Ethical Student Hackers

Network Forensics

The Legal Bit

- The skills taught in these sessions allow identification and exploitation of security vulnerabilities in systems. We strive to give you a place to practice legally, and can point you to other places to practice. These skills should not be used on systems where you do not have explicit permission from the owner of the system. It is VERY easy to end up in breach of relevant laws, and we can accept no responsibility for anything you do with the skills learnt here.

- If we have reason to believe that you are utilising these skills against systems where you are not authorised you will be banned from our events, and if necessary the relevant authorities will be alerted.

- Remember, if you have any doubts as to if something is legal or authorised, just don't do it until you are able to confirm you are allowed to.

- Relevant UK Law: https://www.legislation.gov.uk/ukpga/1990/18/contents

Code of Conduct

- Before proceeding past this point you must read and agree to our Code of Conduct - this is a requirement from the University for us to operate as a society.
- If you have any doubts or need anything clarified, please ask a member of the committee.
- Breaching the Code of Conduct = immediate ejection and further consequences.
- Code of Conduct can be found at **shefesh.com/conduct**

AGM

24th March

All positions available

Please speak to committee if you have any questions

https://forms.gle/6zmKx7dMkav7tUus9

Background - Hubs

- Historically, hubs were used to connect devices together on a LAN
- Connects networked devices together, such as clients and servers
- Can be interconnected to provide more ports -> leads to more errors
- Receives information in one port and rebroadcasts to all the other ports

Background - Switches

- Much like a hub, it connects networked devices together
- Switches learn what devices are on which switch ports
- Switches only forward traffic received from a port to the destination port, based on the device's hardware (MAC) address
- Provides more security and more bandwidth efficient than a hub

ARP

- ARP links IP and MAC addresses
- It caches the IP and MAC links
- If a device doesn't exist on the cache, it asks every device if they are associated with the IP
- Only the device with the associated IP address should respond
- Who is "xxxx.xxxx.xxxx.xxxx"? Tell "xxxx.xxxx.xxxx.xxxx"

Packet Sniffing

- Sitting on a LAN, you can intercept traffic and analyse communications.
- • Two types
- Passive sniffing
- Active sniffing
- Passive sniffing doesn't really happen anymore - tends to happens on trunk ports/hubs
- Active sniffing
  - More difficult - occurs on switches
  - Few methods to enable this

Switch table flooding

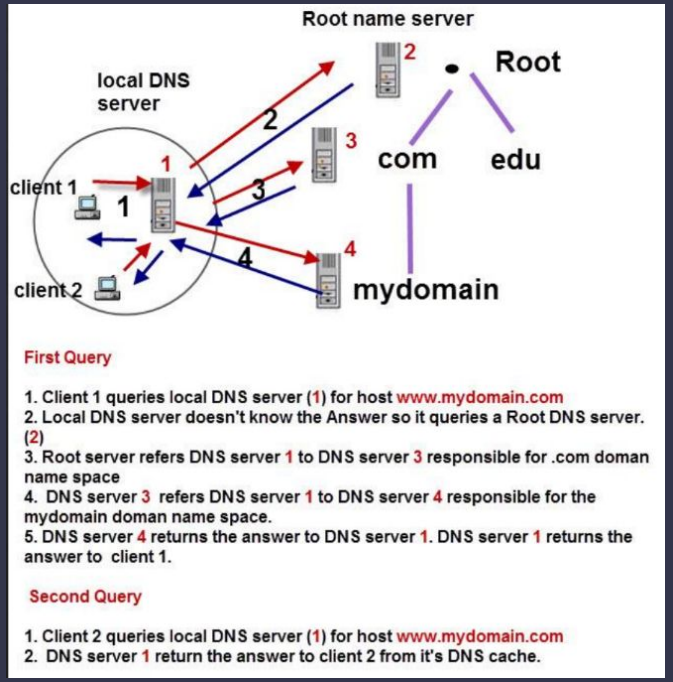
- Fill the table with MACs, causing a failover
- Switches failover to hubs
  - All traffic is broadcast to all ports
- On newer and more powerful switches this doesn't happen any more, specifically designed not to
- Hardware and software fixes

ARP spoofing / poisoning

- ARP Spoofing enables a poisoning attack
  - Spoofing involves crafting bogus ARP packets with false destination/source in an attempt to associate the attacker's MAC with another device's IP
- When this is successful, the ARP cache is 'poisoned' with false information, packets destined for the target will instead go to the attacker's machine
- This is a Man-In-The-Middle (MITM) when the attacker then passes on these packets to the target machine
  - Intercepted packets can then be analysed
- Can also enable us to DHCP spoof, so that we can MITM devices that are looking to lease IPs

Background - DNS

- DNS behaves much like ARP, it 'translates' human-friendly domain names into IP addresses
- This is achieved by contacting a DNS server which will have a lookup table of known IPs/hosts, or will contact other DNS servers until it gets answers (up to root name servers and then down)
- DNS lookups are an inverted tree-like structure
- e.g.ibm.com
    - Local DNS server doesn't know, referred to root server
    - Root server refers to DNS server responsible for .com
    - Then finally the DNS server associated with ibm.com returns an IP



DNS Spoofing

- Attacking the DNS cache of the DNS server allows attacker to modify entries, so attacker
- could redirect traffic destined to a domain to a server they control instead
- It is difficult to verify the IP returned is legitimate, usually assumed correct

Analysis tools

- Most common - you guessed it - Wireshark!
- Other alternatives exist
  - Command-line, more powerful if you know how to use it: t-shark
  - Cloud-based: CloudShark
  - Cain & Abel - Older, Windows based but lots of good features ie ARP spoofing, VoIP recording, SSL breaking etc.
  - tcpdump - Also command-line based
  - Ettercap - older, much like Cain but UNIX based

Unencrypted packets

Unencrypted data is great for us, we can view the contents very easily!

