Malicious Software (Malware)

Information Security (CSC-407)

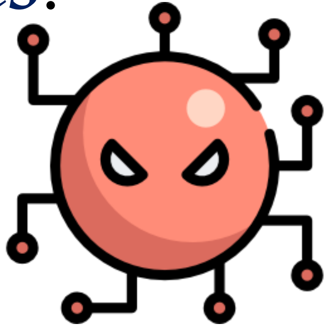
Fall 2024 (BSE-7A & 7B)

Software Attacks

- **Deliberate** software attacks occur when an attacker designs and deploys a software to attack a system.
- The attack can consist of specially crafted software that attackers **trick users** into installing it on their systems.
- These designed software are commonly known as **Malware** **(Malicious Software)**.

Malware

- **Malware:** a program inserted into a system with the intent of compromising **confidentiality**, **integrity** or **availability** of the victim's data, applications or operating system ***OR*** to **annoy/disrupt** the victim.
- Malware can pose threats to ***application programs***, ***utility programs*** (such as compilers) and ***kernel-level programs***.
- Several approaches exists to classify malware.



Malware Classification

Two major approaches to classify malware:

a. One approach classifies malware based on **the means malware uses to spread / propagate** to reach desired targets.

b. Another approach classifies malware based on **the variety of actions / payloads used** once a target is reached.

Malware Classification (Cont.)

Propagation mechanisms include:

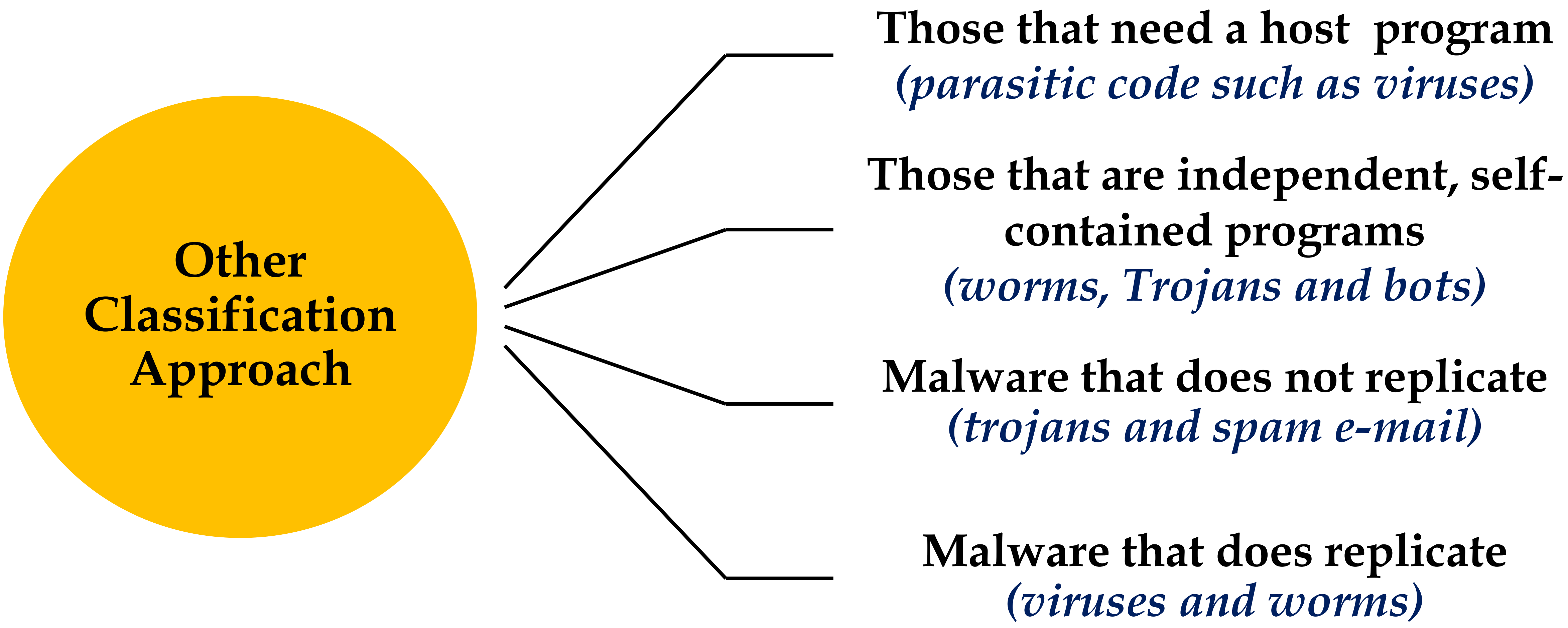
- **Infection of existing content** by viruses that is subsequently spread to other files.
- **Exploit of software vulnerabilities** by worms to allow the malware to replicate.
- **Social engineering** attacks that convince users to install Trojans or respond to phishing attacks.

