The New Nmap
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Nmap Scripting Engine (NSE)

# nmap -A -PN -T4 www.ebay.com
Starting Nmap ( http://nmap.org )
Interesting ports on hp-core.ebay.com
(66.135.200.145):
Not shown: 1715 filtered ports
PORT    STATE  SERVICE VERSION
80/tcp  open   http    Apache Tomcat/Coyote JSP engine 1.1
|_ robots.txt: has 3 disallowed entries
|_ /help/confidence/ /help/policies/ /disney/
|_ HTML title: eBay - New & used electronics, cars, apparel, collectibles...
443/tcp closed https
[...]
Nmap done: 1 IP address (1 host up) scanned in 30.91 seconds

Interesting ports on dns-1.blackhat.com (216.231.63.55):

PORT       STATE SERVICE
53/udp      open  domain
 |_ DNS source port randomness: ERROR: Server refused recursion
 |_ DNS TXID randomness: ERROR: Server refused recursion


PORT       STATE SERVICE
53/udp      open  domain
 |_ Nameserver open recursive queries (CVE-1999-0024) (BID 136, 678): Recursion seems enabled
 |_ DNS source port randomness: 12.21.210.234 is GREAT: 51 queries in 3.2 seconds from 51 ports with std dev 16099
 |_ DNS TXID randomness: 12.21.210.234 is GREAT: 52 queries in 3.3 seconds from 52 txids with std dev 20996
Zenmap GUI
# nmap -A -T4 scanme.nmap.org
Starting Nmap ( http://nmap.org )
Interesting ports on scanme.nmap.org (64.13.134.52):
Not shown: 1709 filtered ports

<table>
<thead>
<tr>
<th>PORT</th>
<th>STATE</th>
<th>SERVICE</th>
<th>VERSION</th>
</tr>
</thead>
<tbody>
<tr>
<td>22/tcp</td>
<td>open</td>
<td>ssh</td>
<td>OpenSSH 4.3 (protocol 2.0)</td>
</tr>
<tr>
<td>25/tcp</td>
<td>closed</td>
<td>smtp</td>
<td></td>
</tr>
<tr>
<td>53/tcp</td>
<td>open</td>
<td>domain</td>
<td>ISC BIND 9.3.4</td>
</tr>
<tr>
<td>70/tcp</td>
<td>closed</td>
<td>gopher</td>
<td></td>
</tr>
<tr>
<td>80/tcp</td>
<td>open</td>
<td>http</td>
<td>Apache httpd 2.2.2 ((Fedora))</td>
</tr>
</tbody>
</table>

Device type: general purpose
Running: Linux 2.6.X
OS details: Linux 2.6.20-1 (Fedora Core 5)
Uptime: 40.425 days (since Tue May 13 12:46:59 2008)
Nmap done: 1 IP address scanned in 30.567 seconds
Raw packets sent: 3464 (154KB) | Rcvd: 60 (3KB)
Optimizing Host Discovery

- Default discover often insufficient
- TCP SYN probes (-PS)
- TCP ACK probes (-PA)
- UDP probes (-PU)
- ICMP echo request, timestamp, netmask probes (-PE, -PP, -PM)
- Protocol probes (-PO)
Default Host Discovery Effectiveness

# nmap -n -sL -iR 50000 -oN - | grep "not scanned" | awk '{print $2}' | sort -n > 50K_IPs

# nmap -sP -T4 -iL 50K_IPs
Starting Nmap ( http://nmap.org )
Host dialup-4.177.9.75.Dial1.SanDiego1-Level3.net (4.177.9.75) appears to be up.
Host dialup-4.181.100.97.Dial1.SanJose1-Level3.net (4.181.100.97) appears to be up.
Host firewall2.baymountain.com (8.7.97.2) appears to be up.
[kilhousands of lines cut]
Host 222.91.121.22 appears to be up.
Host 105.237.91.222.broad.ak.sn.dynamic.163data.com.cn (222.91.237.105) appears to be up.
Nmap done: 50000 IP addresses (3348 hosts up) scanned in 1598.067 seconds
Enhanced Host Discovery Effectiveness

