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Revision Session

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CSC3064 Revision Session

School of Electronics, Electrical Engineering and Computer Science

CSC3064 Schedule

Week 1 (14): Introduction to Network Security	Week 2 (15): Network Security Architecture	Week 3 (16): Security of Internet Protocols	Week 4 (17): Security of Internet Protocols
Week 5 (18): Tunneling and VPNs	Week 6 (19): AAA and Firewalls	Week 7 (20): Intrusion Detection/ Protection Systems	Week 8 (21): Network Security Administration
Week 9 (22): Incident Mgmt./ Network Forensics	Week 10 (23) Denial of Service	Week 11 (24): Cloud/Virtualization Wireless/Mobile	Week 12 (25): Review/Q&A

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Content for final class test

- Tunneling and VPNs
- AAA and Firewalls
- IDPS
- DoS
- Cloud/Virtualization
- Wireless/Mobile

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Tunneling and VPNs - Summary

- IP Filtering
- Network Address Translation – Static, Dynamic
- Virtual Private Networks
  - Types e.g. Network-to-network etc.
  - Point-to Point Tunneling Protocol
  - PPTP vs. L2TP

- IPSec
  - Security Objectives
  - Security Association, Security Policy Definition, SA Database
  - Transport/Tunnel Mode
  - Authentication Header/Encapsulating Security Payload
  - Issues with IPSec

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How to study/revise Tunneling and VPNs

- Can you explain how to filter packets?

- Can you explain how Network Address Translation (NAT) works?
- Could you draw a picture of a network with the location of NAT on it?
- Can you identify a private IP address?

- Can you describe what a virtual private network is for?
- Could you list the VPN protocols that we discussed?
- Do you understand what part of the communication path is protected with the VPN?
  - i.e. depending on where the tunneling protocol is applied

- Can you explain the security objectives of IPSec?
- Can you explain the difference between IPSec transport mode and tunnel mode?
- Can you explain the difference between Authentication Header and Encapsulating Security Payload?
- Could you identify the protocol and mode to apply for a specific communication e.g. POP3 example?
- Could you describe IPSec replay protection?
- Can you identify the issues with IPSec?

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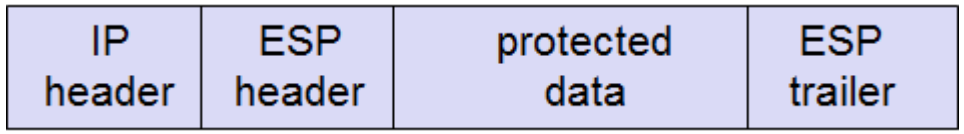
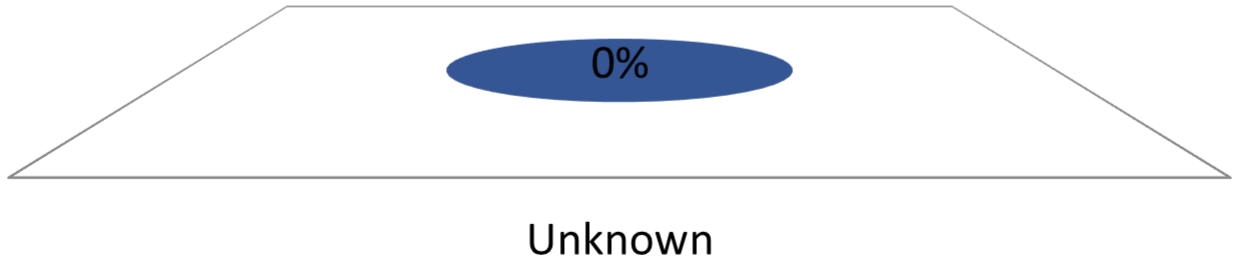
Which IPSec packet type is shown in the figure and what security protection does it provide?





