# CSE/EE 461 – Lecture 25

# Denial of Service

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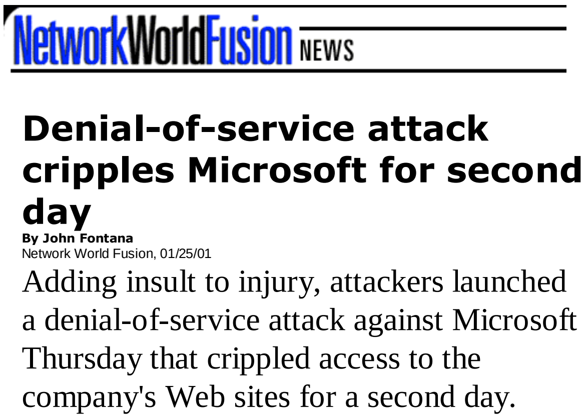
## Denial of Service in the News



NetworkWorldFusion NEWS

**Denial-of-service attack cripples Microsoft for second day**

**By John Fontana**
Network World Fusion, 01/25/01

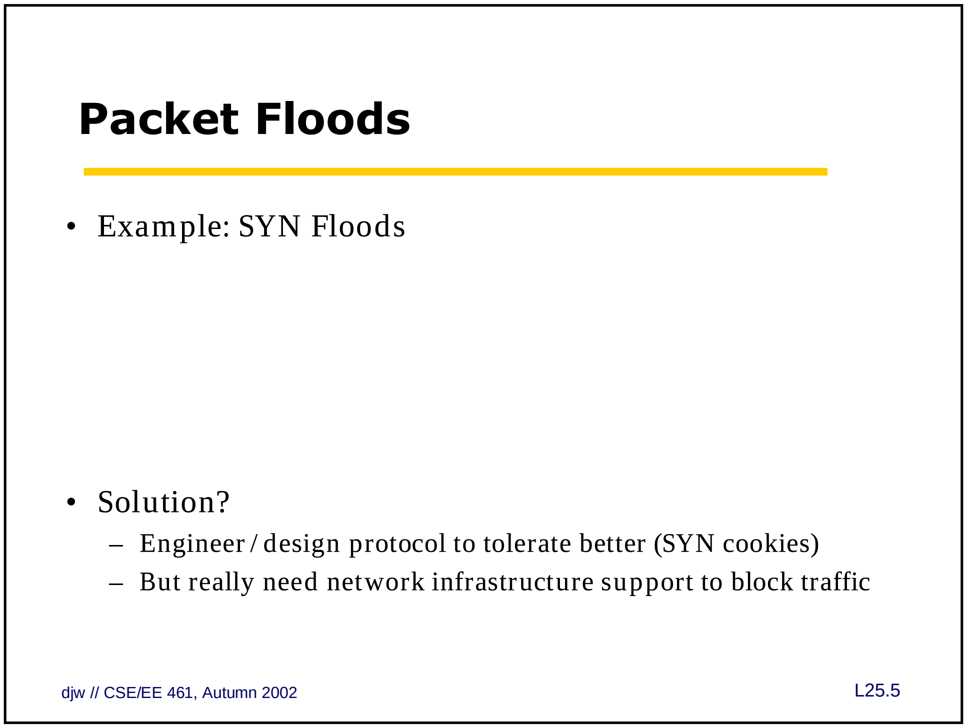
Adding insult to injury, attackers launched a denial-of-service attack against Microsoft Thursday that crippled access to the company's Web sites for a second day.

