PSTN NETWORK

Content over view

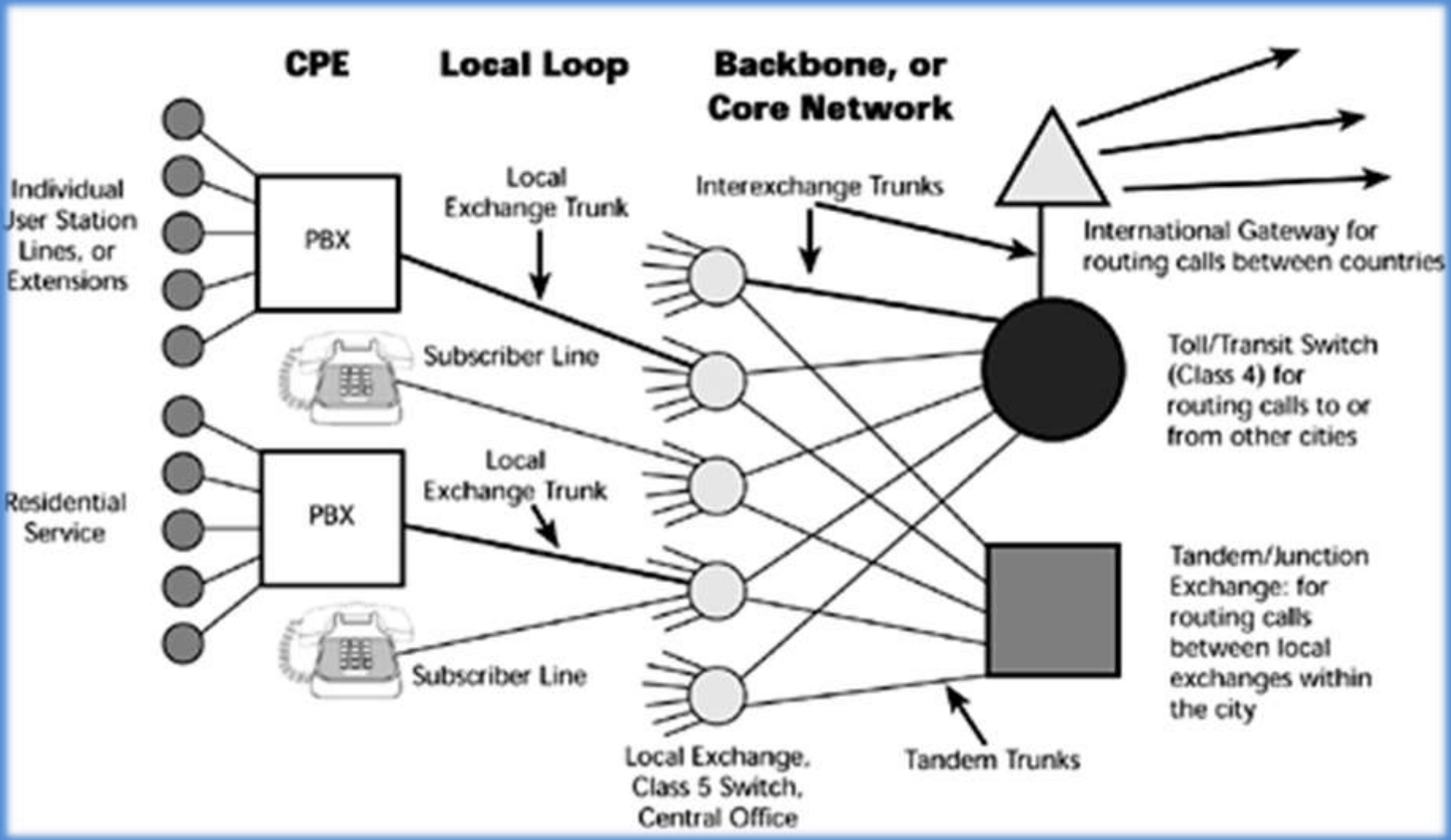
- What is PSTN
- Evolution of PSTN
- Band width allocation
- Numbering schemes
- Call set-up, signaling and switching

What is PSTN?

