

## **Global Information Assurance Certification Paper**

## Copyright SANS Institute Author Retains Full Rights

This paper is taken from the GIAC directory of certified professionals. Reposting is not permited without express written permission.

## Interested in learning more?

Check out the list of upcoming events offering "Network Monitoring and Threat Detection In-Depth (Security 503)" at http://www.giac.org/registration/gcia \*\*\* Northcutt, some good stuff here, check out three, but I found it really hard to read the formatting and thus the points deduction. Good use of an analysis process. Variety of sources, home field advantage, and it shows. With 10 you need to show how the attacker is mapping with spoofed addresses. 72 \*\*\*

name: Charles Mitchell

Log format: date/time: machine/facility: rule: action:interface:protocol: src ip/port: dst ip/port: length:TOS: IP ID: IP Flags: TTL: rule# Mar 4 16:45:46 fw kernel: Packet log: input REJECT eth3 PROTO=17 192.168.1.51:9999 10.0.0.114:53 L=70 S=0x00 I=44736 F=0x0000 T=25 (#100)Mar 4 16:46:08 fw kernel: Packet log: input REJECT eth3 PROTO=17 192.168.1.51:9999 10.0.0.114:53 L=70 S=0x00 I=44737 F=0x0000 T=25 (#100)Mar 4 16:48:26 fw kernel: Packet log: input REJECT eth3 PROTO=17 192.168.1.51:9999 10.0.0.114:53 L=70 S=0x00 I=44544 F=0x0000 T=25 (#100)Mar 4 16:55:40 fw kernel: Packet log: input REJECT eth3 PROTO=17 192.168.1.51:9999 10.0.0.115:53 L=70 S=0x00 I=44992 F=0x0000 T=25 (#100)Mar 4 16:55:42 fw kernel: Packet log: input REJECT eth3 PROTO=17 192.168.1.51:9999 10.0.0.116:53 L=70 S=0x00 I=45057 F=0x0000 T=25 (#100)Mar 4 16:55:52 fw kernel: Packet log: input REJECT eth3 PROTO=17 192.168.1.51:9999 10.0.0.115:53 L=70 S=0x00 I=44800 F=0x0000 T=25 (#100)Mar 4 16:56:11 fw kernel: Packet log: input REJECT eth3 PROTO=17 192.168.1.51:9999 10.0.0.114:53 L=70 S=0x00 I=44544 F=0x0000 T=25 (#100)

Mar 4 16:58:40 fw kernel: Packet log: input REJECT eth3 PROTO=17 192.168.1.51:9999 10.0.0.115:53 L=70 S=0x00 I=44800 F=0x0000 T=25 (#100)Mar 4 17:08:03 fw kernel: Packet log: input REJECT eth3 PROTO=17 192.168.1.51:9999 10.0.0.116:53 L=70 S=0x00 I=45057 F=0x0000 T=25 (#100)This sequence repeats after a  $\sim 7:30$  pause for one hour 30 minutes. Notables: \* The IP ID used the same numbers in each repetition of the sequence. \* The packet size was always the same. Payload unknown. \* Each live machine on our network received packets during each repetition. \* The source port was the same in every repetition. \* Approx. 8 packets in each repetition. Summary: This detect comes from the packet filter logs on our firewall. Its pattern stands out clearly from simply grepping the logs. An nslookup on the source IP gives machine51.somewhere.tld. which seems to indicate a lab type machine probably with little supervision. A nice place to do network mapping from and ship the results 'home'. Technique: Poor Perhaps they are just learning to use their new tool? One scan would have been interresting, but repeating it for an hour and a half is foolish. Intent: Information gathering. They are trying to locate (and possibly determine version) DNS servers at each IP. Severity: Low. All the packets were dropped by the firewall. DNS is not accessible from the outside.