Malware Classification (Cont.)

Payload actions performed by malware include:

- **Corruption** of system or data files.
- **Theft of information** from the system, usually by **keylogging** or through **spyware** programs.
- **Theft of service** to make the system an attack **zombie agent** as part of a **botnet**.
- **Stealthing** where malware hides its presence on the system.

Malware Classification (Cont.)



Other Classification Approach

Those that need a host program *(parasitic code such as viruses)*

Those that are independent, self-contained programs *(worms, Trojans and bots)*

Malware that does not replicate *(trojans and spam e-mail)*

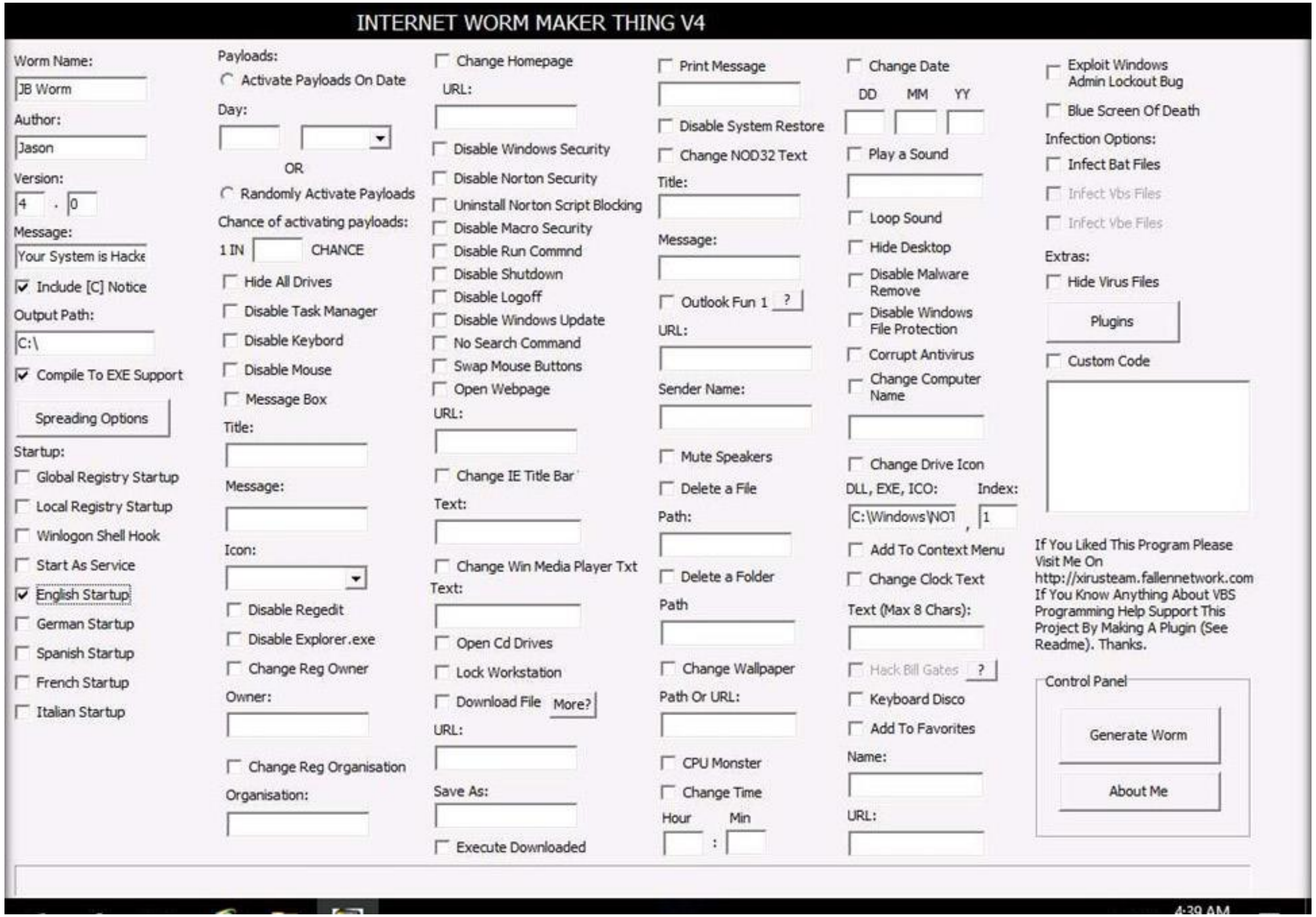
Malware that does replicate *(viruses and worms)*

