Unit 1

Security Basics

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How safe is your information?

•Recent events show that commercial, personal and sensitive information is very hard to keep secure, and some estimates point to 2007 as being the worst year on record for data loss.

•As breaches in information security continue to make headline news, it is becoming increasingly clear that technological solutions are not the only answer.

•Research conducted in 2007 suggests that at least 80% of data leakages are caused by staff rather than IT systems (source: Financial Times/Forrester Research, Nov-07).

•It is clear therefore that Information Security should be viewed as a management function rather than one of IT alone.

•Here, the syllabus outline the main management principles

- Challenges in Security?

1.Use of computer with internet

2. Software tools are available freely

3. Importance of information

4.Lack of awareness/ignorance/hesitation

- PROTECTION

1.Unahorized Access by intentionally or unintentionally.

To protect the operation of any organization

1.Physical Security:- Access control to physical device

E.g:- Pen drive, Hard drive, CD/DVD, Computer,

2. Private Security :- Individual or group

3. Project Security :- Design , Code operation security

Introduction

- Information:- *Computers, Networks, Internet, Mobile.*
- Security:-trying to understand *how to protect.*
- *The various dangers & pitfalls when we use technology.*
- *The consequences of not setting up the right*

✓ *Security Policies*

✓ *Security Framework*

✓ *Security Technology*

Why is Security Required?

- Business & different types of transactions r being conducted to a large extent over Internet.
- Inadequate or improper *security mechanism* *can bring whole business down or play havoc with people's lives!*
- *Since Electronic Documents & Messages r now becoming equivalent to proper documents in terms of their legal validity & binding*.

Why Study Information Security

- Businesses collect mass amounts of data about their customers, employees, and competitors.
- Most of this data is stored on computers and transmitted across networks.
- If this information should fall into the hands of a competitor, the result could be loss of business, lawsuits and bankruptcy.
- Protecting corporate data is no longer an option, it is a requirement.

Information Security

- Protecting information and information systems from unauthorized access, use, disclosure, disruption, modification, or destruction.

Background

- Throughout history, confidentiality of information has always played a key role in military conflict.
- In Past No or little security.

The Need for Security(Current Scenario)

- Now a days Importance of data was truly realized.

✓ *Financial & Personal data*

- Therefore various areas in security began to gain prominence.
- Typical Examples of Basic Security Mechanism:

✓ Authenticate a User->id, pw

✓ Encode->DB->Not Visible to user who do not have the right permission.

- *Organization employed their own mechanism.*

The Need for Security In Modern Life

- Internet took the world by **storm.**
- Technology Improved
- Communication Infrastructure became extremely mature.
- Newer & newer applications begins to developed for various user demands & need.
- *Soon peoples realized that basic security measures were not quite enough.*

Information traveling from a client to a server over the internet.

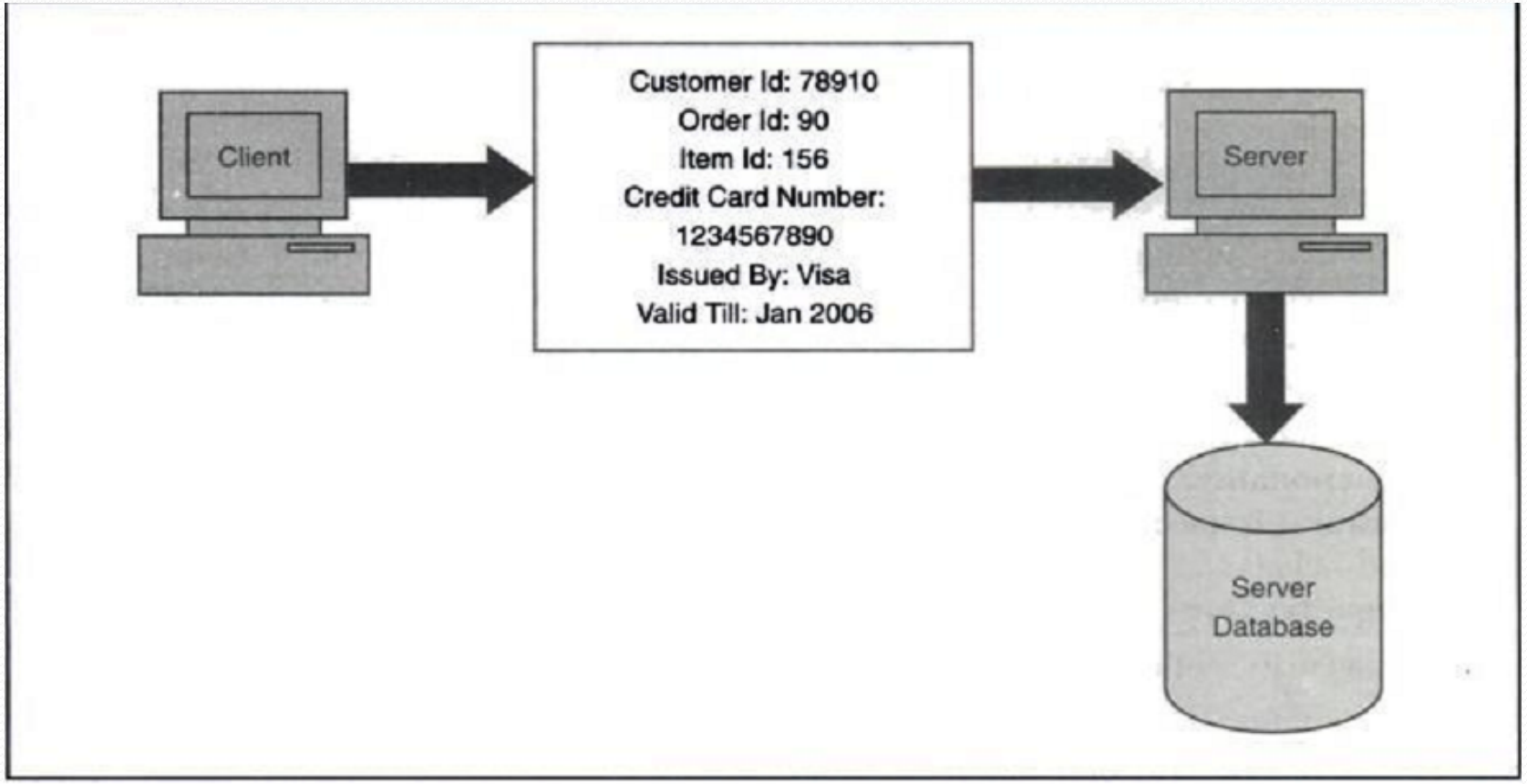


Fig. 1.1 *Example of information traveling from a client to a server over the Internet*

