Introduction to Network Security

Chapter 12

Network-Based Mitigation

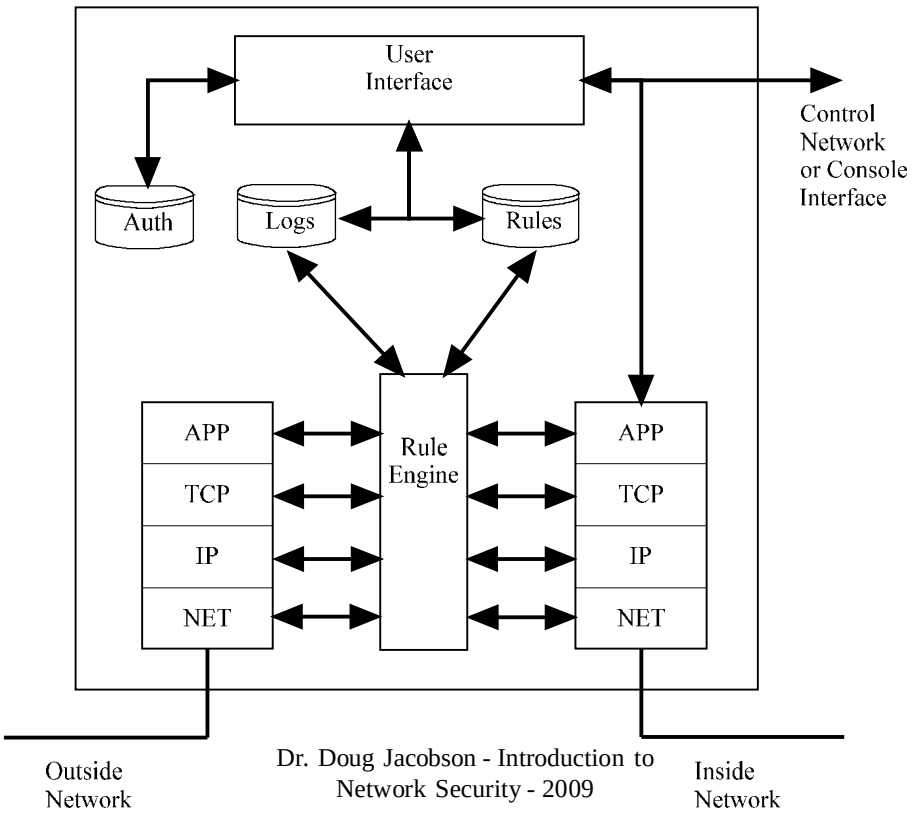
Topics

- Network-Based Mitigation
  - Network Firewalls
  - Intrusion Detection and Prevention
  - Data Loss Prevention

Network Firewalls

- Designed to “look” at each packet on the network and decide if the packet should be allowed to pass through the firewall or not.
- Uses set of rules to decide if the packet should be blocked
- Rules are typically based on the packet headers (IP & TCP)
- Public domain versions are available

Firewall



Firewall Rules

- Stateless
  - Each packet is independent
  - Very fast and simple to implement
  - Only simple rules
  - Example: block all UDP but port 53
- Stateful
  - Deals with packet streams
  - Slower and requires more resources
  - Can implement complex rules
  - Example: Block all port 53 unless there is a pending request.

