Intrusion Detection in Depth
GCIA Practical Assignment
Version 3.1

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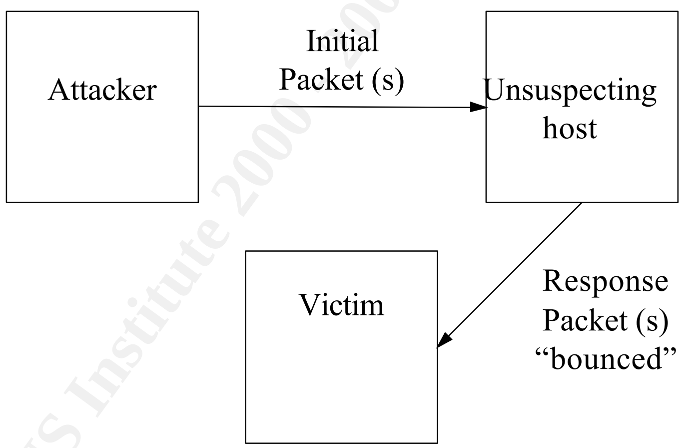
Part 1: Describe the State of Intrusion Detection

Introduction

The focus of this paper is to analyze the Distributed Reflection Denial of Service attack presented on Steve Gibson's website at http://grc.com/dos/drdos.htm . We will use the analysis format provided in the SANS Intrusion Detection practical to do the examination the attack based on the information provided on Mr. Gibson's website. Before doing the analysis, we will first look at the anatomy of a packet bounce and some basic network functionality.

Bounce Attack Overview

Before we begin looking at any specific bounce attacks, we need to define a bounce attack in a generic manner. A bounce attack simply consists of sending some sort of packet (TCP, UDP etc) to an unsuspecting system that is up and running on the Internet. The unsuspecting system then sends a response back to what is believed to be the requesting system. The following example will help to clarify the point:



Once again, speaking in generic terms for a moment, this attack is usually carried out by an attacker that is sending packets to make the unsuspecting host believe it is the victim who wants to talk with him. Depending on the type of packet sent, it will elicit different responses from the victim.

Stimulus and Response

A quick review of stimulus and response concepts is necessary to understand the intent of the packet bounce in question. It is necessary to have a clear understanding of what is considered "normal" network traffic in order to understand what might be gained from an activity and even if the activity is normal. "Correct traffic is consistent with the specifications of the *Request for Comment* (RFC) documents that define the IP protocols. Incorrect traffic violates these protocols." (Northcutt, 133) We are going to look at some different aspects of "normal" network traffic and then apply it to a given packet bounce scenario. This is by no means a comprehensive analysis of "normal" network traffic.

ICMP Traffic

ICMP is a connectionless protocol with no ports associated with it. It is basically the Internet messenger. If there trouble getting a packet from point A to point B, it is ICMP that lets you know what is going on with the transmission and tells you if it is fixable or not. If you're talking to fast to another host, it's ICMP that sends the source quench message to throttle back the transmission. ICMP helps to keep this running smoothly on the Internet. It is amazing what this one protocol can do. Here is a chart taken from page 71 of Dr. Stevens's book called *TCP/IP Illustrated, Volume 1, The Protocol* that illustrates all the many functions that ICMP can provide.

Type	Code	Description	Query	Error
0	0	Echo reply	•	
3		destination unreachable:		
	0	Network unreachable		•
	1	Host Unreachable		•
	2	Protocol unreachable		•
	3	Port unreachable		•
	4	Fragmentation needed but don't fragment bit set		•
	5	Source route failed		•
	6	Destination network unknown		•
	7	Destination host unknown		•
	8	Source host isolated		•
	9	Destination network administratively prohibited		•
	10	Destination host administratively prohibited		•
	11	Network unreachable for TOS		•
	12	Host unreachable for TOS		•
	13	Communication administratively prohibited		•
	14	Host precedence violation		•
	15	Precedence cutoff in effect		•
4	0	Source quench		•
5		Redirect:		
	0	Redirect for network		•
	1	Redirect for host		•
	2	Redirect for type-of-service and network		•
	3	Redirect for type of service and host		•
8	0	Echo request	•	
9	0	Router advertisement	•	
10	0	Router solicitation	•	
11		Time exceeded:		
	0	Time-to-live equals 0 during transit	•	
	1	Time-to-live equals 0 during reassembly	•	
12		Parameter problem:		
	0	IP header bad (catchall error)		•
	1	Required option missing		•
13	0	Timestamp request	•	
14	0	Timestamp reply	•	
15	0	Information request (obsolete)	•	
16	0	Information reply (obsolete)	•	

17	0	Address mask request	•	
18	0	Address mask reply	•	

As you can see, ICMP provides for the ICMP echo request and echo reply. If ICMP echo request is sent, you can see all of the possible expected answers that you could receive other than an echo reply that tells you the host is up. You might get a type 3, code 1 back telling you that the host is unreachable. These are all "normal" network traffic stimulus and responses.

TCP Traffic

Transmission Control Protocol (TCP) is a connection oriented protocol. This means that it requires an established connection before data is exchanged. (Stevens, 223) A quick look at the three way handshake will help to clarify what is expected. The computer that wishes to talk to another computer must first send a SYN (synchronization) packet which is like a "hello" in human language. This really isn't a different packet, but the SYN flag is set in the TCP packet. The receiving computer might accept the connection by sending an ACK (acknowledge) packet as well as setting the SYN flag and establishing its own connection with its own sequence number to the originating system. Each side of the connection uses their own sequence numbers to ensure they track the packets as they come in and in the right order and that all the data is received. The initiating system will send its own ACK packet and the three way handshake is complete. The systems can now talk.

What if the receiving computer didn't want to talk? One option is to send a RST (reset). This is a TCP packet with the RST flag set. This lets the initiating computer know the other computer doesn't want to talk now. Maybe it is not even up and running and ICMP steps up and delivers the message from a router. Or maybe the packet is just silently dropped. These are all normal behavior with TCP traffic. Chapters 17-24 of Dr. Richard Stevens book *TCP/IP Illustrated Volume1* addresses the usage of TCP.

Malicious Usage

The defining of the characteristics and behavior of network traffic is essential for all the devices on the Internet to be able to talk. As with everything, someone will come up with a way to use its prescribed behavior in a way that it was not intended. Maybe it is using the standards to perform a scan or maybe launch an attack. Let's look at a couple of quick examples of how a packet bounce could be used.

Packet Bounce Scans

There are ways to scan a network by bouncing a packet. For an example we will look at the Hping pattern discussed in the (SANS 3.5/3.6, Section 7-3). Based upon the normal characteristics of IP, the IP packet has a field called the identification field (IP ID). This field identifies each IP datagram and increments by 1 with every packet. Different OSs generate their IP IDs differently, so you will need to ensure how the system is incrementing theirs. If there is no response, the IP ID will not increment, but remain the same. (Stevens, 36) How could you use this as a scan? Well, it gives the ability to conceal the identity of originator by bouncing the packet off of a system. Let's look at it.

To do this, you need to find a host that is up on the network and confirm it is NOT talking to anyone. This will be called our idle host. If this machine is not idle, this will not work. Our target host is the host(s) from which more information is to be obtained. The attacker sends a packet to the idle machine and verifies the IP ID. A SYN packet is then crafted and sent to the target host with source address of the idle host. If the host exists and is listening on the port, it will send a SYN/ACK to the idle host. If it is not, it will send a RST/ACK. The idle host will respond with a RST to the SYN/ACK since it did not originate the SYN packet and increment its IP ID. It will not respond to the RST/ACK. The attacker would then send another packet to the idle host and check the IP ID. If it is incremented by 1, this means the target machine is not listening because the idle host did not respond to it. If it is incremented by 2, the target host is listening on the port.

This is a good example of how the normal characteristics of TCP were used in a way not intended to gain information.

Packet Bounce Attacks

The same thing applies to a packet bounce attack. We'll look at a simple one such as a Smurf attack. In this attack, ICMP is used to launch an attack by bouncing it off an amplifying network. An attacker crafts an ICMP echo request packet with the source address of the target host and sends it to a broadcast address. All of the hosts on that broadcast address respond with an echo reply and uses up the available bandwidth causing a denial of service attack. (Northcutt, Novak, 242-243) Once again, the normal characteristics of ICMP were used in a way not intended.

Distributed Reflection Denial Of Service

On his website, at www.grc.com/dos/drdos.htm , Mr. Gibson states, "At 2:00 AM, January 11th 2002, grc.com was blasted off the Internet by a more advanced malicious packet flood. This new style of DDoS attack could be called a Distributed Reflection Denial of Service attack—DRDoS." The essence of the attack as recorded by Mr. Gibson was that "We appeared to be under attack by more than TWO HUNDRED of the Internet's core infrastructure routers." He later states that it was SYN/ACK packets, with a source port of 179, flooding grc.com and provides only a list of IP addresses and resolved names. There was a second wave recorded that originated from different servers with various well known source ports as their origin.

We will look at the attack as recorded by Mr. Gibson and do an analysis of the attack to determine if it is a new attack or if it is possible an old attack with a different twist. We will apply as possible the analysis format that will be used in Part II of the practical as a means of applying a logical look at the attack.

Source of Trace:

The data for the attack was provided by Mr. Gibson on his web site at www.grc.com/dos/drdos.htm. From Mr. Gibson's description of his web server it is behind his ISP's aggregation router and he has two T1 trunk lines.

Detect was generated by:

The data was provided in the following manner (see table 1) with this being only a small representation of the table showing the routers involved. The second wave was documented in a like manner, but with much less IP addresses (see table 2). It is important to note that there was no mention of what source the data was collected from only that the packets were captured. The type of data given will make it difficult to do a proper analysis of what occurred. There is much information missing that could be helpful such as log files, packet dumps, destination ports etc.

Table 1

Source IP	Machine Name
129.250. 28. 1	ge-6-2-0.r03.sttlwa01.us.bb.verio.net
129.250. 28. 3	ge-1-0-0.a07.sttlwa01.us.ra.verio.net
129.250. 28. 20	ge-0-1-0.a12.sttlwa01.us.ra.verio.net
129.250. 28. 33	ge-0-0-0.r00.bcrtfl01.us.bb.verio.net
129.250. 28. 49	ge-1-1-0.r01.bcrtfl01.us.bb.verio.net
129.250. 28. 98	ge-1-2-0.r00.sfldmi01.us.bb.verio.net
129.250. 28. 99	ge-1-0-0.a00.sfldmi01.us.ra.verio.net
129.250. 28.100	ge-1-1-0.a01.sfldmi01.us.ra.verio.net
129.250. 28.113	ge-1-2-0.r01.sfldmi01.us.bb.verio.net
129.250. 28.116	ge-1-1-0.a00.sfldmi01.us.ra.verio.net
129.250. 28.117	ge-1-0-0.a01.sfldmi01.us.ra.verio.net
129.250. 28.131	ge-0-3-0.a00.scrmca01.us.ra.verio.net
129.250. 28.142	ge-0-2-0.r00.scrmca01.us.bb.verio.net
129.250. 28.147	ge-1-2-0.a00.scrmca01.us.ra.verio.net

Table 2

Source IP	Machine Name
.	
.	
64.152. 4. 80	www.wwfsuperstars.com
128.121.223.161	veriowebsites.com
131.103.248.119	www.cc.rapidsite.net
164.109. 18.251	whalenstoddard.com
171. 64. 14.238	www4.Stanford.EDU
205.205.134. 1	shell1.novalinktech.net
206.222.179.216	forsale.txic.net
208. 47.125. 33	gary7.nsa.gov
216. 34. 13.245	channelserver.namezero.com
216.111.239.132	www.jeah.net
216.115.102. 75	w3.snv.yahoo.com

Probability the source address was spoofed:

There are two different conclusions you could arrive at based on the information provided by Mr. Gibson. All we know from Mr. Gibson's write-up are the following:

1. SYN/ACK packets from Internet Routers
2. SYN/ACK packets from Servers

Based on this, it is possible it could be spoofed addresses or crafted packets.

Spoofed IP address

Based on the information given, it is possible that the packets were sent from spoofed IP addresses. The following URL, http://online.securityfocus.com/archive/1/37272, documents a tool called Idlescan. This gives you the ability to conduct port scans that appear to becoming from numerous IP addresses, similar to the capabilities of Nmap, Queso and other tools used for spoofing IP address. Based on the given information, you can not rule out the source IP addresses as being spoofed using a tool capable of spoofing packets.

Description of the attack:

According to Mr. Gibson, the attack began at 0200 on 11 January 2002. Grc.com was flooded by SYN/ACK packets originating from "more than TWO HUNDRED of the Internet's core infrastructure routers." (www.grc.com/dos/drdos.htm) The destination port was TCP 179 which is used as the port for Border Gateway Protocol (BGP). At 0400, Mr. Gibson contacted his service provider Verio and requested a block of all incoming traffic with a source port of 179. The second wave of the attack immediately followed. It was also SYN/ACK packets, this time originating from source ports 22, 23, 53, 80, 4001 and 6668 and coming from many different Internet web servers. There is no information as to the total time period of the attack. Mr. Gibson did say that "Verio's router had discarded more than one billion (1,072,519,399) malicious SYN/ACK packets." (www.grc.com/dos/drdos.htm)

Attack Mechanism

Let's look at the attack mechanism and see if we can determine what happened. There is not much concrete evidence provided in Mr. Gibson's analysis. As such, we can only draw from what he writes for the possible answers.

Is this a Stimulus or Response?

Based on the information provided by Mr. Gibson, it is difficult to make a definite determination as to what is taking place. It is possible that all of the IPs used were generated as decoys for the real IP address and the SYN/ACKs were direct stimulus of the GRC.com website. But what was the purpose? The sheer number of packets that Mr. Gibson talks about makes it unlikely that this is a stimulus. Also, the length of time that this took place lends itself to this conclusion.

In order to get the sheer number of packets that Mr. Gibson said was flooding Verio's router, it makes more sense that this was a response that grc.com was seeing. The stimulus was unseen and the devices were responding to a SYN packet.

Keep in mind that what is missing are packet captures that show many different items. The TTL would be useful in determining how many hops away all of the devices are. If the packets have the same or very close TTL, it would lend more support that these are crafted packets. The Internet routers listed are from all over the place. There should be a varying TTL for the routers in different locations. It also never mentions the destination address or the destination port. It always mentions the source port. What were these packets aimed at? Many other items of a packet capture would have been useful in determining whether these are stimulus or response.

What service is being targeted?

This is not completely known based on the write-up. The source port is the only one mentioned for all of the packets. If these are indeed responses, then the ports listed in Mr.

Gibson's write up would be what are being targeted. He lists the following ports: 179 (BGP), 22(Secure Shell), 23(Telnet), 53(DNS), 80(HTTP/Web), 4001 (possible proxy) and 6668 (IRC chat). (www.grc.com/dos/drdos.htm)

Does the service have known vulnerabilities or exposures?

All of these services have known vulnerabilities. It does not appear however that vulnerability was being sought. It appears from the information known that the normal characteristics of network traffic were being used in a malicious manner.

Is this benign, an exploit, denial of service, or reconnaissance?

This appears to be a denial of service attack against Mr. Gibson's website. It was obviously not benign if it knocked grc.com off the air for a time period greater than two hours. If it was a reconnaissance attempt on all of those unsuspecting routers and servers, it was a poorly designed and noisy attempt. As for an exploit, based on the above discussion on vulnerabilities, it does not appear that vulnerability was being sought.

Correlations

A search of BugTrap, Incidents.org, Cert.org, SecurityFocus and many of different web sites as well as Internet searches did not reveal any increased activity on 11 January 2002. It is hard to image that something as large scaled as described by Mr. Gibson and involving as many different IPs went unnoticed. Mr. Gibson did mention some posts on BugTrap after the event, but they discussed mild SYN flood reports and were not the night of the event. I also tried contacting Verio about information pertaining to that night, but they did not have information they could provide without permission.

Evidence of active targeting

It would appear that grc.com was actively targeted. The SYN/ACKs from multiple sources were destined for grc.com, although the destination address was not given. That would lend credence to it being active targeting. If SYN packets were crafted to multiple routers and servers, then the source address of grc.com was selected. This would cause the SYN/ACKs to be sent back. Once again, there are no packets to analyze to look for other clues such as time gaps in the packets which could indicate someone else was being hit during that time, or, the time between the SYN/ACKs. Was it following the normal TCP retries of three, six and nine seconds? A possibility exists, without knowing the exact destination address, that this was a DOS against Verio and Mr. Gibson's website was just a means of accomplishing this. If Mr. Gibson was shut down with two T1 lines, then maybe the attack was against Verio instead.

Conclusion

The lack of information provided by Mr. Gibson made it difficult to do a thorough analysis based on actual data. The analysis had to be based upon information provided. The question still remains. Is this a new DoS? Here are the summarized conclusions based upon Mr. Gibson's write-up.

The attack started at 0200 in the morning and went for an undetermined amount of time. The attack appears to be a response to an unknown stimulus. It also appears to be active targeting because Mr. Gibson's website was shut down. It was SYN/ACK packets and over one billion of them hit Verio's router. We were told the source port and there were several listed.

What is not known is the exact destination address and port. There are no packet captures provided in the write-up although Mr. Gibson says that he captured them. Everything is based on Mr. Gibson's write-up.

What kind of attack actually occurred on 11 January 2002? Mr. Gibson says it is a "new style of DDOS attack could be called a Distributed Reflection Denial of Service attack –DRDoS." (www.grc.com/dos/drdos.htm) As an analyst, it does not appear from the information given to be a new type of attack at all. Remember the packet bounce we discussed in the earlier section? Packets were sent to an idle host, while the true victim was somewhere else and the idle host performed the dirty work? It was a way of using the normal characteristics of network traffic in a malicious way. The Smurf attack using ICMP is a prime example of this. When you look at Mr. Gibson's attack, the characteristics are very similar. SYN packets were sent to an unsuspecting host and they replied with SYN/ACKs as was expected. This is normal stimulus and response behavior. I do not believe this was a new type of attack at all, but a common packet bounce used in a DDOS. As a final note, there is an excellent paper dated June 26, 2001 by Vern Paxson titled "An Analysis of Using Reflectors for Distributed Denial-of-Service Attacks." (Paxson, http://www.icir.org/vern/papers/reflectors.CCR.01/index.html) In this paper Mr. Paxson looks at how to defend against a packet bounce, but he refers to them as reflectors. I have to conclude based on information given, that this not a new type of attack at all. It is a packet bounce using the normal characteristics of the protocol for a malicious intent.