Blended Malware Attacks

- Currently, a growth of **blended malware attacks** are noticed.
- **Blended malware attacks** incorporates a range of both **propagation mechanisms** and **payloads**.
- Blending both techniques increase its ability to spread, hide and perform a range of actions on targets.
- **Polymorphic malware:** a type of malware that constantly changes its ***identifiable features*** to evade detection.

Attack Kits

- Malware creation toolkits and the more general attack kits greatly assist in development and deployment of malware.
- **These toolkits (crimeware) have following properties**:
  - Include a variety of **propagation mechanisms** and **payload modules** that even novices can deploy.
  - Can be customized with latest discovered vulnerabilities.
  - Malware from such toolkits tends to be less sophisticated.
  - New variants can be generated by attackers.
- E.g. crimeware toolkits: ***Zeus, Blackhole, Sakura, Phoenix***.



INTERNET WORM MAKER THING V4

Worm Name: JB Worm

Author: Jason

Version: 4 . 0

Message: Your System is Hacke

☑ Include [C] Notice

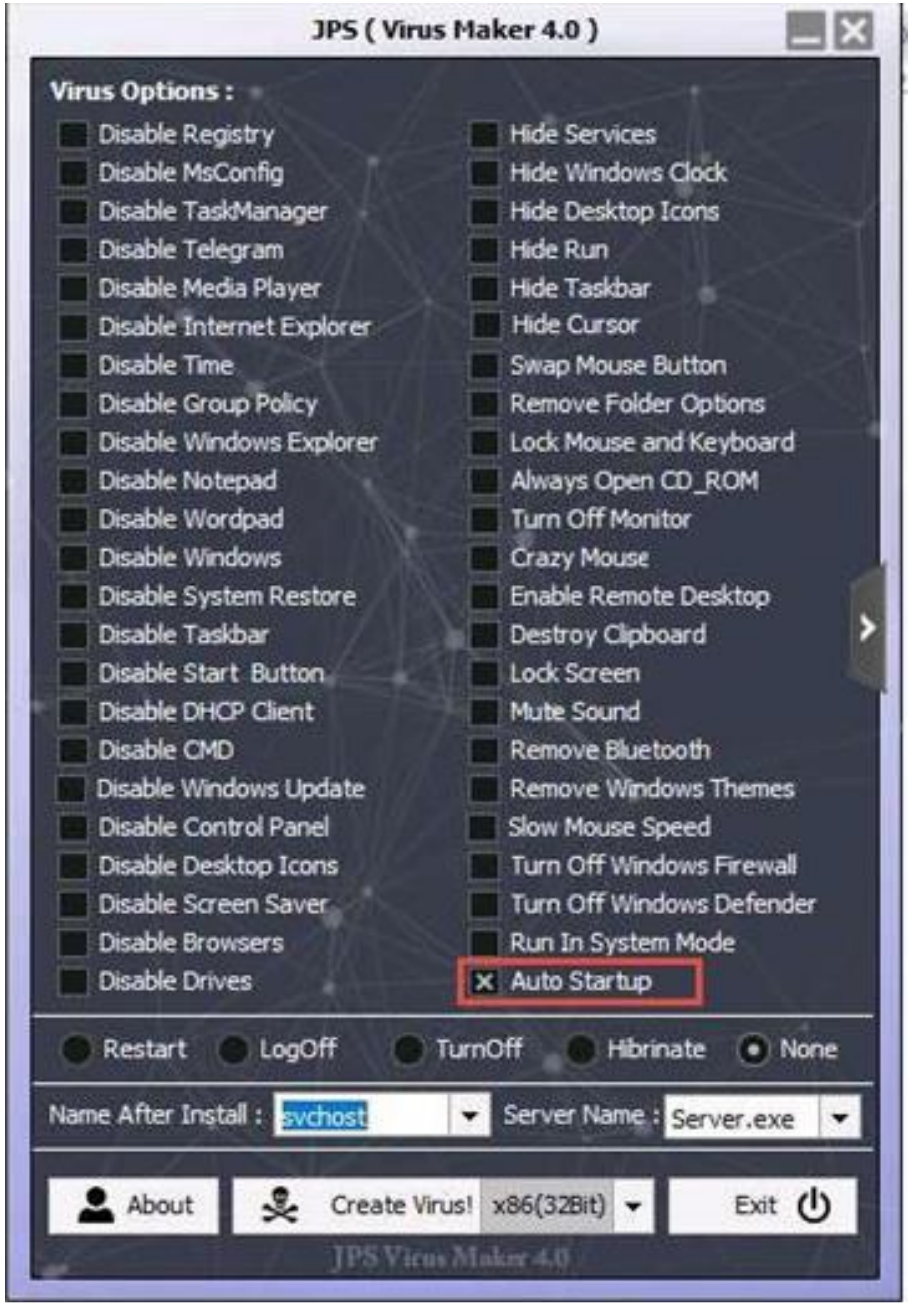
Output Path: C:\

☑ Compile To EXE Support

☑ English Startup

DLL, EXE, ICO: C:\Windows\NOT Index: 1

If You Liked This Program Please Visit Me On http://xirusteam.fallennetwork.com If You Know Anything About VBS Programming Help Support This Project By Making A Plugin (See Readme). Thanks.



JPS (Virus Maker 4.0)

