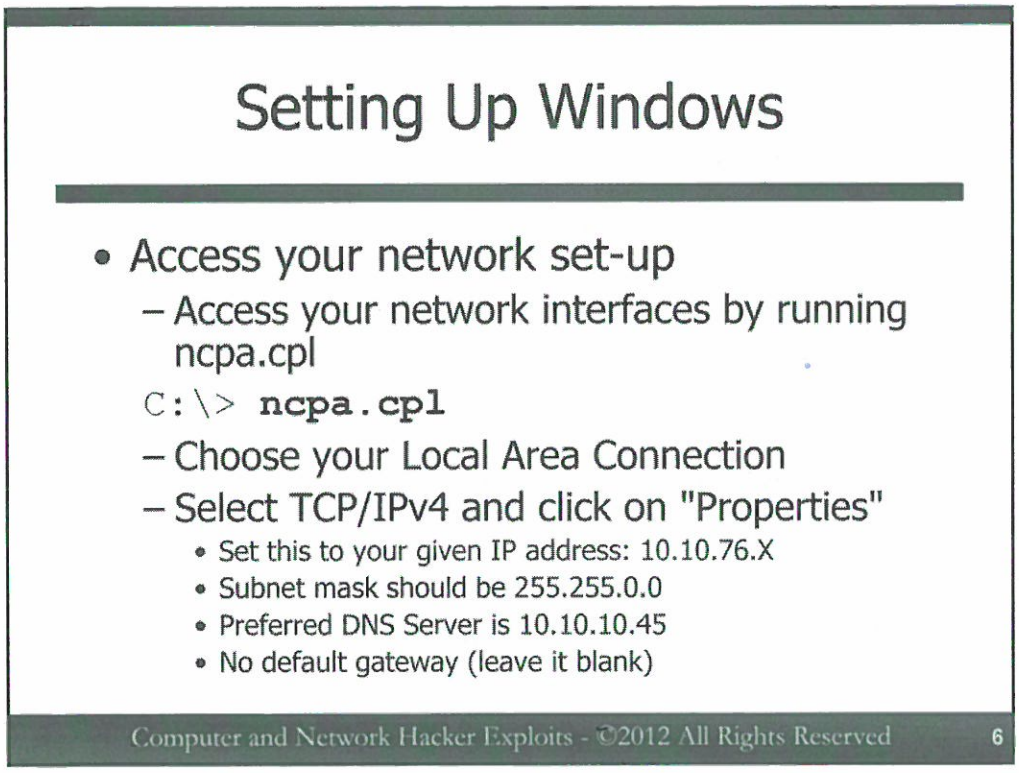
For help getting networked, please see me.

YOU DO NOT HAVE PERMISSION TO ATTACK YET!!! NO SCANS, NO ZONE TRANSFERS, NO PROBES... NOTHING!! ONLY ICMP ECHO REQUEST MESSAGES WITH NO PAYLOAD TO 10.10.10.45.

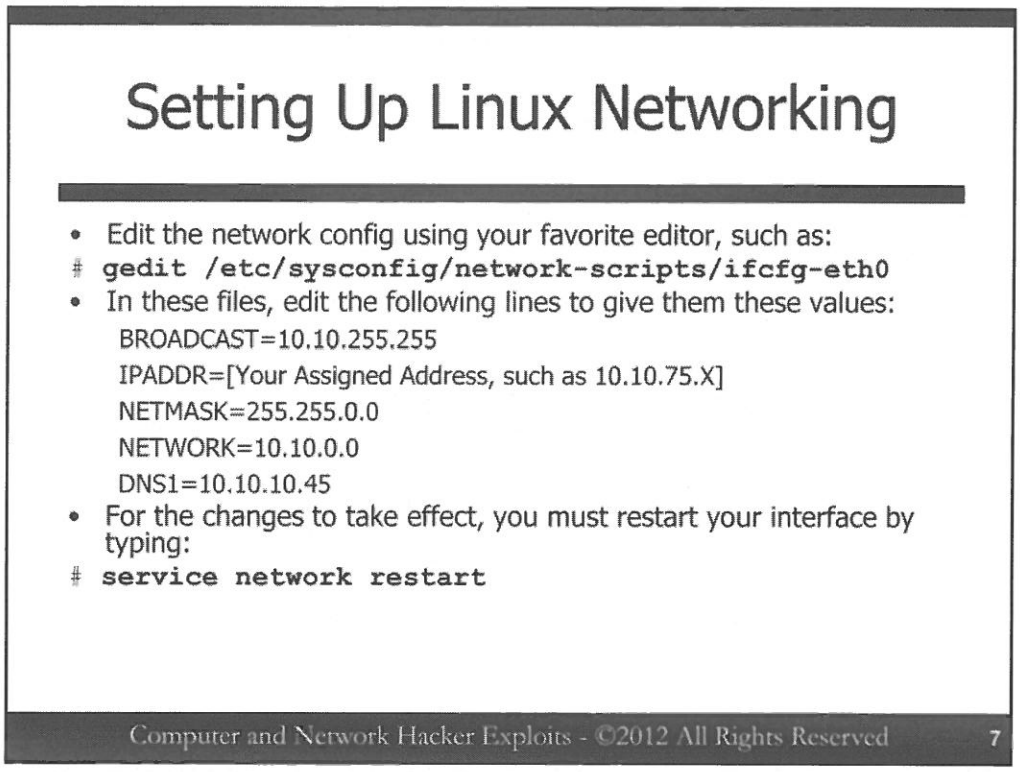


Our network is flat. No routers are in use here. Your focus should be on compromising the end systems to gather their flags, not on reverse engineering a network architecture.

Whatever you do, please do not place yourself on 10.10.10.X. That's the line of fire, and you very well may get hacked on that network. All of our targets will be on 10.10.10.X. If you really do want to be attacked, let me know, and I'll give you an address on 10.10.10.X specifically for you. I'll announce to the other participants that this is a student who has volunteered to enter the target network, so they know that this new target isn't one that is officially part of the game.



You should know how to configure your Windows networking. Just in case you don't, here are some hints.



In Linux, give yourself the following network settings by editing **/etc/sysconfig/network-scripts/ifcfg-eth0:**

BROADCAST=10.10.255.255
IPADDR=[Your Assigned Address, such as 10.10.75.X]
NETMASK=255.255.0.0
NETWORK=10.10.0.0
DNS1=10.10.10.45

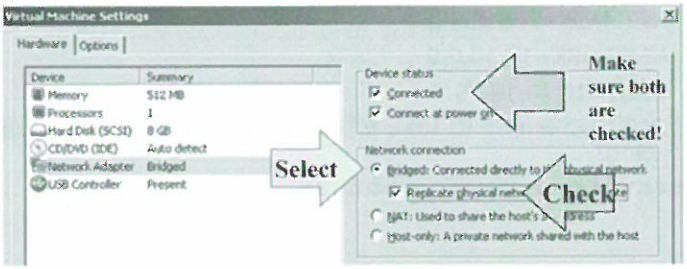
To apply these changes, run this command:

```
# service network restart
```

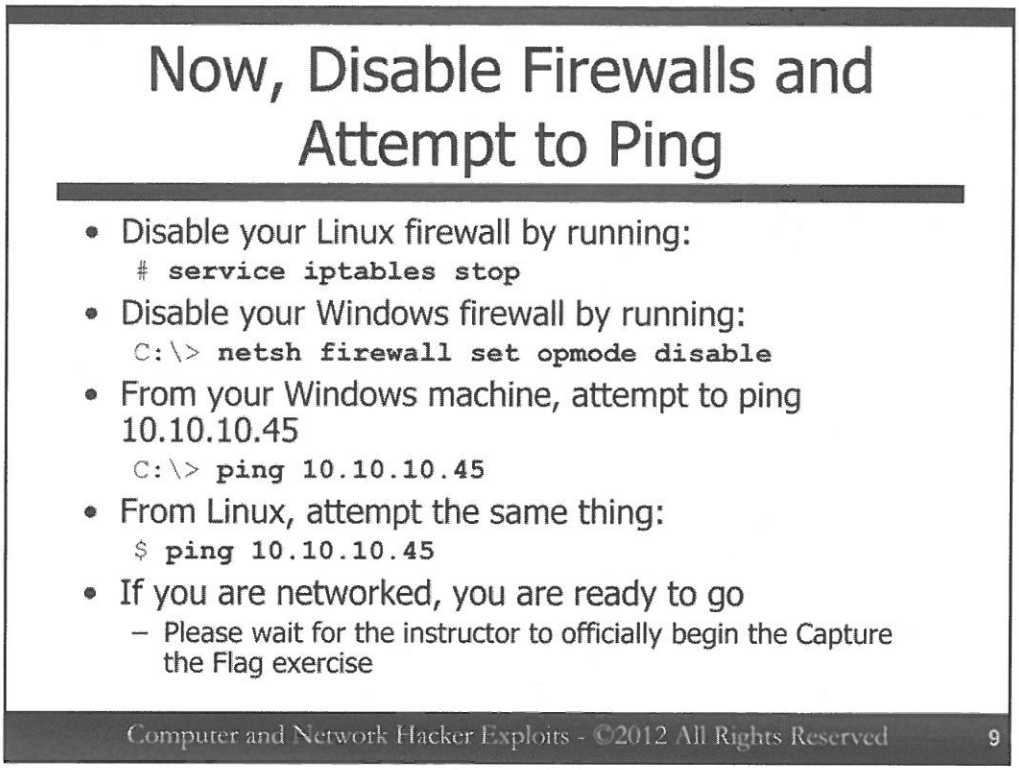
VMware Bridged Networking

- In VMware, used Bridged networking
  - Host-only doesn't make sense
  - NAT will get in your way

VMware
Under VM→
Settings



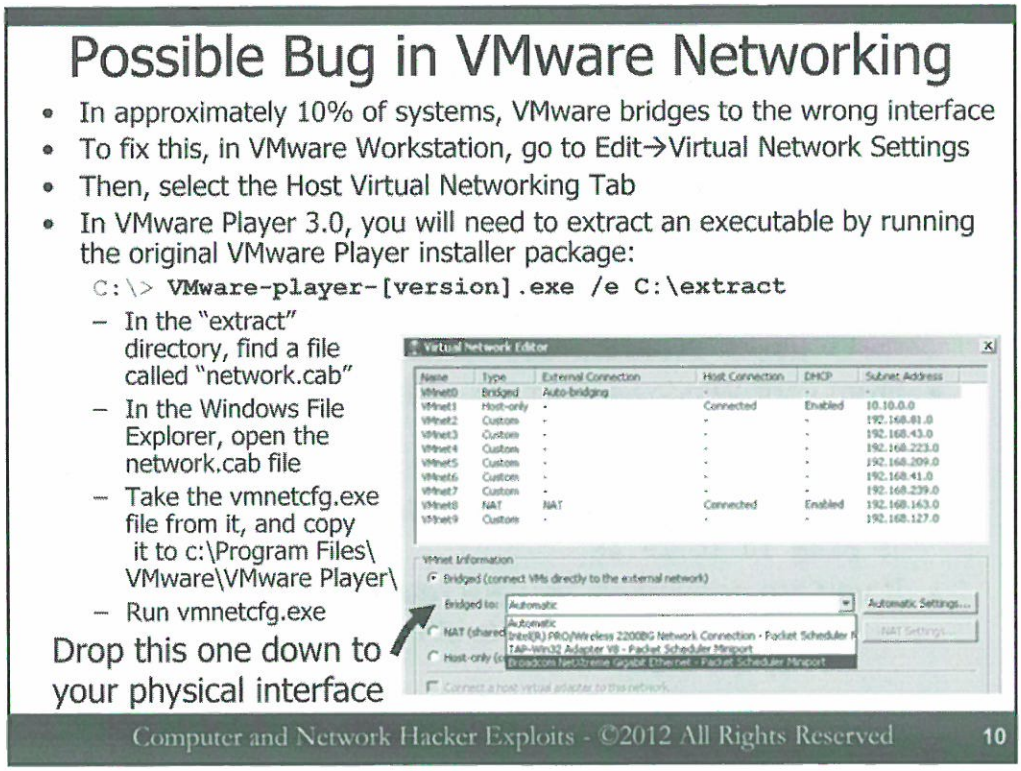
Configure your guest machine to use bridged networking. In VMware (Workstation or Player), go to VM→Settings. Click on "Network Adapter", and select "Bridged" networking. Select "Replicate physical network connection state." Then, make sure that you have a check next to "Connected" and "Connect at power on".



Once you have configured your host and guest IP addresses, as well as VMware for Bridged networking, please disable the firewalls on both operating systems so you can communicate freely across the network, using the commands on the slides above. Then, attempt to ping 10.10.10.45 from both Windows and Linux.

If it is working, you have successfully networked your system for the Capture the Flag event. Please do not attack the target machines yet. Instead, wait for the instructor to officially begin the Capture the Flag exercise.

If your networking doesn't work, it may be due to a bug in VMware, described on the next slide.



Sometimes, when using bridged networking, VMware will not be able to connect the network interface VMnet0 to your physical interface automatically. You may see errors in the guest machine associated with a disabled interface, or sometimes even IP address conflicts when there are no conflicts.

To fix this problem, in VMware Workstation, go to Edit→Virtual Network Settings. Then, select the middle tab, called Host Virtual Network Mapping. Select VMnet0. Then, under the "Bridged" portion of the screen, select the drop down box to choose your physical Ethernet adapter. You can even do this while the virtual machine is running. No reboot is necessary.

Click "Apply" and then "OK". Then, try again to ping 10.10.10.45.

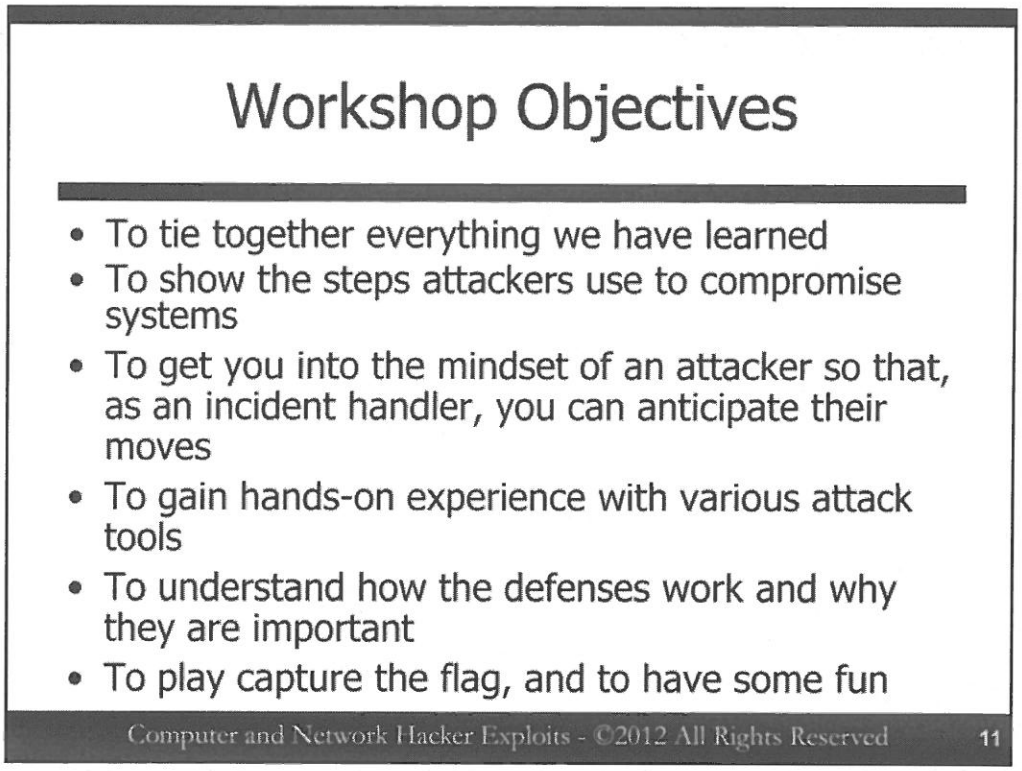
In VMware Player versions less than 3.0, you can do this same thing by running a program in C:\Program Files\VMware\VMware Player\vmnetcfg.exe. Run that program, and make the same change you see above.

If you are in VMware Player 3.0 or later, you need to extract the vmnetcfg.exe program from the VMware installation package. You can do that by running the following commands:

```
C:\> VMware-player-[version].exe /e C:\extract
C:\> cd c:\extract
C:\> explorer .
```

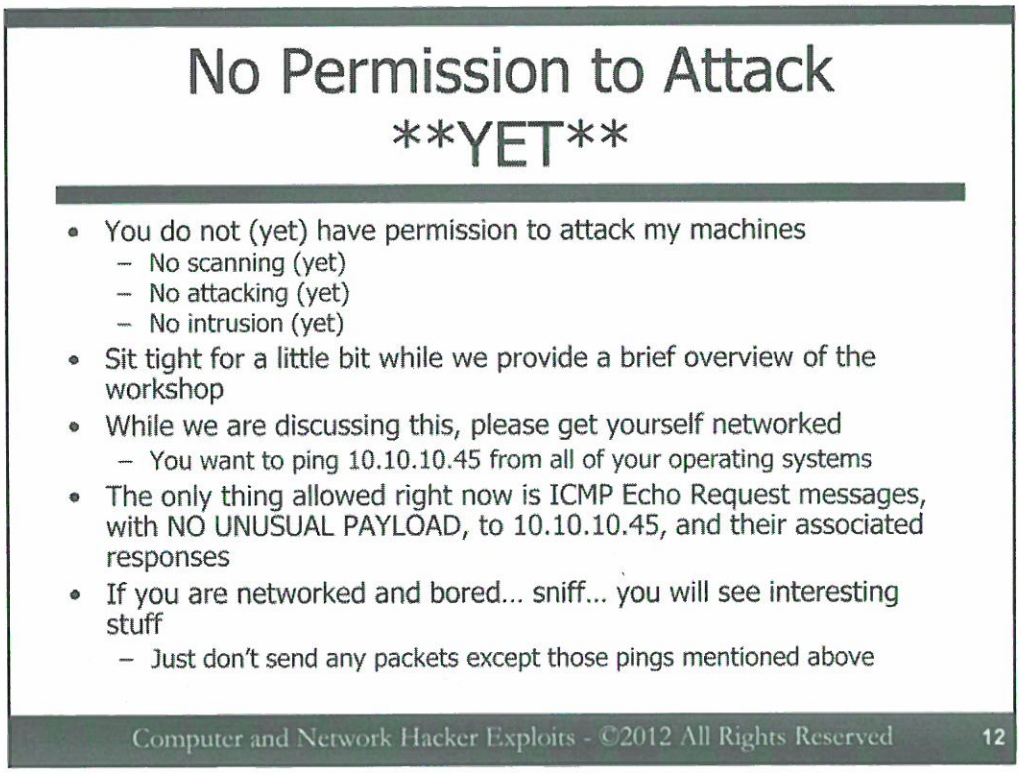
Now, find the file called network.cab, and double click on it. Here you will see a file called vmnetcfg.exe. Copy this file to C:\Program Files\VMware\VMware Player\

Then, run the vmnetcfg.exe file to reveal the GUI shown above. Select your local area connection physical adapter in the "Bridged to:" drop down menu, and click "Apply" and then "OK".