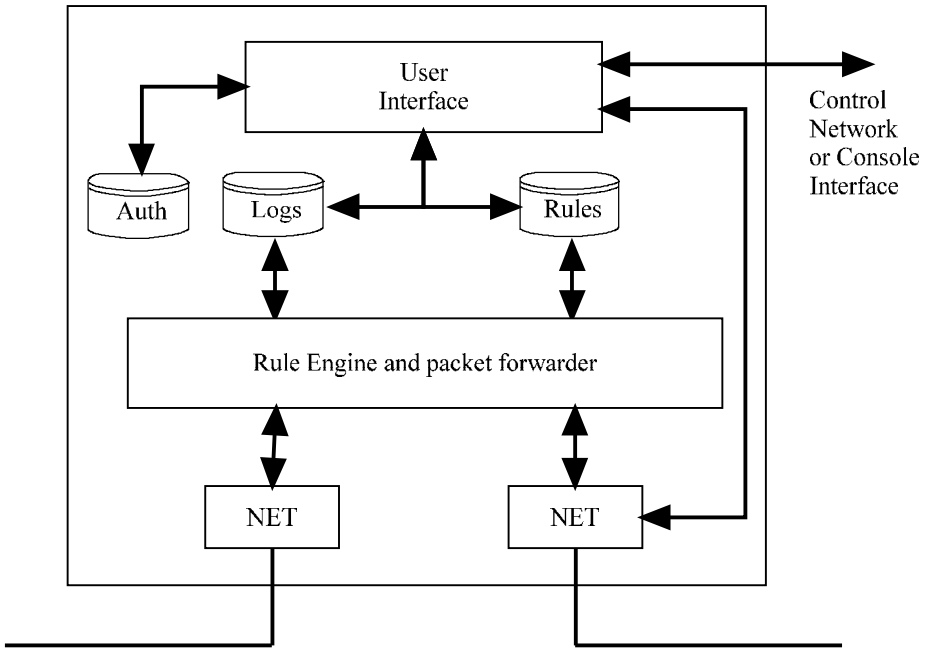
User control

- GUI on the device
- Network based
  - Typically password protected
  - Only allows access to control interface from inside network
  - Can use a separate control network

Firewall types

- Transparent
- Router-based
- NAT-based
- Application

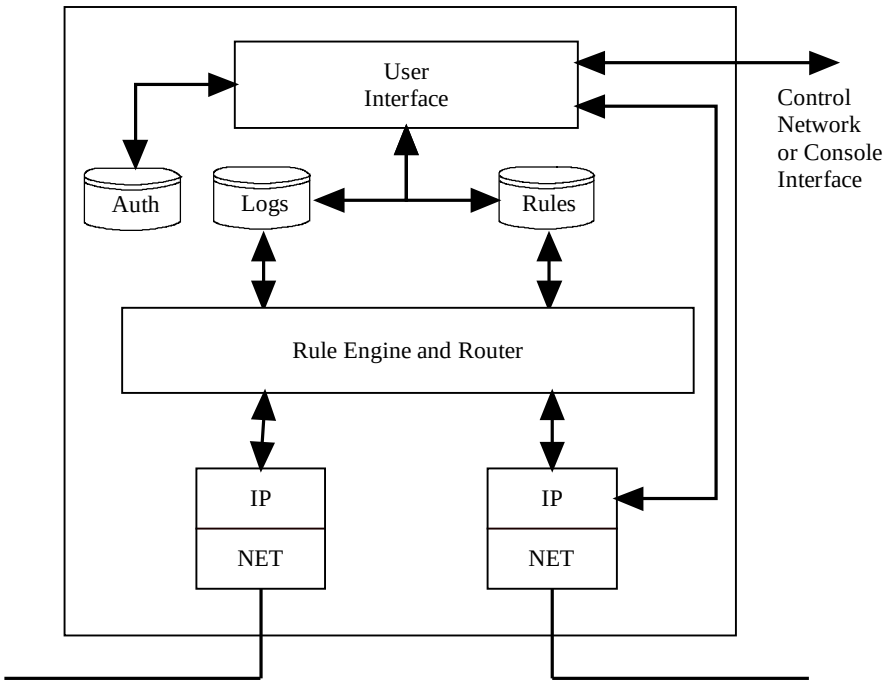
Transparent Firewall



Transparent Firewall

- Two network interfaces
- “sniff” traffic
- Does not have an IP layer for the packet flow
- No need to change network configuration
- Can be implemented as a single port firewall
- Typically simple rule set (mostly stateless)