AAA and Firewalls - Summary

- Network Access Control
- Authentication, Authorization, Accounting
    - RADIUS - Networking protocol providing centralized AAA services
    - Kerberos – Network Authentication Protocol
- Network Access Enforcement
    - IEEE 802.1X port-based Network Access Control
    - IEEE 802.1Q virtual local area networks (VLANs)
- Firewalls
    - What they can and can’t do
    - Default permit/default deny strategies
    - Types: Packet Filtering, Stateful Inspection, Application Proxy, Next Generation Firewalls
    - Deployment: Bastion Host/DMZ
    - Example Ruleset

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How to study/revise AAA and Firewalls

- Can you explain network access control?
- Can you define AAA i.e. what does each A mean?
- Can you briefly explain the steps in a AAA service such as RADIUS or Kerberos?

- Can you explain how port-based network access control (IEEE 802.1X) works?
- Can you describe what a virtual local area network (IEEE 802.1Q) is for?

- Can you explain what firewalls can and cannot do?
- Do you understand the differences between the various firewall types e.g. which firewall would you use for different types of protection?
- Can you explain the De-militarized zone (DMZ)?
- Given a firewall rule, could you explain what traffic is allowed/denied at the firewall?

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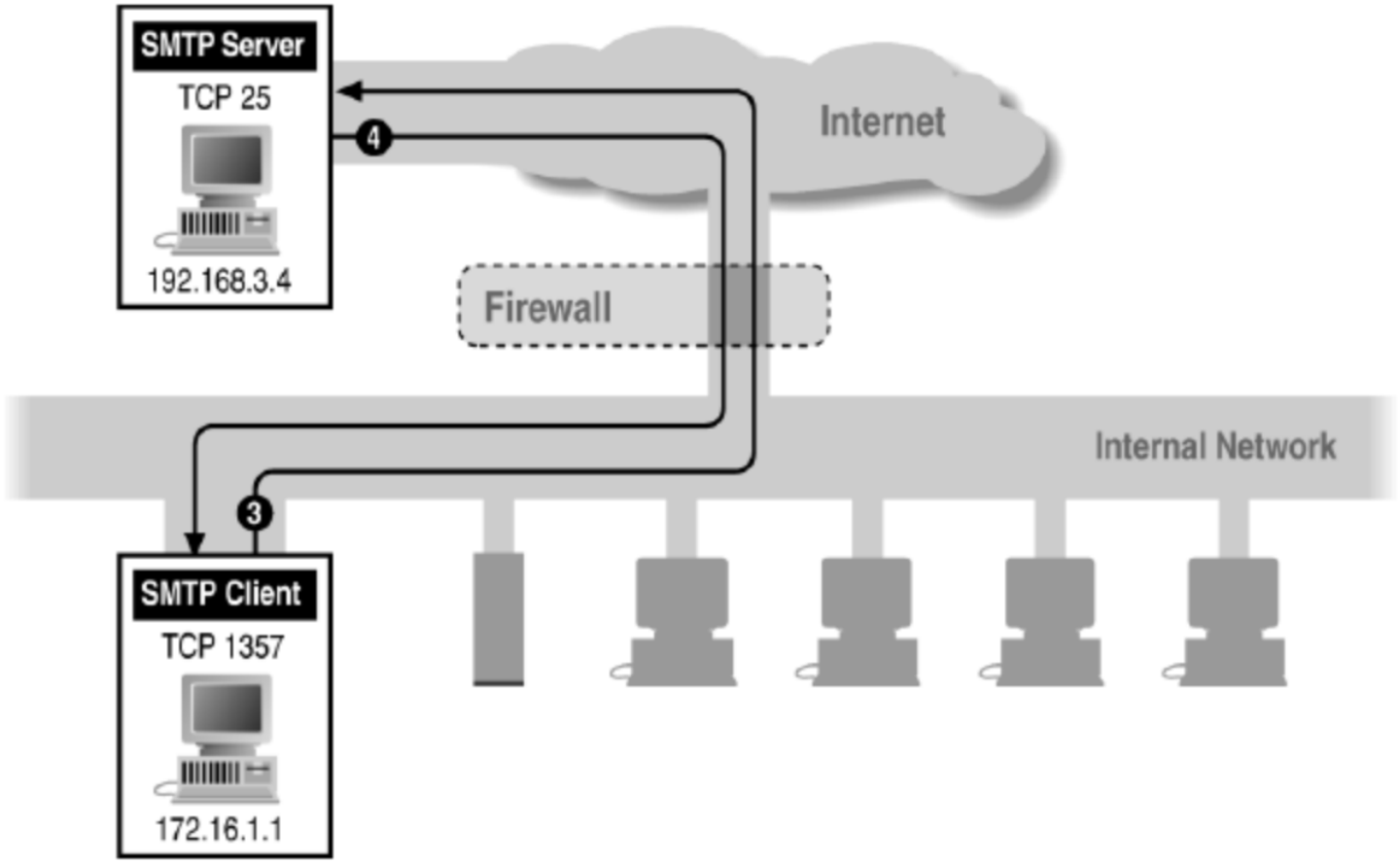
Example Question

