Network attack and defense

CS 594 Special Topics/Kent Law School:

Computer and Network Privacy and Security: Ethical, Legal, and Technical Consideration

Outline

1. Overview of attacks involving network
2. Bots and DoS
3. Firewalls
4. Logs and auditing logs

Specific network attacks

- Snooping/sniffing: passively reading packets bound for other machines
- IP spoofing: falsify source IP address so it appears to come from different computer
- Man-in-the-middle attacks and replay attacks
- Denial-of-service (DoS): saturation of

Common points of attack

- Web Server
- DNS Server
- Mail server (SMTP)
- Firewall itself; especially DOS
- Test/Development Systems

Who attacks and why

- The Challenge (So 1999)
- Fame (ditto)
- Industrial Espionage
- **Profit, especially by organized crime**
- Ideology: Hacktivism/Cyberterroism

DOS/DDoS

- DOS: Attack on availability
- Distributed Denial of Service (DDoS) attack is mounted from multiple platforms
- Successful attacks two pronged:

1. Attack the protection of computers
2. Used the compromised systems for DOS attacks on intended victim

Denial of Service Attacks in general

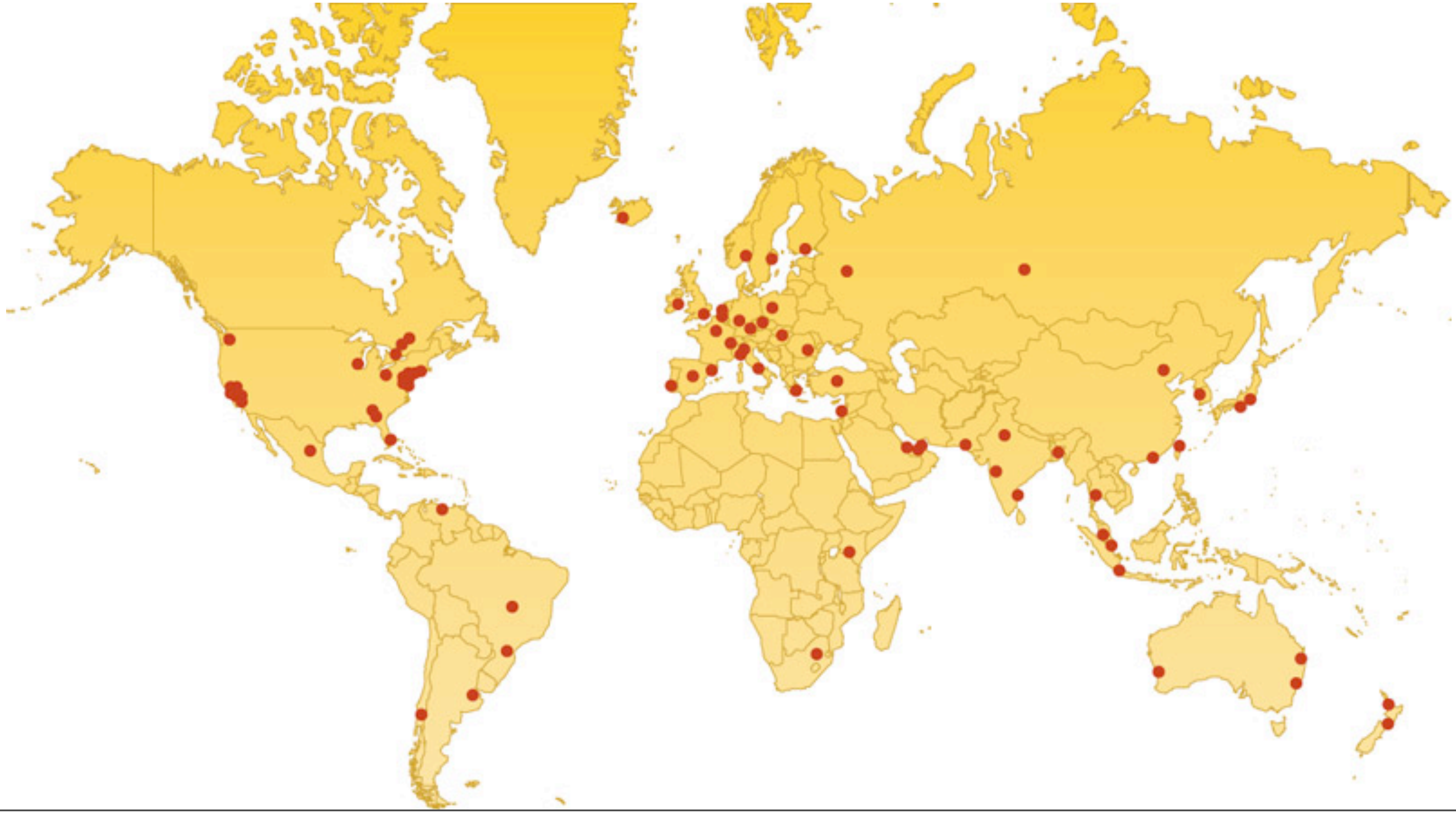
- Keep the system so busy that it does not have time to respond to legitimate requests
- Exhaust something:
  - Network bandwidth
  - System resources either at transport layer or in some application (e.g., web server)

