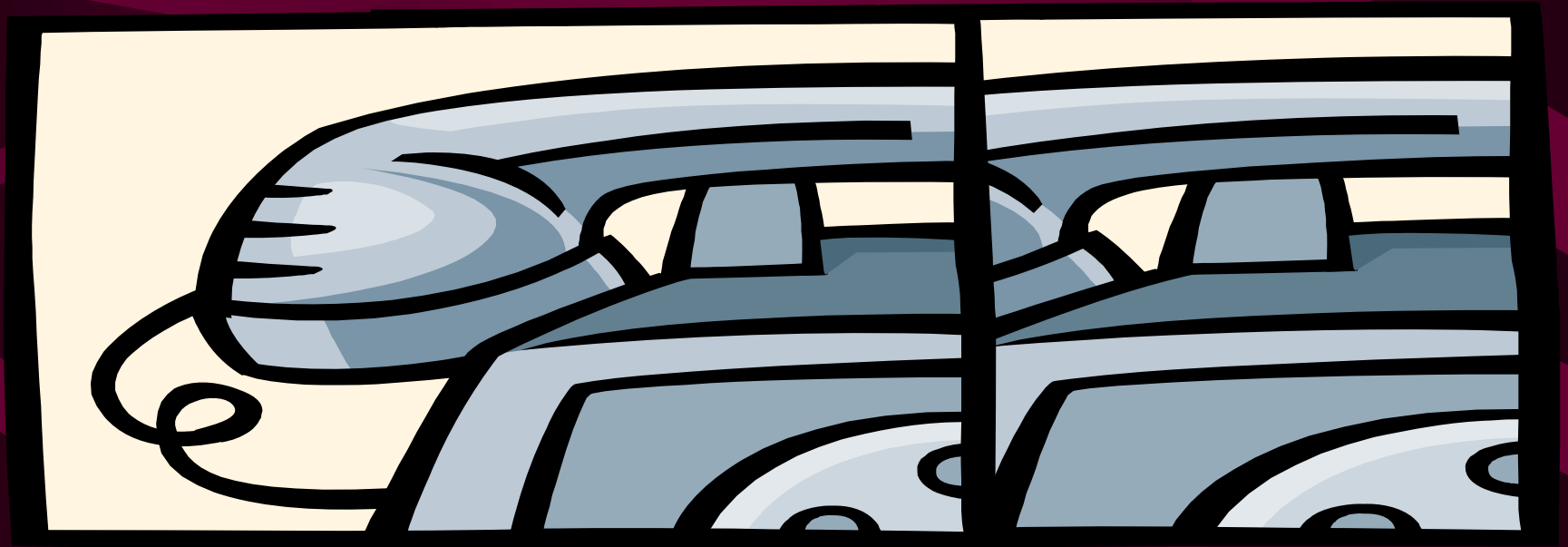


Introduction



Data Communications

- Data
- Plural of datum
 - Raw material from which useful information is derived
 - Objective measurements of attributes of entities
 - Can be numeric, text, voice & images
 - The terms data & information are often interchanged

Information

- ❑ Data converted into useful & meaningful form is information
- ❑ subjected to a value added process where:
 - I. Its form is aggregated, manipulated & organised
 - II. Its content is analysed & manipulated
 - III. It is contextualised for human users

Data Communications

- Need to transfer information from one storage location to another
- Need to transfer data from the CPU to peripheral devices
- Need to transfer data from one local computer to another or from local data terminals to distant mainframe computers

