University of BRISTOL

Computer System- B Security

Introduction to Network Security

Intrusion Detection Systems

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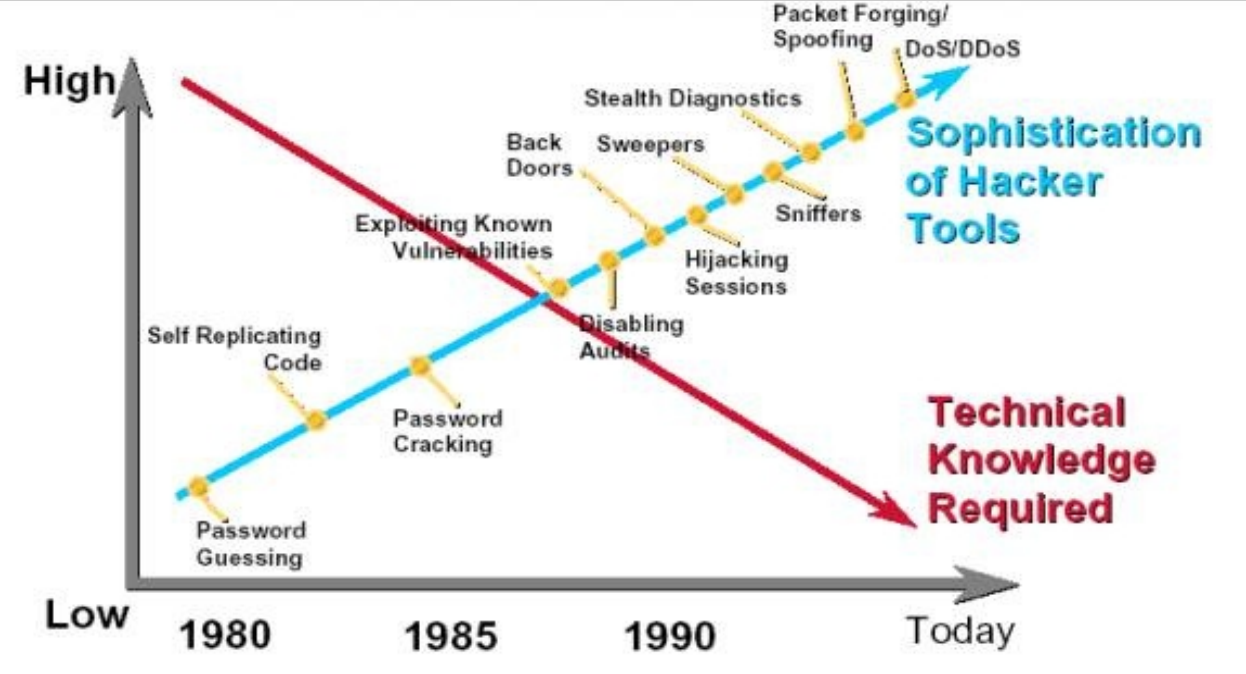
Intrusions

- DARPA IDS Evaluation Project 1998 attack categories[1]:
  - Probes (e.g. port scanning, fingerprinting)
  - Denial of Service (DoS) (e.g. packet flooding, crash)
  - Remote to Local (R2L)
  - User to Root (U2R)

1. http://www.ll.mit.edu/mission/communications/cyber/CSTcorpora/ideval/docs/attackDB.html