Write the firewall rule to enable outbound SMTP traffic as shown in the figure. Fill in the blanks to create the firewall rule. Src Address: [ ], Dst Address: [ ], Protocol: TCP, Src. Port: [ ], Dst. Port [ ], Action: [ ]. Fill in the blanks to identify what additional fields should be set to improve the filter protection. The [ ] of the traffic should be added and the [ ] should be checked. [3 marks]



IDPS - Summary

- Intrusion Detection Systems
  - Host-based (HIDS), Network-based (NIDS)
  - Signature-based detection
  - Anomaly-based detection
- IDS Evasion
- Problems of IDS
- Intrusion Prevention System Approaches
- Unified Threat Management

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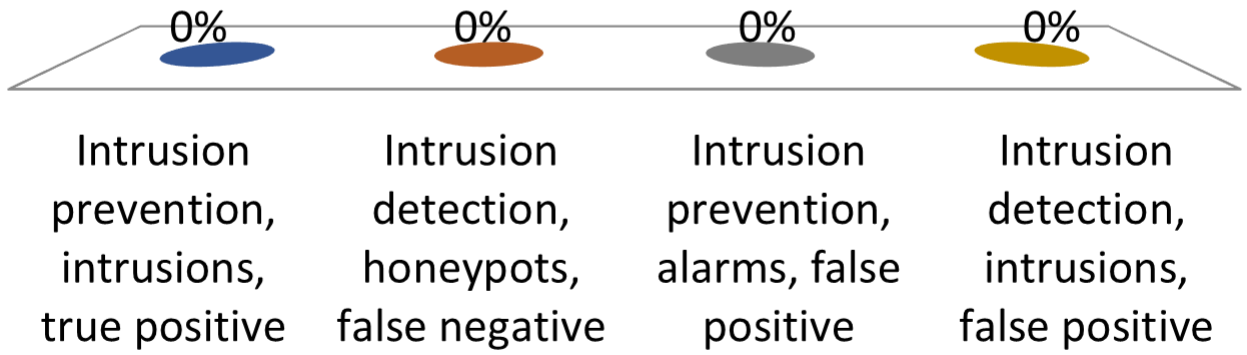
How to study/revise IDPS

- Can you define a network intrusion?
- Can you identify examples of intrusions?
- Can you explain the goals/objectives of network intrusion detection systems?
- Can you explain detection quality i.e. accuracy, sensitivity, precision and FP/FN/TP/TN?
- Can you compare host-based IDS with network-based IDS?
- Can you explain the difference between signature-based detection and anomaly-based detection?

- Can you identify and describe some of the problems with IDS?
- Can you explain the pros/cons of intrusion prevention systems e.g. race conditions?
- Can you describe a honeypot?
- Can you describe unified threat management?

To be of practical use, an _____ _____ system should detect a substantial percentage of _____ while keeping the _____ _____ rate at an acceptable level.