These are the reasons we are here today:

- To tie together everything we have learned throughout the previous five days.
- To show the steps attackers use to compromise systems.
- To get you into the mindset of an attacker so that, as an incident handler, you can anticipate their moves
- To gain hands-on experience with various attack tools.
- To understand how the defenses work and why they are important.
- To play capture the flag, and to have some fun.

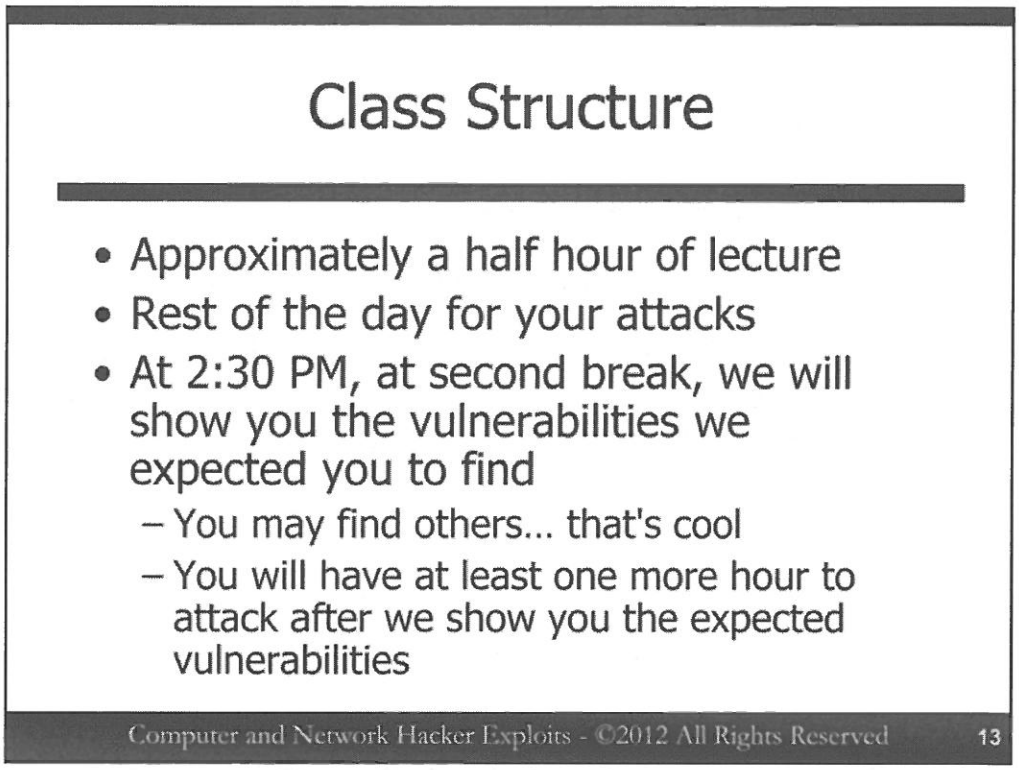


Just hang on for a little while. If you are already networked, you can start copying tools from the CD to your hard drive.

If your tools are all ready to go, please be patient. You'll be able to launch your attacks within half an hour.

The only thing allowed right now is ICMP Echo Request messages, with NO UNUSUAL PAYLOAD, to 10.10.10.45, and their associated responses.

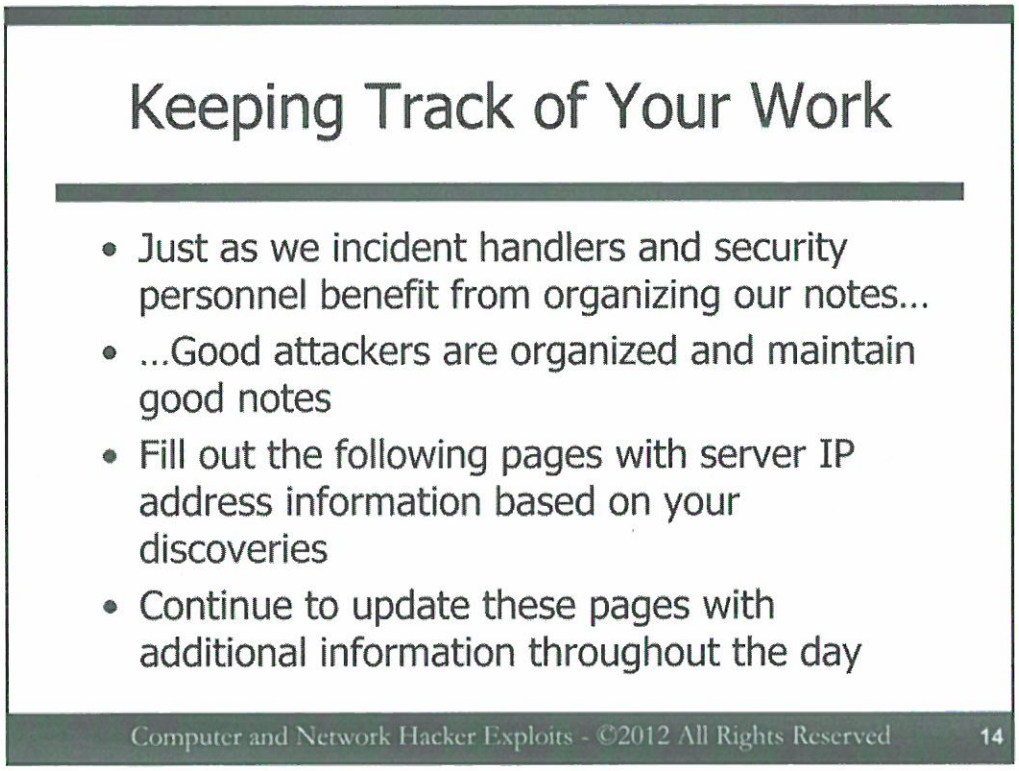
You are allowed to do passive sniffing, if you'd like. You will see some interesting packets coming occasionally from 10.10.10.X.



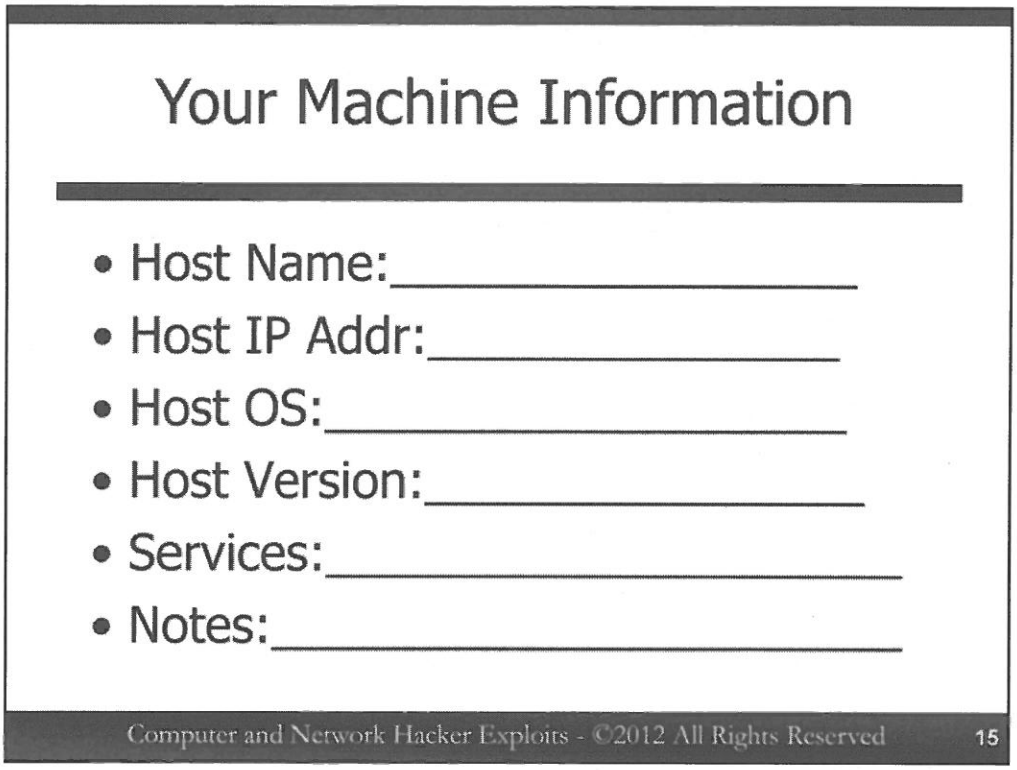
You will have plenty of time to attack the systems. Please get yourself networked.

At 2:30 PM, at our afternoon break, we will show you a vulnerability map describing the state of the systems when we arrived this morning. We'll go over each vulnerability and explain how it can be exploited. You may find other vulnerabilities beyond what we show at 2:30 PM… that's cool, and we welcome you to comment on your findings in class at 2:30 PM. Please feel free to dazzle the class with information about your brazen exploits (while following the GROUND RULES!).

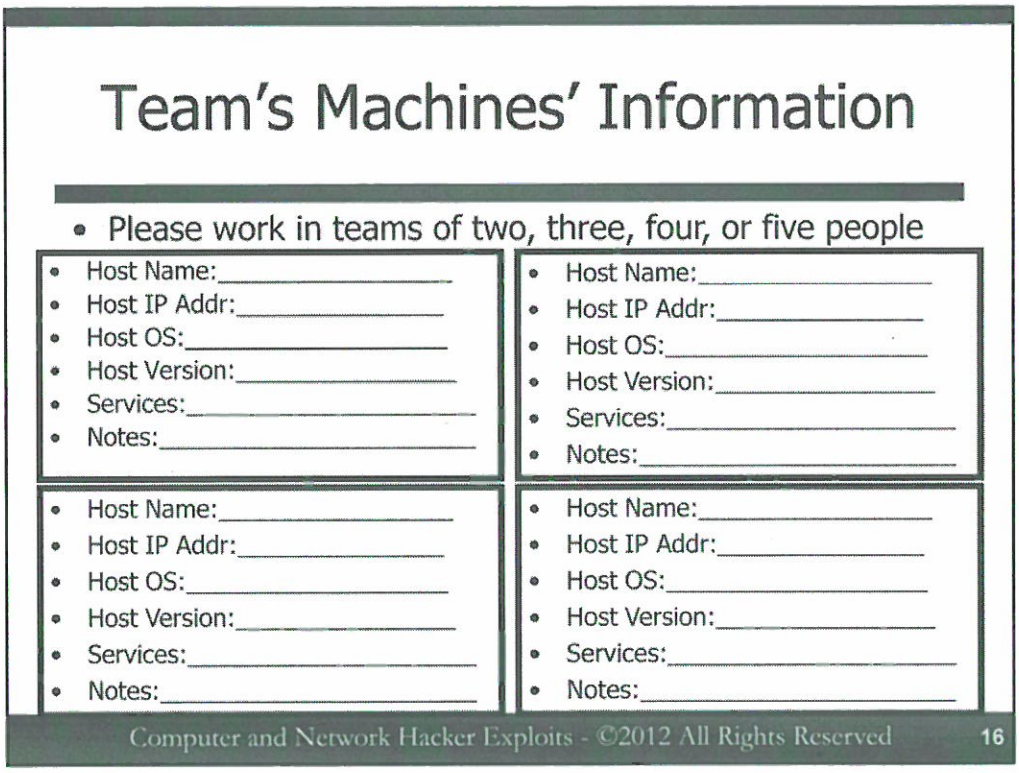
You will have at least one more hour to attack after we show you the expected vulnerabilities. That way, you'll have all the vulnerability information you need, and can attack with full knowledge of the target environment.



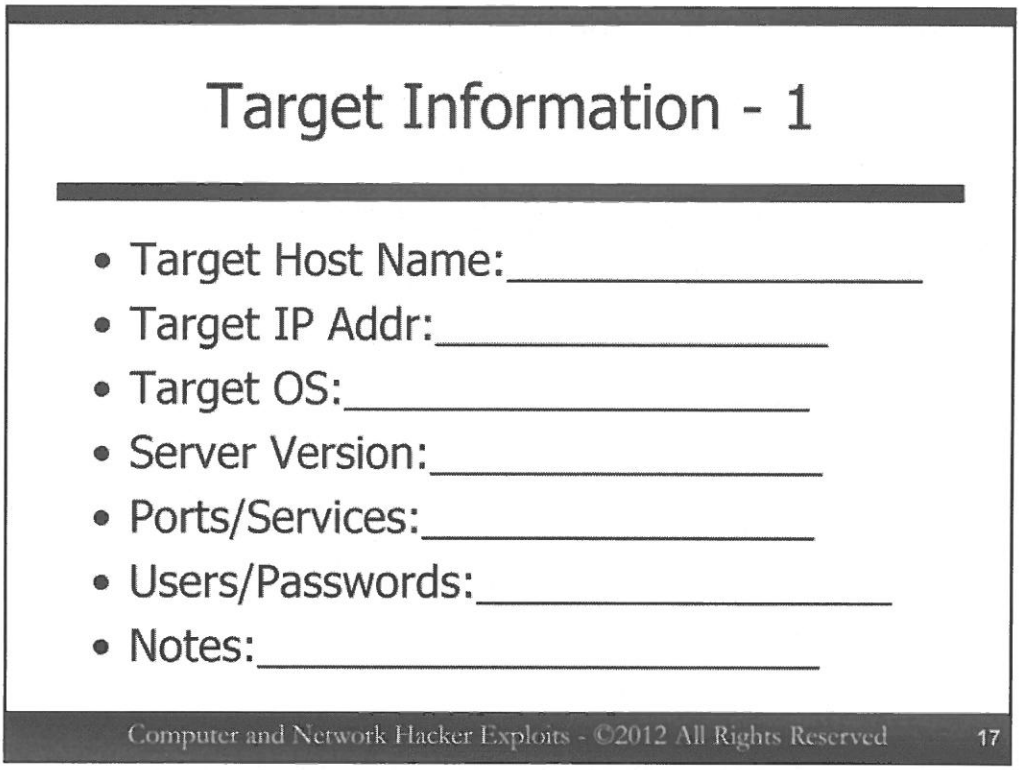
Take detailed notes. Remember, information gathered from one system might be useful in attacking other systems.



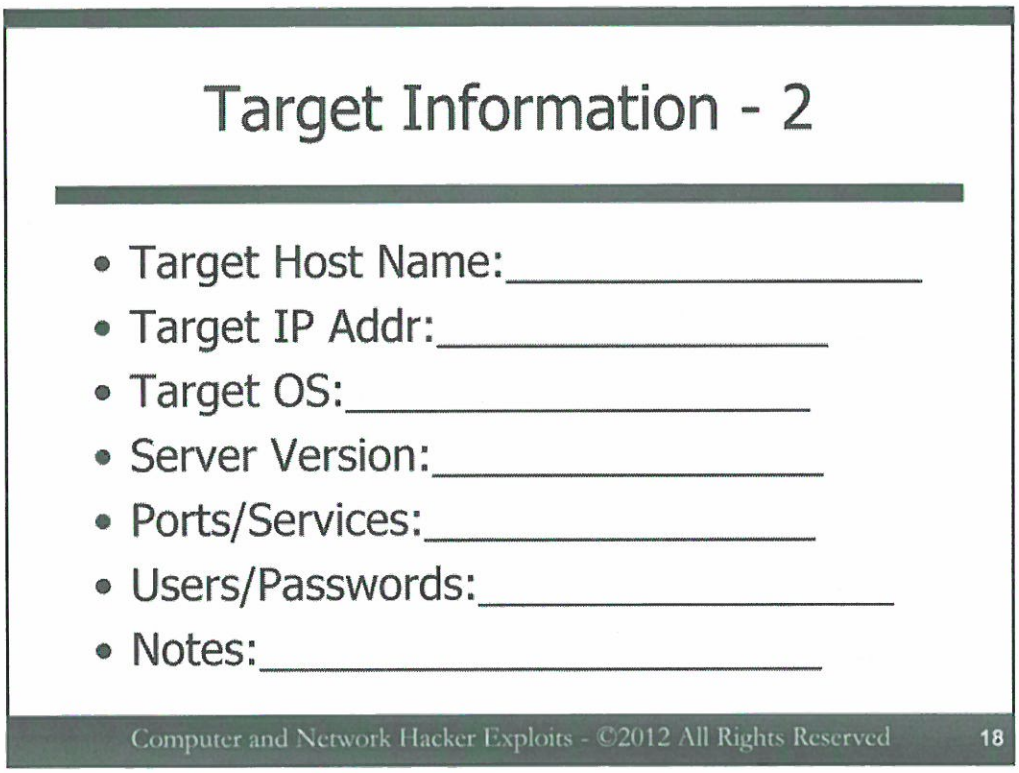
You will receive your IP address from a room monitor. To get an IP address, you will be required to show the room monitor your badge and your MAC address.



