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Practical Assignment (SANS 2000 Monterey)
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Assignment 1 – Network Detects

[1 2 3 4]

Detect #1 – "An RPC service attack"

1. Source of Trace

```
(Toby Miller)

A little RPC and 9088. Checked many places for this port and has come up short. Anyone
have any ideas?

WHOIS 24.3.24.41
@Home Network (NETBLK-ATHOME)   ATHOME                24.0.0.0 - 24.23.255.255
     @Home Network (NETBLK-MD-COMCAST-CATV-1) MD-COMCAST-CATV-1

Nov 11 16:49:53 socretes kernel: Packet log: input REJECT eth1 PROTO=6
  24.3.24.41:1218 xxx.xxx.xxx.xxx:111 L=60 S=0x00 I=28466 F=0x4000 T=53
  SYN (#9)
Nov 11 17:35:57 socretes kernel: Packet log: input DENY eth1 PROTO=6
  24.3.24.41:3936 xxx.xxx.xxx.xxx:9088 L=60 S=0x00 I=31177 F=0x4000 T=53
  SYN #107)
Nov 11 17:36:00 socretes kernel: Packet log: input DENY eth1 PROTO=6
  24.3.24.41:3936 xxx.xxx.xxx.xxx:9088 L=60 S=0x00 I=31326 F=0x4000 T=53
  SYN (#107)
Nov 11 17:36:06 socretes kernel: Packet log: input DENY eth1 PROTO=6
  24.3.24.41:3936 xxx.xxx.xxx.xxx:9088 L=60 S=0x00 I=31847 F=0x4000 T=53
```

```
  SYN (#107)
```

[Global Incident Analysis Center: 11/16/00]

2. Detect was generated by:

This detect was generated from the packet filtering capability available in linux kernels. Logging is sent to syslog (stored in `/var/log/messages` on redhat). The log contains date/time, hostname, action, and details of the packet that matched a rule. For example, take the first entry:

```
Nov 11 16:49:53 socretes kernel: Packet log: input REJECT eth1 PROTO=6
  24.3.24.41:1218 xxx.xxx.xxx.xxx:111 L=60 S=0x00 I=28466 F=0x4000 T=53
  SYN (#9)
```

Nov 11 16:49:53	date/time
socretes	hostname
input	direction of traffic
REJECT	action
eth1	interface
PROTO=6	protocol (TCP)
24.3.24.41:1218	source IP:source port
xxx.xxx.xxx.xxx:111	destination IP:destination port
L=60	packet length
S=0x00	type of service flags
I=28466	sequence number
F=0x4000	fragment offset
T=53	time to live (TTL)
SYN	flags – SYN flag set
(#9)	this packet matched rule #9

(A good reference for the log format is available here.)

3. Probability the source address was spoofed

This attack depends on a 3-way TCP handshake. The first step of the attack is to connect to TCP port 111, the portmapper, to obtain the mapping of RPC services to ports. Because of this, the probability of spoofing is extremely low.

4. Description of attack:

By exploiting a format string vulnerability in rpc.statd, an attacker can gain remote access to a root login interactive shell. CVE reference: CVE-2000-0666.

5. Attack mechanism:

This is a format string vulnerability in rpc.statd. A format string vulnerability exploits weaknesses in C program functions for printing output. The printf() function is used by programmers for output with formatting. Many parts of programs pass user data straight to the printf function without any checks. Users are able to insert formatting syntax through this input to manipulate areas of memory. The statd service has one such vulnerability in it's call to syslog().

If the attacker knows which port statd is running on, the exploit can be targeted immediately to that port. In most cases the portmapper must be referenced. The portmapper gives a list of mappings for all RPC based services to ports. portmapper runs on TCP/UDP port 111.

In this attack, the attacker first tries to determine which port statd is running on with a connection to port 111. This connection matches a rule in the packet filter rule set (#9) and is REJECTed. (A REJECT differs from DENY in that an ICMP message is sent to the source saying the packet has been dropped for administrative reasons) The attack has failed at this point.

If the connection were permitted, the list of portmappings would be returned to the attacker. At this point, the attacker would determine the port for statd and connect to it. Upon connection, a string is sent to the statd service. The exploit code is contained in this string which exploits the formatting in the syslog() call.

This statd log entry provided by Laurie (see Correlations below) provides a higher level of fidelity, and thus more insight into the exploit:

```
Aug 12 06:56:58 hostp statd[284]: statd: attempt to create
  "/var/statmon/sm/%08x %08x %08x %08x %08x%08x %08x %08x
  %08x %08x %08x %08x %08x %08x %0242x%n%055x%n%012x%n%0192x
  %nK^v ^( ^ ^. #^1 F'F* FF+, NV1@/bin/sh -c echo "9088
  stream tcp nowait root /bin/sh -i" >> /tmp/m;
  /usr/sbin/inetd /tmp/m;"
```

The format string exploit code is located at the beginning. The tail end of the code attempts to connect an interactive shell (`/bin/sh -i`) to port 9088. This is done by creating a custom inetd.conf file to pass as an argument to `/usr/sbin/inetd`. This would allow unauthenticated, root shell access.

6. Correlations:

Lots of correlation data available for this one. First, a search for "rpc 9088" on www.google.com turned up:

> http://www.sans.org/y2k/081600.htm
> Laurie[@.edu] submitted a kernel log, with one of the detects showing an attacker trying to use the statd vulnerability to create a custom inetd.conf with /bin/sh tied to port 9088.
>
> http://lists.insecure.org/incidents/2000/Aug/0162.html

A reply from Andreas Östling warning a user to check port 9088 after a post containing the syslog entry for a statd attack.

http://lists.insecure.org/incidents/2000/Sep/0057.html
Matthew Caldwell reports seeing similar scans going to ports 9704, 5000, and 9088 following an attempt to exploit statd.

A further search with "statd port" turns up a CERT advisory:

http://www.cert.org/advisories/CA-2000-17.html
"CERT® Advisory CA-2000-17 Input Validation Problem in rpc.statd"

7. Evidence of active targeting:

There is some evidence of active targeting. The attacker follows up the portmapper connection with 9088 connections, so it's not just a port 111 scan. However, the fact that the statd port is never obtained since port 111 is blocked reveals that some automation is involved. If this were a manual exploit attempt, the attacker would have known that the statd exploit was not successful, and /bin/sh was not available on 9088. Therefore the subsequent connection attempts to 9088 indicate some level of automation. A determination of whether this were part of a wider scale scan would require correlation with perimeter based logs – firewalls, NIDS located at gateways, etc.

8. Severity:

```
(Criticality + Lethality) – (System + Net Countermeasures) = Severity
```

Criticality **3**, the detect did not include information on the target, however, since it's a Unix box it's assumed to have some useful purpose other than a desktop
Lethality **5**, this attack would allow unauthenticated, remote root access
Countermeasures
System **5**, kernel level packet filtering has blocked this
Network **0**, the attack made it all the way through the network to the target operating system

```
(3 + 5) – (5 + 0) = 3
```

9. Defensive recommendation:

Turn off RPC services if not needed. There are several vulnerabilities associated with RPC based services. If these services are not needed, they should be turned off. If they are needed, they should be protected by TCP Wrappers or kernel packet filtering (which is done in this case). Linux based systems should upgrade the nfs-utils RPM to v1.9.1 or greater to mitigate this particular vulnerability. Connections to the portmapper, TCP/UDP 111, should also be blocked at the gateway firewall. Rarely are RPC services used across the gateway.

10. Test question:

True or false: RPC based services run on port 111.

Answer: False, port 111, portmapper, is referenced for RPC service to port mappings only.

Detect #2 – "Web server logs"

1. Source of Trace

```
(Roland Grefer)
Apparently somebody tried an exploit targeted at IIS earlier this week on our
web server:
```

[#1]

```
         Date:               11/05/2000
         Access from:        209.19.244.162
         Documents Not Found:
                   /scripts/..À¯../winnt/system32/cmd.exe?/c dir c:\

Those are some quite interesting special characters used in there ... On another
occasion somebody else was kind enough to leave the  following trace
```

[#2]

```
         Date:               10/08/2000
         Access from:        162.33.194.162
         Documents Not Found:
http://www.rusftpsearch.net/cgi-
bin/pst.pl?pstmode=writeip&psthost=12.34.56.78&pstport=80

where 12.34.56.78 was our web server's address.
```

[Global Incident Analysis Center: 11/14/00]

2. Detect was generated by:

Detects were obtained from web server logs. The logs indicate the date, source, and URL of missing documents requested. Web server logs are useful in intrusion detection as they report anomalous behavior. In this case, the logs reported these sources trying to access documents that don't exist on the server. This behavior warrants the attention of an analyst.

3. Probability the source address was spoofed

[#1] This attack depends on a 3-way TCP handshake. Upon establishing the port 80 connection to the webserver, the attacker requests a document with a malformed URL. If successful, the contents of c:\ is returned to the source. Based on this, spoofing is highly unlikely.

[#2] The 3-way handshake is required for this attack as well. A port 80 connection must be established before, the pst.pl GET request is sent. Spoofing is highly unlikely.

4. Description of attack:

[#1] By using the extended UNICODE "/" or "\" in a GET URL, an attacker can execute random commands. In this case, the attacker was attempting to execute a shell (cmd.exe) and list the contents of the C:\ directory. CVE reference: CAN-2000-0884.