☒ Auto Startup

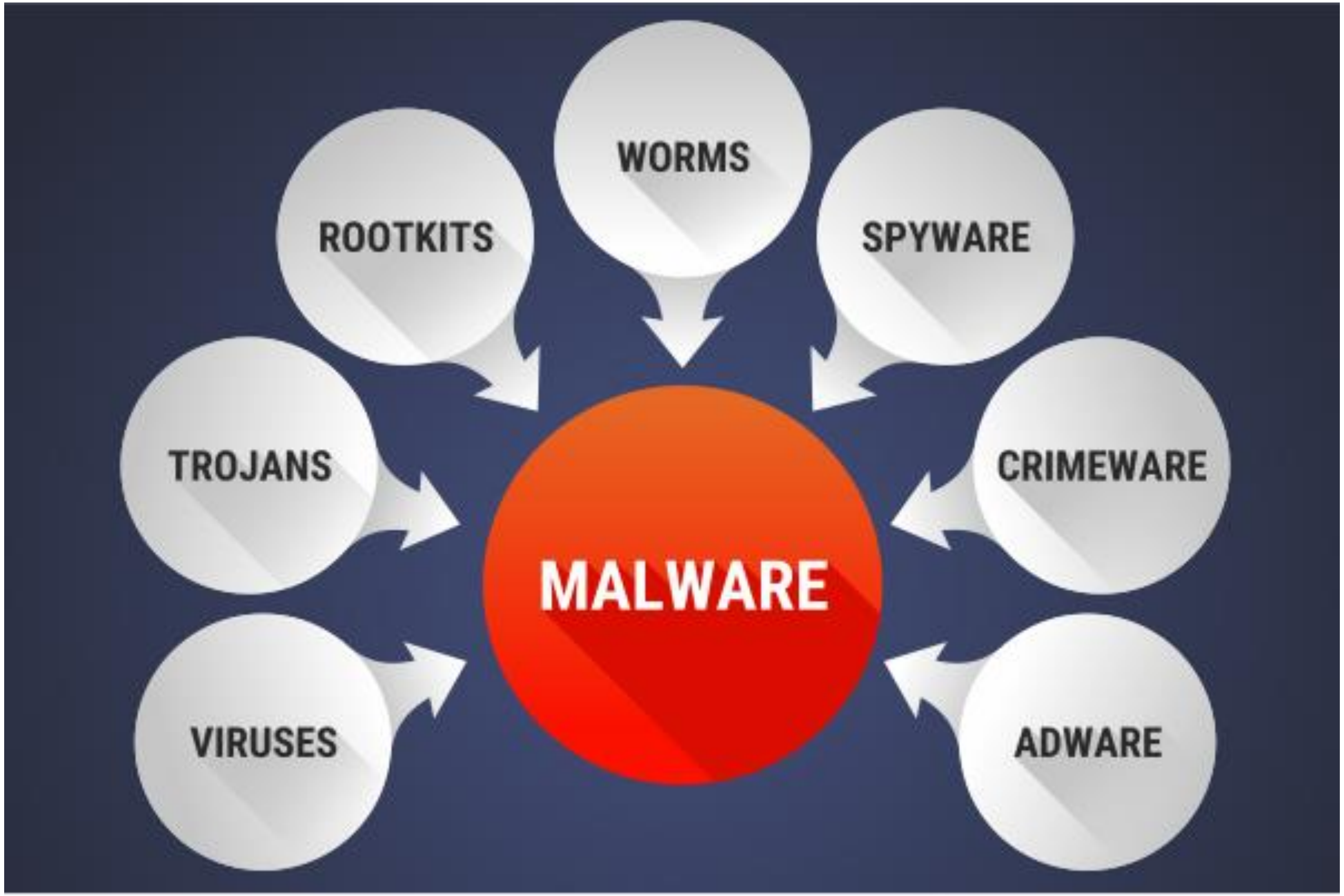
● None

Name After Install : svchost

Server Name : Server.exe

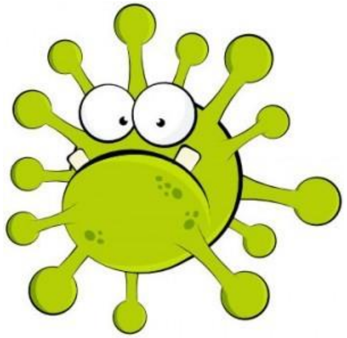
x86(32Bit)

Malware Types



Computer Virus

- **Virus:** **parasitic software** fragments that attach themselves to some existing executable content ***(i.e. infects)***, and when executed, tries to replicate itself into other executable contents.
- Infections by computer virus formed the **majority of malware** seen in the early personal computer era.
- The term **"computer virus"** is still often used to refer to malware in general.



Nature of Computer Virus

- The **nature** of a computer virus include:
  - **Modifies** other programs by injecting the **“original code”** with a routine to make copies of the **“virus code”**, which can then go on to infect other content.
  - **Replicates** itself where the computer virus can make perfect copies of itself and goes on to infect other content.
  - **Easily spreads** by exchanging **carrier files** though USB stick or in a networked environments.

Nature of Computer Virus (Cont.)

- A virus can do anything that the program is permitted to do, i.e. allowed by ***privileges*** of the ***current user***.
- Viruses dominated the malware scene in earlier years due to the ***lack of user authentication*** and ***access controls*** on personal computer systems at that time.
- Inclusion of tighter ***access controls*** on modern OS significantly hinders the ease of infection of such traditional viruses.
- Many forms of infection can also be blocked by denying normal users the ***right to modify programs*** on the system.