Citation of Sources

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Part 2: Network Detects

Detect 1

```
1 06:53:31.383133   xxx.xxx.xxx.219 > 10.0.0.1: icmp: echo request (wrong icmp csum) (ttl
208, id 36441, len 48)
0x0000     4500 0030 8e59 0000 d001 d5a4 cff2 acdb       E..0.Y..........
0x0010     0a00 0001 0845 2457 209b ba10 0000 0000       .....E$W........
0x0020     5018 1e8d 6f75 0000 0000 0000 0000 0000       P...ou..........
2 06:53:31.383449   xxx.xxx.xxx.220 > 10.0.0.1: icmp: host 0.0.0.0 unreachable- admin
prohibited (wrong icmp csum) (ttl 246, id 20967, len 48)
0x0000     4500 0030 51e7 0000 f601 ec15 cff2 acdc       E..0Q...........
0x0010     0a00 0001 030a 2457 209b ba10 0000 0000       ......$W........
0x0020     5018 1e8d 6f75 0000 0000 0000 0000 0000       P...ou..........
3 06:53:31.384069   xxx.xxx.xxx.220 > 10.0.0.1: icmp: ip reassembly time
exceeded (wrong icmp csum) (ttl 200, id 48005, len 48)
0x0000     4500 0030 bb85 0000 c801 b077 cff2 acdc       E..0.......w....
0x0010     0a00 0001 0b01 0000 0000 0000 0000 0000       ................
0x0020     5018 1e8d 6f75 0000 0000 0000 0000 0000       P...ou..........
4 06:53:31.390306   xxx.xxx.xxx.221 > 10.0.0.1: icmp: type-#20 (wrong icmp csum) (ttl 233,
id 2044, len 48)
0x0000     4500 0030 07fc 0000 e901 4300 cff2 acdd       E..0......C.....
0x0010     0a00 0001 14d0 745d 1192 b5e2 0a00 0001       ......t]........
0x0020     5018 4035 23d9 0000 0000 0000 0000 0000       P.@5#...........
5 06:53:31.392159  0:d0:58:43:38:80 0800 194: xxx.xxx.xxx.222 > 10.0.0.1:
icmp: echo request (wrong icmp csum) (ttl 247, id 14614, len 180)
0x0000     4500 00b4 3916 0000 f701 0361 cff2 acde       E...9......a....
0x0010     0a00 0001 0837 44e0 7b2e 30a8 0a00 0001       .....7D.{.0.....
0x0020     5010 4733 b651 0000 0000 0000 0000 0000       P.G3.Q..........
0x0030     0000 0000 0000 0000 0000 0000 4953 5350       ............ISSP
0x0040     4e47 5251 0073 2079 6f75 2e2e 2e00 0000       NGRQ.s.you......
                                (7 Lines of zeros deleted)
6 06:53:31.393935  0:d0:58:43:38:80 0800 194: xxx.xxx.xxx.223 > 10.0.0.1:
icmp: echo request (wrong icmp csum) (ttl 202, id 20696, len 180)
0x0000     4500 00b4 50d8 0000 ca01 189e cff2 acdf       E...P...........
0x0010     0a00 0001 085a 1e61 0000 0000 0a00 0001       .....Z.a........
0x0020     5038 398d da43 0000 0000 0000 0000 0000       P89..C..........
0x0030     0000 0000 0000 0000 0000 0000 006d 7033       .............mp3
                                (8 Lines of zeros deleted)
7 06:53:31.395705   xxx.xxx.xxx.224 > 10.0.0.1: icmp: type-#31 (wrong icmpcsum) (ttl 232,
id 47353, len 48)
0x0000     4500 0030 b8f9 0000 e801 92ff cff2 ace0       E..0............
0x0010     0a00 0001 1fd4 0019 93ac a8bf 0a00 0001       ................
0x0020     5000 6620 cb1d 0000 0000 0000 0000 0000       P.f.............
8 06:53:31.402633   xxx.xxx.xxx.220 > 10.0.0.1: icmp: parameter problem - code 2 (wrong
icmp csum) (ttl 199, id 14141, len 48)
0x0000     4500 0030 373d 0000 c701 35c0 cff2 acdc       E..07=....5.....
0x0010     0a00 0001 0c02 aee7 b066 14cc 0a00 0001       .........f......
0x0020     5010 0e5e 2c80 0000 0000 0000 0000 0000       P..^,...........
9 06:53:31.411383  0:d0:58:43:38:80 0800 194: xxx.xxx.xxx.226 > 10.0.0.1:
icmp: echo reply (wrong icmp csum) (ttl 233, id 19911, len 180)
0x0000     4500 00b4 4dc7 0000 e901 fcab cff2 ace2       E...M...........
0x0010     0a00 0001 004f e45d 029b c448 0a00 0001       .....O.]...H....
0x0020     5018 5eb3 9845 0000 0000 0000 0000 0000       P.^..E..........
0x0030     0000 0000 0000 0000 0000 0000 6669 636b       ............fick
0x0040     656e 002e 6578 653f 6162 6f75 7400 0000       en..exe?about...
                                (7 Lines of zeros deleted)
10 06:53:31.423107   xxx.xxx.xxx.229 > 10.0.0.1: icmp: type-#40 (wrong icmp csum) (ttl
246, id 62067, len 48)
0x0000     4500 0030 f273 0000 f601 4b80 cff2 ace5       E..0.s....K.....
0x0010     0a00 0001 2801 106b 3109 3ef5 0a00 0001       ....(..k1.>.....
0x0020     5038 0408 660e 0000 0000 0000 0000 0000       P8..f...........
11 06:53:31.428923  0:d0:58:43:38:80 0800 194: xxx.xxx.xxx.231 > 10.0.0.1:
```

```
icmp: echo reply (wrong icmp csum) (ttl 222, id 3578, len 180)
0x0000     4500 00b4 0dfa 0000 de01 4774 cff2 ace7        E.........Gt....
0x0010     0a00 0001 0015 0019 0000 ff5c 0a00 0001        ...........\....
0x0020     5000 eb66 cf76 0000 0000 0000 0000 0000        P..f.v..........
0x0030     0000 0000 0000 0000 0000 0000 4141 4141        ............AAAA
0x0040     4141 4141 4141 0046 424f 5246 572e 4558        AAAAAA.FBORFW.EX
0x0050     455c 2200 0000 0000 0000 0000 0000 0000        E\".............
                                (6 Lines of zeros deleted)
12 06:53:31.430783   xxx.xxx.xxx.232 > 10.0.0.1: icmp: type-#110 (wrong icmp csum) (ttl
211, id 7080, len 48)
0x0000     4500 0030 1ba8 0000 d301 4549 cff2 ace8        E..0......EI....
0x0010     0a00 0001 6e35 5cc6 7471 da3e 0a00 0001        ....n5\.tq.>....
0x0020     5018 2441 e05c 0000 0000 0000 0000 0000        P.$A.\..........
13 06:53:31.431458   xxx.xxx.xxx.220 > 10.0.0.1: icmp: source quench (wrong icmp csum)
(ttl 227, id 65454, len 48)
0x0000     4500 0030 ffae 0000 e301 514e cff2 acdc        E..0......QN....
0x0010     0a00 0001 0447 0050 01cd db0c 0a00 0001        .....G.P........
0x0020     5038 2d7e 0a5b 0000 0000 0000 0000 0000        P8-~.[..........
14 06:53:31.433324  0:d0:58:43:38:80 0800 194: xxx.xxx.xxx.234 > 10.0.0.1:
icmp: echo request (wrong icmp csum) (ttl 228, id 64561, len 180)
0x0000     4500 00b4 fc31 0000 e401 5339 cff2 acea        E....1....S9....
0x0010     0a00 0001 081c cc1d 77f8 9cca 0a00 0001        ........w.......
0x0020     5030 dd03 75b3 0000 0000 0000 0000 0000        P0..u...........
0x0030     0000 0000 0000 0000 0000 0000 0102 0304        ................
0x0040     0506 0708 090a 0b0c 0d0e 0f10 0000 0000        ................
                                (7 Lines of zeros deleted)
15 06:53:31.435075   xxx.xxx.xxx.235 > 10.0.0.1: icmp: echo request (wrong icmp csum) (ttl
207, id 20202, len 48)
0x0000     4500 0030 4eea 0000 cf01 1604 cff2 aceb        E..0N...........
0x0010     0a00 0001 0878 a863 029a 0000 0a00 0001        .....x.c........
0x0020     5018 0774 2d00 0000 0000 0000 0000 0000        P..t-...........
16 06:53:31.435373   xxx.xxx.xxx.236 > 10.0.0.1: icmp: time stamp reply id 666 seq 0 : org
0xa000001 recv 0x50180774 xmit 0x2d000000 (wrong icmp csum) (ttl 239, id 49620, len 48)
0x0000     4500 0030 c1d4 0000 ef01 8318 cff2 acec        E..0............
0x0010     0a00 0001 0e78 a863 029a 0000 0a00 0001        .....x.c........
0x0020     5018 0774 2d00 0000 0000 0000 0000 0000        P..t-...........
17 06:53:31.440461  0:d0:58:43:38:80 0800 194: xxx.xxx.xxx.237 > 10.0.0.1:
icmp: echo reply (wrong icmp csum) (ttl 227, id 22537, len 180)
0x0000     4500 00b4 5809 0000 e301 f85e cff2 aced        E...X......^....
0x0010     0a00 0001 0055 03ff 007b 0000 0a00 0001        .....U...{......
0x0020     5038 f6ec e3ec 0000 0000 0000 0000 0000        P8..............
0x0030     0000 0000 0000 0000 0000 0000 7368 656c        ............shel
0x0040     6c20 626f 756e 6420 746f 2070 6f72 7400        l.bound.to.port.
                                (7 Lines of zeros deleted)
18 06:53:31.467158   xxx.xxx.xxx.220 > 10.0.0.1: icmp: redirect-#34 0.0.0.0 to net
114.101.45.225 (wrong icmp csum) (ttl 245, id 63303, len 48)
0x0000     4500 0030 f747 0000 f501 47b5 cff2 acdc        E..0.G....G.....
0x0010     0a00 0001 0522 3184 7265 2de1 0a00 0001        ....."1.re-.....
0x0020     5038 a8bd 14fe 0000 0000 0000 0000 0000        P8..............
19 06:53:31.471227   xxx.xxx.xxx.238 > 10.0.0.1: icmp: type-#39 (wrong icmp csum) (ttl
227, id 35512, len 48)
0x0000     4500 0030 8ab8 0000 e301 c632 cff2 acee        E..0.......2....
0x0010     0a00 0001 2700 0019 1fa9 0876 0a00 0001        ....'......v....
0x0020     5020 57f6 6f09 0000 0000 0000 0000 0000        P.W.o...........
20 06:53:31.476674   xxx.xxx.xxx.240 > 10.0.0.1: icmp: router solicitation
(wrong icmp csum) (ttl 252, id 10092, len 48)
0x0000     4500 0030 276c 0000 fc01 107d cff2 acf0        E..0'l.....}....
0x0010     0a00 0001 0a00 0019 7bde 30be 0a00 0001        ........{.0.....
0x0020     5000 a683 bff6 0000 0000 0000 0000 0000        P...............
21 06:53:31.480432   xxx.xxx.xxx.220 > 10.0.0.1: icmp: parameter problem - code 2 (wrong
icmp csum) (ttl 252, id 56670, len 48)
0x0000     4500 0030 dd5e 0000 fc01 5a9e cff2 acdc        E..0.^....Z.....
0x0010     0a00 0001 0c02 4ee7 891c 13f8 0a00 0001        ......N.........
0x0020     5038 4b85 f4b3 0000 0000 0000 0000 0000        P8K.............
22 06:53:31.495096   xxx.xxx.xxx.241 > 10.0.0.1: icmp: echo request (wrong icmp csum) (ttl
246, id 48371, len 48)
```

```
0x0000     4500 0030 bcf3 0000 f601 80f4 cff2 acf1        E..0............
0x0010     0a00 0001 0827 485f 2c63 259c 0a00 0001        .....'H_,c%.....
0x0020     5038 5173 ac38 0000 0000 0000 0000 0000        P8Qs.8..........
23 06:53:31.503292   xxx.xxx.xxx.242 > 10.0.0.1: icmp: type-#40 (wrong icmp csum) (ttl
247, id 34372, len 48)
0x0000     4500 0030 8644 0000 f701 b6a2 cff2 acf2        E..0.D..........
0x0010     0a00 0001 2800 a14d 13dc 25b4 0a00 0001        ....(..M..%.....
0x0020     5010 c13f 91db 0000 0000 0000 0000 0000        P..?............
24 06:53:31.507033   xxx.xxx.xxx.220 > 10.0.0.1: icmp: time exceeded-#110
(wrong icmp csum) (ttl 208, id 64829, len 48)
0x0000     4500 0030 fd3d 0000 d001 66bf cff2 acdc        E..0.=....f.....
0x0010     0a00 0001 0b6e bcca 65c2 0170 0a00 0001        .....n..e..p....
0x0020     5000 479b 19ed 0000 0000 0000 0000 0000        P.G.............
25 06:53:31.508482  0:d0:58:43:38:80 0800 194: xxx.xxx.xxx.243 > 10.0.0.1:
icmp: echo request (wrong icmp csum) (ttl 228, id 43566, len 180)
0x0000     4500 00b4 aa2e 0000 e401 a533 cff2 acf3        E..........3....
0x0010     0a00 0001 086e bcca 65c2 0170 0a00 0001        .....n..e..p....
0x0020     5010 479b 19ed 0000 0000 0000 0000 0000        P.G.............
0x0030     0000 0000 0000 0000 0000 0000 a920 5375        ..............Su
0x0040     7374 6169 6e61 626c 6520 536f 0000 0000        stainable.So....
                                   (7 Lines of zeros deleted)
26 06:53:31.537866  0:d0:58:43:38:80 0800 194: xxx.xxx.xxx.244 > 10.0.0.1:
icmp: echo request (wrong icmp csum) (ttl 239, id 14687, len 180)
0x0000     4500 00b4 395f 0000 ef01 0b02 cff2 acf4        E...9_..........
0x0010     0a00 0001 085c c0de 589a 6f8c 0a00 0001        .....\..X.o.....
0x0020     5018 58a1 fb95 0000 0000 0000 0000 0000        P.X.............
0x0030     0000 0000 0000 0000 0000 0000 abcd abcd        ................
0x0040     abcd abcd abcd abcd abcd abcd 0000 0000        ................
                                   (7 Lines of zeros deleted)
27 06:53:31.540602  0:d0:58:43:38:80 0800 194: xxx.xxx.xxx.246 > 10.0.0.1:
icmp: echo reply (wrong icmp csum) (ttl 216, id 20184, len 180)
0x0000     4500 00b4 4ed8 0000 d801 0c87 cff2 acf6        E...N...........
0x0010     0a00 0001 0089 336e 029d e045 0a00 0001        ......3n...E....
0x0020     5018 16be 4de9 0000 0000 0000 0000 0000        P...M...........
0x0030     0000 0000 0000 0000 0000 0000 7369 636b        ............sick
0x0040     656e 0000 0000 0000 0000 0000 0000 0000        en..............
                                   (7 Lines of zeros deleted)
28 06:53:31.543279   xxx.xxx.xxx.247 > 10.0.0.1: icmp: type-#35 (wrong icmp csum) (ttl
216, id 4295, len 48)
0x0000     4500 0030 10c7 0000 d801 4b1b cff2 acf7        E..0......K.....
0x0010     0a00 0001 2300 006f 36ac 0f80 0a00 0001        ....#..o6.......
0x0020     5038 5bda ab11 0000 0000 0000 0000 0000        P8[.............
29 06:53:31.544436   xxx.xxx.xxx.248 > 10.0.0.1: icmp: router solicitation
(wrong icmp csum) (ttl 226, id 22632, len 48)
0x0000     4500 0030 5868 0000 e201 f978 cff2 acf8        E..0Xh.....x....
0x0010     0a00 0001 0a00 006f 36ac 0f80 0a00 0001        .......o6.......
0x0020     5038 5bda ab11 0000 0000 0000 0000 0000        P8[.............
30 06:53:31.561740   xxx.xxx.xxx.249 > 10.0.0.1: icmp: type-#39 (wrong icmp csum) (ttl
243, id 49667, len 48)
0x0000     4500 0030 c203 0000 f301 7edc cff2 acf9        E..0......~.....
0x0010     0a00 0001 2700 0000 0000 0000 0a00 0001        ....'...........
0x0020     5038 b57e 96eb 0000 0000 0000 0000 0000        P8.~............
31 06:53:31.580512   xxx.xxx.xxx.220 > 10.0.0.1: icmp: host 0.0.0.0 unreachable- admin
prohibited (wrong icmp csum) (ttl 216, id 50578, len 48)
0x0000     4500 0030 c592 0000 d801 966a cff2 acdc        E..0.......j....
0x0010     0a00 0001 030a 0fd1 d198 7403 0a00 0001        ..........t.....
0x0020     5018 231b ff51 0000 0000 0000 0000 0000        P.#..Q..........
32 06:53:31.595083   xxx.xxx.xxx.220 > 10.0.0.1: icmp: 0.0.0.0 unreachable -source host
isolated (wrong icmp csum) (ttl 234, id 6735, len 48)
0x0000     4500 0030 1a4f 0000 ea01 2fae cff2 acdc        E..0.O..../.....
0x0010     0a00 0001 0308 0000 0000 0000 0a00 0001        ................
0x0020     5038 f1de dfa6 0000 0000 0000 0000 0000        P8..............
33 06:53:31.605668   xxx.xxx.xxx.220 > 10.0.0.1: icmp: redirect-tos 0.0.0.0 to net 0.0.0.0
(wrong icmp csum) (ttl 207, id 52230, len 48)
0x0000     4500 0030 cc06 0000 cf01 98f6 cff2 acdc        E..0............
0x0010     0a00 0001 0503 0000 0000 0000 0a00 0001        ................
```

```
0x0020     5030 f615 3b79 0000 0000 0000 0000 0000        P0..;y..........
34 06:53:31.607036   xxx.xxx.xxx.220 > 10.0.0.1: icmp: redirect-tos 0.0.0.0 to net 0.0.0.0
(wrong icmp csum) (ttl 249, id 29171, len 48)
0x0000     4500 0030 71f3 0000 f901 c909 cff2 acdc        E..0q...........
0x0010     0a00 0001 0503 0000 0000 0000 0a00 0001        ................
0x0020     5030 f615 3b79 0000 0000 0000 0000 0000        P0..;y..........
35 06:53:31.609822   xxx.xxx.xxx.252 > 10.0.0.1: icmp: echo reply (wrong icmp csum) (ttl
237, id 2475, len 48)
0x0000     4500 0030 09ab 0000 ed01 3d32 cff2 acfc        E..0......=2....
0x0010     0a00 0001 0082 0000 0000 0000 0a00 0001        ................
0x0020     5030 f615 3b79 0000 0000 0000 0000 0000        P0..;y..........
36 06:53:31.612285  0:d0:58:43:38:80 0800 194: xxx.xxx.xxx.253 > 10.0.0.1:
icmp: echo request (wrong icmp csum) (ttl 241, id 24120, len 180)
0x0000     4500 00b4 5e38 0000 f101 e41f cff2 acfd        E...^8..........
0x0010     0a00 0001 0873 0019 380c 1e50 0a00 0001        .....s..8..P....
0x0020     5030 aa8e 7244 0000 0000 0000 0000 0000        P0..rD..........
0x0030     0000 0000 0000 0000 0000 0000 6162 6364        ............abcd
0x0040     6566 6768 696a 6b6c 6d6e 6f70 002e 4558        efghijklmnop..EX
0x0050     455c 2200 0000 0000 0000 0000 0000 0000        E\".............
                                (6 Lines of zeros deleted)
37 06:53:31.613612  0:d0:58:43:38:80 0800 194: xxx.xxx.xxx.254 > 10.0.0.1:
icmp: echo request (wrong icmp csum) (ttl 233, id 39695, len 180)
0x0000     4500 00b4 9b0f 0000 e901 af47 cff2 acfe        E.........G.....
0x0010     0a00 0001 0873 0019 380c 1e50 0a00 0001        .....s..8..P....
0x0020     5030 aa8e 7244 0000 0000 0000 0000 0000        P0..rD..........
0x0030     0000 0000 0000 0000 0000 0000 0062 6364        .............bcd
0x0040     6566 6768 696a 6b6c 6d6e 6f70 002e 4558        efghijklmnop..EX
0x0050     455c 2200 0000 0000 0000 0000 0000 0000        E\".............
                                (6 Lines of zeros deleted)
38 06:53:31.623101   xxx.xxx.xxx.220 > 10.0.0.1: icmp: 0.0.0.0 protocol 151 unreachable
(wrong icmp csum) (ttl 239, id 12182, len 48)
0x0000     4500 0030 2f96 0000 ef01 1567 cff2 acdc        E..0/......g....
0x0010     0a00 0001 0302 48ae 00e9 f565 0a00 0001        ......H....e....
0x0020     5038 6a1c 2697 0000 0000 0000 0000 0000        P8j.&...........
39 06:53:31.625531   xxx.xxx.xxx.220 > 10.0.0.1: icmp: 0.0.0.0 unreachable -need to frag
(mtu 16045) (wrong icmp csum) (ttl 231, id 49338, len 48)
0x0000     4500 0030 c0ba 0000 e701 8c42 cff2 acdc        E..0.......B....
0x0010     0a00 0001 0304 ba05 13d3 3ead 0a00 0001        ..........>.....
0x0020     5038 18bf 2a99 0000 0000 0000 0000 0000        P8..*...........
40 06:53:31.642962   xxx.xxx.xxx.220 > 10.0.0.1: icmp: source quench (wrong icmp csum)
(ttl 248, id 33889, len 48)
0x0000     4500 0030 8461 0000 f801 b79b cff2 acdc        E..0.a..........
0x0010     0a00 0001 0400 f9a3 7d86 a512 0a00 0001        ........}.......
0x0020     5020 4170 5a4e 0000 0000 0000 0000 0000        P.ApZN..........
41 06:53:31.645742   xxx.xxx.xxx.50 > 10.0.0.1: icmp: type-#116 (wrong icmp csum) (ttl
215, id 45405, len 48)
0x0000     4500 0030 b15d 0000 d701 ac49 cff2 ac32        E..0.].....I...2
0x0010     0a00 0001 74b1 468b 0ab8 0674 0a00 0001        ....t.F....t....
0x0020     5018 28f2 131f 0000 0000 0000 0000 0000        P.(.............
42 06:53:31.658886   xxx.xxx.xxx.220 > 10.0.0.1: icmp: net 0.0.0.0 unreachable - tos
prohibited (wrong icmp csum) (ttl 199, id 8018, len 48)
0x0000     4500 0030 1f52 0000 c701 4dab cff2 acdc        E..0.R....M.....
0x0010     0a00 0001 030b 1c46 140c 4095 0a00 0001        .......F..@.....
0x0020     5033 8577 f758 0000 0000 0000 0000 0000        P3.w.X..........
43 06:53:31.660281   xxx.xxx.xxx.51 > 10.0.0.1: icmp: type-#36 (wrong icmp
csum) (ttl 213, id 47412, len 48)
0x0000     4500 0030 b934 0000 d501 a671 cff2 ac33        E..0.4.....q...3
0x0010     0a00 0001 240b 1c46 140c 4095 0a00 0001        ....$..F..@.....
0x0020     5033 8577 f758 0000 0000 0000 0000 0000        P3.w.X..........
44 06:53:31.672283  0:d0:58:43:38:80 0800 194: xxx.xxx.xxx.52 > 10.0.0.1: icmp:echo
request (wrong icmp csum) (ttl 215, id 19036, len 180)
0x0000     4500 00b4 4a5c 0000 d701 12c5 cff2 ac34        E...J\.........4
0x0010     0a00 0001 0800 0019 3509 f220 0a00 0001        ........5.......
0x0020     5010 36d0 5cdf 0000 0000 0000 0000 0000        P.6.\...........
0x0030     0000 0000 0000 0000 0000 0000 4142 4344        ............ABCD
0x0040     4546 4748 494a 4b4c 4d4e 4f50 5152 5354        EFGHIJKLMNOPQRST
```

```
0x0050     5556 5741 4243 4445 4647 4849 0000 0000        UVWABCDEFGHI....
                                (6 Lines of zeros deleted)
45 06:53:31.676374  0:d0:58:43:38:80 0800 194: xxx.xxx.xxx.53 > 10.0.0.1: icmp: echo reply
(wrong icmp csum) (ttl 218, id 38002, len 180)
0x0000     4500 00b4 9472 0000 da01 c5ad cff2 ac35        E....r.........5
0x0010     0a00 0001 0063 0000 029c 0000 0a00 0001        .....c..........
0x0020     5030 5898 5afd 0000 0000 0000 0000 0000        P0X.Z...........
0x0030     0000 0000 0000 0000 0000 0000 6765 7375        ............gesu
0x0040     6e64 6865 6974 2100 0000 0000 0000 0000        ndheit!.........
                                (7 Lines of zeros deleted)
46 06:53:31.726406   xxx.xxx.xxx.57 > 10.0.0.1: icmp: type-#30 (wrong icmp
csum) (ttl 236, id 61835, len 48)
0x0000     4500 0030 f18b 0000 ec01 5714 cff2 ac39        E..0......W....9
0x0010     0a00 0001 1ec5 153e 53b5 377a 0a00 0001        .......>S.7z....
0x0020     5018 776b 536b 0000 0000 0000 0000 0000        P.wkSk..........
47 06:53:31.730371  0:d0:58:43:38:80 0800 194: xxx.xxx.xxx.58 > 10.0.0.1: icmp:echo reply
(wrong icmp csum) (ttl 219, id 60600, len 180)
0x0000     4500 00b4 ecb8 0000 db01 6c62 cff2 ac3a        E.........lb...:
0x0010     0a00 0001 0084 969e 03e8 6f04 0a00 0001        ..........o.....
0x0020     5038 d750 4e69 0000 0000 0000 0000 0000        P8.PNi..........
0x0030     0000 0000 0000 0000 0000 0000 7370 6f6f        ............spoo
0x0040     6677 6f72 6b73 0000 0000 0000 0000 0000        fworks..........
                                (7 Lines of zeros deleted)
48 06:53:31.740310   xxx.xxx.xxx.60 > 10.0.0.1: icmp: echo request (wrong icmp csum) (ttl
253, id 64346, len 48)
0x0000     4500 0030 fb5a 0000 fd01 3c42 cff2 ac3c        E..0.Z....<B...<
0x0010     0a00 0001 0852 6ff0 0e6b 6ec0 0a00 0001        .....Ro..kn.....
0x0020     5030 ba41 fe6d 0000 0000 0000 0000 0000        P0.A.m..........
49 06:53:31.746581  0:d0:58:43:38:80 0800 194: xxx.xxx.xxx.61 > 10.0.0.1: icmp: echo
request (wrong icmp csum) (ttl 217, id 38457, len 180)
0x0000     4500 00b4 9639 0000 d901 c4de cff2 ac3d        E....9.........=
0x0010     0a00 0001 0856 d9af 126c 8f40 0a00 0001        .....V...l.@....
0x0020     5018 69aa e691 0000 0000 0000 0000 0000        P.i.............
0x0030     0000 0000 0000 0000 0000 0000 0102 0304        ................
0x0040     0506 0708 090a 0b0c 0d0e 0f10 0000 0000        ................
                                (7 Lines of zeros deleted)
50 06:53:31.757598   xxx.xxx.xxx.220 > 10.0.0.1: icmp: xxx.xxx.xxx.220 protocol 17
unreachable (wrong icmp csum) (ttl 238, id 52118, len 48)
0x0000     4500 0030 cb96 0000 ee01 7a66 cff2 acdc        E..0......zf....
0x0010     0a00 0001 0302 0a3a 3a8d 4d8c 0a00 0001        .......::.M.....
0x0020     5018 6429 5b11 8330 0000 0000 cff2 acdc        P.d)[..0........
51 06:53:31.763831  0:d0:58:43:38:80 0800 194: xxx.xxx.xxx.62 > 10.0.0.1: icmp:echo
request (wrong icmp csum) (ttl 250, id 38329, len 180)
0x0000     4500 00b4 95b9 0000 fa01 a45d cff2 ac3e        E..........]...>
0x0010     0a00 0001 0859 8251 4537 8af2 0a00 0001        .....Y.QE7......
0x0020     5018 f7e7 b315 0000 0000 0000 0000 0000        P...............
0x0030     0000 0000 0000 0000 0000 0000 5768 6174        ............What
0x0040     7355 7020 2d20 4120 4e65 7477 0000 0000        sUp.-.A.Netw....
                                (7 Lines of zeros deleted)
52 06:53:31.799162   xxx.xxx.xxx.220 > 10.0.0.1: icmp: source quench (wrong icmp csum)
(ttl 199, id 15975, len 48)
0x0000     4500 0030 3e67 0000 c701 2e96 cff2 acdc        E..0>g..........
0x0010     0a00 0001 04b2 0019 5a44 b2d8 0a00 0001        ........ZD......
0x0020     5020 9276 6931 0000 0000 0000 0000 0000        P..vi1..........
53 06:53:31.800463   xxx.xxx.xxx.220 > 10.0.0.1: icmp: parameter problem -
octet 90 (wrong icmp csum) (ttl 247, id 55286, len 48)
0x0000     4500 0030 d7f6 0000 f701 6506 cff2 acdc        E..0......e.....
0x0010     0a00 0001 0c00 0019 5a44 b2d8 0a00 0001        ........ZD......
0x0020     5020 9276 6931 0000 0000 0000 0000 0000        P..vi1..........
54 06:53:31.807215  0:d0:58:43:38:80 0800 194: xxx.xxx.xxx.63 > 10.0.0.1: icmp:echo reply
(wrong icmp csum) (ttl 245, id 27241, len 180)
0x0000     4500 00b4 6a69 0000 f501 d4ac cff2 ac3f        E...ji.........?
0x0010     0a00 0001 0085 2a3b 03e8 b366 0a00 0001        ......*;...f....
0x0020     5018 603f 0c5d 0000 0000 0000 0000 0000        P.`?.]..........
0x0030     0000 0000 0000 0000 0000 0000 7370 6f6f        ............spoo
0x0040     6677 6f72 6b73 006c 732f 6765 7464 7276        fworks.ls/getdrv
```

```
0x0050     732e 6578 6500 0000 0000 0000 0000 0000        s.exe...........
                                       (6 Lines of zeros deleted)
```
55 06:53:31.809034 0:d0:58:43:38:80 0800 194: xxx.xxx.xxx.64 > 10.0.0.1: icmp:echo request (wrong icmp csum) (ttl 223, id 32832, len 180)
```
0x0000     4500 00b4 8040 0000 df01 d4d4 cff2 ac40        E....@.........@
0x0010     0a00 0001 0885 2a3b 03e8 b366 0a00 0001        ......*;...f....
0x0020     5018 603f 0c5d 0000 0000 0000 0000 0000        P.`?.]..........
0x0030     0000 0000 0000 0000 0000 0000 4461 7461        ............Data
0x0040     0077 6f72 6b73 006c 732f 6765 7464 7276        .works.ls/getdrv
0x0050     732e 6578 6500 0000 0000 0000 0000 0000        s.exe...........
                                       (6 Lines of zeros deleted)
```
56 06:53:31.813043 0:d0:58:43:38:80 0800 70: xxx.xxx.xxx.65 > 10.0.0.1: icmp:host xxx.xxx.xxx.65 unreachable (ttl 255, id 3281, len 56)
```
0x0000     4500 0038 0cd1 0000 ff01 28bf cff2 ac41        E..8......(....A
0x0010     0a00 0001 0301 d6a2 0000 0000 4500 00b4        ............E...
0x0020     eb9d 0000 d806 7071 0a00 0001 cff2 ac41        ......pq.......A
0x0030     006e 1bed 0a00 0001                            .n......
```
57 06:53:31.843820   xxx.xxx.xxx.66 > 10.0.0.1: icmp: router solicitation (wrong icmp csum) (ttl 201, id 13142, len 48)
```
0x0000     4500 0030 3356 0000 c901 3841 cff2 ac42        E..03V....8A...B
0x0010     0a00 0001 0acb 856f 2108 8b6d 0a00 0001        .......o!..m....
0x0020     5038 6dc3 743c 0000 0000 0000 0000 0000        P8m.t<..........
```
58 06:53:31.857102   xxx.xxx.xxx.220 > 10.0.0.1: icmp: source quench (wrong icmp csum) (ttl 210, id 46680, len 48)
```
0x0000     4500 0030 b658 0000 d201 aba4 cff2 acdc        E..0.X..........
0x0010     0a00 0001 0400 0000 0000 0000 0a00 0001        ................
0x0020     5013 929f 76d7 0000 0000 0000 0000 0000        P...v...........
```
59 06:53:31.860536 0:d0:58:43:38:80 0800 194: xxx.xxx.xxx.67 > 10.0.0.1: icmp:echo request (wrong icmp csum) (ttl 219, id 17708, len 180)
```
0x0000     4500 00b4 452c 0000 db01 13e6 cff2 ac43        E...E,.........C
0x0010     0a00 0001 0860 085c 0000 0000 0a00 0001        .....`.\........
0x0020     5013 929f 76d7 0000 0000 0000 0000 0000        P...v...........
0x0030     0000 0000 0000 0000 0000 0000 0102 0304        ................
0x0040     0506 0708 090a 0b0c 0d0e 0f10 0000 0000        ................
                                       (7 Lines of zeros deleted)
```
60 06:53:31.866035 0:d0:58:43:38:80 0800 194: xxx.xxx.xxx.68 > 10.0.0.1: icmp:echo request (wrong icmp csum) (ttl 203, id 11049, len 180)
```
0x0000     4500 00b4 2b29 0000 cb01 3de8 cff2 ac44        E...+)....=....D
0x0010     0a00 0001 087c b2b7 04cf 9fe1 0a00 0001        .....|..........
0x0020     5018 c071 2922 0000 0000 0000 0000 0000        P..q)"..........
0x0030     0000 0000 0000 0000 0000 0000 4953 5350        ............ISSP
0x0040     4e47 5251 0000 0000 0000 0000 0000 0000        NGRQ............
                                       (7 Lines of zeros deleted)
```
61 06:53:31.867338 0:d0:58:43:38:80 0800 194: xxx.xxx.xxx.69 > 10.0.0.1: icmp:echo request (wrong icmp csum) (ttl 230, id 22301, len 180)
```
0x0000     4500 00b4 571d 0000 e601 f6f2 cff2 ac45        E...W..........E
0x0010     0a00 0001 087e 3d5d c0a1 f184 0a00 0001        .....~=]........
0x0020     5010 8bfd 409a 0000 0000 0000 0000 0000        P...@...........
0x0030     0000 0000 0000 0000 0000 0000 8804 2020        ................
0x0040     2020 2020 2020 2020 2020 2020 0000 0000        ................
                                       (7 Lines of zeros deleted)
```
62 06:53:31.873506   xxx.xxx.xxx.70 > 10.0.0.1: icmp: type-#40 (wrong icmp csum) (ttl 220, id 5243, len 48)
```
0x0000     4500 0030 147b 0000 dc01 4418 cff2 ac46        E..0.{....D....F
0x0010     0a00 0001 2800 58e4 1e97 517a 0a00 0001        ....(.X...Qz....
0x0020     5018 dfc0 3271 0000 0000 0000 0000 0000        P...2q..........
```
63 06:53:31.877137 0:d0:58:43:38:80 0800 194: xxx.xxx.xxx.71 > 10.0.0.1: icmp:echo reply (wrong icmp csum) (ttl 202, id 7154, len 180)
```
0x0000     4500 00b4 1bf2 0000 ca01 4e1c cff2 ac47        E.........N....G
0x0010     0a00 0001 00e1 2b94 03e8 ad40 0a00 0001        ......+....@....
0x0020     5038 a80f 7109 0000 0000 0000 0000 0000        P8..q...........
0x0030     0000 0000 0000 0000 0000 0000 7370 6f6f        ............spoo
0x0040     6677 6f72 6b73 0069 0000 0000 0000 0000        fworks.i........
                                       (7 Lines of zeros deleted)
```
64 06:53:31.882183   xxx.xxx.xxx.220 > 10.0.0.1: icmp: host 0.0.0.0 unreachable - tos prohibited (wrong icmp csum) (ttl 224, id 47383, len 48)

```
0x0000     4500 0030 b917 0000 e001 9ae5 cff2 acdc        E..0...........
0x0010     0a00 0001 030c 614c 1778 2f74 0a00 0001        ......aL.x/t....
0x0020     5038 2350 6683 0000 0000 0000 0000 0000        P8#Pf...........
65 06:53:31.883052   xxx.xxx.xxx.72 > 10.0.0.1: icmp: type-#36 (wrong icmp
csum) (ttl 207, id 49866, len 48)
0x0000     4500 0030 c2ca 0000 cf01 a2c6 cff2 ac48        E..0..........H
0x0010     0a00 0001 2400 daeb 090d 065c 0a00 0001        ....$......\....
0x0020     5038 488f 86d4 0000 0000 0000 0000 0000        P8H.............
66 06:53:31.889054   xxx.xxx.xxx.220 > 10.0.0.1: icmp: redirect-tos 0.0.0.0 to net
203.237.226.116 (wrong icmp csum) (ttl 254, id 26556, len 48)
0x0000     4500 0030 67bc 0000 fe01 ce40 cff2 acdc        E..0g......@....
0x0010     0a00 0001 0502 e217 cbed e274 0a00 0001        ...........t....
0x0020     5018 a59b 6ebe 0000 0000 0000 0000 0000        P...n...........
67 06:53:31.893877   xxx.xxx.xxx.73 > 10.0.0.1: icmp: type-#7 (wrong icmp csum)(ttl 244,
id 36175, len 48)
0x0000     4500 0030 8d4f 0000 f401 b340 cff2 ac49        E..0.O.....@...I
0x0010     0a00 0001 0700 63da 11fd eb14 0a00 0001        ......c.........
0x0020     5018 5a21 b191 0000 0000 0000 0000 0000        P.Z!............
68 06:53:31.895614   xxx.xxx.xxx.220 > 10.0.0.1: icmp: 0.0.0.0 unreachable -source route
failed (wrong icmp csum) (ttl 208, id 10903, len 48)
0x0000     4500 0030 2a97 0000 d001 3966 cff2 acdc        E..0*.....9f....
0x0010     0a00 0001 0305 0000 0000 0000 0a00 0001        ................
0x0020     5018 6861 7f4f 0000 0000 0000 0000 0000        P.ha.O..........
69 06:53:31.895908   xxx.xxx.xxx.220 > 10.0.0.1: icmp: redirect-tos 0.0.0.0 to net 0.0.0.0
(wrong icmp csum) (ttl 245, id 34545, len 48)
0x0000     4500 0030 86f1 0000 f501 b80b cff2 acdc        E..0............
0x0010     0a00 0001 0503 0000 0000 0000 0a00 0001        ................
0x0020     5018 6861 7f4f 0000 0000 0000 0000 0000        P.ha.O..........
70 06:53:31.904127   xxx.xxx.xxx.74 > 10.0.0.1: icmp: echo reply (wrong icmp csum) (ttl
205, id 633, len 48)
0x0000     4500 0030 0279 0000 cd01 6516 cff2 ac4a        E..0.y....e....J
0x0010     0a00 0001 0000 0000 0000 0000 0a00 0001        ................
0x0020     5018 1b16 7096 0000 0000 0000 0000 0000        P...p...........
71 06:53:31.904951   xxx.xxx.xxx.75 > 10.0.0.1: icmp: type-#32 (wrong icmp
csum) (ttl 244, id 38341, len 48)
0x0000     4500 0030 95c5 0000 f401 aac8 cff2 ac4b        E..0...........K
0x0010     0a00 0001 2072 f10d 03c2 85f0 0a00 0001        .....r..........
0x0020     5018 facf c4bc 0000 0000 0000 0000 0000        P...............
72 06:53:31.905247   xxx.xxx.xxx.77 > 10.0.0.1: icmp: type-#33 (wrong icmp
csum) (ttl 249, id 43089, len 48)
0x0000     4500 0030 a851 0000 f901 933a cff2 ac4d        E..0.Q.....:...M
0x0010     0a00 0001 2100 f10d 03c2 85f0 0a00 0001        ....!...........
0x0020     5018 facf c4bc 0000 0000 0000 0000 0000        P...............
73 06:53:31.906109  0:d0:58:43:38:80 0800 194: xxx.xxx.xxx.78 > 10.0.0.1: icmp:echo
request (wrong icmp csum) (ttl 239, id 9893, len 180)
0x0000     4500 00b4 26a5 0000 ef01 1e62 cff2 ac4e        E...&......b...N
0x0010     0a00 0001 08ba d941 0000 0000 0a00 0001        .......A........
0x0020     5018 4bf9 bd6a 0000 0000 0000 0000 0000        P.K..j..........
0x0030     0000 0000 0000 0000 0000 0000 0032 3026        .............20&
0x0040     4369 5265 7374 7269 6374 696f 6e3d 6e6f        CiRestriction=no
0x0050     6e65 2643 6948 696c 6974 6554 7970 653d        ne&CiHiliteType=
0x0060     4675 6c6c 2048 5454 502f 312e 3000 0000        Full.HTTP/1.0...
                                (5 Lines of zeros deleted)
74 06:53:31.911133   xxx.xxx.xxx.220 > 10.0.0.1: icmp: host 0.0.0.0 unreachable -
precedence cutoff (wrong icmp csum) (ttl 249, id 48567, len 48)
0x0000     4500 0030 bdb7 0000 f901 7d45 cff2 acdc        E..0......}E....
0x0010     0a00 0001 030f 3030 038c 267d 0a00 0001        ......00..&}....
0x0020     5038 7ac0 70e9 0000 0000 0000 0000 0000        P8z.p...........
75 06:53:31.912329   xxx.xxx.xxx.79 > 10.0.0.1: icmp: address mask request
(wrong icmp csum) (ttl 241, id 8255, len 48)
0x0000     4500 0030 203f 0000 f101 234b cff2 ac4f        E..0.?....#K...O
0x0010     0a00 0001 1100 f18e cb8d 4f0f 0a00 0001        ..........O.....
0x0020     5018 b62c 6373 0000 0000 0000 0000 0000        P..,cs..........
76 06:53:31.913588   xxx.xxx.xxx.80 > 10.0.0.1: icmp: echo reply (wrong icmp csum) (ttl
208, id 40099, len 48)
0x0000     4500 0030 9ca3 0000 d001 c7e5 cff2 ac50        E..0..........P
```

```
0x0010     0a00 0001 006e 1379 356b 9d9e 0a00 0001        .....n.y5k......
0x0020     5010 900a 7f6a 0000 0000 0000 0000 0000        P....j..........
77 06:53:31.915441  0:d0:58:43:38:80 0800 194: xxx.xxx.xxx.83 > 10.0.0.1: icmp:echo
request (wrong icmp csum) (ttl 209, id 14081, len 180)
0x0000     4500 00b4 3701 0000 d101 2c01 cff2 ac53        E...7.....,....S
0x0010     0a00 0001 08eb 69d0 587b bfd8 0a00 0001        ......i.X{......
0x0020     5018 bcf2 3bb5 0000 0000 0000 0000 0000        P...;...........
0x0030     0000 0000 0000 0000 0000 0000 4f4d 6574        ............OMet
0x0040     6572 4f62 6573 6541 726d 6164 0000 0000        erObeseArmad....
                                (7 Lines of zeros deleted)
78 06:53:31.923191  0:d0:58:43:38:80 0800 194: xxx.xxx.xxx.85 > 10.0.0.1: icmp:echo
request (wrong icmp csum) (ttl 220, id 3387, len 180)
0x0000     4500 00b4 0d3b 0000 dc01 4ac5 cff2 ac55        E....;....J....U
0x0010     0a00 0001 088b 768a 3bf5 a1c0 0a00 0001        ......v.;.......
0x0020     5018 93c0 8037 0000 0000 0000 0000 0000        P....7..........
0x0030     0000 0000 0000 0000 0000 0000 a920 5375        ..............Su
0x0040     7374 6169 6e61 626c 6520 536f 0000 0000        stainable.So....
                                (7 Lines of zeros deleted)
79 06:53:31.932658   xxx.xxx.xxx.220 > 10.0.0.1: icmp: time exceeded in-transit (wrong
icmp csum) (ttl 244, id 45859, len 48)
0x0000     4500 0030 b323 0000 f401 8cd9 cff2 acdc        E..0.#..........
0x0010     0a00 0001 0b00 0000 0000 0000 0a00 0001        ................
0x0020     5018 6089 2bce 0000 0000 0000 0000 0000        P.`.+...........
80 06:53:31.935834  0:d0:58:43:38:80 0800 194: xxx.xxx.xxx.86 > 10.0.0.1: icmp:echo
request (wrong icmp csum) (ttl 219, id 45206, len 180)
0x0000     4500 00b4 b096 0000 db01 a868 cff2 ac56        E..........h...V
0x0010     0a00 0001 08b7 1ab6 0000 0000 0a00 0001        ................
0x0020     5018 a893 b78d 0000 0000 0000 0000 0000        P...............
0x0030     0000 0000 0000 0000 0000 0000 5069 6e67        ............Ping
0x0040     696e 6720 6672 6f6d 2044 656c 0000 0000        ing.from.Del....
                                (7 Lines of zeros deleted)
81 06:53:31.936104   xxx.xxx.xxx.87 > 10.0.0.1: icmp: time stamp query id 0 seq 0 (wrong
icmp csum) (ttl 243, id 19719, len 48)
0x0000     4500 0030 4d07 0000 f301 f47a cff2 ac57        E..0M......z...W
0x0010     0a00 0001 0d00 1ab6 0000 0000 0a00 0001        ................
0x0020     5018 a893 b78d 0000 0000 0000 0000 0000        P...............
82 06:53:31.938880   xxx.xxx.xxx.220 > 10.0.0.1: icmp: source quench (wrong icmp csum)
(ttl 239, id 376, len 48)
0x0000     4500 0030 0178 0000 ef01 4385 cff2 acdc        E..0.x....C.....
0x0010     0a00 0001 043c 4344 0d5f 79ae 0a00 0001        .....<CD._y.....
0x0020     5018 9a7b 01a2 0000 0000 0000 0000 0000        P..{............
83 06:53:31.944668   xxx.xxx.xxx.88 > 10.0.0.1: icmp: type-#7 (wrong icmp csum)(ttl 215,
id 60738, len 48)
0x0000     4500 0030 ed42 0000 d701 703e cff2 ac58        E..0.B....p>...X
0x0010     0a00 0001 070d 50fe 00ee 4df5 0a00 0001        ......P...M.....
0x0020     5018 5320 03d3 0000 0000 0000 0000 0000        P.S.............
84 06:53:31.946270   xxx.xxx.xxx.220 > 10.0.0.1: icmp: parameter problem -
octet 0 (wrong icmp csum) (ttl 219, id 30368, len 48)
0x0000     4500 0030 76a0 0000 db01 e25c cff2 acdc        E..0v......\....
0x0010     0a00 0001 0c00 0000 0000 0000 0a00 0001        ................
0x0020     5038 d6a7 11c0 0000 0000 0000 0000 0000        P8..............
85 06:53:31.948939   xxx.xxx.xxx.90 > 10.0.0.1: icmp: type-#32 (wrong icmp
csum) (ttl 240, id 61848, len 48)
0x0000     4500 0030 f198 0000 f001 52e6 cff2 ac5a        E..0......R....Z
0x0010     0a00 0001 2000 0000 0000 0000 0a00 0001        ................
0x0020     5010 e9e2 1564 0000 0000 0000 0000 0000        P....d..........
86 06:53:31.956133   xxx.xxx.xxx.91 > 10.0.0.1: icmp: type-#40 (wrong icmp
csum) (ttl 252, id 10646, len 48)
0x0000     4500 0030 2996 0000 fc01 0ee8 cff2 ac5b        E..0)..........[
0x0010     0a00 0001 2801 e71f 433f 33d0 0a00 0001        ....(...C?3.....
0x0020     5038 f122 8cf2 0000 0000 0000 0000 0000        P8."............
87 06:53:31.958689   xxx.xxx.xxx.220 > 10.0.0.1: icmp: parameter problem - code 2 (wrong
icmp csum) (ttl 243, id 20541, len 48)
0x0000     4500 0030 503d 0000 f301 f0bf cff2 acdc        E..0P=..........
0x0010     0a00 0001 0c02 10d3 1554 e6fa 0a00 0001        .........T......
0x0020     5000 49f3 f8dd 0000 0000 0000 0000 0000        P.I.............
```

```
88 06:53:31.965373   xxx.xxx.xxx.94 > 10.0.0.1: icmp: router advertisement
lifetime 10:14:40 149: [size 61] (wrong icmp csum) (ttl 238, id 13131, len 48)
0x0000     4500 0030 334b 0000 ee01 1330 cff2 ac5e        E..03K.....0...^
0x0010     0a00 0001 0934 ef28 953d 9010 0a00 0001        .....4.(.=......
0x0020     5010 7520 2b5f 0000 0000 0000 0000 0000        P.u.+_..........
89 06:53:31.965701   xxx.xxx.xxx.95 > 10.0.0.1: icmp: echo request (wrong icmp csum) (ttl
233, id 9164, len 48)
0x0000     4500 0030 23cc 0000 e901 27ae cff2 ac5f        E..0#.....'...._
0x0010     0a00 0001 0834 ef28 953d 9010 0a00 0001        .....4.(.=......
0x0020     5010 7520 2b5f 0000 0000 0000 0000 0000        P.u.+_..........
90 06:53:31.968448   xxx.xxx.xxx.96 > 10.0.0.1: icmp: type-#2 (wrong icmp csum)(ttl 237,
id 61603, len 48)
0x0000     4500 0030 f0a3 0000 ed01 56d5 cff2 ac60        E..0......V....`
0x0010     0a00 0001 0200 0019 22da 9090 0a00 0001        ........".......
0x0020   5000 0d4c 95bb 0000 0000 0000 0000 0000     P..L............
```