Types of Transmission

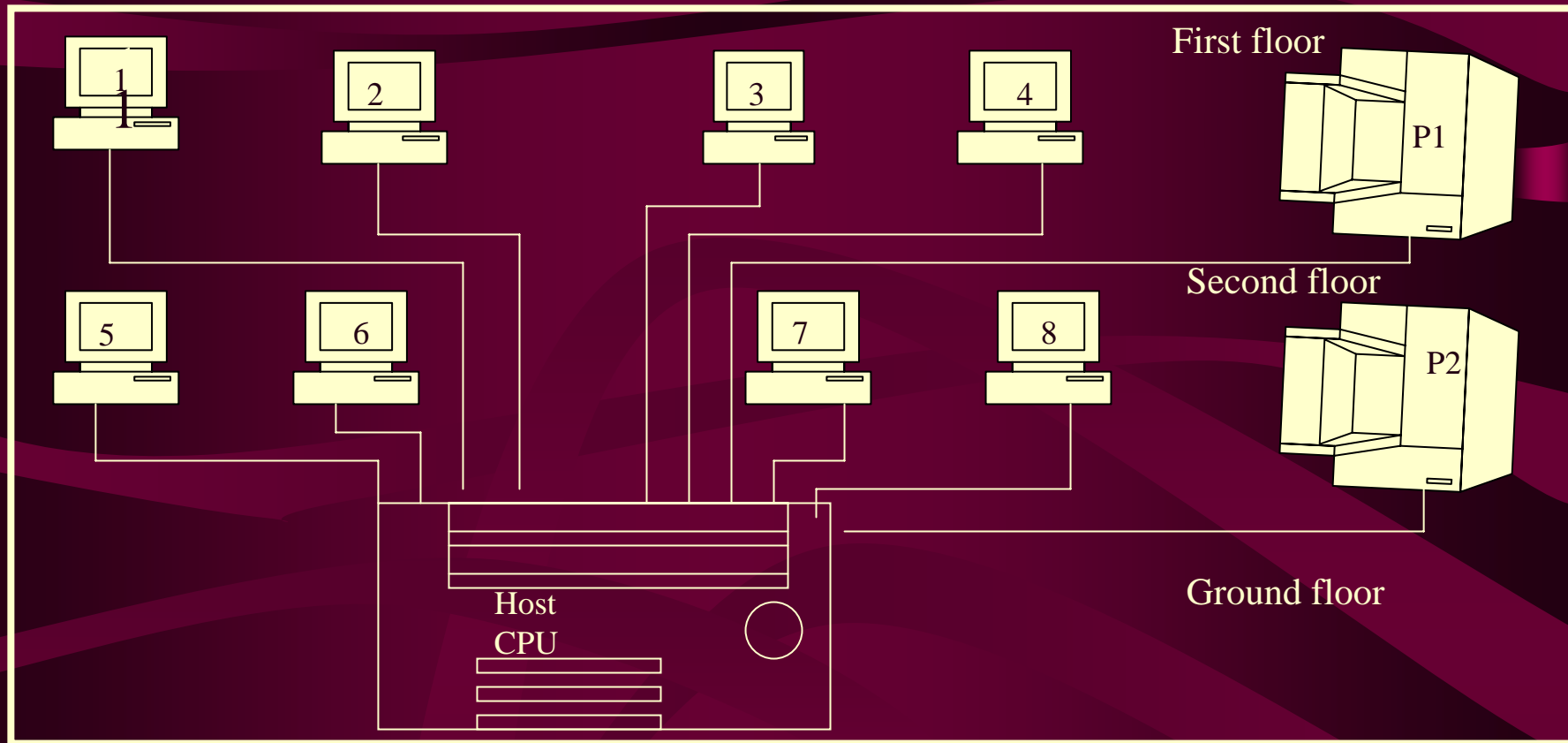


- Internal (within a computer)
- External (either local peripheral equipment)

Communication system elements

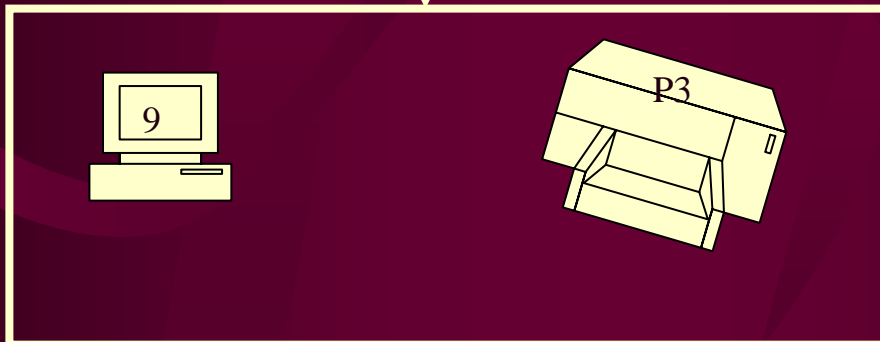
- I. Host computer handles the processing
- II. Peripheral devices send data or receive data from the host computer
- III. Communication media transmit the data
- IV. Modems convert computer signals into a form compatible with the phonelines and vice versa
- V. Communication management devices optimise the flow of messages