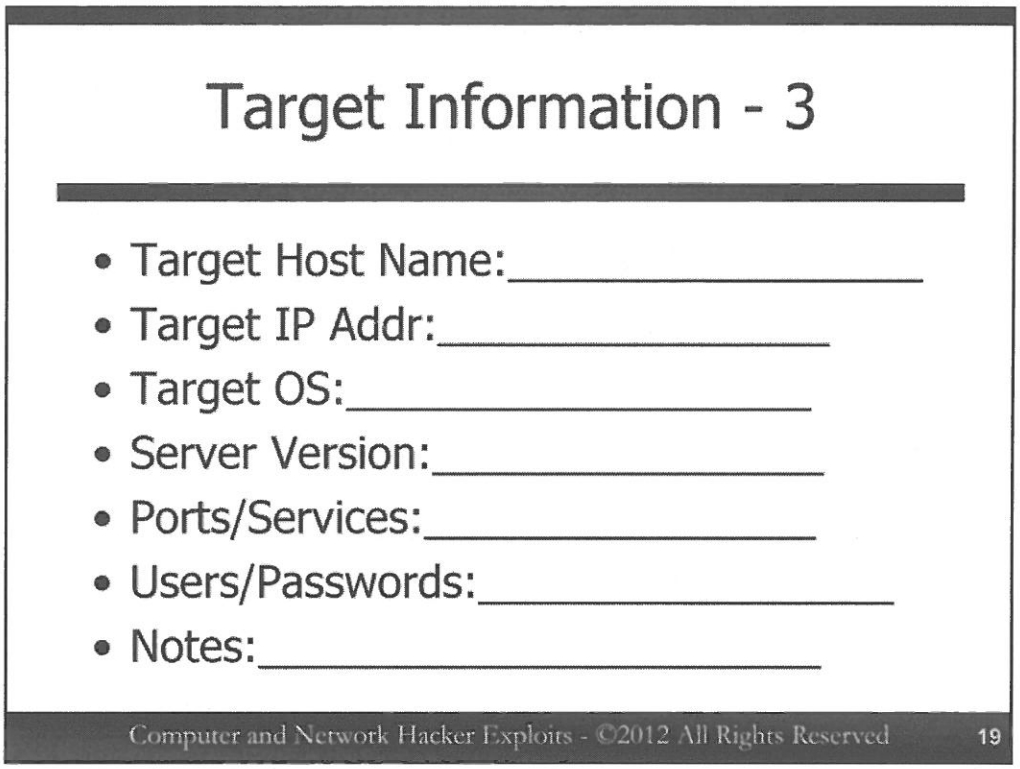
I strongly encourage you to work in a team of two, three, four, or five people. That's how many attackers work. Also, you will learn far more if you work with a team throughout the day. You'll get further, and perhaps make a new friend, although there are no guarantees. ☺



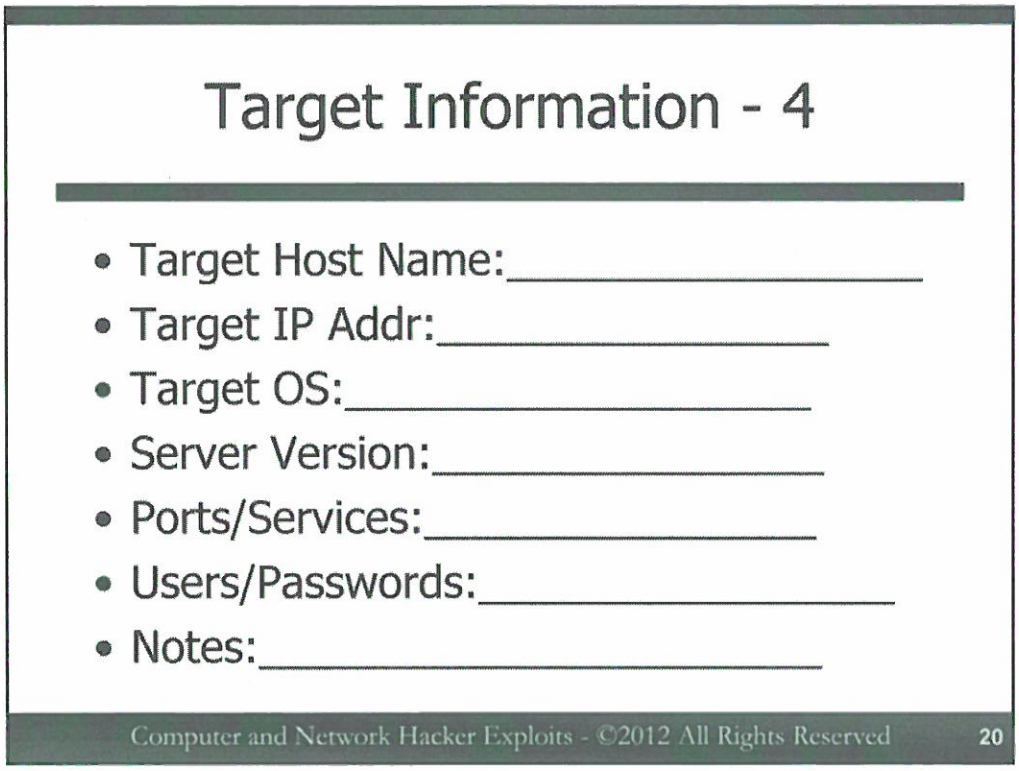
You will be filling these sheets out with the information you discover during your scans and attacks.



You will be filling these sheets out with the information you discover during your scans and attacks.

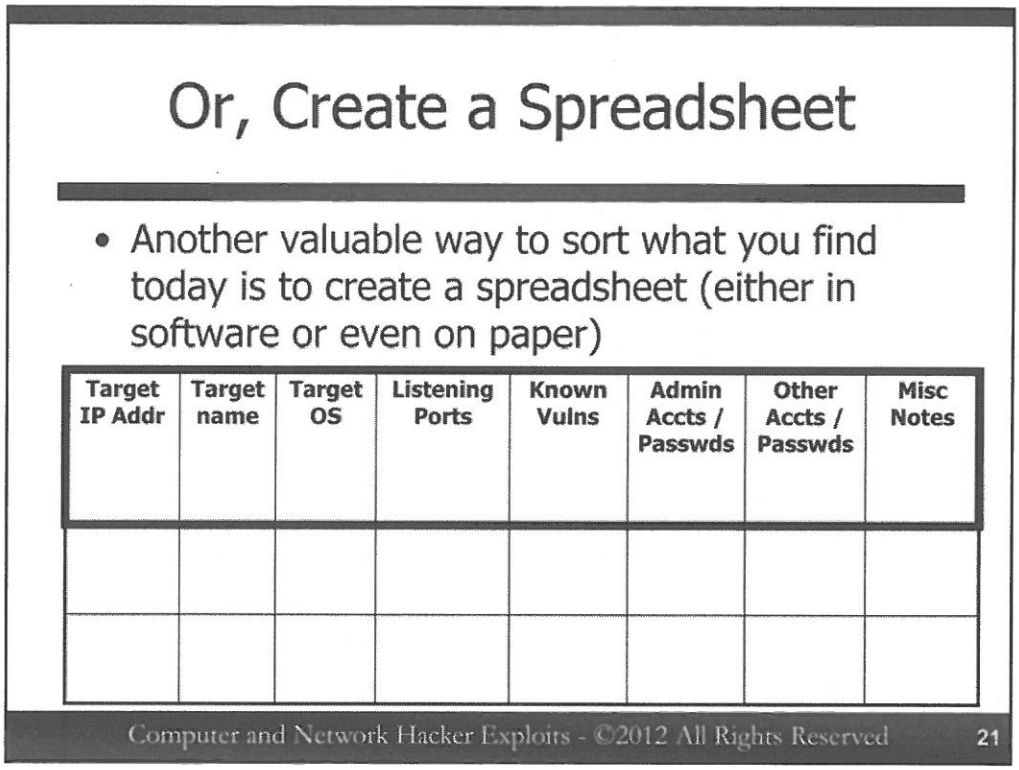


You will be filling these sheets out with the information you discover during your scans and attacks.

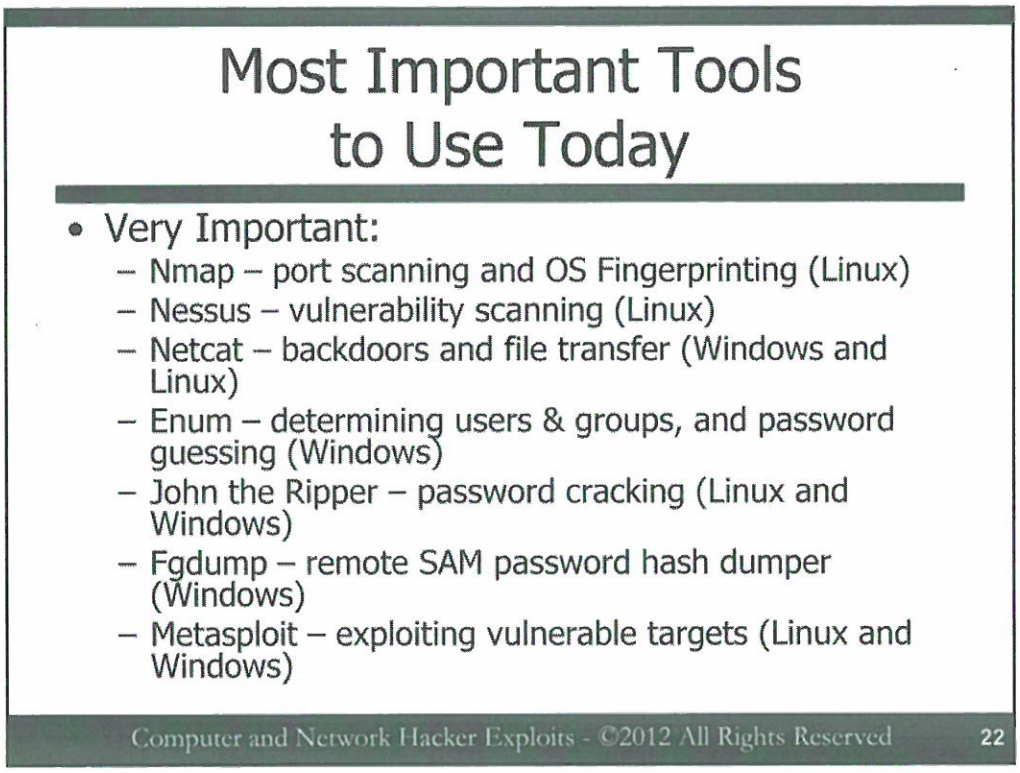


You will be filling these sheets out with the information you discover during your scans and attacks.

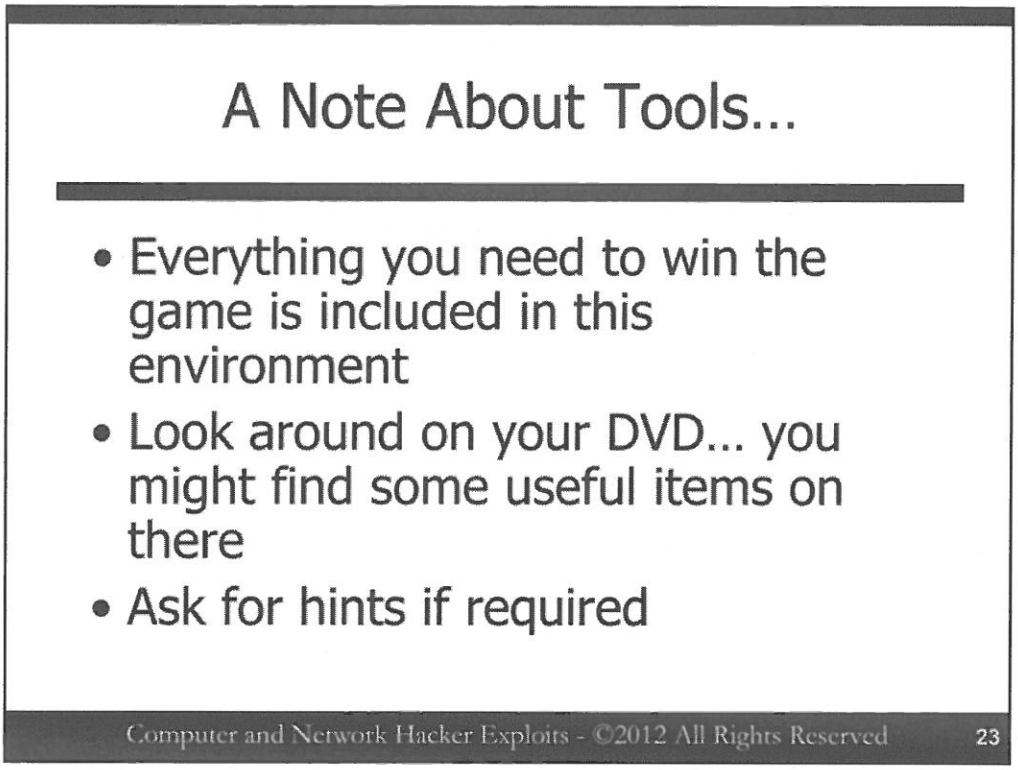
You may even find more servers on the 10.10.10.x network. Write notes about such servers below.



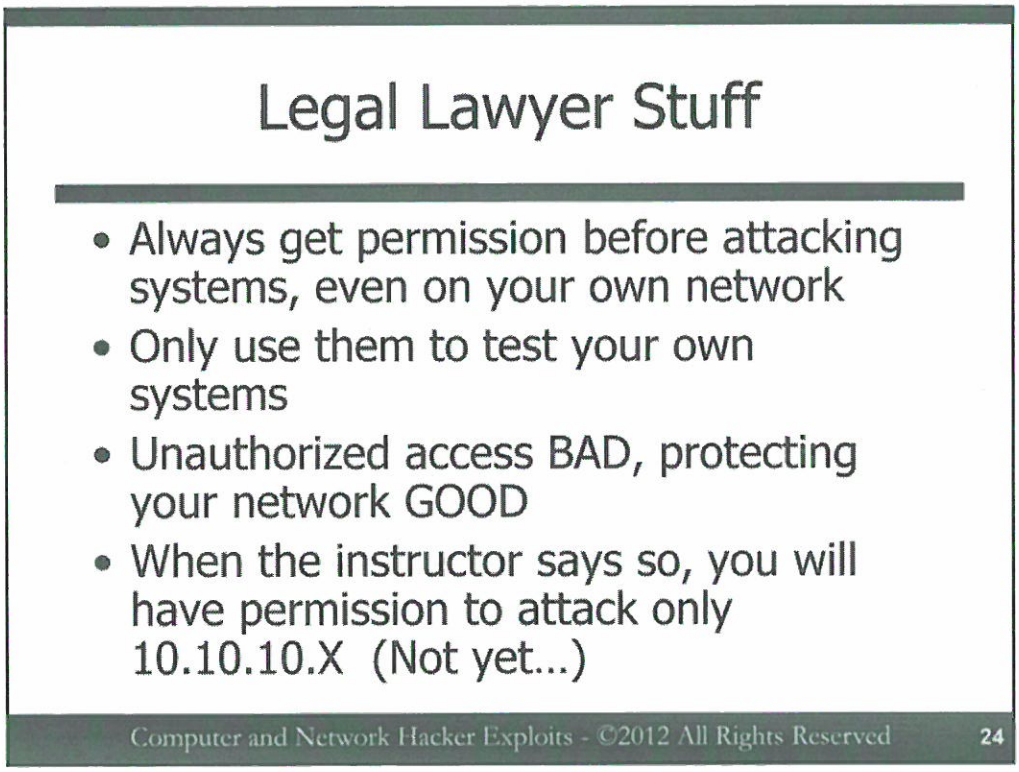
Another format that is especially useful when doing penetration exercises is a spreadsheet of all findings so far, recording each cell in the spreadsheet as you discover new information. You may want to do this for your work today, either in a software spreadsheet or even on paper.



You should attempt to use all of the Very Important tools (on your own or on a partner's machine). The others are nice to use, but are not essential.



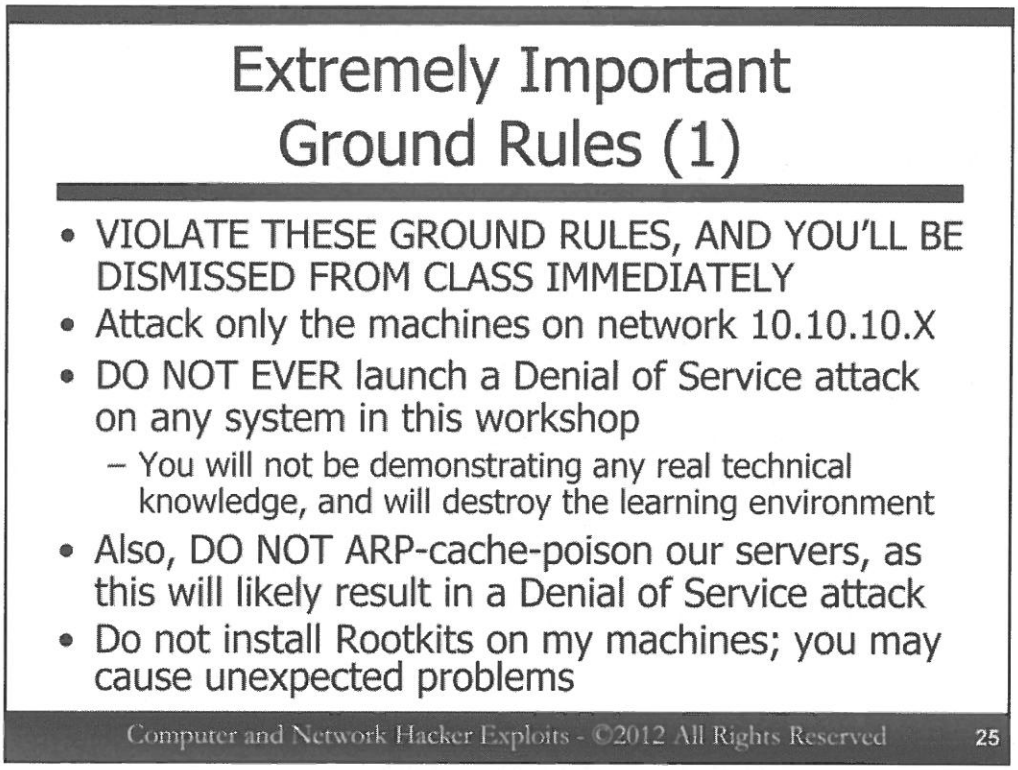
You can win the capture the flag game with everything you have in this environment. Look around on the course DVD for interesting tools and features. Feel free to ask for hints about given tools.