PSTN - short for public switched telephone network, also knows 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 there 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

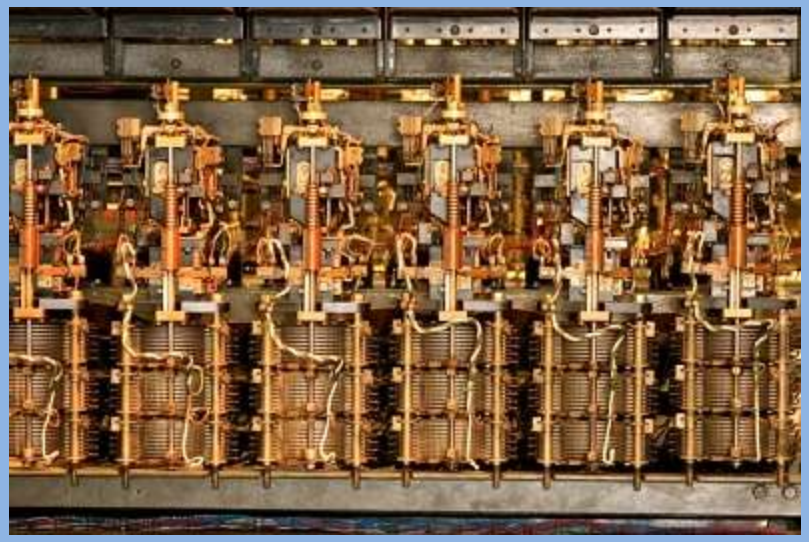
Intermediate

- 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 introduces
- 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