Some real time attacks

- Russian Attacker **Maxim** actually manage to intruder into a merchant Internet site & obtained 300,000 credit card numbers from its DB.
- He then attempted extortion by demanding protection money($100,000) from the merchant.
- The merchant refused to oblige.
- **Following this, the attacker published about 25,000 of the credit card numbers on the internet!**
- **Some banks reissued all the credit cards at a cost of $20 per card & others forewarned their customers about unusual entries in their statements.**

Consequences of Attack

- Great Losses-both in terms of finance & goodwill.
- Cost of attack $20*300000=$6M
- **Another Example:-**
- 1999 Swedish hacker broke into Microsoft's Hotmail Website & created a mirror site.
- This allowed anyone to enter any Hotmail user's email id & read their emails.
- 2005 survey about the losses that occur due to successful attacks on security. **$455,848,000**
- Next year this figure reduced to **$201,757340!**

Modern Nature Of Attack

1. *Automating Attacks*:-

✓ Traditional Attack: Produce Coins using machinery & Bring them into circulation.

✓ Modern Attack: Steal half a dollar from million accounts in a few minutes time digitally.

2. **Privacy Concern**:-Every Company are collecting & processing lots of information about us. Without we realizing when & how it is going to be used.

3. **Distance does not matter**:- Attack Can be launched from the distance.

E.g:- In 1995, a Russian hacker broke into Citibank's computer remotely, stealing $12M.

Although the attacker was traced, it was very difficult to get extradited him for the court case.

1.2 ELEMENTS OF INFORMATION SECURITY

- This will Help us understand the attacks better & also help us in thinking about the possible solution to tackle it.
- Information Security provide services to user.

Principle/Goals Of Security

- These r the 4 chief principles of security.

1. Confidentiality:- Is msg seen by someone else?
2. Authentication:- Do u trust the sender of msg?
3. Integrity:- Is the meg changed during transmit?
4. Non-repudiation:- Can sender refute the msg?

- *Above principles r related to a particular message.*
- *There r 2 more linked to overall system as a whole.*

5. Access Control:- Who can Access what? [ACL]
6. Availability:- Information should be available timely.

Confidentiality

- Confidentiality is the process of preventing disclosure of information to unauthorized individuals or systems.

Examples: Credit card

- Confidentiality is necessary, but not sufficient to maintain privacy

Interception Causes Loss of Message Confidentiality

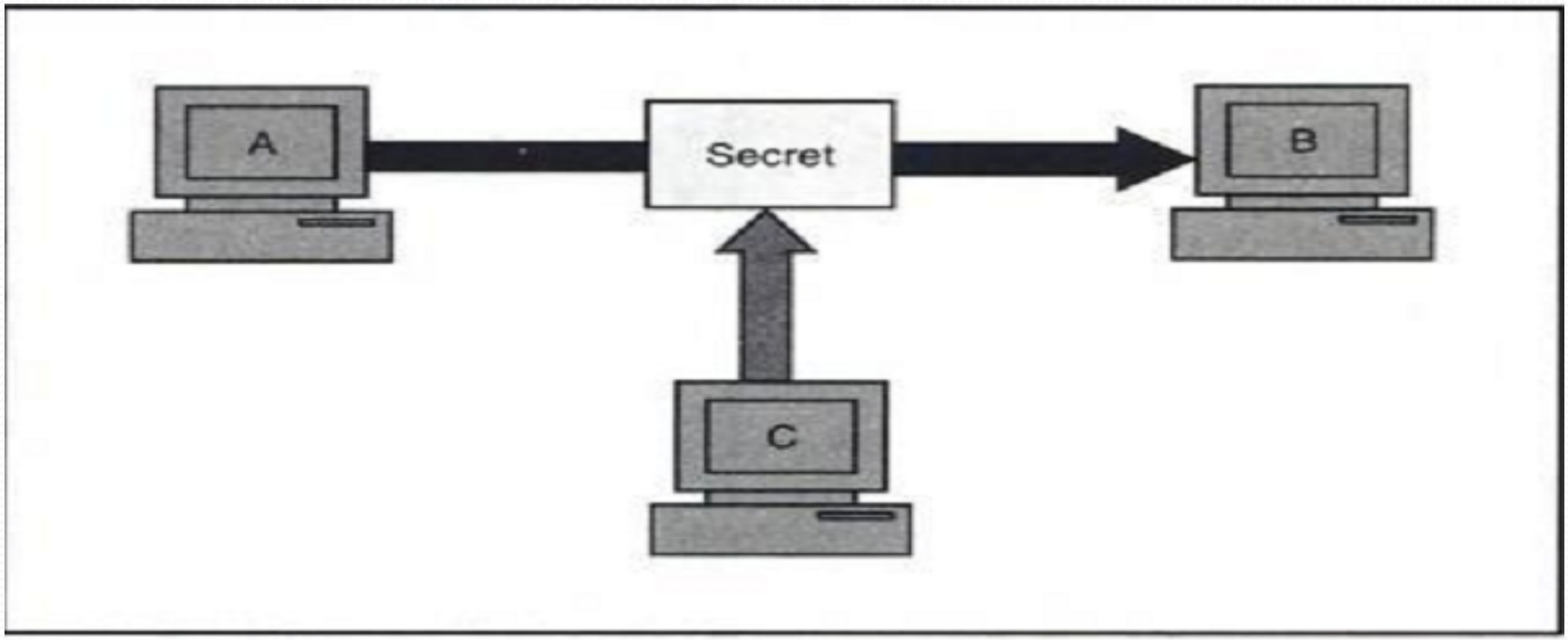


Fig. 1.2 *Loss of confidentiality*

Authenticity

- In computing, e-Business and information security it is necessary to ensure that the data , transactions, communications or documents (electronic or physical)

  are genuine (i.e. they have not been forged or fabricated.)

