Freedom of Speech: Accountability

Sometimes People Misbehave

- Hacking
- Libel
- Copyright infringement
- Threats
- Child pornography
- Other illegal behavior

There’s a Balance

- Tuesday, I said we needed anonymity
- Today, I’m saying there are reasons it can’t be absolute
- Which is it?

Checks and Balances

- Few rights are absolute
- Who can track someone?
- Under what conditions can they track someone?
- Is it possible to bypass the restrictions?

Criminal Offenses

- Full power of wiretap law
- But — wiretaps are limited to certain serious offenses
- Also use pen registers, trap-and-trace, informants, bugs, etc.
- Must convince police or prosecutor that the offense is real and of sufficient magnitude to warrant prosecution: “de minimis non curat lex” (“the law does not care about trifles”)

Civil Offenses

- Can still get subpoenas, even against third parties
- But — only courts can issue subpoenas
- De minimis non curat lex — and you generally can't get a subpoena until there's a real lawsuit

SLAPP

- SLAPP — *Strategic Lawsuit Against Public Participation*
- Sometimes filed by large organizations to harass opponents
- Force the opponents to spend a lot of money defending themselves, even if the lawsuit is preposterous
- Also — break their anonymity/pseudonymity

There Are Real Problems

- Can online commentary or harrassment be actionable?
- Certainly — though usually it isn't
- The standards for libel online are the same as offline
- Anonymity (or perceived anonymity) seems to breed irresponsible behavior

☞ Of course, free speech applies online, too

Tracing a Connection

- Available to recipient (e.g., in mail headers)
- Log files
- Higher layers (e.g., cookies)

Log Files: Mail

```
Feb 22 21:20:26 machshav postfix/smtpd[28530]: connect from
    brinza.cc.columbia.edu[128.59.29.8]
Feb 22 21:20:26 machshav postfix/smtpd[28530]: 45ECC52D4E9:
    client=brinza.cc.columbia.edu[128.59.29.8]
Feb 22 21:20:26 machshav postfix/cleanup[8850]: 45ECC52D4E9:
    message-id=<4D03745C-C345-41A8-95E2-EF43F771A045@cs.columbia.edu>
Feb 22 21:20:26 machshav postfix/qmgr[23733]: 45ECC52D4E9:
    from=<smb@cs.columbia.edu>, size=1023, nrcpt=1 (queue active)
Feb 22 21:20:26 machshav postfix/smtpd[28530]: disconnect
    from brinza.cc.columbia.edu[128.59.29.8]
```

(recipient not shown here because of spam filter)

What’s Interesting?

- IP address of the immediate (but not original) sender
- Timestamp — but no time zone. . .
- DNS hostname of sender — a spam clue. . .

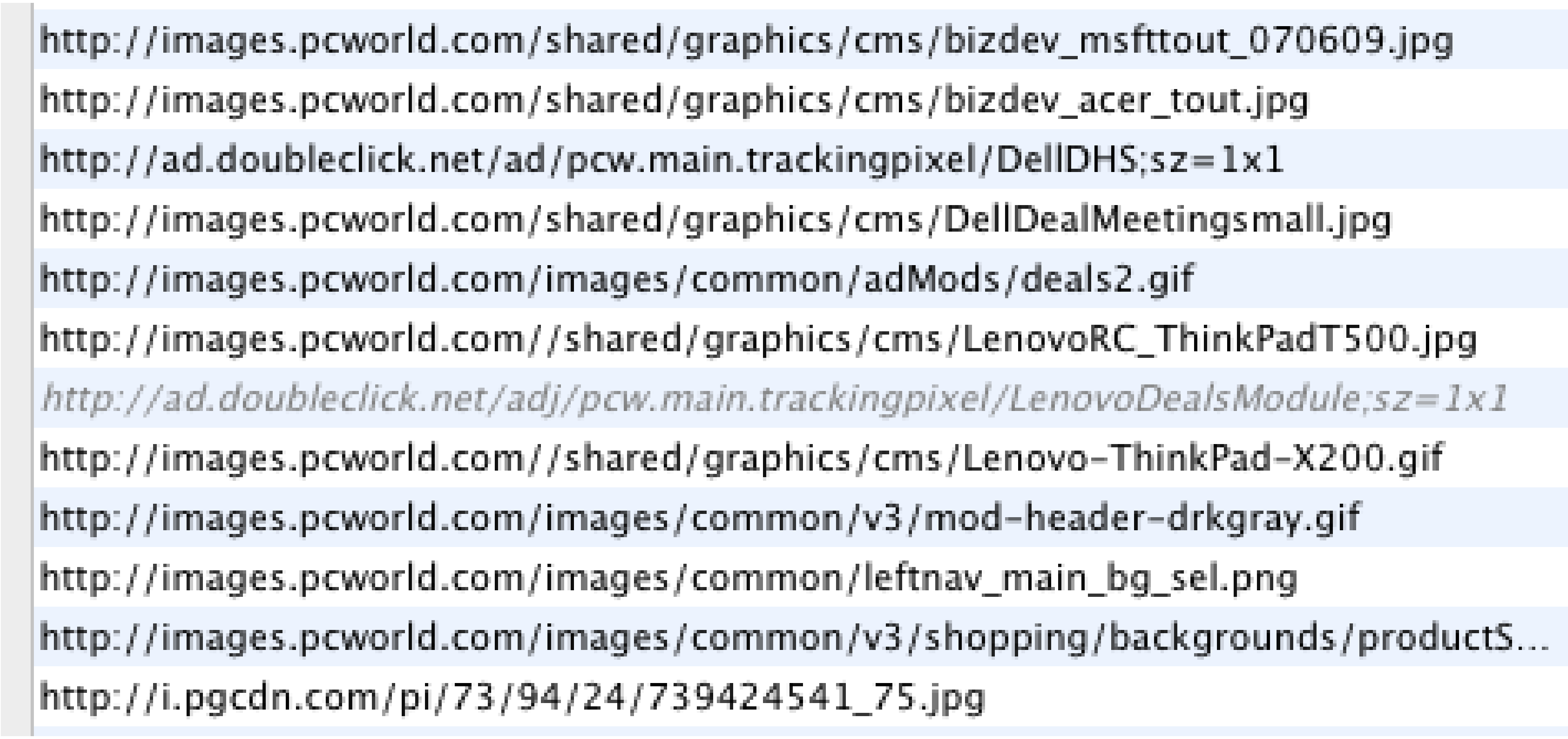
```
Feb 22 21:31:53 machshav postfix/smtpd[19642]: connect
    from unknown[222.252.161.130]
Feb 22 21:31:53 machshav postfix/smtpd[19642]: NOQUEUE:
    reject: RCPT from unknown[222.252.161.130]: 550 5.1.1
    <easycert@machshav.com>: Recipient address rejected:
    User unknown in local recipient table;
    from=<happenedb33@ldbrewer.com> to=<easycert@machshav
    proto=ESMTP helo=<localhost>
```