Filtering Router



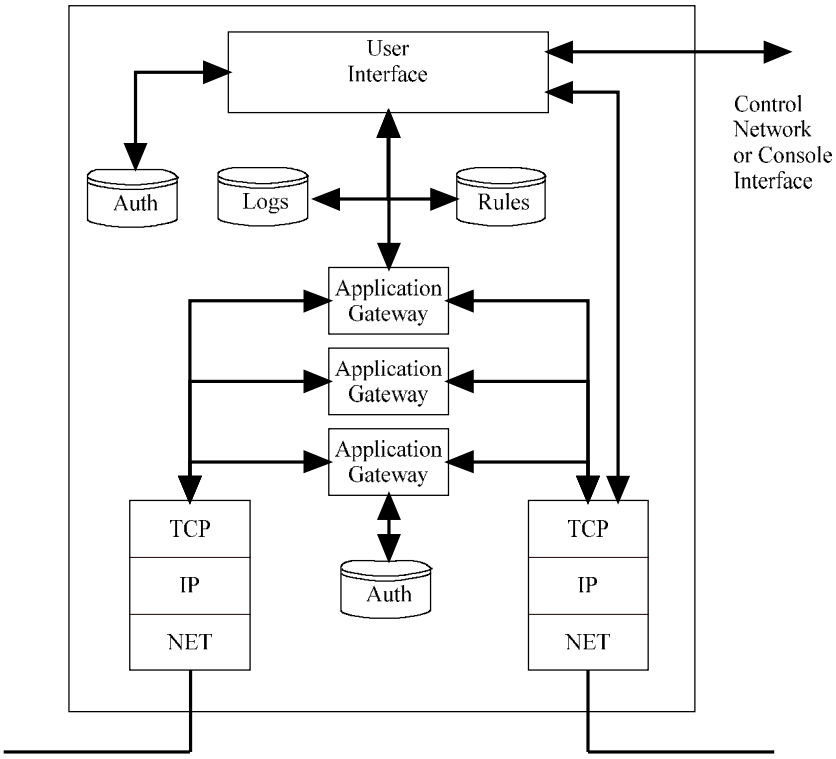
Filtering Router

- Acts like a normal router
- Both stateless and stateful (with simple rules)
- Often some stateless firewall functionality included in most routers

NAT-Based

- Implemented as part of a NAT
- Firewall rules can restrict traffic even more than a normal NAT

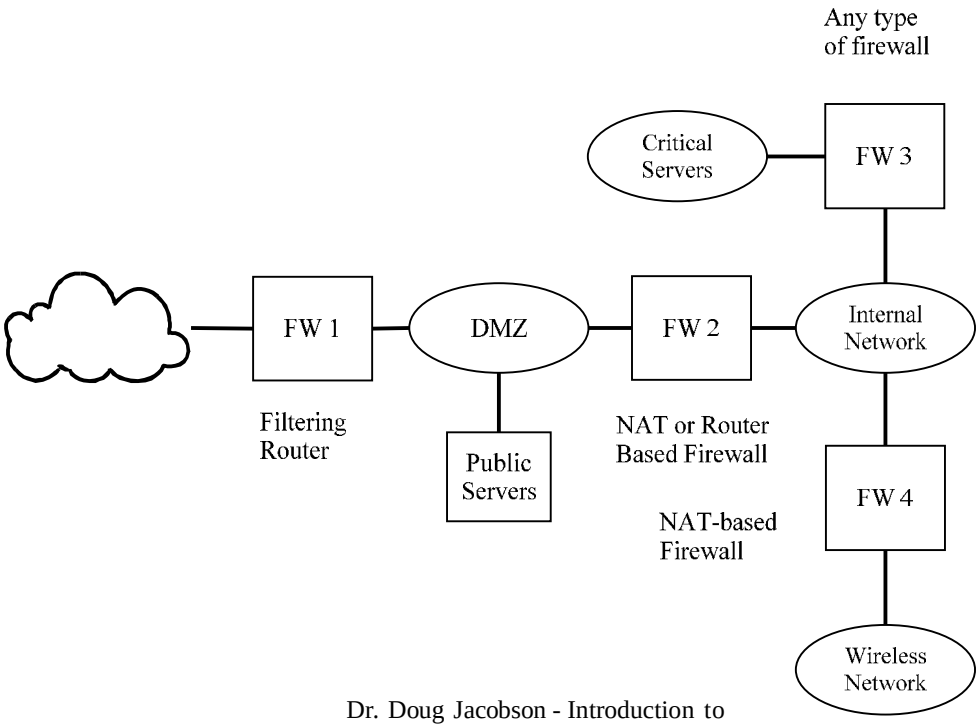
Application Firewall



Application Firewall

- Uses application gateways to allow a user to gain access through the network.
- Application gateways look like an application and typically require user-based authentication to gain access through the firewall.
- Also typically supports NAT functionality for applications without a gateway