Tele-communication system for a mail catalog firm



Telephone
line

Head-office at Bangalore



1 to 9 – Display terminals
P1 to P3 – Printers

Communication system

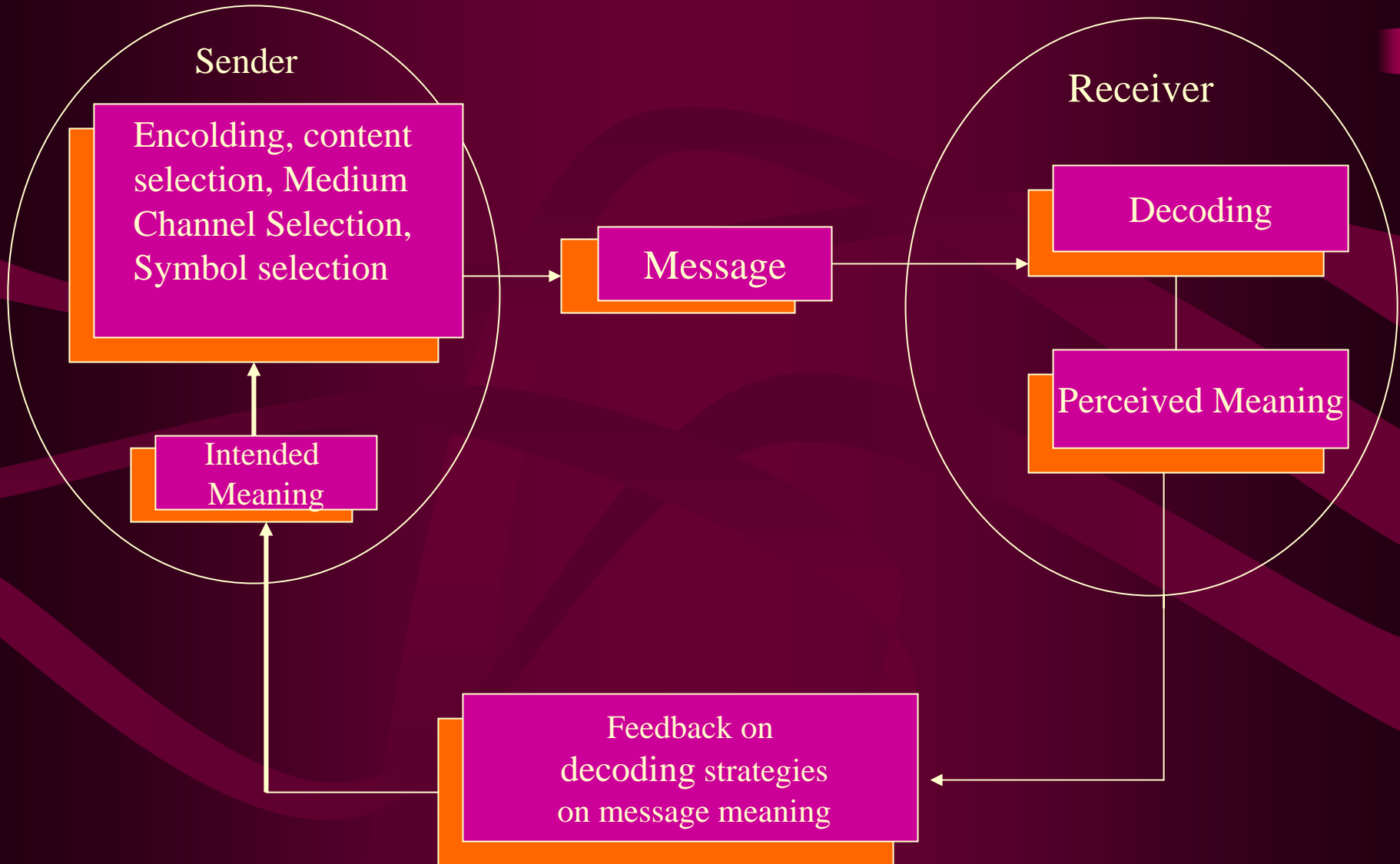


Communication System

□ Two Devices

- Physical Lines : Twisted wire pairs, coaxial cable & fiber optic cable. This is bounded media.
- Microwaves : Terrestrial microwave stations, communications satellites. This is unbounded media.