Wireshark handily distinguishes between different protocols for us so we can quickly identify which are in use

Selecting a packet will bring all the information associated with it in a readable format as well as hex

Following data streams

Single packets aren't necessarily useful, it can be better to look at whole streams to understand a bigger picture.

Analyze -> Follow -> xxx stream

Can quickly browse through different streams, communication direction denoted by different highlighting colour

Wireshark applies the filter for you

Filtering

You can apply a lot of filters through the GUI or by entering them into the command bar

Can filter by protocol, IP addresses, strings etc. A lot of possibilities!

Logical operators can be used, daisy-chain commands together to get a better filter on the traffic you want

E.g. if I wanted to narrow my view down to HTTP traffic with a specific IP

http && ip.addr == XXX.XXX.XXX.XXX

Advanced Analysis tools

Wireshark can also be used to pull and recreate images/binaries/files from packet captures. Very easy to export through File -> Export Objects

Other protocols such as RTP used for VoIP/media streaming can also be recreated. Can extract audio data

→Wireshark provides a lot of different statistical views of packet captures, can be useful to

look at these first to see where potentially more interesting communications are occurring

https://www.wireshark.org/docs/

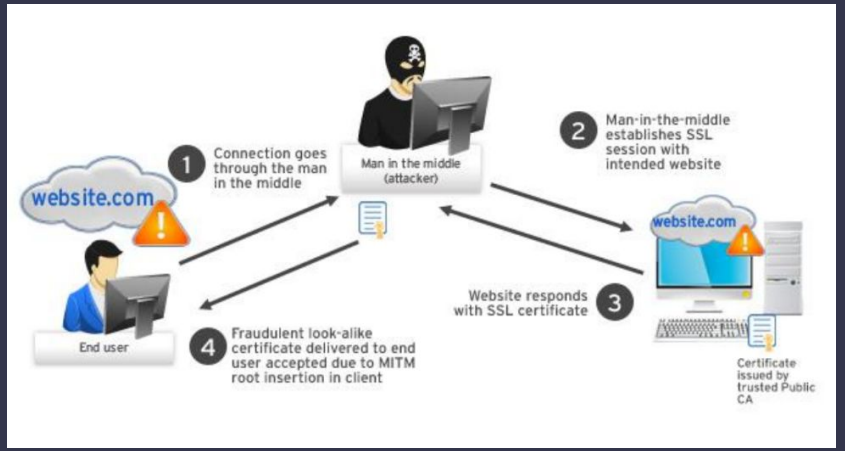
MITM and breaking SSL

Encrypted traffic makes it much more difficult for us to see what's going on

If we have the SSL keys, we can decrypt this and see what's going on - but it's not too often you get your hands on these

Sitting as a Man-In-The-Middle, we can intercept SSL requests.

Tools include Cain, mitmproxy and sslsplit



MITM and breaking SSL

User makes request, we detect this and instead make an SSL request to the intended server

Intended server then replies with a certificate

We then pull the details from this certificate and create a 'realistic' looking certificate with the same details, to be used between us and the victim

The victim will get a certificate warning, so we're relying on them to not investigate further than the details we implanted in the certificate

We can then decrypt the traffic between us and the victim using our certificate, as well as passing this on to the actual intended server - victim is none the wiser as all works as normal

Seen this before?

In the real world

Users have been systematically trained to click "Okay" to errors and warnings

Especially SSL certificate warnings - intranets, outdated systems etc.

This means that the users are likely to ignore when they're being intercepted!

Some major online services have protections against this

Network sniffing countermeasures

Solid networking gear - port security, shuts down ports in case of violation

Monitor for ARP cache poisoning - IDS product, ARPwatch, Snort etc.

Use encrypted protocols - use a VPN if you're on an untrusted network

Train train train! Users are the #1 weakness in any system, don't indoctrinate them into ignoring warnings!

DNSsec for your DNS servers – digitally signing replies from zones

VPNs

All you're doing is shifting your trust from the administrator of the local network to the administrator of your VPN service

Is your data worth more or less than $25?

Think about the running costs of a large-scale VPN service, bandwidth costs, server costs, legal fees etc.

A lot of these services run on the business-model that a majority of users will never

actually utilise them a lot in the long run

Unsustainable?

Feedback

Please leave your feedback :) We want to know what we can do to improve.

Please leave constructive and honest feedback only.

https://forms.gle/VTYd74K5BHqbC7F68

Practical

https://www.vulnhub.com/entry/tophatsec-fartknocker,115/

https://tryhackme.com/room/c2carnage

https://shefesh.com/rp/challenge.pcap

Upcoming Sessions

What's up next?

www.shefesh.com/sessions

DRM (hopefully!)

Cryptography + AGM

Any Questions?

www.shefesh.com

Thanks for coming!