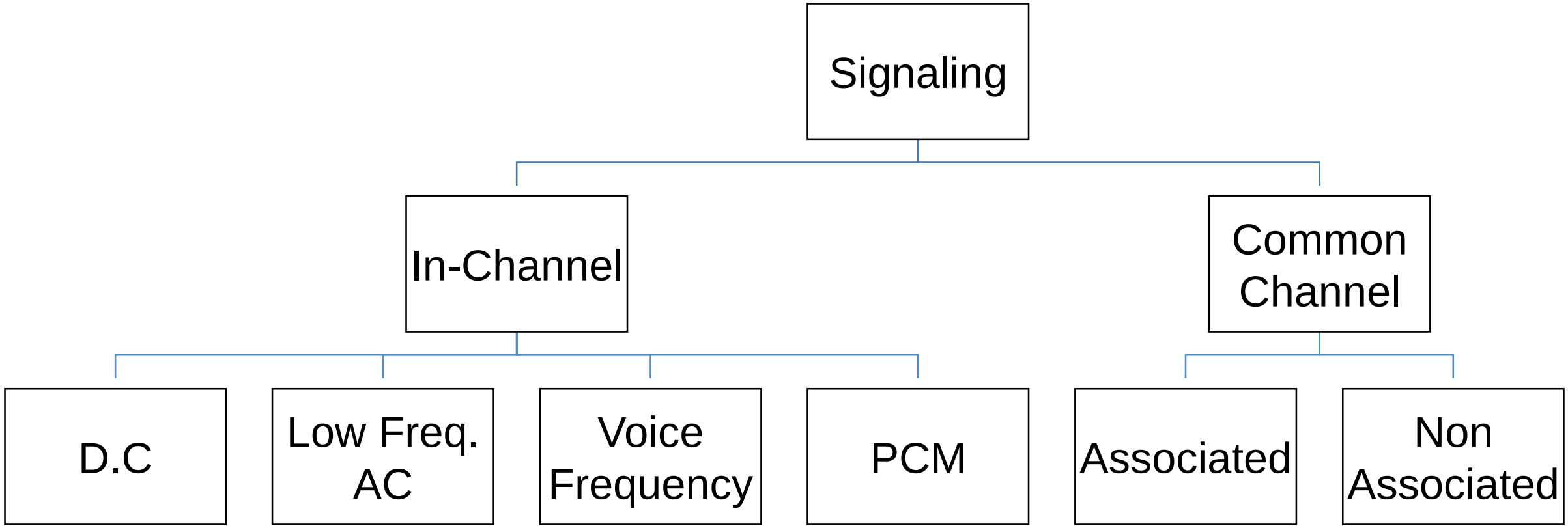
SIGNALING IN TELEPHONE NETWORKS

ETI 2506

Monday, 05 December 2016

SIGNALLING TECHNIQUES



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

VOICE FREQUENCY SIGNALLING

- **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.

INTRA-EXCHANGE SIGNALING

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.