# What is Denial of Service?

- Attacker can deny service to legitimate users if they can overwhelm the system providing the service
  - System is full of bugs … just send it packets that trigger them
  - System has limited bandwidth, CPU, memory, etc. … just sent it too many packets to handle
- Big issue in practice and lack of effective solutions
  - Today, patch as found (CERT) or build implementation to tolerate DOS
  - Tomorrow, design protocols to withstand, possibly network support for shutting down attack?
- Two broad classes:
  - Nasty packets trigger implementation bugs, e.g., Ping of Death
  - Packet floods target bandwidth, CPU, memory, e.g., SYN flood

# Nasty Packet Attacks

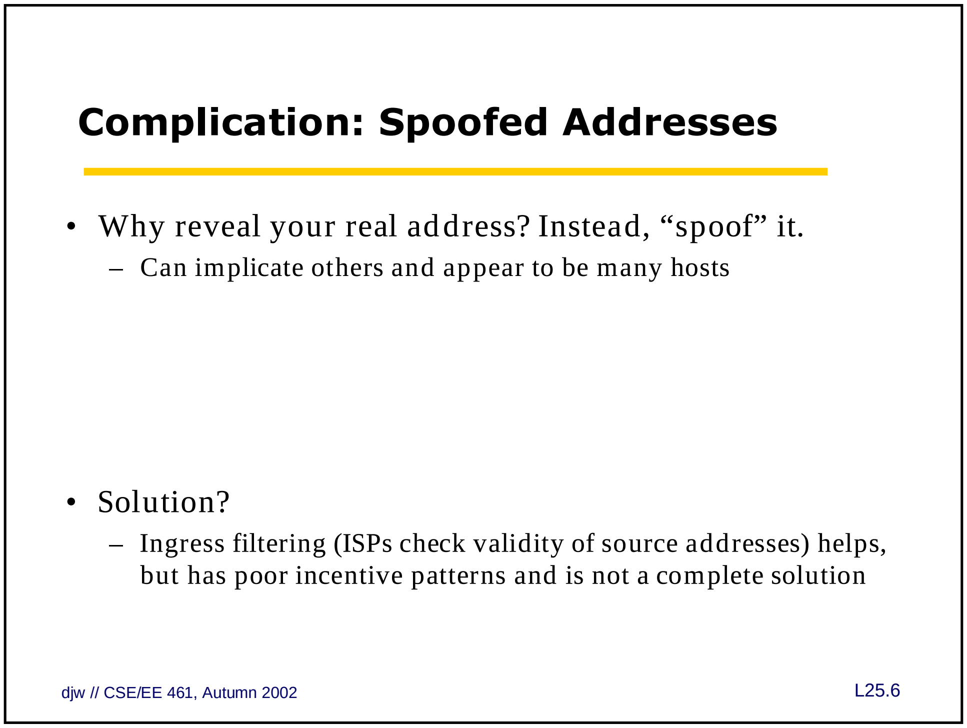
- Example: Ping of Death
- Solution?
  - Patch OS bugs



## Packet Floods

- Example: SYN Floods

- Solution?
  - Engineer / design protocol to tolerate better (SYN cookies)
  - But really need network infrastructure support to block traffic



## Complication: Spoofed Addresses

- Why reveal your real address? Instead, “spoof” it.
  - Can implicate others and appear to be many hosts

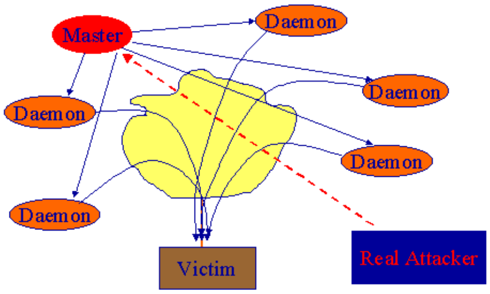
- Solution?
  - Ingress filtering (ISPs check validity of source addresses) helps, but has poor incentive patterns and is not a complete solution

## Complication: Reflectors & Amplifiers

- Some packets arriving "out of the blue" trigger a reply
  - Use this with spoofing to launder attack traffic (e.g., DNS)
  - Use with broadcast addresses to amplify attack (e.g., Smurf)

## Distributed DOS (DDOS)

- Use automated tools to set up a network of zombies
  - Trin00, TFN, mstream, Stacheldraht, …


Master
Daemon
Daemon
Daemon
Daemon
Daemon
Daemon
Victim
Real Attacker