Communication model



The Basic Communication Media

- The process is called mediated process because no direct interaction is used except the mediation of :
 - Software
 - Computers
 - Transmission technologies

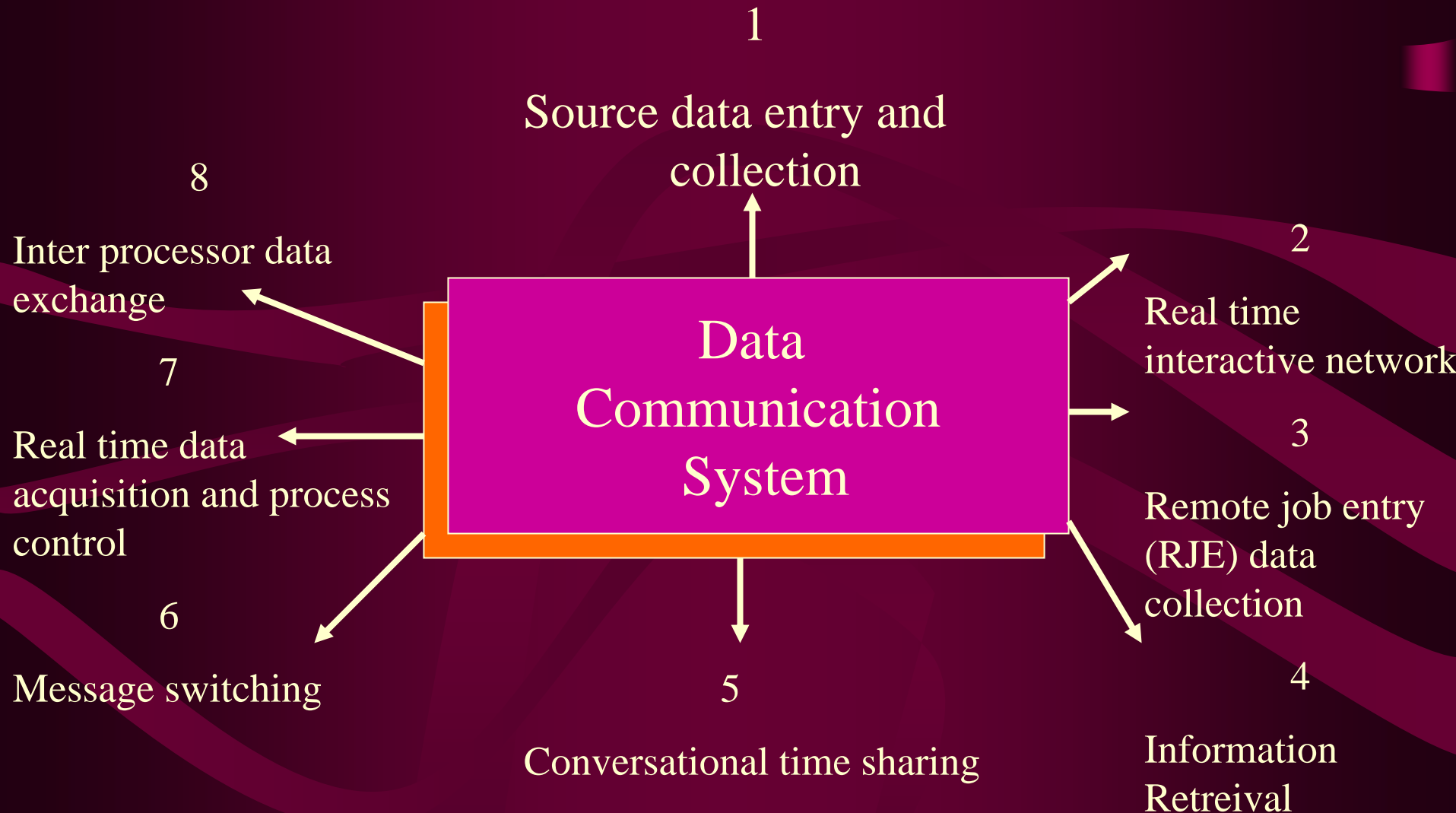
Data communication system components

- Message - pictures, numbers, text, sound, video or combination of such items
 - Sender
 - Receiver
- } Computer, workstation, telephone, handset, video camera etc.
- Medium – twisted pairwire, coaxial cable, microwaves, optic cables, radio waves etc.
 - Protocol – a set of rules that govern data communication