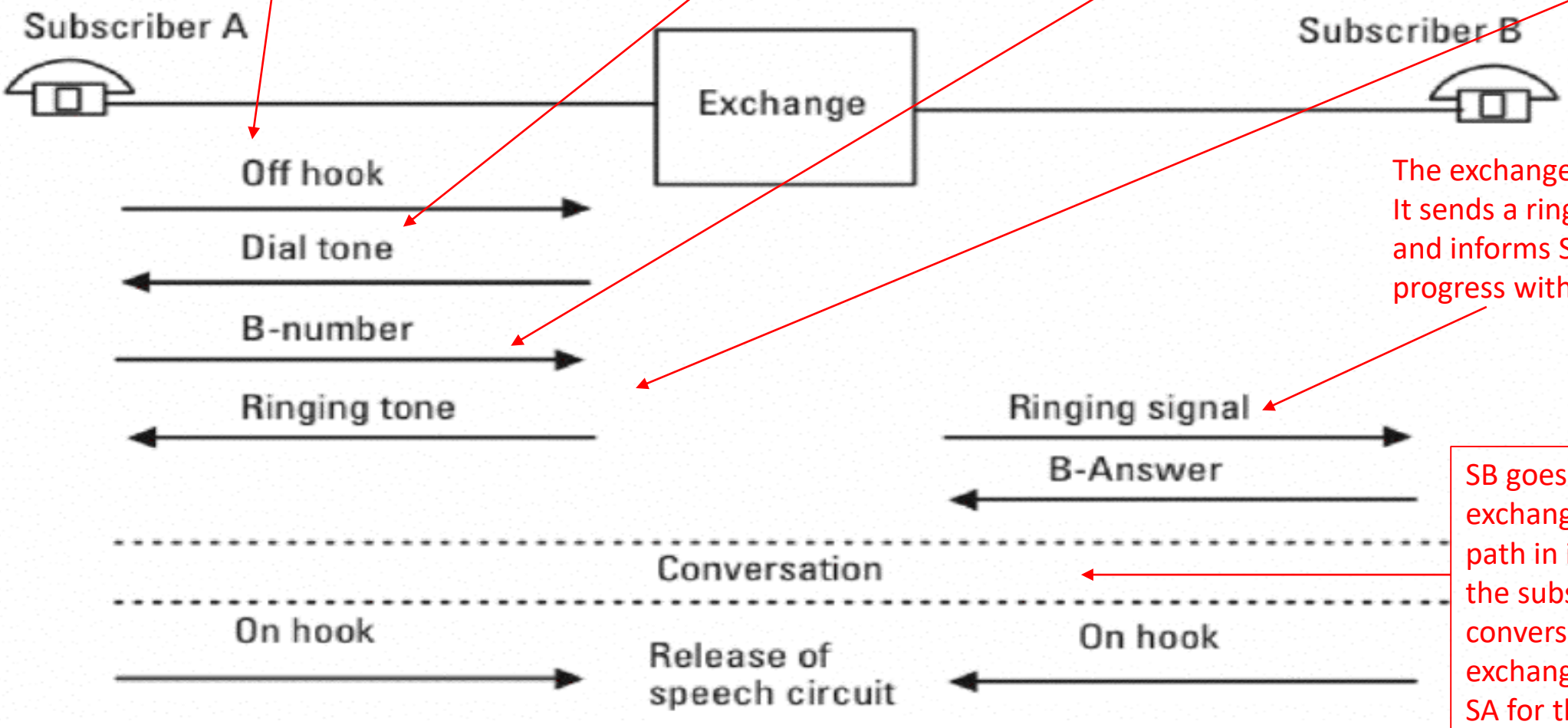
SIGNALLING IN A LOCAL TELEPHONE EXCHANGE

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.

