

Lab 2: Creating Secure Architectures

A Challenge

Our challenge is to setup **MyBank Incorp**, where each of you will be allocated a network and hosts to configure and get on-line (Figure 1). For this you will be allocated your own network (group_01, group_02, and so on) which you can access from the vCenter Cloud infrastructure (vsoc.napier.ac.uk). Table 1 outlines your challenges and how you might achieve them. You have a pfSense firewall, a Linux host, and a Windows host to achieve your objectives.

Main gateway: 10.200.3.254

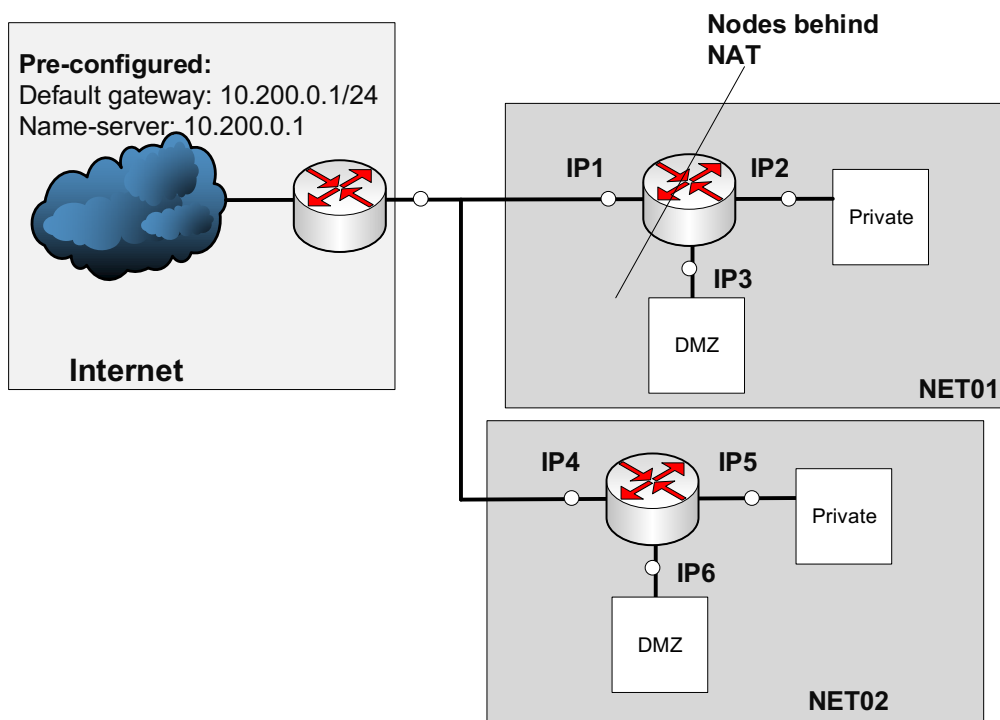


Figure 1: My Bank architecture

A Setting up the network

In this lab we will connect multiple firewalls to the main gateway, and be able to complete the challenges in Table 1. You will be given two things:

Group Number:

Your networks will be: 192.168.x.0/24 192.168.y.0/24

Demo of connecting: <https://www.youtube.com/watch?v=I94AJbZ4Qrs>

First log into vCenter (vsoc.napier.ac.uk), and then select your network infrastructure. Use this to configure the network addresses for your firewall from Table 2.