[#2] The source is infected with the RingZero Trojan. This Trojan randomly scans for anonymous web proxies, that is, proxies that do not authenticate and can therefore be used to hide a user's true identity. (No CVE reference)

5. Attack mechanism:

[#1] This is an attack targeted at IIS web servers that use an extended UNICODE set. The attacker first establishes a TCP connection with the web server. A GET request is then sent. In this request, the extended UNICODE representation of "/" and "\" are used. Research from rain forest puppy indicates that "IIS seems to decode UNICODE at the wrong instance (after path checking, rather than before)." As a result, unauthenticated users can access any files and run executables from their browsers.

As illustrated in the securityfocus.com exploit area, this vulnerability can be used in many ways. In one example, TFTP was used to transfer a file onto the web server. This was done using a GET URL with the TFTP command and syntax to transfer a text file. This was verified with a directory listing and a "type" command to view the contents of the text file—both done with GET commands to the webserver.

[#2] RingZero is a Trojan that infects windows based systems. It's purpose is to use the victim's machine to scan for anonymous web proxies. The virus is spread through email attachments. When run, an executable is extracted which registers itself to run each time windows is started. This executable scans IP addresses at random. It is looking at ports 80, 3128, and 8080. If a port is found to be active, a GET URL is sent to the target (the URL appears in the web server log). If the target is an anonymous proxy, this request will be forwarded to www.rusfptsearch.net, where the pst.pl script will record the target's IP address and port.

6. Correlations:

Both of these detects are widespread. The IIS UNICODE [#1] vulnerability surfaced in October of this year. It has generated substantial discussion on several mailing lists and web sites.

RingZero [#2] surfaced over a year ago, but is still alive in the wild. In fact, an altavista search for parts of the URL's will often return web server usage pages. These pages often show the pst.pl as a high request script or document not found.

7. Evidence of active targeting:

RingZero randomly selects addresses for scanning. This would not be considered active targeting. On the other hand, the IIS UNICODE detect could be considered active targeting. More information is needed to make a determination. The attacker may be using a script that simply scans the internet for vulnerable servers. On the other hand, the attacker could be targeting the network and simply checking the web server for this specific vulnerability. To determine active targeting in this case, other logs should be reviewed for this class C network (209.19.44). Firewalls with a "deny everything" policy programmed in would be a good source for this. If other logs are not available, active targeting should be assumed.

8. Severity:

```
(Criticality + Lethality) – (System + Net Countermeasures) = Severity
```

[#1]

Criticality **3**, this is a web server – it probably holds information which could cause harm to the organization if the confidentiality, integrity, or availability (aka. CIA triad) were affected

Lethality **0**, this has some assumption built in: from the wording of the notes which precede the detect, the target web server is not IIS based

Countermeasures

System **3**, security posture (OS patches, TCP wrappers, etc.) for this system is not known, however, logging is enabled on the web server

Network **0**, the attack made it through to the web server, so it is not blocked at the network level

(3 + 0) – (3 + 0) = **0**

[#2]

Criticality **3**, this is a web server – it probably holds information which could cause harm to the organization if the confidentiality, integrity, or availability (aka. CIA triad) were affected

Lethality **0**, the URL was logged as a document not found on the server, this is not a proxy server

Countermeasures

System **3**, security posture (OS patches, TCP wrappers, etc.) for this system is not known, however, logging is enabled on the web server

Network **0**, the attack made it through to the web server, so it is not blocked at the network level

(3 + 0) – (3 + 0) = **0**

9. Defensive recommendation:

At the network, intrusion detection could catch these with a simple string match on TCP traffic with a destination of port 80. The arachNIDS archive currently contains three signatures for the IIS UNICODE [#1] attack: IDS432, IDS433, IDS434.

Example snort rule given in IDS434:

```
alert TCP $EXTERNAL any -> $INTERNAL 80 (msg: "IDS434/web-iis-unicode-traversal-backslash"; flags: AP; content: "..|25|c1|25|9c"; nocase;)
```

This rule alerts on TCP traffic from outside the network destined to any host inside the network, port 80. It looks for the ACK and PUSH flags on a TCP packet and the culprit extended UNICODE characters within the payload. (This assumes the GET requests are sent on the 3rd step of the TCP handshake with the ACK flag set and a PUSH flag indicating no more data is coming. Web communications rarely send ACKs by themselves, but rather piggyback the flags with data.)

arachNIDS does not contain a RingZero [#2] signature, but one can easily be derived:

```
alert TCP $EXTERNAL any -> $INTERNAL 80 (msg: "ringzero"; flags: AP; content: "http://www.rusftpsearch.net/cgi-bin/pst.pl"; nocase;)
```

Moving closer to the application itself, host based IDS is also available. There is a product called Perfecto that will act as a proxy in front of your web server and defend against web-based attacks. Perfecto learns what appropriate behavior is for web applications, or forms, and makes decisions based on this. Both of these URL's would be considered deviant from expected behavior. The GET request would be blocked, logged, and reported to the administrator.

10. Test question:

Which logs would contain the best level of fidelity for analysis of attacks on cgi-bin based web applications?

a) Firewall
b) NIDS
c) Web server
d) TCP wrappers

Answer: **c**, web server logs provide more insight into the GET/POST requests used in cgi-bin scripts.

Detect #3 – "Port 515 scans"

1. Source of Trace

```
(Patrick Prue)

Been logging a bunch of these scans over the last 3 days from various sources.

Was wondering what they were possibly looking for on port 515 . Haven't really been able
to find anything with regards to what it possibly is .
```

```
[**] IDS06 - MISC-Source Port Traffic 20 TCP [**]
10/31-18:47:21.973424 208.184.219.253:20 -> x.x.x.2:515
TCP TTL:244 TOS:0x0 ID:59824
**S***** Seq: 0x1000000 Ack: 0x0 Win: 0x3FFF

[**] IDS06 - MISC-Source Port Traffic 20 TCP [**]
10/31-18:47:53.157274 208.184.219.253:20 -> x.x.x.4:515
TCP TTL:244 TOS:0x0 ID:25472
**S***** Seq: 0x1000000 Ack: 0x0 Win: 0x3FFF

[**] IDS06 - MISC-Source Port Traffic 20 TCP [**]
10/31-18:52:02.641247 208.184.219.253:20 -> x.x.x.20:515
TCP TTL:244 TOS:0x0 ID:12802
**S***** Seq: 0x1000000 Ack: 0x0 Win: 0x3FFF

[**] IDS06 - MISC-Source Port Traffic 20 TCP [**]
10/31-19:03:59.876453 208.184.219.253:20 -> x.x.x.66:515
TCP TTL:244 TOS:0x0 ID:9143
**S***** Seq: 0x1000000 Ack: 0x0 Win: 0x3FFF
```

[Global Incident Analysis Center: 11/2/00]

2. Detect was generated by:

These are snort logs. Apparently Patrick has a signature setup to alarm on incoming connections with low numbered source ports. In this case, port 20, the FTP data port, is being used.

```
[**] IDS06 - MISC-Source Port Traffic 20 TCP [**]            <- Name of the signature
10/31-18:52:02.641247 208.184.219.253:20 -> x.x.x.20:515     <- Date-time Source IP:port -> Target IP:port
TCP TTL:244 TOS:0x0 ID:12802                                 <- Protocol, Time to live value, type of service flags, fragment ID
**S***** Seq: 0x1000000 Ack: 0x0 Win: 0x3FFF                 <- flags (SYN), sequence number, ack. number, window size
```

3. Probability the source address was spoofed

This attack depends on a 3-way TCP handshake. The first step of the attack is to connect to TCP port 515, the Unix print spooler port. At a minimum, the source would need to receive a SYN-ACK to determine if this service is running. Because of this, the probability of spoofing is extremely low.

4. Description of attack:

This is a recon attempt for hosts servicing TCP port 515. The attacker is attempting to map the target network. By using source port 20, some perimeter devices may let these packets in. From the whitehats.com archive:

> This problem is due to design flaws in the consideration of some packetfilters. A typical ruleset would have a rule to allow FTP response traffic, by allowing traffic in that had the source port 20. However, an attacker can easily set their source port to 20 using a tool like netcat, and circumvent this type of primitive filter.

Port 20 is used for FTP data. FTP commands are passed on port 21. When a file is transferred, a connection is established on port 20. The target initiates the connection back to the source. For a firewall to intelligently allow this connection, it must be stateful. In other words, it knows an FTP session has been established between the source (internal host, protected by firewall) and the target. Based on this "stateful" knowledge, a firewall can make an intelligent decision to let this connection attempt through. The attacker is hoping there are no stateful inspection devices like this on the network.

5. Attack mechanism:

TCP port 515 is the Unix print spooler port. This port is used for network printing between windows hosts. Win2k also supports this network printing as well.

Microsoft TCP/IP Printing Services, aka Print Services for Unix, allows an attacker to cause a denial of service via a malformed TCP/IP print request.
CVE-2000-0232 securityfocus.com

6. Correlations:

Search of source address returned no results. Neither could I find any other scans of port 515 using source port 20. Just other scans for port 515:

11/30: security@auckland reports incoming 515 connections from the @home network.
11/28: security@auckland reports incoming 515 connections from 128.255.130.28.
11/27: Stephen Odak reports incoming 515 connections.

No significant correlations available at this time.

7. Evidence of active targeting:

This is a scan of the network to find open 515 ports. Chances are if this source were targeting this network in general, other alarms would be triggered as well. The attacker would be looking for several vulnerabilities to exploit remotely. Based on the data available for analysis, this is a general scan for port 515 vulnerabilities through a range of network addresses. There is no evidence of active targeting.

