

PSTN NETWORK

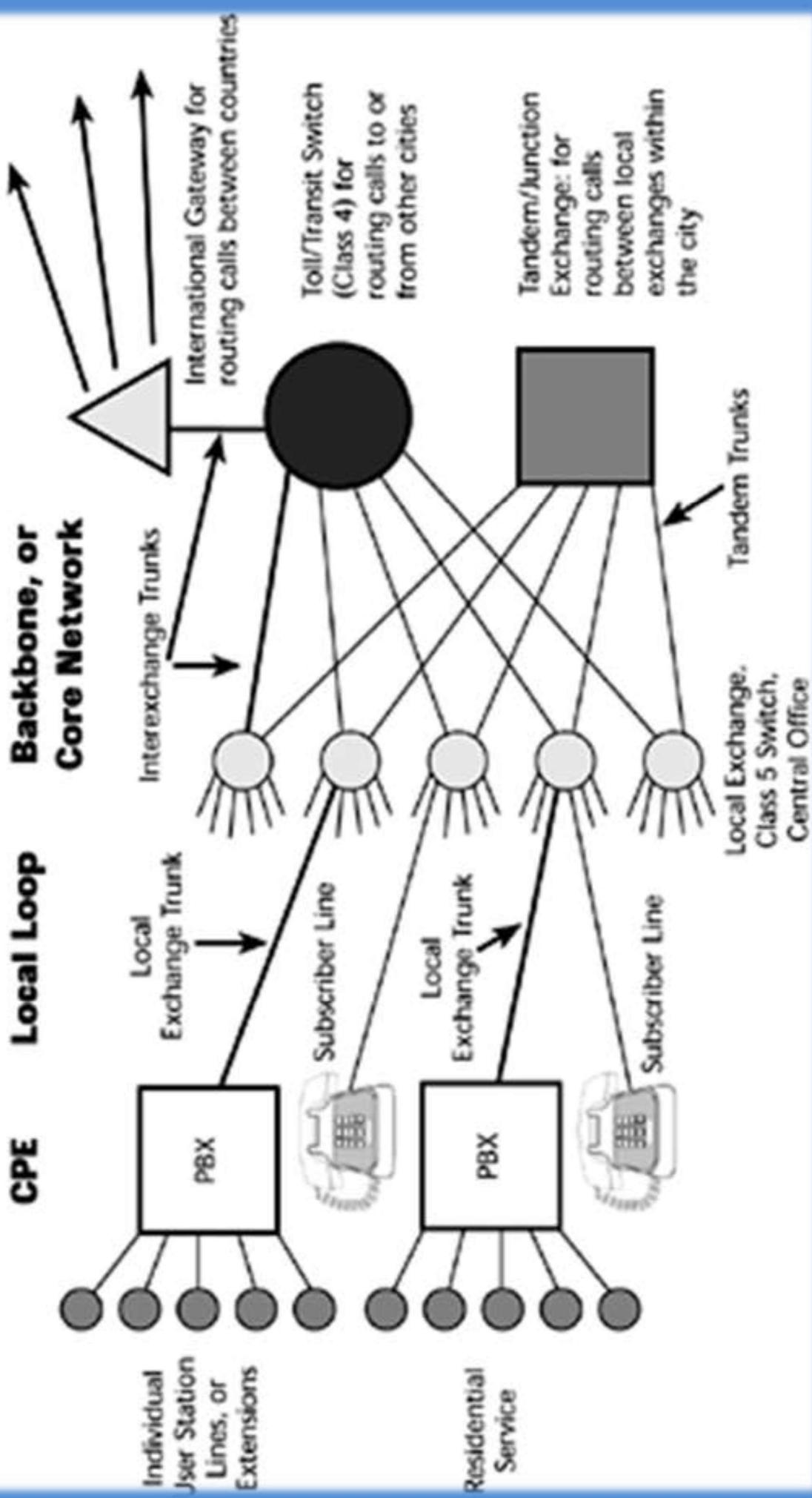
Content overview

- ❖ What is PSTN
- ❖ Evolution of PSTN
- ❖ Band width allocation
- ❖ Numbering schemes
- ❖ Call set-up, signalling and switching

What is PSTN?

