Tracking Down the Phantom Host

by John Payton
last updated June 18, 2003

Most information systems security professionals are familiar with the procedures for identifying malicious tr
and many of the same professionals are familiar with the forensic procedures required once you have ident
more than one occasion, I have been asked how to locate a problem host when you are not sure where it is

This problem can arise innocently, such as when network wiring diagrams are not kept up-to-date, or not-s
than-trustworthy administrator decides to put a web server on the company's DMZ so as not to use all the
cable modem. Let's suppose this is the case, and you start seeing that server probing port 80 on other mac
You dump the traffic, and the request it is making looks a little something like this:

```
/default.ida?XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXX%u9090%u6858%ucbd3
%u7801%u9090%u6858%ucbd3%u7801%u9090%u6858%ucbd3%u7801%u9090%u9090%u81
90%u00c3%u0003%u8b00%u531b%u53ff%u0078%u0000%u00=a HTTP/1.0
```

...and you think, "OK, I have the IP address of the machine that is trying to infect my network with CodeRe
here?"

Relax. In the former case, it is relatively easy to locate the machine if you know the IP address. In the case
however, it can be quite difficult to locate the offending host, as the owner of the system likely does not wa
ranging from hidden hosts above the ceiling tiles and below the raised floor, to rogue servers installed in el
professionally) into the facility cable plant.

The Easy Way

The easiest way to go about finding the host is to ping the IP address that is performing the offending actio
network bandwidth, or providing IRC connectivity to burgeoning h4x0rs). This is assuming that you have a
your interest was piqued while you were located on the local segment with the host, and assuming that it h
attempt to protect its secret location. Check the Time-To-Live (TTL) to verify that the rogue host is on the s
same broadcast domain, the TTLs should not decrement. They should be 255, 128, 64, or 32. I can think o
where they will not be one of these numbers.

```
C:\>ping 10.1.1.100

Pinging 10.1.1.10 with 32 bytes of data:

Reply from 10.1.1.100: bytes=32 time<1ms TTL=128
Reply from 10.1.1.100: bytes=32 time<1ms TTL=128
Reply from 10.1.1.100: bytes=32 time<1ms TTL=128
Reply from 10.1.1.100: bytes=32 time<1ms TTL=128

Ping statistics for 10.1.1.100:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

If it is not on the same logical segment, use traceroute to determine hop count and identify the segment yo host. Use the command `tracert` in Windows and `traceroute` in Linux or Unix.

```
C:\>tracert 172.16.1.100

Tracing route to 172.16.1.100 over a maximum of 30 hops

  1     *        *        *     Request timed out.
  2     1 ms     1 ms     1 ms  10.1.1.1
  3    13 ms    13 ms    11 ms  172.16.1.254
  4    11 ms    11 ms    11 ms  172.16.1.100

Trace complete.
```

Bear in mind that being on the same logical segment simply means you do not have a router or other devic between you and the host in question. You may still have a Layer 2 device to traverse before you are on th your host. Once you have determined the physical segment and have situated yourself accordingly, ping ar

Remember, the Internet Protocol [1] is a layer 3 protocol and knows nothing about the hardware associate To find the physical address of the destination host, the Address Resolution Protocol (ARP)[2] is used to loc example below that the ARP cache shows no entry for 10.1.1.180. Once a ping is initiated, the Address Res broadcast to the local segment looking for the hardware address associated with that IP address. Checking the entry for 10.1.1.180.

From Windows:

```
C:\>arp -a

Interface: 10.1.1.160 --- 0x2
  Internet Address      Physical Address      Type
  10.1.1.130           00-60-cf-20-b3-72     dynamic
  10.1.1.132           00-90-27-d0-8a-07     dynamic
  10.1.1.133           00-06-5b-3d-16-32     dynamic
  10.1.1.254           08-00-20-c3-9a-9e     dynamic

C:\>ping 10.1.1.180

Pinging 10.1.1.180 with 32 bytes of data:

Reply from 10.1.1.180: bytes=32 time<1ms TTL=255
Reply from 10.1.1.180: bytes=32 time<1ms TTL=255
Reply from 10.1.1.180: bytes=32 time<1ms TTL=255
Reply from 10.1.1.180: bytes=32 time<1ms TTL=255