8. Severity:

```
(Criticality + Lethality) – (System + Net Countermeasures) = Severity
```

Criticality 2, if the mapping is successful, the attacker would have knowledge of possible denial of service targets
Lethality 3, this is a denial of service attack
Countermeasures
System 0, it is unknown whether the target network has this service running anywhere
Network 3, snort picked up the mapping attempt, but it is unknown if these were blocked on the network

(2 + 3) - (0 + 3) = **2**

NOTE: Based on the sophistication of the attacker (by using source port 20), I'd add a point or two to this!

9. Defensive recommendation:

This attack should be blocked at the perimeter. In most instances, there will not be a reason to let print requests through the perimeter. A firewall with a deny all but what is explicitly permitted would satisfy this. See SANS Top 10, Appendix B, for further information on how and what to block at the perimeter. Further, based on the sophistication of this attack, a watchlist for this source network (208.184.219) is recommended.

10. Test question:

A **stateless** perimeter security device would have trouble blocking which packet?

a. x.x.x.x:20 -> x.x.x.2:515 Flags: SYN
b. x.x.x.x :8821 -> x.x.x.2:515 Flags: SYN
c. x.x.x.x:22112 -> x.x.x.2:515 Flags: FIN, SYN
d. x.x.x.x:80 -> x.x.x.2:1824 Flags: SYN

Correct answer: **a**, incoming port 20 connections need to be established for FTP data transfers. To successfully defend, yet provide FTP communications, the device must have knowledge of (or keep the "state" of) current outgoing FTP connections.

Detect #4 – "synscan"

1. Source of Trace

(Laurie@.edu)

Bell Global Network Operations, Ottawa Ontario, CA (again)

```
Jan 19 22:10:07, Jan 21 15:37:48
Jun 29 05:56:35 207.236.111.226:21 -> z.y.w.98:21 SYNFIN **SF****
Jun 29 05:56:51 207.236.111.226:21 -> z.y.w.98:21 SYNFIN **SF****
Jun 29 05:57:54 207.236.111.226:21 -> z.y.w.98:21 SYNFIN **SF****
```

```
Jun 29 05:57:57 207.236.111.226:20755 -> z.y.w.98:21 SYN **S*****
Jun 29 05:58:02 207.236.111.226:1628 -> z.y.w.98:53 UDP
Jun 29 05:58:10 207.236.111.226:21 -> z.y.w.98:21 SYNFIN **SF****
Jun 29 05:58:11 207.236.111.226:22819 -> z.y.w.98:21 SYN **S*****
--------
[**] SCAN-SYN FIN [**]
06/29-05:56:34.871172 207.236.111.226:21 -> z.y.w.98:21
  TCP TTL:27 TOS:0x0 ID:39426
  **SF**** Seq: 0x7E45DE1F Ack: 0x50A11826 Win: 0x404
  00 00 00 00 00 00 ......
[**] SCAN-SYN FIN [**]
06/29-05:56:50.946947 207.236.111.226:21 -> z.y.w.98:21
  TCP TTL:27 TOS:0x0 ID:39426
  **SF**** Seq: 0x1C4719EB Ack: 0x1E77A02F Win: 0x404
  00 00 00 00 00 00 ......
[**] SCAN-SYN FIN [**]
06/29-05:57:53.886933 207.236.111.226:21 -> z.y.w.98:21
  TCP TTL:27 TOS:0x0 ID:39426
  **SF**** Seq: 0x2627C01C Ack: 0x61572CE9 Win: 0x404
  00 00 00 00 00 00 ......
[**] SCAN-SYN FIN [**]
06/29-05:58:10.093075 207.236.111.226:21 -> z.y.w.98:21
  TCP TTL:27 TOS:0x0 ID:39426
  **SF**** Seq: 0x43F05EC6 Ack: 0x6F270653 Win: 0x404
  00 00 00 00 00 00 ......
```

[Global Incident Analysis Center: 7/2/00]

2. Detect was generated by:

These are snort logs. The first set of entries are fast alerts. This is an abbreviated format that provides a timestamp, source and destination, as well as the options that were included in the rule (in this case, the SIN and FIN flags being set simultaneously). The second set of logs provides more detail – the entire packet.

3. Probability the source address was spoofed

This attack depends on a 3-way TCP handshake. The source is trying to determine if the FTP service, port 21, is running on the target. The source depends on receiving a response (in the form of a RST) from the target to determine this. Because of this, the probability of spoofing is extremely low.

4. Description of attack:

This is a network recon attempt. The source is attempting to map well-known ports on the target network, in this case, FTP and DNS.

5. Attack mechanism:

There are two suspicious characteristics present in this attack:

1. Source port = Target port
2. SYN **AND** FIN flags are set

The first characteristic is not exactly illegal, but would not be found in normal TCP/IP traffic. The SYNFIN flags should never be set together. There is no reason for this. The response a target gives to these illegal packets can reveal the target's architecture and O.S. type. RFC's do not specify how stack programmer's should handle these illegal packets. Therefore, different operating systems behave differently and send different responses when receiving these illegal packets. Some may send a RST, some may send nothing. By poking and prodding with illegal packets like this, the attacker can reference a database of known responses to determine the target O.S. This is the basis of TCP/IP fingerprinting methods found in tools such as 'nmap' and 'queso'.

6. Correlations:

The trace provided in the arachNIDS synscan signature definition, IDS441, exhibit the same qualities as our trace.

```
11/30-17:54:10.623674 10.200.1.100:218 -> 10.1.1.38:218
TCP TTL:42 TOS:0x0 ID:39426
**SF**** Seq: 0x55A0EF7B   Ack: 0x40F9DC84   Win: 0x404
```

- source port, destination port are same
- ID = 39426
- Window size = 0x404

7. Evidence of active targeting:

With the data given, there is no evidence of active targeting. This is probably part of a larger range scan.

8. Severity:

```
(Criticality + Lethality) - (System + Net Countermeasures) = Severity
```

<u>Criticality</u> **2**, if the mapping is successful, the attacker would have knowledge of possible denial of service targets
<u>Lethality</u> **0**, this is just a probe/mapping attempt.
Countermeasures
<u>System</u> **0**, it is unknown whether the target network has this service running anywhere
<u>Network</u> **3**, snort picked up the mapping attempt, but it is unknown if these were blocked on the network

```
(2 + 0) - (0 + 3) = -1
```

9. Defensive recommendation:

There are many IDS signatures for catching illegal packets or suspicious traffic such as this. Snort signature - IDS441:

```
alert TCP $EXTERNAL any -> $INTERNAL any (msg: "IDS441/probe-Synscan-Portscan";
id: 39426; flags: SF;)
```

10. Test question:

Which of the following packets is illegal?

a. x.x.x.x:20 -> x.x.x.2:515 Flags: SYN, ACK
b. x.x.x.x :515 -> x.x.x.2:515 Flags: ACK
c. x.x.x.x:22112 -> x.x.x.2:515 Flags: FIN, SYN
d. x.x.x.x:80 -> x.x.x.2:515 Flags: SYN

Answer: **c**, the SYN and FIN flags should never be set together.

Assignment 2 – Describe an Attack – 'twinge.c'

twinge.c [source: technotronic.com]

'twinge' generates most ICMP types to send to a remote host with spoofed sources. These ICMP packets may have adverse affects on some TCP/IP stack implementations – specifically Win32. This technique could be used for Denial of Service [DoS] attacks. From the source:

```
/*
  twinge.c - by sinkhole@dos.org [6/99]

  this cycle through all the possible icmp types and subtypes and
  send to target host, 1 cycle == 1 run thru all of em

  Crashes almost all Windows boxes over a LAN.

  DISCLAIMER:
  This is a PoC (Proof Of Concept) program for educational purposes
  only. Using this program on public networks where other people
  are affected by your actions is _HIGHLY ILLEGAL_ and is not what
  this is made for.

  for without help from ryan this wouldnt have been coded. =)
*/
```

Code was compiled and executed on a Redhat 6.2 box. Target was a Win2k Professional workstation. The generated ICMP packets did not appear to have an affect on the target. Apparently Microsoft has addressed these issues in their latest OS release as these ICMP packets were known to wreak havoc on Win32 boxes in the past.