Computer Virus Lifetime

Typical virus goes through four phases during its lifetime:

1. **Dormant phase**
   - Virus is **idle**, but will eventually be activated by some event.
2. **Triggering phase**
   - Virus is **activated.**
   - Can be caused by a variety of system events, such as ***date, presence of another program or file, disk capacity exceeding some limit, a command***.

Virus Phases (Cont.)

Typical virus goes through four phases during its lifetime (Cont.):

3. **Propagation phase**
   - Virus places a copy of itself into other programs.
   - The copy may not be identical to the propagating version.
   - Each infected program will contain a clone of virus which itself will enter a propagation phase.
4. **Execution phase**
   - Function is performed.
   - May be **harmless** or **damaging**.

Antiviruses

- Current software marketplace has several established vendors, such as:
  - *Avast*
  - *Bitdefender*
  - *Symantec Norton Antivirus*
  - *Kaspersky Antivirus*
  - *AVG Antivirus*
  - *McAfee VirusScan*
  - *Panda Antivirus*

Macro Computer Virus

- **Macro viruses:** a virus that attaches itself to documents and uses the **macro programming** capabilities of the document's application to execute and propagate.
- **Macro viruses** infect **scripting code** used to support the **active content** in a variety of user document types, such as MS Word, Excel files or Adobe PDF.

Macro Computer Virus (Cont.)

- More recently (since mid-1990s), **macro viruses** became by far the most prevalent type of virus.
- **Properties of such documents:**
  - Easily modified
  - Easily shared by users
  - Not protected by same ***access controls*** as programs

Macro Computer Virus (Cont.)

- **Macro viruses are threatening for a number of reasons:**

1. Macro viruses are **platform independent.**
    - ***Many macro viruses infect "active content" in commonly used applications.***
    - ***Any OS or hardware platform that supports such applications can be infected.***
2. Macro viruses **infect documents**, whereas most of the information shared among computer system is in the form of documents.

Macro Computer Virus (Cont.)

- **Macro viruses are threatening for a number of reasons (Cont.):**

3. Macro viruses are easily spread as the documents they exploit are **shared commonly**, such as through **E-mails**.
4. Traditional file system **access controls are of limited use** in preventing their spread.
5. Macro viruses are much **easier to write / modify** than traditional executable viruses.

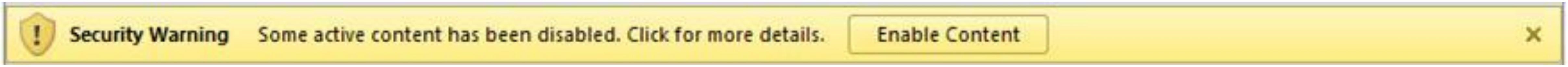
Microsoft Macro Security

- Macros are a powerful way to **automate tasks** in MS office. But, macro malware uses this functionality to infect devices.
- **MS Word** and **Excel** documents are common targets of **Marco viruses** due to their widespread use.
- Macro malware hides in MS office files and can be delivered as email attachments or inside ZIP files ***(e.g. invoices, receipts, legal documents, etc.)***.
- Macro malware was fairly common several years ago since macros **ran automatically** whenever a document was opened.

Microsoft Macro Security (Cont.)

- In recent versions of MS office, macros are **disabled by default**, while malware authors need to convince users to turn on macros so that their malware can run.
- Ways to prevent such viruses can be summarized as below:

1. Microsoft offers a ***Macro Virus Protection tool*** that detects suspicious Word files and alerts the customer to the potential risk of opening a file with macros.