A. Intrusion prevention, intrusions, true positive
B. Intrusion detection, honeypots, false negative
C. Intrusion prevention, alarms, false positive
✓ D. Intrusion detection, intrusions, false positive



(D)DoS - Summary

- What is a (D)DoS?
- Attack techniques: Resource destruction, reservation, depletion
- Attack types: Amplification attacks, SYN Flooding attacks – low rate, massive, DNS DoS, DoS via route hijacking, DoS at higher layers
- Attack network topologies

- DDoS Countermeasures/Defences
  - Client Puzzles
  - Ingress Filtering
  - Traceback/Edge Sampling
  - Rate-Limiting
- Recent DDoS attack methods

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How to study/revise (D)DoS

- Can you describe a denial-of-service attack?
- Can you explain the DoS attack techniques e.g. resource destruction, reservation and depletion?
- Can you describe some (D)DoS attacks e.g. amplification, reflection etc.?
- Can you describe the operation of a botnet?

- Can you identify the stages of DDoS defense i.e. before, during and after attack?
- Can you describe some defenses against DoS attack techniques e.g. resource destruction etc.?
- Can you explain the pros/cons of where you place the DDoS defense?

- Can you explain how a client puzzle works?
- Can you explain how ingress filtering works?
- Can you explain how traceback/edge sampling works?
- Can you explain how rate limiting works?

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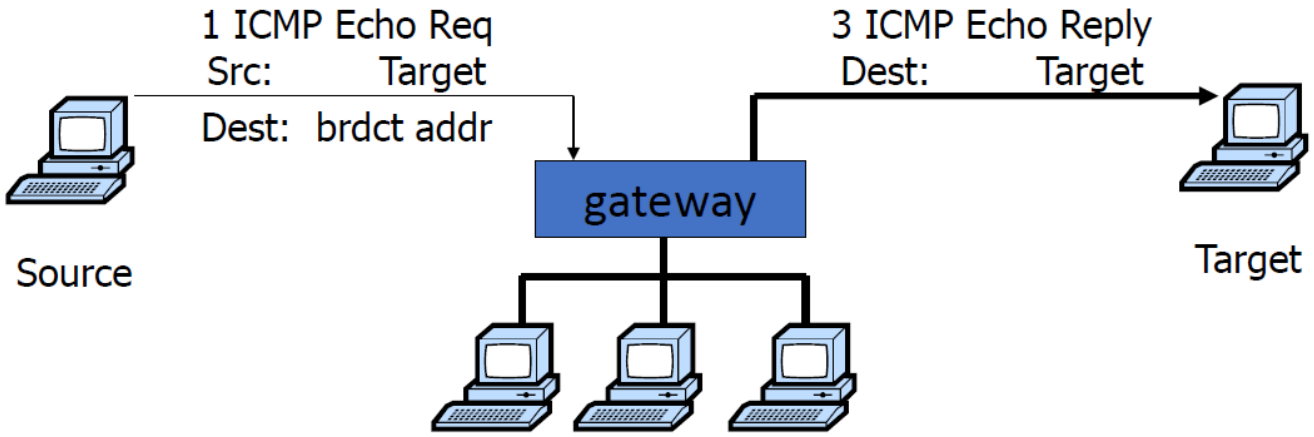
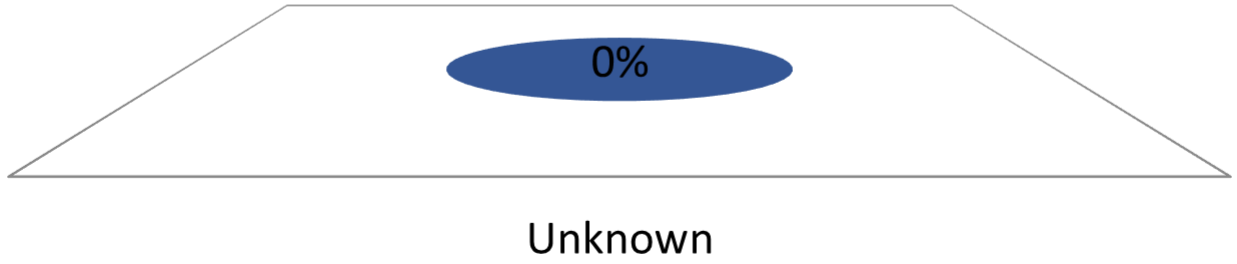
What specific network attack is shown in the figure?