- PSTN - short for public switched telephone network, also known as the plain old telephone system(POTS) is basically the inter-connected telephone system over which telephone calls are made via copper wires.
- PSTN is based on the principles of circuit switching
- Therefore when a call is made a particular dedicated circuit activates which eventually deactivates when the call ends
- Telephone calls transmits as analogue signals across copper wires

Structure of the PSTN



Evolution of PSTN

Inception

- 1876 – Invention of the first telephone by sir **Alexander Graham Bell**
 - Telephones were sold in pairs and the customers were supposed to lay out their own cables
 - Connectivity type – point to point connections
 - Network structure – mesh topology
- 28th January 1878 – Worlds' first telephone exchange was established at New-Haven in Connecticut in the USA
 - Network structure – star topology
 - Switching technique – manual switching

Manual exchanges

Manual switch board



Manual switching

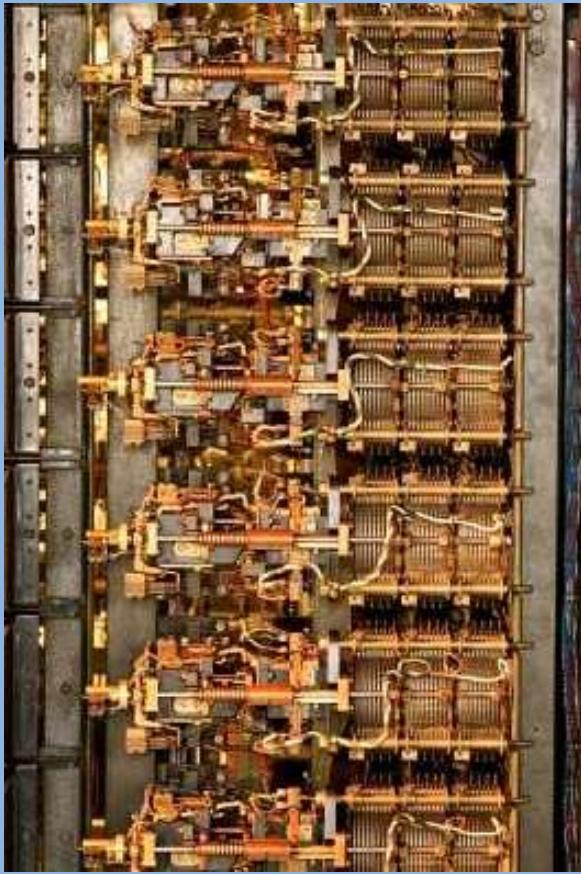
Intermediate

- 1887 – Almon Brown Strowger invented the first electromechanical switch, known as the Strowger switch or step by step switch
- Switch operated according to the train of pulses generated by the customer premises telephone
- Pulses were generated by a telegraph key on the telephone until the dial was introduced
- 1920's – Rotary dial telephones enters service