Source of Trace:

This trace was found at http://lists.jammed.com/incidents/2002/05/ and was submitted by Robert Buckley. The IPs used as the source are from Mr. Buckley's external IP addresses. The packets have been numbered with a red number for clarity in referencing during the analysis.

Detect was generated by:

The detect was generated by SHADOW (Secondary Heuristic Analyses for Defensive Online Warfare) and the packet dump was displayed using TCPdump. Mr. Buckley also tells us that SHADOW identified this as Stacheldraht. You will find spoofworks in the ICMP packet and the Arachnids database points to an ICMP ID of 666. This will be discussed in the Analysis portion.

Probability the source address was spoofed:

The probability of this being spoofed is 100%. Upon analyzing the TCPdump output, you will find several things of interest.

1. The biggest indicator that first drew my attention was the lack of MAC addresses in the majority of the packets. However, some of the packets had the source MAC address listed, but there was no destination MAC address. For example:

```
9 06:53:31.411383  0:d0:58:43:38:80 0800 194: xxx.xxx.xxx.226 > 10.0.0.1:
  icmp: echo reply (wrong icmp csum) (ttl 233, id 19911, len 180)
```

As you can see from this, there is only a source MAC address, `0:d0:58:43:38:80`, but no destination MAC address. All of those packets containing a source MAC address, all contained the exact same MAC address, but different IP addresses (see packets 5, 6, 9, 11, 14, 17, 25, 26, 27, 36, 37, 44, 45, 47, 49, 51, 54, 55, 56, 59, 60, 61, 63, 73, 77, 78, 80)

2. Another interesting characteristic of the trace was that all of the packets were going to the same IP address of 10.0.0.1, yet the TTL of each of the packets varied wildly between 199 and 254. You would expect to see the TTLs closer together if going from the same subnet to the same IP address. Especially those coming from the same machine and operating system which is evident by the MAC address. This MAC address will play an important role in future analysis. The source IP range went from .219 to .254 and then

from .50 to .96 with most of the increments being by one.

3. An additional indicator is that almost all of the packets have the wrong ICMP checksums. All packets in the trace, except packet #55 contained wrong ICMP checksums. Many of the spoofing programs are unable to calculate correct ICMP checksums or choose to calculate them incorrectly. Also notice that the entire trace is ICMP. You will find echo request and replies do not add up. There is a reason this could occur. One possibility is that we are not seeing both sides of the conversation. Maybe Mr. Buckley did not post a full capture of the detect, or the IDS was unable to handle all of the traffic and dropped some of the packets.

4. Another characteristic that lends support to this being packet spoofing is packet #56 shown below:

```
56 06:53:31.813043  0:d0:58:43:38:80 0800 70: xxx.xxx.xxx.65 > 10.0.0.1:
icmp:host xxx.xxx.xxx.65 unreachable (ttl 255, id 3281, len 56)
0x0000     4500 0038 0cd1 0000 ff01 28bf cff2 ac41       E..8......(....A
0x0010     0a00 0001 0301 d6a2 0000 0000 4500 00b4       ............E...
0x0020     eb9d 0000 d806 7071 0a00 0001 cff2 ac41       ......pq.......A
0x0030     006e 1bed 0a00 0001                           .n......
```

This is the only packet which contains the packet header that caused the ICMP unreachable to be sent. Dr. Richard Stevens book TCP/IP Illustrated Volume 1 The Protocols states on page 70 that "When an ICMP error message is sent, the message always contains the IP header and the first 8 bytes of the IP datagram that caused the ICMP error to be generated." Notice first that this packet was sent from IP xxx.xxx.xxx.65 to 10.0.0.1 stating that host xxx.xxx.xxx.65 is unreachable. This should not be seen. A computer should not tell another computer that it is unreachable. Also notice this is one of the packets containing the source MAC address. Let's look at the trace and specifically at the IP header in bold contained within the ICMP reply. I assume the hex conversion process to be understood by the reader. Everything appears normal: **4500** (IP version 4, Internet Header Length (IHL) 5 and no Type of Service (ToS)), **00b4** (Total packet length is 180), **eb9d** (ID field is 60317), **0000** (no fragments its 0), **d806** (TTL is 216 and the protocol is TCP), **7071** (Header checksum is 28785), **0a00 0001** (source IP: 10.0.0.1), **cff2 ac41** (destination IP: 207.242.172.65), **006e** (source port: 110), **1bed** (Destination Port: 7149). I am not sure why this would occur; nothing seems abnormal except the host unreachable being sent.

5. The final aspect of this being packet spoofing is packet # 16 which contains a timestamp reply with the following data passed:

```
time stamp reply id 666 seq 0 : org 0xa000001 recv 0x50180774 xmit 0x2d000000
```

At first glance, nothing appears abnormal till you convert the data: org = 167,772,161; recv = 1,343,752,052; and xmit = 754,974,720. According to Dr. Richard Stevens book TCP/IP Illustrated Volume 1 The Protocols on page 75 states "Since the timestamp values are the number of milliseconds past midnight, UTC they should always be less than 86,400,000 (24 x 60 x 60 x 1000)." As you can see from the above timestamps, we are just a little over.

Description of the attack:

According to Mr. Buckley, the entire duration of the activity was for one minute and it was nothing but ICMP. The initial diagnosis of Stacheldraht at first was misleading. Mr. Buckley thought it looked strange, but another individual responded that it was Stacheldraht by virtue of "You can see the ECHO REPLY packet containing the passphrase of "sicken."" However, after dumping the packet fields into an Excel spreadsheet, it appeared to be missing some important characteristics. Mr. David Dittrich wrote and excellent paper entitled "The "stacheldraht" distributed denial of service attack tool" and it can be found at http://staff.washington.edu/dittrich/misc/stacheldraht.analysis.txt. According to his analysis Stacheldraht uses TCP as well as ICMP. There should be traffic seen to/from TCP port 16660 or 65000 depending on whether this was an agent/handler/client. None of this was found in the trace. Also, Stacheldraht uses Blowfish for its encryption of the traffic. However, several of the packets contained payloads that were not encrypted and will be discussed further in the attack Mechanism.

It appears that this is a scan of some sort, but as of now I have not been able to identify the exact tool in use. The following table shows a breakdown of the ICMP usage. The first column is the red number used earlier to help identify which packet was being discussed.