Conclusion: Network mapping that has no consequence on our network. No action needed. 1111111111111111 Log format: date/time: machine/facility: rule: action:interface:protocol: dst ip/port: length:TOS: IP ID: IP src ip/port: Flags: TTL: rule# Apr 1 20:51:25 fw kernel: Packet log: input REJECT eth3 PROTO=6 192.168.1.93:51 10.0.0.114:110 L=40 S=0x00 I=53798 F=0x0000 T=53 SYN (#73) Apr 1 20:51:25 fw kernel: Packet log: input REJECT eth3 PROTO=6 192.168.1.93:51 10.0.0.114:2000 L=40 S=0x00 I=3285 F=0x0000 T=53 SYN (#87) Apr 1 20:51:27 fw kernel: Packet log: input REJECT eth3 PROTO=6 192.168.1.93:51 10.0.0.114:2049 L=40 S=0x00 I=49912 F=0x0000 T=53 SYN (#89) Apr 1 20:51:35 fw kernel: Packet log: input REJECT eth3 PROTO=6 192.168.1.93:51 10.0.0.114:111 L=40 S=0x00 I=21697 F=0x0000 T=53 SYN (#85) Apr 1 20:51:44 fw kernel: Packet log: input REJECT eth3 PROTO=6 192.168.1.93:51 10.0.0.114:37 L=40 S=0x00 I=23787 F=0x0000 T=53 SYN (#67) Apr 1 20:51:54 fw kernel: Packet log: input REJECT eth3 PROTO=6 192.168.1.93:51 10.0.0.114:525 L=40 S=0x00 I=35691 F=0x0000 T=53 SYN (#82) Apr 1 20:51:56 fw kernel: Packet log: input REJECT eth3 PROTO=6 192.168.1.93:51 10.0.0.114:515 L=40 S=0x00 I=54522 F=0x0000 T=53 SYN (#80) Notables: \* Source port is the same for each packet. \* All the destination ports are 'interresting'.

\* The size is the same for each packet. \* all packets arrived in quick succession. \* tcpd and other services didn't see anything indication a SYN stealth scan. \* Test runs of nmap show 40 as the default packet size for a SYN stealth scan. Summary: This detect is from the log files on our firewall. Testing with nmap shows identical results for the SYN scan when lack of tcpd logging is taken into account. Nslookup for the source gives a numbered machine at a large local university. Technique: Fair. They thought far enough to use a 'stealth' SYN scan. Intent: Host service mapping. Severity: Low. Currently no important services live on machines accessible to the public. Services that are accessible are completely isolated from our internal network. Conclusion: Higher education at work. No further action needed. 333333 Log format: date/time: \_\_\_\_ machine/facility: rule: action:interface:protocol: src ip/port: dst ip/port: length:TOS: IP ID: IP Flags: TTL: rule# Mar 28 21:00:38 fw kernel: Packet log: input REJECT eth3 PROTO=17 192.168.1.80:3 10.0.0.114:111 L=28 S=0x00 I=13888 F=0x0000 T=37 (#86) Mar 28 21:00:38 fw kernel: Packet log: input REJECT eth3 PROTO=17

192.168.1.80:3 10.0.0.115:111 L=28 S=0x00 I=40419 F=0x0000 T=37 (#86) Mar 28 21:00:39 fw kernel: Packet log: input REJECT eth3 PROTO=17 192.168.1.80:3 10.0.0.116:111 L=28 S=0x00 I=9586 F=0x0000 T=37 (#86) Notables: \* Each IP is touched exactly once. \* Source port remains constant. \* Timing is very quick. Summary: This detect comes from the logs on our firewall. This scan touched every exposed IP on our network exactly once. Nslookup on the source IP shows that this system is a numbered system from the residence halls of a local university. Technique: Fair. This one keeps a low profile by keeping traffic volume low. The scan is very focussed. Intent: Network mapping for a specific service, RPC. Severity: Medium. This attacker has a very specific target service. Any hits are almost certain to be followed by an exploit. Conclusion: There are no machines on our network that are accessible by the public that run any kind of RPC. The scan does not effect our network, no further action needed. 333333 4444444444 Log format: date/time: machine/facility: UID : EUID : process name : PID