Breakdown of 'tcpdump –nvvx' output:

```
21:17:06.709813 eth0 > 13.129.59.21 > 192.168.142.1: icmp: echo reply (ttl 255, id
61978)
                          4500 001d f21a 0000 ff01 3285 0d81 3b15
```

```
c0a8 8e01 0000 ffff 0000 0000 00
```

13.129.59.21 spoofed source IP
192.168.142.1 target

IP:

4500 001d	version, length, TOS, total header length
f21a 0000	identification, flags, fragment offset
ff01 3285	TTL, protocol, header checksum
0d81 3b15	source IP
c0a8 8e01	destination IP

IP:

0000 ffff	message type, message code type, checksum
0000 0000 00	type specific parameter [32 bits], data

Start of tcpdump capture:

```
Kernel filter, protocol ALL, datagram packet socket
tcpdump: listening on all devices
```

Type #0: Echo Reply:

```
21:17:06.709813 eth0 > 13.129.59.21 > 192.168.142.1: icmp: echo reply (ttl 255, id
61978)
                          4500 001d f21a 0000 ff01 3285 0d81 3b15
                          c0a8 8e01 0000 ffff 0000 0000 00
```

[ICMP Header: Message type: `00`, code type: `00`, Checksum: **`ffff`** **]**

Types #1 and #2 are Unassigned:

```
21:17:06.750523 eth0 > 111.142.235.73 > 192.168.142.1: icmp: type-#1 (ttl 255, id
11128)
                          4500 001d 2b78 0000 ff01 e6e5 6f8e eb49
                          c0a8 8e01 0100 feff 0000 0000 00
21:17:06.771878 eth0 > 161.173.209.126 > 192.168.142.1: icmp: type-#2 (ttl 255, id
15660)
                          4500 001d 3d2c 0000 ff01 bcdd a1ad d17e
                          c0a8 8e01 0200 fdff 0000 0000 00
```

Type #3: **Network Unreachable**:

```
21:17:06.786327 eth0 > 32.42.4.52 > 192.168.142.1: [|icmp] (ttl 255, id 19880)
                          4500 001d 4da8 0000 ff01 fb2f 202a 0434
                          c0a8 8e01 0300 fcff 0000 0000 00   [network unreach]
21:17:06.800118 eth0 > 32.42.4.52 > 192.168.142.1: [|icmp] (ttl 255, id 19880)
                          4500 001d 4da8 0000 ff01 fb2f 202a 0434
                          c0a8 8e01 0301 fcfe 0000 0000 00   [host unreach]
21:17:06.809113 eth0 > 32.42.4.52 > 192.168.142.1: [|icmp] (ttl 255, id 19880)
                          4500 001d 4da8 0000 ff01 fb2f 202a 0434
                          c0a8 8e01 0302 fcfd 0000 0000 00   [protocol unreach]
21:17:06.819585 eth0 > 32.42.4.52 > 192.168.142.1: [|icmp] (ttl 255, id 19880)
                          4500 001d 4da8 0000 ff01 fb2f 202a 0434
                          c0a8 8e01 0303 fcfc 0000 0000 00   [port unreach]
21:17:06.825515 eth0 > 32.42.4.52 > 192.168.142.1: [|icmp] (ttl 255, id 19880)
                          4500 001d 4da8 0000 ff01 fb2f 202a 0434
                          c0a8 8e01 0304 fcfb 0000 0000 00   [packet to big, DF bit
set]
21:17:06.842751 eth0 > 32.42.4.52 > 192.168.142.1: [|icmp] (ttl 255, id 19880)
                          4500 001d 4da8 0000 ff01 fb2f 202a 0434
                          c0a8 8e01 0305 fcfa 0000 0000 00   [source route failed]
21:17:06.852835 eth0 > 32.42.4.52 > 192.168.142.1: [|icmp] (ttl 255, id 19880)
                          4500 001d 4da8 0000 ff01 fb2f 202a 0434
```

```
                         c0a8 8e01 0306 fcf9 0000 0000 00  [destination network
unknown error]
21:17:06.861397 eth0 > 32.42.4.52 > 192.168.142.1: [|icmp] (ttl 255, id 19880)
                         4500 001d 4da8 0000 ff01 fb2f 202a 0434
                         c0a8 8e01 0307 fcf8 0000 0000 00  [destination host
unknown error]
21:17:06.870986 eth0 > 32.42.4.52 > 192.168.142.1: [|icmp] (ttl 255, id 19880)
                         4500 001d 4da8 0000 ff01 fb2f 202a 0434
                         c0a8 8e01 0308 fcf7 0000 0000 00  [source host isolated
error]
21:17:06.877339 eth0 > 32.42.4.52 > 192.168.142.1: [|icmp] (ttl 255, id 19880)
                         4500 001d 4da8 0000 ff01 fb2f 202a 0434
                         c0a8 8e01 0309 fcf6 0000 0000 00  [destination network
admin prohibited]
```

Type #4: Source Quench:

```
21:17:06.896608 eth0 > 119.231.110.104 > 192.168.142.1: icmp: source quench
Offending pkt: [|ip] (ttl 255, id 52060)
                         4500 001d cb5c 0000 ff01 bb89 77e7 6e68
                         c0a8 8e01 0400 fbff 0000 0000 00
```

Type #5: Redirect:

```
21:17:06.906971 eth0 > 152.191.132.29 > 192.168.142.1: [|icmp] (ttl 255, id 8176)
                         4500 001d 1ff0 0000 ff01 3069 98bf 841d
                         c0a8 8e01 0500 faff 0000 0000 00  [network error]
21:17:06.913510 eth0 > 152.191.132.29 > 192.168.142.1: [|icmp] (ttl 255, id 8176)
                         4500 001d 1ff0 0000 ff01 3069 98bf 841d
                         c0a8 8e01 0501 fafe 0000 0000 00  [host error]
21:17:06.922702 eth0 > 152.191.132.29 > 192.168.142.1: [|icmp] (ttl 255, id 8176)
                         4500 001d 1ff0 0000 ff01 3069 98bf 841d
                         c0a8 8e01 0502 fafd 0000 0000 00  [TOS and network error]
21:17:06.932742 eth0 > 152.191.132.29 > 192.168.142.1: [|icmp] (ttl 255, id 8176)
                         4500 001d 1ff0 0000 ff01 3069 98bf 841d
                         c0a8 8e01 0503 fafc 0000 0000 00  [TOS and host error]
```

Type #6: Alternate Host Address:

```
21:17:06.942121 eth0 > 199.173.70.82 > 192.168.142.1: icmp: type-#6 (ttl 255, id
61007)
                         4500 001d ee4f 0000 ff01 70e6 c7ad 4652
                         c0a8 8e01 0600 f9ff 0000 0000 00
```

Type #7: Unassigned:

```
21:17:06.952554 eth0 > 32.82.18.71 > 192.168.142.1: icmp: type-#7 (ttl 255, id
31792)
                         4500 001d 7c30 0000 ff01 be6c 2052 1247
                         c0a8 8e01 0700 f8ff 0000 0000 00
```

Type #8: Echo:

```
21:17:06.963567 eth0 > 118.242.97.123 > 192.168.142.1: icmp: echo request (ttl
255, id 22260)
                         4500 001d 56f4 0000 ff01 3dd4 76f2 617b
                         c0a8 8e01 0800 f7ff 0000 0000 00
```

Type #9: Router Advertisement:

```
21:17:06.972993 eth0 > 202.194.65.49 > 192.168.142.1: icmp: router advertisement
lifetime 0 0: [size 0] (ttl 255, id 32294)
                         4500 001d 7e26 0000 ff01 e31b cac2 4131
                         c0a8 8e01 0900 f6ff 0000 0000 00
```

Type #10: Router Selection:

```
21:17:06.982902 eth0 > 6.229.235.101 > 192.168.142.1: icmp: router solicitation
(ttl 255, id 51447)
                         4500 001d c8f7 0000 ff01 b1f3 06e5 eb65
                         c0a8 8e01 0a00 f5ff 0000 0000 00
```

Type #11: Time exceeded:

```
21:17:06.992532 eth0 > 214.101.213.90 > 192.168.142.1: [|icmp] (ttl 255, id 57760)
                         4500 001d e1a0 0000 ff01 dfd4 d665 d55a
                         c0a8 8e01 0b00 f4ff 0000 0000 00  [TTL expired]
21:17:07.001628 eth0 > 214.101.213.90 > 192.168.142.1: [|icmp] (ttl 255, id 57760)
                         4500 001d e1a0 0000 ff01 dfd4 d665 d55a
                         c0a8 8e01 0b01 f4fe 0000 0000 00  [fragment reassembly
timeout]
```

Type #12: Parameter Problem:

```
21:17:07.015131 eth0 > 22.16.121.4 > 192.168.142.1: icmp: parameter problem -
octet 0 Offending pkt: [|ip] (ttl 255, id 63583)
```

```
                          4500 001d f85f 0000 ff01 e5c1 1610 7904
                          c0a8 8e01 0c00 f3ff 0000 0000 00
```

Type #13: Timestamp:

```
21:17:07.016078 eth0 > 23.1.38.121 > 192.168.142.1: icmp: time stamp request (ttl
255, id 24182)
                          4500 001d 5e76 0000 ff01 d145 1701 2679
                          c0a8 8e01 0d00 f2ff 0000 0000 00
```

Type #14: Timestamp reply:

```
21:17:07.017355 eth0 > 92.249.166.45 > 192.168.142.1: icmp: time stamp reply (ttl
255, id 10783)
                          4500 001d 2a1f 0000 ff01 3ff0 5cf9 a62d
                          c0a8 8e01 0e00 f1ff 0000 0000 00
```

Type #15: Information Request:

```
21:17:07.018175 eth0 > 8.222.246.98 > 192.168.142.1: icmp: information request
(ttl 255, id 8432)
                          4500 001d 20f0 0000 ff01 4d05 08de f662
                          c0a8 8e01 0f00 f0ff 0000 0000 00
```

Type #16: Information Reply:

```
21:17:07.018771 eth0 > 240.223.235.87 > 192.168.142.1: icmp: information reply
(ttl 255, id 64098)
                          4500 001d fa62 0000 ff01 969b f0df eb57
                          c0a8 8e01 1000 efff 0000 0000 00
```

Type #17: Address Mask Request:

```
21:17:07.019669 eth0 > 27.120.76.77 > 192.168.142.1: icmp: address mask request
(ttl 255, id 65234)
                          4500 001d fed2 0000 ff01 069e 1b78 4c4d
                          c0a8 8e01 1100 eeff 0000 0000 00
```

Observations:

