SIGNALLING TECHNIQUES

Signaling

- In-Channel
  - D.C
  - Low Freq. AC
  - Voice Frequency
  - PCM

- Common Channel
  - Associated
  - Non Associated
DC & LOW-FREQUENCY AC

- **DC Signalling** can be used in un-amplified metal-based audio lines. DC signaling is simple, cheap and reliable.

- **AC Signalling** can be used in Amplified Audio Circuits.

- **DC and Low Frequency AC** cannot be used when FDM systems are in use then Voice Frequency Signalling are used.
• Disadvantage of In-Band
  • In-band Voice Frequency Signalling must be protected against false operation by speech.

• Advantage of In-band
  • Control signals can be sent to every part voice can reach.

• Disadvantage of Out-band
  • Very narrow bandwidth is available

• Voice Frequency Signalling Schemes suffer from very limited bandwidth.
1. **Intra-exchange signalling** is the exchange of control information, i.e. call setup, call supervision and call termination within a telephone exchange.

2. There are three types of inter-exchange signalling are:
   
   (I) **Supervision Signals** also known as line signals communicate events that occur on the telephone lines, such as on-hook and off-hook.
   
   (II) **Address Signals** also known as selection signals, digits, or register signals communicate the called subscriber number.
   
   (III) **Tones and Announcements**, e.g. ringing-tone and busy-tone communicate the status of the called subscriber.
SIGNALLING IN A LOCAL TELEPHONE EXCHANGE

SA starts by going off-hook (lifting the handset of the telephone from its cradle).

In response, the exchange returns dial-tone, indicating that it is ready to receive digits.

SA then sends the digits of number of SB, using the dial or the keypad of the telephone.

Upon receipt of 3-4 digits, the exchange recognizes the exchange code as local (itself).

The exchange confirms SB is free. It sends a ringing signal to alert SB and informs SA about the call progress with a ringing-tone.

SB goes off-hook. The exchange then sets up a path in its switch between the subscriber lines. The conversation starts, and the exchange begins to charge SA for the call.
1. **Inter-exchange signalling** is the exchange of control information, i.e. call setup, call supervision and call termination between two switching units in a telecommunication network.

2. There are three types of inter-exchange signalling are:
   (I) **Supervision Signals** also known as line signals communicate events that occur on the trunk, such as seizure, proceed-to-send, answer, or clear-forward.
   (II) **Address Signals** also known as selection signals, digits, or register signals communicate the called subscriber number.
   (III) **Tones and Announcements**, e.g. ringing-tone and busy-tone communicate the status of the called subscriber and are the same as in subscriber signalling.
SIGNALING DURING A TRANSIT CALL

Local Exchange A

Intermediate Exchange B

Local Exchange C

S₁ Finishes Dialing

Seizure

Proceed-to-send (Wink)

First Digit

Last Digit

Seizure

Proceed-to-send (Wink)

First Digit

Last Digit

Ringing-tone

Answer

Conversation

Clear-back

Clear-forward

Release-guard

S₂ Answers

S₁ Clears

Clear-back

Clear-forward

Release-guard

S₂ Clears
• When exchange B has received the complete called number, it seizes an available trunk $T_2$ to destination exchange C and sends a seizure signal on the trunk.

• Exchange C responds with a wink signal, after which exchange B sends the digits of the called number and cuts through a path between trunks $T_1$ and $T_2$. 
• Exchange C then checks whether called subscriber $S_2$ is idle. If this is the case, it sends a ringing signal to $S_2$ and ringing-tone on trunk $T_2$. Because there is a connection between the calling subscriber $S_1$ and exchange C, and subscriber $S_1$ hears a ringing-tone.

• When $S_2$ answers, exchange C sends an answer signal on $T_2$, and exchange B repeats the signal on trunk $T_1$.

• Assuming that originating exchange A is responsible for charging the call, it establishes a billing record that includes the calling and called numbers, the date, and the time of answer.
• The conversation now begins.
• If the called party $S_2$ hangs up first, Exchange C sends a clear-back signal to exchange B, which repeats the signal to exchange A.
• On receipt of the clear-back, exchange A stops charging and enters the time when it received the clear-back in the billing record of the call. It also starts a 30–60 second timer. It then awaits a clear-forward from calling party $S_1$, or the expiration of the timer, and initiates the release of the connection when one of these events occurs.
1. “Billable minutes” refer to the duration (counted in minutes) for which the reporting service provider is entitled to bill the customers. If the reporting service provider offers any free-of-charge minutes to its customers, the free-of-charge traffic should be reported as part of the “billable minutes”.

2. “Conversation minutes” refer to the duration (counted in minutes) measured by the reporting service provider in which conversations can take place between the calling and the called parties. A “conversation minute” represents one minute of “conversation time”. “Conversation time” is defined in the relevant ITU-T Recommendation to be the interval that elapses between:

- the moment when the reply condition (answer signal in the backward direction) is detected at the point where the recording of the call duration takes places; and

- the moment when the clear forward condition (clear forward signal) is detected at the same point.
• Modern trend is to provide Enhanced signaling through a packet switched Common Channel Signaling (CCS) Scheme.

• Common channel signalling involves the use of a separate data communication system for control signals.

• There are two types of CCS schemes:

  1. **Associated CCS**: The Signaling Channel tracks the trunk groups on the entire length of the connection, i.e they follow the same path.

  2. **Non-associated CCS**: The Signaling Channel does not track the trunk groups, i.e signaling network (data switched) is separate from the voice communication network (circuit switched)
<table>
<thead>
<tr>
<th><strong>IN-CHANNEL</strong></th>
<th><strong>COMMON CHANNEL</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Trunks must be held during signaling</td>
<td>Trunks are not required for signaling</td>
</tr>
<tr>
<td>Signal repertoire is limited</td>
<td>Extensive Signal repertoire is possible</td>
</tr>
<tr>
<td>Interference between Voice and Control Signals may occur</td>
<td>No Interference since the channels are physically separate</td>
</tr>
<tr>
<td>Signalling equipment is required for every trunk and hence is expensive</td>
<td>Only one equipment is required for a whole group of trunks making CCS much cheaper</td>
</tr>
<tr>
<td>There is a potential for misuse by customers who can generate signals to mimic signalling</td>
<td>Control channel is un-accessible to users</td>
</tr>
<tr>
<td>Signalling is relatively slow</td>
<td>Signalling is significantly faster</td>
</tr>
<tr>
<td>Speech circuit reliability is assured</td>
<td>There is no automatic test of the speech circuit</td>
</tr>
<tr>
<td>It is difficult to add or change signals since all trunks must be altered</td>
<td>Signals can be added or altered more easily</td>
</tr>
<tr>
<td>It is difficult to handle signaling during the speech period</td>
<td>Signalling can be handled at any time due to the separate signaling channel</td>
</tr>
<tr>
<td>Reliability of the signaling path is not critical</td>
<td>Reliability of the signaling path is critical</td>
</tr>
</tbody>
</table>