

Operational Security

Peter Levinsky, Roskilde, Datamatiker

15.11.2021

Firewall – Survey

- Purpose of a Firewall
 - To allow ‘proper’ traffic and discard all other traffic
- Characteristic of a firewall
 - All traffic must go through the firewall
 - Allow and blocking traffic
 - The Firewall itself should be immune of attacked

Firewall – possibilities

- 5(6) areas to control:
 - Services (web, ftp, mail ...) i.e. Port#
 - Network (hosts) i.e. IP addresses
 - Direction i.e. control inside-out or reverse
 - User i.e. only authorized users allow
 - Behaviour (e.g. attachment to mail)
 - (Denial of Service Inspection)

Firewall – solutions

- Solutions:
 - HW – screening router
 - SW – Computer Based (build in the OS)
 - SW – dedicated Host Firewall

Firewall – limitations

- 3 limitations of Firewalls
 - Cannot protect against traffic not running through the firewall (obvious!!)
 - Cannot protect against threats from inside (e.g. as the school network)
 - Cannot protect against viruses (i.e. they come in by legal traffic)

Firewall – Types

- 3 types of Firewalls
 - Packet-filtering
 - Packet-filtering – with state-full inspection
 - Application- gateways

Firewall – Packet-filtering – Layer 3

- Level 3 – network (IP-packets)
 - Filtering on (the access control list):
 - Source/Destination IP-addresses
 - Source/Destination Port-numbers
 - IP-protocol field (e.g. icmp, tcp, egp)
 - TCP-direction (SYN-bit)
 - IN / OUT on each interface
 - ICMP message type

Firewall – Packet-filtering

- Configurations
 - Policies:
 - 1:optimistic: default set to allow
 - 2:pessimistic: default set to discard (normal)
 - Setting up rules

Firewall – Packet-filtering

- Weakness
 - Cannot ‘look’ into appl. Level information
 - Limited logging information
 - Do normally not support authentication
 - Can be attack by weakness in IP (e.g. IP-spoofing)

Firewall – Packet-filtering

- Stateful - inspection
 - Normal packet-filtering only look at one packet at a time.
 - Stateful packet-filtering can **remember a sequence** of packets.
(can be used to detect spoofing)

Firewall – Application-level – Layer 5

- Level 5 Application gateway
 - Using Proxy Servers
(e.g. a mail-client and a mail-server)
- Spilt connections into 2
(one for inbound and one for outbound)

Firewall – Application-level

- More secure
 - Stateful inspection even more developed
 - User authentication are used
- Weakness
 - slow-down performance
 - need to have proxies for all services

Intrusion System

- Deep packet inspection
 - Read and remember history of packets
- Two types
 - Intrusion **Detection** System (IDS)
 - Send alert if behaviour is odd
 - One implementation snort (open source / Linux)
 - Intrusion **Prevention** System (IPS)
 - Filter out suspicious packets

Firewall – Architecture

- One recommended solution:
- Screened subnet firewall MOST secure
DMZ – demilitarized zone
(2 packet-filter + bastion host on the net (DMZ) in between)
- Home Firewall
like ZoneAlarm/Windows-firewall