Web Server Logs

```
209.2.227.65 - - [22/Feb/2010:21:45:07 -0500] "GET /
    HTTP/1.1" 200 401 "-" "Mozilla/5.0 (Macintosh;
    U; Intel Mac OS X 10.6; en-US; rv:1.9.1.8) Gecko/20100202
    Firefox/3.5.8"
209.2.227.65 - - [22/Feb/2010:21:45:07 -0500] "GET /favicon.i
    HTTP/1.1" 404 328
```

Note all of the information about the browser version

Third Party Web Logs



```
http://images.pcworld.com/shared/graphics/cms/bizdev_msfttout_070609.jpg
http://images.pcworld.com/shared/graphics/cms/bizdev_acer_tout.jpg
http://ad.doubleclick.net/ad/pcw.main.trackingpixel/DellDHS;sz=1x1
http://images.pcworld.com/shared/graphics/cms/DellDealMeetingsmall.jpg
http://images.pcworld.com/images/common/adMods/deals2.gif
http://images.pcworld.com//shared/graphics/cms/LenovoRC_ThinkPadT500.jpg
http://ad.doubleclick.net/adj/pcw.main.trackingpixel/LenovoDealsModule;sz=1x1
http://images.pcworld.com//shared/graphics/cms/Lenovo-ThinkPad-X200.gif
http://images.pcworld.com/images/common/v3/mod-header-drkgray.gif
http://images.pcworld.com/images/common/leftnav_main_bg_sel.png
http://images.pcworld.com/images/common/v3/shopping/backgrounds/productS...
http://i.pgcdn.com/pi/73/94/24/739424541_75.jpg
```

Ads on Web Sites

- Remember that many ads on web sites are from third-party sites
- Each site has a log
- Each log has its own set of IP addresses
- Collect and correlate, especially for attacks on web sites. . .

Using an IP Address

- We now have the bad guy’s IP address
- What we want, though is a person
- How do we track down the target?

Address Registries

```
$ whois -a 128.59.0.0

OrgName:    Columbia University
OrgID:      COLUMB
Address:    612 W 115TH ST
City:       NEW YORK
StateProv:  NY
PostalCode: 10025
Country:    US

NetRange:   128.59.0.0 - 128.59.255.255
CIDR:       128.59.0.0/16
NetName:    CU-NET
NetHandle:  NET-128-59-0-0-1
Parent:     NET-128-0-0-0-0
NetType:    Direct Assignment
...
```

Contact information is in there, too — does CUIT know the owner?