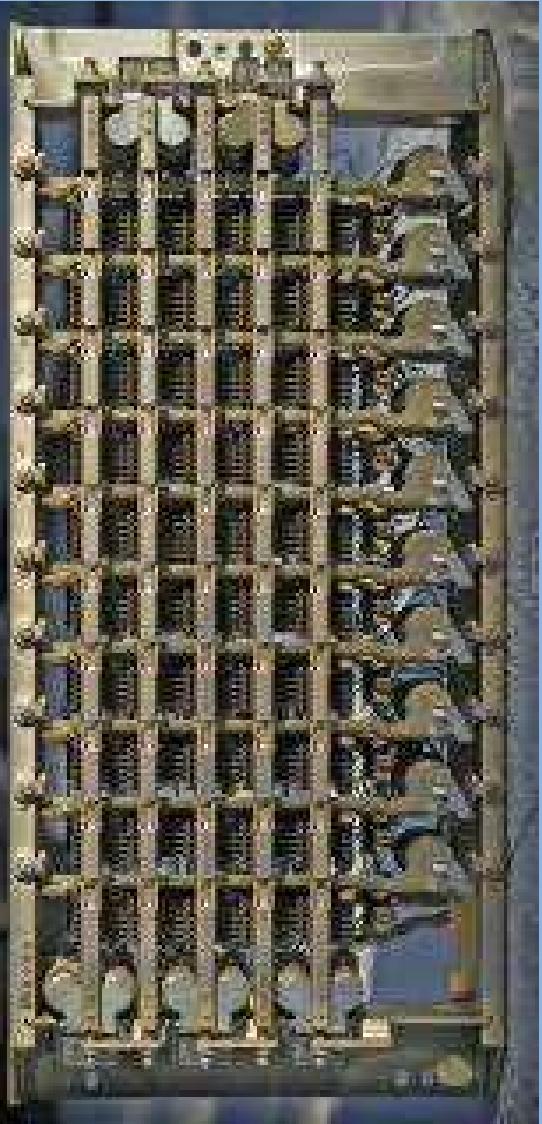
Intermediate

- 1935 – Crossbar switches were introduced
 - Intersecting bars move to make contact in order to complete the circuit
 - Markers were used to control exchanges
 - Takes only 1/10 of a second to complete a call
- 1950 – Time division multiplexing (TDM) is introduced
- 1960's – touch tone pad phones were introduces
- 1968 – stored program control switching was introduces
 - An electronic switch
 - Upgradable to new versions since software dependant
 - Call set-up is controlled by programmed software's
 - calls are completed within nano seconds

Electro-mechanical exchanges



Strowger switch



Crossbar switch



Present

- In today's PSTN, call routing from source to destination is predominantly controlled by digital switches that were introduced in the 1970's
- Apart from voice communications, data communications are also provided via the PSTN at present