Examples: Passport, Credit card Accounts, academic transcripts

Fabrication is possible in absence of proper authentication

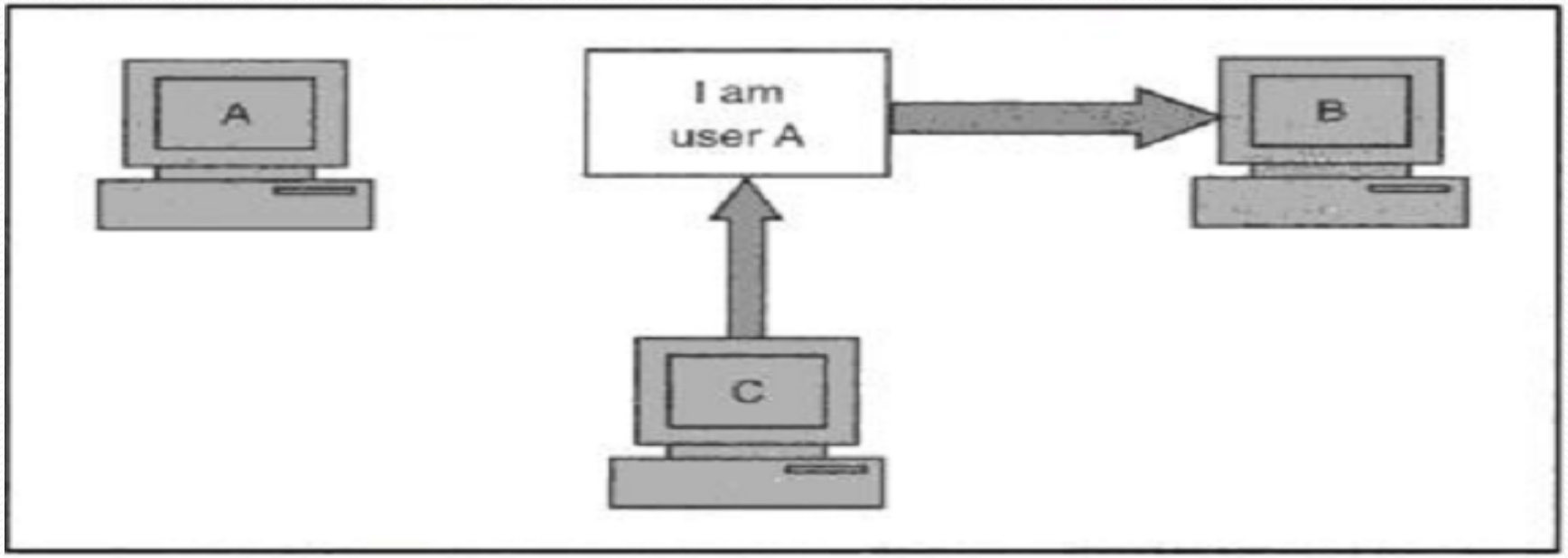


Fig. 1.3 *Absence of authentication*

Integrity

- Integrity means that data cannot be modified / change without Authorization

Examples: Manual deletion or alteration or creation of important data files, Virus infection, Employee altering their own salary , website vandalism, polling fraud.

Modification Causes Loss of Message integrity

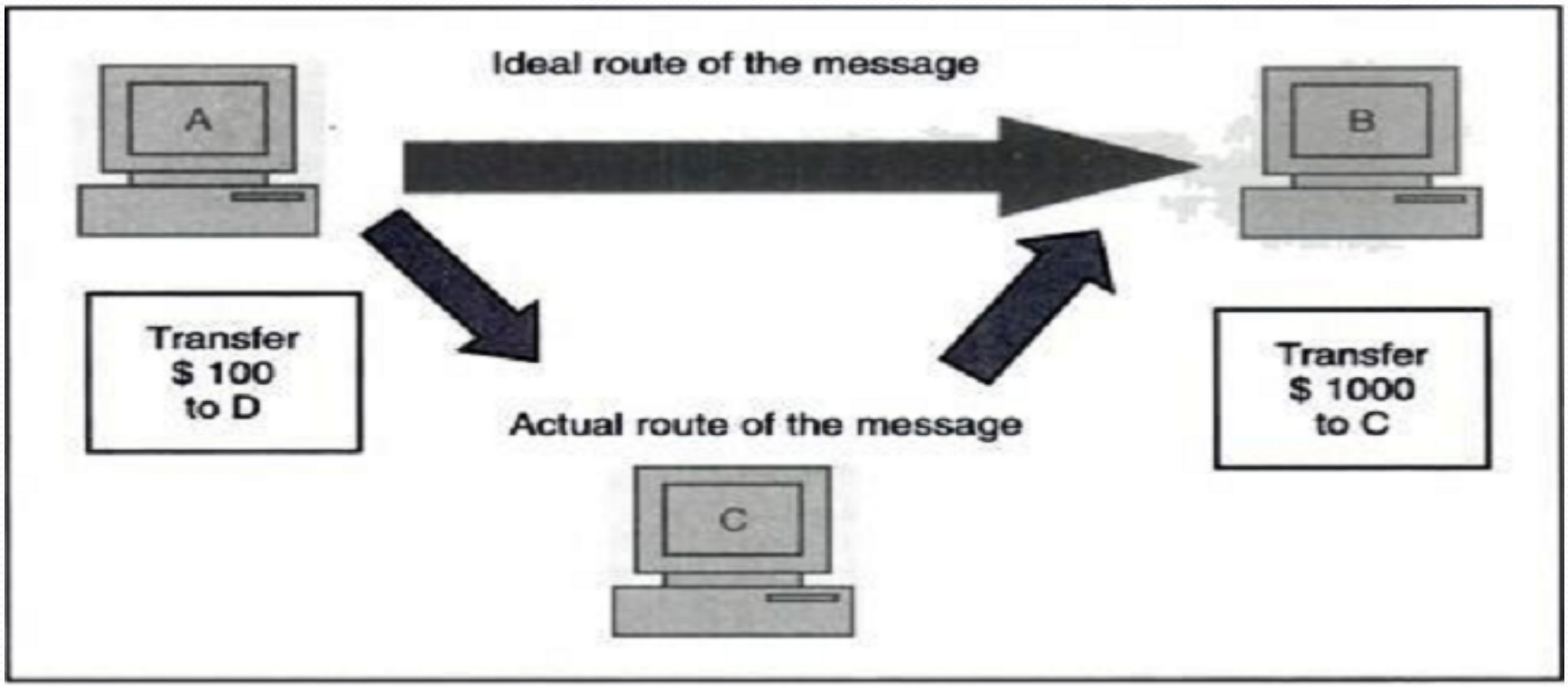


Fig. 1.4 *Loss of integrity*

Non-Repudiation

- It is a complex term used to describe the lack of deniability of ownership of a message, piece of data, or Transaction.