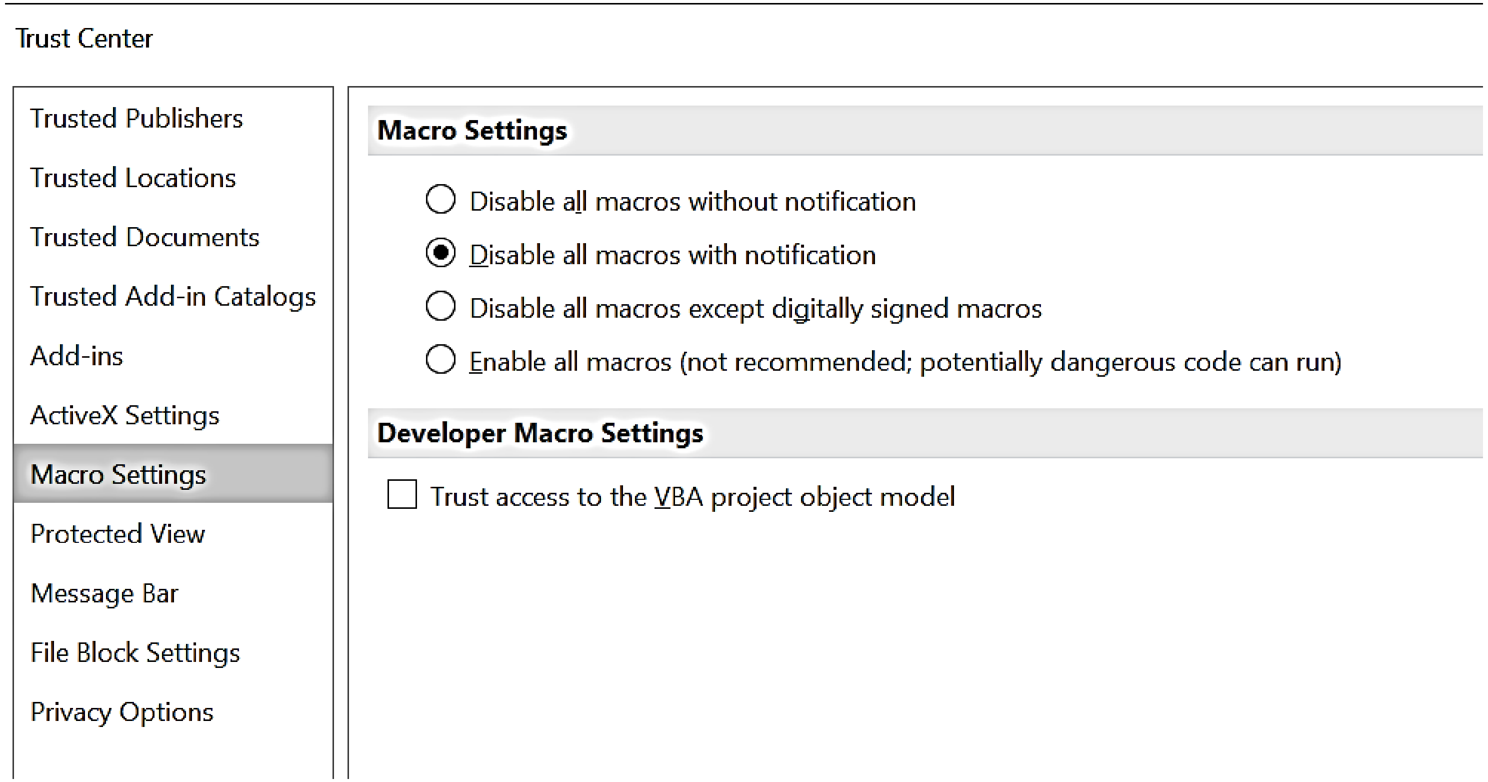
Security Warning Some active content has been disabled. Click for more details.

Microsoft Macro Security (Cont.)

- …(Cont.):
  2. MS office allows macros to be **digitally signed** by their author and for authors to be **listed as trusted**. Users are warned if a document contains ***unsigned*** or ***signed but untrusted*** macros.
  3. Various **anti-virus** products have tools to detect and remove macro viruses.
  4. Avoid opening suspicious emails or attachments.

Microsoft Macro Security (Cont.)

- …(Cont.):
  5. Make sure macros are **disabled** in MS office applications.



Trust Center

Macro Settings

○ Disable all macros without notification

● Disable all macros with notification

○ Disable all macros except digitally signed macros

○ Enable all macros (not recommended; potentially dangerous code can run)

Developer Macro Settings

□ Trust access to the VBA project object model

Microsoft Macro Security (Cont.)