INTER-EXCHANGE SIGNALING

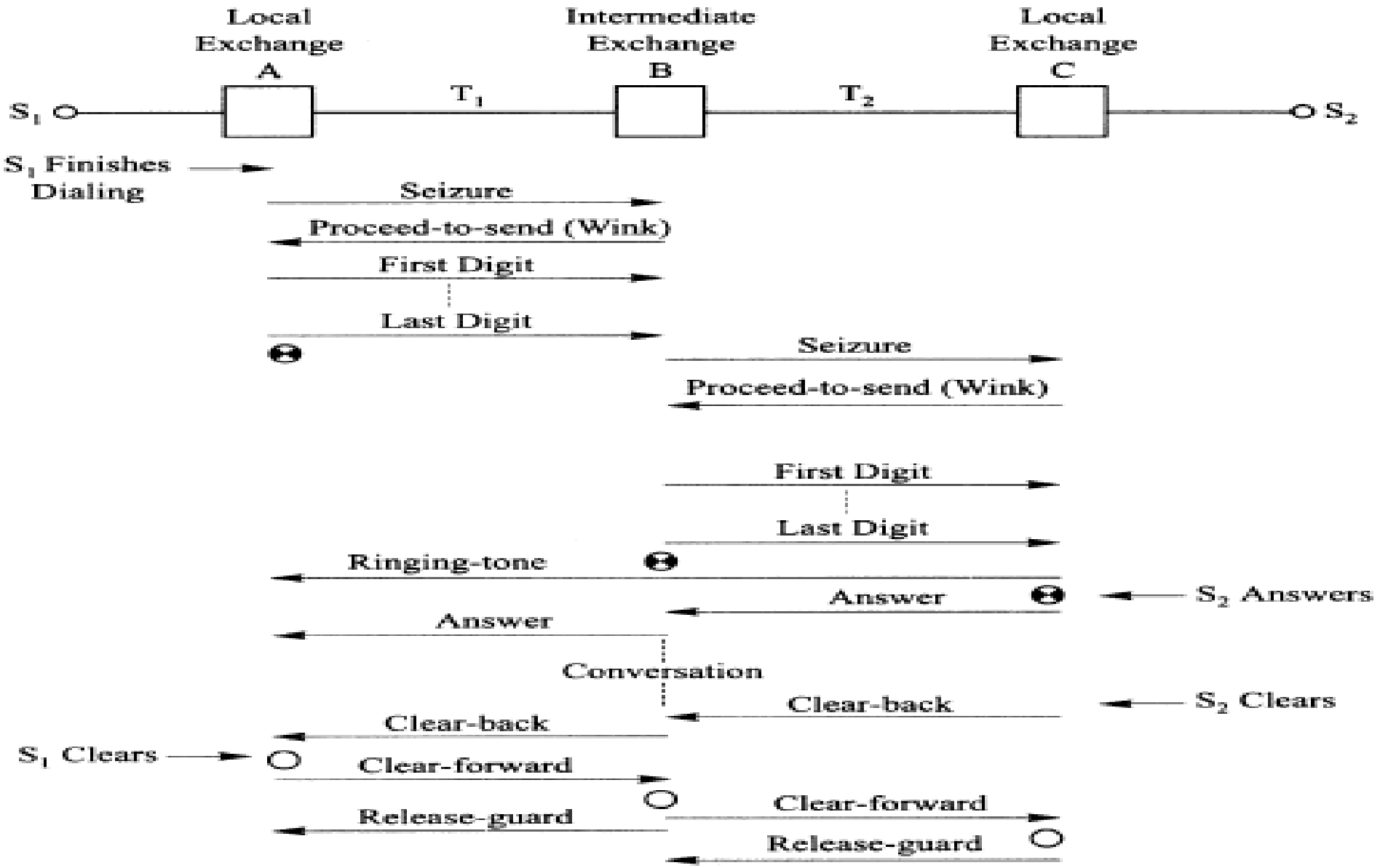
1. **Inter-exchange signalling** is the exchange of control information, i.e call setup, call supervision and call termination between two switching units in a telecommunication network.
2. There are three types of inter-exchange signalling are:

   (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.