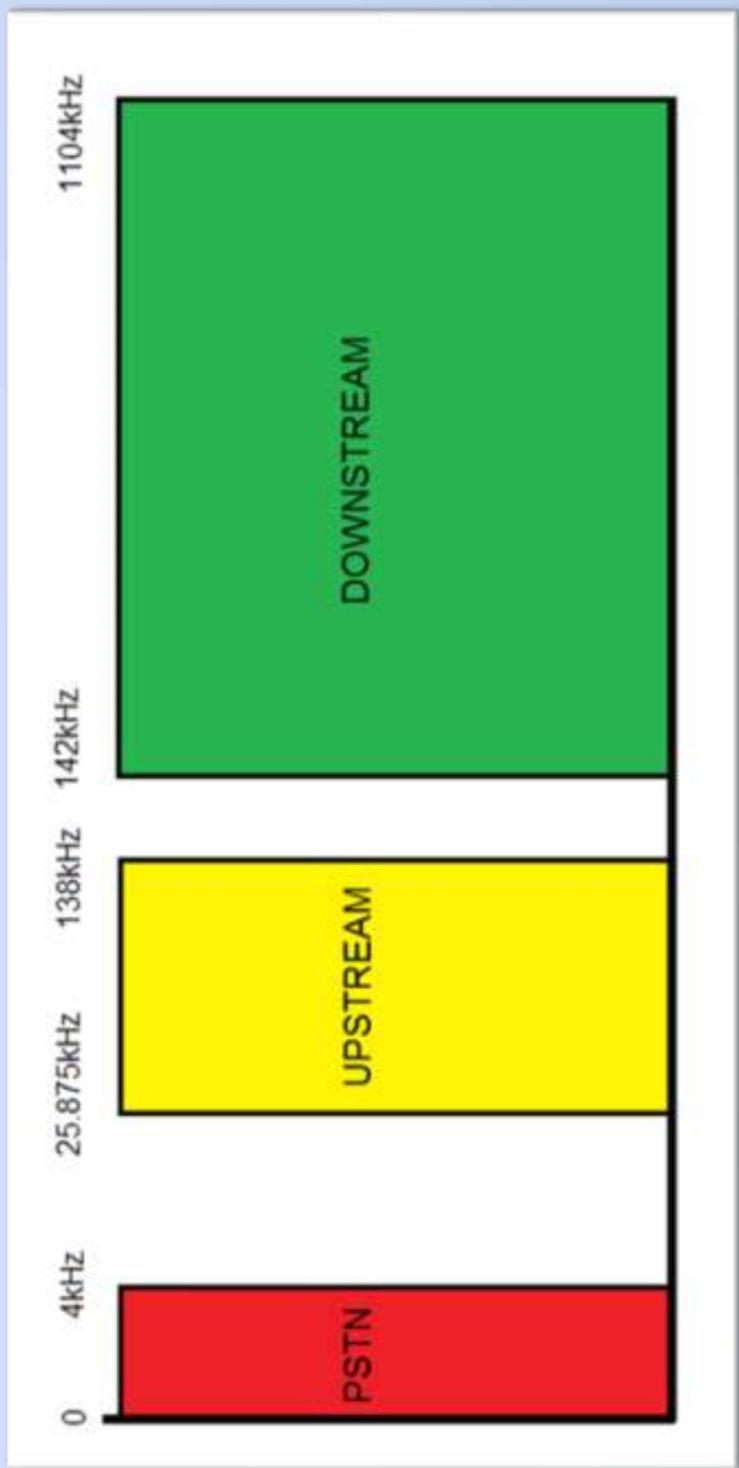
DMS - 100 digital switch

Evolution of the Telephone



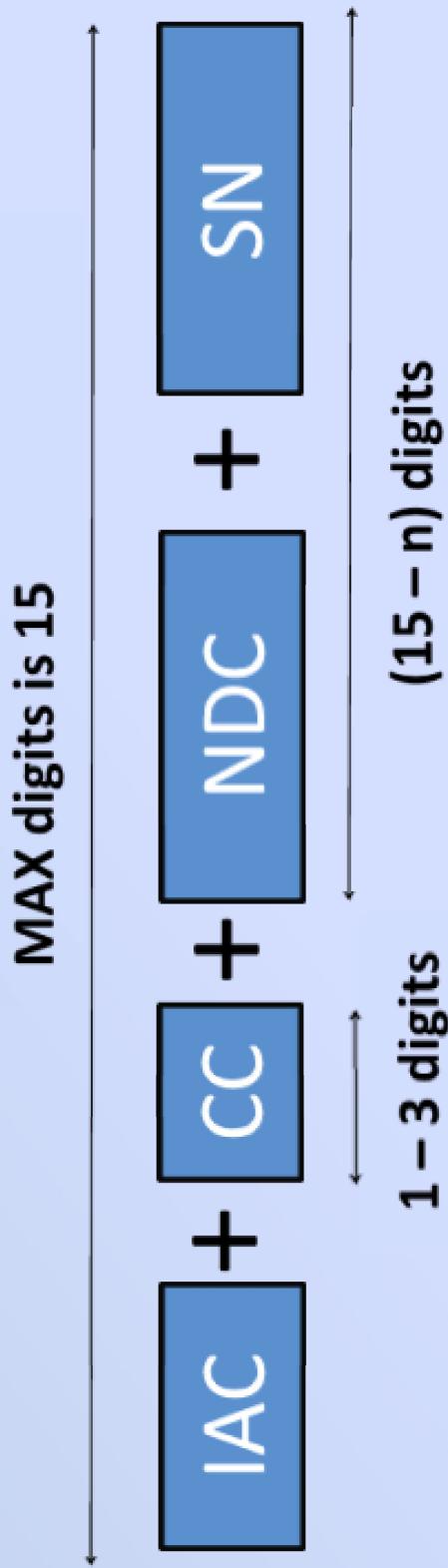
Bandwidth allocation

- voice bandwidth – 300 – 3400Hz
- DSL frequency bands
 - Up stream – 25.875kHz – 138kHz
 - Down stream – 142kHz – 1104kHz



Numbering schemes

- ❖ A PSTN number comprises of,
 - A international access code/exit code (IAC/EC)
 - A country code (CC)
 - A national destination code also know as an area code (NDC/AC)
 - A subscriber number (SN)
- ❖ Maximum length of a number is 15digits