For example

- Flooding attacks using the SYN start of TCP connection formerly very popular; still around.
  - Floods the buffer that is used in the middle of the 3-way SY handshake
- Various attacks against DNS itself popular

2007: DNS Backbone

There are 13 highest-level (*above* .com, .org, etc.) DNS *root name servers*. Some are in fact distributed. As of March 2007:



Attack: Feb 6, 2007

- 5 hour attack starting around 11 a.m. Central time by botnet allegedly traced to South Korea against all the root name servers.
  - None crashed, but two “suffered badly”; rest had “heavy traffic.”
  - At height of attack; 94% of DNS queries answered as opposed to usual near 100%

Bots, botnets

- **Bot** (robot) or **zombie** or drone is program that secretly takes over another Internet-attached computer and uses it for no good
- Difficult to trace to bot's creator
- In **botnet** of hundreds to (often) 10,000+ to (sometimes) 1.5 million controlled by **herder.**

Botnets

- Got started in serious way around 2004; explosive growth since then
- Jan. 2008 estimate: *3.7 million instances per day* of bot doing something no good
- Rental prices dropping; $1,000/day for 2,000

Botnet prognosis

“There's no economic incentive for [a smaller] ISP to sit on the phone for an hour and a half to help a customer get [his or her machine] disinfected. The cost of that is more than the subscription cost,” said Stewart. That fact, coupled with the large percentage of computer users running Windows versions without up-to-date patches, creates an environment that's ripe for abuse.

— “Is the Botnet Battle already Lost?”, *eWeek.com*,

That was optimistic view….

On a typical day, 40% of the 800 million computers connected to the Internet are bots engaged in distributing e-mail spam, stealing sensitive data typed at banking and shopping websites, bombarding websites as part of extortionist denial-of-service attacks, and spreading fresh infections

—Rick Wesson, CEO of Support Intelligence, quoted in *USA Today*, March 2008

Bot Uses

- DDoS
- Spamming
- Keylogging and packet sniffing
- Spreading new malware
- Installing adware for profit
- Click fraud; manipulating online polls

230 dead as storm batters Europ

- Botnet of the Year: Storm.
- Born Jan. 2007
- Run for profit; 100% on Windows
- Sept. 2007 *Info Week* article claimed 2 million distinct computers sending spam per day; others: 0.15–50 million computers

What to do about DDoS attacks

- **Protect machines against compromise!**
- Turn off/refuse connections from attacking machines
- First have to identify the attacking machines

Identification of attacking machines

- Volume protects the attackers
- More machines in attack⇒fewer packets

  per attacking machine suffice
  - Really hard to distinguish low-level DOS attack from increase in business
- ⇒ Impossible to prevent very large DDoS