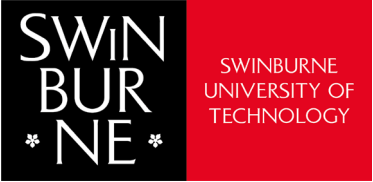


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# DNS Attacks

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# DNS and Hosts

- Before the internet got big, people typed in the IP address of each site they wanted to visit.
- This became tedious, so a scheme was devised whereby the host and domain name of frequently visited web sites was added to a file (HOSTS) which is used to look up the IP address which corresponds to a ***host.domain*** name. Users could download and install updated versions of *HOSTS* files from popular web sites.
- DNS automated the domain name lookup process using dedicated DNS servers which could communicate with each other and any interested PC through UDP port 53.

# DNS and Hosts...

- The contents of a HOSTS file take precedence over DNS queries. HOSTS should be empty or just contain the loopback address (127.0.0.1) on modern PCs.
- A common strategy used by spy/adware, browser hijackers and ***pharmers*** is to add incorrect entries to the HOSTS file so that correctly entered URIs direct you to the wrong web site.
- A common strategy used for web filtering is to add the domain names of forbidden sites to the hosts file with the loopback address.
- On Linux: see ***/etc/hosts***
- On Win: see ***\Windows\System32\drivers\etc\hosts***

# DNS Attacks

- DNS cache poisoning
  - Attacker sends many DNS queries and replies at the same time. The replies spoof the IP of the authoritative name server.
  - Need to guess the DNS query ID (0-65535)
    - may be predictable
    - birthday paradox increases chances of a correct guess to ~50%
- Kaminsky attack
  - Query non-existent hosts on the target domain.
    - Easier to guess the DNS query ID
    - DNS client caches ADDITIONAL record (including IP of target host)

# DNS Cache Poisoning Prevention

- Use random identifiers for queries
- Always check identifiers
- Port randomization for DNS requests
- Deploy DNSSEC
  - Challenging because it is still being deployed and requires reciprocity

# Kaminsky Defences

- 2008 – patches which increases randomness of DNS IDs
- Local DNS servers only accept queries from inside the network
- Source-port randomisation
- UDP packet ID combined with DNS ID to enlarge ID range to 32bits (3 billion)
- DNSSEC

# DNSSec

- DNSSec adds two important features to the DNS protocol
  - Data origin authentication (verify where data came from) & Data integrity protection (verify data didn't been modified during transit)
- DNS queries, replies are digitally signed.
  - prevents replies from being spoofed (fake source address, ID)
  - requires public key crypto, chain of trust
    - But certificates, private keys get stolen
    - DNSSec adoption very small (1%)
    - <https://www.eweek.com/security/dnssec-adoption-needs-to-grow-to-secure-core-internet-protocols/>

# NSLookup (Win/Linux/Mac)

- NSLookup queries the domain name system to find the IP address of a domain name.
- NSLookup can
  - Resolve DNS Issues
  - Search for optimal mail servers



# NSLookup

- NSLookup works for different levels of the DNS system.
- For the details of the *.edu.au* name servers, try

```
c:\temp>nslookup -type=mx edu.au
```

```
Server: venus.it.swin.edu.au
```

```
Address: 136.186.5.30
```

edu.au

```
primary name server = ns1.ausregistry.net
```

```
responsible mail addr = dns.ausregistry.net.au
```

```
serial = 2003071563
```

```
refresh = 14400 (4 hours)
```

```
retry = 3600 (1 hour)
```

```
expire = 3600000 (41 days 16 hours)
```

```
default TTL = 86400 (1 day)
```

# Reverse DNS Lookup

- **Use this to verify that an IP points to a domain name.**
  - *"The reverse DNS entry for an IP is found by **reversing the IP**, adding it to **"in-addr.arpa"**, and looking up the PTR record. So, the reverse DNS entry for 66.249.72.14 is found by looking up the PTR record for **14.72.249.66.in-addr.arpa**."*  
[DNSStuff.com](http://DNSStuff.com)

```
c:\temp>nslookup -type=ptr 14.72.249.66.in-addr.arpa
Server: venus.it.swin.edu.au
Address: 136.186.5.30
```

```
Non-authoritative answer:
14.72.249.66.in-addr.arpa      name = crawl-66-249-72-14.googlebot.com
```

```
72.249.66.in-addr.arpa nameserver = ns4.google.com
72.249.66.in-addr.arpa nameserver = ns1.google.com
72.249.66.in-addr.arpa nameserver = ns2.google.com
72.249.66.in-addr.arpa nameserver = ns3.google.com
ns1.google.com internet address = 216.239.32.10
ns2.google.com internet address = 216.239.34.10
ns3.google.com internet address = 216.239.36.10
ns4.google.com internet address = 216.239.38.10
```

# Whois

- Gets name server info + details of system administrators.
- Difficult to use (have to get the right whois server).

```
[jhamlynharris@mercury jhamlynharris]$  
whois -h whois.melbourneit.com  
telstra.COM  
[whois.melbourneit.com]
```

```
Domain Name..... telstra.com  
Creation Date..... 1995-09-14  
Registration Date.... 2001-08-28  
Expiry Date..... 2009-09-13  
Organisation Name.... Telstra Corporation  
Organisation Address. 18/300  
Organisation Address.  
Organisation Address. MELBOURNE  
Organisation Address. 3000  
Organisation Address. VIC  
Organisation Address. AUSTRALIA
```

```
Admin Name..... Domains Administrator  
Admin Address..... 18/300  
Admin Address.....  
Admin Address..... MELBOURNE
```

```
Admin Address..... 3000  
Admin Address..... VIC  
Admin Address..... AUSTRALIA  
Admin Email..... cdp@tppinternet.com  
Admin Phone..... +61.883084046  
Admin Fax.....
```

```
Tech Name..... Domains Administrator  
Tech Address..... 18/300  
Tech Address.....  
Tech Address..... MELBOURNE  
Tech Address..... 3000  
Tech Address..... VIC  
Tech Address..... AUSTRALIA  
Tech Email.....  
corpdomains@team.telstra.com  
Tech Phone..... +61.883084046  
Tech Fax.....  
Name Server..... dns0.telstra.net  
Name Server..... dns1.telstra.net  
Name Server..... sec1.apnic.net  
Name Server..... sec3.apnic.net
```

```
[jhamlynharris@mercury jhamlynharris]$
```

- **On the web at**  
**<http://www.whois.net/>**
- **and on Linux computers.**
  - try `whois -h whois.aunic.net`  
`swin.edu.au`