Examples: Proof of an ATM transaction, a stock trade, or an email

It does not allow the sender of a message to refute the claim of not sending that message

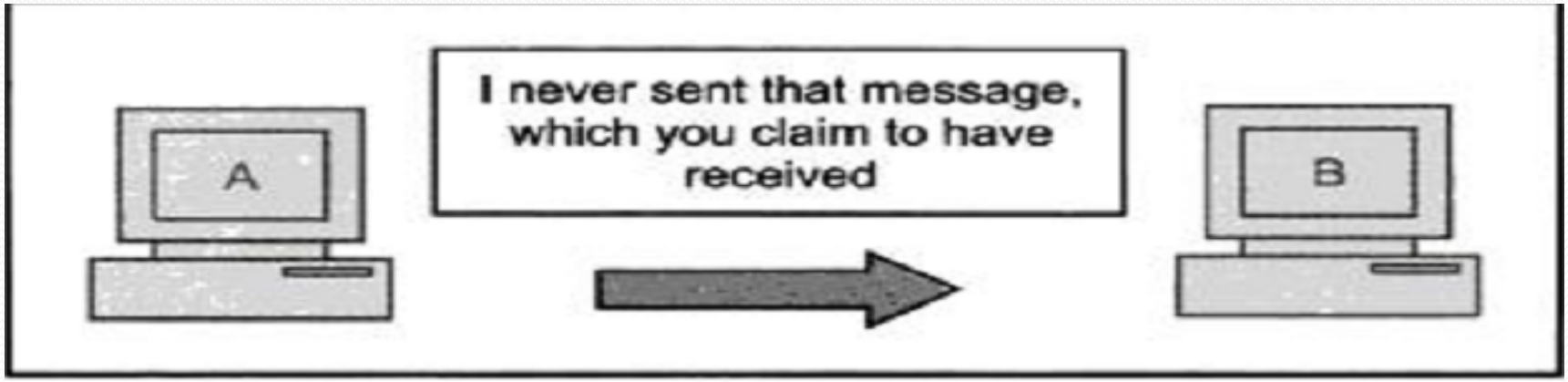


Fig. 1.7 *Establishing non-repudiation*

Access Control

- Role Management->User Side->Which user can do what.
- Rule Management->Resource Side->Which resources r accessible and under what circumstances.
- Access Control List is subset of Access Control Matrix.

Availability

- For any information/system to *serve* its purpose,
- The information must be *accessible & usable* when it is needed.
- *Computing systems* used to store and process the information, the *security controls* used to protect it, and the *communication channels* used to access it must be functioning correctly.

Examples: Power outages, Hardware failures, System upgrades and Preventing denial-of-service attacks

Interruption puts the availability of resources in danger.

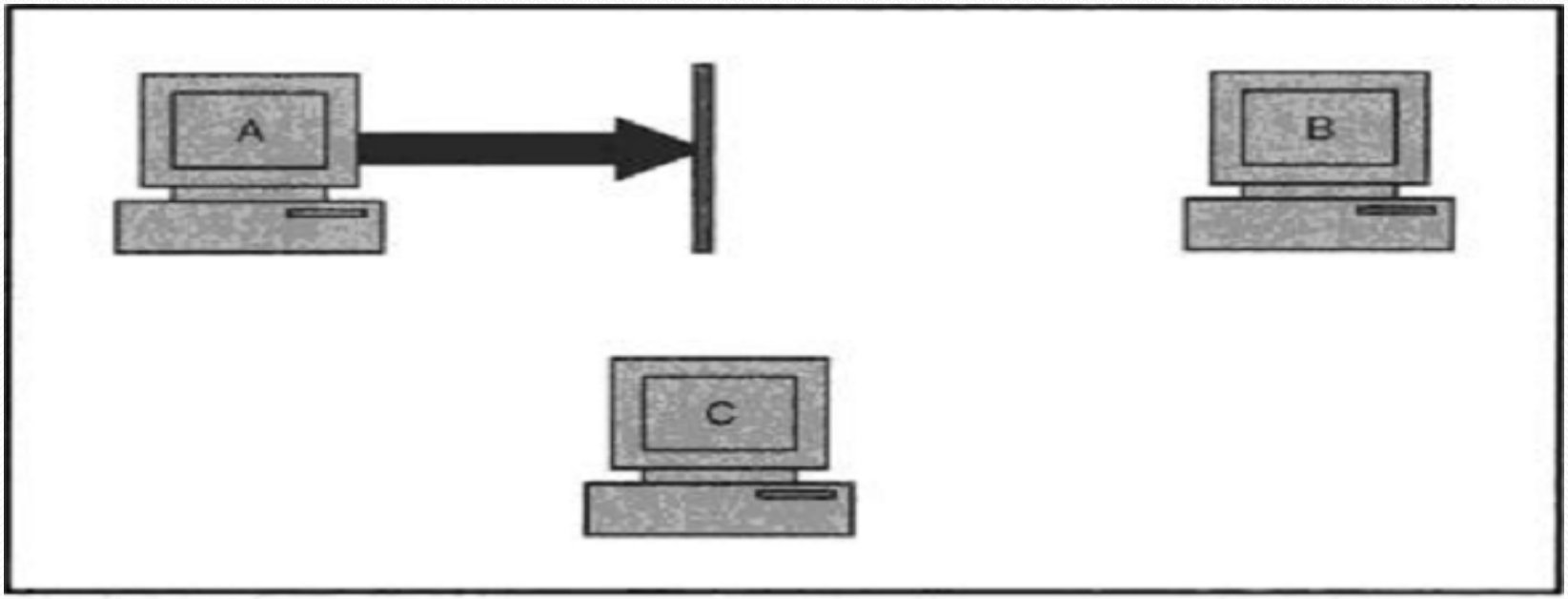


Fig. 1.5 *Attack on availability*

1.3 SECURITY POLICY

- Risk ->Secure->Action
- To control the threats
- Providing techniques & measures(e.g Audit)
- Developing a secure computing platform to restrict the users to perform the only particular actions that is permitted.
- At the same time restrict this user too misuse their rights to use the system.

1. External Approach:- for external attacker
2. Internal Approach:- for inside environmental attack

1.4 SECURITY TECHNIQUES

- Cryptographic Techniques:- Confidentiality & integrity of data
- Authentication Techniques:- to guarantee that communication end-points.

  E.g:- who they say the are.

- Chain of trust techniques- *authentic software*
- Access Control- *privilege & authorization*
- Capability to detect un-patched known flaws
- Back up of data
- Anti-virus software
- Firewall
- IDS/IPS- *related to access & misuse*
- Information Security Awareness- *social engineering*

1.5 Steps for better Security

Security is the most important aspect of computer world

Following r the steps one should follow:-

- Assets:- Decide, Identify, Protect
- Risks:- identify threats, attacks, vulnerabilities, exploits, theft
- Protection:- find out the solutions
- Tools & Technique:- select
- Priorities:- decide the order of point 4

1.6 CATEGORY OF COMPUTER SECURITY

1. Cryptography:- *Mathematical "scrambling" of data.*
2. Data Security:- *Protective measures, keep safe from un- authorized access, privacy, prevent breaches , etc.*
3. Computer Security Model:-

   It Depends on computer architecture, specification, security issues, protection mechanism.