Three Fundamentals for Effective Data Communication

- Delivery - To the correct destination
- Accuracy – To deliver data accurately
- Timeliness – To deliver data at the appropriate time. This is also termed as real-time transmission

Data Communication system



Data Communication networks are established -

- To collect data from remote points
- To transmit that data to a central point
- To perform the reverse process alternatively
- To combine some of the two
- To facilitate more efficient use of central computers

Data Communication networks are established - 2

- To improve the day-to-day control of a business by providing faster information flow
- To provide message transfer services
- To offer better and more timely interchange of data among their users
- To bring the power of computers closer to more users

Advantages of Distributed System

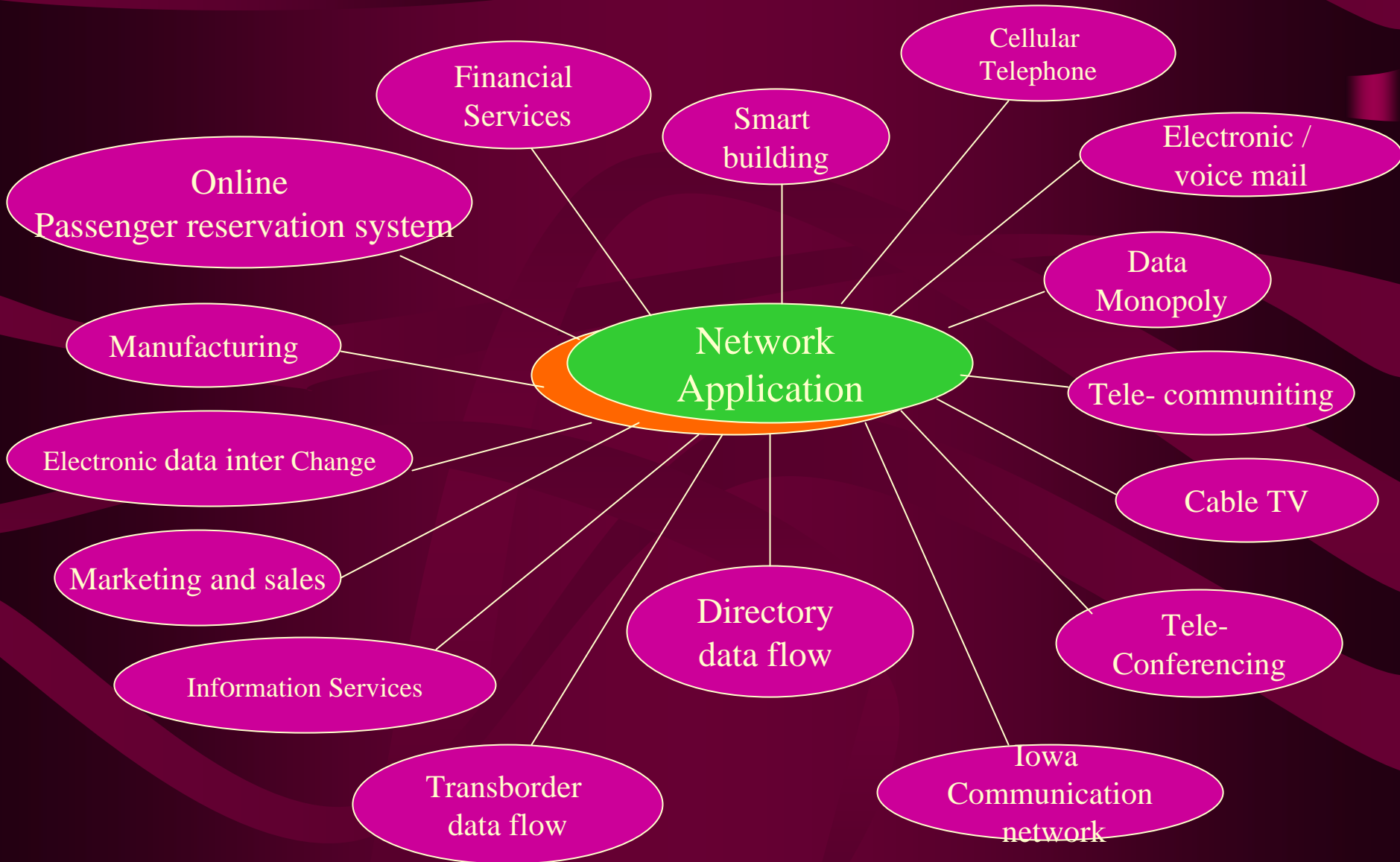
- Security / encapsulation
- Distributed database
- Quick problem solving
- High degree of cohesiveness & transparency
- Existence of multiple autonomous computers

