Dealing with Public Ethernet Jacks: Switches, Gateways, and Authentication

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The Problem: Public Ethernet Jacks.

• Public access points to our campus network, Insecure PC (Windows and Macintosh) labs as well as public Ethernet jacks for laptops
  ○ People off the street walk in, then use/abuse.
  ○ Students may use the labs to cause mischief on or off campus.

• In the past, to prevent abuse labs weren’t routed off our campus. (Internet use by proxy only). Still a source of attacks on campus.

• More and more demand for mobile plug-in type access, and other protocols we didn’t want to proxy. We needed a better solution.
What Did We Want?

The same level of control we have with our student access UNIX systems.

- We already make use of Kerberos (we have about 50,000 User IDs).
- Needed a solution to work both with public plug-in access and labs of insecure PC’s (win95, win98, Mac).
- Wanted something to integrate with the Kerberos IDs we already give out to all students and staff.
- Must prevent unauthorized net usage
- Must ensure authorized usage can be easily tracked.
- Must be relatively secure and attack resistant.
What We Looked At.

• Windows NT
• Nontransparent Proxies (FWTK etc.)
• Commercial firewall products
• DHCP registration systems

We found nothing that did what we wanted at a price we could afford.
What We Did.

• An authenticating gateway, which when placed in front of a lab forces the user to authenticate before allowing access from their IP address.

• Once authenticated, everything is allowed, (although much is logged). To do this we wrote some custom software for our gateways.

• We ensure our gateways are configured to avoid problems with IP spoofing.

• We use only switched networks with the switches configured appropriately to prevent sniffing and hijacking.
The Switches.

• Our system authenticates a user based on their source IP address.

• To do this in a reasonable manner, we needed a network which was not vulnerable to spoofing or hijacking attempts.
  ○ MAC-lock switches where possible.
  ○ Where not possible, ensure they do not broadcast unknown traffic

• Ensure nothing in the lab can talk to the switch.

• Goal: ensure nobody can see anyone else’s session
The Gateways

- Our gateways are built using OpenBSD (version 2.5).

- The gateways by default blocks all outgoing traffic from the labs using packet filters (ipf).

- Our gateways allow a user to connect and authenticate using their Kerberos ID and password.

- On successful authentication the gateway adds rules to allow out all traffic (and log some of it).

- As soon as the authenticating session disconnects, the filter rules added above are removed.
authipf - Our Program For Filter Rules

• Users connect to gateway with telnet (Why telnet? because they all have it and can use it!)

• User authenticates with login, login runs authipf, a program which adds filter rules when started, removes when done.

• TCP KEEPALIVE values tuned to ensure that unresponsive sessions go away in under a minute.

• authipf logs to syslog when users authenticate, and when they disconnect. It also puts in rules to log tcp sessions.
Security and Configuration Issues

• To reiterate, switches must be configured properly to avoid traffic snooping and hijacking
  o MAC lock each port or..
  o Turn off unknown unicast flooding.

• We periodically review switch configs to ensure we haven’t made mistakes

• Our switches deal with traffic at the MAC level, yet we authenticate based on IP address - this means that there is a potential problem..
IP spoofing

- An attacker can fake a ARP reply, or just try to use an IP address from the lab to get an IP address that is in use in the lab and already authenticated.

- We react to this possibility by having the gateway watch for the occurrence of such events. ARP changes are logged by OpenBSD.

- When we see an ARP table change, we use swatch to ensure that if there is a running authipf process for that address, it gets killed.

- This ensures that if an IP address is taken over, it is no longer authenticated, and must reauthenticate

- We also get notified when this happens.
Other Issues

- Students can walk away.
  - We deal with this in our traditional way of dealing with the "Oh gee, you left yourself logged on" cases.

- Users must know how to telnet to the gateway and authenticate. We put big posters everywhere, and icons on the desktops in the labs of machines.

- This does not address the (in)security of the client machines due to what is running on them.
  - The laptop is the users problem.
  - Labs of machines reload an image regularly on boot to minimize trojan/virus exposure (and warn users in big letters)
Other Nice Stuff

• Gateway intercepts IDENT (rfc 1413) requests aimed at inside hosts. answers them with the authenticated user.

• We intercept and proxy IMAP and SMTP outbound to our main central servers which use the same id and passwords. These proxies then substitute in the username/password for those connections with the one used to authenticate.

• We don’t regularly proxy http on the gateways, but have the capability to do it when tracking problems (at our site we watch http requests elsewhere)
Well, Does it work?

- Deployed in front of student residences and over 30 labs and laptop areas at University of Alberta. More all the time.
- Students rapidly became used to how it works. very little user training necessary.
- Other on campus departments now less fearful of connections from public labs (some used to block them entirely!)
- No more off-street people showing up to abuse labs (It’s not interesting if they have no Internet connection). Places without this installed are now requesting it.
- Time to identify the user responsible for harrasing e-mail from these locations via hotmail is down to about 60 seconds. (other stuff quick to find too) This saves *lots* of work.
Possible Future Enhancements

• ssh

• netbios

• More proxies

• Support for more/different authentication mechanisms (YP, LDAP, etc.)
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- ftp://sunsite.ualberta.ca/pub/Local/People/beck/authipf
- http://www.ualberta.ca/~beck/lisa99.ps

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