Dec 21 04:40:40 merlin kernel: Security: return onto stack running as UID 0, EUID 0, process named:67 Summary: This is syslog output from Solar Designer's nonexecutable stack patch to prevent some types of buffer busting. The source is my main home network server which has some ports visible to the public through the firewall. The attack causes the named process to dump core and die, but a watchdog on this system brings it back at most 60 seconds later. Unfortunately no data was collected on the source of the attack. Technique: Fair. When it didn't work the attacker should have gone away. Instead they tried once more after the watchdog brought named back up. Intent: To take control of my system. Severity: High. The attacker knows (at least some of) the services that are running on my network. He also has exploits prepared to attack any weeknesses found. Up to this point he remained undetected by not scanning all ports on my firewall. Apparently only ports open to the public were scanned. Conclusion: This was very nearly a successful attack. Thank you Solar. Further action was to upgrade to that latest BIND distribution and also to the latest version of all the other publicly accessible services.

55555555 Log format: date/time: source IP: command:args: result: 192.168.1.28 - - [07/Feb/1999:23:04:22 -0500] "GET /cgibin/phf" 404 -192.168.1.28 - - [07/Feb/1999:23:04:23 -0500] "GET /cgibin/test-cgi" 200 407 192.168.1.28 - - [07/Feb/1999:23:04:23 -0500] "GET /cqibin/handler" 404 -Log format: date/time: status: source IP: message: [Sun Feb 7 23:04:22 1999] [error] [client 192.168.1.28] script not found or unable to stat: /var/lib/apache/share/cgi-bin/phf [Sun Feb 7 23:04:23 1999] [error] [client 192.168.1.28] script not found or unable to stat: /var/lib/apache/share/cgi-bin/handler Notables: \* phf and handler failed. \* test-cgi succeeded as shown in the second log. Summary: This detect if from the access logs (first block) and error logs (second block) of my home network. The attack was detected by activity lights on the modem while I was reading a book. I was curious about who was checking me out, so I looked at the logs. I was, by luck, able to respond to the attack in near real time. The attacker did gather some information about my system. The source of this attack resolved to a dynamic IP from an ISP dialup bank. Technique: Fair. This attack would have gone un-noticed for perhaps weeks

had I not been curious. That would have been plenty of time to run crack had phf worked. Intent: Host information gathering and ultimately exploit. Severity: Medium. I was running up to date enough to have phf turned off. They did, however, successfully gather information from test-cqi. Conclusion: This attack was partially successful. Further action was that I spent the next couple hours learning about apache configuration so that I could turn off all access to cgi-bin and enable access only for specific and known scripts. 55555555 666666666 Log format: date/time: machine/facility: rule: action:interface:protocol: src ip/port: dst ip/port: length:TOS: IP ID: IP Flags: TTL: rule# Apr 4 10:51:34 fw kernel: Packet log: input REJECT eth3 PROTO=6 10.2.7.240:80 10.0.0.114:1863 L=52 S=0x00 I=4939 F=0x4000 T=49 (#11) Apr 4 10:51:35 fw kernel: Packet log: input REJECT eth3 PROTO=6 10.2.7.240:80 10.0.0.114:1863 L=52 S=0x00 I=5341 F=0x4000 T=49 (#11) Apr 4 10:51:37 fw kernel: Packet log: input REJECT eth3 PROTO=6 10.2.7.240:80 10.0.0.114:1863 L=52 S=0x00 I=5756 F=0x4000 T=49 (#11) Apr 4 10:51:41 fw kernel: Packet log: input REJECT eth3 PROTO=6 10.2.7.240:80 10.0.0.114:1863 L=52 S=0x00 I=6710 F=0x4000 T=49 (#11)