Attacker's Picture



Curtsey: Internet source

3

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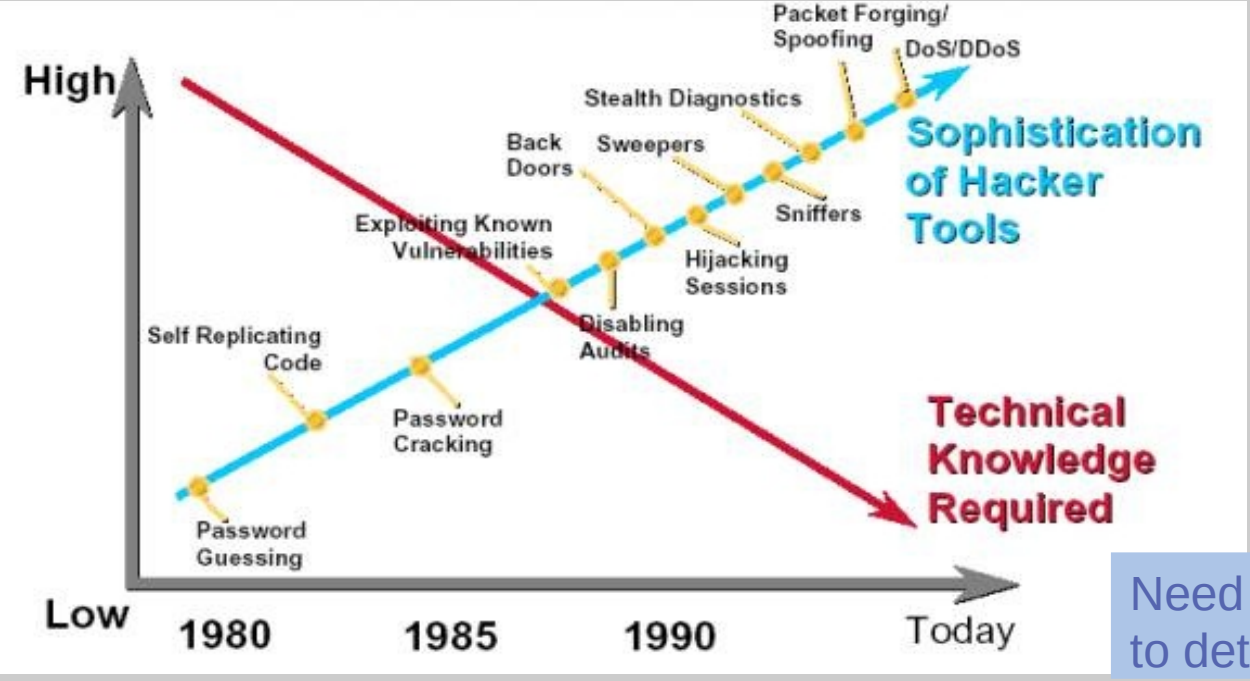

Need of automatic ways to detect them!

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Intrusion Detection Systems

What is intrusion detection?

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- Intrusion detection is the process of monitoring the events occurring in a computer system or network and analyzing them for signs of *intrusions,* defined as attempts to compromise the confidentiality, integrity, availability, or to bypass the security mechanisms of a computer or network.

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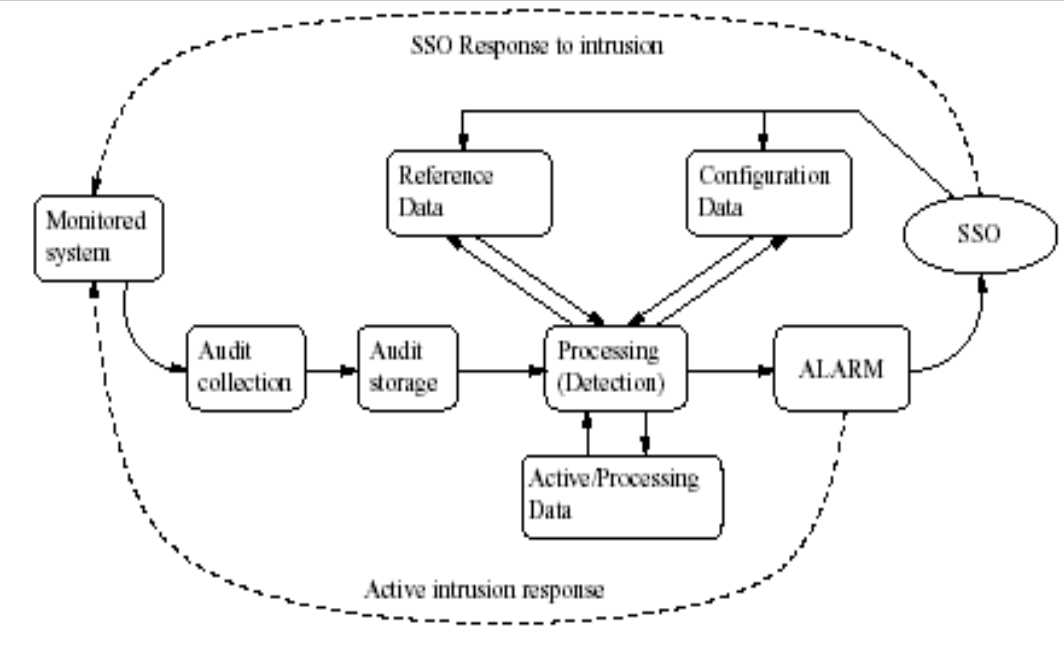
- The ability to identify a perpetrator.
- The ability to discover new attack patterns.
- The ability to produce evidence.