Cloud/Virtualization Security - Summary

- Cloud Computing – Definition, Elements, Roles
- Cloud security threats and countermeasures
- Cloud Security Alliance – Security Guidance
    - Virtualization and Containers
    - Incident Response
    - Security as a Service

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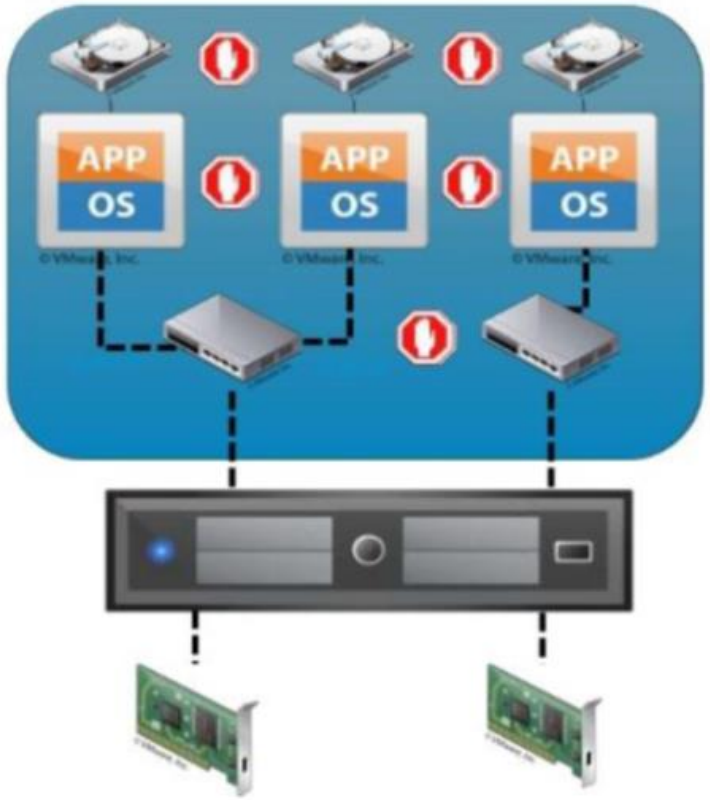
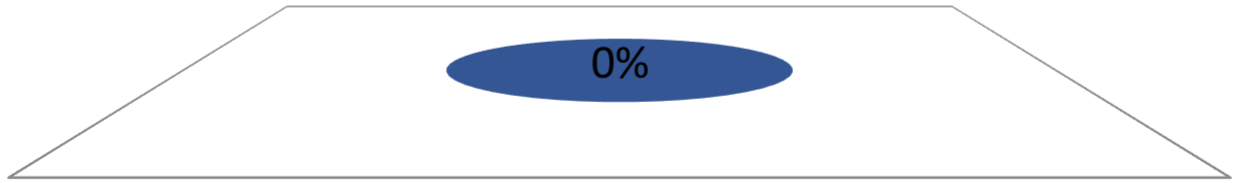
How to study/revise cloud/virtualization security

- Can you identify the five essential characteristics, three service models, and four deployment models of cloud computing?
- Can you identify the cloud actors and their roles?
- Do you understand the security responsibility with respect to the three cloud computing service models?
- Can you identify the cloud security threats and their relevant countermeasures?
- Can you describe the security challenges in virtualization and the security recommendations?
- Can you explain the security recommendations if adopting cloud security as a service?

What virtual network security recommendation is illustrated in the figure?





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Wireless/Mobile Security - Summary

- Security aspects of mobile communication
- Security aspects of wireless communication
- IEEE 802.11 security claims/issues
- IEEE 802.11i (Robust Security Network)

How to study/revise wireless/mobile security

- Can you identify the main security issues with mobile devices?
- Can you identify the main security issues with wireless devices?
- Can you identify threats unique to the wireless network?

- Can you explain the security claims of IEEE 802.11 and the issue with these claims?
- Can you describe the security provided by Robust Security Network (RSN)/IEEE 802.11i?