I am not a lawyer and I do not play one on TV. However, I just want to make sure everyone realizes that the exploits and programs that we are going to cover today could get you into trouble if you use them improperly. We are covering them so that you can learn to protect your network and respond to attacks. In no way, shape, or form are we giving you a license to hunt. The tools should only be used to test your own network and only after you get the proper permission.

You do not have permission to attack yet. When I say so, you will be able to attack 10.10.10.X, subject to our ground rules.

Speaking of ground rules, let's discuss them in detail next.



WAKE UP! This is important stuff for the rest of the day.

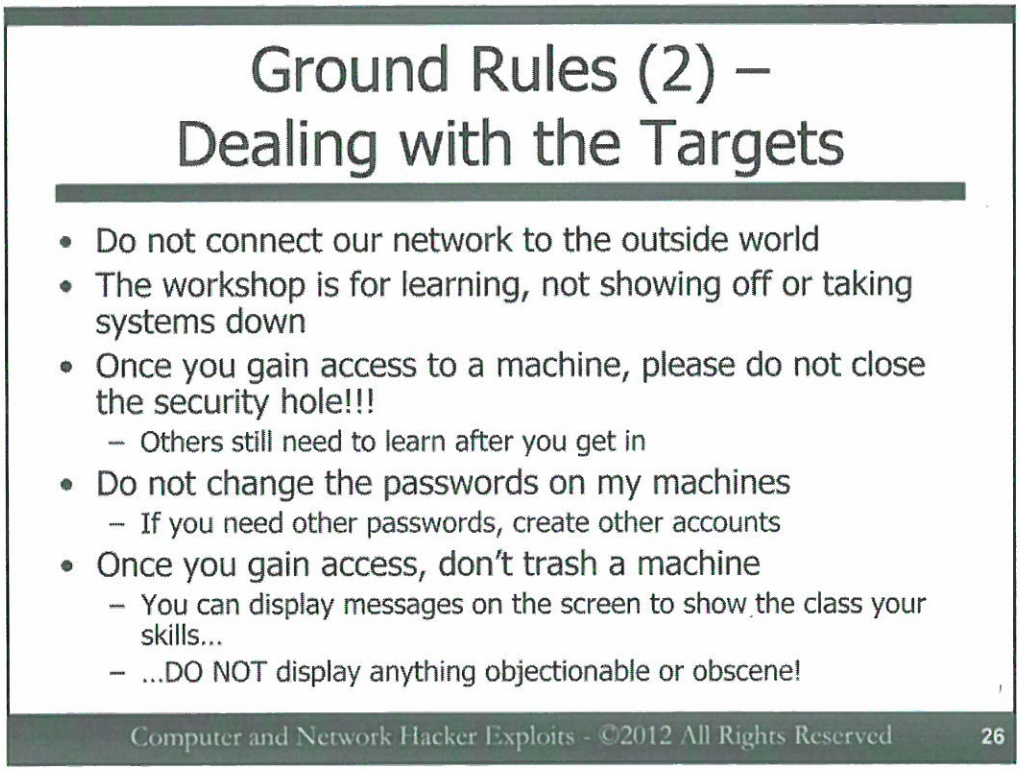
Attack only the target machines, which are all located on 10.10.10.x.

Denial of service attacks are strictly forbidden!

No ARP cache poisoning! That could turn into a Denial of Service Attack, if you aren't careful. Frankly, I don't want to risk it, and neither should you.

For Rootkits, you can install them on your own machine to experiment. However, do not install them on the class target servers (10.10.10.x). Replacing system executables or modifying the kernel can easily result in destroying the OS, which would damage the learning environment.

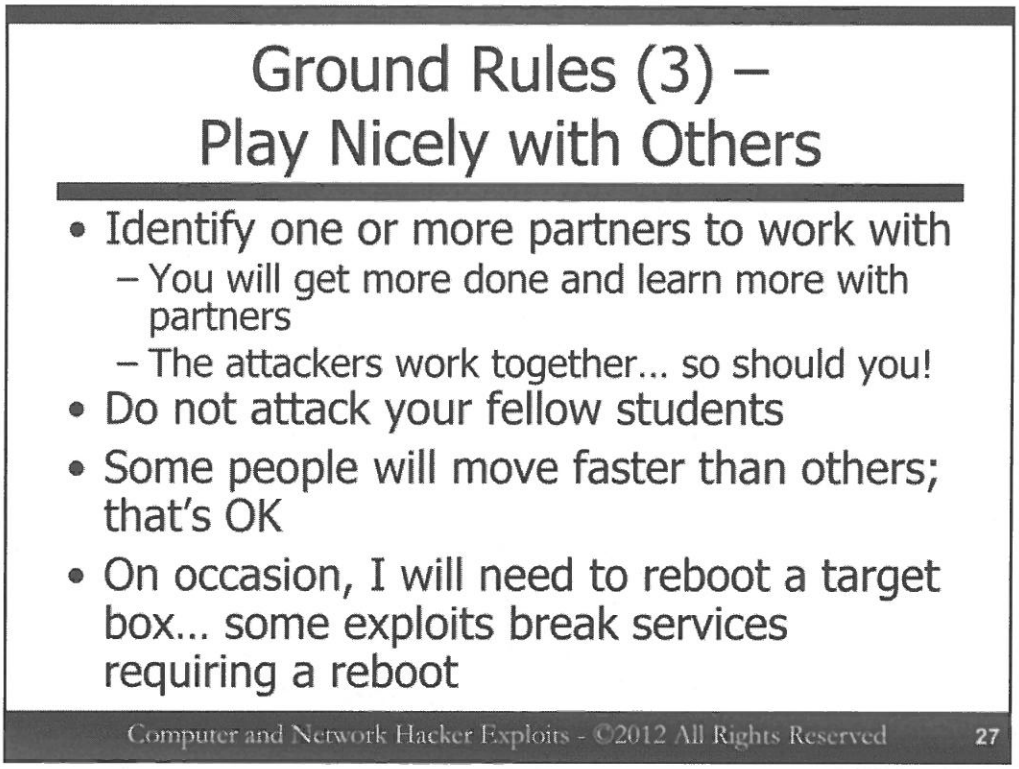
Please do follow these rules. They really aren't _that_ onerous. They are mandatory!



Please follow the ground rules. Not following the ground rules could result in dismissal from class.

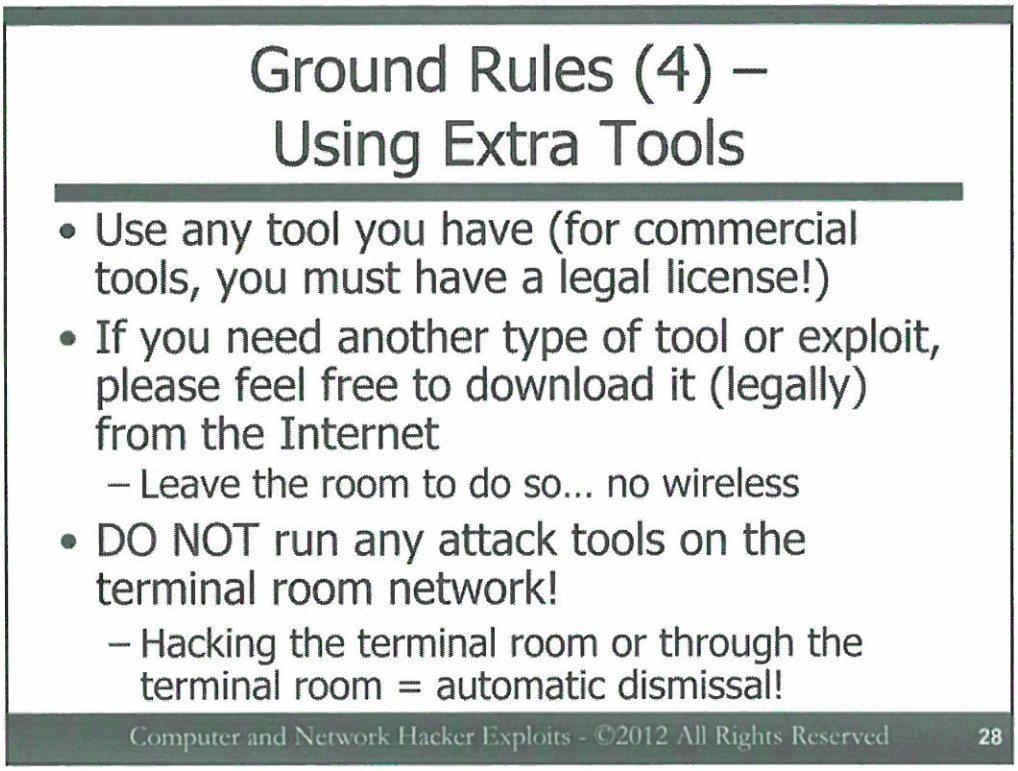
Connections to the outside world (SANS' networks, hotel networks, or the Internet) are strictly forbidden.

Don't trash a machine, or fix a hole. If you do that, you'll destroy the learning environment, with its carefully placed security vulnerabilities, each designed to teach a specific lesson.



Please follow the ground rules. Not following the ground rules could result in dismissal from class.

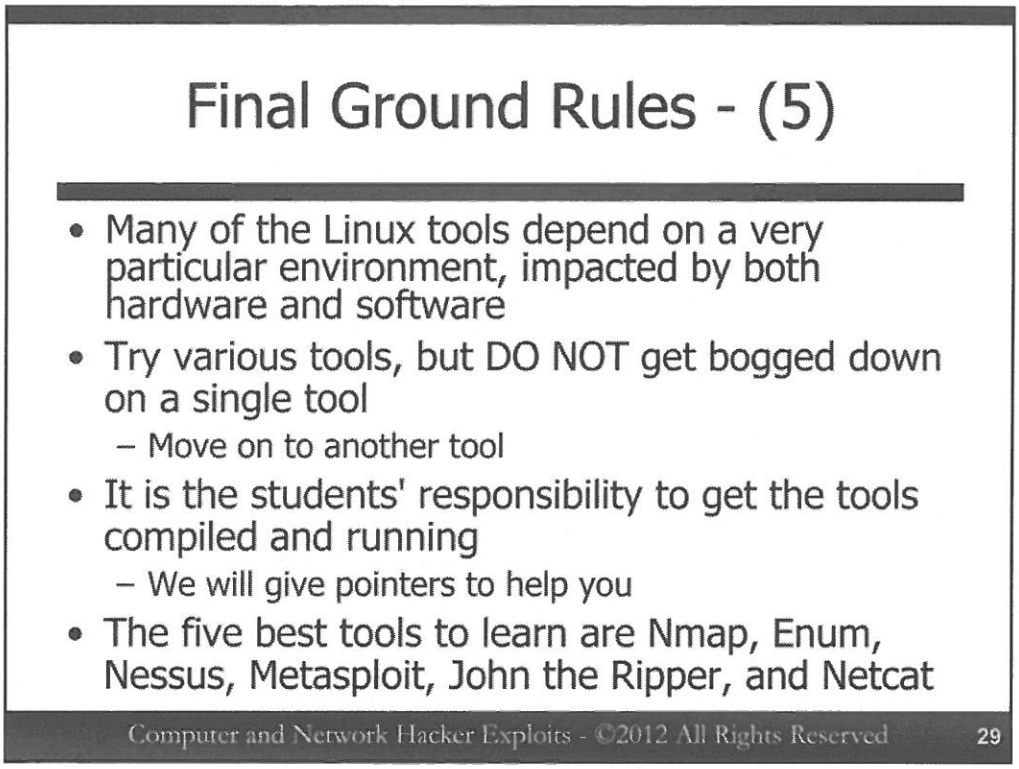
Work with a partner, and, above all, do not get frustrated! Ask for help, if you need it.



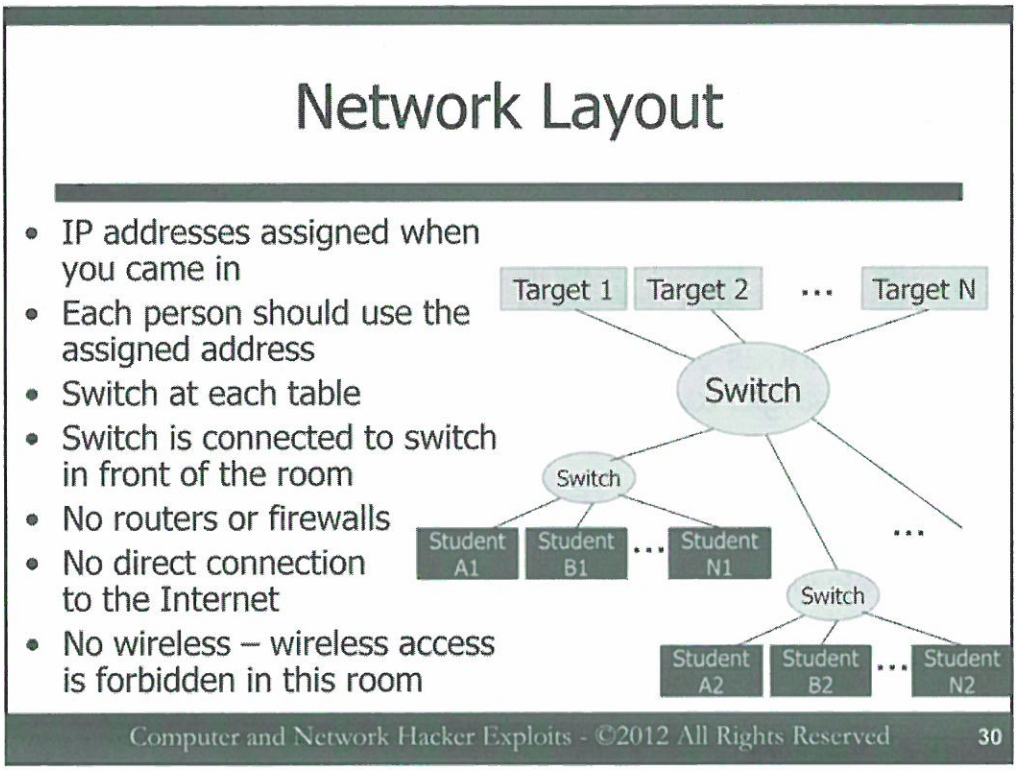
Please follow the ground rules. Not following the ground rules could result in dismissal from class, especially the rule about not attacking the terminal room!

Do not pirate software! That violates SANS' rules, and is ethically wrong.

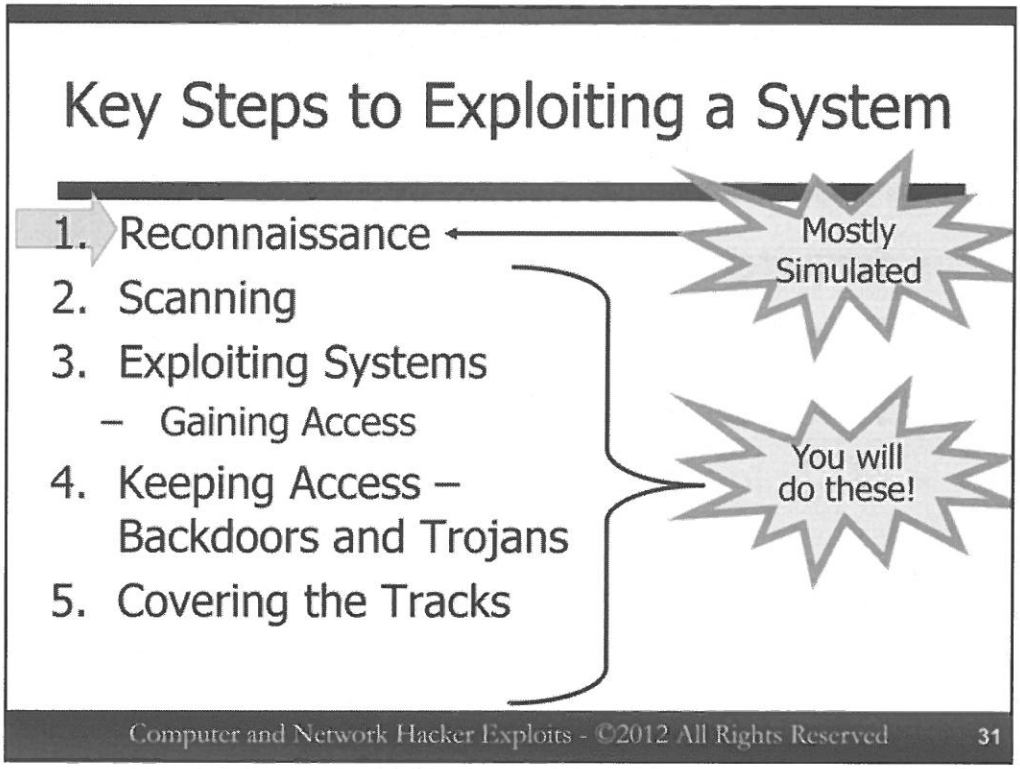
If you need another tool, feel free to download it from the Internet, provided that you have a legal license.



Feel free to use any tools for which you have a legal license, but remember not to get stuck for more than 30 minutes on a single tool. Move on if it doesn't work, or try to have another team member run that tool. You can make great progress in the capture the flag game, if you are very clever, using only Nmap, Enum, Nessus, Metasploit, John the Ripper, and Netcat. However, other tools can help you to win even faster. You can refer to the Linux mini-workshop in the back of book 504.1 for additional tips on Linux.