Ping statistics for 10.1.1.180:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

```
C:\>arp -a

Interface: 10.1.1.160 --- 0x2
  Internet Address      Physical Address      Type
  10.1.1.130          00-60-cf-20-b3-72     dynamic
  10.1.1.132          00-90-27-d0-8a-07     dynamic
  10.1.1.133          00-06-5b-3d-16-32     dynamic
  10.1.1.180          08-00-20-fd-c6-52     dynamic
  10.1.1.254          08-00-20-c3-9a-9e     dynamic
```

From Linux the output will look a little different:

```
[root@portcullis root]# arp -a
www.testlan.xyz   (10.1.1.130) at 00:60:cf:20:b3:72 [ether] on eth0
dns.testlan.xyz   (10.1.1.100) at 00:90:27:d0:8a:07 [ether] on eth0
mail.testlan.xyz  (10.1.1.200) at 08:00:20:c3:9a:9e [ether] on eth0
```

But the information is still the same. All together, this a relatively easy way to come up with the hardware
rogue IP. It will not always be that easy.

The Hard Way

In the event the perpetrator of this heinous theft of network resources has taken steps to mask his illicit ac
a only single service on the machine, and will not accept connections to any other ports, the task can get n
not work. And as such, you will have to find other means of locating the box. Much has been written on ide
by banner grabbing and identifying the OS by passive fingerprinting. I won't belabor those topics by rehash
thorough research than mine has been done on the subject. Toby Miller has written a couple of excellent pa
be found at [3] and [4]. Just be cognizant of the fact that it may be a little harder to originally identify the
capture the traffic to find the MAC address for the end hop of the segment you are currently monitoring an
to its origin.

Either Way

Once you have the MAC address, you can login to your switch and begin to track down the host. Again, unl
segment as the host in question, you are tracking down one leg in the journey to the destination.