Packet Seq	SRC MAC Address	Source IP	Protocol	ICMP Type/Code
1		xxx.xxx.xxx.219	icmp: echo request	Type 8, Echo Request
2		**xxx.xxx.xxx.220**	icmp: host 0.0.0.0 unreachable- admin prohibited	Type 3, Code 10: Router selection
3		**xxx.xxx.xxx.220**	icmp: ip reassembly time	Type 11, Code 1: Fragment Reassembly Time Exceeded
4		xxx.xxx.xxx.221	icmp: type-#20	Type 20: Reserved
5	0:d0:58:43:38:80	xxx.xxx.xxx.222	icmp: echo request	Type 8, Echo Request
6	0:d0:58:43:38:80	xxx.xxx.xxx.223	icmp: echo request	Type 8, Echo Request
7		xxx.xxx.xxx.224	icmp: type-#31	Type 31: Datagram Conversion Error
8		**xxx.xxx.xxx.220**	icmp: parameter problem – code 2	Type 12, Code 2: Bad Length
9	0:d0:58:43:38:80	xxx.xxx.xxx.226	icmp: echo reply	Type 0: Echo Reply
10		xxx.xxx.xxx.229	icmp: type-#40	Type 40, Code 1: Authentication Failed
11	0:d0:58:43:38:80	xxx.xxx.xxx.231	icmp: echo reply	Type 0: Echo Reply
12		xxx.xxx.xxx.232	icmp: type-#110	Type 110: Unassigned????
13		**xxx.xxx.xxx.220**	icmp: source quench	Type 4: Source Quench
14	0:d0:58:43:38:80	xxx.xxx.xxx.234	icmp: echo request	Type 8, Echo Request
15		xxx.xxx.xxx.235	icmp: echo request	Type 8, Echo Request
16		xxx.xxx.xxx.236	icmp: time stamp reply id 666 seq 0 : org 0xa000001 recv 0x50	Type 14: Timestamp Reply
17	0:d0:58:43:38:80	xxx.xxx.xxx.237	icmp: echo reply	Type 0: Echo Reply
18		**xxx.xxx.xxx.220**	icmp: redirect-#34 0.0.0.0 to net 114.101.45.225	Type 5: Redirect
19		xxx.xxx.xxx.238	icmp: type-#39	Type 39: SKIP
20		xxx.xxx.xxx.240	icmp: router solicitation	Type 10: Router Selection

21		**xxx.xxx.xxx.220**	icmp: parameter problem – code 2	Type 12, Code 2: Bad Length
22		xxx.xxx.xxx.241	icmp: echo request	Type 8, Echo Request
23		xxx.xxx.xxx.242	icmp: type-#40	Type 40, Code 0: Bad SPI
24		**xxx.xxx.xxx.220**	icmp: time exceeded-#110	Type 11: TTL exceede in transit
25	0:d0:58:43:38:80	xxx.xxx.xxx.243	icmp: echo request	Type 8, Echo Request
26	0:d0:58:43:38:80	xxx.xxx.xxx.244	icmp: echo request	Type 8, Echo Request
27	0:d0:58:43:38:80	xxx.xxx.xxx.246	icmp: echo reply	Type 0: Echo Reply
28		xxx.xxx.xxx.247	icmp: type-#35	Type 35: Mobile Registration Request
29		xxx.xxx.xxx.248	icmp: router solicitation	Type 10: Router Selection
30		xxx.xxx.xxx.249	icmp: type-#39	Type 39: SKIP
31		**xxx.xxx.xxx.220**	icmp: host 0.0.0.0 unreachable- admin prohibited	Type 3, Code 10: Communication with Destination Host is Administratively Prohibited
32		**xxx.xxx.xxx.220**	icmp: 0.0.0.0 unreachable -source host isolated	Type 3, Code 8: Source Host Isolated
33		**xxx.xxx.xxx.220**	icmp: redirect-tos 0.0.0.0 to net 0.0.0.0	Type 5, Code 3: Redirect Datagram for the Type of Service and host
34		**xxx.xxx.xxx.220**	icmp: redirect-tos 0.0.0.0 to net 0.0.0.0	Type 5, Code 3: Redirect Datagram for the Type of Service and host
35		xxx.xxx.xxx.252	icmp: echo reply	Type 0: Echo Reply
36	0:d0:58:43:38:80	xxx.xxx.xxx.253	icmp: echo request	Type 8, Echo Request
37	0:d0:58:43:38:80	xxx.xxx.xxx.254	icmp: echo request	Type 8, Echo Request
38		**xxx.xxx.xxx.220**	icmp: 0.0.0.0 protocol 151 unreachable	Type 3, Code 2: Protocol Unreachable
39		**xxx.xxx.xxx.220**	icmp: 0.0.0.0 unreachable -need to frag	Type 3, Code 4: Fragmentation Needed and Don't Fragment was Set
40		**xxx.xxx.xxx.220**	icmp: source quench	Type 4: Source Quench
41		xxx.xxx.xxx.50	icmp: type-#116	Type 116 Unassigned
42		**xxx.xxx.xxx.220**	icmp: net 0.0.0.0 unreachable - tos prohibited	Type 3, Code 11: Destination Network Unreachable for Type of Service
43		xxx.xxx.xxx.51	icmp: type-#36	Type 36: Mobile Registration Reply
44	0:d0:58:43:38:80	xxx.xxx.xxx.52	icmp:echo request	Type 8, Echo Request
45	0:d0:58:43:38:80	xxx.xxx.xxx.53	icmp: echo reply	Type 0: Echo Reply
46		xxx.xxx.xxx.57	icmp: type-#30	Type 30: Traceroute
47	0:d0:58:43:38:80	xxx.xxx.xxx.58	icmp: echo reply	Type 0: Echo Reply
48		xxx.xxx.xxx.60	icmp: echo request	Type 8, Echo Request
49	0:d0:58:43:38:80	xxx.xxx.xxx.61	icmp: echo request	Type 8, Echo Request
50		**xxx.xxx.xxx.220**	icmp: xxx.xxx.xxx.220 protocol 17 unreachable	Type 3, Code 2:
51	0:d0:58:43:38:80	xxx.xxx.xxx.62	icmp: echo request	Type 8, Echo Request
52		**xxx.xxx.xxx.220**	icmp: source quench	Type 4: Source Quench
53		**xxx.xxx.xxx.220**	icmp: parameter problem -	Type 12, Code 0: Pointer indicates the error
54	0:d0:58:43:38:80	xxx.xxx.xxx.63	icmp:echo reply	Type 0: Echo Reply
55	0:d0:58:43:38:80	xxx.xxx.xxx.64	icmp:echo request	Type 8, Echo Request

56	0:d0:58:43:38:80	xxx.xxx.xxx.65	icmp:host xxx.xxx.xxx.65 unreachable	Type 3, Code 1: Host unreachable
57		xxx.xxx.xxx.66	icmp: router solicitation	Type 10: Router selection
58		**xxx.xxx.xxx.220**	icmp: source quench	Type 4: Source Quench
59	0:d0:58:43:38:80	xxx.xxx.xxx.67	icmp:echo request	Type 8, Echo Request
60	0:d0:58:43:38:80	xxx.xxx.xxx.68	icmp:echo request	Type 8, Echo Request
61	0:d0:58:43:38:80	xxx.xxx.xxx.69	icmp:echo request	Type 8, Echo Request
62		xxx.xxx.xxx.70	icmp: type-#40	Type 40, Code 0: Bad SPI
63	0:d0:58:43:38:80	xxx.xxx.xxx.71	icmp:echo reply	Type 0: Echo Reply
64		**xxx.xxx.xxx.220**	icmp: host 0.0.0.0 unreachable - tos prohibited	Type 3, Code 12: Destination Host Unreachable for Type Of Service
65		xxx.xxx.xxx.72	icmp: type-#36	Type 36: Mobile Registration Reply
66		**xxx.xxx.xxx.220**	icmp: redirect-tos 0.0.0.0 to net 203.237.226.116	Type 5, Code 2: Redirect Datagram for the Type of Service and Network
67		xxx.xxx.xxx.73	icmp: type-#7	Type 7: Unassigned
68		**xxx.xxx.xxx.220**	icmp: 0.0.0.0 unreachable -source route failed	Type 3, Code 5: Source Route Failed
69		**xxx.xxx.xxx.220**	icmp: redirect-tos 0.0.0.0 to net 0.0.0.0	Type 5, Code 3: Redirect Datagram for the Type of Service and Host
70		xxx.xxx.xxx.74	icmp: echo reply	Type 0: Echo Reply
71		xxx.xxx.xxx.75	icmp: type-#32	Type 32: Mobile Host Redirect
72		xxx.xxx.xxx.77	icmp: type-#33	Type 33: IPV6 Where-Are-You
73	0:d0:58:43:38:80	xxx.xxx.xxx.78	icmp:echo request	Type 8, Echo Request
74		**xxx.xxx.xxx.220**	icmp: host 0.0.0.0 unreachable - precedence cutoff	Type 3, Code 15: Precedence cutoff in effect
75		xxx.xxx.xxx.79	icmp: address mask request	Type 17: Address Mask Request
76		xxx.xxx.xxx.80	icmp: echo reply	Type 0: Echo Reply
77	0:d0:58:43:38:80	xxx.xxx.xxx.83	icmp:echo request	Type 8, Echo Request
78	0:d0:58:43:38:80	xxx.xxx.xxx.85	icmp:echo request	Type 8, Echo Request
79		**xxx.xxx.xxx.220**	icmp: time exceeded in-transit	Type 11, Code 0: Time to Live Exceeded in Transit
80	0:d0:58:43:38:80	xxx.xxx.xxx.86	icmp:echo request	Type 8, Echo Request
81		xxx.xxx.xxx.87	icmp: time stamp query id 0 seq 0	Type 13: TimeStamp
82		**xxx.xxx.xxx.220**	icmp: source quench	Type 4: Source Quench
83		xxx.xxx.xxx.88	icmp: type-#7	Type 7: Unassigned
84		**xxx.xxx.xxx.220**	icmp: parameter problem -	Type 12, Code 0:
85		xxx.xxx.xxx.90	icmp: type-#32	Type 32: Mobile Host Redirect
86		xxx.xxx.xxx.91	icmp: type-#40	Type 40, Code 1: Authentication Failed
87		**xxx.xxx.xxx.220**	icmp: parameter problem – code 2	Type 12, Code 2: Bad Length
88		xxx.xxx.xxx.94	icmp: router advertisement	Type 9: Router Advertisement
89		xxx.xxx.xxx.95	icmp: echo request	Type 8, Echo Request
90		xxx.xxx.xxx.96	icmp: type-#2	Type 2: Unassigned

As you can see from the above table, many different types of ICMP packets were sent. It appears that this is an aggressive, but brief scan mechanism. I believe it is directed against the gateway router to determine its configuration. There are several things which appear in the above trace which lends support of this. If you notice, the IP address XXX.XXX.XXX.220 appears many times through out the trace. It is only IP address which duplicates itself. Almost all of the ICMP messages being sent are specific to routers. There are several redirects sent by XXX.XXX.XXX.220 and from Dr. Richard Stevens book TCP/IP Illustrated Volume 1 The Protocols on page 122 we know that "redirects are generated only by routers, not by hosts." (see packets 18, 33, 34, 66 and 69) We also find Type 3, Code 15: Precedence cutoff in effect; Type 3, Code 11: Destination Network Unreachable for Type of Service; icmp: host 0.0.0.0 unreachable- admin prohibited, etc. allow coming from XXX.XXX.XXX.220. By virtue of the number of times it appears and the ICMP used, I would say it is a router. However, there is always the possibility this not the case. There are other packets that contain router specific information such as Packet 87 sent a router advertisement, but it was not IP XXX.XXX.XXX.220. An interesting characteristic found in all of the packets except for three of them (1, 2, and 56) is as follows:

```
0x0000   4500 0030 f0a3 0000 ed01 56d5 cff2 ac60
0x0010   0a00 0001 0200 0019 22da 9090 0a00 0001
```

All packets contain the IP address of 10.0.0.1 in hex in the exact same location regardless of the ICMP type. I have not be able to determine why the start of the ICMP datagram is set to this, unless it is to ensure communication or some sort of IP tunneling.

There are several other things about this trace that offer clues, but not necessarily answers. In packet #18, we find a redirect to net 114.101.45.225. Looking this up at www.arin.net provided the following information.

Search results for: 114.101.45.225

```
IANA (RESERVED-8)
   Internet Assigned Numbers Authority
   4676 Admiralty Way, Suite 330
   Marina del Rey, CA 90292-6695
   US

   Netname: RESERVED-8
   Netblock: 96.0.0.0 - 126.255.255.255
```

Unfortunately, this does not tell us a lot. However we find another redirect in packet #66 to 203.237.226.116 and another search of the IP reveals better results seen below:

Query the APNIC Whois Database

```
% [whois.apnic.net node-2]
% How to use this server        http://www.apnic.net/db/
```

% Whois data copyright terms http://www.apnic.net/db/dbcopyright.html

```
inetnum:       203.237.216.0 - 203.237.231.255
netname:       DKUNET-KR
descr:        Dankook University
descr:        San 8 Hannam-dong Yongsan-gu
descr:        SEOUL
```

```
descr:         140-714
country:        KR
admin-c:        CM17-KR
tech-c:         SB130-KR
remarks:        This IP address space has been allocated to KRNIC.
remarks:        For more information, using KRNIC Whois Database
remarks:        whois -h whois.nic.or.kr
mnt-by:         MNT-KRNIC-AP
remarks:        This information has been partially mirrored by APNIC
from
remarks:        KRNIC. To obtain more specific information, please use
the
remarks:        KRNIC whois server at whois.krnic.net.
changed:        hostmaster@nic.or.kr 20020805
source:         KRNIC
```

A redirect to Korea? It is possible, but Mr. Buckley's email is rbuckley@synapsemail.com. A quick lookup of synapsemail.com using nslookup reveals:

> synapsemail.com
Server: dialcache040.ns.uu.net
Address: 198.6.1.140
Name: synapsemail.com

This IP address in an Arin lookup resolves to:

```
UUNET Technologies, Inc. (NETBLK-UUNETCBLK6)
   3060 Williams Drive, Suite 601
   Fairfax, VA 22031
   US
```

By function of a redirect, a machine sitting off a router requests an IP which has a shorter route using another gateway. The router will send a redirect to the host, if on the same network, telling it to use a new gateway router which is the closest router in the path to its destination. It is hard to believe that Korea would be the next closest router. We also know since the redirect was sent, that 10.0.0.1 is on the same subnet as this router. The effect of this would be to update the routing table of the host to this new route for all requests to this network with this new gateway.

We also find several packets that need to be looked at more in depth. All of those packets with the same source MAC address, all had one thing in common. Each of these packets was either an echo request or an echo reply. Also, each of them had data with in the packets. Look at the following table constructed:

Packet Seq	Source IP	ICMP Type/Code	Data Contained in Packet	Signature from SNORT Rule Base
5	xxx.xxx.xxx.222	Type 8, Echo Request	ISSPNGRQ.s.you	ISS Pinger
9	xxx.xxx.xxx.226	Type 0: Echo Reply	ficken .exe?about	
11	xxx.xxx.xxx.231	Type 0: Echo Reply	AAAAAAAAAA.FBORF W.EXE\"	
14	xxx.xxx.xxx.234	Type 8, Echo Request	(From Hex values)	Flowpoint 2200DSL Router

17	xxx.xxx.xxx.237	Type 0: Echo Reply	Shell.bound.to.port	TFN server response
25	xxx.xxx.xxx.243	Type 8, Echo Request	Sustainable.So	IP NetMonitor Macintosh
26	xxx.xxx.xxx.244	Type 8, Echo Request	(From Hex values)	Cisco Type.x
27	xxx.xxx.xxx.246	Type 0: Echo Reply	sicken	Stacheldraht server-response-gag
36	xxx.xxx.xxx.253	Type 8, Echo Request	abcdefghijklmnop.EXE\"	Microsoft Windows: Same as 14 and 26
37	xxx.xxx.xxx.254	Type 8, Echo Request	bcdefghijklmnop.EXE\"	Microsoft Windows: Same as 14 and 26
44	xxx.xxx.xxx.52	Type 8, Echo Request	ABCDEFGHIJKLMNOPQRSTUVWABCDEFGHI	PING-SCANNER-L3RETRIEVER
45	xxx.xxx.xxx.53	Type 0: Echo Reply	gesundheit!	
47	xxx.xxx.xxx.58	Type 0: Echo Reply	spoofworks	
49	xxx.xxx.xxx.61	Type 8, Echo Request	(From Hex values)	Flowpoint 2200DSL Router
51	xxx.xxx.xxx.62	Type 8, Echo Request	WhatsUp.-.A.Netw	WhatsupGold Windows
54	xxx.xxx.xxx.63	Type 0: Echo Reply	spoofworks.ls/getdrvs.exe	
59	xxx.xxx.xxx.67	Type 8, Echo Request	(From Hex values)	Flowpoint 2200DSL Router
60	xxx.xxx.xxx.68	Type 8, Echo Request	ISSPNGRQ	ISS Pinger
61	xxx.xxx.xxx.69	Type 8, Echo Request	(From Hex values)	Seer Windows
63	xxx.xxx.xxx.71	Type 0: Echo Reply	spoofworks.i	
73	xxx.xxx.xxx.78	Type 8, Echo Request	20&CiRestriction=none&CiHiliteType=Full.HTTP/1.0	Attempt to retrieve ASP contents
77	xxx.xxx.xxx.83	Type 8, Echo Request	OMeterObeseArmad	Ping-O-MeterWindows
78	xxx.xxx.xxx.85	Type 8, Echo Request	Sustainable.So	IP NetMonitor Macintosh
80	xxx.xxx.xxx.86	Type 8, Echo Request	Pinging.from.Del	Delphi-Piette Windows

The majority of these had to be figured out by searching for the hex values in SNORT rule sets when looking at the data contained with in them. Why would you see so many prominent signatures? At first I was wondering about the source MAC address only listed in certain packets. I believe this was to ensure a response back from the receiving system. If two systems have the same IP address, the MAC address will determine the delivery, especially if you update the routing table to reflect an IP is at a different MAC address. It seems they were looking for something.

Attack Mechanism

After looking at the above analysis, I cannot say exactly what is going on. There are many many different possibilities. One that seems the most plausible is that this is a scan to determine a router configuration. It is more difficult not knowing the network configuration; however Mr. Buckley says that 10.0.0.1 is not a valid host. Given the information from the above analysis, it appears that a local host off of the router is attempting to scan the router for configuration information. The IP addresses used are spoofed and some undetermined program would be generating the ICMP traffic we are seeing due to the speed of the scan and the spoofing IPs. I am unable to figure out exactly which program. It has characteristics of many of them, but I don't find one in particular that has this signature. It is possible that this is scripted ICMPush or a SING (Send ICMP Nasty Garbage) scan which can be found at http://hispahack.ccc.de/ . However, I don't find they support the IPV6 Where are you and some of the others that are found. The scan starts by spoofing IP XXX.XXX.XXX.219 and spoofs through the IP range to .XXX.XXX.XXX.254 then restarting at XXX.XXX.XXX.50 and goes to XXX.XXX.XXX.96. Keep in mind this occurs for one minute and is all ICMP traffic. I believe the different signatures are used because the router would respond differently to different type ICMP traffic from different type programs. These are the packets which contain a source MAC address, which I believe are used to ensure they receive the response to the packets. It is possible with the 10.0.0.1 appearing in the data portion of the ICMP packet in almost everyone that this is a covert channel in use and the redirect to 203.237.226.116 and to 114.101.45.225 would ensure the host of 10.0.0.1 could pass the traffic. I believe this to be an initial reconnaissance. The signatures found in the in the packets could also be used as a decoy to throw an IDS off of what is really happening.

Correlations

There are correlations to different aspects of the attack, but I am unable to find one that fits this pattern of traffic. Each of the individual signatures has been found in different cases:

1. ISS Pinger: http://www.digitaltrust.it/arachnids/IDS158/event.html
   CAN-1999-0523: http://cve.mitre.org/cgi-bin/cvename.cgi?name=CAN-1999-0523
   adVICE: http://www.iss.net/security_center/advice/Intrusions/2001508/default.htm
   CA 1993-14: http://www.cert.org/advisories/CA-1993-14.html
2. Flowpoint 2200DSL Router: http://www.digitaltrust.it/arachnids/IDS158/event.html
   CAN-1999-0523: http://cve.mitre.org/cgi-bin/cvename.cgi?name=CAN-1999-0523
3. TFN Server Response: http://www.digitaltrust.it/arachnids/IDS182/event.html
   CAN-2000-0138: http://cve.mitre.org/cgi-bin/cvename.cgi?name=CAN-2000-0138
4. IP NetMonitor Macintosh: http://www.digitaltrust.it/arachnids/IDS157/event.html
   CAN-1999-0523: http://cve.mitre.org/cgi-bin/cvename.cgi?name=CAN-1999-0523
5. Cisco Type.x: http://www.digitaltrust.it/arachnids/IDS153/event.html
   CAN-1999-0523: http://cve.mitre.org/cgi-bin/cvename.cgi?name=CAN-1999-0523
6. Stacheldraht server-response-gag:
   http://www.digitaltrust.it/arachnids/IDS195/event.html
   CAN-2000-0138: http://cve.mitre.org/cgi-bin/cvename.cgi?name=CAN-2000-0138
7. Microsoft Windows: http://www.digitaltrust.it/arachnids/IDS159/event.html
   CAN-1999-0523: http://cve.mitre.org/cgi-bin/cvename.cgi?name=CAN-1999-0523

8. PING-Scanner-L3Retriever: http://www.digitaltrust.it/arachnids/IDS311/event.html
   CAN-1999-0523: http://cve.mitre.org/cgi-bin/cvename.cgi?name=CAN-1999-0523
9. WhatsupGold Windows: http://www.digitaltrust.it/arachnids/IDS168/event.html
   CAN-1999-0523: http://cve.mitre.org/cgi-bin/cvename.cgi?name=CAN-1999-0523
10. Seer Windows: http://www.digitaltrust.it/arachnids/IDS166/event.html
    CAN-1999-0523: http://cve.mitre.org/cgi-bin/cvename.cgi?name=CAN-1999-0523
11. Attempt to retrieve ASP contents:
    http://216.239.53.100/search?q=cache:lk1foV7BQwAC:www.securiteam.com/exploits/5YQ0I000CU.html+%22%22%2520%26CiRestriction%3Dnone%26CiHiliteType%3DFull+HTTP/1.0%22&hl=en&ie=UTF-8
12. Ping-O-Meter Windows: http://www.digitaltrust.it/arachnids/IDS164/event.html
    CAN-1999-0523: http://cve.mitre.org/cgi-bin/cvename.cgi?name=CAN-1999-0523
13. Delphi-Piette Windows: http://www.digitaltrust.it/arachnids/IDS155/event.html
    CAN-1999-0523: http://cve.mitre.org/cgi-bin/cvename.cgi?name=CAN-1999-0523

Evidence of active targeting

This would be active targeting. We see all packets going to 10.0.0.1. We also see the contents of the packet causing the ICMP host unreachable message to be sent in packet #56 from 10.0.0.1. Almost all of the ICMP requests or ICMP replies were router specific. Even if 10.0.0.1 were not an active host, the router would still send some responses back to the originator. The identical source MAC address would help to ensure that the information was returned.

Severity

The severity is calculated with information available. This could change if more information about the network were known.

Severity = (Criticality + Lethality) – (System Countermeasures + Network Countermeasures)

Criticality = 5, the router is a critical piece of the infrastructure

Lethality = 4, because we don't know the router's configuration, this would be a higher number due to the information that can be received by whoever is doing the reconnaissance.

System Countermeasures = 3, because we don't know what the router is; how it's configured; or what vulnerabilities exist with it.

Network Countermeasures = 2, the IDS picked up the scan, but it does not stop the scan.

Severity = (5+4) – (3+2) = 4:

Defensive recommendations

Since the router is outside the firewall, the IDS is a good start. Make sure the IDS has the most current rule set and that it has been properly configured. Ensure the router has all of the latest patches applied. Review the ACL list to ensure it has been configured correctly is and blocking dangerous ICMP. This will have to be determined by the router owner and the networks being serviced. Block all ICMP traffic going in and out of the router that is not needed. Review the logs daily and watch for malicious behavior.

Multiple choice test question

Question: Time Stamp replies should always be

a. greater than 86,400,000
b. less than 86,400,000
c. less than 60,400,000
d. greater than 60,400,000

Answer: ***B,*** the way to calculate the timestamp is: (24 x 60 x 60 x 1000)

Detect 2

May 04 15:13:54.192847 213.114.155.74.10363 > A.B.24.105.32320: R 0:0(0) ack 2093292673 win 0
May 10 10:32:02.907545 202.96.170.175.23132 > A.B.24.105.16147: R 0:0(0) ack 2119353641 win 0 (DF)
May 10 10:33:02.244385 202.96.170.175.28393 > A.B.24.105.27350: R 0:0(0) ack 2093292673 win 0 (DF)
May 11 17:41:25.668000 195.159.0.90.25787 > A.B.24.105.50026: R 0:0(0) ack 2093292673 win 0 (DF)
May 12 20:57:40.114036 195.159.0.90.17655 > A.B.24.105.42560: R 0:0(0) ack 2093292673 win 0 (DF) [tos 0x60]
May 13 02:43:49.277926 210.51.195.242.30405 > A.B.24.105.55321: R 0:0(0) ack 2093292673 win 0
May 13 02:47:42.141686 210.51.195.242.13712 > A.B.24.105.13470: R 0:0(0) ack 2119353641 win 0
May 13 03:08:44.392753 210.51.195.242.14624 > A.B.24.105.25786: R 0:0(0) ack 2119353641 win 0
May 13 03:09:02.581235 210.51.195.242.21772 > A.B.24.105.55043: R 0:0(0) ack 2093292673 win 0
May 13 03:14:07.108680 210.51.195.242.16260 > A.B.24.105.50721: R 0:0(0) ack 2093292673 win 0
May 13 03:23:01.695751 210.51.195.242.24690 > A.B.24.105.43529: R 0:0(0) ack 2093292673 win 0
May 13 03:30:40.841510 210.51.195.242.20326 > A.B.24.105.32961: R 0:0(0) ack 2119353641 win 0
May 13 03:53:25.418298 195.159.0.90.28711 > A.B.24.105.54951: R 0:0(0) ack 2093292673 win 0 (DF) [tos 0x60]
May 13 19:23:30.740548 202.103.196.69.5890 > A.B.24.105.55141: R 0:0(0) ack 2093292673 win 0
May 14 09:14:44.181069 202.108.58.52.18598 > A.B.24.105.19788: R 0:0(0) ack 2119353641 win 0
May 14 16:53:22.218980 195.159.0.90.14934 > A.B.24.105.42941: R 0:0(0) ack

2093292673 win 0 (DF) [tos 0x60]
May 14 17:00:47.116523 195.159.0.90.22228 > A.B.24.105.54487: R 0:0(0) ack 2093292673 win 0 (DF) [tos 0x60]
May 18 08:51:27.644959 218.1.1.158.2471 > A.B.24.105.49396: R 0:0(0) ack 2093292673 win 0
May 19 02:35:23.141419 202.103.196.69.32229 > A.B.24.105.27436: R 0:0(0) ack 2093292673 win 0
May 19 02:47:53.563776 202.103.196.61.8113 > A.B.24.105.32263: R 0:0(0) ack 2093292673 win 0
May 19 02:55:12.054609 202.103.196.61.14270 > A.B.24.105.32852: R 0:0(0) ack 2093292673 win 0
May 19 09:17:19.226250 218.1.1.158.26563 > A.B.24.105.35030: R 0:0(0) ack 2093292673 win 0
May 20 20:54:03.565186 211.155.241.86.4949 > A.B.24.105.7930: R 0:0(0) ack 2119353641 win 0
May 21 21:59:32.021667 61.139.77.80.28873 > A.B.24.105.36294: R 0:0(0) ack 2093292673 win 0
May 21 22:01:09.809743 61.139.77.80.16712 > A.B.24.105.55967: R 0:0(0) ack 2093292673 win 0
May 21 22:03:04.032252 61.139.77.80.20641 > A.B.24.105.24336: R 0:0(0) ack 2093292673 win 0
May 21 22:05:35.751460 61.139.77.80.23510 > A.B.24.105.47833: R 0:0(0) ack 2093292673 win 0
May 21 22:19:15.208975 61.139.77.80.27333 > A.B.24.105.33607: R 0:0(0) ack 2119353641 win 0
May 21 22:30:17.176497 61.139.77.80.7683 > A.B.24.105.25473: R 0:0(0) ack 2119353641 win 0
May 22 01:25:46.457981 61.139.77.80.21143 > A.B.24.105.34794: R 0:0(0) ack 2093292673 win 0
May 22 01:29:13.261296 61.139.77.80.17424 > A.B.24.105.46475: R 0:0(0) ack 2093292673 win 0
May 22 01:39:44.960026 61.139.77.80.24893 > A.B.24.105.12434: R 0:0(0) ack 2119353641 win 0
May 22 06:54:09.159673 61.144.236.154.23977 > A.B.24.105.37501: R 0:0(0) ack 2093292673 win 0
May 22 22:04:59.837793 211.144.65.118.18268 > A.B.24.105.32230: R 0:0(0) ack 2119353641 win 0
May 23 16:12:32.902699 32.97.166.142.23906 > A.B.24.105.40741: R 0:0(0) ack 2093292673 win 0 (DF) [tos 0x8]
May 24 07:27:13.613784 213.156.32.125.19650 > A.B.24.105.20404: R 0:0(0) ack 1702151370 win 0

Source of Trace:

The trace was taken from http://cert.uni-stuttgart.de/archive/intrusions/2002/05/msg00402.html and posted by Mr. Michael Scott. He does not list what the network configuration looked like.