Apr 4 10:51:49 fw kernel: Packet log: input REJECT eth3 PROTO=6 10.2.7.240:80 10.0.0.114:1863 L=52 S=0x00 I=9439 F=0x4000 T=49 (#11) Apr 4 10:52:06 fw kernel: Packet log: input REJECT eth3 PROTO=6 10.2.7.240:80 10.0.0.114:1863 L=52 S=0x00 I=15009 F=0x4000 T=49 (#11) Apr 4 10:52:38 fw kernel: Packet log: input REJECT eth3 PROTO=6 10.2.7.240:80 10.0.0.114:1863 L=52 S=0x00 I=18496 F=0x4000 T=49 (#11) Apr 4 10:53:44 fw kernel: Packet log: input REJECT eth3 PROTO=6 10.2.7.240:80 10.0.0.114:1863 L=52 S=0x00 I=33762 F=0x4000 T=49 (#11) Apr 4 10:55:44 fw kernel: Packet log: input REJECT eth3 PROTO=6 10.2.7.240:80 10.0.0.114:1863 L=52 S=0x00 I=61459 F=0x4000 T=49 (#11) Apr 4 10:57:44 fw kernel: Packet log: input REJECT eth3 PROTO=6 10.2.7.240:80 10.0.0.114:1863 L=52 S=0x00 I=20983 F=0x4000 T=49 (#11) Apr 4 10:50:00 fw kernel: Packet log: input REJECT eth3 PROTO=6 10.2.7.244:80 10.0.0.114:1834 L=52 S=0x00 I=49491 F=0x4000 T=49 (#11) Apr 4 10:50:02 fw kernel: Packet log: input REJECT eth3 PROTO=6 10.2.7.244:80 10.0.0.114:1834 L=52 S=0x00 I=49863 F=0x4000 T=49 (#11) Apr 4 10:50:07 fw kernel: Packet log: input REJECT eth3 PROTO=6 10.2.7.244:80 10.0.0.114:1834 L=52 S=0x00 I=50288 F=0x4000 T=49 (#11) Apr 4 10:50:16 fw kernel: Packet log: input REJECT eth3 PROTO=6 10.2.7.244:80 10.0.0.114:1834 L=52 S=0x00 I=52618 F=0x4000 T=49 (#11) Notables: \* The time between packets starts at 1 second and doubles between each pair up to 120 seconds where it stays for about 20

\* The source address is spoofed. \* There were two sequences of this going on in parallel from very similar spoofed IPs. \* The TTLs were the same between the two 'sessions'. \* The detect repeats from one of the IPs four hours later. \* Each detect was to a different unknown TCP port. \* The timing doesn't match other 'load balancing' detects. \* The ports involved don't match other 'load balancing' detects. Summary: This detect is from our firewall logs. Only the IP of the firewall was touched. Only ports 1863, 1834, and 1050 are probed. The timing indicates a desire to evade port scan detection tools. The spoofed IP indicates a desire to camaflague the real activity with chaff. The timing and destination ports don't match 'load balancing' detects. Technique: Fair. The slow timing of the packets is useful, but the spoofed source addresses make the detect much easier. Intent: Informatin gathering or response measurement. Severity: Medium. Nothing else of use was detected. Perhaps they carried out a successful 'stealth' scan of a single or very few real target ports. Conclusion: \_ This attack may very well have succeeded. The target information they were seeking is unknown. Further action is continued watching now that snort is running on the public segment. 666666666 777777777

Log format:

date/time: machine/facility: rule: action:interface:protocol: src ip/port: dst ip/port: length:TOS: IP ID: IP Flags: TTL: rule# Dec 23 17:08:51 fw kernel: Packet log: input REJECT eth3 PROTO=17 10.0.0.16:138 10.0.0.255:138 L=216 S=0x00 I=49943 F=0x0000 T=128 (#19) Dec 23 17:09:15 fw kernel: Packet log: input REJECT eth3 PROTO=17 10.0.0.200:138 10.0.0.255:138 L=234 S=0x00 I=36748 F=0x0000 T=128 (#19) Dec 23 17:09:17 fw kernel: Packet log: input REJECT eth3 PROTO=17 10.0.0.200:137 10.0.0.255:137 L=78 S=0x00 I=37516 F=0x0000 T=128 (#17) Dec 23 17:09:48 fw kernel: Packet log: input REJECT eth3 PROTO=17 10.0.0.15:138 10.0.0.255:138 L=246 S=0x00 I=4096 F=0x0000 T=128 (#19) Dec 23 17:10:08 fw kernel: Packet log: input REJECT eth3 PROTO=17 10.0.0.5:138 10.0.0.255:138 L=229 S=0x00 I=27910 F=0x0000 T=128 (#19) Dec 23 17:10:18 fw kernel: Packet log: input REJECT eth3 PROTO=17 10.0.0.15:138 10.0.0.255:138 L=231 S=0x00 I=19712 F=0x0000 T=128 (#19) Dec 23 17:10:40 fw kernel: Packet log: input REJECT eth3 PROTO=17 10.0.0.23:138 10.0.0.255:138 L=241 S=0x00 I=44376 F=0x0000 T=128 (#19) Syslog from a system under test on our network. Dec 27 11:42:11 tun1 /bsd: ARP information for 10.0.0.254 overwritten from ethernet address 00:D0:B7:0E:AA:9C Dec 27 11:45:34 tun1 /bsd: ARP information for 10.0.0.254 verwritten from ethernet address 00:D0:B7:06:83:00 Notables: \* There are many source IPs involved. \* Thay match the actual distribution of our private network.