Firewall Deployment



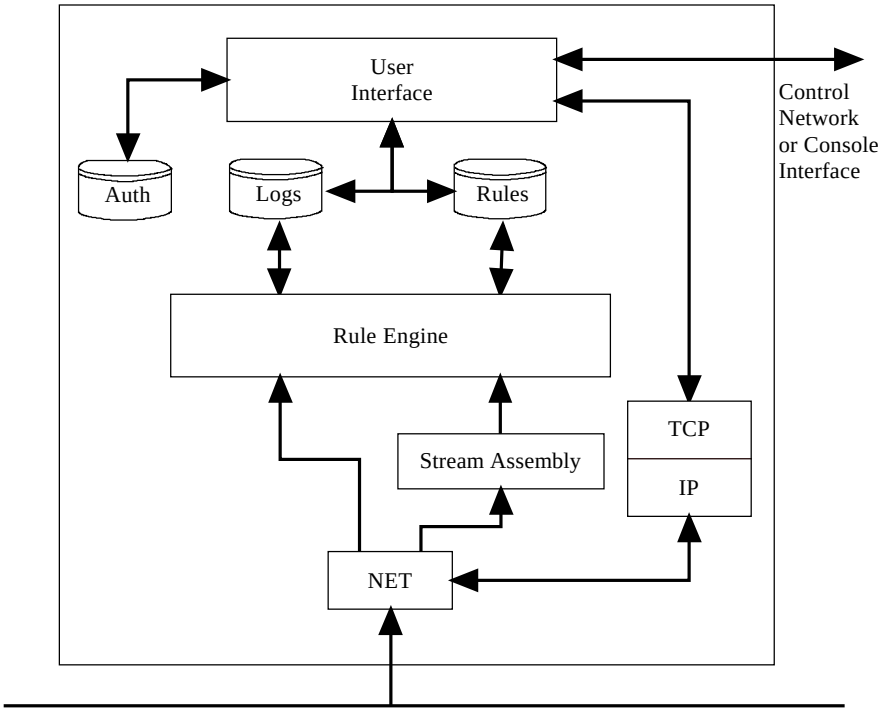
Firewall Deployment

- DMZ
  - Used to support public servers

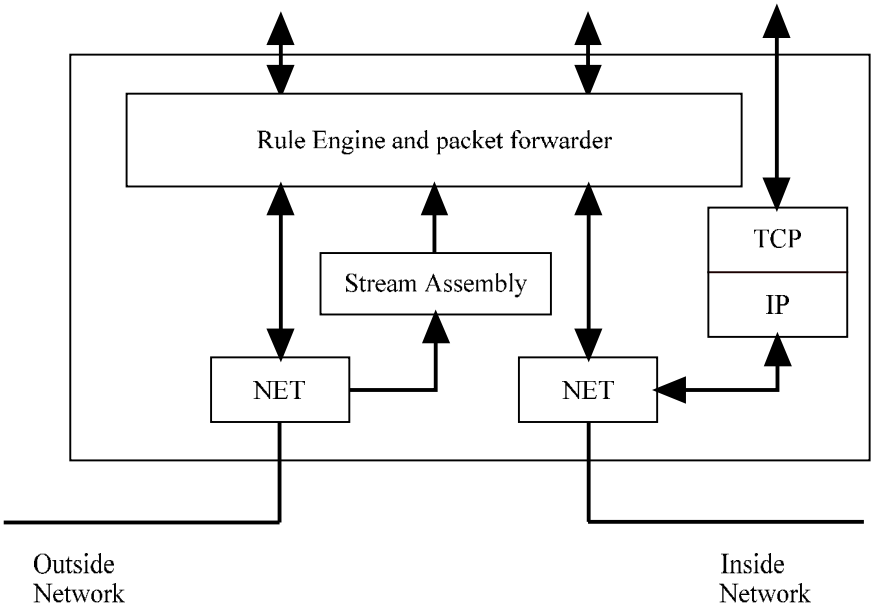
Intrusion Detection/ Prevention

- IDS
  - Watches the network traffic looking for traffic patterns that could be an attack
- IPS
  - Same as an IDS, but will also block traffic based on rules