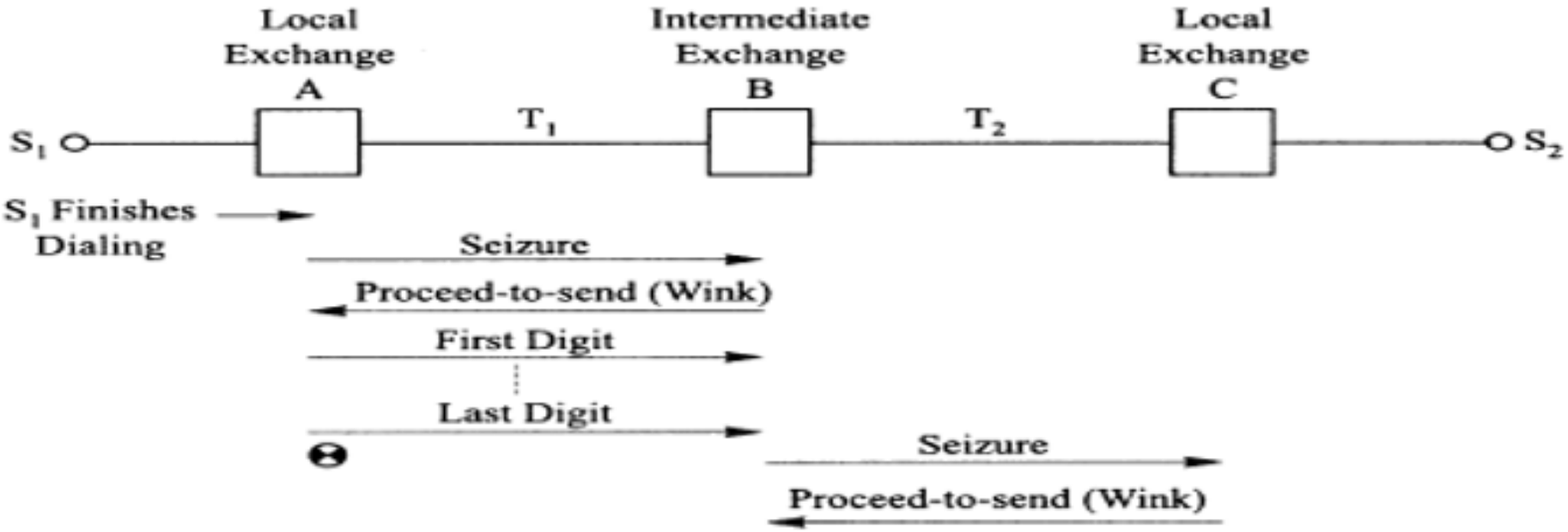
   (II) Address Signals also known as selection signals, digits, or register signals communicate the called subscriber number.

   (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.