IP Address Assignment

- Two types, static and dynamic
- Static: simple; consult a file
- Dynamic addresses: handed out for a short time; reclaimed and reassigned later
- Simple: unauthenticated *DHCP*
- More complex: based on some form of authentication, perhaps done by underlying hardware

DHCP

- DHCP — Dynamic Host Configuration Protocol
- Assigns a *lease* to some IP address to the proferred *MAC address*
- A MAC address is manufactured into your network hardware
- It can be overridden, but most people don't know how to
- Most DHCP servers log the lease
- Who owns a given MAC address?

MAC Addresses

- Who owns a given MAC address?
- No a priori way to tell, though the first 3 bytes indicate the manufacturer of the network card
- If the machine is seized, its MAC address can be compared to the DHCP logs
- Some sites require MAC addresses to be registered
- Other sites divert you to a login page

Hackers

- Good hackers steal or make up IP and MAC addresses
- Even if they don’t do that, even bad hackers use other people’s machines as stepping stones
- Many have “botnets” of thousands — many thousands — of machines belonging to innocent people
- Conclusion: address-tracing goes only so far in locating the real guilty party

Switch Logs

- The site's network hardware can log which IP addresses and which MAC addresses appear on a given port
- Helpful if the attacker is stealing IP and MAC addresses
- For wired networks, can trace the occurrence to a particular wall jack
- Not nearly as useful for WiFi networks; an access point can reach up to 100 meters — more if the attacker has a good antenna

Authenticating Devices

- For some networks, especially wireless ones, the device itself authenticates to the network
- The network provider then has logs associating a user with an IP address
- Again, this is a short-term (but generally renewable) lease

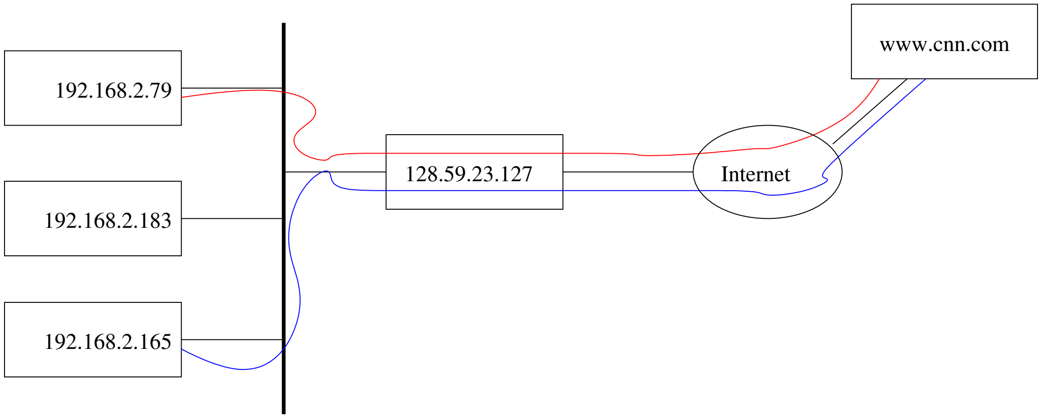
But. . .

- How long are the DHCP and switch logs retained?
- (What about the mail and web server logs?)
- Are the clocks properly synchronized?
- What time zone are the different logs in?

Network Address Translators

- We’re basically out of IP addresses — there aren’t enough to go around
- Most homes and many companies use *private address space* (sometimes known as *RFC 1918 space*)
- A *NAT* box at the border translates from private space to a very few public addresses

NAT



Outbound packets will always have the public address of the NAT box. Because there can be multiple connections to a single destination, the source port number is also changed to allow disambiguation and routing of return packets.

Translations

- A packet from 192.168.2.79:2345 is sent to www.cnn.com:80
- Another machine sends traffic from 192.168.2.165:7890 to the same place
- After translation, they appear to be from 128.59.23.127:45678 and 128.59.23.127:46324
- The translation is reversed on inbound packets

Logs: Lost in Translation

- Most NAT boxes do not keep logs of translations
- They can't — it would have to be one per TCP connection
- Even if they did, it wouldn't help — receiving site logs do not include port numbers
- Attacks can be traced to the NAT, but rarely beyond it

Other Means of Attribution

- Remember all of those third-party web ads?
- They all have cookies and logs, and cookies pass unchanged through NATs and Tor networks
- Maybe one of those ads also appears on some site where the bad guy has an account

Example: Cookie Crumb Tracing

- The bad guy attacks a web site via a page that has a Doubleclick cookie
- Doubleclick also serves ads on a NY Times page that person visits
- The NY Times registration is tied to the attacker’s home subscription to the paper edition of the Times
- That, of course, is tied to a physical address

Buts. . .

- You have to get logs from three different web sites to establish the linkage
- You have to get address data from a site that has no connection to the attack
- It takes persistence and court orders — and money. . .

Who Can Do All This?

- Law enforcement, with search warrants
- Plaintiffs in civil suits — if they have deep pockets or expect to win a big settlement
- Anti-terrorism investigators, with “National Security Letters”?
- What are the limits?