Intrusion Detection



Intrusion Prevention

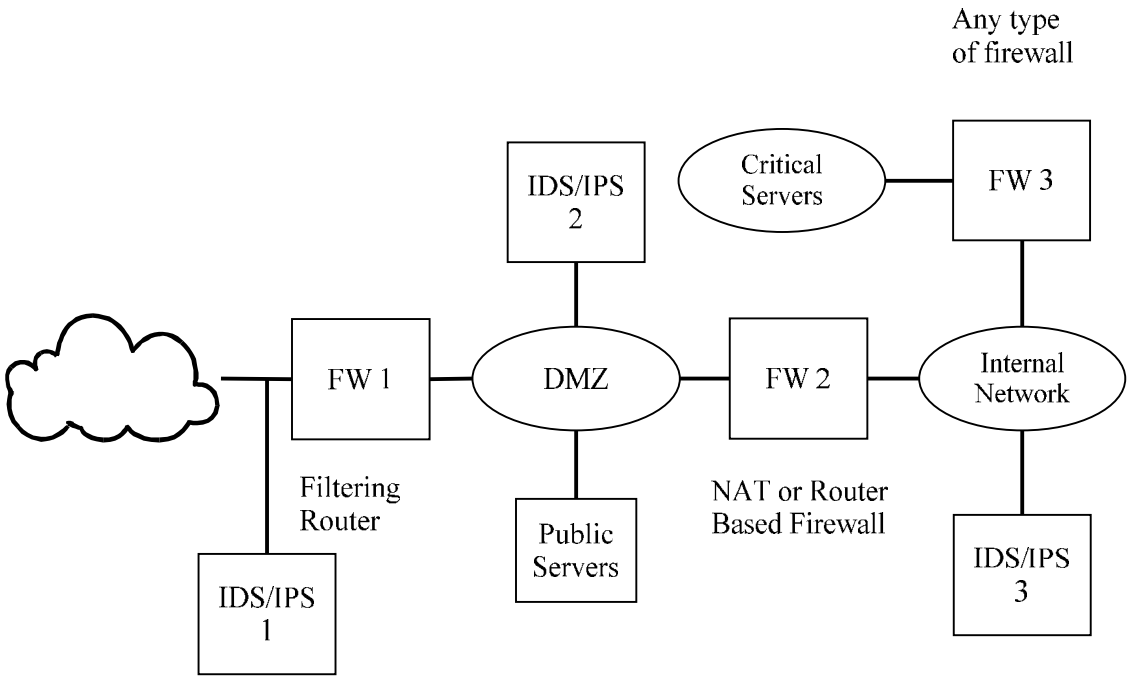


Intrusion Prevention

IDS/IPS rules

- Correctly identify the attack
- False Positives
  - Identifying an attack that is not there
- False Negative
  - Missing an attack
- Balance between the false positive and false negative rate is difficult
- Large log files are hard to deal with

IDS/IPS Deployment



Data Loss Prevention

- Stop data from leaving an organization
- Like an IDS/IPS except it looks at the payload
- Two data types
  - Structured: data that can be matched to a list like credit card numbers
  - Unstructured: data like letters or memos

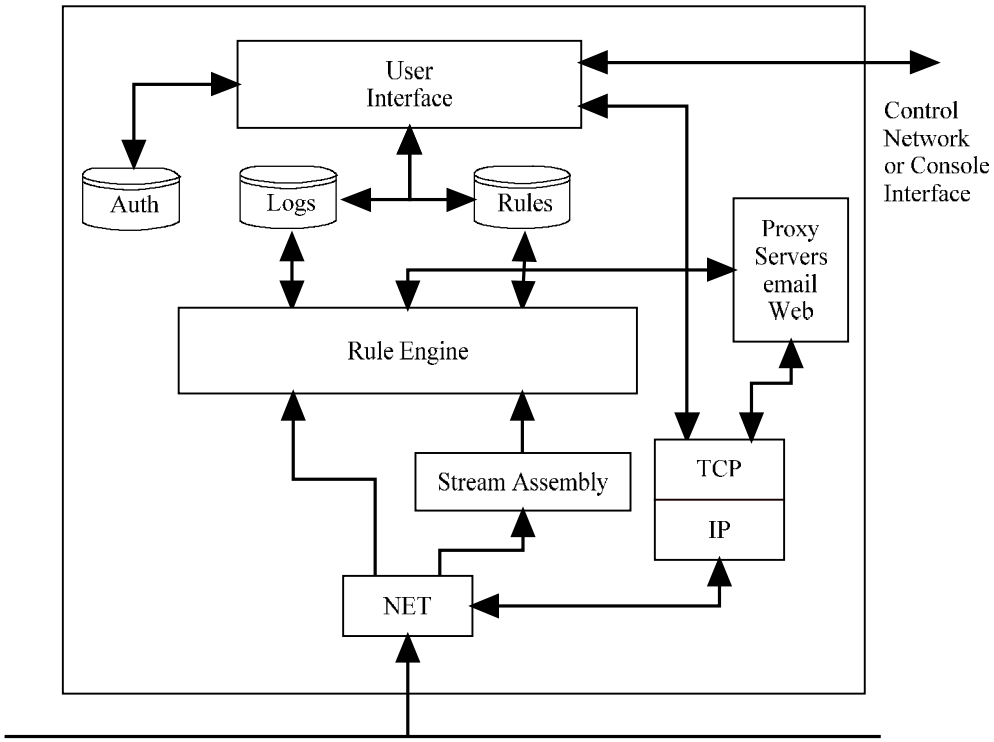
DLP

- Structured data
  - Pattern matching
- Unstructured
  - Fingerprinting
  - Lexical analysis

DLP

- What to do when you find data leaving
  - Block
  - Log
  - Redirect or quarantine

Single Port DLP



Single Port

Dual port DLP