   Act as a framework for information system security policy.

Continue…

4. Network Security:-

   Protection during transmission,

   Policies & provision by Admin,

   Authorization & Access Control,

5. Computer Security Procedure:-

   strategies, guideline, policies, standards, specification, regulations & laws.

6. Security Exploits:-

   Vulnerabilities,

   Unintended & un-patched flaws in s/w,

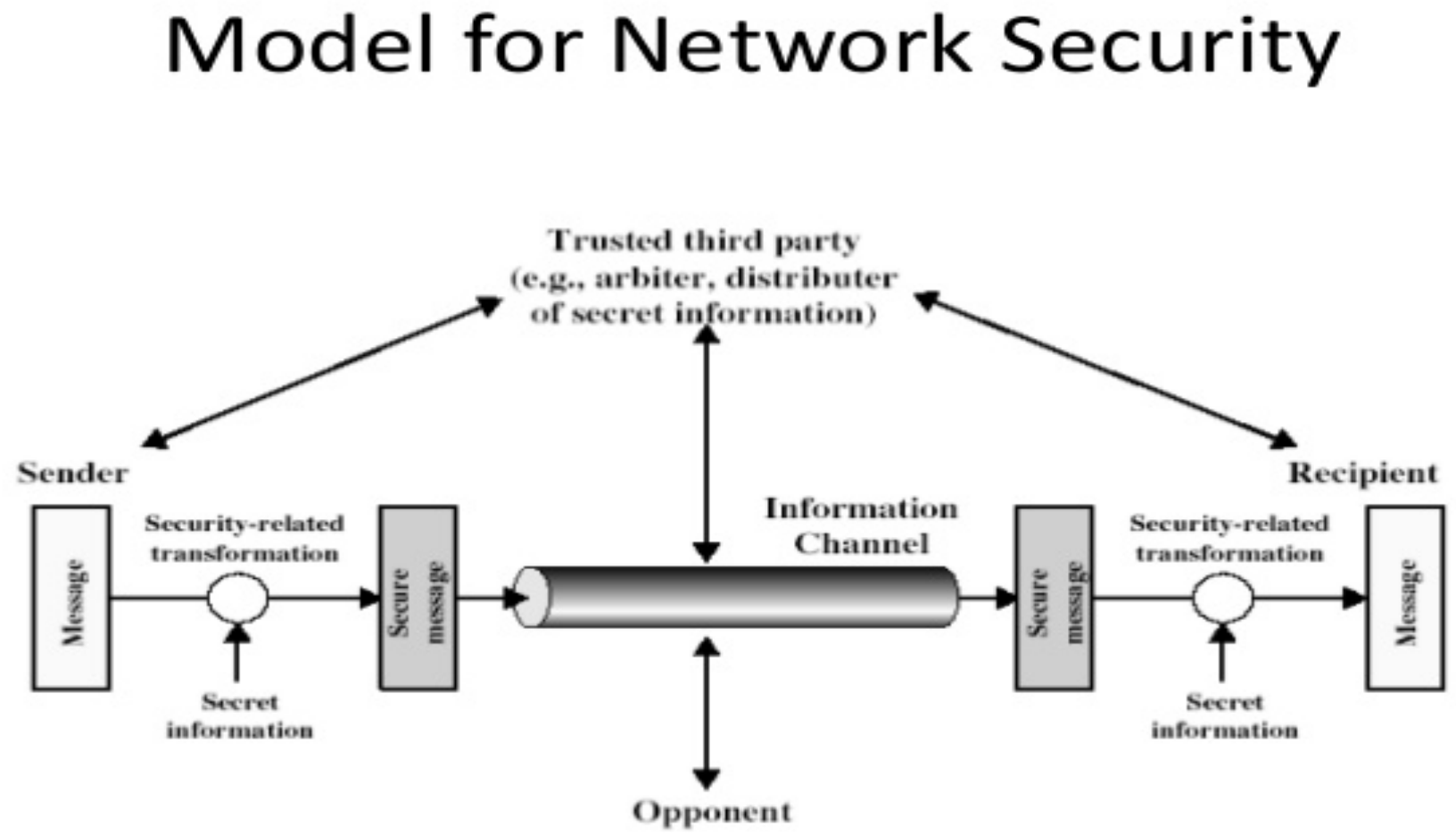
   Virus, worms & Trojan horses, malwares

   Different types of attacks,

Continue…

7. *Authentication*:- *person, computer, program*
8. *Identity management*:- *user, device, services*
9. *Internet policy*:- *whatsapp, FB, ect..*
10. *Security Software*