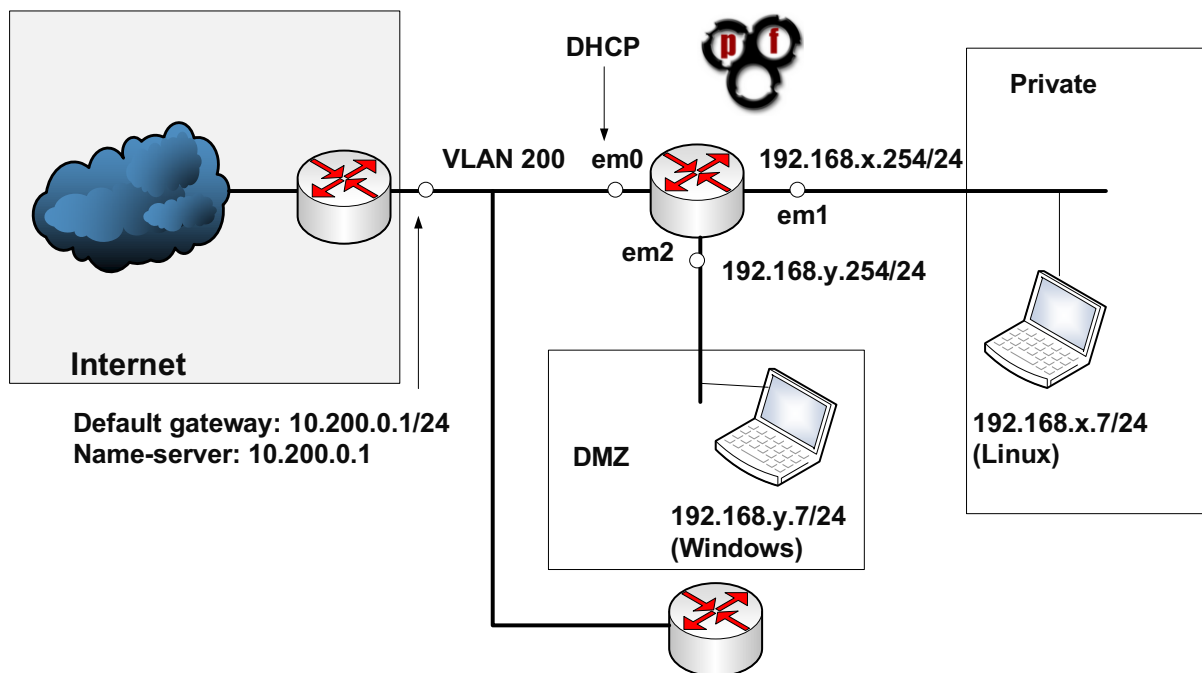


Figure 2: Lab setup

Locate your instances from:	Production->CSNxyz
There is a demo of the lab here:	http://youtu.be/1wn2io8EWvs
Your IP address allocation:	http://asecuritysite.com/csn10107/prep Allocation A

User logins: Ubuntu (User: napier, Password: napier123), Windows: (User: Administrator, Password: napier), Vyatta (User: vyatta, Password: vyatta), pfsense (User: admin, Password: pfsense)

B Initial Firewall Creation

Now go to the **g** folder, and select the firewall for your network. Next configure the Linux server in the **Private zone**, and the Windows server in the **DMZ**.

☞ Boot your firewall, and say no to setting up VLANs.

Now setup the first three networks adapters with em0 (WAN), em1 (LAN) and em2 (OPT1).

☞ Check that you have been granted an IP address on the WAN (em0) port. What address is it:

Can you ping the main gateway from the firewall (10.200.0.1) and your own WAN port?

Yes/No

Now we want to setup your private network gateway.

☞ Select the (2) option to change the IP addresses on the interfaces. Setup the IP address for the em1 interface to 192.168.x.254/24.

☞ Note the URL that you can configure your firewall. What is the URL:

That's it! You are all finished in doing the initial configuration on the firewall. We will now go ahead and configure the hosts and gain access to the firewall from a Web browser.

C Host setup

Now we will configure the hosts to sit on the Private and DMZ zones.

☞ Setup the Linux host to connect to 192.168.x.7/24 with a default gateway of your firewall port (192.168.x.254/24).

```
sudo ifconfig ethx 192.168.x.7 netmask 255.255.255.0 up
sudo route add default gw 192.168.x.254
```

☞ Next setup the nameserver on the Linux host by editing the /etc/resolv.conf and adding a nameserver:

```
sudo nano /etc/resolv.conf
```

then add:

```
nameserver 10.200.3.254
```

On the Windows server modify the static address on the interface with:

```
IP: 192.168.y.7
Subnet mask: 255.255.255.0
Gateway: 192.168.y.254
DNS: 10.200.0.1
```

Now we will finalise the configuration of the firewall:

Log into the firewall from the Linux host on the Private zone with:

```
http://192.168.x.254
```

Username: admin, Password: pfsense

Setup the required IP on the DMZ (192.168.y.254) and subnet mask.