- **Disable all macros without notification;** will allow only macros installed in trusted locations to run. Any other macros, ***signed or unsigned***, will be disabled.
- **Disable all macros with notification;** will prompt you to choose whether or not a macro can run.
- **Disable all macros except digitally signed macros;** allows macros ***signed by trusted publishers*** to run automatically, and prompts you for ***signed macros from other publishers***, and ***prevents unsigned macros from running***.
- **Enable all macros;** allows all macros to run. This setting is not recommend, since it allows potentially dangerous code to run without warning.

Worm

- **Worm:** a computer program that can run ***independently*** and can propagate a complete working version of itself onto other hosts on a network while exploiting **software vulnerabilities**.
- The most state-of-the-art malicious code attack is the **multivector worm**.
- These worms can use several **attack vectors** ***(up to six known attack vectors)*** to spread copies of themselves to networked peer computers by exploiting a variety of vulnerabilities.

Worm (Cont.)

- Example of worms include; ***Code Red, Sircam, Nimda and Klez***.
- **Nimda:**
  - Outbreak occurred in **Sept. 2001**.
  - Spread across the Internet address space of **14 countries** in less than **25 minutes**.
  - Used five different attack vectors.

Worm Possible Impact

A worm once infects a system can have following impact:

- Redistribute itself to e-mail addresses found on infected system.
- Take advantage of open shared resources on the network.
- Place copies of their code onto the server so that users are likely to become infected.

Virus/Worm Hoaxes

- **Case#01:** sending group e-mails warning of supposedly dangerous viruses that maybe does not exist.
  - **Impact:** network becomes overloaded ***(may also lead to DoS)***, while users waste time and energy. Some of such hoaxes are known as **"weapons of mass distraction"**.
  - **Correct Approach:** follow virus-reporting procedures.

- **Case#02: Teddy Bear** hoax (e-mail spam, 2002) tricked users into deleting necessary OS file *(jdbgmgr.exe)*, which made their systems stop working.

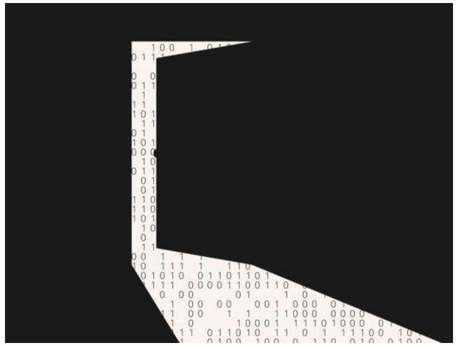
Trojan Horse

- **Trojan horse:** a computer program that ***appears to have a useful function***, but also has ***a hidden and potentially malicious function*** that evades security mechanisms.
- E.g. **SMiShing**, in which the victim is tricked into downloading malware onto a mobile phone via a text message.

Spyware

- **Spyware:** software that secretly collects information from a computer and transmits it to another system by monitoring keystrokes, screen data, network traffic, etc.
- E.g. **"tracking cookie"** placed on users' computers to track their activity on different Web sites and create a detailed profile of their behavior.
- Can be used in a ***social engineering*** or ***identity theft attack***.

Backdoors



- **Backdoor (trapdoor):** a secret entry point into a program that allows someone who is aware of the backdoor to gain access without going through the usual security access procedures.
- Viruses and worms can have a payload that installs a **backdoor** or **trapdoor** component in a system, allowing the attacker to access the system at will with special privileges.
- **Backdoor** is hard to detect because the person or program that places it often makes the access **exempt** from the system's usual **audit logging** features.

Other Malware Types

- **Adware:** advertising that is integrated into software, that can result in pop-up ads or redirection to a commercial site.
- **Keyloggers:** a program that captures keystrokes on a compromised system.
- **Zero-day attack:** a software attack that makes use of a malware that is not yet known by the anti-malware software companies.
- **Zombie/bot:** program activated on an infected machine to launch attacks on other machines.

Thank You!