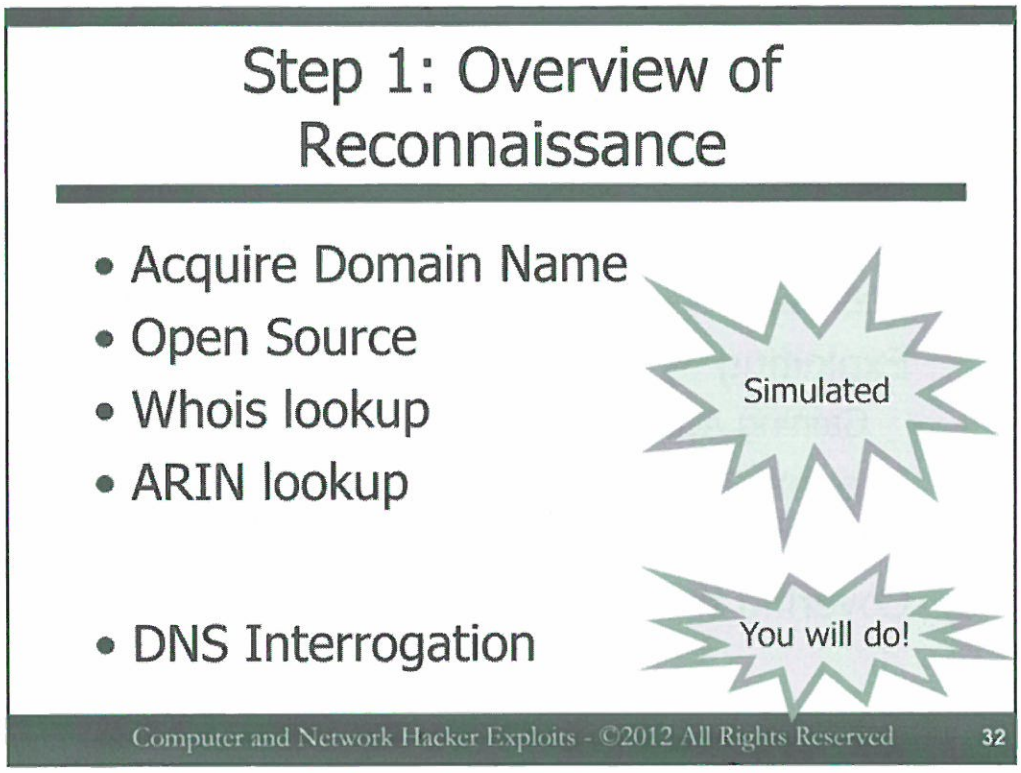


If you use wireless LAN cards, there is a chance that you will inadvertently bridge the whole class to the Internet. The class would then, potentially, leak attack packets on to the public Internet. We must avoid this, so wireless LAN cards are forbidden.



As we have discussed throughout this session, these are the steps an attacker would use to conquer a system. These items are what you need to understand and protect against. We will actually try out each of these steps.

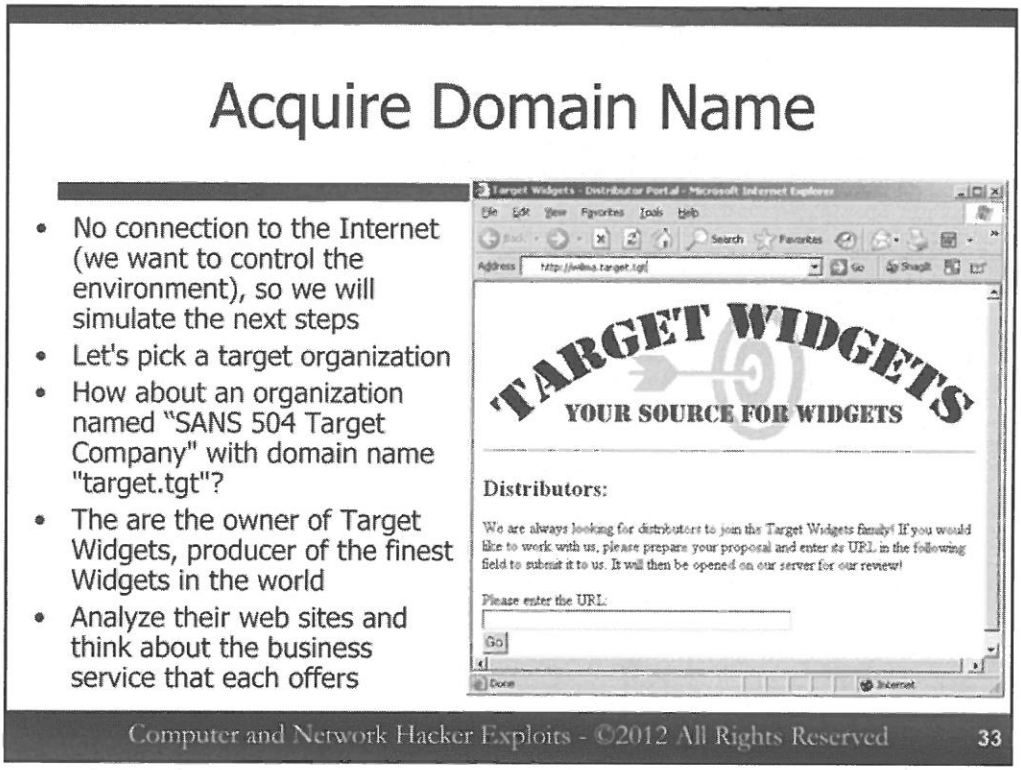
Here's the scenario: we're performing a penetration test of a target organization by running through these phases. Your goal is to break into as many target systems on the 10.10.10.X network as possible, with the highest privileges you can achieve.



Step 1 is casing the joint. Because we have no Internet connection, most of this phase will be simulated.

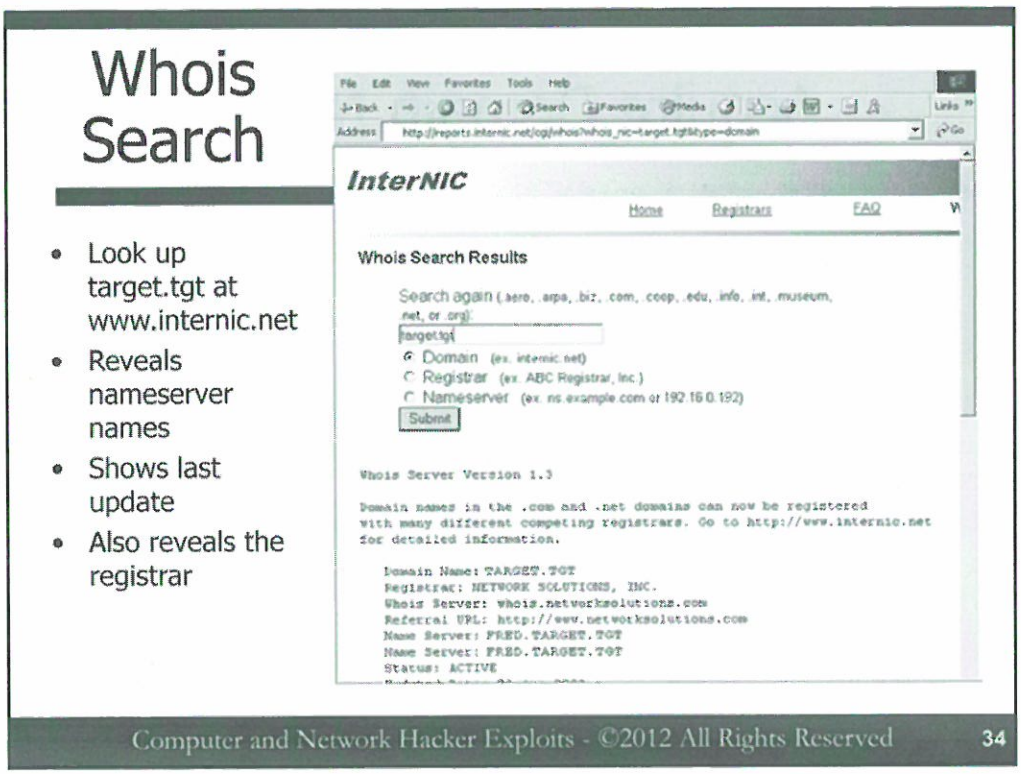
We'll walk through the steps performed during normal recon, telling you the results you would have gotten in a real penetration attempt.

However, you'll be performing the last element of recon, DNS Interrogation, on your own against one of our servers.



In order to get started, we need to pick a target organization. Just for reference purposes only, let's pick a sample organization named "SANS 504 Target Company". This company owns a company called "Target Widgets", which produces some of the finest widgets in the world.

When you analyze their websites, try to think about what each one is doing from a business perspective. That'll help you sort out your planned attack.



Here is the result we get when we perform a whois lookup of our target site (target.tgt) using www.internic.net. Remember, this is a completely hypothetical search; there is no real "SANS 504 Target Company" in the outside world. This InterNIC record is simulated.

Note the very relevant information here: the target DNS server name is fred.target.tgt, and this domain was registered with www.networksolutions.com. Next, we'll interrogate this network solutions whois server for more details.

Whois – Detailed Search (1)

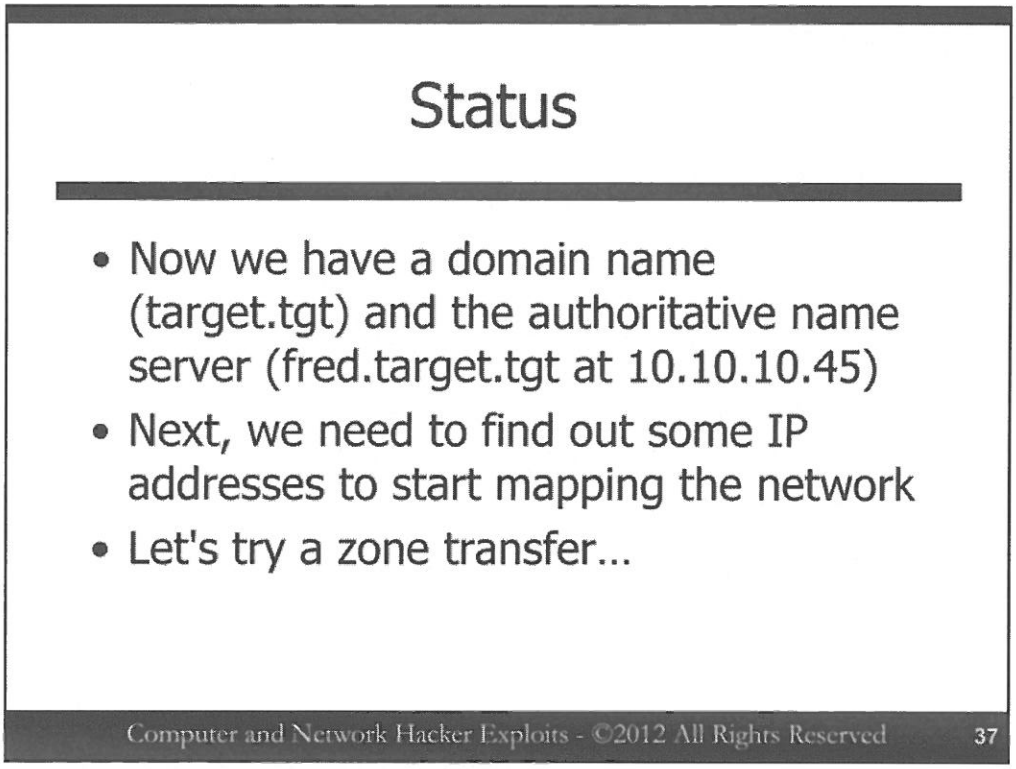
```
TARGET.TGT
Registrant:
Johnson, Bob "Nugget"
   (BN160)  bob@target.tgt
   555 Main St.
   City, State Zip
   222-555-1212

Technical Contact:
   Falken, Professor
   (FF1243)
   333 State St.
   City, State Zip

   444-555-6541 (FAX) 444-
   555-6551

Billing Contact:
   Smith, Susan  (ZQ1458)
   susan@target.tgt
   666 Acorn Ave.
   City, State Zip
      777-555-1212
```

Computer and Network Hacker Exploits - ©2012 All Rights Reserved 35

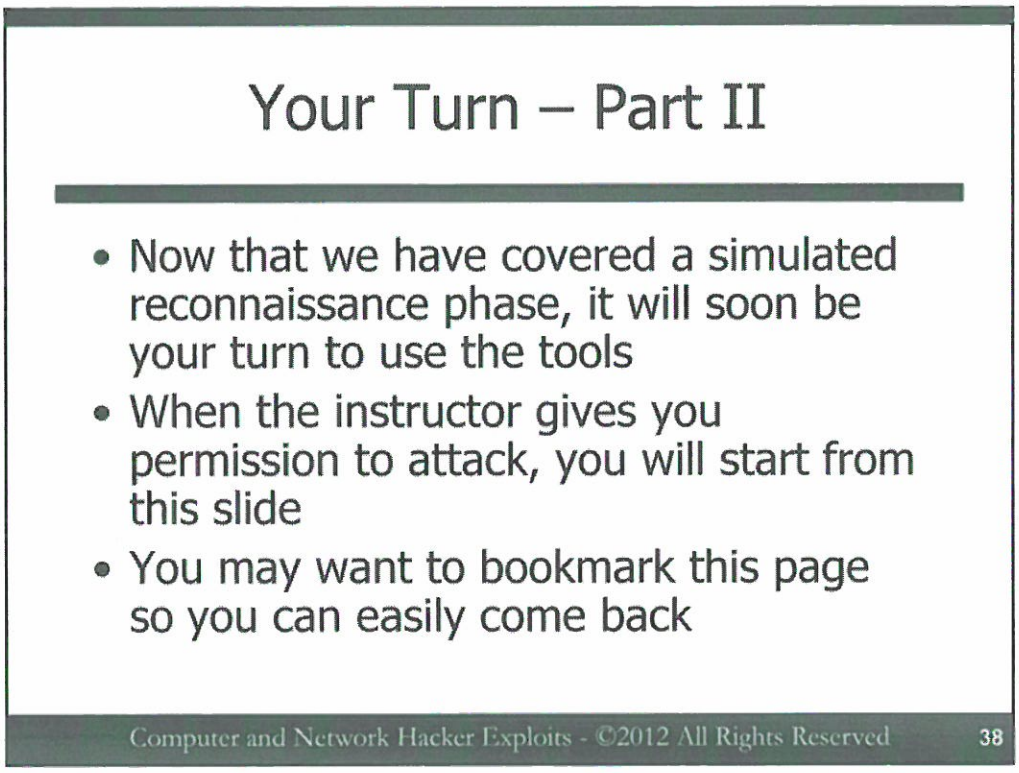
Here is some additional useful information associated with our target domain. Note those interesting names, addresses, and phone numbers.

Finally, at the end of the detailed record, we get the IP address of the DNS server for our target organization. We'll use this value shortly to attempt a zone transfer.

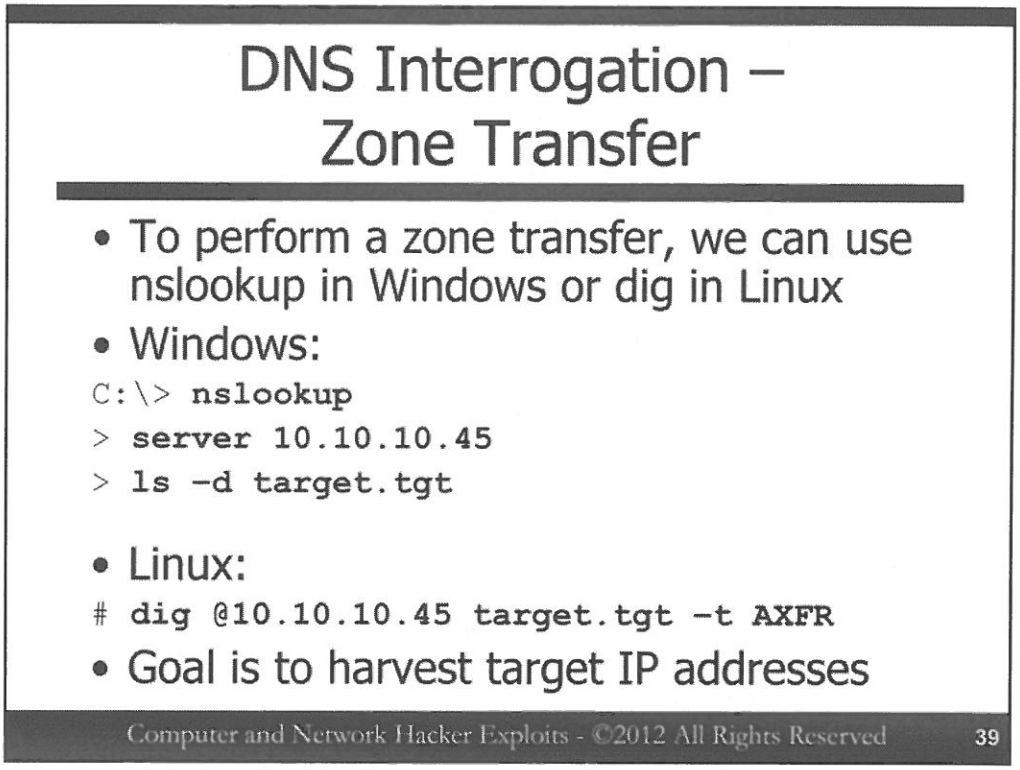
Remember that the target organization's DNS server is 10.10.10.45. That's hugely useful information.



It's important to take inventory. What have we gotten so far? A target organization's name, a domain name, and a DNS server! Not bad for a few minutes' work.