Detect was generated by:

The log format is TCPdump, but what captured the trace is not given.

Probability the source address was spoofed:

The probability the IP addresses are spoofed is low. There are 14 different IP addresses used over a 13 day period. As you can see below, the IPs break down as follows: one from Norway, one with AT&T, one from Italy and 11 from China. If the resets were deliberate, then the originator would want to see a reply back. This definitely not a DoS (Denial of Service). If the destination IP A.B.24.105 was being used against another system, the IP we are responding to with a reset would be the IP being scanned/attacked and would still be a legitimate IP.

195.159.0.90

```
inetnum:       195.159.0.0 - 195.159.6.63
netname:       POWERTECH-CORE-NETS
descr:         PowerTech, Oslo, Norway
country:       NO
```

202.103.196.61, 202.103.196.69

```
inetnum:       202.103.192.0 - 202.103.255.255
netname:       CHINANET-GX
descr:         CHINANET Guangxi province network
descr:         Data Communication Division
descr:         China Telecom
country:       CN
```

202.108.58.52

```
inetnum:       202.108.58.0 - 202.108.58.255
netname:       REDSAIL-INFOR-TECH-CO
descr:         Beijing Telecom Red Sail Information
descr:         Technology Co.Ltd
country:       CN
```

202.96.170.175

```
inetnum:       202.96.128.0 - 202.96.191.255
netname:       CHINANET-GD
descr:         CHINANET Guangdong province network
descr:         Data Communication Division
descr:         China Telecom
country:       CN
```

210.51.195.242

```
inetnum:       210.51.195.240 - 210.51.195.243
netname:       ZHENJIANG-JUYOU-NETBAR
descr:         zhenjiang city
```

```
country:       CN
```

211.144.65.118

```
inetnum:       211.144.65.1 - 211.144.65.255
netname:       XUHUI1POPNET
descr:         Cable OnLine Network XUHUI1POPNet
descr:         Internet Service Provider
descr:         Shanghai China
country:       CN
```

211.155.241.86

```
inetnum:       211.155.241.80 - 211.155.241.95
netname:       BEI-YONG
descr:         BEIJING BEI-YOUG-KE-JI CO.LTD
descr:         Co.Ltd
descr:         Beijing
country:       CN
```

213.114.155.74

```
inetnum:      213.112.0.0 - 213.115.255.255
netname:       SE-CYBER-20000314
descr:         Provider Local Registry
country:       SE
```

213.156.32.125

```
inetnum:      213.156.32.0 - 213.156.32.255
netname:       FASTWEB-DATACENTER
descr:        Streaming and gaming public subnet
descr:        Infrastructure for Fastweb's main location
country:       IT
```

218.1.1.158

```
inetnum:       218.1.0.0 - 218.1.255.255
netname:       CHINANET-SH
descr:         CHINANET Shanghai province network
descr:         Data Communication Division
descr:         China Telecom
country:       CN
```

32.97.166.142

```
OrgName:     AT&T Global Network Services
OrgID:       ATGS

NetRange:    32.0.0.0 - 32.255.255.255
CIDR:        32.0.0.0/8
```

61.139.77.80

```
inetnum:       61.139.77.0 - 61.139.77.255
netname:       CHENGDU-SCINFO-IDC
descr:         Sichuan Public Information Industry Co.Ltd IDC
descr:         ChengDu,Sichuan
descr:         PR China
country:       CN
```

61.144.236.154

```
inetnum:        61.144.0.0 - 61.144.255.255
netname:        CHINANET-GD
descr:          CHINANET Guangdong province network
descr:          Data Communication Division
descr:          China Telecom
country:        CN
```

Description of the attack:

Before we start, it is important to note that the same two ack numbers of 2093292673 and 2119353641 are used in all of the packets except one. The packet from Italy had an ack number of 1702151370. Upon looking at this packet, the IP is 213.156.32.125 and it is registered to Streaming and gaming public subnet. The source port was checked on a www.google.com query and returned a hit on http://216.239.51.100/search?q=cache:Kik6rn_w9KMC:runarena.com/stats/cs27015%40e1/pbc/81265/+%22+Port+20404%22&hl=en&ie=UTF-8 which is a gaming site. This appears to be legitimate traffic of someone looking for a gaming port.

The other traffic is all resets. This does not appear to be a scan, because they are all going to one IP address. You wouldn't learn much from this. However, the IP address of 195.159.0.90 resolves to:

```
inetnum:       195.159.0.0 - 195.159.6.63
netname:        POWERTECH-CORE-NETS
descr:          PowerTech, Oslo, Norway
country:        NO
```

Another interesting characteristic of this IP is that it is an IRC server for Norway and is listed on many sites such as http://www.frenzy.com/~dougmc/irc-stats/server-lists/server-list.990325 as: irc.homelien.no 195.159.0.90 Norway. An nslookup also provides the following results:

C:\>nslookup
Default Server: dialcache040.ns.uu.net
Address: 198.6.1.140

> 195.159.0.90
Server: dialcache040.ns.uu.net
Address: 198.6.1.140

Name: irc.homelien.no
Address: 195.159.0.90

It is unlikely that 13 different IP addresses over a 13 day period would randomly choose the same IP to use for whatever purpose, especially since the majority of this is from China. In addition to this, all spoof the same two ack numbers. This appears to be a coordinated effort if indeed these are not spoofed IPs. The IRC server's IP appearing poses some interesting possibilities as hackers use the IRC quite frequently. It could be efforts were coordinated over IRC. If so, these resets could be to verify the host is up and available for some purpose. Keep in mind this is only a theory, but one I would pursue if I were looking at it and had all of the facts.

Attack Mechanism

There are two ways this traffic could occur. The first is that a crafted syn packet was sent to the source IP address with the destination IP address of A.B.24.105 and we are seeing the rst/ack being sent back. This does not make much sense, because nothing would be gained by an attacker as they would not see the reset. Unless we don't see they bigger reset scan, or they are sniffing the traffic before it arrives. However, a reset sent to A.B.24.105 can be useful in determining if the machine is a valid host and especially if it is up and running. If the IP is not valid or not alive, the router would send a host unreachable ICMP error message. A host that is up would not respond to a reset. In an inverse scan of this nature, you would discard the host unreachable messages and those from which you did not receive a reply would be considered alive. With the crafted packets and the few packets received on any given day, it appears they could be checking to see if the host is up. The most packets received on a given day are seven and they were spaced over a period of 1-11/2 hours. It is also possible that this A.B.24.105 is participating in IRC chats or the IP is behind a firewall or proxy and someone is trying to knock them offline.

Correlations

It is hard to determine exact correlations because many analysts ignore resets as being harmless. http://archives.neohapsis.com/archives/incidents/2000-11/0115.html has an example of more resets coming in for an undetermined reason. I also searched www.google.com for IP 195.159.0.90 and found another incident in July 2002 of an intrusion attempt from this IP address. This can be found at: http://tyholt.uninett.no/pipermail/ripe-notify/2002-July/034431.html.

There are noted vulnerabilities associated with using resets:
1. CVE-2000-0613: Pix Firewall found at http://cve.mitre.org/cgi-bin/cvename.cgi?name=CVE-2000-0613
2. CAN-1999-1291: TCP/IP in Windows 95 and NT: http://cve.mitre.org/cgi-bin/cvename.cgi?name=CAN-1999-1291
   BUGTRAQ:19981005 New Windows Vulnerability
   URL:http://www.securityfocus.com/archive/1/10789 "(Public chat connections such as IRC have been found to be susceptible to this attack. These are particularly fun as you get to see them being reset (again and again :))."
   XG:nt-brkill(1383)
   URL:http://xforce.iss.net/static/1383.php

Evidence of active targeting

This appears to be active targeting. Given the nature that the packets are from all over China, one from AT&T and one from Italy, it appears that this is active targeting since it is unlikely they all chose the same IP. Also, the two ack numbers used are used by all of the IPs.

Severity

The severity is calculated with information available. This could change if more information about the network were known.
Severity = (Criticality + Lethality) – (System Countermeasures + Network Countermeasures)
Criticality = 4, the individual who submitted these detects was concerned and it was found in the logs. Since we don't know the system, but it was actively used by a wide spread range of IPs, we will give it a 4.
Lethality = 3, because we don't 100% we are the direct receivers of the resets, I give this a 3 because they will gain information on whether the system is up and we also don't know what will follow.
System Countermeasures = 3, we don't know what the system is; how it's configured; or what vulnerabilities exist with it.
Network Countermeasures = 2, the IDS picked up the scan, but it does not stop the scan and we don't know what the system is.

Severity = (4+3) – (3+2) = 2:

Defensive recommendations

Ensure the system is properly patched and the correct security features for it in place. Ensure it is watched for anything unusual since it was targeted. If possible, protect it with a firewall or if outside the firewall, make sure that a good ACL list is on the router.

Multiple choice test question

Question: A reset is handled in what fashion when received by a host?

a. Respond with an ack
b. Respond with a reset
c. If a router receives it and the host is unavailable respond with an ICMP Time exceeded in Transit
d. Silently drop the packet.

Answer: D, A host should never respond to a reset. It should always drop the packet without a reply.

Detect 3

```
12:59:34.427801 < port90.ds1-vj.adsl.cybercity.dk >
d226-19-71.home.cgocable.net: icmp: echo request (frag 44560:1480@0+)
12:59:34.427801 > d226-19-71.home.cgocable.net >
ct299951-b.edgewd1.ky.home.com: (frag 43565:1480@50320+)
```

```
12:59:34.427801 > d226-19-71.home.cgocable.net >
ct299951-b.edgewd1.ky.home.com: (frag 43565:1480@51800+)
12:59:34.427801 > d226-19-71.home.cgocable.net >
ct299951-b.edgewd1.ky.home.com: (frag 43565:1480@53280+)
12:59:34.427801 > d226-19-71.home.cgocable.net >
ct299951-b.edgewd1.ky.home.com: (frag 43565:1480@54760+)
12:59:34.427801 > d226-19-71.home.cgocable.net >
ct299951-b.edgewd1.ky.home.com: (frag 43565:1480@56240+)
12:59:34.437800 > d226-19-71.home.cgocable.net >
ct299951-b.edgewd1.ky.home.com: (frag 43565:1480@57720+)
12:59:34.437800 > d226-19-71.home.cgocable.net >
ct299951-b.edgewd1.ky.home.com: (frag 43565:1480@59200+)
12:59:34.437800 > d226-19-71.home.cgocable.net >
ct299951-b.edgewd1.ky.home.com: (frag 43565:1480@60680+)
12:59:34.437800 > d226-19-71.home.cgocable.net >
ct299951-b.edgewd1.ky.home.com: (frag 43565:1480@62160+)
12:59:34.437800 > d226-19-71.home.cgocable.net >
ct299951-b.edgewd1.ky.home.com: (frag 43565:368@63640)
12:59:34.457799 < port90.ds1-vj.adsl.cybercity.dk >
d226-19-71.home.cgocable.net: (frag 44560:1480@1480+)
12:59:34.477797 < port90.ds1-vj.adsl.cybercity.dk >
d226-19-71.home.cgocable.net: (frag 44560:1480@2960+)
12:59:34.507795 < port90.ds1-vj.adsl.cybercity.dk >
d226-19-71.home.cgocable.net: (frag 44560:1480@4440+)
12:59:34.537793 < port90.ds1-vj.adsl.cybercity.dk >
d226-19-71.home.cgocable.net: (frag 44560:1480@5920+)
12:59:34.557791 < port90.ds1-vj.adsl.cybercity.dk >
d226-19-71.home.cgocable.net: (frag 44560:1480@7400+)
12:59:34.587789 < port90.ds1-vj.adsl.cybercity.dk >
d226-19-71.home.cgocable.net: (frag 44560:1480@8880+)
12:59:34.617787 < port90.ds1-vj.adsl.cybercity.dk >
d226-19-71.home.cgocable.net: (frag 44560:1480@10360+)
12:59:35.087752 < D5E02291.kabel.telenet.be > d226-19-
71.home.cgocable.net: icmp: echo request (frag 58961:1480@0+)
12:59:35.267739 < D5E02291.kabel.telenet.be > d226-19-
71.home.cgocable.net: (frag 58961:1480@1480+)
12:59:35.317735 < D5E02291.kabel.telenet.be > d226-19-
71.home.cgocable.net: (frag 58961:1480@2960+)
12:59:35.377731 < D5E02291.kabel.telenet.be > d226-19-
71.home.cgocable.net: (frag 58961:1480@4440+)
12:59:35.467724 < D5E02291.kabel.telenet.be > d226-19-
71.home.cgocable.net: (frag 58961:1480@5920+)
12:59:35.557717 < D5E02291.kabel.telenet.be > d226-19-
71.home.cgocable.net: (frag 58961:1480@7400+)
12:59:35.657710 < D5E02291.kabel.telenet.be > d226-19-
71.home.cgocable.net: (frag 58961:1480@8880+)
12:59:35.747703 < D5E02291.kabel.telenet.be > d226-19-
71.home.cgocable.net: (frag 58961:1480@10360+)
12:59:35.847696 < D5E02291.kabel.telenet.be > d226-19-
71.home.cgocable.net: (frag 58961:1480@11840+)
12:59:35.937689 < D5E02291.kabel.telenet.be > d226-19-
71.home.cgocable.net: (frag 58961:1480@13320+)
12:59:35.947689 < 12-248-194-107.client.attbi.com >
d226-19-71.home.cgocable.net: icmp: echo request (frag 56714:1480@0+)
12:59:35.957688 < 12-248-194-107.client.attbi.com >
d226-19-71.home.cgocable.net: (frag 56714:1480@1480+)
12:59:35.977687 < 12-248-194-107.client.attbi.com >
d226-19-71.home.cgocable.net: (frag 56714:1480@2960+)
```

```
12:59:35.987686 < 12-248-194-107.client.attbi.com >
d226-19-71.home.cgocable.net: (frag 56714:1480@4440+)
12:59:35.997685 < 12-248-194-107.client.attbi.com >
d226-19-71.home.cgocable.net: (frag 56714:1480@5920+)
12:59:36.037682 < D5E02291.kabel.telenet.be > d226-19-
71.home.cgocable.net: (frag 58961:1480@14800+)
12:59:36.127675 < D5E02291.kabel.telenet.be > d226-19-
71.home.cgocable.net: (frag 58961:1480@16280+)
12:59:36.217669 < D5E02291.kabel.telenet.be > d226-19-
71.home.cgocable.net: (frag 58961:1480@17760+)
12:59:36.317661 < D5E02291.kabel.telenet.be > d226-19-
71.home.cgocable.net: (frag 58961:1480@19240+)
12:59:36.407655 < D5E02291.kabel.telenet.be > d226-19-
71.home.cgocable.net: (frag 58961:1480@20720+)
12:59:36.507647 < D5E02291.kabel.telenet.be > d226-19-
71.home.cgocable.net: (frag 58961:1480@22200+)
```

Source of Trace:

Located at http://lists.jammed.com/incidents/2002/01/0168.html. This trace was submitted by Sebastian Ip. We have no information of the network configuration.

Detect was generated by:

The output is TCPdump, but I don't know what detected the traffic. We do know that it was directed to Mr. Ip's network. However, one set of traces appear to be from Mr. Ip's network. www.arin.net and www.ripe.net has the IP addresses registered as follows:

d226-19-71.home.cgocable.net (IP address from nslookup: 24.226.19.71)

```
CustName:    Cogeco Cable Solutions
Address:     950 Syscon Drive Burlington, ON L7R 4S6
Country:     CA
```

port90.ds1-vj.adsl.cybercity.dk (IP address from nslookup: 212.242.123.157)

```
inetnum:      212.242.96.0 - 212.242.127.255
netname:       DK-CYBERCITY-POPS1
descr:         CyberCity POPs
country:       DK
```

12-248-194-107.client.attbi.com (IP address from nslookup: 12.248.194.107)

```
OrgName: AT&T WorldNet Services
OrgID:   ATTW
Address: 400 Interpace Parkway Parsippany, NJ 07054
Country: US
```

D5E02291.kabel.telenet.be (IP address from nslookup: 213.224.34.145)

```
inetnum:      213.224.0.0 - 213.224.51.255
netname:       TELENET
descr:         Telenet Operaties N.V.
country:       BE
```

The two destination addresses are:

ct299951-b.edgewd1.ky.home.com (IP address from nslookup: Non-existent domain)

*** dialcache040.ns.uu.net can't find ct299951-b.edgewd1.ky.home.com: Non-existent domain

d226-19-71.home.cgocable.net (IP address from nslookup: 24.226.19.71)

```
CustName:    Cogeco Cable Solutions
Address:     950 Syscon Drive Burlington, ON L7R 4S6
Country:     CA
```

Probability the source address was spoofed:

The probability that these are spoofed is very high. There are only four source IPs however, d226-19-71.home.cgocable.net is also a destination IP and receives the majority of the traffic. The fragmentation we see appears to be malicious and a response back would not be the intention of the sender. The host d226-19-71.home.cgocable.net (IP 24.226.19.71) also appears on the active proxy list at www.lachuleta.org which has tools for mIRC.

Description of the attack:

What we see occurring is malicious fragmentation. Fragmentation is dangerous because it can pass through many firewalls, IDSs, routers and other devices that are designed to provide network security. Mr. Id stated he believed that the ICMP echo request was causing his systems to respond. This does not appear to be the case. When looking at fragmentation, it is important to look at the fragmentation (frag) ID. This ID is the IP identification number taken from the IP header. Fragmentation packets do not necessarily arrive in the order they were sent. As a quick overview, fragmentation appears in the following format:

```
12:59:36.507647 < D5E02291.kabel.telenet.be > d226-19-
71.home.cgocable.net: (frag 58961:1480@22200+)
```

The frag ID is 58961 and all fragments that relate to this packet will have that frag ID so they can be reassembled. The 1480 is the length of the data contained. The @22200+ is the offset in the original packet and the + means more fragments follow. The first packet in the fragmentation is the only one that has the protocol header. You will not be able to tell from the rest of the fragments what protocol is being used. This will be key later on in the analysis.

If you sort the packets according to the frag ID, you get a different picture than you see in the original trace as it is sorted by the time. Here is what it looks like sorted by the frag ID:

Time	Source Address	Destination Address	Protocol	Fragmentation
12:59:34.427801	d226-19-71.home.cgocable.net	ct299951-b.edgewd1.ky.home.com:		(frag 43565:1480@50320+)
12:59:34.427801	d226-19-71.home.cgocable.net	ct299951-b.edgewd1.ky.home.com:		(frag 43565:1480@51800+)

12:59:34.427801	d226-19-71.home.cgocable.net	ct299951-b.edgewd1.ky.home.com:		(frag 43565:1480@53280+)
12:59:34.427801	d226-19-71.home.cgocable.net	ct299951-b.edgewd1.ky.home.com:		(frag 43565:1480@54760+)
12:59:34.427801	d226-19-71.home.cgocable.net	ct299951-b.edgewd1.ky.home.com:		(frag 43565:1480@56240+)
12:59:34.437800	d226-19-71.home.cgocable.net	ct299951-b.edgewd1.ky.home.com:		(frag 43565:1480@57720+)
12:59:34.437800	d226-19-71.home.cgocable.net	ct299951-b.edgewd1.ky.home.com:		(frag 43565:1480@59200+)
12:59:34.437800	d226-19-71.home.cgocable.net	ct299951-b.edgewd1.ky.home.com:		(frag 43565:1480@60680+)
12:59:34.437800	d226-19-71.home.cgocable.net	ct299951-b.edgewd1.ky.home.com:		(frag 43565:1480@62160+)
12:59:34.437800	d226-19-71.home.cgocable.net	ct299951-b.edgewd1.ky.home.com:		(frag 43565:368@63640)
12:59:34.427801	port90.ds1-vj.adsl.cybercity.dk	d226-19-71.home.cgocable.net:	icmp: echo request	(frag 44560:1480@0+)
12:59:34.617787	port90.ds1-vj.adsl.cybercity.dk	d226-19-71.home.cgocable.net:		(frag 44560:1480@10360+)
12:59:34.457799	port90.ds1-vj.adsl.cybercity.dk	d226-19-71.home.cgocable.net:		(frag 44560:1480@1480+)
12:59:34.477797	port90.ds1-vj.adsl.cybercity.dk	d226-19-71.home.cgocable.net:		(frag 44560:1480@2960+)
12:59:34.507795	port90.ds1-vj.adsl.cybercity.dk	d226-19-71.home.cgocable.net:		(frag 44560:1480@4440+)
12:59:34.537793	port90.ds1-vj.adsl.cybercity.dk	d226-19-71.home.cgocable.net:		(frag 44560:1480@5920+)
12:59:34.557791	port90.ds1-vj.adsl.cybercity.dk	d226-19-71.home.cgocable.net:		(frag 44560:1480@7400+)
12:59:34.587789	port90.ds1-vj.adsl.cybercity.dk	d226-19-71.home.cgocable.net:		(frag 44560:1480@8880+)
12:59:35.947689	12-248-194-107.client.attbi.com	d226-19-71.home.cgocable.net:	icmp: echo request	(frag 56714:1480@0+)
12:59:35.957688	12-248-194-107.client.attbi.com	d226-19-71.home.cgocable.net:		(frag 56714:1480@1480+)
12:59:35.977687	12-248-194-107.client.attbi.com	d226-19-71.home.cgocable.net:		(frag 56714:1480@2960+)
12:59:35.987686	12-248-194-107.client.attbi.com	d226-19-71.home.cgocable.net:		(frag 56714:1480@4440+)
12:59:35.997685	12-248-194-107.client.attbi.com	d226-19-71.home.cgocable.net:		(frag 56714:1480@5920+)
12:59:35.087752	D5E02291.kabel.telenet.be	d226-19-71.home.cgocable.net:	icmp: echo request	(frag 58961:1480@0+)
12:59:35.747703	D5E02291.kabel.telenet.be	d226-19-71.home.cgocable.net:		(frag 58961:1480@10360+)
12:59:35.847696	D5E02291.kabel.telenet.be	d226-19-71.home.cgocable.net:		(frag 58961:1480@11840+)
12:59:35.937689	D5E02291.kabel.telenet.be	d226-19-71.home.cgocable.net:		(frag 58961:1480@13320+)
12:59:35.267739	D5E02291.kabel.telenet.be	d226-19-71.home.cgocable.net:		(frag 58961:1480@1480+)
12:59:36.037682	D5E02291.kabel.telenet.be	d226-19-71.home.cgocable.net:		(frag 58961:1480@14800+)
12:59:36.127675	D5E02291.kabel.telenet.be	d226-19-71.home.cgocable.net:		(frag 58961:1480@16280+)
12:59:36.217669	D5E02291.kabel.telenet.be	d226-19-71.home.cgocable.net:		(frag 58961:1480@17760+)
12:59:36.317661	D5E02291.kabel.telenet.be	d226-19-71.home.cgocable.net:		(frag 58961:1480@19240+)
12:59:36.407655	D5E02291.kabel.telenet.be	d226-19-71.home.cgocable.net:		(frag 58961:1480@20720+)
12:59:36.507647	D5E02291.kabel.telenet.be	d226-19-71.home.cgocable.net:		(frag 58961:1480@22200+)

12:59:35.317735	D5E02291.kabel.telenet.be	d226-19-71.home.cgocable.net:		(frag 58961:1480@2960+)
12:59:35.377731	D5E02291.kabel.telenet.be	d226-19-71.home.cgocable.net:		(frag 58961:1480@4440+)
12:59:35.467724	D5E02291.kabel.telenet.be	d226-19-71.home.cgocable.net:		(frag 58961:1480@5920+)
12:59:35.557717	D5E02291.kabel.telenet.be	d226-19-71.home.cgocable.net:		(frag 58961:1480@7400+)
12:59:35.657710	D5E02291.kabel.telenet.be	d226-19-71.home.cgocable.net:		(frag 58961:1480@8880+)

Only three of the four source IP addresses contain the first fragment. From these you see they are ICMP echo requests. This in itself is unusual due to the massive size of the ICMP echo request packets. However, none of the packet totals exceed the threshold of 65,535 bytes allowed in an ICMP packet. There are a couple of other things wrong with what we see. The first fragmented packet, with a frag ID of 43565, does not have the first fragment with an offset of 0, but it does have the final fragment. The other three fragmented packets are just the opposite. They all have the first fragment, but none of them have the final fragment. They all have the more fragments follows flag set. It is unknown what data was contained in these packets.

Attack Mechanism

The attack is using malicious fragmentation to cause a DoS or at least degradation in service. This according to the times recorded by the capture, the entire attack took place in two seconds. We are going to focus initially on the three packets that have the initial fragments. The spoofed source address sends three large fragmented ICMP echo request packets (using programs such as Fragrouter, Packet Shell, etc) to the destination host of d226-19-71.home.cgocable.net. The packets are large in size and they do not contain the final fragment. As such, the host would try to reassemble the fragments and be waiting for the final fragment to arrive, which is never does. The massive size of the packets combined with them arriving almost simultaneously would cause a DoS to the host or a severe **degradation** in service.