On the firewall, from Diagnostics, view the ARP cache. Which addresses are in the cache:

On the firewall, from Diagnostics, ping each of the 192.168.x.254 and 192.168.x.7 interfaces from the LAN network. Can you ping them? Yes/No

On the Windows host, ping 192.168.y.254 and 192.168.y.7 interfaces. Can you ping them? Yes/No Why can't you ping the 192.168.y.254 interface?

On the firewall, create a rule which allows a host on the DMZ to use ICMP to any destination.

On the Windows host, ping 192.168.y.254 and 192.168.y.7 interfaces. You should now be able to ping them.

On the Windows host, ping 192.168.x.254 and 192.168.x.7 interfaces. You should now be able to ping them.

On the firewall, create a rule which allows the Public network to ping both the DMZ and Private network. From the firewall, can you ping the hosts in the DMZ and Private network from the WAN port.

Now from the Windows host and the Linux host, ping all the key addresses, including the gateway 10.200.0.1 and 10.200.0.2.

Now we will investigate NAT on the device.

Run packet capture on the firewall, and then ping from both the Windows host and the Linux host. Stop the trace.

Which IP address appears in the pings?

Why is it just a single address?

Now we will investigate the routing table on the firewall.

On the firewall, investigate the firewall, and identify how the device makes decisions on the routing of data packets. What is the default gateway?

D Device Audit

Now we will make sure everything is in order with our infrastructure, such as for testing for network traffic, MAC addresses and so on. Audit list:

On the firewall, capture traffic on the DMZ port, and generate some traffic from the LAN to the DMZ (such as accessing the Web server in the DMZ).

Does the traffic have the IP address of the gateway on the LAN port? Tick []

On the firewall, capture traffic on the WAN port, and generate some traffic from the LAN and DMZ (such as accessing Google.com).

Does the traffic have the IP address of the WAN port? Tick []

On the firewall, examine the ARP table. Also on the hosts in the DMZ and the LAN, run arp -a, and determine all your MAC addresses.

Do all the MAC addresses tie-up? Tick []

E NMAP

Run Wireshark on both hosts. Now run NMAP from the Linux host to the Windows host, and from the Windows host to the Linux host.

What IP addresses are used in the source addresses of the scan?

Which services have been identified from the Linux host to the Windows host?

Which services have been identified from the Windows host to the Linux host?

Why are these different in their scope? Where is the blocking happening?

Now enable http, https, and ftp from the Private network to the DMZ.

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Re-do NMAP. How are the scans different?

Can you now access the Web server from the Linux host to the Windows host?

Can you now access the Web server from the Windows host to the Linux host?

Access Google.com from the Linux host.

Can you access it? If not, on the firewall, enable UDP/TCP DNS (Port 53) from DMZ and also from the Private network. Add logging on the rule.

Can you now access Google.com from the Linux host and the Windows host?

On the firewall, examine the log and view the accesses for a DNS lookup on Google.com. Which addresses are present?

F Identifying Services

Within a network infrastructure we have services which run on hosts. These services provide a given functionality, such as for sending/receiving email, file storage, and so on.