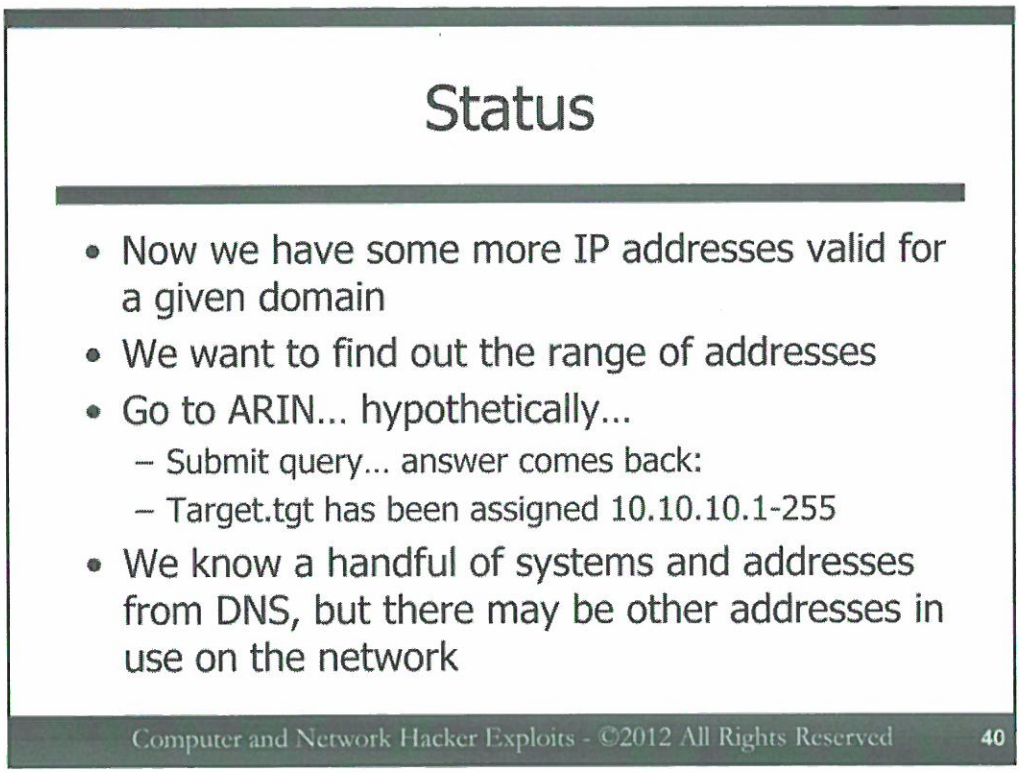


You may want to dog-ear or bookmark this page, as it is the place where you will return after the lecture component of this class.

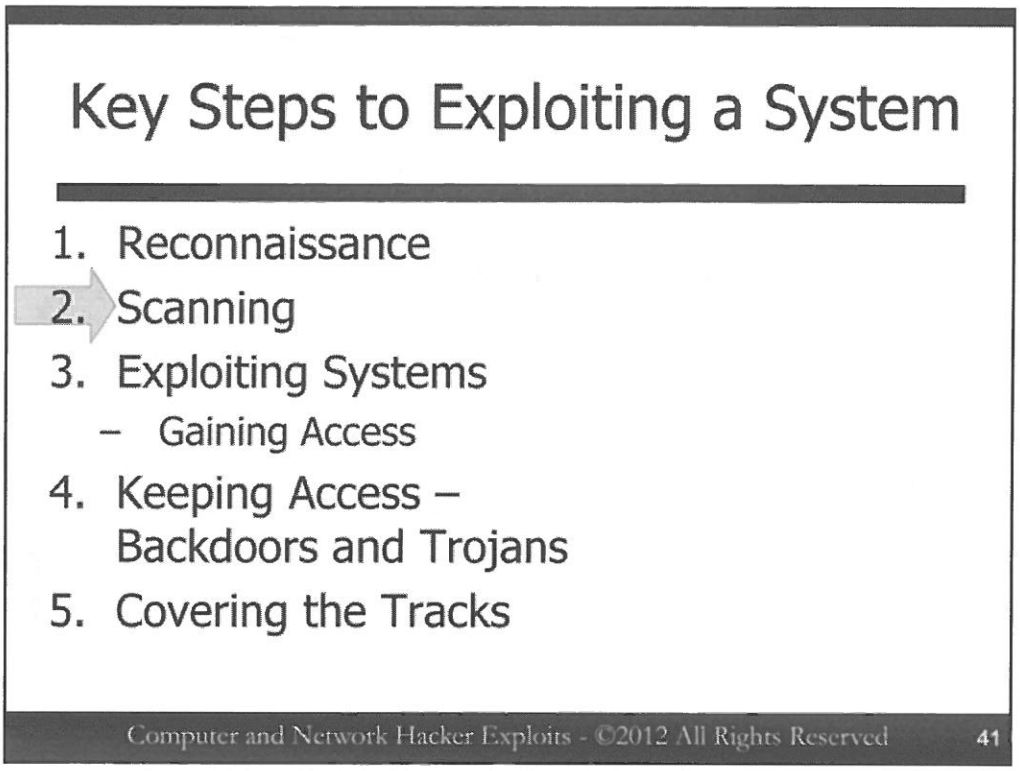


Try to harvest domain names using nslookup in Windows or dig in Linux.

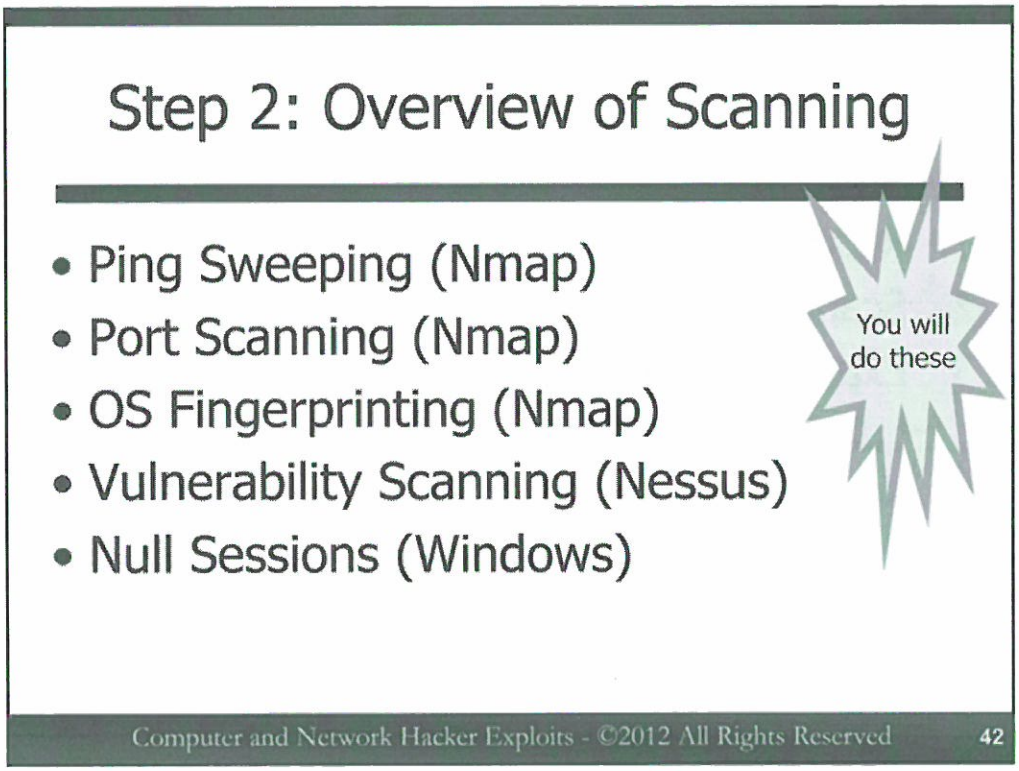
If zone transfers are blocked on these machines, we can skip this step and move on directly to scanning the 10.10.10.1-255 target network.



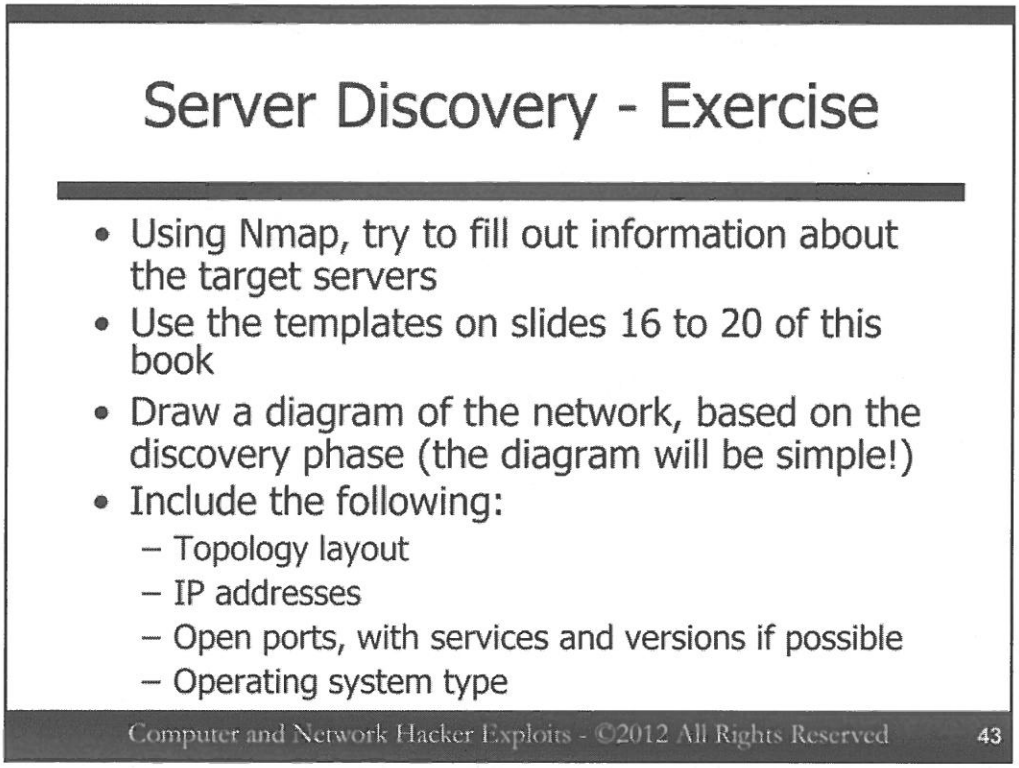
After a zone transfer of target.tgt or ping sweep of 10.10.10.1-255, you should have a series of IP addresses that you are ready to attack.



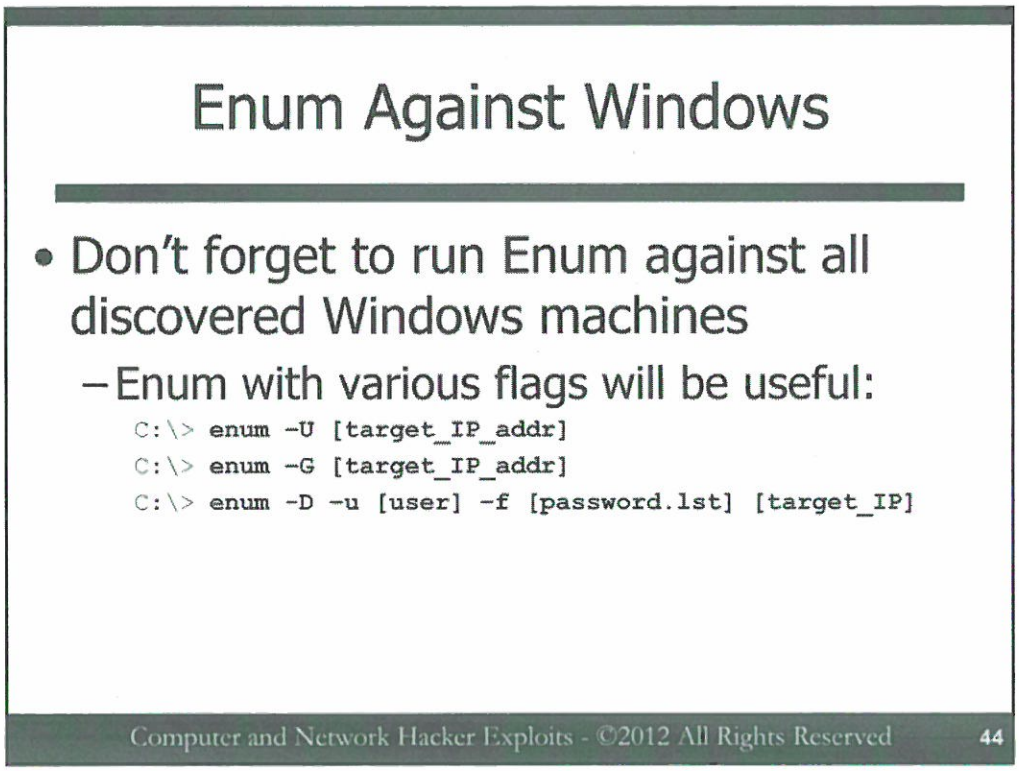
Next, we move to scanning, whereby we'll try to find openings in the target machines.



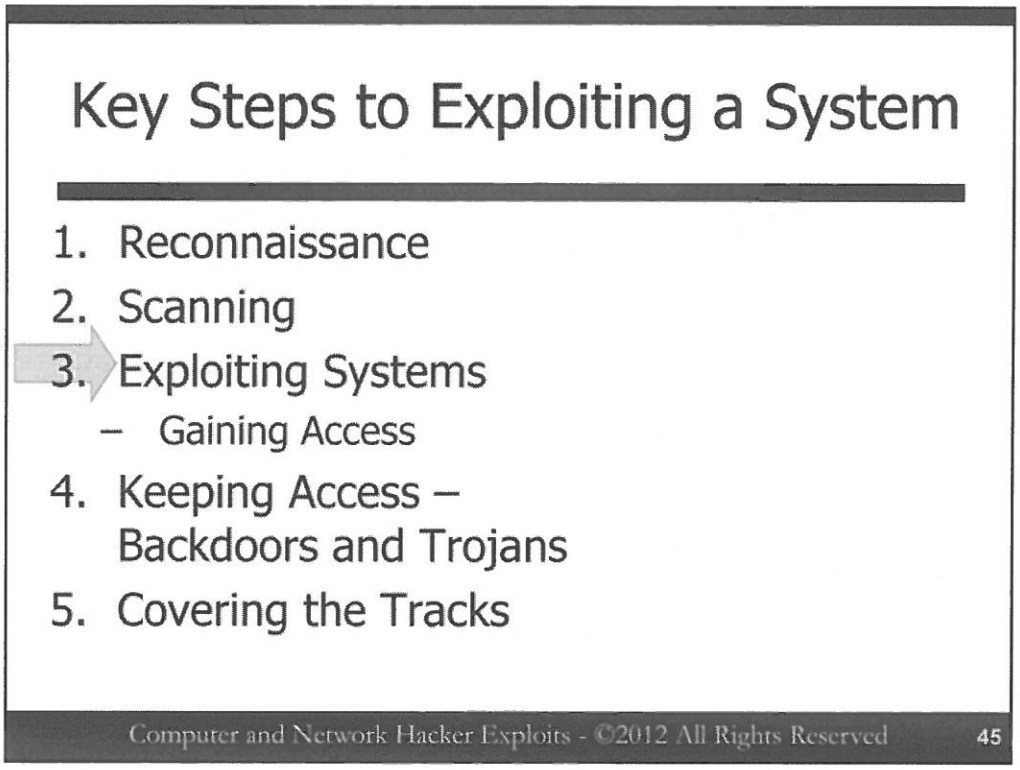
Here are some of the elements of the scanning phase. You should try each of these to get maximum information about your target network.



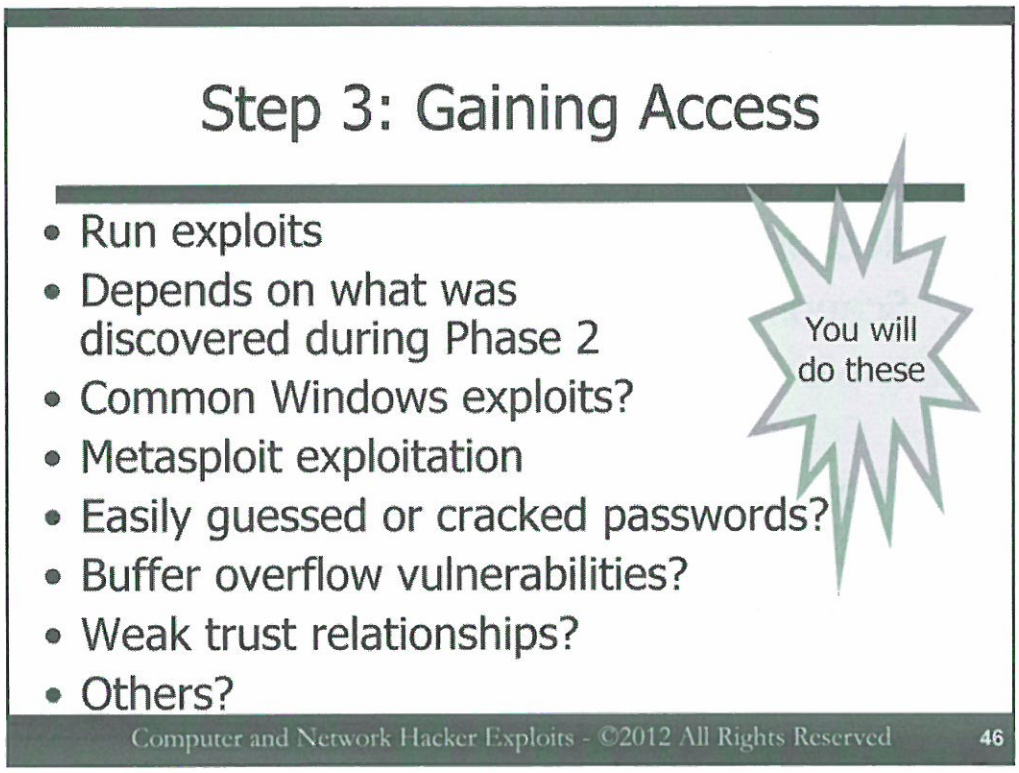
You could use Nmap to get detailed information about the topology, IP addresses, and openings on the target network.