The last packet to look at is the one without an initial fragment, but with a final fragment. Our not seeing the initial fragment could be because it passed through a network device that did not allow that type of protocol. It would drop that initial fragment, but allow the others to pass through. This could be normal traffic from d226-19-71.home.cgocable.net.

Correlations

The lists of vulnerabilities associated with fragmentation on the CVE website were numerous. They ranged from vulnerabilities in firewalls, IDSs, operating systems, etc. Here are a few of them listed.

1. FreeBSD: CVE-1999-0052: http://cve.mitre.org/cgi-bin/cvename.cgi?name=CVE-1999-0052
2. Cisco PIX: CVE-1999-0157: http://cve.mitre.org/cgi-bin/cvename.cgi?name=CVE-1999-0157
3. Windows systems: CVE-1999-0918: http://cve.mitre.org/cgi-

bin/cvename.cgi?name=CVE-1999-0918

Evidence of active targeting

This is active targeting because of the malicious fragments were directed at destination host of d226-19-71.home.cgocable.net. The attacker was deliberately trying to achieve a DoS or degradation in service.

Severity

The severity is calculated with the information available. This could change if more information about the network were known.
Severity = (Criticality + Lethality) – (System Countermeasures + Network Countermeasures)
Criticality = 4, If the device is a proxy server providing service to many customers, this would be a critical piece of the infrastructure
Lethality = 4, this attack would cause a denial of service or a severe **degradation** in service.
System Countermeasures = 3, because we don't know what the host configuration is; or what vulnerabilities exist with it, we will give it an average number. One would hope that if it is a proxy server for an IRC channel, it would be properly hardened.
Network Countermeasures = 2, the packets were detected, but they were allowed to pass.

Severity = (4+4) – (3+2) = 3:

Defensive recommendations

Ensure that all of your systems are up to date on all of their patches. Many vendors have patches available that help to prevent malicious fragmentation from having an effect. In cases like this, stateful security devices such as firewalls, routers, etc are your friend. By maintaining state, they can help defend against malicious fragmentation.

Multiple choice test question

Question: With fragmentation, all fragments should always contain:

a. overlapping offsets
b. a IP ID
c. a final fragment
d. the protocol

Answer: C

Part 3: Analyze This

Executive Summary:

We have been asked to provide a security audit for GIAC University and they have provided us with five days worth of logs to analyze. The data was collect using Snort however; they did not provide us with a copy of the rule set in use at the time. As such, we downloaded the latest rule set from www.snort.org and are using this as our basis for analysis.
Here is a listing of five days of consecutive files obtained from GIAC University. There are three types of data files to analyze and they are Scans, OOS (Out of Spec) and Alerts. Here are the files that will be analyzed for this security audit:

Scans	**OOS**	**Alerts**
scans.020706.gz	oos_Jul.6.2002.gz	alert.020706.gz
scans.020707.gz	oos_Jul.7.2002.gz	alert.020707.gz
scans.020708.gz	oos_Jul.8.2002.gz	alert.020708.gz
scans.020709.gz	oos_Jul.9.2002.gz	alert.020709.gz
scans.020710.gz	oos_Jul.10.2002.gz	alert.020710.gz

We will analyze the logs above as a complete five day set and not individual logs. This will help with correlations and make sure we see the big picture, not just isolating one day of events. Several tools were used to complete the analysis. As a quick overview, I will list the tools used and what purpose they serve. Several different tools were used to ensure a good look at the data was accomplished. The complete description of their usage will be provided at the end of the security audit.

- ✓ SnortSnarf: Used to analyze the alert files against the current Snort rule set and summarize them into a web based output.
- ✓ Snort_Sort: Breaks the alerts down into a web based output. Lists the alerts and those packets that generated them.
- ✓ WinGrep: Used to generate the OOS logs into a format that could be exported into excel. Also used to look for certain pieces of information within the files.
- ✓ CSV.pl: Converts the alert file into a CSV format. (From Tod Beardsley's practical found at http://www.giac.org/GCIA.php)
- ✓ Summarize.pl: Summarizes the data from generated from the CSV.pl into a summary looking at different aspects of the data. (From Tod Beardsley's practical found at http://www.giac.org/GCIA.php)
- ✓ Alertcount.pl: Used to total the alerts. Used to compare against the snort_snarf output, since snort_snarf would not process a concatenated file of all of the logs due to a lack of memory. (From Chris Kuethe's practical found at http://www.giac.org/GCIA.php)
- ✓ Scanalyze.pl: Used to process the scan logs (with the flag set not to exclude anything) into a usable format this is then passed to scancount. (From Chris Kuethe's practical found at http://www.giac.org/GCIA.php)

- ✓ Scancount.pl: Used to total up the scans of the different scan types found in the Scan logs. (From Chris Kuethe's practical found at http://www.giac.org/GCIA.php)
- ✓ Excel.exe: Used to organize the OOS logs into a more usable format.

The analysis will be completed by looking at the detects occurring most frequently. For our purposes, this will be those occurring greater than 1500 times over the five day period for a total of 18 detects. MY.NET was replaced with 10.0 for purposes are parsing the data. Each detect will be analyzed providing the following: a descriptions of the attack, correlations of the attack (if available) and recommendations for improving the University's defensive posture. Snort_sort will be used in conjunction with alertcount.pl since snort_snarf could not be used to process all of the alert logs. Snort_snarf was done for each day and will be used to determine the rules and help with the correlations. Here the analyzed scan results from GIAC University's alert logs:

789224	TFTP - Internal TCP connection to external tftp server
290278	Incomplete Packet Fragments Discarded
90505	SUNRPC highport access!
69486	SNMP public access
63279	IDS552/web-iis_IIS ISAPI Overflow ida INTERNAL nosize
53555	Watchlist 000220 IL-ISDNNET-990517
28533	SMB Name Wildcard
26191	NIMDA - Attempt to execute cmd from campus host
13459	spp_http_decode: IIS Unicode attack detected
11429	External RPC call
9210	Watchlist 000222 NET-NCFC
7531	UDP SRC and DST outside network
7135	TFTP - External UDP connection to internal tftp server
4334	High port 65535 udp - possible Red Worm - traffic
3152	spp_http_decode: CGI Null Byte attack detected
2636	SYN-FIN scan!
2096	AFS - Off-campus activity
1577	beetle.ucs
1241	Attempted Sun RPC high port access
883	IDS552/web-iis_IIS ISAPI Overflow ida nosize
776	IRC evil - running XDCC
655	Null scan!
325	IDS452/web-iis_http-iis-unicode-binary
278	Queso fingerprint
213	High port 65535 tcp - possible Red Worm - traffic
200	SMB C access
183	MYPARTY - Possible My Party infection
137	Possible trojan server activity
133	SCAN Proxy attempt
92	IDS475/web-iis_web-webdav-propfind
84	STATDX UDP attack
61	EXPLOIT x86 NOOP
51	SMTP relaying denied
46	Port 55850 udp - Possible myserver activity - ref. 010313-1
44	TFTP - Internal UDP connection to external tftp server
43	Back Orifice
39	Port 55850 tcp - Possible myserver activity - ref. 010313-1
31	INFO - Possible Squid Scan
29	IDS305/web-iis_http-iis_translate_f
14	EXPLOIT NTPDX buffer overflow

14	FTP DoS ftpd globbing
14	SCAN FIN
14	TCP SRC and DST outside network
13	NMAP TCP ping!
12	EXPLOIT x86 setuid 0
11	EXPLOIT x86 setgid 0
8	RFB - Possible WinVNC - 010708-1
8	SMB D access
6	SCAN Synscan Portscan ID 19104
6	connect to 515 from outside
4	EXPLOIT x86 stealth noop
4	SMTP chameleon overflow
4	Tiny Fragments - Possible Hostile Activity
3	External FTP to HelpDesk 130.85.70.49
2	BACKDOOR NetMetro Incoming Traffic
2	IDS50/trojan_trojan-active-subseven
2	IDS553/web-iis_IIS ISAPI Overflow idq
2	TFTP - External TCP connection to internal tftp server
1	FTP passwd attempt
1	HelpDesk 130.85.70.50 to External FTP
1	IDS433/web-iis_http-iis-unicode-traversal-optyx

Prioritized detects/Analysis

Detect:

TFTP - Internal TCP connection to external tftp server: Occurrence = 789,224

Detect Description:

TFTP (Trivial File Transfer Protocol) uses UDP and does not provide for security of any sort. (http://www.webopedia.com/TERM/T/TFTP.html) This detect is of concern because there is no security available, it is using TCP instead of UDP, and there are multiple vulnerabilities for this type of attack. There are also a high number of these occurring in a five day period.

Correlations:

- CERT® Advisory CA-1991-18 Active Internet tftp Attacks: http://www.cert.org/advisories/CA-1991-18.html
- Alcatel ADSL modems grant unauthenticated TFTP access via Bounce Attacks: http://www.kb.cert.org/vuls/id/211736
- Microsoft IIS and PWS Extended Unicode Directory Traversal Vulnerability: http://216.239.35.100/search?q=cache:dWh3qkHmLhMC:online.securityfocus.com/bid/1806/exploit/+%22TFTP%22+vulnerabilities&hl=en&ie=UTF-8
- Other detects of the same kind can be found at:
  www.giac.org/practical/Edward_Peck_GCIA.doc
  www.giac.org/practical/Mike_Poor_GCIA.doc

Defensive Recommendations:

GIAC University should carefully monitor the TFTP traffic and block it if necessary. They should also ensure that all of their primary systems such as switches, modems etc are protected by the recommendations of the vendor. Many more vulnerabilities can be found by doing a search on www.google.com

Detect:

Incomplete Packet Fragments Discarded: Occurrence = 290,278

Detect Description:

Fragmentation can be a nightmare for intrusion detection. Fragmentation is dangerous because it can pass through many firewalls, IDSs, routers and other devices that are designed to provide network security. This does not mean that is the case. There are two possible reasons for seeing this. It may be malicious traffic or Mr. Martin Roesch answered a question on this message with the Snort version 1.8.2 at http://archives.neohapsis.com/archives/snort/2001-11/0822.html and recommended ensuring the individual was using the frag2 processor. Without knowing the Snort configuration, it is difficult to answer this one.

Correlations:

- Other detects of the same kind can be found at:
  www.giac.org/practical/Matthew_Fiddler_GCIA.doc
  www.giac.org/practical/Edward_Peck_GCIA.doc

Defensive Recommendations:

GIAC University should carefully monitor all fragmentation for possible malicious usage. Ensure all of their servers and primary network devices have tight security lockdowns and all of the latest patches and fixes. Also, ensure that Snort is using the frag2 processor.

Detect:

SUNRPC highport access! Occurrence = 789,224

Detect Description:

SUNRPC (Remote Procedure call) detect is looking to connect to port 32771 tcp/udp. This can be an attempt to hide communication.

Correlations:

- CVE-1999-0003: http://www.cve.mitre.org/cgi-bin/cvename.cgi?name=CVE-1999-0003
- CVE-1999-0008: http://www.cve.mitre.org/cgi-bin/cvename.cgi?name=CVE-1999-0008
- CVE-1999-0208: http://www.cve.mitre.org/cgi-bin/cvename.cgi?name=CVE-1999-0208
- CVE-1999-0212: http://www.cve.mitre.org/cgi-bin/cvename.cgi?name=CVE-1999-0212
- Other detects of the same kind can be found at:
  http://www.sans.org/giactc/snort/SnortA14.txt
  http://www.sans.org/capsans/snort/SnortA34.txt
  www.giac.org/practical/dana_mclaughlin_gcia.doc
  www.giac.org/practical/Dennis_Davis_GCIA.doc

Defensive Recommendations:

GIAC University should ensure that all of the Sun servers are properly configured and locked down according to the proper procedures. Also, block access to this port if not needed on the network.

Detect:
SNMP public access Occurrence = 69,486
Detect Description:
SNMP public access is an attempted to gain access as an authorized user to a network device running SNMP. The community string is set by default, and if not changed can provide a way for hackers to gain access. The use of "public" can be an attempt to gain access to one of these devices.
Correlations:
- Good article on the attack: http://ki.sei.cmu.edu/idar/drill_attack.cfm?attack=SNMP%20Grabbing
- CVE-1999-0472: http://www.cve.mitre.org/cgi-bin/cvename.cgi?name=CVE-1999-0472
- CVE-1999-0516: http://www.cve.mitre.org/cgi-bin/cvename.cgi?name=CVE-1999-0516
- CVE-1999-0517: http://www.cve.mitre.org/cgi-bin/cvename.cgi?name=CVE-1999-0517
- Other detects of the same kind can be found at:
  http://www.sans.org/giactc/snort/SnortA48.txt
  http://www.sans.org/y2k/051200.htm
  www.giac.org/practical/dana_mclaughlin_gcia.doc
  www.giac.org/practical/Dennis_Davis_GCIA.doc

Defensive Recommendations:
The number of vulnerabilities that exist with SNMP is growing large. This is just one of them. GIAC University should ensure that the SNMP community string has been changed. If it is not necessary, do not run SNMP. Ensure all systems are locked down, patched and up to date. Identify all devices running SNMP and ensure they have no known vulnerabilities left unpatched. If not running it, consider block access at the router (I know it's difficult in an university environment)

Detect:
IDS552/web-iis_IIS ISAPI Overflow ida INTERNAL nosize: Occurrence = 63,279
Detect Description:
This means that an attempt has been made to compromise or recon an IIS server. If this occurs, system level access can be gained. In this event, the IP address is usually not spoofed since it requires a TCP connection to be established. It would warrant further investigation. It could also be Code Red or some other similar worm. The packets would need to be looked at closer to determine what the intent of the attack.
Correlations:
- IDS552/IIS ISAPI OVERFLOW IDA: http://www.whitehats.com/info/IDS552
- Other detects of the same kind can be found at:
  www.giac.org/practical/Stan_Hoffman_GCIA.doc
  www.giac.org/practical/Matthew_Fiddler_GCIA.doc

Defensive Recommendations:

GIAC University should carefully monitor this traffic and determine if it is Code Red or Nimda attempts. They should also ensure that all of their web servers are patched to defend against this. If it is Code Red or Nimda, http://www.cert.org has advisories for how to create ingress and egress filtering to defend against this. If it is not one of these, further investigation is warranted as to the activities of the attacker.

Detect:

Watchlist 000220 IL-ISDNNET-990517: Occurrence = 53,555

Detect Description:

This detect is one that watches IL-ISDNNET-990517 for activity. This IP range from Israel has been known for malicious activity and to such an extent that a watch was created. In looking at the data from GIAC University we see several activities originating from 212.179.XXX.XXX subnet. These are some of the ones producing the most traffic:

- NMSD listens on Port 1239, but I am unable to determine what that is or if something else is occurring.
  07/07-02:46:55.698426 212.179.43.225:17040 -> 10.0.111.130:1239
- This appears to be the CD Database Protocol (CDDBP) which uses port 888. It is database storage for music CD and allows access and downloads. (www.giac.org/practical/Edward_Peck_GCIA.doc)
  07/07-04:20:56.505706 212.179.105.44:2958 -> 10.1.163.240:888
- Kazaa uses port 1214. It is possible someone has a machine configured as a Supernode to be able to allow others to upload and download files that are shared. This is concerning with the IP coming from Israel.
  07/07-11:15:07.307631 212.179.126.3:18014 -> 10.1.88.162:1214
- IANA has port 1057 registered to STARTRON which is an Internet game. More information can be found at http://www.startron.org/support_main.html
  07/07-15:09:26.522975 212.179.35.119:1214 -> 10.0.150.209:1057
- There were various connections from port 80 to numerous destination ports.
  07/07-15:09:47.820529 212.179.66.17:80 -> 10.0.150.209:1072
  07/07-21:51:49.294236 212.179.66.17:80 -> 10.0.110.224:1059
  07/10-09:47:58.782895 212.179.35.128:80 -> 10.0.84.191:1149
- Port 1037 is unassigned, but many Microsoft Operating systems use it for communications including NBT. It is worth watching.
  07/07-21:51:40.353047 212.179.35.119:1214 -> 10.0.110.224:1037
- Multiple attempts to port 80. This could be numerous things especially if port 80 allows for unrestricted access.
  07/08-06:06:20.036178 212.179.42.189:15532 -> 10.0.99.174:80
- The Remote USB System Port is listening on 3422.
  07/10-01:18:31.854357 212.179.32.130:54435 -> 10.0.110.92:3422

Correlations:

- Other detects of the same kind can be found at:
  www.sans.org/y2k/051900.htm
  www.giac.org/practical/Rick_Yuen_GCIA.doc

www.giac.org/practical/REUBEN_RUBIO_GCIA.doc
www.sans.org/y2k/practical/Guy_Bruneau.doc

Defensive Recommendations:

GIAC University should carefully monitor this traffic and determine if this is authorized traffic for their network. If not, I would advise blocking it at the router and/or firewall for all IP addresses from this range for the unsolicited traffic. Part of this could be legitimate traffic. They should also ensure that all of their key network devices are patched to defend against this.

Detect:

SMB Name Wildcard: Occurrence = 28,533

Detect Description:

This detect is one that watches for NetBIOS traffic. You will see this alert on normal activities of Windows systems, especially when file sharing is enabled. This should be watched closely when it originates from an external network to an internal network as this is used as a preattack probe. There is some good information on this found at http://www.finchhaven.com/pages/incidents/030102_udp_137.html The majority of this traffic looks like normal NetBIOS traffic on Port 137. There are a couple of exceptions of traffic originating from outside GIAC University. These should be followed up on and flag the IPs for future activity. These are some of those that are from outside sources:

07/07-02:27:10.043732 203.218.7.171:3016 -> 10.0.82.2:137

```
inetnum:       203.218.0.0 - 203.218.255.255
netname:       NETVIGATOR
descr:         PCCW Limited
descr:         PO Box 9896 GPO Hong Kong
country:       HK
```

07/07-02:39:54.350922 202.99.232.194:33458 -> 10.0.184.238:137

```
inetnum:       202.99.224.0 - 202.99.255.255
netname:       CHINANET-NM
descr:         CHINANET Neimenggu province network
descr:         Data Communication Division
descr:         China Telecom
country:       CN
```

07/07-03:01:33.809627 216.78.248.247:137 -> 130.85.85.97:137

```
OrgName:     BellSouth.net Inc.
OrgID:       BELL
```

07/07-02:40:05.001892 209.158.44.22:137 -> 130.85.111.130:137

```
OrgName:     Integrity Total Systems, Inc.
OrgID:       ITS-36
```

07/07-02:40:17.744012 63.183.192.115:137 -> 130.85.111.130:137

```
OrgName:     Sprint
OrgID:       SPDN
```

07/07-03:02:55.564861 192.104.147.241:137 -> 130.85.157.250:137

```
OrgName: Aristotle University of Thessaloniki
OrgID:   AUT-1
Address: P.O.Box 888
         Thessaloniki, Macedonia GR 540 06 ,
Country: GR
```

Correlations:

- CERT® Vulnerability Note VN-2000-03 http://www.cert.org/vul_notes/VN-2000-03.html
- Other detects of the same kind can be found at:
  www.chrisgrout.com/data/chrisgrout_gcia.pdf
  www.giac.org/practical/Robert_Nine_GCIA.doc
  www.giac.org/practical/chris_kuethe_gcia.html

Defensive Recommendations:

GIAC University should block all incoming and outgoing NetBIOS traffic at the border router or firewall as it is not needed for the functionality of the network. Ensure all systems are locked down and patched appropriately.

Detect:

NIMDA - Attempt to execute cmd from campus host: Occurrence = 26,191

Detect Description:

NIMDA is a worm that propagates itself via email, web services and file sharing. The alert triggered on an internal host that was infected and trying to look for other IIS servers to infect. Instructions for removal can be found at CERT® Advisory CA-2001-26 Nimda Worm at URL http://www.cert.org/advisories/CA-2001-26.html . Here are the IP addresses found. These are compromised systems and need to be fixed.

07/06-00:16:34.142358 10.0.105.120:4044 -> 63.79.65.244:80
07/06-00:16:34.358029 10.0.117.27:3792 -> 0.71.160.76:80

Correlations:

- CERT® Advisory CA-2001-26 Nimda Worm http://www.cert.org/advisories/CA-2001-26.html
- Other detects of the same kind can be found at:
  www.giac.org/practical/Rick_Yuen_GCIA.doc
  www.giac.org/practical/Gregory_Lajon_GCIA.doc

Defensive Recommendations:

GIAC University should immediately patch all systems running IIS and ensure they configured correctly and securely. Some defense can be provided by using ingress filters and blocking traffic originating from outside the network. This may not be practical for the University. Egress filtering can be done on port 69, however this will impact TFTP. (http://www.cert.org/advisories/CA-2001-26.html) Neither of these filters can stop the propagation of the NIMDA totally since it propagates itself by many means. Firewalls that filter can block .eml extensions and help as well.

Detect:

spp_http_decode: IIS Unicode attack detected: Occurrence = 13,459

Detect Description:

This attack is carried out by passing Unicode to the IIS server in an attempt to gain access. There are also other false positives and can cause this alert. User's normal outbound traffic as well as Netscape can produce false positives. (http://www.snort.org/docs/faq.html#4.17) It is impossible to tell what all of these are with out knowing the network configuration and what is considered normal network traffic at the University to say what each of these are. We have Unicode alerts on both inbound and outbound traffic. Some of the traffic however appears to be Unicode scans and they are from internal hosts to external host:

07/06-00:38:58.458879 10.0.84.220:1923 -> 60.101.11.42:80
07/06-00:38:58.459721 10.0.84.220:1926 -> 129.236.112.105:80
07/06-00:38:58.461105 10.0.84.220:1928 -> 27.223.85.101:80
07/06-00:38:58.463307 10.0.84.220:1931 -> 188.124.219.11:80
07/06-00:38:58.464588 10.0.84.220:1930 -> 40.167.88.35:80
07/06-00:38:58.465887 10.0.84.220:1932 -> 147.122.173.183:80
07/06-00:38:58.468449 10.0.84.220:1934 -> 178.9.121.214:80
07/06-00:38:58.472294 10.0.84.220:1936 -> 93.21.24.206:80
07/06-00:38:58.473428 10.0.84.220:1935 -> 142.166.122.37:80
07/06-00:38:58.478384 10.0.84.220:1907 -> 97.76.188.70:80

Correlations:

- http://cve.mitre.org/cgi-bin/cvename.cgi?name=CVE-2000-0884
- http://cve.mitre.org/cgi-bin/cvename.cgi?name=CAN-2001-0709
- Other detects of the same kind can be found at:
  www.giac.org/practical/Jeff_Zahr_GCIA.doc
  www.giac.org/practical/Matthew_Fiddler_GCIA.doc
  www.sans.org/y2k/practical/Miika_Turkia_GCIA.html

Defensive Recommendations:

GIAC University should immediately patch all systems running IIS and ensure they configured correctly and securely. It is important to learn what normal network traffic is. This will aid in determining if it is a Unicode attack/scan or if it is normal network traffic.

Detect:

External RPC call: Occurrence = 11,429

Detect Description:

This attack is carried out by looking for a listening RPC port. Typically this is port 111. Portmapper is a well known service running at port 111 for both TCP and UDP connections. "However, security personnel should know that under some versions of Unix, and Solaris rpcbind not only listens on the TCP/UDP port 111, but it also listens on UDP ports greater than 32770."

(http://www.sans.org/newlook/resources/IDFAQ/blocking.htm) If the attacker is able to find a listening RPC port, then they may be able to determine the services running on that machine or even gain root access to make calls to those services. GIAC University was being actively scanned for port 111. Here is a list of the IP addresses, some were resolved to show who the IP belonged to, but not all of them.

07/07-06:15:08.834069 61.185.139.2:4767 -> 10.0.253.17:111

```
inetnum:       61.185.0.0 - 61.185.255.255
netname:       CHINANET-SN
descr:         CHINANET Shanxi(SN) province network
descr:         Data Communication Division
descr:         China Telecom
country:       CN
```

07/07-08:09:48.513611 212.45.32.75:2407 -> 10.0.1.2:111

```
inetnum:      212.45.32.0 - 212.45.44.255
netname:       SOLCON
descr:         Solcon Internetdiensten
country:       NL
```

07/07-11:30:09.190873 203.239.155.2:60117 -> 10.0.159.29:111

```
inetnum:      203.239.128.0 - 203.239.191.255
netname:       ELIMNET
descr:         Elimnet Co. LTD.
country:       KR
```

07/07-17:00:53.044927 210.119.9.16:2790 -> 10.0.28.3:111

```
inetnum:       210.116.0.0 - 210.123.255.255
netname:       KRNIC-KR
descr:         KRNIC
descr:         Korea Network Information Center
country:       KR
```

07/07-17:15:17.058009 195.117.179.12:2879 -> 10.0.111.21:111

```
inetnum:      195.117.179.0 - 195.117.179.255
netname:       PIRXNET-GLIWICE
descr:         PirxNet
descr:         Gliwice
country:       PL
```

07/07-20:06:28.273757 210.66.217.187:51361 -> 10.0.5.127:111
07/08-04:07:56.625483 210.117.174.62:45989 -> 10.0.6.62:111
07/08-12:01:15.373028 195.116.95.216:3320 -> 10.0.28.8:111
07/08-15:15:59.770334 210.119.58.4:47226 -> 10.0.28.3:111
07/08-21:00:00.638189 80.49.3.86:4783 -> 10.0.10.174:111
07/09-07:33:47.244785 202.172.46.43:3516 -> 10.0.15.178:111
07/09-08:30:22.397409 203.48.91.12:4190 -> 10.0.28.13:111
07/10-04:37:46.101755 217.128.79.111:1487 -> 10.0.157.254:111
07/10-09:16:21.442046 203.231.125.187:3556 -> 10.0.5.95:111
07/10-17:15:15.819605 211.118.11.219:3072 -> 10.0.80.69:111
07/10-22:22:24.912459 62.131.210.36:1123 -> 10.0.197.119:111

Correlations:

- ❖ Vulnerability Note VU#638099 http://www.kb.cert.org/vuls/id/638099
- ❖ CERT® Advisory CA-2000-17 Input Validation Problem in rpc.statd http://www.cert.org/advisories/CA-2000-17.html
- ❖ Other detects of the same kind can be found at: www.giac.org/practical/James_Conz_GCIA.doc www.giac.org/practical/dana_mclaughlin_gcia.doc

Defensive Recommendations:

GIAC University should immediately patch all systems running portmapper and RPCbind. If it is not being used, then port 111 should be blocked with the egress and ingress filters. Keep in mind; this will not eliminate the vulnerability in its entirety.