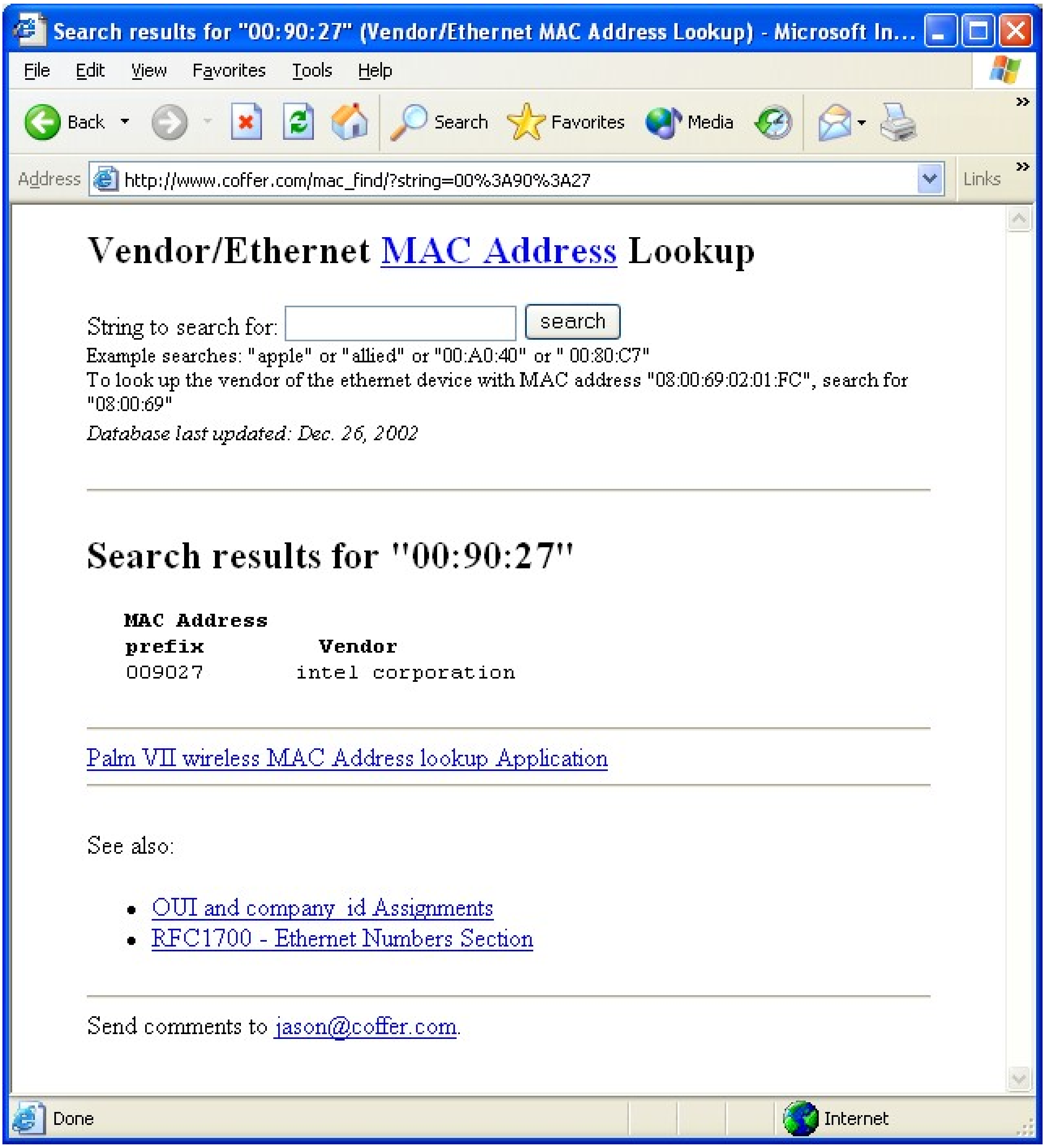
Once you are logged into the switch, the command `show cam dynamic` will show the dynamic entries in the
(CAM) table on a Cisco CatOS switch [5]. More specifically, it will show you the mapping of hardware addre
switches with the CatIOS, the command would be `show mac`.

```
Cisco Systems Console

Enter password:
Console> show cam dynamic
*=Static Entry. +=Permanent Entry. #=System Entry. R=Router Entry.
X=Port Security Entry $=Dot1x Security Entry

VLAN Dest MAC/Route Des [CoS] Destination Ports or VCs/ [Protocol Type]
```

```
---- ------------------ ----- ------------------------------------
592   00-b0-d0-ab-b7-40             3/15 [ALL]
590   00-b0-d0-ea-38-fc             4/16 [ALL]
592   00-04-75-c1-a2-6e             3/39 [ALL]
592   00-06-5b-3d-16-32             3/31 [ALL]
590   00-b0-d0-ea-3e-c4             4/16 [ALL]
590   00-b0-d0-fc-45-3d             3/37 [ALL]
590   08-00-20-e7-64-87             3/41 [ALL]
590   08-00-20-bf-b4-a2             3/48 [ALL]
590   00-06-2a-f9-03-04             4/13 [ALL]
592   08-00-20-c3-9a-9e             3/35 [ALL]
590   00-06-5b-84-28-34             4/13 [ALL]
592   02-01-00-00-00-01             4/7  [ALL]
590   00-b0-d0-ea-2a-ea             4/16 [ALL]
590   00-b0-d0-ea-2a-5e             4/16 [ALL]
592   00-01-02-6c-f4-58             3/45 [ALL]
592   00-01-02-6c-f4-48             4/3  [ALL]
592   00-01-02-6c-f4-d9             3/26 [ALL]
592   00-90-27-d0-8a-07             3/28 [ALL]
592   00-04-75-96-d8-35             4/6  [ALL]
592   00-04-75-96-d8-7d             3/22 [ALL]
592   00-04-75-96-d8-dc             3/5  [ALL]
592   00-04-75-96-d7-7b             4/6  [ALL]
Do you wish to continue y/n [n]? y
```

Armed with the knowledge of the module and port number, we can proceed to trace the connection to the
the cable you trace from the port may lead to another segment and you will have to start this procedure ag

This would also be a good time to look up the MAC address by vendor. One place to perform said lookup is
http://www.coffer.com/mac_find/. Another is http://standards.ieee.org/regauth/oui/index.shtml. The form
better for looking up the address itself, and the latter is better for looking up the address ranges assigned t
each his own.


