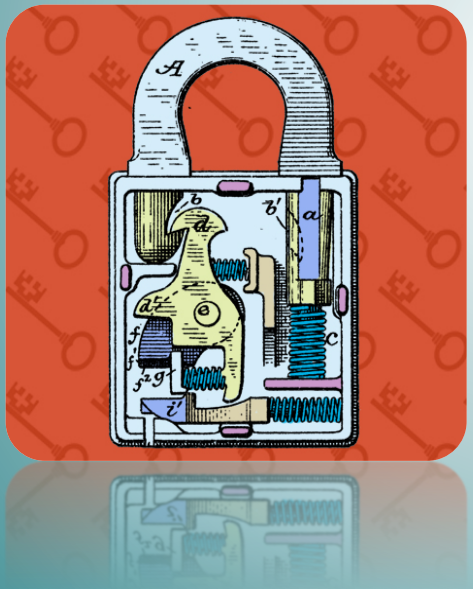
Garantía y Seguridad en Sistemas y Redes

Tema 6. Denial-of-Service



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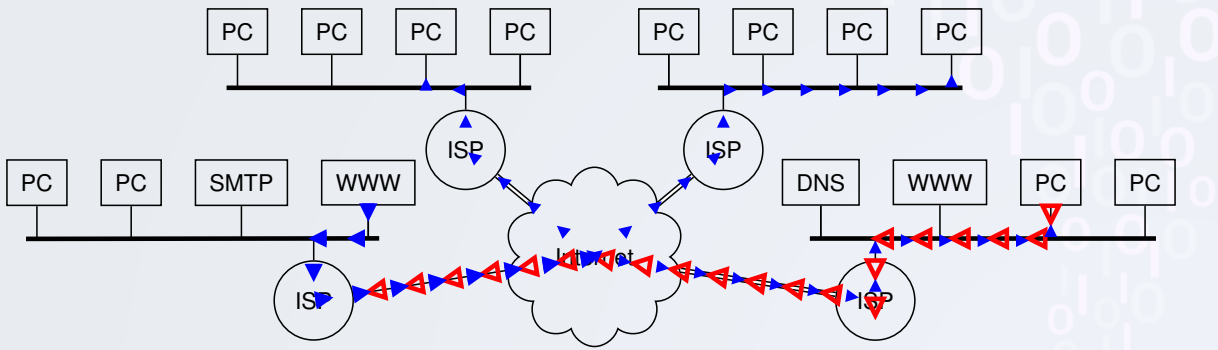
Contents

Denial-of-Service Attacks

- Criminals might find benefit in an entity not providing its service.
- This can be done by infiltrating the machine with malware.
- But also from outside with Denial-of-Service (DoS) attacks.
- They exploit flaws in the communication/services layers.
  - Request flood
  - Incomplete/delayed protocol
  - Application overload
  - Trigger bugs (**poison packet**)
- Can be **Single source** or **Distributed DoS** (DDos)