1.7 The Operational Model Of N/W Security



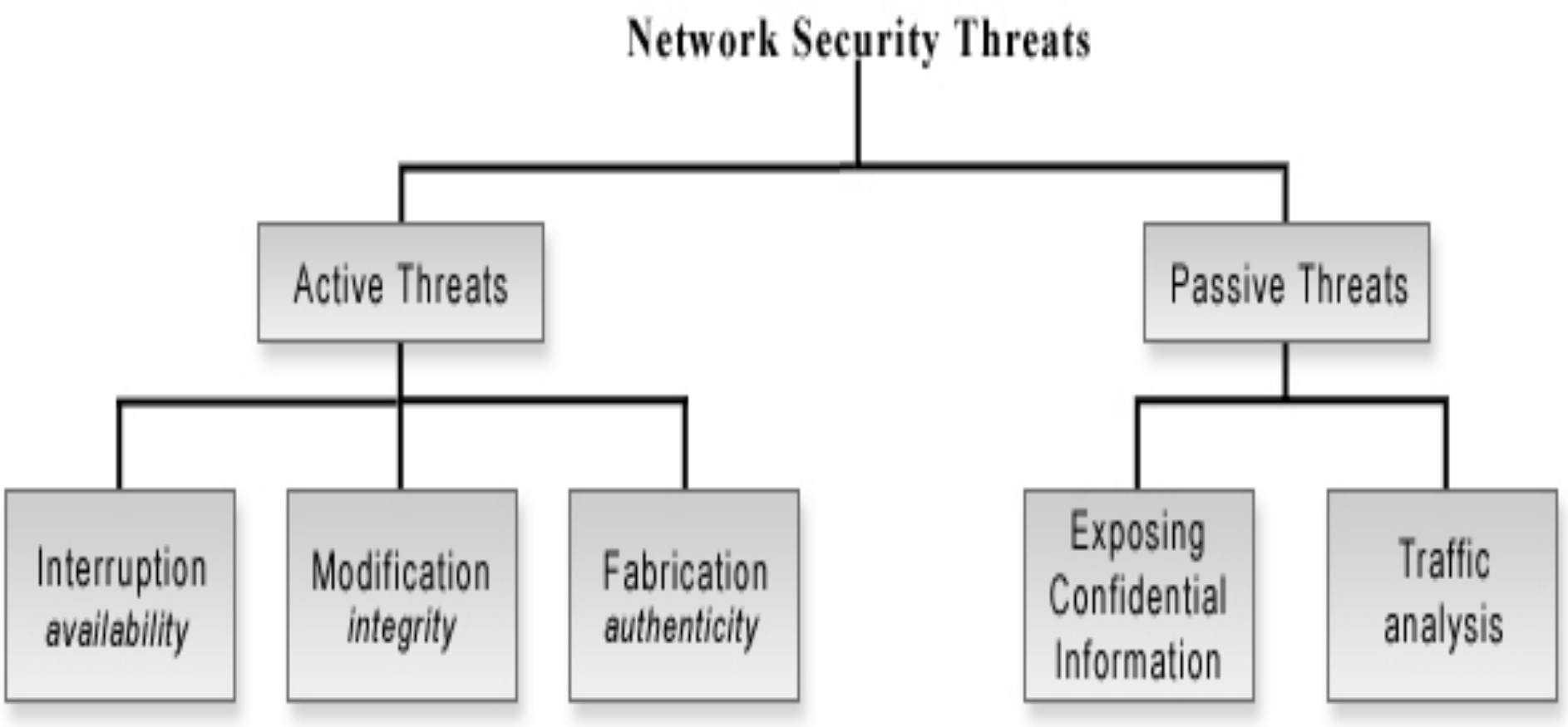
1.8 Basic N/W Security Terminology

- NOTE:- Covered through out the syllabus

Security Services

- Digital Signature
- Password
- Encryption
- Hash algorithms

Security Attack



Types of Attack

- Attacks: **A Technical View**

1. Theoretical Concepts behind this attack.

✓ Inception:- Copying of data & program & listening to N/W Traffic.

✓ Fabrication:-Attacker may add fake records to a database. Creation of illegal objects on the computer system.

✓ Modification:-Attacker modifies Value of DB

✓ Interruption:- Resources became unavailable, lost or unusable. Causing problems to a H/W device, erasing program, Data or OS components.

Further Grouped in to types:

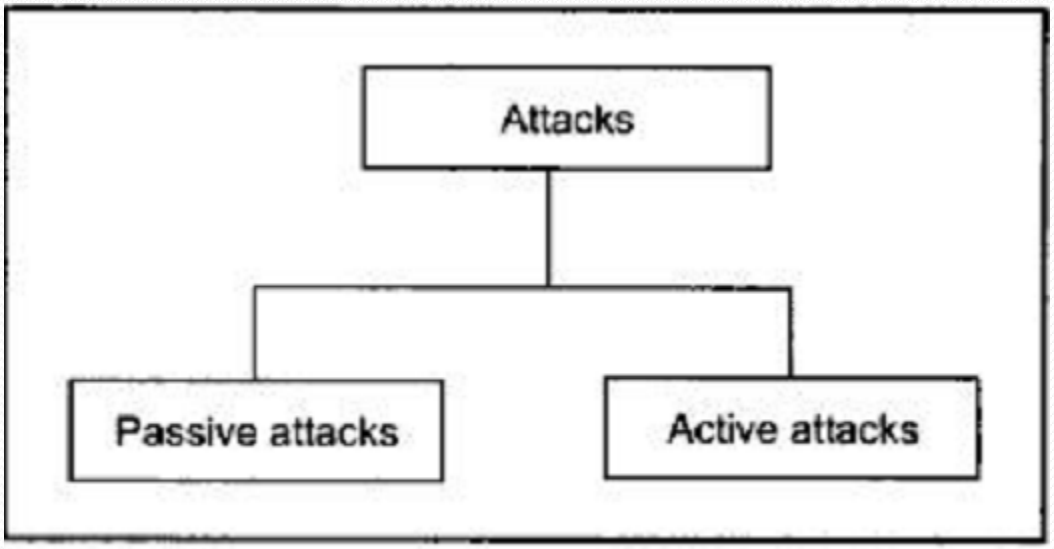


Fig. 1.10 *Types of attacks*

Passive Attack

- Attacker *eavesdropping* or *monitoring* of data transmission.
- Tries too learn something out of it & make use of it.
- Aims to obtain information that is in transmit.
- No Modification
- Detection harder.