Search results for "00:90:27" (Vendor/Ethernet MAC Address Lookup) - Microsoft In...
File Edit View Favorites Tools Help
Back
Search
Favorites
Media
Address
http://www.coffer.com/mac_find/?string=00%3A90%3A27
Links
Done
Internet

Vendor/Ethernet MAC Address Lookup

String to search for: search

Example searches: "apple" or "allied" or "00:A0:40" or " 00:80:C7"
To look up the vendor of the ethernet device with MAC address "08:00:69:02:01:FC", search for "08:00:69"

Database last updated: Dec. 26, 2002

Search results for "00:90:27"

MAC Address prefix	Vendor
009027	intel corporation

Palm VII wireless MAC Address lookup Application

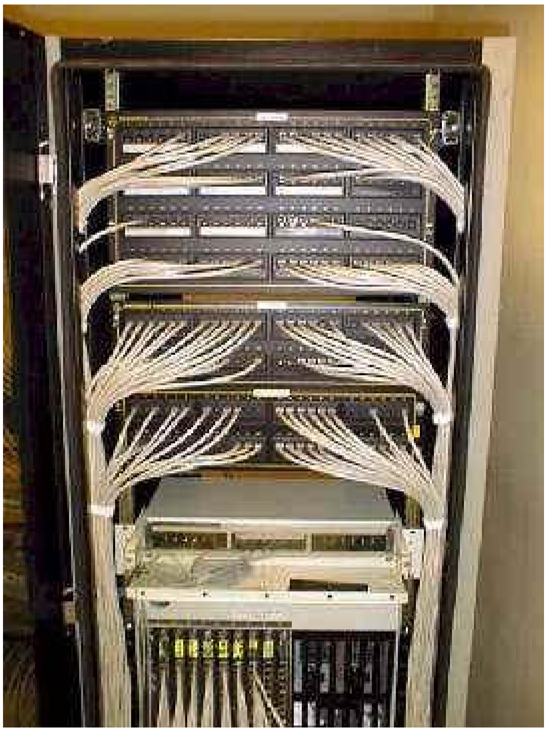
See also:

- OUI and company id Assignments
- RFC1700 - Ethernet Numbers Section

Send comments to jason@coffer.com.

This lookup won't necessarily tell you everything about the host you're looking for, but it can definitely helr you the NIC vendor or telling you the vendor of the hardware in question. It can also serve to inform you a thereof) to the host. For example, if the MAC lookup turns up a listing for Cisco Systems, and the host you' on Linux, you can probably continue your search and take comfort in the knowledge that, while you have n you are one step closer to your destination.

Once completed, all that remains is the trace to the host. This can be a tricky proposition at times, as the c of a bundle, or through cable trays above the ceiling tiles or below the floor.



There are a couple of other instances that are worth mentioning when considering the problem of rogue ho server, the other is a rogue wireless access point.

In the case of the rogue DHCP server, it can become a problem if it is offering IPs to all requests and has n with local policy. Whereas a DHCP server can be used to set the default gateway and DNS servers used, a to reroute traffic through a false gateway, thereby making all traffic subject to sniffing or man-in-the-middl locating a rogue DHCP server are the same as what has been detailed herein. All that remains is to see if tl address (in Windows try `ipconfig /renew`) and then looking to see which DHCP server assigned the addre

Rogue wireless access points are a fairly recent problem. With the advent of 802.11, wireless networks are would like to identify any rogue APs in your network, I would recommend downloading a wireless sniffer an against your network. For further information look here [6]. Once you have captured some traffic, check fo

A short list:

Vendor	Default SSID	Possible MAC	Default Channel(s)
3com	comcomcom		
Compaq	Compaq		
Cisco	tsunami, Wavelan Network		2, 3
D-Link	WLAN		11
Intel	101, 195, xlan, intel	00:A0:F8	
Linksys	linksys		3, 6, 11
Netgear	Wireless	00:30:AB	6
SMC	WLAN, BRIDGE	00:90:D1	11

An alternative way of going about it is to browse the CAM table looking for MAC address ranges belonging t

Parting Ways

When I originally started writing this article, I wrote it from the perspective of finding an unauthorized gam tracking it down. It was brought to my attention that a gaming server is not really a security risk. While it r server is not, in and of itself, a security risk, I would submit that a rogue server whatever the function is a Information security is not about risk elimination, it is about risk acceptance. It is mostly impossible to elim security professionals perform analyses of the risk and help business units define acceptable levels of risk t required to do business. Any unauthorized host has bypassed this risk analysis, and therefore, any risk it p by management. Hopefully the procedures detailed in this article will help you find and eliminate any unaut

The author would like to thank Hal Munsell, CCIE for originally teaching me this procedure.

John Payton is an information systems security consultant in the Washington D.C. metropolitan area.