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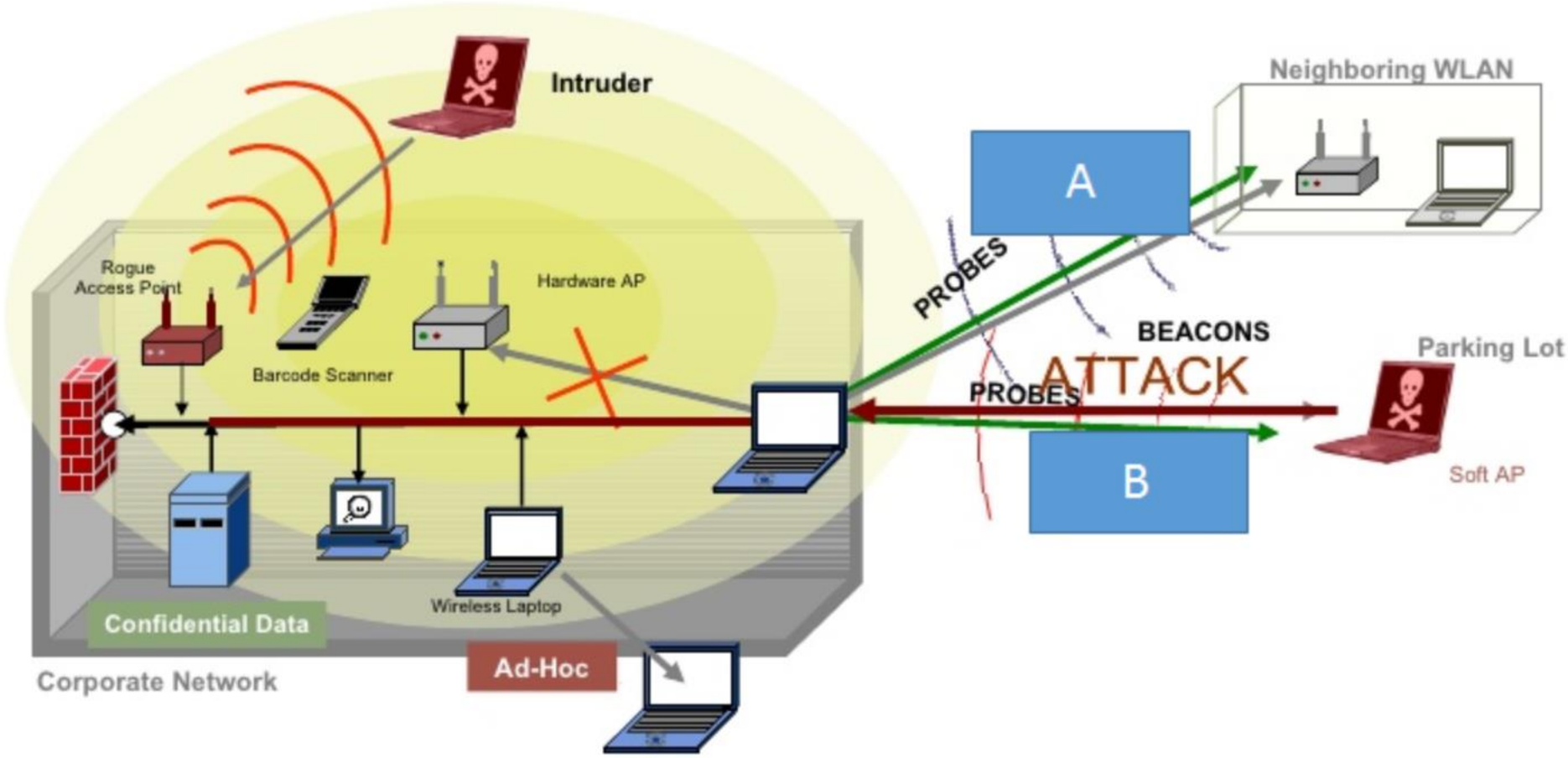
Example question

Identify and briefly describe the two wireless network threats indicated by Boxes A and B in the figure. [4 marks]



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Test Structure

- 1 hour
- 20 Questions
- QuestionMark e.g. Multiple Choice, Matching, Short Essay Response

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Questions?

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