
Operation Security & Malicious Software

Objective

- Understand the core of Operations Security (OPSEC)
- Define & identify targets and threats
- Establish countermeasures
- Identify the Critical Information Commandments
- Decipher the value of information

What is Operation Security...?

- **Have you ever taken precautions against Someone...**
 - ...breaking into your house while you're on vacation?
 - ...stealing your purse?
 - ...stealing packages from your car while your shopping?
 - ...fraudulently using your credit card?

Then you have used OPSEC!

What is Operation Security ...?

- OPSEC is a risk management instrument that enables a manager or commander to view an operation or activity from the perspective of an adversary. It is a process of identifying, analyzing and controlling critical information.

What is Operation Security ...?

- Identify Critical Information
- Analyze Threats
- Discover Vulnerabilities
- Assess Risks
- Develop Countermeasures

What is Operation Security ...?

- Identify Critical Information:
 - Credit card numbers, travel dates, passwords, patterns, changes in patterns, inspection results, information base systems, etc..
- Analyze Threat:
 - Adversaries, Intelligence agencies – Open source information, corporate/state sponsored spies, eavesdropping, photographing, etc...

What is Operation Security ...?

- Discover Vulnerabilities:
 - Flow of information, operations, timing of events, how an adversary would acquire the information, etc...
 - How would the loss of such data impact the organization?
- Assess Risks:
 - Estimated loss \$ x impact of risk x likelihood of risk = \$

What is Operation Security ...?

- Develop Countermeasures:
 - are based on the vulnerabilities and inherent risks.

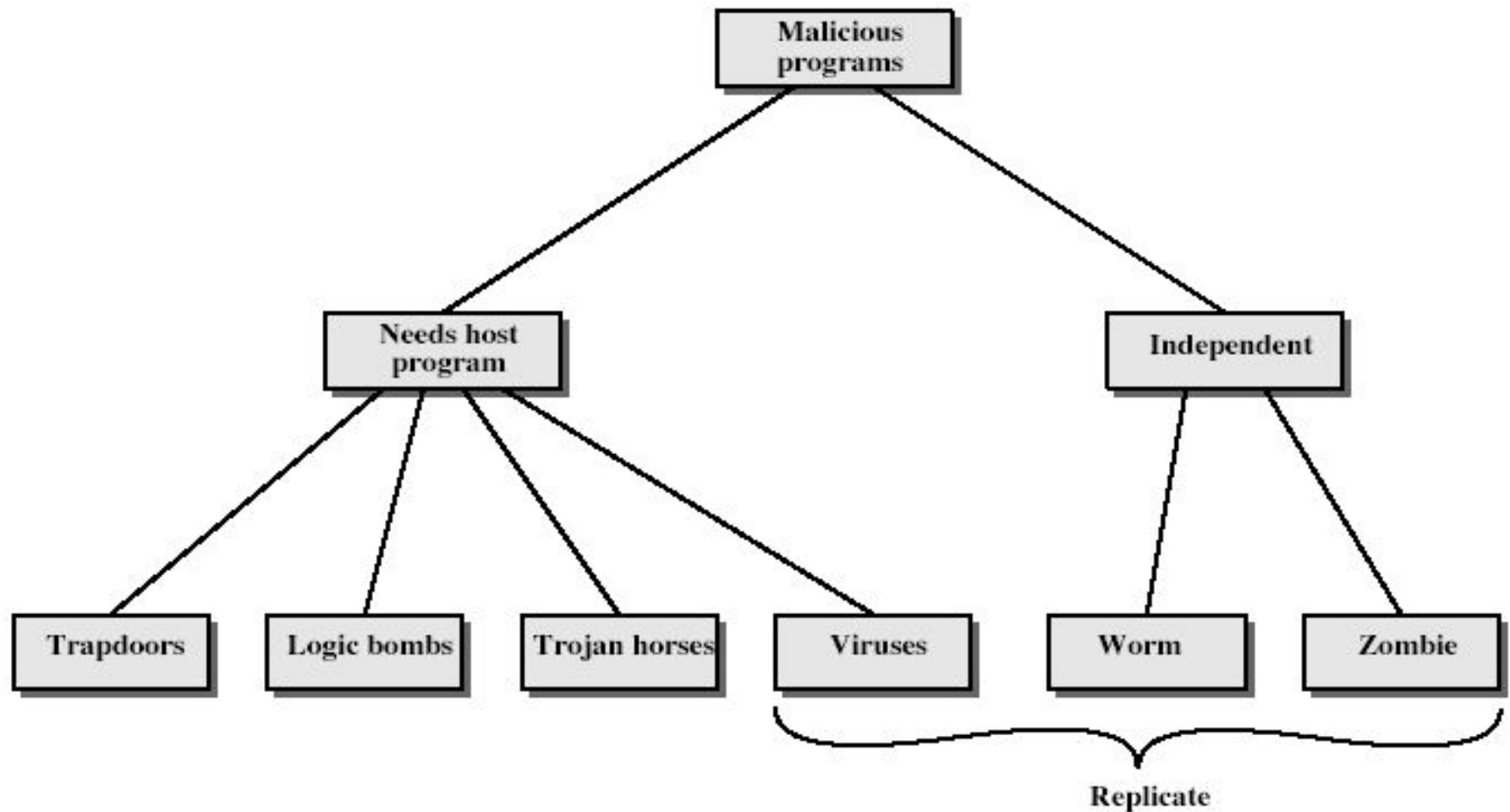
Viruses and Other Malicious Content

- computer viruses have got a lot of publicity
- one of a family of **malicious software**
- effects usually obvious
- have figured in news reports, fiction, movies
- getting more attention than deserve
- are a concern though