1. For plain text Message

- Solution prevention :- encryption

2. For Encoded Message

- Similarity -> Pattern -> Clue

Classification of Passive Attack

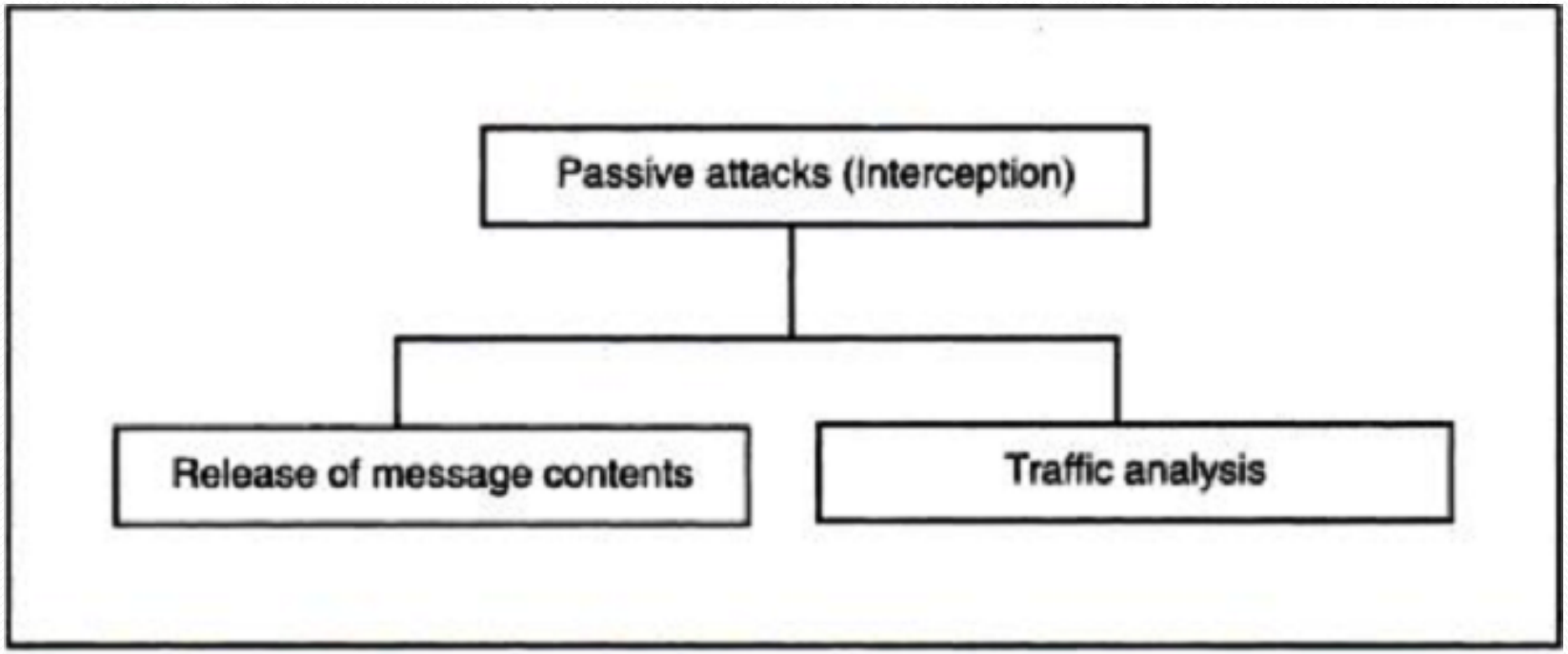


Fig. 1.7 *Passive attacks*

Active Attack

- Modification
- Creation of False Msg
- No prevention
- Solution Detection & Recovery