- spoofed source IP and IP ID change when type increments, but not when type code increments.
- Changes TTL to 255 compared to standard 64 (see below).
- Payload [parameters and data] stays constant: `0000 0000 00`

A normal echo request/reply (ping) generated from Redhat 6.2 box to target:

```
22:35:20.345043 eth0 > 192.168.142.128 > 192.168.142.1: icmp: echo request (ttl 64, id
40801)
                          4500 0054 9f61 0000 4001 3d75 c0a8 8e80
                          c0a8 8e01 0800 dbac 6c06 0000 78d7 3e3a
                          0938 0500 0809 0a0b 0c0d 0e0f 1011 1213
                          1415 1617 1819 1a1b 1c1d 1e1f 2021 2223
                          2425 2627 2829 2a2b 2c2d 2e2f 3031 3233
                          3435 3637
22:35:20.346345 eth0 < 192.168.142.1 > 192.168.142.128: icmp: echo reply (ttl 128, id
11992)
                          4500 0054 2ed8 0000 8001 6dfe c0a8 8e01
                          c0a8 8e80 0000 e3ac 6c06 0000 78d7 3e3a
                          0938 0500 0809 0a0b 0c0d 0e0f 1011 1213
                          1415 1617 1819 1a1b 1c1d 1e1f 2021 2223
                          2425 2627 2829 2a2b 2c2d 2e2f 3031 3233
                          3435 3637
```

Defensive recommendations:

Block ICMP at the firewall. Note, however, that blocking type 3 (dest. unreach) and type 11 (time exceeded) may cause problems with IP communications.

Possible Snort signature: [**untested**]

```
alert ICMP $EXTERNAL any -> $INTERNAL any (msg: "icmp-unassigned-1"; itype: 1;)
```

Assignment 3 – "Analyze This" Scenario

This report is based on Snort alarm data recorded from 11 Aug through 14 Sep, or **68,597** alarms total.

NOTE! Your sensor appeared to be missing several days of log data. Specifically, 12-14 Aug, 1 Sep, and 4 Sep.

Update on past reporting

In past reports, `MY.NET.5.37` has been identified as possibly compromised. However, lack of activity in our data logs show the security issues on this host have been addressed. There is still 'watchlist' activity to `MY.NET.100.230`, but this appears to be normal mail traffic. We are still catching wu-ftp exploits. This vulnerability has serious consequences (root access). We are still seeing RPC traffic as well. RPC is plagued with vulnerabilities and should be blocked at the perimeter as there are very few cases where RPC communications are needed across the internet. No alarms were seen for the Trinoo server at `MY.NET.97.112`.

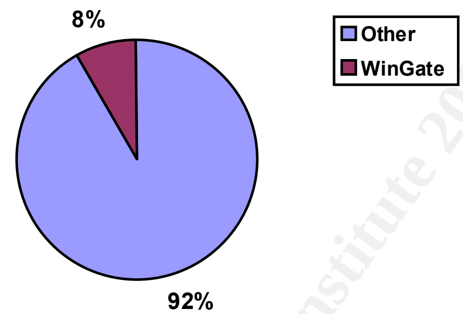
EVENTS OF INTEREST [EOI]

Source	whois	Target	Activity	Date	Recommended action
128.61.105	Georgia Institute of Technology	MY.NET.218	Recon	8-Sep	Implement watchlist this source
130.149.41	Technische Universitaet Berlin, Germany	MY.NET.223, MY.NET.217	Recon	17-Sep	Implement watchlist this source
141.223.124	Pohang Institute of Science and Technology, Republic of Korea	MY.NET.100, MY.NET.6	**SUN RPC ACCESS**	19-Sep	Check targets for compromise; block sour implement watchlist
151.196.73.119	Windermer Information Systems Technology, Annapolis, MD	MY.NET.253	Recon	8-Sep	Implement watchlist this source
18.116.0	Massachusetts Institute of Technology	MY.NET.100, MY.NET.15, MY.NET.6	Sun RPC access, Recon	18-Aug	Check targets for compromise; block sour implement watchlist
192.55.91	NASA Lewis Network Control Center	MY.NET.5	Recon	19/20-Aug	Implement watchlist this source
202.187.24	Universiti Tun Abdul Razak [APNIC]	MULTIPLE	Recon	MULTIPLE	Implement watchlist this source
205.128.11.157	HeadHunter.net, Atlanta, GA	MY.NET.1	Recon	MULTIPLE	Implement watchlist this source
205.188.153	America Online, Inc	MULTIPLE	Sun RPC access	MULTIPLE	Check targets for compromise; block sour implement watchlist
205.188.179	America Online, Inc	MY.NET.217	Sun RPC access	15/16-Aug	Check targets for compromise; block sour implement watchlist
207.151.147	Los Nettos, Marina del Rey, CA	MY.NET.60	Recon	16-Aug	Implement watchlist this source
209.160.238	Brooks Fiber Properties, Inc., Sacramento, CA	MULTIPLE	Sun RPC access	19-Aug	Check targets for compromise; block sour implement watchlist
209.218.228.201	RND Networks, Mahwah, NJ	MY.NET.1	Recon	11/15-Aug	Implement watchlist this source
210.100.199	Korea Telecom	MY.NET.100, MY.NET.6	Sun RPC access	3-Sep	Check targets for compromise; block sour implement watchlist
210.101.101	Korea Telecom	MY.NET.6	Sun RPC access, Recon	2-Sep	Check targets for compromise; block sour implement watchlist
210.61.144	Abnet Information Co., Ltd,	MULTIPLE	Exhaustive Recon	11-Sep	Source has performed an exhaustive SIN-I

	Taiwan				on the entire network – recommend block implement watchlist this source
212.204.196	The Netherlands	MY.NET.6	Sun RPC access	2/7-Sep	Check targets for compromise; block sour implement watchlist
213.25.136	E-SOLUTIONS, Poland	MULTIPLE	Exhaustive Recon	7-Sep	Source has performed an exhaustive SIN-I on the entire network – recommend block implement watchlist this source
216.15.191.130	Twistedhumor.com, San Diego, CA	MY.NET.6, MY.NET.253	Recon	MULTIPLE	Implement watchlist this source
24.17.189.83	@Home Network	MY.NET.150.24, MY.NET.99.104, MY.NET.202.190, MY.NET.202.202	wu-ftpd exploit attempts	8-Sep	Source has attempted known exploits to th server. Check targets for compromise. R block and/or implement watchlist this sou
24.180.134	@Home Network	MY.NET.208	Recon	11-Sep	Implement watchlist this source
24.23.198	@Home Network	MY.NET.217	Recon	17/18-Aug	Implement watchlist this source
24.3.161	@Home Network	MY.NET.145	Recon	5,13,13-Aug	Implement watchlist this source
24.68.58	@Home Network	MY.NET.210, MY.NET.217	Tiny Fragments	11,13-Sep	Suspect denial of service attempts against Recommend block and/or implement watc source.
62.76.42	SSAU - Samara State Aerospace University, Russia	MY.NET.1, MY.NET.212	Tiny Fragments	14-Sep	Suspect denial of service attempts against Recommend block and/or implement watc source.
63.226.208	Netpoint, Springville, UT	MY.NET.253	Recon	2-Sep	Implement watchlist this source
64.80.63	CollegePark/LexingtonCrossing, Gainseville, FL	MULTIPLE	Recon	MULTIPLE	Implement watchlist this source

Anonymous Web Proxy (WinGate)

6193 alerts



These alerts indicate possible anonymous web proxies setup inside your network. An anonymous web proxy is used to hide the sources true identity when they surf to internet sites. There are several Trojans that automatically scan the internet for these proxies. This is the primary cause for what may be considered false positives. However, the top 3 targets in this category indicate possible proxy configurations and should be investigated immediately:

SOURCE	TARGET	DESCRIPTION
MULTIPLE	MY.NET.60.11	Target is being used as an anonymous web proxy, port 1080 **Outgoing telnets**, 8/11-16:11
MULTIPLE	MY.NET.60.8	Target is being used as an anonymous web proxy, port 1080 **Incoming telnets** from 159.226.45.108 [8/11 01:27-02:25]
MULTIPLE	MY.NET.100.2	Several hosts from 151.17.144 network attempted port 1080 access

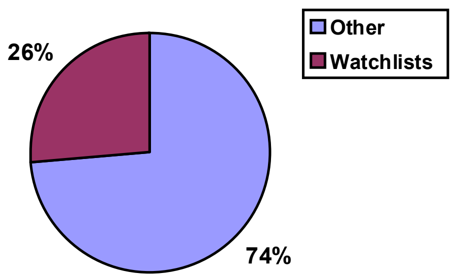
Top WinGate targets (10 or more hits)

10	MY.NET.185.20	**12**	MY.NET.202.118	**15**	MY.NET.97.115	**20**	MY.NET.98.162
	MY.NET.97.156		MY.NET.217.46		MY.NET.97.187	**21**	MY.NET.98.185
	MY.NET.97.182		MY.NET.98.131	**16**	MY.NET.97.169	**22**	MY.NET.97.192
	MY.NET.98.199		MY.NET.98.137		MY.NET.98.157	**23**	MY.NET.98.124