 $\ast$  The TTLs are all the same and indicate they are probably not from the

internet. \* They are logged because they are on the wrong ethernet interface of the firewall. \* The packet sizes seem realistic. Summary: For a few days users on our network were complaining that internet response was sometimes very slow. During the same period I was having mysterious session drops when using ssh to connect to our firewall. tcpdump showed traffic that appeared to come from our private network on the public interface of the firewall. The break came when a system being built with OpenBSD was placed on the internal network. It began producing the conflicting ARP messages from the second block of logs above. The MAC addresses were for the public and private interfaces of the firewall. Technique: Fair. Someone felt that they could bypass the logging features of our web proxy by attaching a cable from our private hub to the hub built into our external router. Intent: To evade traffic controls for our internet connection. Severity: Medium. The traffic carried over this backdoor link is unknown. Traffic may have been able to enter our network from the internet. Service was degraded for all users during the several days this lasted. Conclusion: The cable was removed. Locking policy for the room containing the equipment was revisited.

88 Log format: Rule: date/time: source IP/port: dest IP/port: Proto: TTL: TOS: IP ID: Length [\*\*] Traceroute [\*\*] 04/06-22:47:56.083764 192.168.1.130:38459 -> 10.0.0.116:33489 UDP TTL:1 TOS:0x0 ID:23015 Len: 20 04/06-22:48:08.856300 192.168.1.130:38467 -> 10.0.0.115:33489 UDP TTL:1 TOS:0x0 ID:23493 Len: 20 04/06-22:48:25.482514 192.168.1.130:38483 -> 10.0.0.114:33489 UDP TTL:1 TOS:0x0 ID:24138 Len: 20 Notables: \* The trace has been trimmed, it is typical traceroute. \* They ran a traceroute to each IP in our public range. Summary: This detect came very soon after I installed snort on our firewall. Nslookup showed the source of the scan to be a numbered system at a .edu. Technique: Poor. They are mapping the route to each host to determine subnetting and routes within our range. Intent: Network mapping. Severity: Low. They can find that all our public servers are behind our firewall. Conclusion: Standard network mapping. No further action needed. 88

999999999 Log format: date/time: machine/facility: rule: action:interface:protocol: src ip/port: dst ip/port: length:TOS: IP ID: IP Flags: TTL: rule# Apr 5 07:05:57 fw kernel: Packet log: input REJECT eth3 PROTO=6 10.1.1.23:80 10.0.0.114:2111 L=40 S=0x00 I=11116 F=0x4000 T=118 (#11) Apr 5 15:17:27 fw kernel: Packet log: input REJECT eth3 PROTO=6 10.1.1.23:80 10.0.0.114:1612 L=40 S=0x00 I=61508 F=0x4000 T=110 (#11) Apr 6 09:37:09 fw kernel: Packet log: input REJECT eth3 PROTO=6 10.1.1.23:80 10.0.0.114:3759 L=40 S=0x00 I=21643 F=0x4000 T=110 (#11) Notables: \* The timing is extremely slow. \* Don't fragment is set. \* The packet size matches nmaps default size for 'stealth' SYN scan. \* Only the firewall's external IP was touched. Summary: Here is another detect from the logs on our firewall. The timing is extremely slow. Nslookup showed nothing for this system, but traceroute to it ended with routers in Poland. Technique: Good. This detect shows activity at an extremely low level. Scan detection tools would have missed this. They seem to know which host is our firewall and now they want to know about its configuration. Intent: Careful, undetected host mapping.