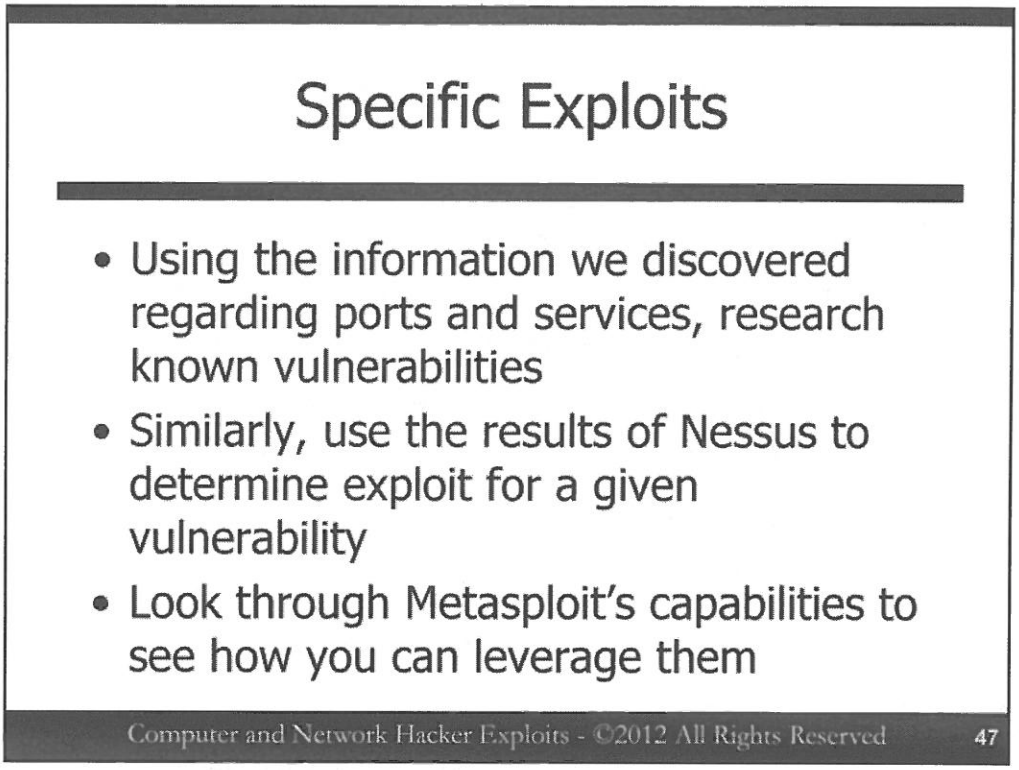
Don't leave this section without trying the enum command against your Windows targets. It can turn up a good deal of useful information.



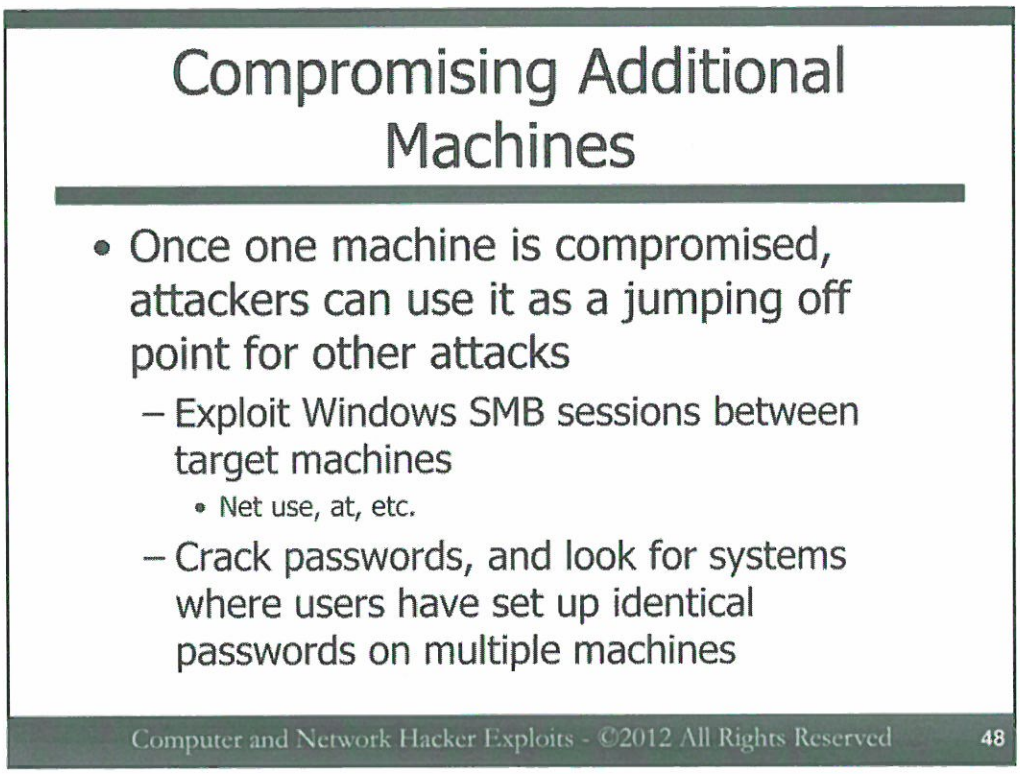
Now that scanning is complete, you can attempt to gain access.



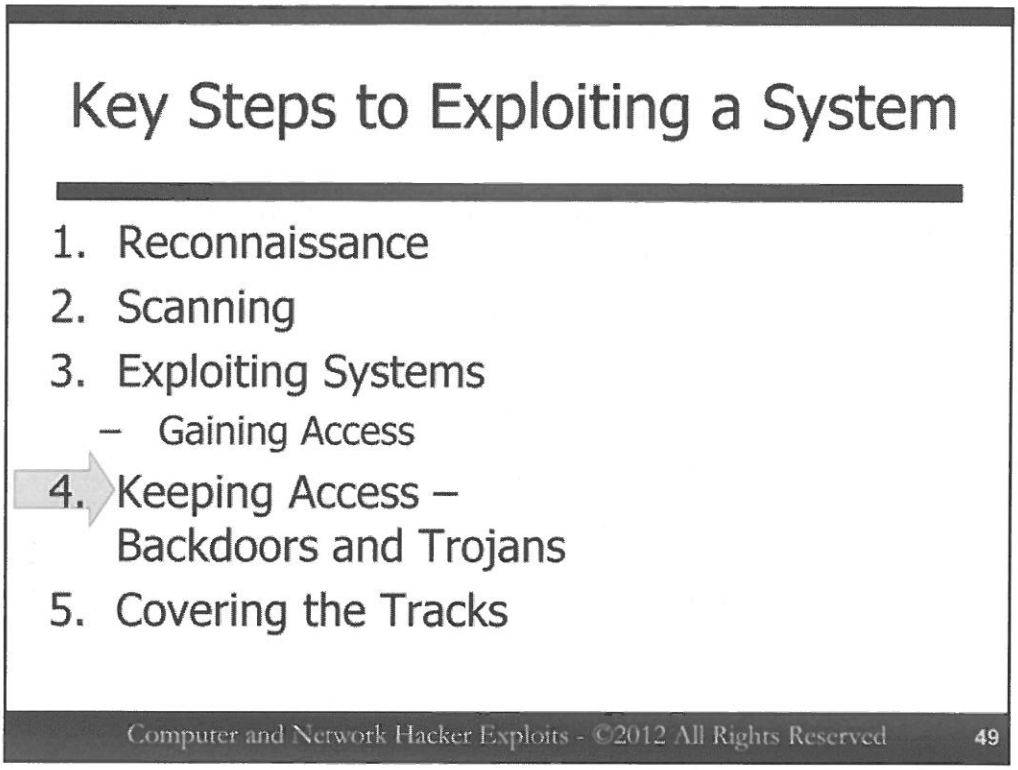
Your actions in Step 3 will depend heavily on what you found during your scanning step. The slide contains a few hints of the items you may discover.



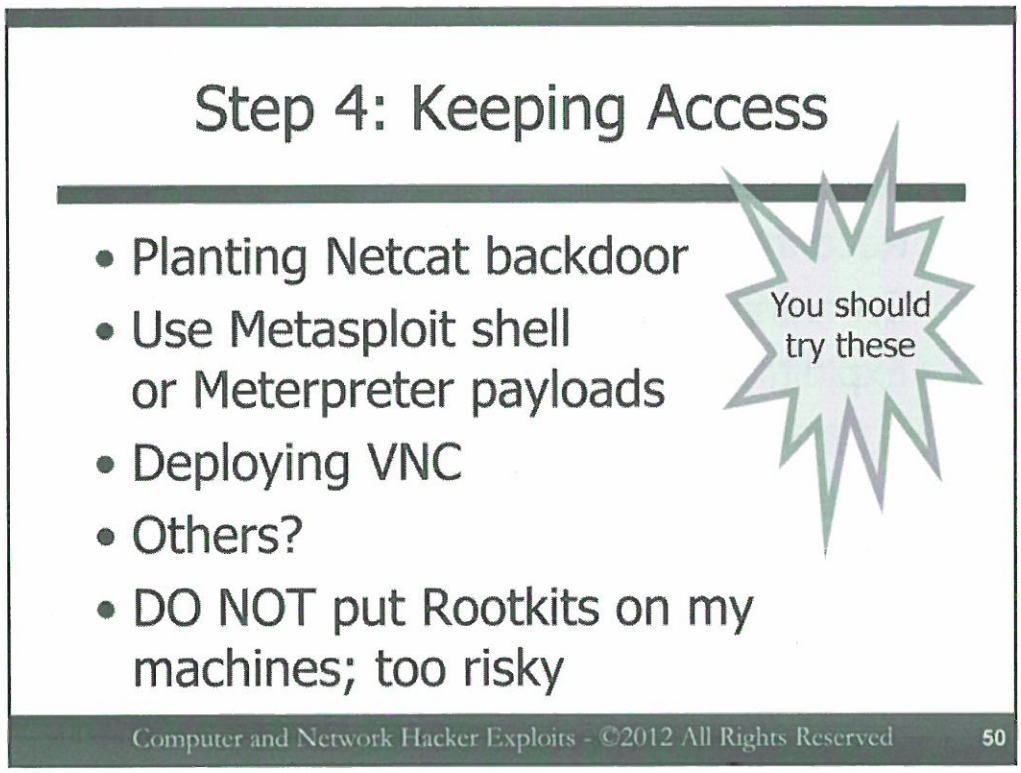
Use the information from your scanning phase to determine what kind of exploits you should try. What did we cover in class that might be of use here? We specifically chose exercises in class to help you in this step. If you are having trouble here and get bogged down, by all means, please ask the instructor and/or proctors for help.



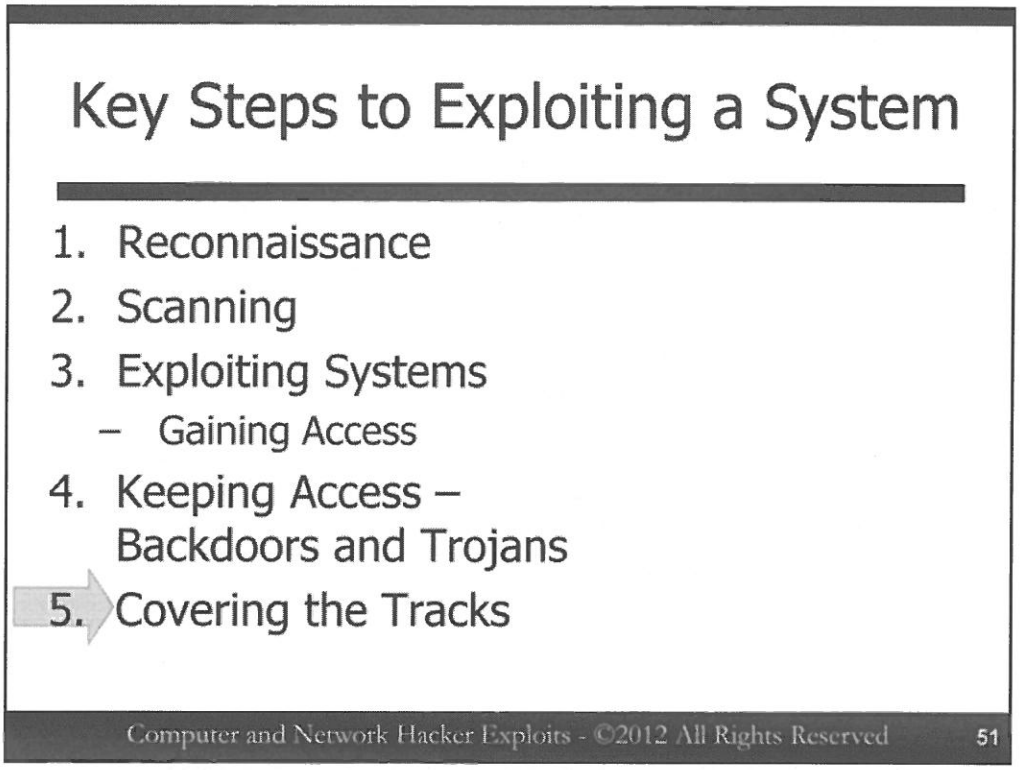
Remember, sometimes the easiest way in is through a full frontal assault on a machine. For other systems, the easiest way in is to use information you've plundered from other boxes, exploiting trust relationships or shared accounts/passwords on the boxes.



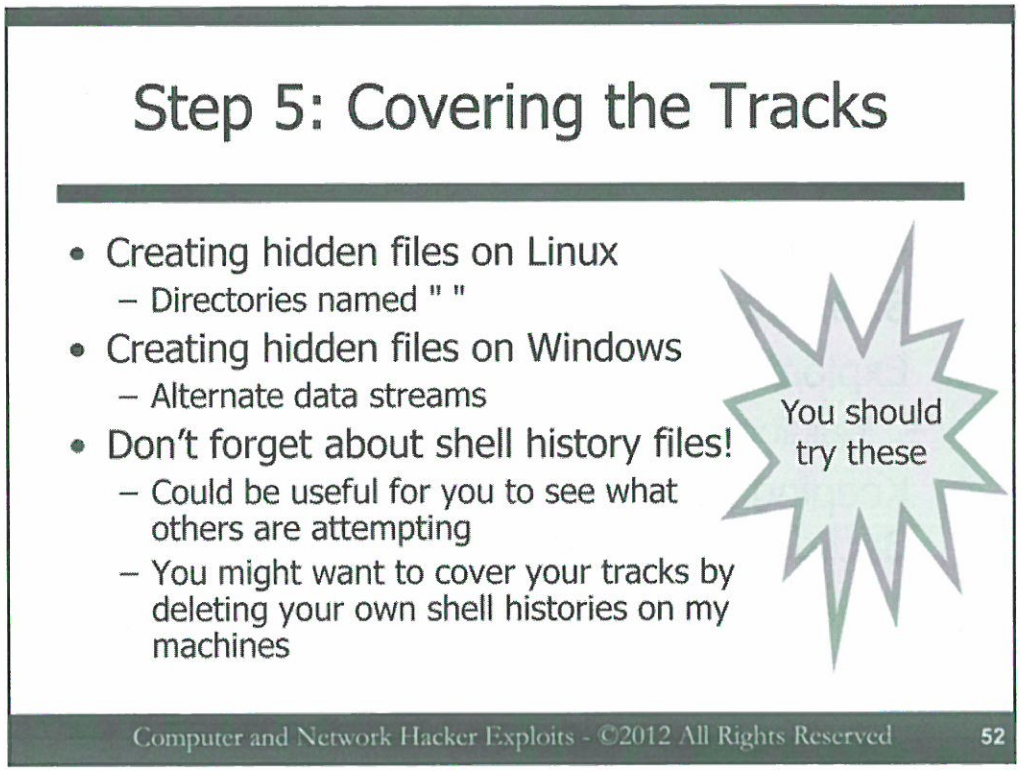
Once you gain a sufficient level of access, you may want to keep that access. You can do that by using backdoors (such as Netcat or VNC). Remember… NO ROOTKITS OR KERNEL-LEVEL ROOTKITS SHOULD BE INSTALLED ON THE TARGET SYSTEMS!



Feel free to deploy application-layer Trojan Horse backdoors, like Netcat or VNC. Or, use Metasploit to exploit a target, gaining remote shell or Meterpreter access of it.

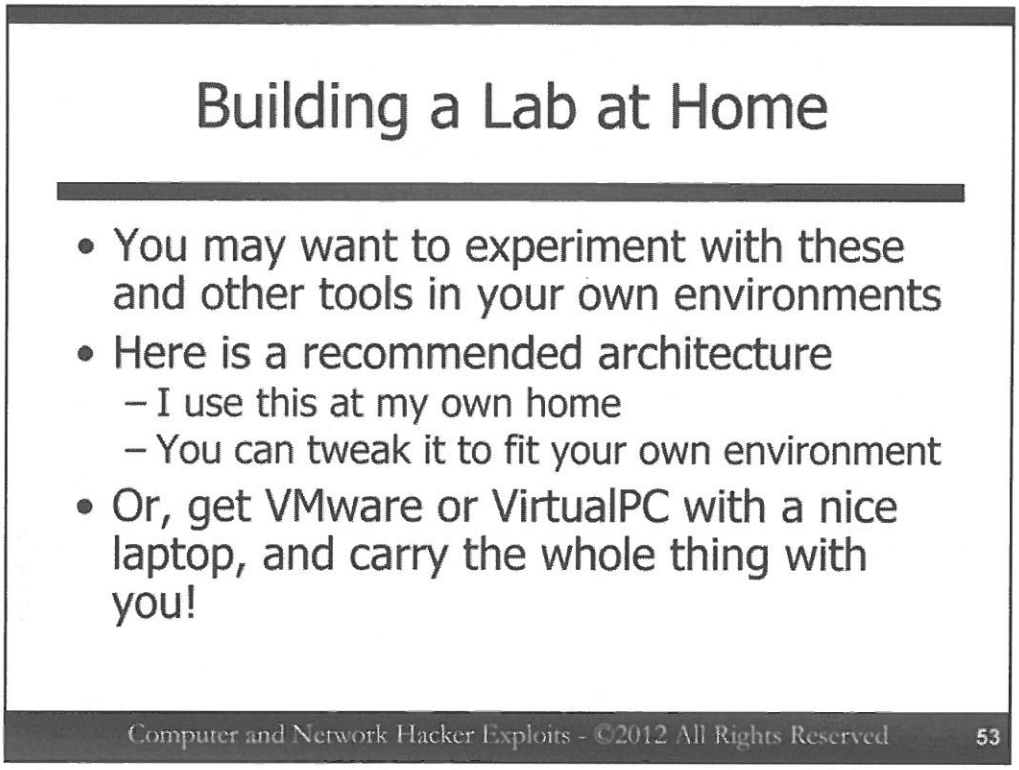


Finally, we will experiment with different techniques for covering tracks, especially file hiding and covert channels.