11	MY.NET.152.45		MY.NET.98.197	**17**	MY.NET.53.48	**31**	MY.NET.98.111
	MY.NET.98.108	**13**	MY.NET.203.218		MY.NET.97.215	**33**	MY.NET.222.198
	MY.NET.98.127		MY.NET.60.38		MY.NET.98.106	**39**	MY.NET.60.16
	MY.NET.98.129		MY.NET.97.226	**18**	MY.NET.97.119	**91**	**MY.NET.100.2**
			13 MY.NET.98.170		MY.NET.97.237	**139**	**MY.NET.60.8**
		14	MY.NET.201.50		MY.NET.98.193	**177**	**MY.NET.60.11**
				19	MY.NET.98.130		

Watchlists

24,754 alerts



Watchlists raise alerts based on source IP alone. They are usually implemented for networks that have known to be hostile. There appear to be two watchlists configured:

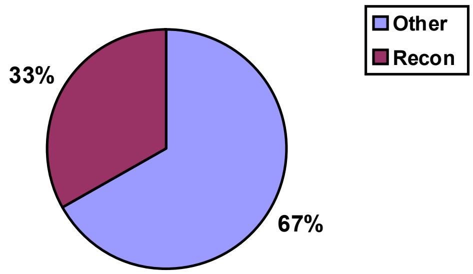
12.179.44.0 - 212.179.44.63 ISDN Net Ltd.
Israel

159.226.0.0 The Computer Network Center Chinese
Academy of Sciences (NET-NCFC)
Beijing, China

SOURCE	TARGET	DESCRIPTION
159.226.45.108 159.226.45.3	MY.NET.6.7 MY.NET.60.8	These sources are telnet'ing into the targets. [11, 16 Aug] This indicates the target may be compromised!
MY.NET.96.168 MY.NET.60.11	212.176.58.2 159.226.41.166	Sources (internal) appear to have telnet connections to the targets. This is suspicious. Sources should be inspected for tampering.
MY.NET.163.32	159.226.45.3	Outgoing telnet AND pop3 (mail). Inspect source for tampering.
212.179.29.150	MY.NET.53.28	Incoming connections on port 4407. This port has some correlation associated with Trojan type activity. The target should be inspected.
MULTIPLE	MY.NET.70.33	Multiple connections to port 8765. There is a known vulnerability associated with this port – Ultraseek search engine (from Infoseek) buffer overflow. Is the target running this?
159.226.5.152	MY.NET.100.165	Source attempted HTTP (web) connections to target. No other traffic.
159.226.63.200	MY.NET.100.230	Several ident (113) connections with no mail traffic. Ident is a simple authentication mechanism usually seen with mail traffic. Ident can also be used to enumerate usernames for information gathering.
212.179.61.247 159.226.22.44	MY.NET.5.27 MY.NET.253.112	Sources attempted SHTTP connections to target. SHTTP traffic is encrypted and could be used to tunnel attacks through.
159.226.114.29	MY.NET.162.199	Target appears to FTP out, which is followed by several connections to higher ports (32766,68,70). Suspicious.

Network Recon (Scans) [Statistics only, ref. EOI by Source for details]

34,626 alerts



Attackers perform network scanning as a form of recon. This information can be used in subsequent attacks. By exploiting weaknesses in protocols (ie. Different flag settings with TCP packets), attackers can glean much information from a network and sometimes avoid IDS and firewalls. The intrusion detection sensor picks up the following recon attempts:

NMAP TCP Ping - uses the TCP protocol vs. ICMP to determine if a hosts exists [**138** alerts]
Null Scan - uses TCP as well, no flags set [**181** alerts]
NMAP Fingerprint - uses TCP, set all flags, observe response which varies by O.S. [**64** alerts]
Queso Fingerprint - uses TCP, set SYN flag and reserved, observe response [**54** alerts]
SYN-FIN - uses TCP, set SYN and FIN (illegal), observe response [**5457** alerts]
Portscans - if a source attempts a predetermined threshold [7 connections in 2 seconds] of connections, this plug-in raises an alert [**28,732** alerts]

Other Notes of Interest

"nbtstat" attempts

These are attempts to connect to the NetBIOS ports of the targets and view a list of shares.

DATE	SOURCE	TARGET
9 Sep	129.37.160.81	MY.NET.100.130
11 Aug	168.167.8.12	MY.NET.253.24
11 Aug	205.229.90.194	MY.NET.181.37
11 Aug	24.28.62.226	MY.NET.70.121
11 Aug	64.7.58.194	MY.NET.20.10
11 Aug	206.171.108.1	MY.NET.6.7
11 Aug	209.150.98.231	MY.NET.130.91
18 Aug	4.17.88.66	MY.NET.6.15
11 Aug	62.136.168.18	MY.NET.70.121
11 Aug	207.79.66.3	MY.NET.253.53
11 Aug	207.79.66.3	MY.NET.253.53
19 Aug	129.37.161.200	MY.NET.100.130
11 Aug	131.118.254.222	MY.NET.6.7
11 Aug	168.143.29.9	MY.NET.60.17
11 Aug	166.72.86.217	MY.NET.100.230
11 Aug	166.72.86.217	MY.NET.100.165

"tiny fragments"

Fragmented traffic is commonly associated with attacks. These are normally attacks against TCP/IP stacks themselves or attempts to "fly under the radar" of perimeter security. The following sources were observed sending fragmented traffic.

212.160.15.85
213.132.131.201
24.68.58.96
62.76.42.17

62.76.42.18

"SMTP source connections"

These hosts attempted connections originating from source port 25, SMTP. This is done as an attempt to penetrate firewall configurations that permit port 25 through. A true internet client/server program would initiate IP communication using a high port, 1024. This activity is suspicious:

DATE	SOURCE	TARGET
17 Aug	206.46.170.21	MY.NET.97.181
10 Sep	156.40.66.2	MY.NET.253.53

"Happy 99" Worm

It appears the "Happy 99" worm has been passed on your network.:

DATE	SOURCE	TARGET
16 Aug	128.8.198.101	MY.NET.6.35
20 Aug	24.2.2.66	MY.NET.179.80

High port to high port connections.

Trojan horses will often use high ports for communication. No other traffic preceded these connections. Therefore they are suspicious.

SOURCE	PORT	TARGET	PORT	DATE
212.179.44.62	30246 30945	MY.NET.15.41	6690	8/17, 00-01
212.179.62.74	1984	MY.NET.224.78	6346	9/3, 07:30
212.179.27.6	1948	MY.NET.253.105	26411	9/3, 13:22
212.179.61.5	21263	MY.NET.220.42	2367	9/6, 08:41
		MY.NET.204.150	2667	9/13, 15:09
212.179.47.30	6346	MY.NET.223.62	2995	9/6, 18:47
			1283	9/6, 22:59
212.179.127.45	1063	MY.NET.202.58	6688	9/12, 10:20

False Positives

These hosts were observed passing what was considered normal traffic. For this analysis, they were assumed to have the indicated functions.

MY.NET.253.41, .42, .43	- Mail servers [**7,670** Watchlist alerts] *** NOTE: In classifying these as false positives, we assume the IDS is not responsible for **virus** traffic
NAPSTER TRAFFIC	- the following hosts appear to be running napster (ports 6699, 6700): [**3,126** Watchlist alerts] MY.NET. 181.87, 221.94, 205.254, 157.200, 208.178
REALAUDIO	- outgoing on port 7070 [**30** alerts]
MY.NET.101.192	- this appears to be a network management stations using SNMP. The SNMP string is set to the default, "public". This is a serious security risk and should be changed immediately. [**922** alerts]
ICQ TRAFFIC (205.188.153.x)	- ICQ is an internet chat client that defaults to port 4000 and 32771. Port 32771 falls within the range of RPC clients. The "Attempted Sun RPC high port access" is triggered when ports within this range are accessed. RPC services that run on these ports have several vulnerabilities associated with them. However, because these

originate from the icq network (205.188.153), these are considered false positives. [**1985** alerts] [Reference Lenny Zelster practical]

Analyst Observations

- MY.NET.6, .15, .100 are getting RPC attacks – different sources, same target set
- MY.NET.97, .98, .101 are on the external side of the snort box
- The following hosts have isolated incoming mail traffic (port 25) from watchlist sources. Are these really mail servers?

MY.NET.1.14	5 Sep, 09:55
MY.NET.6.34	7 Sep, 02:42
MY.NET.1.2	7 Sep, 03:11
MY.NET.110.150	8 Sep, 08:15

DEFENSIVE RECCOMENDATIONS

If you have not already done so, establish a network perimeter defense. This can be done with a firewall. The firewall should block all traffic except that which is specifically permitted. You intrusion detection capability should be placed in front of the firewall. This will give you a situational awareness and let you know when someone is trying something on your network. Minimum recommendations for your policy (firewall ruleset):

- Block incoming TCP port 1080
- Block incoming TCP port 111
- Do not allow incoming FTP (TCP port 21) connections

Viruses have been seen passing into your network. If you do not already have virus software installed, this should be a priority. Virus scanning can be done at the desktop, the gateway, or both.

You should also address the use of what may be inappropriate software on your network. RealAudio, Napster, and ICQ are all in use on the network. These can pose security threats to not only the boxes they are installed on, but the entire network as well. A written or verbal policy should be established with your employees to preclude the use of this software. You may consider implementing security awareness training for your employees to curtail there problems.

Assignment 4 – Analysis Process

Analysis of bulk data is different than real-time analysis. The analyst can choose to either parse through all the logs as if real-time analysis were being performed. But this can be time consuming with the amount of data we are dealing with. A better approach is to start at a high level and drill down into the data. In this section, I will discuss the strategy I used to perform this analysis.