NETWORKS

- Resource sharing
- High reliability
- Money saving
- Scalability
- Communication medium
- Access to remote information
- Interactive entertainment
- User to user communication
- Social issues



Network applications



Teleconferencing in USA

- More than 20 million meetings are held everyday
- 75% of the meetings last less than 30 minutes
- 50% of all meetings are handled by voice communication only
- 90% of the American airlines travel is for business

Financial Services

- Credit history searching
- Foreign exchange & investment services
- Electronic funds transfer (EFT) includes ATM (Automated Teller Machine), automatic paycheque deposit etc.

Data communication standards



Difference between Proprietary & non proprietary standards

- Proprietary standards : originally invented by commercial organisations to operate its products
- Non proprietary standards : originally developed by various groups that have been introduced for the benefits of the public

Network Architecture

Hardware

Software

Protocols

Standards

□ Advantages

- Buying hardware & software from any vendor
- Promotes competition & helps in reducing the prices
- Easy development of hardware & software
- Early updation

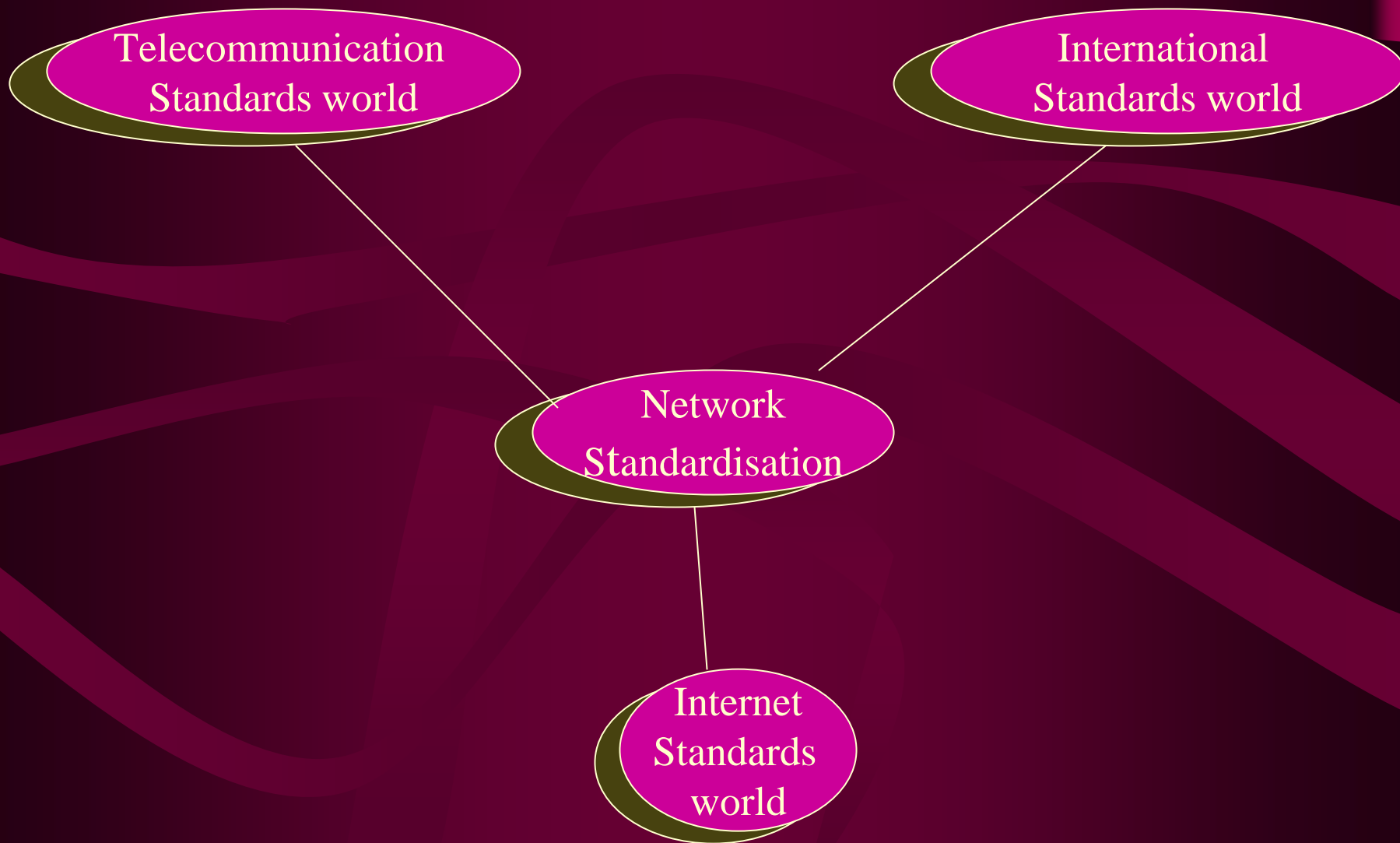
Classification of Standards

Specification Stage

Identification of Choices Stage

Acceptance Stage

STANDARDS ORGANISATIONS



ISO

- **ANSI** (in USA)
- **NIST** (National Institute of Standards & Technology of the US Dept. of Commerce)
- **IEEE** (Institute of Electric & Electronic Engineers)
- Electronic Industry Association (**EIA**)

Telecommunication Standards

❑ COMMUNICATIONS

- ❖ Mail
- ❖ Telegraph
- ❖ Telephone
- ❖ Radio
- ❖ Television

Three main sectors of ITU

Radio communication sector (ITU-R)

Telecommunication standardisation sector (ITU-T)

Development sector (ITU-D)

ITU-T Standards

- V series (V.32, V.33, V.42) for data communication over phone lines
- X series (X.25, X.400, X.500) for transmission over public digital networks
- E-mail & directory services
- ISDN (Integrated services digital networks)

Communication standards

- SNA (System network architecture)
- Internet relay chat
- Newbies & FAQs
- Video conferencing
- Internet Telephone Services

OSI

Data communication tasks -A

□ SEVEN LAYERS

1. Physical (handles voltages, electrical pulses, connectors & switches for transmission over network media)