Detect:

Watchlist 000222 NET-NCFC: Occurrence = 9,210

Detect Description:

This watchlist is for the subnet 159.226.XXX.XXX and is registered to:

```
OrgName:    The Computer Network Center Chinese Academy of Sciences
OrgID:      CNCCAS
```

These were detected at GIAC University. Here is a list of the IP addresses and a list of possible activity.

- o Port 4230 is registered in IANA to VRML Multi User Systems which are "systems which support distributed virtual worlds in which objects can be shared by different users" (http://www.c-lab.de/vrml99/courses.html)

  07/06-00:29:41.411926 159.226.210.220:80 -> 10.0.84.220:4230
- o This was an interesting one. Port 4160 TCP/UDP is registered to Jini Discovery. Sun describes it in this fashion: "Jini technology provides a flexible infrastructure for delivering services in a network and for creating spontaneous interactions between clients that use these services regardless of their hardware or software implementations." (http://wwws.sun.com/software/jini/faqs/index.html#1)

  07/06-00:45:25.442036 159.226.119.3:80 -> 10.0.84.220:4160
- o Port 3785 is unassigned and no other information was available about what activity may be occurring.

  07/06-00:50:37.310954 159.226.67.196:80 -> 10.0.84.220:3785
- o Port 80 is http and as such it is difficult to know what was going on. These packets would require a closer look and monitoring. A connection from the outside to internal hosts on port 80 is not a good security practice.

  07/07-03:13:30.308645 159.226.100.51:3094 -> 10.0.252.23:80
  07/07-05:02:50.495320 159.226.49.157:19043 -> 10.0.111.140:80
  07/07-06:44:56.547291 159.226.47.236:1818 -> 10.0.198.199:80
  07/07-08:54:07.783066 159.226.221.122:4819 -> 10.0.146.97:80
  07/07-13:48:28.919806 159.226.217.11:64583 -> 10.0.179.80:80
  07/08-00:30:11.184703 159.226.4.142:1232 -> 10.0.111.140:80
  07/08-16:01:42.705235 159.226.110.142:2602 -> 10.0.158.2:80
  07/10-00:37:17.310790 159.226.39.251:64743 -> 10.0.111.140:80
  07/10-03:11:01.972951 159.226.165.70:3694 -> 10.0.111.140:80

07/10-05:01:39.776616 159.226.92.118:1408 -> 10.0.145.18:80
07/10-20:47:19.391527 159.226.100.203:3526 -> 10.0.139.230:80

- Port 25 is SMTP and is used for mail services. This could be spam or some other attack on an email system or a scan for an email system. It would require further investigation.
  07/10-10:35:14.215434 159.226.64.138:1662 -> 10.0.6.40:25

Correlations:

- Other detects of the same kind can be found at:
  www.giac.org/practical/Dennis_Davis_GCIA.doc
  www.stearns.org/doc/william_stearns_gcia.html

Defensive Recommendations:

GIAC University should carefully monitor this traffic and determine if this is authorized traffic for their network. If not, I would advise blocking it at the router and/or firewall for all IP addresses from this range for the unsolicited traffic. Part of this could be legitimate traffic. They should also ensure that all of their key network devices are patched to defend against this.

Detect:

UDP SRC and DST outside network: Occurrence = 7,531

Detect Description:

This detect is concerned with the source and destination IP address both being external sources. This should cause a concern that someone is spoofing that IP address or crafting packets or a system is participating in some malicious activity. I do not believe these are reconnaissance scans because they would not get a response back with a spoofed IP. What ever is going on, they do not care to get an answer in return. All of these should be followed up on to ensure malicious activity is not leaving the university network. Here are some of the packets and activity that it is associated with:

- This activity appears to be NetBIOS which is port 137. They could be trying different attacks on NetBIOS. There are several vulnerabilities.
  07/09-08:03:48.596811 192.168.5.2:137 -> 216.254.108.22:137
  Destination IP resolves to:

```
CustName:   RIO MOTOR SPORTS, INC
Address:    25 Broadway New York, NY 10004
Country:    US
```

- Port 53 is used for DNS (Domain Name Services). There are many known attacks against DNS. Ironically, this IP address is part of the private address space so I am unsure what would be gained from this.
  07/09-10:09:35.911263 169.254.236.55:137 -> 172.25.0.51:53
- At port 1900 resides SSDP (Simple services discover protocol) and this one seems pretty clear what is going on. The traffic is multicast and there is vulnerability in SSDP that takes advantage of the multicast traffic and can force a windows box into high CPU and memory utilization causing it to hang or forcing a reboot.

(http://security.ucdavis.edu/alerts/122101.html) "The DDoS exploit uses this same vulnerability, taking advantage of the broadcast and multicast nature of SSDP to direct an attack from multiple "devices" against a single victim or against a range of victims." (http://216.239.35.100/search?q=cache:b0k1llJGuEUC:online.securityfocus.com/infocus/1548+%22SSDP%22+vulnerability&hl=en&ie=UTF-8)

07/10-06:37:31.678812 192.52.179.46:1033 -> 239.255.255.250:1900

- VPJP (Virtual Place Java Port). I am unable to determine the exact nature of this port, but the name tends to describe the function it is used for.

  07/08-06:00:47.012233 130.207.15.163:1032 -> 229.55.150.208:1345

- Here is our multicast destination IP again. There is vulnerability for Novell clients with this particular port and SLP. Apparently when scanning a network with NMAP using a half open scan across port 427, it will instantly blue screen. (http://packetstormsecurity.nl/9901-exploits/novell-iwc-DoS.txt)

  07/10-11:31:37.953412 169.254.64.119:49289 -> 239.255.255.253:427

Correlations:

- DoS vulnerability in Novell Intranetware Client 3.0.0.0: http://packetstormsecurity.nl/9901-exploits/novell-iwc-DoS.txt
- Vulnerability Note VU#411059 (SSDP): http://www.kb.cert.org/vuls/id/411059
- winme-ssdp-dos (7318): http://www.iss.net/security_center/static/7318.php
- CERT® Incident Note IN-2001-03 (port 53, DNS): http://www.cert.org/incident_notes/IN-2001-03.html
- CERT® Vulnerability Note VN-2000-03(NetBIOS) http://www.cert.org/vul_notes/VN-2000-03.html
- Other detects of the same kind can be found at: www.giac.org/practical/Rick_Yuen_GCIA.doc www.giac.org/practical/Dennis_Davis_GCIA.doc

Defensive Recommendations:

GIAC University should install egress filters on their border router that drops all traffic not originating from the internal network with a source IP address of the internal network. Do not allow NetBIOS traffic to leave the internal network. If you are running your own DNS servers, you can ensure users use these and allow only the DNS server to traffic to leave the network. If not, you are just going to have to monitor the network. Ensure all of your network devices drop private address spaces and do not route them.

Detect:

TFTP - External UDP connection to internal tftp server: Occurrence = 7,135

Detect Description:

This detect is concerned with the source IP address being external sources. The TFTP traffic is coming from an IP address of the University and destined for an IP address that is a private address space. Also, it always to same four IP addresses listed below and to numerous ports at the destination IP address. It should be looked at for what is occurring here. Here are some of the packets and activity that it is associated with:

07/10-23:31:29.212986 10.0.111.230:69 -> 192.168.0.216:3320
07/10-23:31:29.215575 10.0.111.219:69 -> 192.168.0.216:3320
07/10-23:31:33.218013 10.0.111.231:69 -> 192.168.0.216:3320
07/10-23:31:33.218022 10.0.109.105:69 -> 192.168.0.216:3320

Correlations:

- CERT® Advisory CA-1991-18 Active Internet tftp Attacks: http://www.cert.org/advisories/CA-1991-18.html
- Alcatel ADSL modems grant unauthenticated TFTP access via Bounce Attacks: http://www.kb.cert.org/vuls/id/211736
- Microsoft IIS and PWS Extended Unicode Directory Traversal Vulnerability: http://216.239.35.100/search?q=cache:dWh3qkHmLhMC:online.securityfocus.com/bid/1806/exploit/+%22TFTP%22+vulnerabilities&hl=en&ie=UTF-8
- Other detects of the same kind can be found at:
  www.giac.org/practical/Matthew_Fiddler_GCIA.doc
  www.giac.org/practical/Mike_Poor_GCIA.doc
  www.giac.org/practical/Karim_Merabet_GCIA.doc

Defensive Recommendations:

GIAC University should carefully monitor the TFTP traffic and block it if necessary. It would be key to identify where the traffic is coming from within the University. There is an awful lot of TFTP traffic entering and leaving the University. They should also ensure that all of their primary systems such as switches, modems etc are protected by the recommendations of the vendor. Many more vulnerabilities can be found by doing a search on www.google.com

Detect:

High port 65535 udp - possible Red Worm - traffic: Occurrence = 4,334

Detect Description:

This detect is concerned with the source IP address being external sources. The TFTP traffic is coming from an IP address of the University and destined for an IP address that is a private address space. Also, it always to same four IP addresses listed below and to numerous ports at the destination IP address. It should be looked at for what is occurring here. Here are some of the packets and activity that it is associated with:

07/10-23:31:29.212986 10.0.111.230:69 -> 192.168.0.216:3320
07/10-23:31:29.215575 10.0.111.219:69 -> 192.168.0.216:3320
07/10-23:31:33.218013 10.0.111.231:69 -> 192.168.0.216:3320
07/10-23:31:33.218022 10.0.109.105:69 -> 192.168.0.216:3320

Correlations:

- Alcatel ADSL modems grant unauthenticated TFTP access via Bounce Attacks: http://www.kb.cert.org/vuls/id/211736
- Other detects of the same kind can be found at:
  www.giac.org/practical/Tyler_Schacht_GCIA.doc
  http://www.giac.org/practical/Christof_Voemel_GCIA.txt
  www.giac.org/practical/Karim_Merabet_GCIA.doc

www.giac.org/practical/Dan_Hawrylkiw_GCIA.doc

Defensive Recommendations:

GIAC University should carefully monitor the TFTP traffic and block it if necessary. It would be key to identify where the traffic is coming from within the University. There is an awful lot of TFTP traffic entering and leaving the University. They should also ensure that all of their primary systems such as switches, modems etc are protected by the recommendations of the vendor. Many more vulnerabilities can be found by doing a search on www.google.com

Detect:

spp_http_decode: CGI Null Byte attack detected: Occurrence = 3,152

Detect Description:

This detect is alerted by the SNORT rule looking for a null value in the http traffic. There are many cases of false positives that occur with this, however Martin Roesch created a patch for the http_decode processor to ensure what was being handed to it was valid and thus to eliminate some of the false positives. (http://archives.neohapsis.com/archives/snort/2001-03/0425.html) This traffic, for the alert, needs to be examined for null values and see if they are false positives or actual alerts. The ones listed appear to be normal web traffic resulting in a false positive.

07/10-20:34:30.804035 10.0.111.220:50595 -> 216.241.219.28:80

```
OrgName:    The Cobalt Group, Inc
OrgID:      THECOB
```

07/10-14:46:44.164834 10.0.137.35:4478 -> 199.104.95.15:80

```
OrgName:    Deseret News
OrgID:      DESERE-1
```

07/10-15:15:39.330715 10.0.163.125:1460 -> 128.167.120.48:80

```
OrgName:    Genuity
```

OrgID: GNTY

Correlations:

- http://archives.neohapsis.com/archives/snort/2001-03/0425.html
- http://cert.uni-stuttgart.de/archive/incidents/2001/12/msg00006.html
- Other detects of the same kind can be found at:
  www.giac.org/practical/Mike_Poor_GCIA.doc
  www.giac.org/practical/Karim_Merabet_GCIA.doc

Defensive Recommendations:

GIAC University should carefully monitor all web traffic closely for malicious activity. In this particular circumstance, they need to make sure SNORT has the latest patches to help eliminate the false positives.

Detect:

SYN-FIN scan!: Occurrence = 2,636

Detect Description:

This detect is alerted by having both the SYN and FIN flags set on TCP connections. The purpose is to get the packets passed some firewalls and IDSs. Most of these are done as part of OS fingerprinting and are very loud and noisy for most systems today. There are many different type of scanners that produce this combination. Here are the sources using SYN/FIN scans that are looking for port 21 which is an FTP port.

07/07-02:06:35.631184 62.153.209.202:21 -> 10.0.111.224:21

```
inetnum:        62.153.209.200 - 62.153.209.207
netname:        BERGKEMPER-NET
descr:          Ursula Bergkemper EDV-Engineering
country:        DE
```

07/07-02:17:55.221415 166.104.219.69:21 -> 10.0.88.114:21

```
OrgName:     Hanyang University
OrgID:       HANYAN
```

07/08-03:32:02.739547 211.171.149.164:21 -> 10.0.1.203:21

```
inetnum:        211.168.0.0 - 211.171.255.255
netname:        KRNIC-KR
descr:          KRNIC
descr:          Korea Network Information Center
country:        KR
```

Correlations:

- Symantec Norton Personal Firewall 2002 SYN/FIN scan issue: http://securityresponse.symantec.com/avcenter/security/Content/2002.05.16.html
- http://www.sans.org/PH2000/snort/SnortAle.txt
- Other detects of the same kind can be found at:
  www.giac.org/practical/Alex_Stephens_GCIA.htm
  www.giac.org/practical/chris_kuethe_gcia.html

Defensive Recommendations:

GIAC University needs to ensure that all systems are patched and to test their key network devices such as routers, firewalls and IDSs to see if they are allowing them to pass through. Symantec says "Although a Microsoft Windows 2000 computer can be detected through the SYN/FIN scan, Symantec Norton Personal Firewall 2002 continues to protect the computer from an actual intrusion by blocking connections to the computer."(http://securityresponse.symantec.com/avcenter/security/Content/2002.05.16.html) They did however come up with a patch. It is critical to test your security devices and know what is getting through!

Detect:

AFS - Off-campus activity: Occurrence = 2,096

Detect Description:

This detect appears to be looking for an AFS vulnerability. "By scanning port 7001 and sending malicious packets the attacker was able to crash AFS servers. Reports have shown that at least Solaris 5.6 and 5.7 machines and AIX 4.3.3 machines are affected." (https://lists.openafs.org/pipermail/openafs-info/2002-June/004784.html) If they are not attacking it, then it would be important to find out if someone has setup file sharing with

AFS on these boxes. There is also vulnerability on this port for BEA Weblogic's Proxy, however, I would not expect to see this many proxies on the University. Also, this not from Port 80, but port 7000 which is part of AFS. These are the IP addresses specifically targeted by all IP addresses in question. It is important to note they did not scan for these, but all went directly to them. They were known targets! Here is a partial list of IP addresses hitting these machines.

07/07-00:42:58.963654 63.250.205.49:7000 -> 10.0.99.207:7001
07/07-12:18:42.522629 63.250.205.17:7000 -> 10.0.152.167:7001
07/07-13:19:15.323416 63.250.219.185:7000 -> 10.0.152.174:7001
07/07-14:19:04.790704 63.250.219.187:7000 -> 10.0.152.172:7001
07/07-14:33:17.724876 63.250.205.39:7000 -> 10.0.152.169:7001
07/07-18:39:38.063368 63.250.205.42:7000 -> 10.0.53.55:7001
07/07-19:52:41.828299 63.250.205.35:7000 -> 10.0.53.40:7001

```
OrgName:    Yahoo! Broadcast Services, Inc.
```

OrgID: [YAHO]

07/07-13:04:38.847088 211.234.117.60:7000 -> 10.0.153.188:7001

```
inetnum:       211.232.0.0 - 211.255.255.255
netname:       KRNIC-KR
descr:         KRNIC
descr:         Korea Network Information Center
country:       KR
```

07/07-18:21:30.994826 61.177.56.226:7000 -> 10.0.153.161:7001

```
inetnum:       61.177.56.224 - 61.177.56.255
netname:       SUZHOU-JIBO-CORP-BB
descr:         Computer Integration Subsidiary
descr:         JinBo Communication Co. ltd.
descr:         Suzhou city
descr:         Jiangsu Province
```

country: CN

07/07-19:17:29.861807 202.101.235.110:7000 -> 10.0.153.161:7001

```
inetnum:       202.101.192.0 - 202.101.255.255
netname:       CHINANET-JX
descr:         CHINANET Jiangxi province network
descr:         Data Communication Division
descr:         China Telecom
country:       CN
```

Correlations:

- Fwd: [OpenAFS] Attacks against AFS lead to crashing machines: https://lists.openafs.org/pipermail/openafs-info/2002-June/004784.html
- Vulnerability Report for BEA Weblogic's Proxy: http:/security-archive.merton.ox.ac.uk/bugtraq-200008/0241.html
- Other detects of the same kind can be found at: www.sans.org/y2k/practical/David_Singer_GCIA.doc

Defensive Recommendations:

GIAC University needs to investigate this further, especially with the locations of the visitors from overseas countries. These IP address were known in advance and were specifically targeted. All target systems should be identified and checked for possible compromise. Appropriate steps should be taken to ensure they are patched properly and secured. If possible, block access from external sources on port 7001.

Detect:

beetle.ucs: Occurrence = 1,577

Detect Description:

This detect appears to be watching two machines at the University with a CD-R. (http://www.gl.umbc.edu/root/common.shtml) The following seems to be normal traffic to and from these two machines:

07/06-00:20:00.827483 10.0.70.69:841 -> 10.0.60.11:782
07/06-00:20:00.827837 10.0.60.11:782 -> 10.0.70.69:841

However, they have visitors as evident from below. The concern would be the external IP addresses were looking for data that had been stored for burning, but not yet taken off of the system. Also, malicious code could be placed on the machine and accidentally burned onto an unsuspecting individual's CDs. We see multiple ports from port 1433: Microsoft SQL, Port 80: HTTP, Port 21: FTP etc.

07/07-08:00:48.037443 206.168.112.119:4945 -> 10.0.70.69:1433
07/07-08:00:48.037617 10.0.70.69:1433 -> 206.168.112.119:4945

```
OrgName: NeTrack
OrgID:   NTRK
Address: PO BOX 17700 Boulder, CO 80308-0700
Country: US
```

07/07-09:03:51.466922 140.131.114.155:4953 -> 10.0.70.69:80
07/07-09:03:51.467204 10.0.70.69:80 -> 140.131.114.155:4953

```
OrgName: Ministry of Education Computer Center
OrgID:   MOEC
Address: 12th Floor No. 106
         Section 2, Ho-Ping East Road
         Taipei, Taiwan, ROC ,
Country: TW
```

07/07-18:27:45.562518 68.39.7.45:22 -> 10.0.70.69:22
07/07-18:27:45.566512 10.0.70.69:22 -> 68.39.7.45:22

```
OrgName: Comcast Cable Communications, Inc.
OrgID:   CMCS
Address: 3 Executive Campus
```

5th Floor Cherry Hill, NJ 08002

07/08-04:05:59.617258 80.140.10.148:4038 -> 10.0.70.69:21
07/08-04:05:59.617503 10.0.70.69:21 -> 80.140.10.148:4038
07/09-23:00:32.960886 62.253.226.1:3749 -> 10.0.70.69:80
07/09-23:00:32.961129 10.0.70.69:80 -> 62.253.226.1:3749

Correlations:

- http://www.gl.umbc.edu/root/common.shtml
- Other detects of the same kind can be found at:
  www.giac.org/practical/Jeff_Zahr_GCIA.doc
  www.giac.org/practical/Edward_Peck_GCIA.doc

Defensive Recommendations:

GIAC University needs to investigate this further, especially with the locations of the visitors from overseas countries. These IP address were known in advance and were specifically targeted. All target systems should be identified and checked for possible compromise. Appropriate steps should be taken to ensure they are patched properly and secured. If possible, block access from external sources on port 7001.

"Top Talkers for OOS and Scan logs"

In order to look at the OOS and the Scan logs in a logical manner with the other logs, the top 5 talkers from each were extracted and then searched for against the other logs to determine possible activity of that particular IP address. This will not take into account if the IP address was spoofed as there is no way to determine this from a big perspective.

OOS Logs Top Five Talkers

Here are the top five talkers for the OOS logs:

Source IP address	Number of Times Appearing
68.32.126.64	230
209.116.70.75	92
65.210.154.210	37
211.110.13.28	19
141.161.105.226	17

Here is a look at the flags for each of the top IP addresses and their destination IP

Source IP Address	Destination IP Address	Destination Port	Flags Set
68.32.126.64	10.0.6.7	110	21S*****
209.116.70.75	Multiple IPs	25	21S*****
65.210.154.210	10.0.111.198	4662	21S*****
211.110.13.28	Multiple IPs	21	**SF****
141.161.105.226	10.0.253.114	80	21S*****

We will look at each IP address and see what activity they appeared to be looking for and if there is any correlations with the other logs.

1. **68.32.126.64:** This was the top talker in the OOS logs and below is an example of the traffic:

```
07/10-13:52:58.741859 68.32.126.64:13369 -> 10.0.6.7:110
TCP TTL:47 TOS:0x0 ID:10510  DF
21S***** Seq: 0xC5B9F5DC   Ack: 0x0   Win: 0x16D0
TCP Options => MSS: 1460 SackOK TS: 39574738 0 EOL EOL EOL EOL
```

The IP address was not found in the other log files. They are hitting one IP address on Port 110 which is POP3 for mail. This scan started just shortly before 1400 and ended at 0004. The packets were sent anywhere from 1 to 15 minutes apart. This does not appear to be a SYN scan as they are only hitting one target; however this can be used as a DoS against another box. It is possible the attacker has identified the box as listening and is using it in an attack against another system. This would be determined by looking at network traffic to see the whole conversation and what is taking place. This is a smart port to use, as it is the mail port and denying access to it would not be feasible. As such, it is critical that the email server be locked down tight and patched accordingly.

2. **209.116.70.75:** This IP address is sending SYN packets to port 25, which is SMTP, on multiple destinations IPs. Here is a look at one of the packets.

07/10-13:53:40.732900 209.116.70.75:55580 -> 10.0.100.217:25
TCP TTL:51 TOS:0x0 ID:1257 DF
21S***** Seq: 0xD4120012 Ack: 0x0 Win: 0x16D0
TCP Options => MSS: 1460 SackOK TS: 757794043 0 EOL EOL EOL EOL

This IP address belonged to a busy individual and was found in the OOS, Scan and Alert Logs. Here is some of the activity found:

Alert Logs

323372: **07/07**-13:42:12.058561 [**] Queso fingerprint [**] 209.116.70.75:55136 -> 10.0.100.217:25
15609: **07/08-**01:37:53.731651 [**] Queso fingerprint [**] 209.116.70.75:59672 -> 10.0.100.217:25
00956: **07/09**-00:00:58.760429 [**] Queso fingerprint [**] 209.116.70.75:52267 -> 10.0.100.217:25
48160: **07/10**-03:16:56.301686 [**] Queso fingerprint [**] 209.116.70.75:36265 -> 10.0.100.217:25

Scan Logs

203953: **Jul 6** 01:38:02 209.116.70.75:42553 -> 10.0.100.217:25 SYN 12****S* RESERVEDBITS
1224390: **Jul 7** 09:02:10 209.116.70.75:51174 -> 10.0.6.40:25 SYN 12****S* RESERVEDBITS
972260: Jul 8 08:25:02 10.0.6.40:42051 -> 209.116.70.75:113 SYN ******S*
945038: **Jul 8** 08:30:25 209.116.70.75:36292 -> 10.0.100.217:25 SYN 12****S* RESERVEDBITS
576796: **Jul 9** 21:22:21 209.116.70.75:56773 -> 10.0.6.40:25 SYN 12****S* RESERVEDBITS
225607: **Jul 10** 03:18:08 209.116.70.75:37855 -> 10.0.100.217:25 SYN 12****S* RESERVEDBITS
1023310: Jul 9 22:31:04 10.0.6.40:46964 -> 209.116.70.75:113 SYN ******S*

It is interesting to note that 10.0.6.40 keeps responding with SYN packets to 209.116.70.75 on port 113. This could be because 10.0.6.40 is running an Ident Service or Auth service which listens on this port. If the attacker probes that box on FTP, HTTP, SMTP etc, the Ident services attempts to connect back to the target for some information. (http://www-h.eng.cam.ac.uk/help/jpmg/CUED_Probed_Me.html) However, Invisible Identd Deamon and Kazimas are two trojans who also listen on this port. It is important check this system for signs of possible compromise.

Apparently this individual doing the scanning was not concerned with noise, or was scanning from a spoofed IP and sniffing in the middle. As such, noise would not be an issue to them. The IP in question is from:

```
OrgName: Inflow
OrgID:   NFLO
Address: 1860 Lincoln Street, Suite 305 Denver, CO 80295
Country: US
```

This traffic needs to be examined further and checked for other possible signs of compromise.

3. **65.210.154.210**: This IP was only found in the OOS and appears to be the part of a file sharing group. Port 4662 is associated with Edonkey and can be found at http://www22.brinkster.com/edonkeyhq/faq.htm. The IP in question is from:

```
OrgName:  Massachusetts Institute of Technology
OrgID:    MIT-2
```

It appears that some files sharing is going on between GIAC University and MIT. If this is acceptable for GIAC University security policy, just monitor for usage to make sure nothing changes. If not, put an ingress filter on that blocks incoming port 4662 connections.