# nmap -sP -PE -PP -PS21,22,23,25,80,113,31339 -PA80,113,443,10042 --source-port 53 -T4 -iL 50K IPs
Starting Nmap 4.65 ( http://nmap.org ) at 2008-06-22 19:07 PDT
Host sim7124.agni.lindenlab.com (8.10.144.126) appears to be up.
Host firewall2.baymountain.com (8.7.97.2) appears to be up.
Host 12.1.6.201 appears to be up.
Host psor.inshealth.com (12.130.143.43) appears to be up.
[thousands of hosts cut]
Host ZM088019.ppp.dion.ne.jp (222.8.88.19) appears to be up.
Host 105.237.91.222.broad.ak.sn.dynamic.163data.com.cn (222.91.237.105) appears to be up.
Host 222.92.136.102 appears to be up.
Nmap done: 50000 IP addresses (4473 hosts up) scanned in 4259.281 seconds
Enhanced Discovery Results

• Enhanced discovery:
  – took 71 minutes vs. 27 (up 167%)
  – Found 1,125 more live hosts (up 34%)
Top 10 TCP Host Discovery Ports

- 80/http
- 25/smtp
- 22/ssh
- 443/https
- 21/ftp
- 113/auth
- 23/telnet
- 53/domain
- 554/rtsp
- 3389/ms-term-server
Top Ports Project

• A massive scan of millions of Internet IPs to determine most commonly open TCP and UDP ports.

• Some large organizations also contributed scan data to give a behind-the-firewall perspective.

• nmap-services file augmented with frequency data for each port.
Default Scan Ports

- In Nmap 4.68: 1715 ports for TCP scans, plus 1488 for UDP scans. Ports 1-1024, plus all named ports above that.

- With augmented nmap-services: Top 1000 ports for each protocol. Finishes faster, and often finds more open ports.
Fast Scan (-F) Ports

• In Nmap 4.68: 1276 ports for TCP scans, plus 1017 for UDP scans. Includes all named ports.

• With augmented nmap-services: Top 100 ports for each protocol.
Fast Scan Example Times

- **Nmap -sUV -F -T4 scanme.nmap.org**
  - With 4.68: 1 hour, 2 minutes, 62 seconds
  - With bhdc08: 6 minutes, 29 seconds
  - With bhdc08 & “--version-intensity 0”: 13 sec
  - All three found the same open port (53)
New --top-ports and --port-ratio features

• --top-ports <n> scans the most commonly open <n> ports for each protocol requested.

• --port-ratio <n> (where <n> is between 0 and 1) scans all ports with a frequency of at least the given level.
Top 10 TCP ports

- 80 (http)
- 23 (telnet)
- 22 (ssh)
- 443 (https)
- 3389 (ms-term-serv)
- 445 (microsoft-ds)
- 139 (netbios-ssn)
- 21 (ftp)
- 135 (msrpc)
- 25 (smtp)
TCP effectiveness of --top-port values

- --top-ports 10: 48%
- --top-ports 50: 65%
- --top-ports 100: 73%
- --top-ports 250: 83%
- --top-ports 500: 89%
- --top-ports 1000: 93%
- --top-ports 2000: 96%
- --top-ports 3674: 100%
Top 10 UDP ports

- 137 (netbios-ns)
- 161 (snmp)
- 1434 (ms-sql-m)
- 123 (ntp)
- 138 (netbios-dgm)
- 445 (microsoft-ds)
- 135 (msrpc)
- 67 (dhcps)
- 139 (netbios-ssn)
- 53 (domain)
UDP effectiveness of –top-port values

• --top-ports 10: 50%
• --top-ports 50: 86%
• --top-ports 100: 90%
• --top-ports 250: 94%
• --top-ports 500: 97%
• --top-ports 1017: 100%
• Note: -p- UDP data not yet available
Packet Rate Control

- --min-rate <packets per second>
- --max-rate <packets per second>

nmap --min-rate 500 scanme.nmap.org
2nd Generation OS Detection

```bash
# nmap -A -T4 scanme.nmap.org
[...]
Device type: general purpose
Running: Linux 2.6.X
OS details: Linux 2.6.20-1 (Fedora Core 5)
```

More info:
# nmap --reason -T4 scanme.nmap.org

[...]