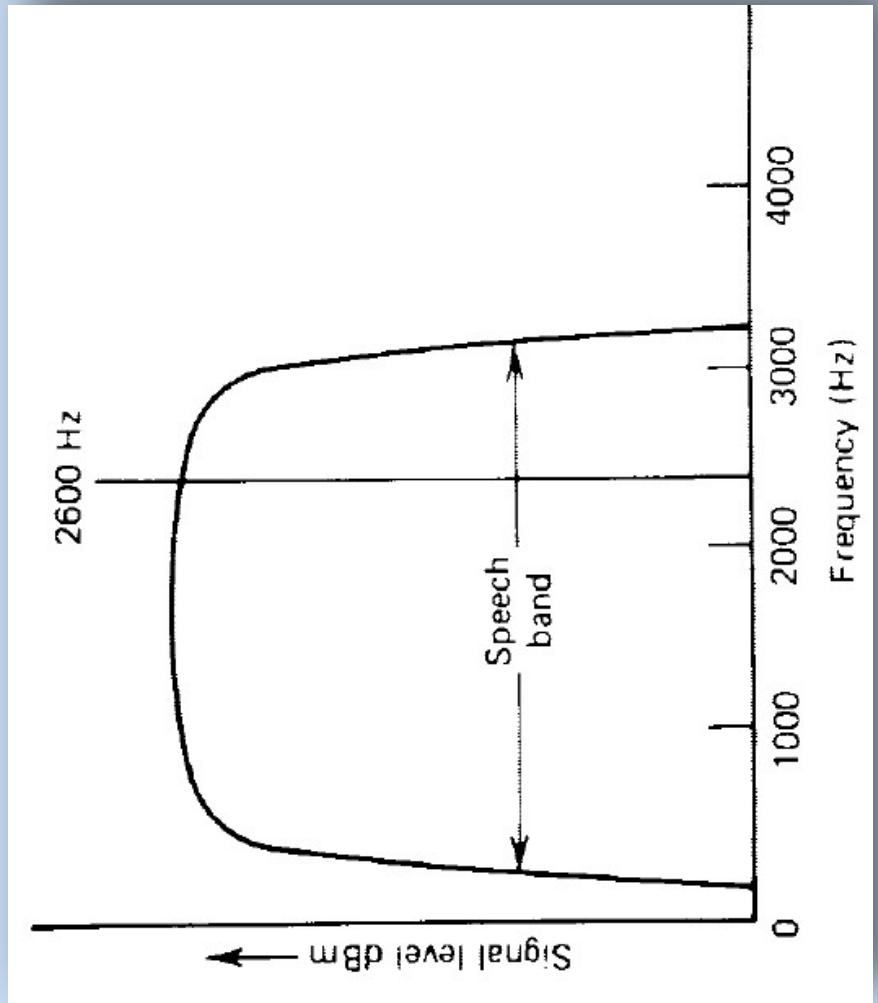
- $n = \text{country code} + \text{international access code}$
- most international access code are either (00) or (011)
except for few exceptions like (009 - Nigeria) and (119 - Cuba)