4. **211.110.13.28**: This IP was the only deviant from the SYN packets we were seeing. This attacker chose to use SYN/FIN scans. There were no other correlations between this IP address and the other logs. Using a SYN/FIN combination allows some packets to slide past firewalls and IDSs. See the above discussion on SYN/FIN scans in the Alert Analysis. This attacker is scanning for a listening FTP server on port 21. Here is where this IP originates from:

```
inetnum:       211.104.0.0 - 211.119.255.255
netname:       KRNIC-KR
descr:         KRNIC
descr:         Korea Network Information Center
country:       KR
```

5. **141.161.105.226**: This IP address was interested in port 80 and only one destination IP. It is difficult to determine what activity they were up to. There were no correlations for this IP address and the other Alert and Scan logs. You would need to look at the logs of the destination IP and see if they logged any malicious activity. Here is a look at one of the packets:

```
07/10-23:12:44.349531 141.161.105.226:43459 -> 10.0.253.114:80
TCP TTL:59 TOS:0x0 ID:8557  DF
21S***** Seq: 0x157A96C9   Ack: 0x0   Win: 0x16D0
TCP Options => MSS: 1460 SackOK TS: 9615268 0 EOL EOL EOL EOL
```

It is not something you can block (life can function without the Internet on a University Campus), but it is important to closely watch all traffic on port 80. Ensure the SNORT rules are kept up to date. If this is not a web server and this traffic is not to originate from external IP addresses, then put an ingress filter on to block traffic from outside to port 80 except for authorized web servers. This IP address is from:

```
OrgName:    Georgetown University
OrgID:      GEORGE-8
```

Scan Logs Top Five Talkers

Here are the top five talkers for the Scan logs. Notice that two of them are from the internal network.

Source IP address	Number of Times Appearing
211.171.149.164	2628
10.0.70.183	207
10.0.186.16	155
207.69.221.121	15
200.221.179.255	13

Scan Type	Number of packets passed
SYNFIN	2639
NULL	391

VECNA	24
INVALIDACK	21
NOACK	12

Source IP Address	Destination IP Address	Destination Port	Scan Type
211.171.149.164	Multiple IPs	21	SYN/FIN
10.0.70.183	Multiple IPs	Multiple Ports	Null
10.0.186.16	Multiple IPs	Multiple Ports	Null
207.69.221.121	Multiple IPs	21	**SF****
200.221.179.255	10.0.253.114	80	21S*****

1. **211.171.149.164**: This IP ran lots of noisy SYN/FIN scans against port 21. They hit all ranges of the MY.NET Subnet looking for a listening FTP server. This IP address showed up in both the Alert and Scan logs for 8 Jul 02. For more information on the SYN/FIN scan see the Alert section.

07/08-03:47:37.917714 [**] SYN-FIN scan! [**] 211.171.149.164:21 -> 10.0.185.48:21

2. **10.0.70.183**: This is an internal IP address and was very busy. It appeared in the following logs: alert.020707, alert.020708, alert.020709, alert.020710, scans.020706, scans.020707, scans.020708, scans.020709, and scans.020710. It was always hitting 10.0.1.4 on port 37 (which is another internal box and the time service) and 150.254.64.64 and on multiple ports. Here are what some of the packets look like:

07/07-08:03:14.064226 [**] Null scan! [**] 10.0.70.183:53974 -> 10.0.1.4:37
Jul 9 22:01:01 10.0.70.183:48121 -> 150.254.64.64:5825 UDP
Jul 9 22:01:02 10.0.70.183:33252 -> 150.254.64.64:6324 UDP
Jul 9 22:01:02 10.0.70.183:12037 -> 150.254.64.64:6920 UDP
Jul 9 22:01:03 10.0.70.183:32304 -> 150.254.64.64:7673 UDP

In addition to this on port 37 resides the time service. "Linux Time Bomb - The inetd running the TCP time services, daytime (port 13) and time (port 37) will crash if you send excessive SYN packets. Once inetd crashes, all other services running through inetd no longer will work." (http://www.attrition.org/security/denial/w/den-list.dos.html) It could also be that this is legitimate network traffic from looking at the time stamps. GIAC University needs to determine if this is indeed a time server. This also identified as a null scan, meaning there were no flags set. In this case, a listening port will always reply with a reset. (RFC 793)
As for the UDP traffic to 150.254.64.64, this could be anything. It always hits the same IP address and on random ports. It could be checking which ports are responding? The address alone leaves one to wonder what is going on. Here is the address information for the destination IP address:

inetnum: `150.254.64.0 - 150.254.64.255`

```
netname:      POZMAN-EDU-150-254-064-000-24
descr:        Address space for Adam Mickiewicz Univercity
country:      PL
```

GIAC University needs to look farther into this one and see what is going on.

3. **10.0.186.16:** This internal IP address is hitting multiple internal hosts on many different ports. It is recorded as a null scan, meaning that no flags were set and open ports should respond with a reset as we stated above. All of these scan were done from port 23 on the source host. Port 23 is where you would find telnet. It appears that someone compromised this box and logged onto it through a telnet session. From there, they proceeded to scan the internal network. If the box wasn't compromised, then the owner of the box needs to be found and determine what was being scanned for. Here is an example of part of the scan:

07/08-07:50:04.704616 [**] Null scan! [**] 10.0.186.16:23 -> 10.0.177.55:1260

This IP address was found in the following logs: alert.020708, alert.020709, alert.020710, scans.020708, scans.020709 and scans.020710.

4. **207.69.221.121**: This IP address certainly was creative. The first time it appeared was in alert.020709 log and it appeared to be a null scan from port 0 to port 0. Here is one of the packets:

07/09-19:46:45.625135 [**] Null scan! [**] 207.69.221.121:0 -> 10.0.115.236:0

However, this was not all that was going on. In the scans.020709 log, we find the following recorded:

```
Jul  9 19:46:46 207.69.221.121:0 -> 10.0.115.236:0 NULL ********
Jul  9 19:46:50 207.69.221.121:1929 -> 10.0.115.236:3796 INVALIDACK 12UAP*SF RESERVEDBITS
Jul  9 19:47:04 207.69.221.121:53545 -> 10.0.115.236:3487 UNKNOWN 12*A**** RESERVEDBITS
Jul  9 19:47:04 207.69.221.121:18244 -> 10.0.115.236:14433 NOACK *2**PRS* RESERVEDBITS
Jul  9 19:47:04 207.69.221.121:0 -> 10.0.115.236:0 NULL ********
Jul  9 19:47:04 207.69.221.121:1344 -> 10.0.115.236:11842 FULLXMAS 12UAPRSF RESERVEDBITS
Jul  9 19:47:14 207.69.221.121:0 -> 10.0.115.236:0 NULL ********
Jul  9 19:48:43 207.69.221.121:28005 -> 10.0.115.236:25721 NOACK *2U*PRS* RESERVEDBITS
Jul  9 19:48:43 207.69.221.121:978 -> 10.0.115.236:943 NOACK *2U***S* RESERVEDBITS
Jul  9 19:48:43 207.69.221.121:0 -> 10.0.115.236:0 NULL ********
Jul  9 19:49:07 207.69.221.121:53545 -> 10.0.115.236:3487 VECNA 1*U****F RESERVEDBITS
Jul  9 19:49:07 207.69.221.121:40560 -> 10.0.115.236:18070 VECNA ****P**F
Jul  9 19:49:07 207.69.221.121:0 -> 10.0.115.236:0 NULL ********
Jul  9 19:49:07 207.69.221.121:19499 -> 10.0.115.236:27 VECNA 12U*P*** RESERVEDBITS
Jul  9 19:49:21 207.69.221.121:0 -> 10.0.115.236:0 NULL ********
```

Here is the IP information on 207.69.221.121:

```
OrgName: EarthLink, Inc.
OrgID:   ERMS
```

Address: 3100 New York Drive Pasadena, CA 91107

The destination IP was always 10.0.115.236. This attacker was certainly interested in this host and tried several combinations of flags against it. Also, notice the null scans are from port 0 to port 0. I am unsure what tool caused the scan. I cannot find one that duplicates this pattern. GIAC University should look at the destination IP and ensure it has not been compromised and what for future traffic.

5. **200.221.179.255**: This IP address was alternating between two different hosts. There was one SYN packet and the rest had the Push flag set. It was always to port 1214 and the source port was 1988 for 10.0.150.133 and port 1938 for 10.0.150.220. The following is a look at the traffic:

Jul 6 12:06:16 200.221.179.255:1988 -> 10.0.150.133:1214 SYN ******S*
Jul 6 12:06:17 200.221.179.255:1938 -> 10.0.150.220:1214 VECNA ****P**
Jul 6 12:07:21 200.221.179.255:1938 -> 130.85.150.220:1214 VECNA ****P***
Jul 6 12:07:28 200.221.179.255:1988 -> 130.85.150.133:1214 VECNA ****P***

Port 1214 is used for Kazaa Lite and may be nothing more looking for someone running Kazaa. However, it would be interesting to know what was in the payload on the packets with the Push flag set. The IP address is registered to:

```
owner:       Comite Gestor da Internet no Brasil
ownerid:     BR-CGIN-LACNIC
responsible: Frederico A C Neves
address:     Av. das Nações Unidas, 11541, 7° andar
address:     04578-000 - São Paulo - SP
country:     BR
```

GIAC University needs to look further at this one. If Kazaa is not allowed by their security policy, block it with an ingress filter.

External Source Addresses

The IP addresses chosen to lookup for those that participated in what could be Trojan activity or one that appears to have a system compromised. Here are the IP addresses with the top talker of each alert being looked up.

1. 211.161.112.18: SubSeven

Query the APNIC Whois Database

```
% [whois.apnic.net node-1]
% How to use this server        http://www.apnic.net/db/
% Whois data copyright terms
http://www.apnic.net/db/dbcopyright.html
inetnum:       211.152.0.0 - 211.163.255.255
netname:       CNNIC
descr:         No.4, Zhongguancun No.4 South Street,
descr:         Haidian District, Beijing
descr:         P.O.Box: No.6 Branch-box of No.349 Mailbox, Beijing
country:       CN
admin-c:       MW1-AP
tech-c:        IPAS1-AP
mnt-by:        APNIC-HM
mnt-lower:     MAINT-CNNIC-AP
changed:       hostmaster@apnic.net 20000627
status:        ALLOCATED PORTABLE
source:        APNIC
role:          CNNIC IPAS CONFEDERATION
address:       No.4, Zhongguancun No.4 South Street, Haidian District,
Beijing
country:       CN
phone:         +86-10-62553604
fax-no:        +86-10-62559892
e-mail:        ipas@cnnic.net.cn
admin-c:       LW152-AP
tech-c:        LY220-AP
nic-hdl:       IPAS1-AP
mnt-by:        MAINT-CNNIC-AP
changed:       ipas@cnnic.net.cn 20020910
```

```
source:       APNIC
person:       Mao Wei
address:      China Internet Information Center(CNNIC)No. 4 of South
street ,Zhongguancun,Haidian District
address:      Beijing,100080
address:      P.R.China
country:      CN
phone:        +86-10-62619750
fax-no:       +86-10-62559892
e-mail:       mao@cnnic.net.cn
nic-hdl:      MW1-AP
mnt-by:       MAINT-CNNIC-AP
changed:      IPAS@CNNIC.NET.CN 20010319
source:       APNIC
```

2. 67.201.32.129: Backdoor NetMetro:

Output from ARIN Whois

```
OrgName:    UUNET Technologies, Inc.
OrgID:      UUDA

NetRange:   67.192.0.0 - 67.255.255.255
CIDR:       67.192.0.0/10
NetName:    UUNET01DU
NetHandle:  NET-67-192-0-0-1
Parent:     NET-67-0-0-0-0
NetType:    Direct Allocation
NameServer: DIALDNS1.UU.NET
NameServer: DIALDNS2.UU.NET
Comment:    ADDRESSES WITHIN THIS BLOCK ARE NON-PORTABLE
RegDate:    2001-09-13
Updated:    2002-03-25

TechHandle: OA12-ARIN
TechName:   UUNet, Technologies
TechPhone:  +1-800-900-0241
TechEmail:  help@uu.net

OrgAbuseHandle: ABUSE3-ARIN
OrgAbuseName:   abuse
OrgAbusePhone:  +1-800-900-0241
OrgAbuseEmail:  abuse-mail@wcom.com

OrgNOCHandle: NAG-ARIN
OrgNOCName:   GridNet International, Net
OrgNOCPhone:  +1-800-998-5520
OrgNOCEmail:  netadmin@ao.wcom.net

OrgTechHandle: NAG-ARIN
OrgTechName:   GridNet International, Net
OrgTechPhone:  +1-800-998-5520
OrgTechEmail:  netadmin@ao.wcom.net

# ARIN Whois database, last updated 2002-09-18 19:05
# Enter ? for additional hints on searching ARIN's Whois database.
```

3. 207.38.1.201: EXPLOIT x86 stealth noop

Output from ARIN Whois

Search results for: ! NET-207-38-0-0-2

```
OrgName:    GameSpy Industries
OrgID:      GAMESP-3

NetRange:   207.38.0.0 - 207.38.1.255
CIDR:       207.38.0.0/23
NetName:    ICI-GAMESPY-1
NetHandle:  NET-207-38-0-0-2
Parent:     NET-207-38-0-0-1
NetType:    Reassigned
NameServer: NS3.INTELENET.NET
NameServer: NS4.INTELENET.NET
NameServer: NS.GAMESPY.COM
NameServer: NS2.GAMESPY.COM
NameServer: NS3.GAMESPY.COM
Comment:
RegDate:    2002-04-11
Updated:    2002-04-11

TechHandle: SB1687-ARIN
TechName:   Berrigan, Stephen
TechPhone:  +1-949-798-4200
TechEmail:  admin@gamespy.com

# ARIN Whois database, last updated 2002-09-18 19:05
# Enter ? for additional hints on searching ARIN's Whois database.
```

4. 195.130.152.11: FTP DoS FTPd globbing

Query the Ripe Whois Database

```
inetnum:       195.130.150.0 - 195.130.159.255
netname:        TELENET
descr:          Telenet Operaties N.V.
country:        BE
admin-c:        PS396-RIPE
tech-c:         PS396-RIPE
status:         ASSIGNED PA
mnt-by:         TELENET-DBM
mnt-lower:      TELENET-DBM
changed:        tech@telenet-ops.be 20010315
source:         RIPE
route:         195.130.128.0/19
descr:          TELENET
origin:         AS6848
mnt-by:         TELENET-OPS-MNT
changed:        tech@telenet-ops.be 20010523
source:         RIPE
role:          Technical Internet
address:        Telenet Operaties N.V.
address:        Liersesteenweg 4
address:        B-2800 Mechelen
```

```
address:       Belgium
e-mail:        tech@telenet-ops.be
trouble:       IMPORTANT: To report intrusion attempts, hacking,
trouble:       IMPORTANT: spamming, or other unaccepted behavior
trouble:       IMPORTANT: by a Telenet/Pandora customer, please
trouble:       IMPORTANT: send a message to abuse@pandora.be
trouble:       IMPORTANT: Voor het rapporteren van inbraakpogingen,
trouble:       IMPORTANT: hacking, spamming, of ander onaanvaardbaar
trouble:       IMPORTANT: gedrag van een Telenet/Pandora klant,
gelieve
trouble:       IMPORTANT: een bericht te zenden naar abuse@pandora.be
admin-c:       TI346-ORG
tech-c:        TI346-ORG
nic-hdl:       PS396-RIPE
mnt-by:        TELENET-DBM
changed:       tech@telenet-ops.be 20000630
source:        RIPE
```

- **Bold: Object type.**
- Underlined: Primary key(s).
- Hyperlinks: Searchable Attributes.

3 records found for '195.130.152.11'

5. 202.166.2.62: SMB C access

Query the APNIC Whois Database

```
% [whois.apnic.net node-2]
% How to use this server        http://www.apnic.net/db/
% Whois data copyright terms
http://www.apnic.net/db/dbcopyright.html
inetnum:      202.166.0.0 - 202.166.31.255
netname:      MAGIX
descr:        Magix Broadband Network
descr:        Singapore Telecommunications LTD
country:      SG
admin-c:      MH213-AP
tech-c:       MH213-AP
mnt-by:       APNIC-HM
mnt-lower:    MAINT-SG-MAGIX
changed:      hostmaster@apnic.net 19981103
changed:      hostmaster@apnic.net 20010117
changed:      hostmaster@apnic.net 20011029
status:       ALLOCATED PORTABLE
source:       APNIC
person:       Magix Hostmaster
address:      Singapore Telecommunications Ltd.
address:      10 Eunos Road 8
address:      Singapore Post Centre
address:      #13-03
address:      Singapore, 408600
country:      SG
phone:        +65-6-848-4052
fax-no:       +65-6-848-4052
e-mail:       hostmaster@magix.com.sg
nic-hdl:      MH213-AP
remarks:      Spam and Security Issues: abuse@magix.com.sg
remarks:      Network Issues          : noc@magix.com.sg
notify:       hostmaster@magix.com.sg
mnt-by:       MAINT-SG-MAGIX
changed:      raymondh@singtel.com 20011111
source:       APNIC
```

- **Bold: Object type.**
- Underlined: Primary key(s).
- Hyperlinks: Searchable Attributes.

2 records found for '202.166.2.62'

Machines to investigate further

There are several machines which are in need of further investigation. These machines are listed below by IP address and why they should be looked at for possible worm, Trojan, or suspicious activity. It is important that these machines are looked at immediately and steps taken to fix any issues that may exist.

1. Back Orifice: A backdoor Trojan giving access to your system. These IP addresses participated in both sides of a conversation:

10.0.253.124	10.0.6.50	10.0.6.52	10.0.6.53	10.0.6.62
10.0.60.10	10.0.99.120			

2. Possible Trojan server activity: Once again we have possible Trojan activity and these IP addresses were actively communicating outside of our network:

10.0.111.140	10.0.111.21	10.0.111.41
10.0.6.40	10.0.70.231	10.0.158.24

3. Nimda: Nimda is a worm that was discussed in the alerts analysis above. Appropriate steps need to be taken to ensure the system is cleaned correctly. Here are the IP addresses:

10.0.105.120	10.0.117.27

4. Possible Red Worm traffic: Red worm traffic is detected from the following IP addresses. They need to be followed up on and cleaned if necessary.

10.0.8.8	10.0.5.74	10.0.6.40
10.0.1.15	10.0.85.97	

5. Suspicious Traffic: This traffic triggered and alert and the IP addresses below need to be checked for possible system compromise.

10.0.162.90	10.0.158.53

6. Possible My Party infection: This is a virus that needs to be cleaned from the infected system:

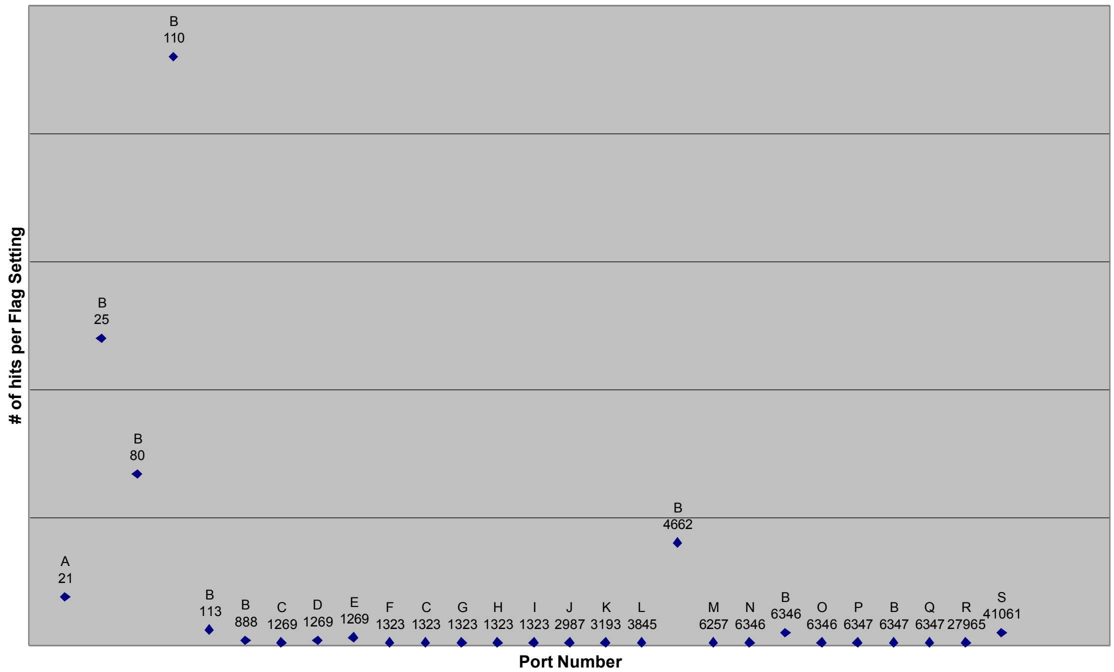
130.85.109.47

Link Graph

The following is a link graph looking at the OOS logs. The logs were totaled and then graphed on the Y axis by number of hits and the X axis by port and flag setting. This was a little difficult so I had to turn off the values on the Y axis or you could not see the data due to the outliers. The graphed value has a letter which corresponds to the flags used and a number which corresponds to the port. By this we are able to see several things:

1. The destination ports our attackers were interested in.
2. An idea of which were the most popular destination ports.
3. The different flag combinations in use and which ones were most used.

OOS Flags



Flag Legend

A=**SF****	B=21S*****	C=*1SF****	D=21**R**U	E=21**RP*U
F=**SF***U	G=2*SF*PAU	H=21**RPA*	I=21S**P**	J=2*SFR**U
K=21**R***	L=*1SFR**U	M=2*SFRPA*	N=21*F***U	O=21SF**AU
P=21*FR***	Q=21SFR**U	R=2*SFR*A*	S=2*SF***U	

Description of the Analysis Process

The analysis process took a little while to figure out how to accomplish. The track did an excellent job of how to do the analysis, but not how to model the data in a usable form and the tools available. Many of the tools were UNIX oriented and I am on a Windows platform. Never having used any of these before, it took experimenting with many different ones to find the right tools. Here are the tools used and how they were used.

- ✓ SnortSnarf: Used to analyze the alert files against the current Snort rule set and summarize them into a web based output. This sounded easy until I had to run it on windows. I soon found there were not clear cut directions on how to do this and finally accomplished it through trial and error. First you need to put the include directory's contents into the perl\site\lib folder. Then you need to ensure that the snort_snarf.pl is there as well. The time modules folder had to be placed in the folder into the same directory. You do not have to compile them under windows to make them work. You also have to use a program to get rid of the MY.NET for the IP address or it dies when running it. I chose WinGrep for this. It was fast. Do not use Notepad it takes a LONG time. I also found that

SnortSnarf is a memory and resource hog. It took a long time to process the logs and kept dying for lack of memory and I have 512 MB in my system. I finally moved it to a system at work with a 1 GB of memory and it did four of the five days well. The fifth day is still working right now. I am leaving it just to see how long it takes. The output is very useful and friendly. I mainly compared it with my other output. SnortSnarf did not become the primary tool as I had anticipated.

- ✓ Snort_Sort: Breaks the alerts down into a web based output. Lists the alerts and those packets that generated them. I found that this tool was easy to use and was not as resource intensive. I concatenated my logs together by using the command at the command line:

  Copy file1+file2+file3+file4+file5 allfiles

  This gave me a concatenated list which I then passed to Snort_Sort for processing. It also gives you the ability to pass it a rule set which I told it to process the results against the latest Snort rules. It did create a big html file, which by the way you have to redirect the output to a file in order to see it.
- ✓ WinGrep: Used to generate the OOS logs into a format that could be exported into excel and to replace MY.NET with 10.0. Also used to look for certain pieces of information within the files. This was very useful for the OOS files so that they could be imported into excel. I found I had to do it by line of the packet and then export that to a .txt file and then import it into excel. Not too graceful, but it worked.
- ✓ CSV.pl: Converts the alert file into a CSV format. (From Tod Beardsley's practical found at http://www.giac.org/GCIA.php). This did exactly what it says very efficiently.
- ✓ Summarize.pl: Summarizes the data from generated from the CSV.pl into a summary looking at different aspects of the data. (From Tod Beardsley's practical found at http://www.giac.org/GCIA.php). I did this, however it was not as useful as I had hoped it would be and I ended up just referencing the data on some of it.
- ✓ Alertcount.pl: Used to total the alerts. Used to compare against the snort_snarf output, since snort_snarf would not process a concatenated file of all of the logs due to a lack of memory. (From Chris Kuethe's practical found at http://www.giac.org/GCIA.php). This worked great. All I did was combine the results into a spreadsheet and I had a great picture of the alerts.
- ✓ Scanalyze.pl: Used to process the scan logs (with the flag set not to exclude anything) into a usable format this is then passed to scancount. (From Chris Kuethe's practical found at http://www.giac.org/GCIA.php) Worked great and was easy to use.
- ✓ Scancount.pl: Used to total up the scans of the different scan types found in the Scan logs. (From Chris Kuethe's practical found at http://www.giac.org/GCIA.php) This gave me a good overview of the scans and their types. I combined all the results into an excel spreadsheet.
- ✓ Excel.exe: Used to organize the OOS logs and aspects of the scan logs into a more usable format.

Once I had my data processed I chose to analyze it as a whole so that I didn't miss anything between the days. I looked at the five days together for each log type and analyzed the alerts based on their numbers. I chose to look at the ones with the highest totals. I wanted to look at the scan logs and OOS logs, but not in a vacuum. So I chose the five top talkers in each and passed each IP address individually to WinGrep and had it search each of the log files for its occurrence. The results for each IP address were then combined into one file and saved by the IP address as a .txt. You now had all of that IP address's activity in one file from all three types of logs. This way, you could see if these outliers played a part in the alerts whether as a prescan or active in the alert itself.

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