Severity: High. This attacker seems to understand some of the pitfals of their activity and is willing to work very hard to avoid them. Conclusion: Further action was to install snort in preparation for what may come. 99999999999 010101010101010 Log format: date/time: machine/facility: rule: action:interface:protocol: src ip/port: dst ip/port: length:TOS: IP ID: IP Flags: TTL: rule# Mar 30 10:14:15 fw kernel: Packet log: input REJECT eth3 PROTO=17 192.168.1.11:53 10.0.0.114:64726 L=232 S=0x00 I=53130 F=0x0000 T=44 (#107)Mar 30 10:14:43 fw kernel: Packet log: input REJECT eth3 PROTO=17 192.168.1.11:53 10.0.0.114:64726 L=232 S=0x00 I=54829  $F=0 \times 0000 T=44 (\#107)$ Mar 30 10:15:39 fw kernel: Packet log: input REJECT eth3 PROTO=17 192.168.1.11:53 10.0.0.114:64726 L=232 S=0x00 I=58238  $F=0\times0000$  T=44 (#107) Mar 30 10:14:19 fw kernel: Packet log: input REJECT eth3 PROTO=17 192.168.5.32:53 10.0.0.114:64726 L=251 S=0x00 I=31367  $F=0 \times 0000 T=44 (\#107)$ Mar 30 10:14:51 fw kernel: Packet log: input REJECT eth3 PROTO=17 192.168.5.32:53 10.0.0.114:64726 L=251 S=0x00 I=37249 F=0x0000 T=44 (#107)Mar 30 10:15:55 fw kernel: Packet log: input REJECT eth3 PROTO=17 192.168.5.32:53 10.0.0.114:64726 L=251 S=0x00 I=48756 F=0x0000 T=44 (#107)

Mar 30 10:14:11 fw kernel: Packet log: input REJECT eth3 PROTO=17 192.168.70.4:53 10.0.0.114:64726 L=232 S=0x00 I=44947 F=0x4000 T=242 (#107)Mar 30 10:14:35 fw kernel: Packet log: input REJECT eth3 PROTO=17 192.168.70.4:53 10.0.0.114:64726 L=232 S=0x00 I=44949 F=0x4000 T=242 (#107)Mar 30 10:15:23 fw kernel: Packet log: input REJECT eth3 PROTO=17 192.168.70.4:53 10.0.0.114:64726 L=232 S=0x00 I=44951 F=0x4000 T=242 (#107)Mar 30 10:14:27 fw kernel: Packet log: input REJECT eth3 PROTO=17 192.168.222.4:53 10.0.0.114:64726 L=232 S=0x00 I=44948 F=0x4000 T=242 (#107)Mar 30 10:15:07 fw kernel: Packet log: input REJECT eth3 PROTO=17 192.168.222.4:53 10.0.0.114:64726 L=232 S=0x00 I=44950 F=0x4000 T=242 (#107)Notables: \* 3 machines/ 4 IPs involved in 'scanning' the dest. port at the same time. \* 2 IPs are from .mil and 2 are from .edu \* One scan has a different length than the others. \* The delay increases rather than staying steady like OS generated traffic would. Each scan shows the same timing pattern. \* The IP ID numbers make sense. \* The TTLs are about correct or the IPs seen. Summary: Here our firewall is receiving packets on a particular port from four sources at once. The machines the packets come from all run DNS. Technique: Fair. There seems to be a scan of multiple machines DNS going on using our IP. Intent: Network mapping with spoofed IPs as chaff. Severity: Low. The .mil systems will be able to understand this. The .edu

systems are probably trafficed enough by this sort of thing to be OK.

Conclusion: Our IP is being spoofed on the network. Source unknown. No further action possible.