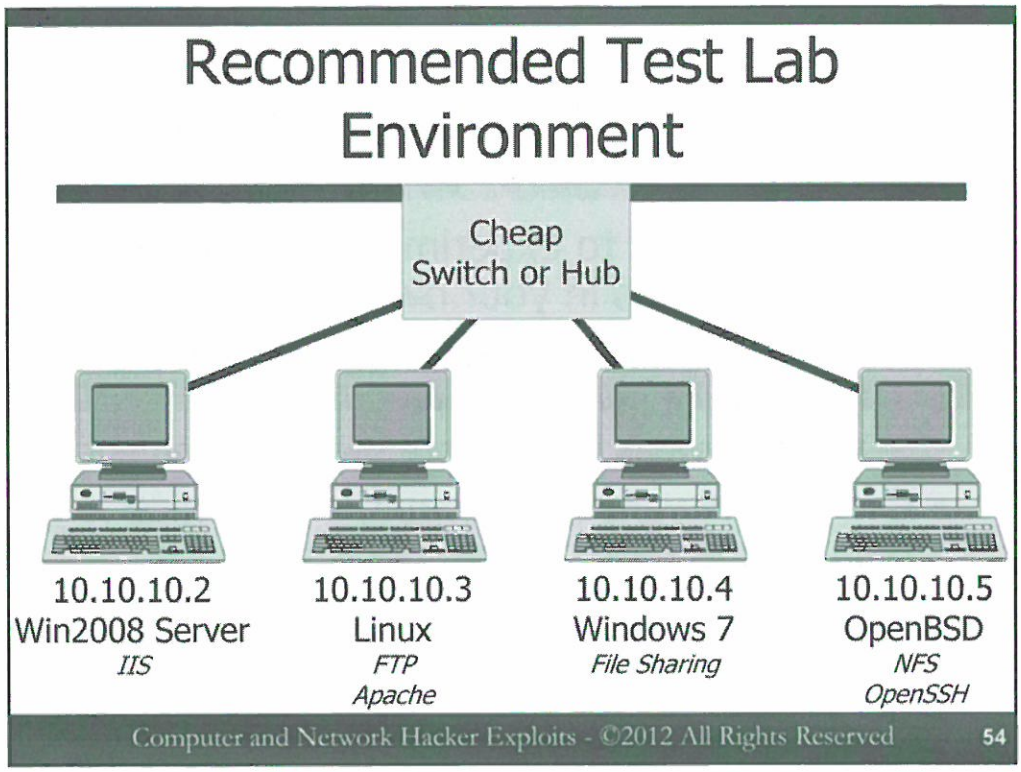


Once you've broken in, feel free to experiment with the hiding techniques we discussed in class.

In particular, hide your tracks on Linux and Windows by concealing files.



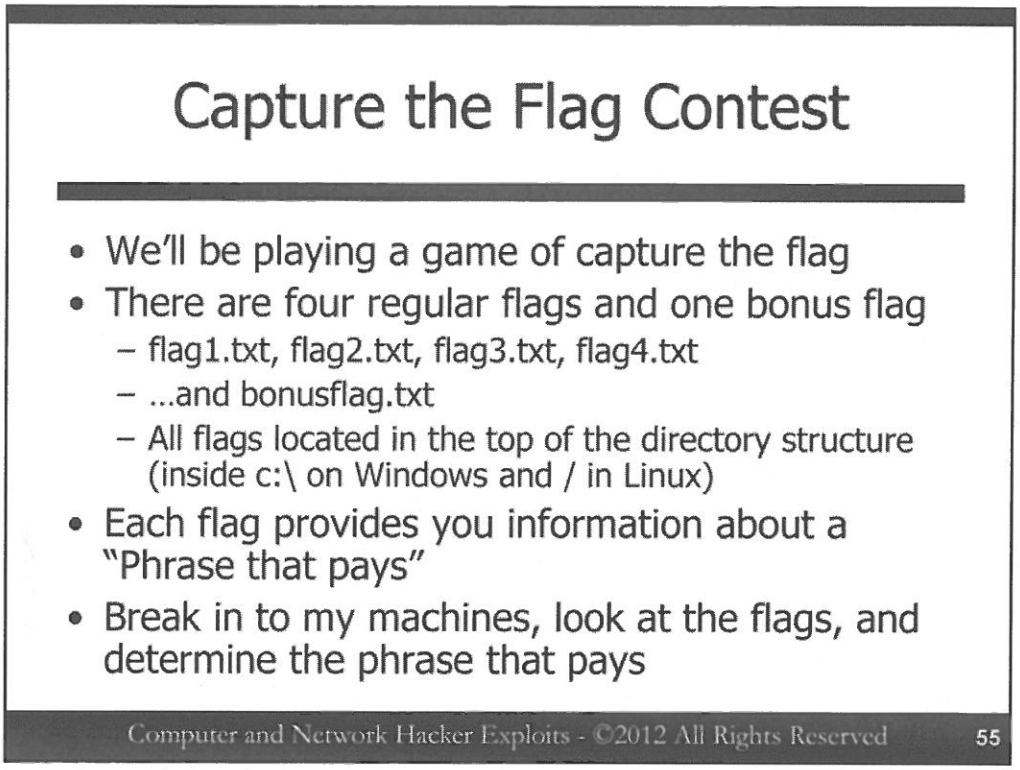
I frequently get asked about how to set up a network for this kind of analysis at home. The next slide shows you an architecture you could use for experimentation.



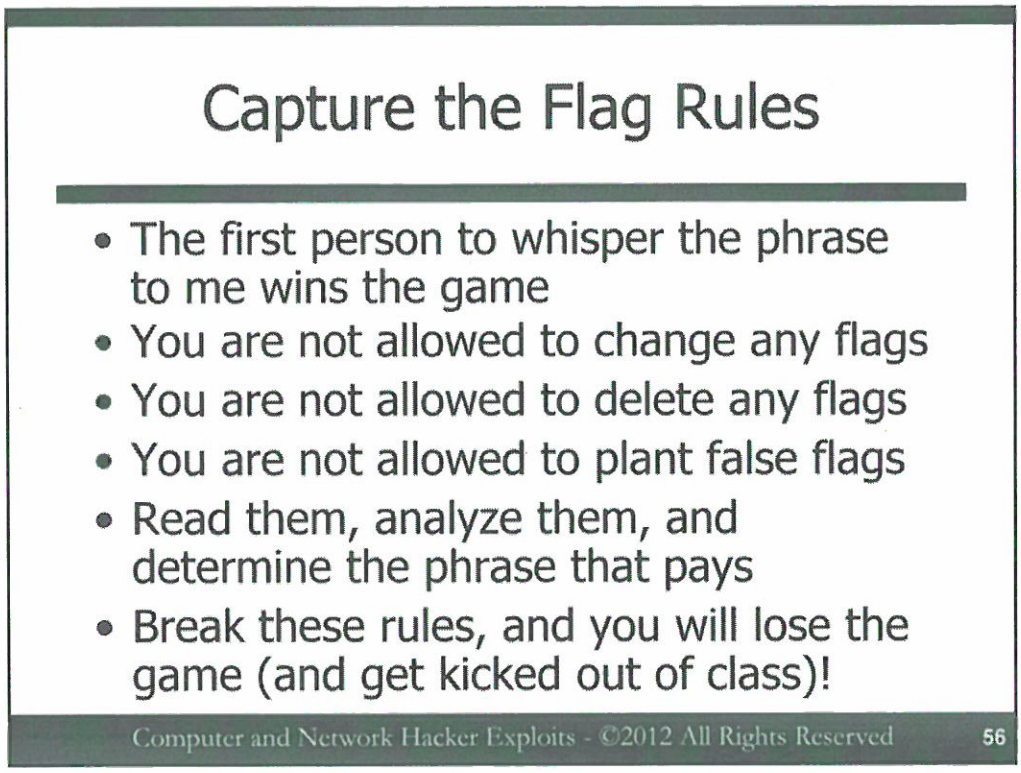
You can vary operating systems, adding OpenBSD, Solaris x86, and other machines as needed.

You can also activate or install other services. The services listed above are just examples of what you might want to run on your test machines.

VMware can help make this type of laboratory more portable by running multiple virtual machines on a single physical box.



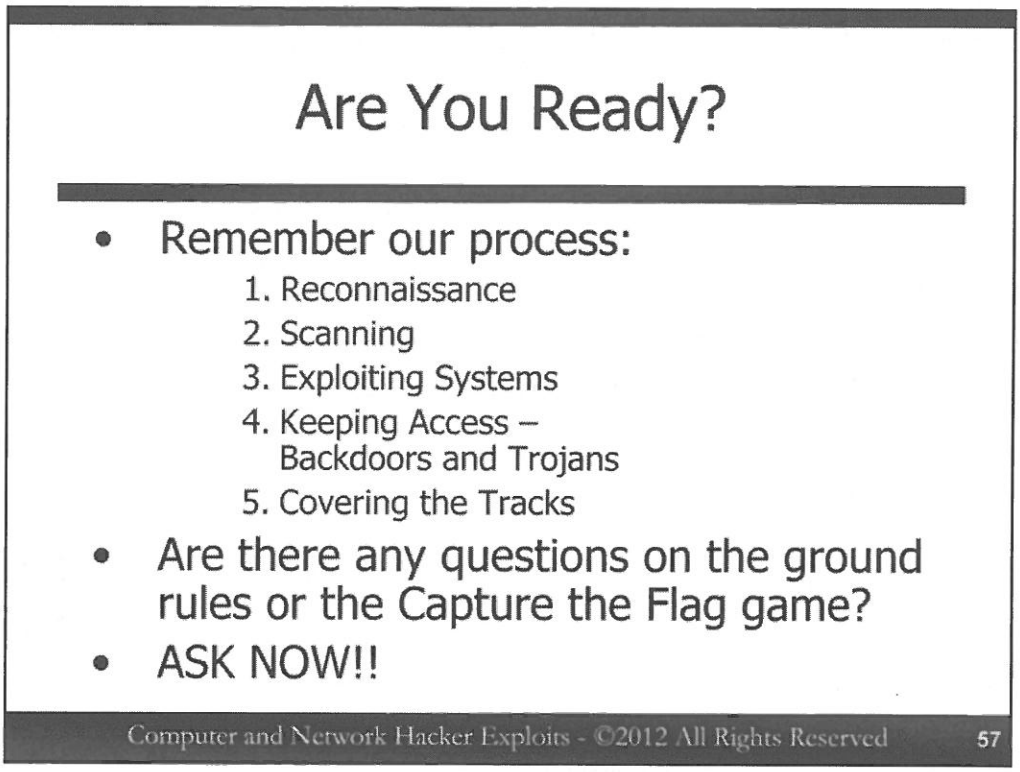
We'll be playing a game of capture the flag. I've got four flags on my machines, plus one bonus flag. You get to hack in and read the flags to determine the phrase that pays. The first one to determine the phrase that pays will win!



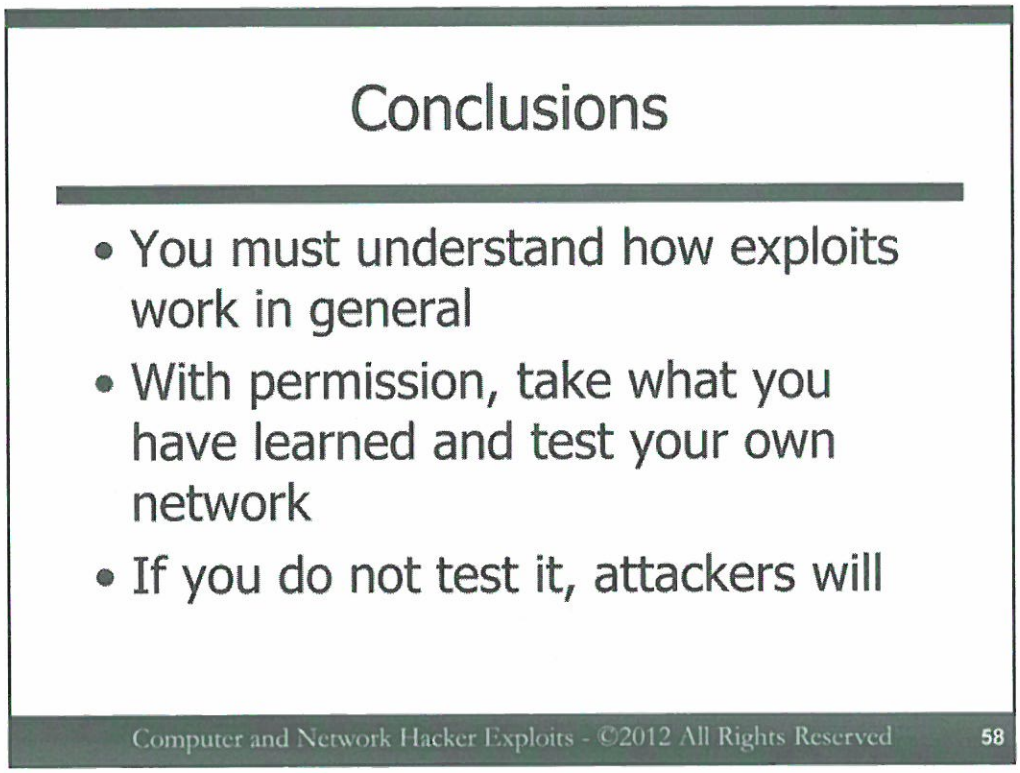
You must follow these rules to win the game. Violating these rules makes you ineligible to win.

The first person to whisper the phrase to me wins the game. Just come up to the front of the room, and tell me the phrase, or show it to me on your screen.

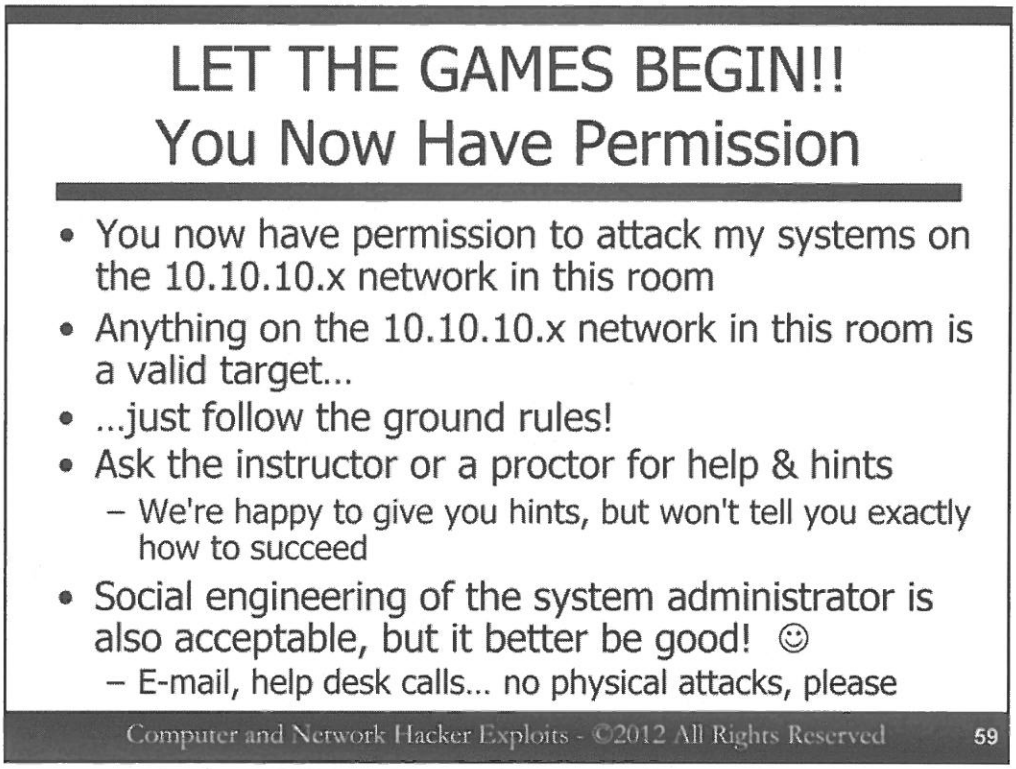
It's crucial to note that you are not allowed to change any flags, you are not allowed to delete any flags, and you are not allowed to plant false flags! If everyone follows these rules, we'll have a great game. If you violate the rules, you will be dismissed from class.



Remember, follow these steps and the guidelines covered in this book. Are you ready?



As we've said all week, it's important to understand the attacker's activities, so we can anticipate their moves and respond to them effectively. With the appropriate permission, take what you've learned here and apply it to your own environment.



Ok, let us begin.

Remember, ask the instructor and/or proctor for help if you get stuck. We are here to give you hints. Also, I'll act as the system administrator for the target machines. My job involves keeping them up in light of the many attacks we'll see today. Every now and then, the instructor may have to reboot a box… we'll work hard to keep that to a minimum, but it will occur.

Also, keep in mind that social engineering of the system administrator is also acceptable, but it better be good. Come see me if you think you have a clever social engineering exploit attempt.