I borrowed the same approach that is used in the data warehousing community, specifically in OLAP. The challenge in OLAP is dealing with huge amounts of data to find trends and produce m ore meaningful data. In a data warehouse, dimension are created. With this data I found four dimensions: source, target, time, and activity. Within each of these dimensions lie further elements, but I start by looking at different combinations of data within these dimensions.

Examples of questions that should be asked:

What source and target combinations produced the most activity?
How were the different types of activity (alarms) distributed over the number of days?
Was activity from a source observed over a range of days or just once day?
Were multiple alarms seen from a source? (ie. Evidence of active targeting?

In order to answer these questions, we must look at the data as a whole. This can be done a number of ways. But the first step is to parse the logs into dimensions. To do this, I used a Perl script. Perl is ideal for this as that was the scripting languages original intent – the manipulation of text. Here is sample output from my parsed log:

```
09/11/2000,06,SYN-FIN scan!,210.61.144,125,21,MY.NET.6,117,21,2
08/20/2000,12,Watchlist 000222 NET-NCFC,159.226.63,190,1031,MY.NET.253,41,25,4
08/11/2000,02,Watchlist 000222 NET-NCFC,159.226.45,108,1054,MY.NET.60,8,23,45
09/05/2000,20,WinGate 1080 Attempt,207.126.106,118,1391,MY.NET.60,8,1080,1
```

As you can see, the script has produced a comma separated value (CSV) file. A CSV file can be fed into many programs such as Excel and Access. A breakdown of the format

```
08/18/2000,13,Watchlist 000222 NET-NCFC,159.226.63,190,113,MY.NET.253,41,48797,1

  08/18/2000,13                          date, hour
  Watchlist 000222 NET-NCFC              alarm
  159.226.63,190,113            source net, source host, source port
  MY.NET.253,41,48797           target net, target host, target port
  1                                      count
```

The last field, count, is a count of all like lines. Since we are losing some fidelity in the longs, there will be many duplicate long entries. Those duplicates are combined into one entry with a total count.

Once this data is imported into Excel or Access, some interesting trends can be found. Two tools I would suggest becoming familiar within Excel are the AutoFilter and the PivotTable. AutoFilter allows you to select specific entries by putting pull downs on the headers. (which by the way will have to be created manually by inserting a row at line 1.) Now you can see all entries for a source network, or all alarms on a given day, etc. This is an efficient way of drilling down within the data.

Access is helpful as well. Attached in Appendix A is a sample Access report. The report gives all alarms for source with their corresponding targets and the dates. This allows the analyst to see active sources. So for instance, if a source has only null scan activity in one day, it's not considered a high threat. But what if the source is targeting several networks, over the span of several days as was the case with 210.61.144. This trend would be hard to spot by just reviewing the snort logs. Another thing to look for is a source with several different types of activity. This could be evidence of active targeting by employing several different recon methods.

In short, by borrowing some ideas from the OLAP world, the month's worth of logs were easier to analyze. The basics are to break the data into dimensions: time, activity, source, destination. (which by the way should hold true for data from all sources, firewalls, IDS, etc.) Then analyze within those dimensions. This type of analysis can even be more effective than real-time analysis for activity spread over a range of days (such as a slow scan). You lose some fidelity, but you can always refer back to the original logs.

Appendix A – EOI by Source [MS Access Report]

SrcNet	Alarm	DstNet	Date
128.138.14			
	Null scan!	MY.NET.179	9/13/200
128.153.151			
	Null scan!	MY.NET.205	9/3/2000
128.194.51			
	Null scan!	MY.NET.210	9/6/2000
128.211.224			
	Attempted Sun RPC high port access	MY.NET.98	8/20/200
128.226.152			
	Null scan!	MY.NET.206	9/8/2000
128.61.105			
	Null scan!	MY.NET.218	9/8/2000
	Queso fingerprint		
128.61.59			
	Null scan!	MY.NET.217	8/17/200
128.8.198			
	Happy 99 Virus	MY.NET.6	8/16/200
129.2.146			
	Queso fingerprint	MY.NET.201	9/14/200
129.37.160			
	SMB Name Wildcard	MY.NET.100	9/9/2000
129.37.161			
	SMB Name Wildcard	MY.NET.100	8/19/200

129.59.24			
	Null scan!	MY.NET.204	9/3/2000
129.93.214			
	Null scan!	MY.NET.223	9/6/2000
130.149.41			
	Null scan!	MY.NET.217	8/17/200
	Probable NMAP fingerprint attempt		
	Queso fingerprint		
	SYN-FIN scan!		
130.239.11			
	Null scan!	MY.NET.181	8/17/200
130.239.142			
	Null scan!	MY.NET.223	9/12/200
130.49.220			
	Null scan!	MY.NET.226	9/12/200
131.118.254			
	SMB Name Wildcard	MY.NET.6	8/11/200
131.155.192			
	Null scan!	MY.NET.5	9/5/2000
132.199.220			
	Null scan!	MY.NET.205	9/5/2000
137.82.136			
	Null scan!	MY.NET.97	8/15/200
139.91.171			
	Null scan!	MY.NET.211	9/12/200
141.213.191			
	Attempted Sun RPC high port access	MY.NET.98	9/12/200
141.223.124			
	External RPC call	MY.NET.100	8/19/200
		MY.NET.6	
141.40.205			
	Null scan!	MY.NET.224	9/6/2000
147.126.59			
	Queso fingerprint	MY.NET.253	9/6/2000
150.216.127			
	Null scan!	MY.NET.206	9/11/200
151.196.73			
	NMAP TCP ping!	MY.NET.253	9/8/2000
	Null scan!		

	Probable NMAP fingerprint attempt		
153.19.25			
	Null scan!	MY.NET.223	9/10/200
156.40.66			
	TCP SMTP Source Port traffic	MY.NET.253	9/10/200
161.31.208			
	External RPC call	MY.NET.6	9/10/200
162.33.184			
	SMB Name Wildcard	MY.NET.60	8/11/200
166.72.86			
	SMB Name Wildcard	MY.NET.100	8/11/200
168.143.29			
	SMB Name Wildcard	MY.NET.60	8/11/200
168.167.8			
	SMB Name Wildcard	MY.NET.253	8/11/200
18.116.0			
	External RPC call	MY.NET.6	8/18/200
	SYN-FIN scan!	MY.NET.100	
		MY.NET.15	
		MY.NET.6	
192.55.91			
	NMAP TCP ping!	MY.NET.5	8/19/200
			8/20/200
193.251.71			
	Null scan!	MY.NET.146	8/17/200
193.64.205			
	SUNRPC highport access!	MY.NET.211	9/6/2000
194.237.99			
	Null scan!	MY.NET.223	9/9/2000
194.94.18			
	Null scan!	MY.NET.220	9/6/2000
195.132.204			
	Null scan!	MY.NET.220	9/10/200
195.150.132			
	Null scan!	MY.NET.202	9/7/2000
2.2.2			
	NMAP TCP ping!	MY.NET.60	9/2/2000
200.145.151			
	Null scan!	MY.NET.221	9/3/2000

200.52.201			
	Null scan!	MY.NET.217	8/11/200
202.187.24			
	NMAP TCP ping!	MY.NET.1	9/12/200
		MY.NET.179	9/7/2000
		MY.NET.60	9/2/2000
			9/3/2000
205.128.11			
	NMAP TCP ping!	MY.NET.1	8/11/200
			8/16/200
			8/17/200
			8/18/200
			8/20/200
205.188.153			
	Attempted Sun RPC high port access	MY.NET.105	8/17/200
			9/8/2000
		MY.NET.206	9/3/2000
	Attempted Sun RPC high port access	MY.NET.217	9/9/2000
		MY.NET.218	9/11/200
		MY.NET.219	9/2/2000
		MY.NET.220	9/7/2000
		MY.NET.222	9/5/2000
			9/6/2000
		MY.NET.53	9/9/2000
205.188.179			
	Attempted Sun RPC high port access	MY.NET.217	8/15/200
			8/16/200
205.188.4			
	SUNRPC highport access!	MY.NET.210	9/8/2000
205.229.90			
	SMB Name Wildcard	MY.NET.181	8/11/200
206.171.108			
	SMB Name Wildcard	MY.NET.6	8/11/200
206.46.170			
	TCP SMTP Source Port traffic	MY.NET.97	8/17/200
207.151.147			
	NMAP TCP ping!	MY.NET.60	8/16/200
	Null scan!		
	Probable NMAP fingerprint attempt		

207.230.248			
	Null scan!	MY.NET.208	9/14/200
207.29.195			
	SUNRPC highport access!	MY.NET.211	9/7/2000
207.79.66			
	SMB Name Wildcard	MY.NET.253	8/11/200
209.10.41			
	SUNRPC highport access!	MY.NET.211	9/11/200
209.150.98			
	SMB Name Wildcard	MY.NET.130	8/11/200
209.160.238			
	External RPC call	MY.NET.100	8/19/200
		MY.NET.15	
		MY.NET.6	
209.218.228			
	NMAP TCP ping!	MY.NET.1	8/11/200
			8/15/200
210.100.199			
	External RPC call	MY.NET.100	9/3/2000
		MY.NET.6	
210.101.101			
	External RPC call	MY.NET.6	9/2/2000
	SYN-FIN scan!		
210.61.144			
	SYN-FIN scan!	MY.NET.1	9/11/200
		MY.NET.10	
		MY.NET.100	
		MY.NET.104	
		MY.NET.105	
		MY.NET.106	
		MY.NET.107	
		MY.NET.108	
		MY.NET.109	
		MY.NET.11	
		MY.NET.110	
		MY.NET.111	
		MY.NET.112	
		MY.NET.115	
	SYN-FIN scan!	MY.NET.12	9/11/200