Generic IDS Architecture



From Wenke Lee et. el

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- **Advantages and Disadvantages**

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- Provide better security against DOS attacks(?)

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- Current network-based monitoring approaches may not efficiently handle high-speed networks.
- Most of Network-based systems are based on predefined attack signatures--signatures that will always be a step behind the latest underground exploits (zero-days)

Host based IDS (HIDS)

- HIDS runs on the system, it is protecting.
- It has better information about the health of the system- more sources of information.
- HIDS are better at detecting more sophisticated attacks.
- OS dependent.
- *For HIDS, reverse the points for advantage/disadvantages of NIDS*
- *Example: Anti-virus software*

Measuring the effectiveness

- Obviously, not every attack can be detected by an IDS and not every alert by an IDS is an attack!

Actual ↓ / Reported →	Attack	Not-attack
Attack	True positive (TP)	False negative (FN)
Not- attack (benign)	False positive (FP)	True negative (TN)

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Ideally, one would like to have 0 FP and 0 FN

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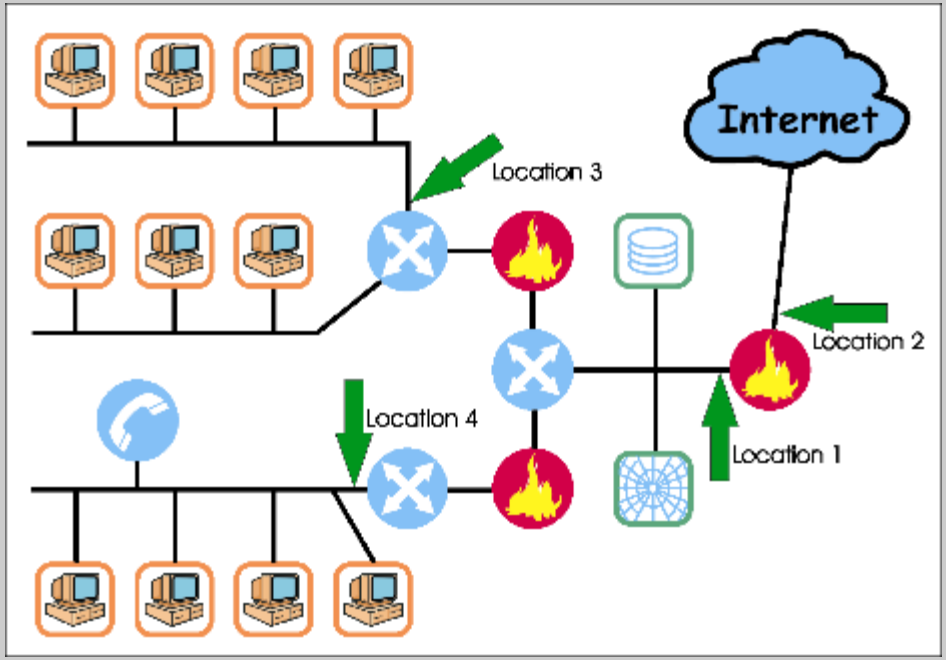
  - Anomaly Detection:
    - identifies abnormal unusual behavior (anomalies) on a host or network
    - Good at detecting new attacks
    - High rate of false positive
    - Often use statistical properties to learn profile

Current Trend in IDS

- Future research trends seem to be converging towards a model that is hybrid of the anomaly and misuse detection models.
- It is slowly acknowledged that neither of the models can detect all intrusion attempts on their own.

Deploying NIDS



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- An IPS is the next security layer to be introduced in the system that combines the protection of firewalls with the monitoring ability of an IDS to protect our networks with the analysis necessary to make the proper decisions on the fly.