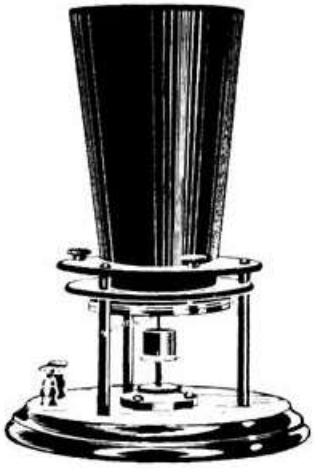
Crossbar switch

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



1876 - Bell's original phone

1880's - Hand crank wall phone

1890's - candle-stick pone

1880's - cradle phone

1914 - Candle-stick rotary dial phone

1920's - Desktop rotary dial phone

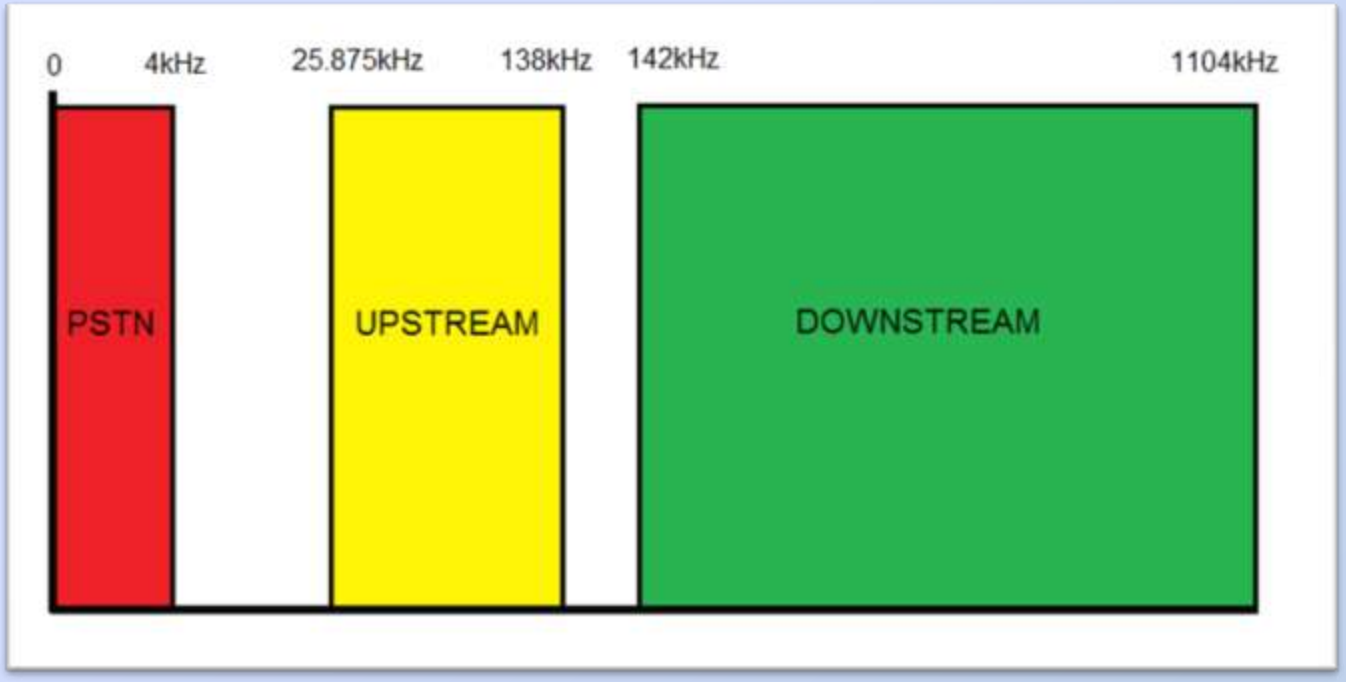
1960's - Touch tone pad phone

1970's - Wall touch tone pad phone

1980's - cordless phone

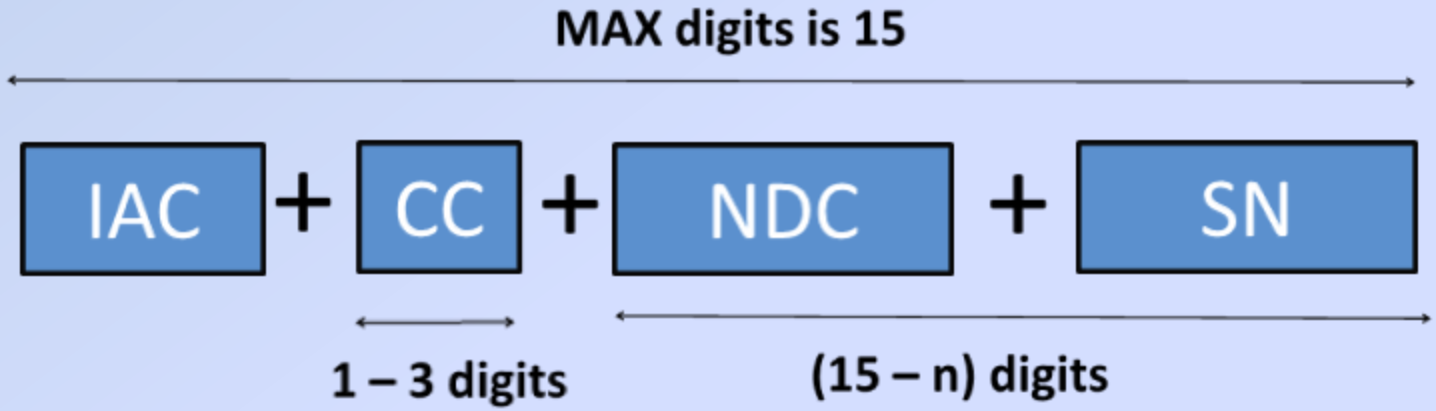
Bandwidth allocation

- 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 = country code + 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

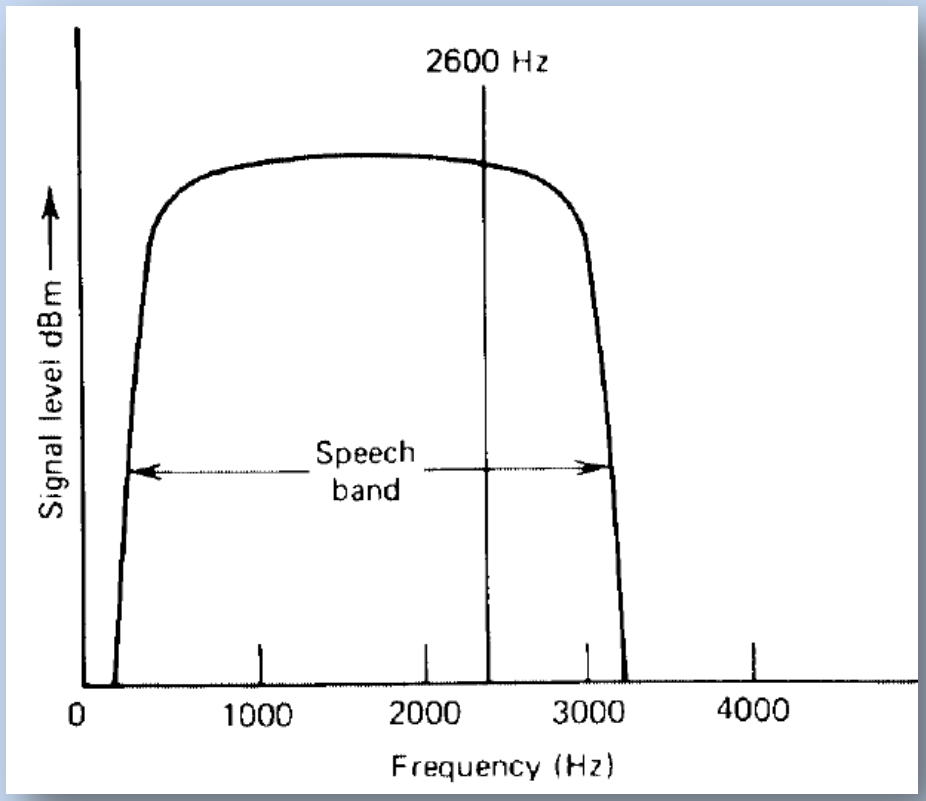
  Ex : call setup, call termination, billing , caller ID etc…
- There are types of signaling
  - Channel associated signaling (CAS) - signaling information is transmitted within the same voice channels
  - Also know as in-band signaling