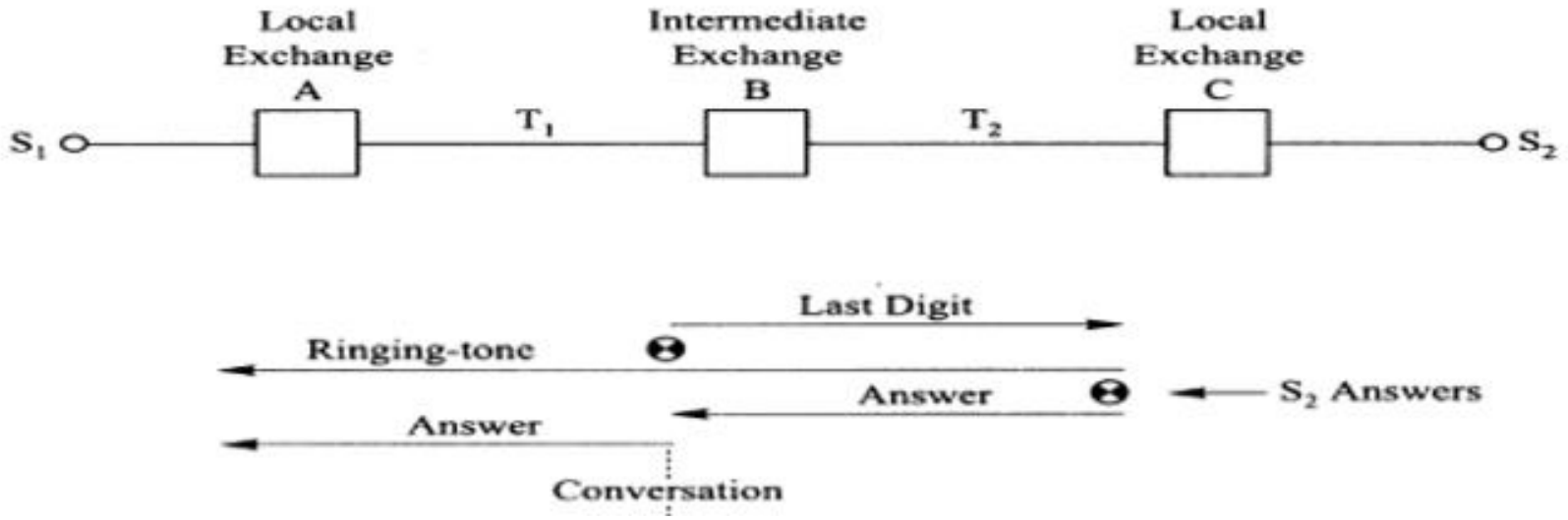
SIGNALING DURING A TRANSIT CALL



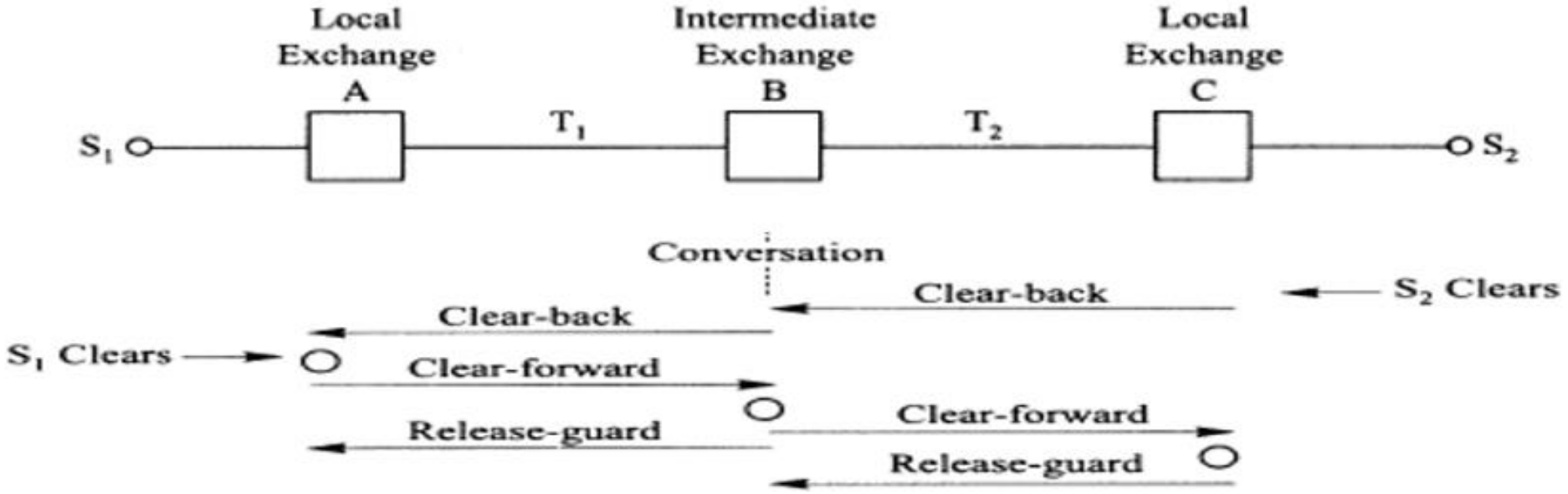
- When exchange B has received the complete called number, it seizes an available trunk T_2 to destination exchange C and sends a seizure signal on the trunk.
- Exchange C responds with a wink signal, after which exchange B sends the digits of the called number and cuts through a path between trunks 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.



NOTE: PRACTICE IN TELECOMM INDUSTRY

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.

COMMON CHANNEL SIGNALLING

- 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)

COMPARISON OF INCHANNEL AND COMMON-CHANNEL SIGNALLING SCHEMES

IN-CHANNEL	**COMMON CHANNEL**
Trunks must be held during signaling	Trunks are not required for signaling
Signal repertoire is limited	Extensive Signal repertoire is possible
Interference between Voice and Control Signals may occur	No Interference since the channels are physically separate
Signalling equipment is required for every trunk and hence is expensive	Only one equipment is required for a whole group of trunks making CCS much cheaper
There is a potential for misuse by customers who can generate signals to mimic signalling	Control channel is un-accessible to users
Signalling is relatively slow	Signalling is significantly faster
Speech circuit reliability is assured	There is no automatic test of the speech circuit
It is difficult to add or change signals since all trunks must be altered	Signals can be added or altered more easily
It is difficult to handle signaling during the speech period	Signalling can be handled at any time due to the separate signaling channel
Reliability of the signaling path is not critical	Reliability of the signaling path is critical