Signaling

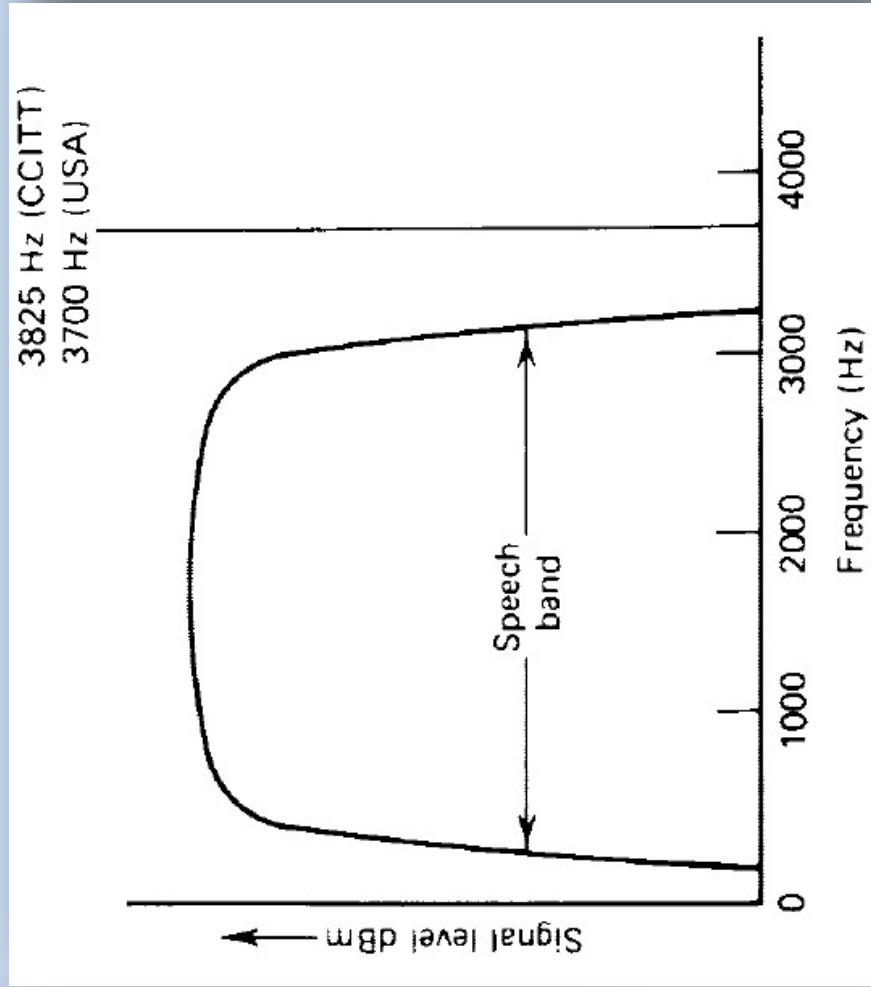
- ❖ Signaling is the controlling of communications
- ❖ Basically anything but voice transmission is signaling
 - Ex : call setup, call termination, billing , caller ID etc...
- ❖ There are types of signaling
 - Channel associated signaling (CAS) - signaling information is transmitted within the same voice channels
 - Also known as in-band signaling
- Ex : Dual tone multi frequency signaling (DTMF)
- Common channel signaling (CCS) - signaling information is transmitted via a separate channel
 - Also known as out-band signaling

Ex : signaling system #7 (SS7)