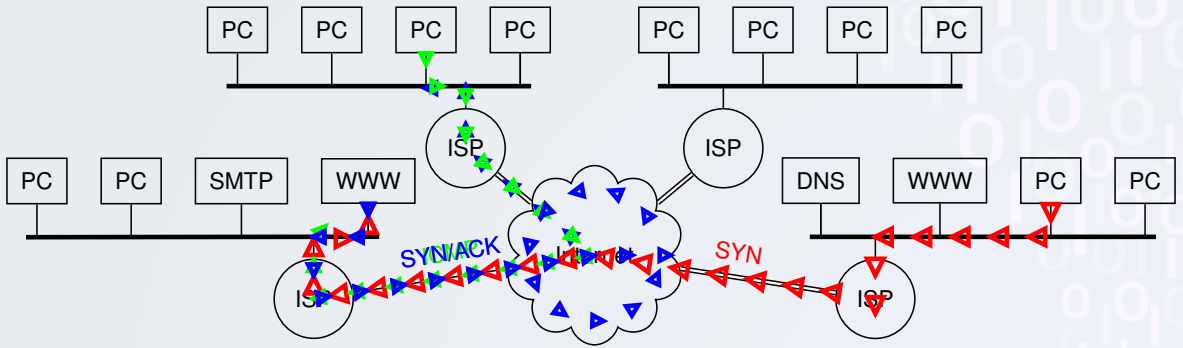
Classic DoS Attacks

- Ping flood attack. Needs has higher bandwidth than victim.
- Attacker has to deal with **backscatter** traffic and is not anonymous.
- Source address spoofing. Ping packets have spoofed source addresses.
- Active machines with spoofed addresses respond with more ICMP. Unilateral source tracing impossible.
- **Egress filtering** recommended but not widely done.



SYN Spoofing

- Attack causes recipient to overflow TCP connection request table.
- Spoofed addresses are usually unused: Timeout and retransmission.
- Attacker does not need high bandwidth.



Flooding Attacks

ICMP Flooding

- ICMP Ping is sometimes disabled to prevent attacks.
- But ICMP unreachable or time exceeded can not.
- These can be larger, thus more effective for attack.

UDP Flooding

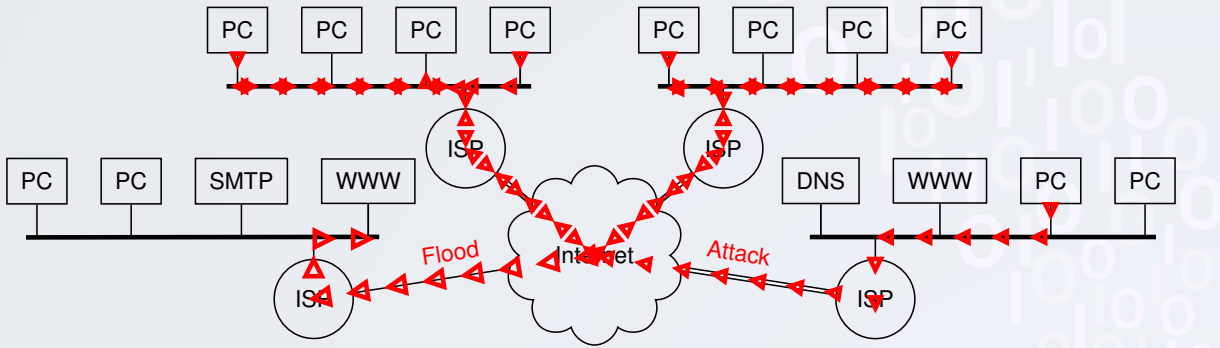
- Any port can be used.
- If listening it will emit response UDP.
- If closed system will emit ICMP unreachable.

TCP Flooding

- Generate congestion, not overload system (SYN).
- Uses data packets, with large payload.

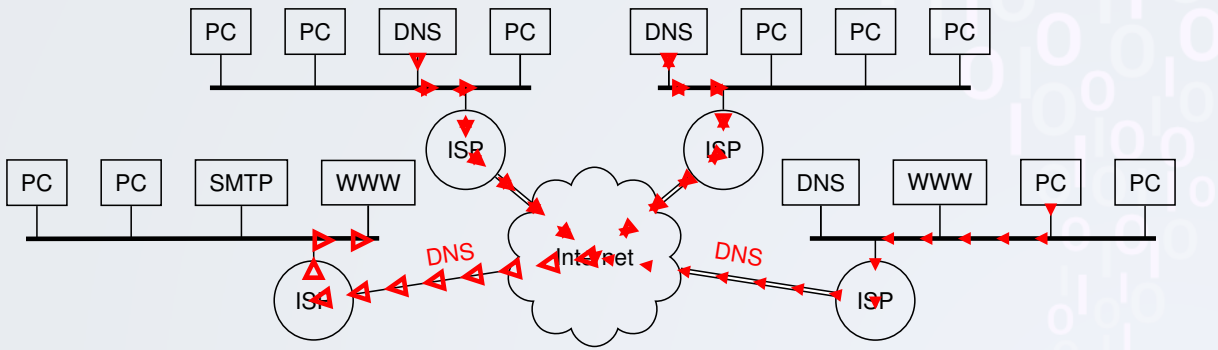
Distributed Denial-of-Service Attacks

- Botnets are used to coordinate large scale attacks.
- No need for spoofing, thus unaffected by egress filtering.