Classification of Active Attack

Masquerade :- *Trying to pose as another entity*

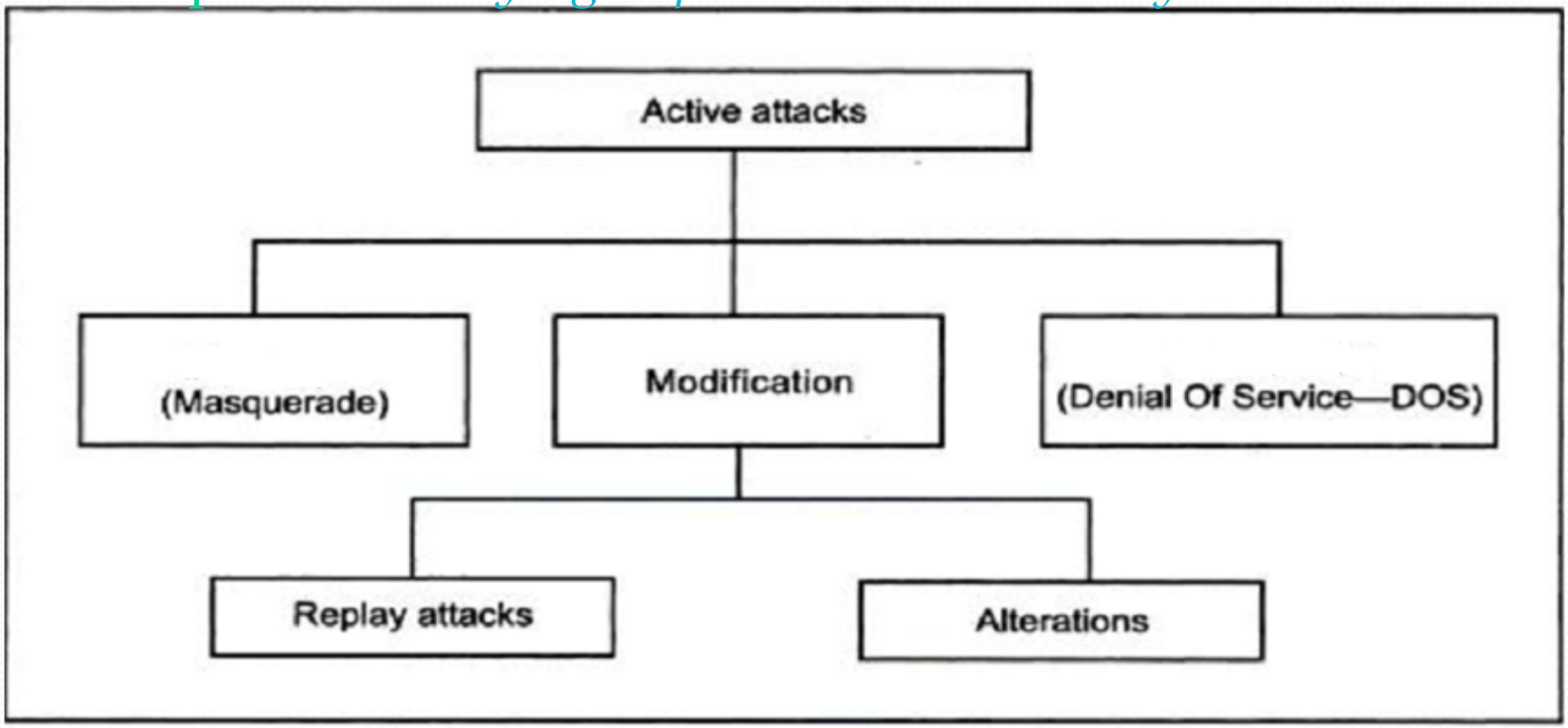


Fig. 1.8 *Active attacks*

2.Practical Side Of Attack

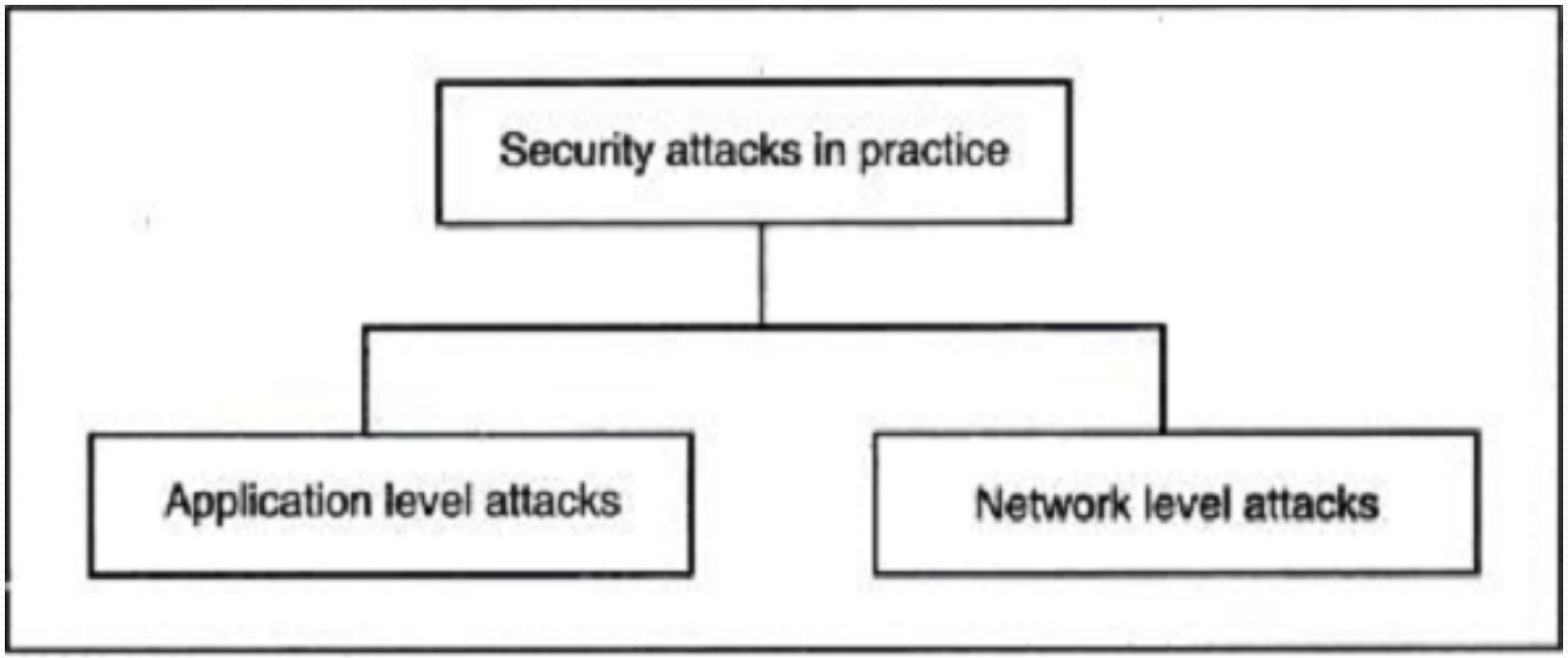


Fig. 1.9 *Practical side of attacks*

- **Application level attacks:** These attacks happen at an application level in the sense that the attacker attempts to access, modify or prevent access to information of a particular application, or the application itself. Examples of this are trying to obtain someone's credit card information on the Internet, or changing the contents of a message to change the amount in a transaction, etc.
- **Network level attacks:** These attacks generally aim at reducing the capabilities of a network by a number of possible means. These attacks generally make an attempt to either slow down, or completely bring to halt, a computer network. Note that this automatically can lead to application level attacks, because once someone is able to gain access to a network, usually she is able to access/modify at least some sensitive information, causing havoc.

References:

- Dr. V.K. Pachghare, Cryptography and Information Security, PHI,ISBN 978-81-303-5082-3
- Atul Kahate, Network Security, Tata McGraw Hill,ISBN 978-0-07-064823-4
- Further Reading use ppt's after this slide

Program That Attacks

- Virus
- Worms
- Trojan Horse
- Applets & ActiveX Controls
- Cookies
- Java Script VB Script Jscript
- Etc.

✓ Program That Attacks to cause some *damage* or to create *confusion*.

1.virus

- Practical Side Of Attack
- *A piece of program code that attaches itself to another legitimate program & causes damage to the computer system or to the N/W.*
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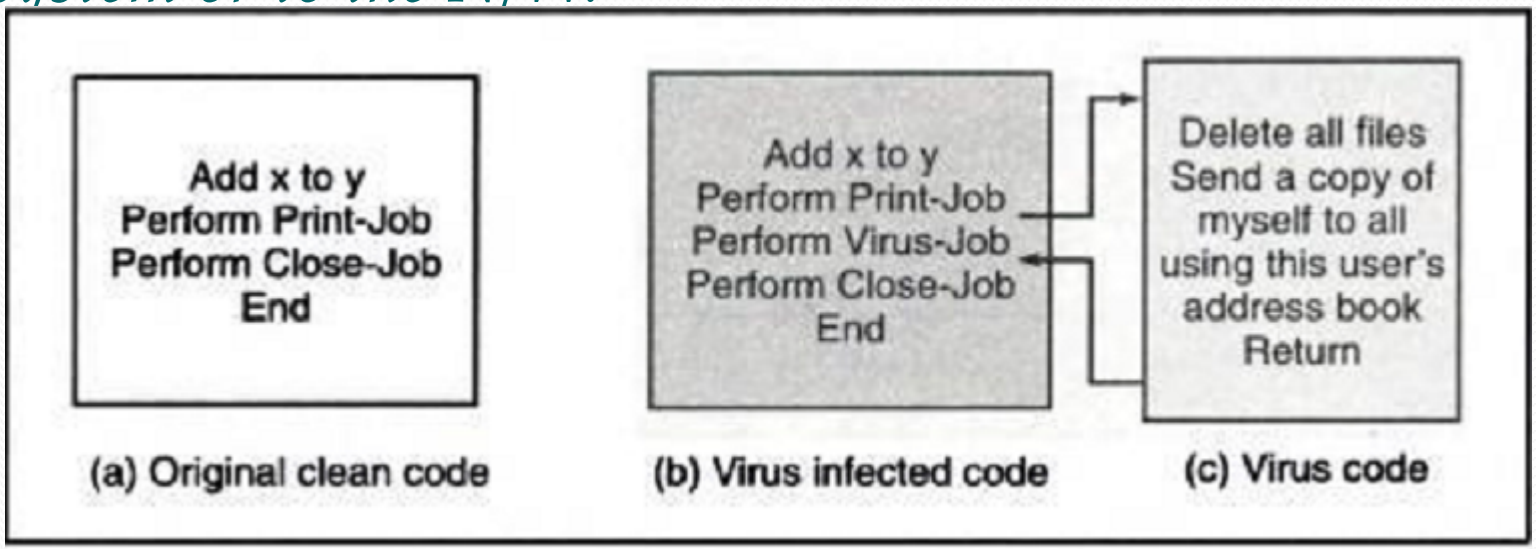

Fig. 1.10 *Virus*

1.virus

- Properties Of Virus

✓ Self-propagates

✓ Action /Event Driven

- Solution->Good backup, recovery Procedure.
- During its life time Virus goes through four phases:-

1. Dormant
2. Propagation
3. Triggering
4. Execution

1.virus

- Virus can be classified into following categories:-

1. Parasitic->.EXE
2. Memory-Resident Virus->.EXE
3. Boot Sector->MBR->Disk->OS
4. Stealth->Intelligence Built in->prevent detection AV
5. Polymorphic->changing its signature->difficult detection
6. Metamorphic->5+rewriting itself every time->more hard
7. Macro virus->Application S/W->like MS office Docs.