Interesting ports on scanme.nmap.org (205.217.153.62):
Not shown: 1709 filtered ports
Reason: 1709 no-responses

<table>
<thead>
<tr>
<th>PORT</th>
<th>STATE</th>
<th>SERVICE</th>
<th>REASON</th>
</tr>
</thead>
<tbody>
<tr>
<td>22/tcp</td>
<td>open</td>
<td>ssh</td>
<td>syn-ack</td>
</tr>
<tr>
<td>25/tcp</td>
<td>closed</td>
<td>smtp</td>
<td>reset</td>
</tr>
<tr>
<td>53/tcp</td>
<td>open</td>
<td>domain</td>
<td>syn-ack</td>
</tr>
<tr>
<td>70/tcp</td>
<td>closed</td>
<td>gopher</td>
<td>reset</td>
</tr>
<tr>
<td>80/tcp</td>
<td>open</td>
<td>http</td>
<td>syn-ack</td>
</tr>
<tr>
<td>113/tcp</td>
<td>closed</td>
<td>auth</td>
<td>reset</td>
</tr>
</tbody>
</table>
# nmap --packet-trace -p 25,113
scanme.nmap.org

Starting Nmap ( http://nmap.org )
[...]
RCVD (0.1430s) TCP 64.13.134.52:25 > 192.168.0.8:46736 RA ttl=55 id=0
iplen=40  seq=0  win=0  ack=2914477947
RCVD (0.1440s) TCP 64.13.134.52:113 > 192.168.0.8:46736 RA ttl=55 id=0
iplen=40  seq=0  win=0  ack=2914477947
[...]

Nmap done: 1 IP address (1 host up)
scanned in 0.15 seconds
# nmap -traceroute scanme.nmap.org

```
[...]
TRACEROUTE (using port 22/tcp)
HOP RTT ADDRESS
1 0.60  wap.nmap-int.org (192.168.0.6)
[...]
6 9.74  151.164.251.42
7 10.89  so-1-0-0.mpr1.sjc2.us.above.net (64.125.30.174)
8 10.52  so-4-2-0.mpr3.pao1.us.above.net (64.125.28.142)
9 14.25  metro0.sv.svcolo.com (208.185.168.173)
10 12.80  scanme.nmap.org (64.13.134.52)
```
Performance and Accuracy

```
# nmap -T4 --max_rtt_timeout 200
--initial_rtt_timeout 150
--min_hostgroup 512 --max_retries 0 -n --P0 -p80 -oG pb3.gnmap
216.163.128.0/20
Starting Nmap
[...]
Nmap run completed -- 4096 IP addresses (4096 hosts up) scanned in 46.052 seconds
```
TCP and IP Header Options

```bash
# nmap -vv -n -sS -P0 -p 445
--ip-options "L 10.4.2.1"
10.5.2.1
```
Ncat

• A modern interpretation of Hobbit's venerable Netcat
• Supports virtually all of the Netcat 1.10 features, except the basic portscanner.
• Also supports SSL, IPv6, multiple platforms, connection brokering, port redirection, proxies (client, server, chaining), shell execution, access control, and more.
• In development since 2005, nearly ready for release. Current dev lead is Kris Katterjohn.
• Available from svn://svn.insecure.org/ncat (login: guest/guest)
Ndiff

- Compares two (or more) scans, displays changes (new/removed hosts, ports, changed services, etc.)
- Great for quick change detection with recurring scans.
- Perl version available from: svn://svn.insecure.org/nmap-exp/ndiff
Upgrade your Nmap

• Many bug fixes and performance improvements in version 4.68. See http://nmap.org/changelog.html
• For even newer, try the svn release. See http://nmap.org/book/install.html#inst-svn
• For all the goods in this presentation: svn co --username guest --password "" svn://svn.insecure.org/nmap-exp/bhdc08
Top Nmap Contributors since 4.50

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Questions and Resources

• Download Nmap from http://nmap.org
• Download these slides from: http://insecure.org/presentations/iSec08/
• Top-ports Nmap: svn://svn.insecure.org/nmap-exp/bhdc08