	MY.NET.120	
	MY.NET.13	
	MY.NET.130	
	MY.NET.138	
	MY.NET.139	
	MY.NET.140	
	MY.NET.141	
	MY.NET.142	
	MY.NET.143	
	MY.NET.144	
	MY.NET.145	
	MY.NET.146	
	MY.NET.15	
	MY.NET.150	
	MY.NET.151	
	MY.NET.152	
	MY.NET.153	
	MY.NET.154	
	MY.NET.155	
	MY.NET.156	
	MY.NET.157	
	MY.NET.158	
	MY.NET.159	
	MY.NET.160	
	MY.NET.161	
	MY.NET.162	
	MY.NET.163	
	MY.NET.17	
	MY.NET.178	
SYN-FIN scan!	MY.NET.179	9/11/200
	MY.NET.18	
	MY.NET.180	
	MY.NET.181	
	MY.NET.182	
	MY.NET.183	
	MY.NET.184	
	MY.NET.185	
	MY.NET.186	
	MY.NET.188	

	MY.NET.190	
	MY.NET.198	
	MY.NET.199	
	MY.NET.2	
	MY.NET.20	
	MY.NET.200	
	MY.NET.201	
	MY.NET.202	
	MY.NET.203	
	MY.NET.204	
	MY.NET.205	
	MY.NET.206	
	MY.NET.207	
	MY.NET.208	
	MY.NET.209	
	MY.NET.21	
	MY.NET.210	
	MY.NET.211	
	MY.NET.212	
	MY.NET.213	
SYN-FIN scan!	MY.NET.214	9/11/200
	MY.NET.215	
	MY.NET.216	
	MY.NET.217	
	MY.NET.218	
	MY.NET.219	
	MY.NET.220	
	MY.NET.221	
	MY.NET.222	
	MY.NET.223	
	MY.NET.224	
	MY.NET.225	
	MY.NET.226	
	MY.NET.227	
	MY.NET.228	
	MY.NET.229	
	MY.NET.230	
	MY.NET.231	
	MY.NET.232	

		MY.NET.25	
		MY.NET.253	
		MY.NET.254	
		MY.NET.26	
		MY.NET.4	
		MY.NET.5	
		MY.NET.53	
		MY.NET.54	
		MY.NET.6	
		MY.NET.60	
		MY.NET.68	
	SYN-FIN scan!	MY.NET.69	9/11/200
		MY.NET.7	
		MY.NET.70	
		MY.NET.71	
		MY.NET.75	
		MY.NET.85	
		MY.NET.9	
		MY.NET.94	
		MY.NET.97	
		MY.NET.98	
		MY.NET.99	
211.111.108			
	Null scan!	MY.NET.224	9/10/200
212.160.15			
	Tiny Fragments - Possible Hostile	MY.NET.160	8/19/200
212.204.196			
	SUNRPC highport access!	MY.NET.6	9/2/2000
			9/7/2000
212.33.70			
	Null scan!	MY.NET.206	9/3/2000
213.132.131			
	Tiny Fragments - Possible Hostile	MY.NET.203	9/8/2000
213.228.1			
	Queso fingerprint	MY.NET.219	9/14/200
213.25.136			
	SYN-FIN scan!	MY.NET.1	9/7/2000
		MY.NET.10	
		MY.NET.11	

		MY.NET.12	
		MY.NET.13	
	SYN-FIN scan!	MY.NET.14	9/7/2000
		MY.NET.15	
		MY.NET.17	
		MY.NET.18	
		MY.NET.2	
		MY.NET.20	
		MY.NET.21	
		MY.NET.25	
		MY.NET.26	
		MY.NET.4	
		MY.NET.5	
		MY.NET.53	
		MY.NET.54	
		MY.NET.6	
		MY.NET.60	
		MY.NET.68	
		MY.NET.69	
		MY.NET.7	
		MY.NET.70	
		MY.NET.71	
		MY.NET.75	
		MY.NET.85	
		MY.NET.9	
213.56.48			
	Null scan!	MY.NET.201	9/2/2000
213.6.43			
	Null scan!	MY.NET.208	9/11/200
213.8.52			
	NMAP TCP ping!	MY.NET.60	8/17/200
216.123.60			
	Null scan!	MY.NET.202	9/9/2000
216.123.63			
	Queso fingerprint	MY.NET.75	8/15/200
216.15.191			
	Queso fingerprint	MY.NET.253	9/9/2000
			9/11/200
			9/12/200

			9/13/200
		MY.NET.6	9/9/2000
			9/11/200
216.161.190			
	Null scan!	MY.NET.226	9/11/200
216.164.133			
	SMB Name Wildcard	MY.NET.60	8/11/200
216.181.188			
	Probable NMAP fingerprint attempt	MY.NET.6	8/15/200
216.63.200			
	Null scan!	MY.NET.203	9/5/2000
24.112.241			
	Null scan!	MY.NET.201	8/20/200
24.113.80			
	Null scan!	MY.NET.203	9/6/2000
24.115.96			
	Null scan!	MY.NET.222	9/9/2000
24.13.104			
	Null scan!	MY.NET.253	8/15/200
24.160.189			
	Null scan!	MY.NET.220	9/6/2000
24.164.181			
	Null scan!	MY.NET.217	8/18/200
24.17.189			
	Possible wu-ftpd exploit -	MY.NET.150	9/8/2000
		MY.NET.202	
	site exec - Possible wu-ftpd exploit -	MY.NET.150	
		MY.NET.202	
		MY.NET.99	
24.180.134			
	NMAP TCP ping!	MY.NET.208	9/11/200
	Null scan!		
	Probable NMAP fingerprint attempt		
24.180.196			
	Null scan!	MY.NET.217	9/6/2000
24.19.101			
	Null scan!	MY.NET.222	9/5/2000
24.19.244			
	Queso fingerprint	MY.NET.162	9/3/2000

24.2.2			
	Happy 99 Virus	MY.NET.179	8/20/200
24.200.201			
	Null scan!	MY.NET.162	8/16/200
24.201.116			
	Null scan!	MY.NET.209	9/12/200
24.201.209			
	SYN-FIN scan!	MY.NET.202	9/2/2000
24.22.125			
	Null scan!	MY.NET.223	9/9/2000
24.23.198			
	Null scan!	MY.NET.217	8/17/200
			8/18/200
	Probable NMAP fingerprint attempt		
24.232.79			
	Null scan!	MY.NET.206	9/6/2000
24.24.137			
	Queso fingerprint	MY.NET.219	9/3/2000
24.28.33			
	Null scan!	MY.NET.224	9/13/200
24.28.62			
	SMB Name Wildcard	MY.NET.70	8/11/200
24.29.7			
	Null scan!	MY.NET.218	9/9/2000
24.3.161			
	Queso fingerprint	MY.NET.145	9/5/2000
			9/12/200
			9/13/200
24.6.140			
	Null scan!	MY.NET.130	9/9/2000
24.68.58			
	Tiny Fragments - Possible Hostile	MY.NET.210	9/13/200
		MY.NET.217	9/11/200
24.72.23			
	Null scan!	MY.NET.213	9/6/2000
24.72.8			
	Null scan!	MY.NET.213	9/6/2000
24.8.241			
	Null scan!	MY.NET.70	8/19/200

24.91.58			
	Null scan!	MY.NET.221	9/14/200
24.92.174			
	Null scan!	MY.NET.217	9/11/200
24.92.188			
	Null scan!	MY.NET.106	9/14/200
4.17.88			
	SMB Name Wildcard	MY.NET.6	8/18/200
62.10.136			
	Null scan!	MY.NET.212	9/13/200
62.136.168			
	SMB Name Wildcard	MY.NET.70	8/11/200
62.2.64			
	Null scan!	MY.NET.218	9/9/2000
62.76.42			
	Tiny Fragments - Possible Hostile	MY.NET.1	9/14/200
		MY.NET.212	
63.144.227			
	Null scan!	MY.NET.208	9/8/2000
63.226.208			
	NMAP TCP ping!	MY.NET.253	9/2/2000
	Null scan!		
	Probable NMAP fingerprint attempt		
64.7.58			
	SMB Name Wildcard	MY.NET.20	8/11/200
64.80.63			
	Queso fingerprint	MY.NET.201	9/7/2000
			9/8/2000
		MY.NET.204	9/7/2000
		MY.NET.208	9/11/200
		MY.NET.209	9/7/2000
			9/8/2000
		MY.NET.210	
		MY.NET.217	
			9/10/200
	Queso fingerprint	MY.NET.223	9/10/200
		MY.NET.224	9/11/200
MY.NET.101			
	SMB Name Wildcard	MY.NET.101	8/15/200

			8/16/200
			8/17/200
			8/19/200
			8/20/200
			9/2/2000
			9/3/2000
			9/7/2000
			9/9/2000
			9/10/200
			9/11/200
			9/12/200
			9/13/200
MY.NET.97			
	SNMP public access	MY.NET.101	8/15/200
			8/16/200
			8/20/200
			9/9/2000
			9/11/200
MY.NET.98			
	SNMP public access	MY.NET.101	8/17/200
			8/19/200
			8/20/200
			9/2/2000
			9/3/2000
			9/7/2000
			9/10/200
	SNMP public access	MY.NET.101	9/12/200
			9/13/200