From → To	Command	Observation
DMZ	On your Windows host, run the command: <code>netstat -a</code> and outline some of the services which are running on your host (define the port number and the name of the service and only pick off the LISTENING status on the port).	Outline some of the services which are running on your host (define the port number and the name of the service):
LAN	For the Ubuntu Virtual Machine, and run the command: <code>netstat -l.</code>	Outline some of the services which are running on your host (define the port number and the name of the service):
DMZ	Next we will determine if these services are working. There should be a Web server working on each of the virtual machines (Ubuntu and Windows 2003), so from the Windows host and using a Web browser, access the home page: <code>http://192.168.x.7</code>	Is the service working: [Yes] [No]

LAN	<p>From Ubuntu, access the Web server at:</p> <pre>http://192.168.y.7</pre>	<p>Is the service working: [Yes] [No]</p>
LAN	<p>Next we will determine if these services are working using a command line. From your UBUNTU host, undertake the following:</p> <pre>telnet 192.168.y.7 80</pre> <p>then enter: GET /</p>	<p>Outline the message that is returned:</p>
DMZ	<p>Repeat the previous example from the WINDOWS host:</p> <pre>telnet 192.168.x.7 80</pre>	
DMZ	<p>There should be an FTP server working on Ubuntu and Windows 2003. From WINDOWS, access the FTP server on the UBUNTU server:</p> <pre>telnet 192.168.x.7 21</pre> <p>then enter:</p> <pre>USER napier PASS napier123 QUIT</pre>	<p>Outline the messages that you received:</p> <p>What happens to each of these when you try with an incorrect username and password:</p>
LAN	<p>From UBUNTU access the WINDOWS host with</p> <pre>telnet 192.168.x.7 21</pre> <p>then enter:</p>	<p>Outline the messages that you received:</p> <p>What happens to each of these when you try with an incorrect username and password:</p>

	<pre> USER Administrator PASS napier QUIT </pre>	
DMZ	<p>On the UBUNTU instance you will see that the VNC service is running, which is the remote access service. From your WINDOWS host, access the VNC service using a VNC client, and see what happens.</p>	<p>What does this service do:</p>
DMZ	<p>Next we will assess the SMTP service running on the WINDOWS virtual machine. From your UBUNTU machine console run a service to access SMTP:</p> <pre>telnet 192.168.y.7 25</pre> <p>Table 1 outlines the commands to use.</p>	<p>On the WINDOWS virtual machine, go into the C:\inetpub\mailroot\queue folder, and view the queued email message.</p> <p>Was the mail successfully queued? If not, which mail folder has the file in?</p> <p>Outline the format of the EML file?</p>

Table 1: SMTP commands

```

220 napier Microsoft ESMTP MAIL Service, Version: 6.0.3790.3959 ready at Sun, 2 Dec 2009 21:56:01 +0000
help
214-This server supports the following commands:
214 HELO EHLO STARTTLS RCPT DATA RSET MAIL QUIT HELP AUTH TURN ETRN BDAT VRFY
helo me
250 napier Hello [192.168.75.1]
mail from: email@domain.com
250 2.1.0 email@domain.com....Sender OK
rcpt to: fred@mydomain.com
250 2.1.5 fred@mydomain.com
Data
354 Start mail input; end with <CRLF>.<CRLF>
From: Bob <bob@test.org>
To: Alice <alice@test.org >

```

```

Date: Sun, 20 Dec 2013
Subject: Test message
Hello Alice.
This is an email to say hello
.
250 2.6.0 <NAPIERMp71zvvrMVHfb00000001@napier> Queued mail for delivery

```

G Enumeration – Host scan

Nmap is one of the most popular network scanning tools. It is widely available, for Windows and Linux/Unix platforms, and has both a Command Line Interface (CLI) and a Graphical User Interface (GUI).

From → To	Command	Observation
LAN to WAN	<code>sudo nmap -sP -r 10.200.0.0/24</code>	Which hosts are on-line:
LAN to DMZ	<code>sudo nmap -sP -r 192.168.y.0/24</code>	Which hosts are on-line:
DMZ to LAN	<code>nmap -sP -r 192.168.x.0/24</code>	Which hosts are on-line:
LAN to DMZ	Run Wireshark on host in LAN, and run: <code>sudo nmap -sP -r 192.168.y.0/24</code>	Which transport layer protocol does NMAP use to discover the host: [ICMP] or [ARP]
LAN to LAN	Run Wireshark on host in LAN, and run: <code>sudo nmap -sP -r 192.168.x.0/24</code>	Which transport layer protocol does NMAP use to discover the host: [ICMP] or [ARP]