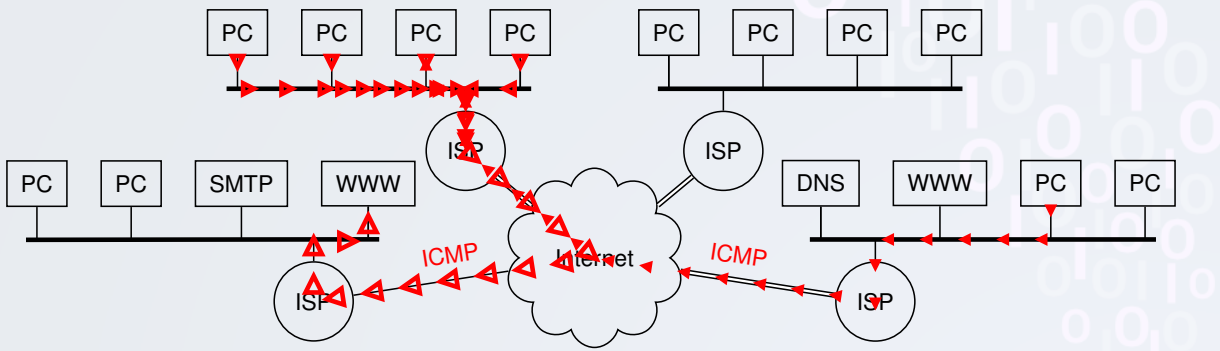
Reflection Attacks

- Send source spoofed traffic to intermediary systems.
- Service on intermediary sends larger responses to victim.
- ECHO, CHARGEN, DNS, SNMP, BGP, SYN.
- DNS: A 60-byte query can turn to a 512-byte or more response.
- Attacker regulates the use of each intermediary systems.
- Can even create loops between intermediary and victim systems.



Amplification Attacks

- Send source spoofed traffic to broadcast addresses.
- Attackers need to find intermediate networks that:
  - Allow external broadcast packets.
  - Have ICMP/UDP services open.
  - Are well connected.



Application layer attacks

Application level flood

- Target expensive server procedures or limited resources.
- Request to download large file.
- Recursively download site.
- Incomplete requests (Slowloris).

Application level attack

- Hard to spot. Legitimate application traffic: HTTP, XML...
- Target a bug, insecure feature.
- Low traffic volume. Single request DoS.
- No source IP spoofing.

Preventing DoS Attacks

What should be done?

- Outlaw source spoofing: RFC-2827.
- Throttle diagnostic ICMP/UDP.
- Ignore external broadcast packets.
- Protection against Bots.

What can we do?

- Modified TCP can work when table is full.
- Drop incomplete handshakes from table.
- Throttle lengthy queries when congested.
- Harden servers (Patching)
- Use Capcha on web servers.
- Monitoring and replication.

DOS attack response

- Seek cooperation from ISP:
  - Contact must be possible without network.
  - Plan and establish protocols and responsibilities.
- Within an organization:
  - Implement solidarity measures.
  - Automated network monitoring and intrusion detection.
  - Know your traffic pattern. Notice the trouble before the users complain.
- During attack:
  - Analyse traffic and identify type of attack
  - Implement specific filters at ISP.
  - Bug attack must be identified and corrected in the future.
  - Switch to alternate backup servers.
  - Provide service on different address.
  - Trace origin of attack?