    Ex : Dual tone multi frequency signaling (DTMF)

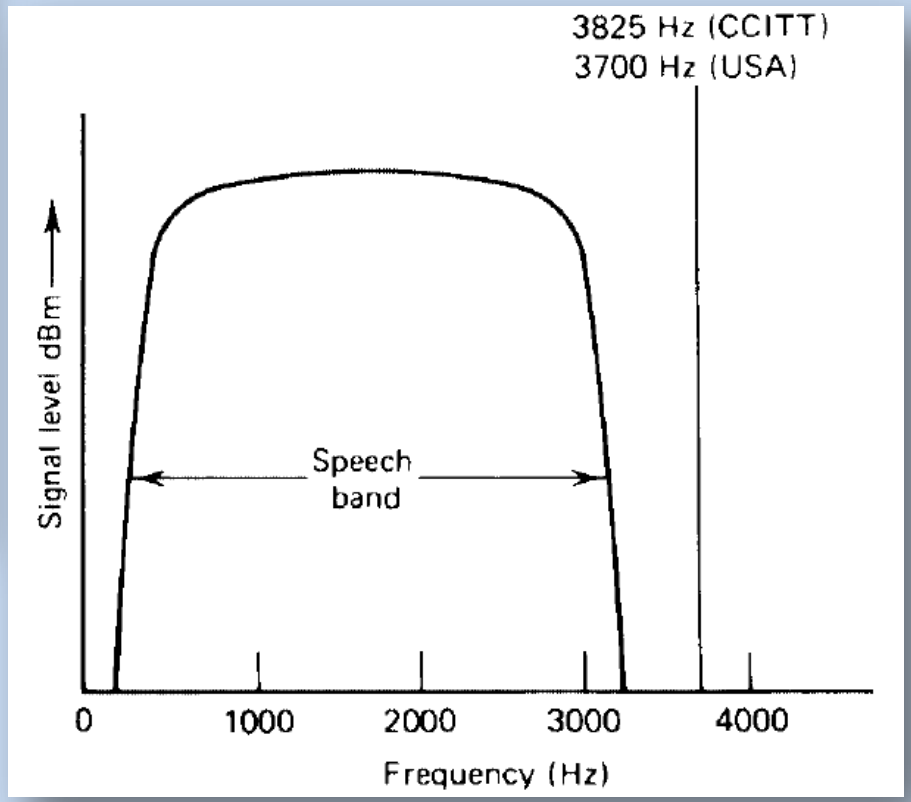
  - Common channel signaling (CCS) - signaling information is transmitted via a separate channel
  - Also know as out-band signaling

    Ex : signaling system #7 (SS7)