1. Data Link (controls grouping data into blocks & transferring blocks from one point in the network to another)

OSI

Data communication tasks -B

- 3 Network (controls routing of data & messages)
- 4 Transport (controls data transfer from sending point to receiving point)
- 5 Session (Establishes & terminates communication links between computers)

OSI

Data communication tasks - C

- 6 Presentation (Acts data transfer between different systems)
- 7 Application (provides network services to users & user applications including file transfer. Provides user interfaces with the systems)

ISO

Prominent Members

- **ANSI** (American National Standard Institute)
- **BSI** (British Standard Institute)
- **AFNOR** (France)
- **DIN** (Germany)

ISO

Assistance

- International exchange of goods & services
- Facilitates by providing good models for compatibility, best quality goods, higher productivity & reduced prices)
- Developing cooperation in scientific, technological and economic fields
- Field of Information technology in the creation of OSI model

Areas of ANSI

- Internet work planning & engineering
- ISDN services
- Signalling & architecture
- Optical hierarchy (SONET)

IEEE

- Largest professional organisation in the world
- 802 for LAN is the key standard
- Develops standards for computing, communication, electrical engineering & electronics
- Aims at advance theory, creativity & product quality

Internet crucial policy issues

- Who will pay for Internet transmission lines?
- How crime & rude behaviour can be curbed?
- How to accelerate speed

EIA

Activities

- Standards development
- Public awareness education
- Physical connection interfaces (in IT)
- Electronic signalling specifications (for data communication)

Legal Standards

- Federal wire tap statute (1968) protects voice communication from interception
- Electronic communications Piracy Act (1986) against interception & tampering
- Computer Fraud & Abuse Act (1987) gives total control of data encryptism standard (DES) to NIST
- Computer virus eradication Act (1988) to fight the spread of computer viruses

Internet Standards World

- Internet Activities Board (IAB)
- IRTF & IETF (Internet Research Task Force & Internet Engineering Task Force)
- Internet Society



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