Signalling



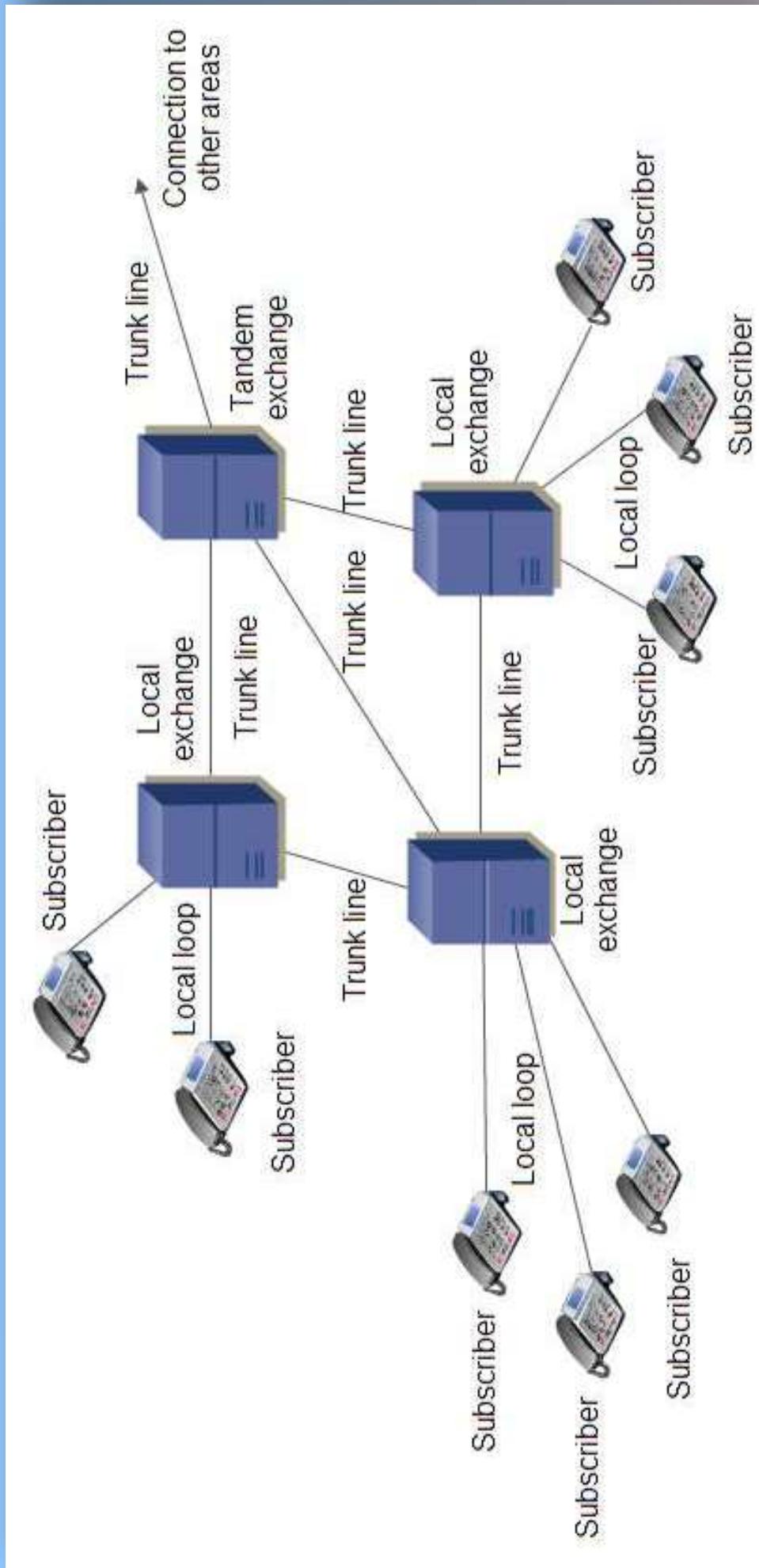
In-band signalling



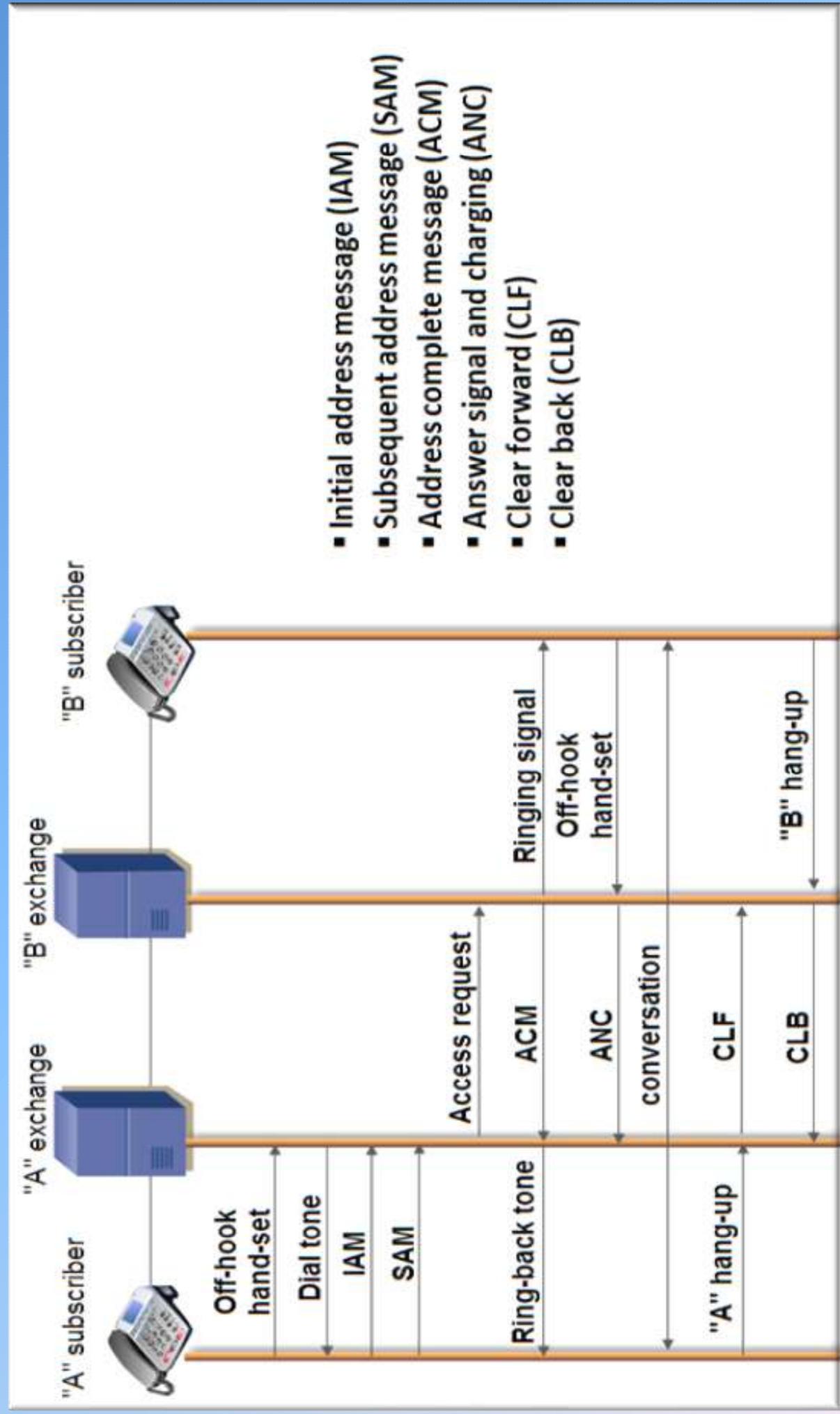
out-band signalling

Switching systems

- ❖ Switching systems, basically are what determines the routing pathway of a call
- ❖ Switches are contained in local exchanges and central offices

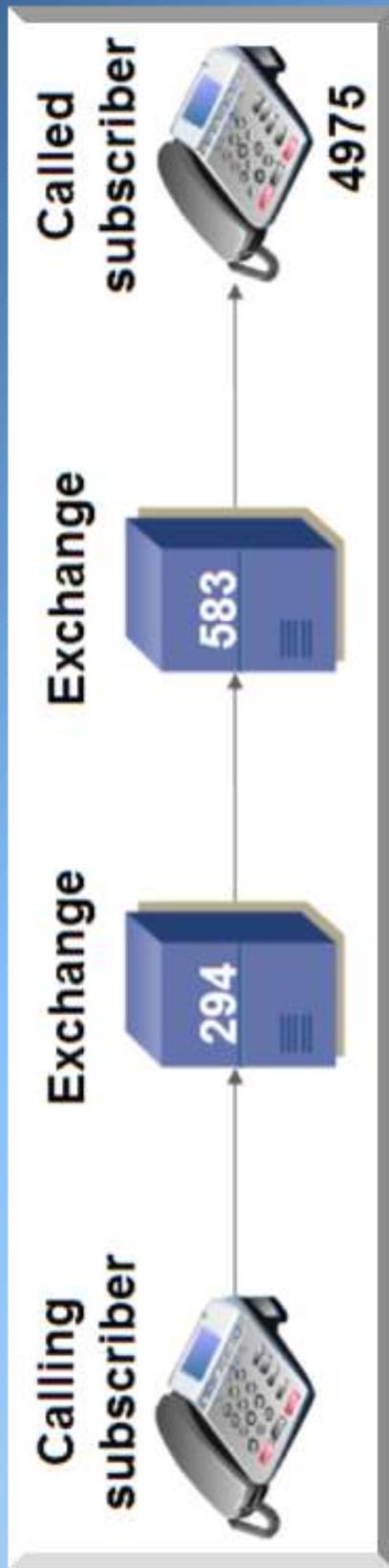


Call setup process



Call setup process

Example : Suppose the calling subscriber dialed “5834975”



- At first the exchange(294) which the calling subscriber is directly connected to, examines the dialed digits “583-4975”
- Secondly it acts upon the first three digits and access its look up table to rout the call to the “583” exchange
- Then the “583” exchange acts upon the information
- It identifies the dialed number and connects the correct subscriber loop which matches the “4975” number
- Then ring current is applied to the loop to alert the called subscriber and when the call is answered conversation begins

THANK YOU