The Most Common Types Of Program To Be Infected by A Virus

- exe
- com
- vbs
- Mp3
- bin
- script files
- macros

Malicious Software



Trapdoors

- secret entry point into a program
- allows those who know access bypassing usual security procedures
- have been commonly used by developers
- a threat when left in production programs allowing exploited by attackers
- very hard to block in O/S
- requires good s/w development & update

Logic Bomb

- one of oldest types of malicious software
- code embedded in legitimate program
- activated when specified conditions met
 - eg presence/absence of some file
 - particular date/time
 - particular user
- when triggered typically damage system
 - modify/delete files/disks

Trojan Horse

- program with hidden side-effects
- which is usually superficially attractive
 - eg game, s/w upgrade etc
- when run performs some additional tasks
 - allows attacker to indirectly gain access they do not have directly
- often used to propagate a virus/worm or install a backdoor
- or simply to destroy data

Zombie

- program which secretly takes over another networked computer
- then uses it to indirectly launch attacks
- often used to launch distributed denial of service (DDoS) attacks
- exploits known flaws in network systems

Viruses

- a piece of self-replicating code attached to some other code
- propagates itself & carries a payload
 - carries code to make copies of itself
 - as well as code to perform some covert task

Virus Operation

- virus phases:
 - dormant – waiting on trigger event
 - propagation – replicating to programs/disks
 - triggering – by event to execute payload
 - execution – of payload

Types of Viruses

- can classify on basis of how they attack
 - parasitic virus
 - memory-resident virus
 - boot sector virus
 - stealth
 - polymorphic virus
 - macro virus

Macro Virus

- **macro code** attached to some **data file**
- interpreted by program using file
 - eg Word/Excel macros
 - esp. using auto command & command macros

Email Virus

- spread using email with attachment containing a macro virus
- triggered when user opens attachment
- or worse even when mail viewed by using scripting features in mail agent
- usually targeted at Microsoft Outlook mail agent & Word/Excel documents

Worms

- replicating but not infecting program
- typically spreads over a network
- using users distributed privileges or by exploiting system vulnerabilities
- widely used by hackers to create **zombie PC's**, subsequently used for further attacks, esp DoS
- major issue is lack of security of permanently connected systems, esp PC's

Worm Operation

- worm phases like those of viruses:
 - dormant
 - propagation
 - search for other systems to infect
 - establish connection to target remote system
 - replicate self onto remote system
 - triggering
 - execution

Virus Countermeasures

- viral attacks exploit lack of integrity control on systems
- to defend need to add such controls
- typically by one or more of:
 - **prevention** - block virus infection mechanism
 - **detection** - of viruses in infected system
 - **reaction** - restoring system to clean state

Summary

- have considered:
 - various malicious programs
 - trapdoor, logic bomb, trojan horse, zombie
 - viruses
 - worms
 - countermeasures

Public Key Cryptosystem

- Essential steps of public key cryptosystem
 - Each end generates a pair of keys
 - One for encryption and one for decryption
 - Each system publishes one key, called public key, and the companion key is kept secret
 - If A wants to send message to B
 - Encrypt it using B's public key
 - When B receives the encrypted message
 - It decrypt it using its own private key

RSA (public key encryption)

Alice wants Bob to send her a message. She:

- selects two (large) primes p , q , TOP SECRET,
- computes $n = pq$ and $\phi(n) = (p-1)(q-1)$,
 $\phi(n)$ also TOP SECRET,
- selects an integer e , $1 < e < \phi(n)$, such that
 $\gcd(e, \phi(n)) = 1$,
- computes d , such that $de \equiv 1 \pmod{\phi(n)}$,
 d also TOP SECRET,
- gives **public** key (e, n) , keeps **private** key (d, p, q) .

RSA Example

1. Select primes: $p=17$ & $q=11$
2. Compute $n = pq = 17 \times 11 = 187$
3. Compute $\phi(n) = (p-1)(q-1) = 16 \times 10 = 160$
4. Select e : $\gcd(e, 160) = 1$; choose $e=7$
5. Determine d : $de=1 \pmod{160}$ and $d < 160$ Value is $d=23$ since $23 \times 7 = 161 = 10 \times 160 + 1$
6. Publish public key $K_U = \{7, 187\}$
7. Keep secret private key $K_R = \{23, 17, 11\}$

RSA Example cont

- sample RSA encryption/decryption is:
- given message $M = 88$ (nb. $88 < 187$)
- encryption:
$$C = 88^7 \bmod 187 = 11$$
- decryption:
$$M = 11^{23} \bmod 187 = 88$$

Q & A

Questions ?