Signaling



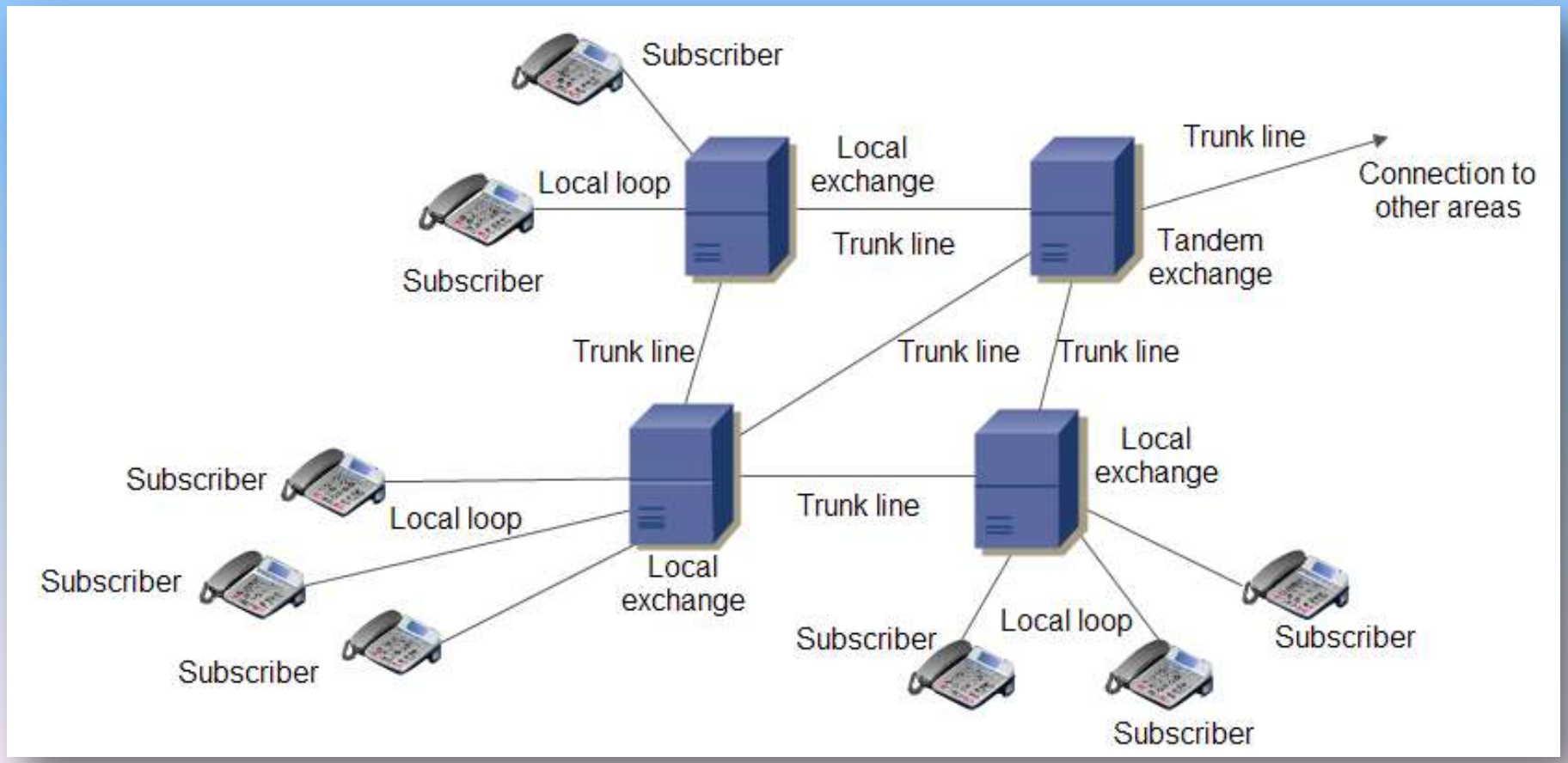
In-band signaling



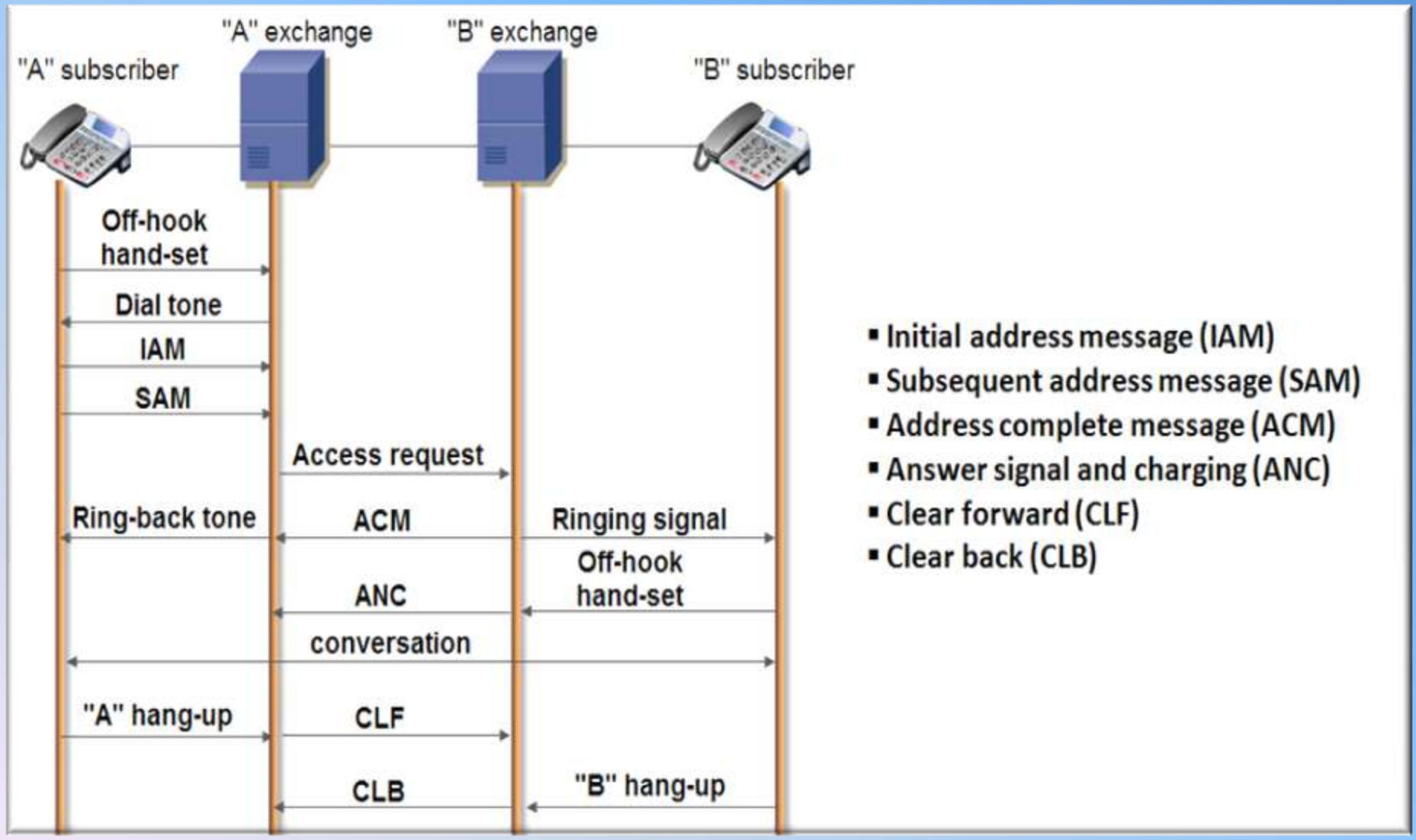
out-band signaling

Switching systems

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



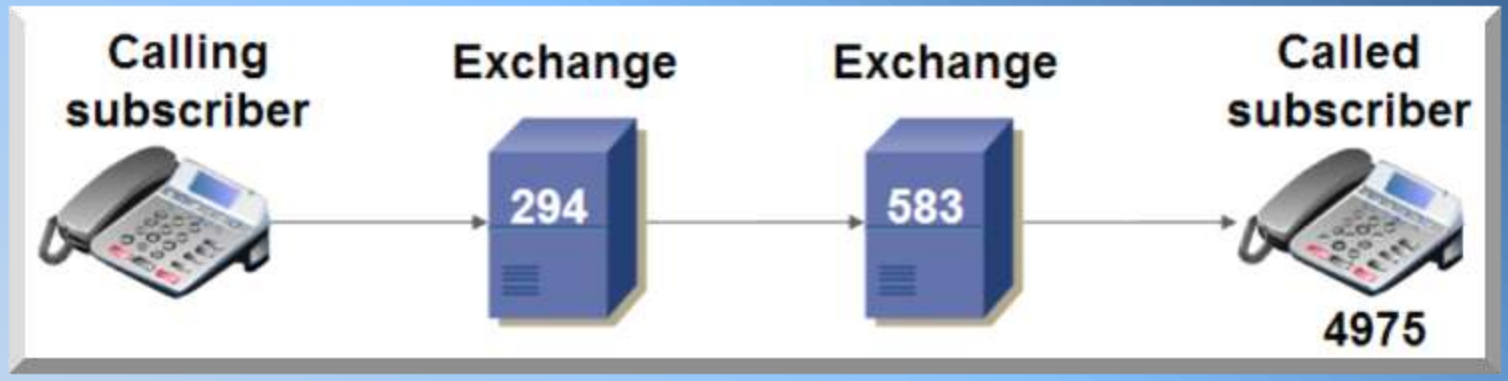
Call setup process



- Initial address message (IAM)
- Subsequent address message (SAM)
- Address complete message (ACM)
- Answer signal and charging (ANC)
- Clear forward (CLF)
- Clear back (CLB)

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