University of Diyala

Telecom Switching Systems

Lecture 5

4th Stage

Communication department / Engineering collage

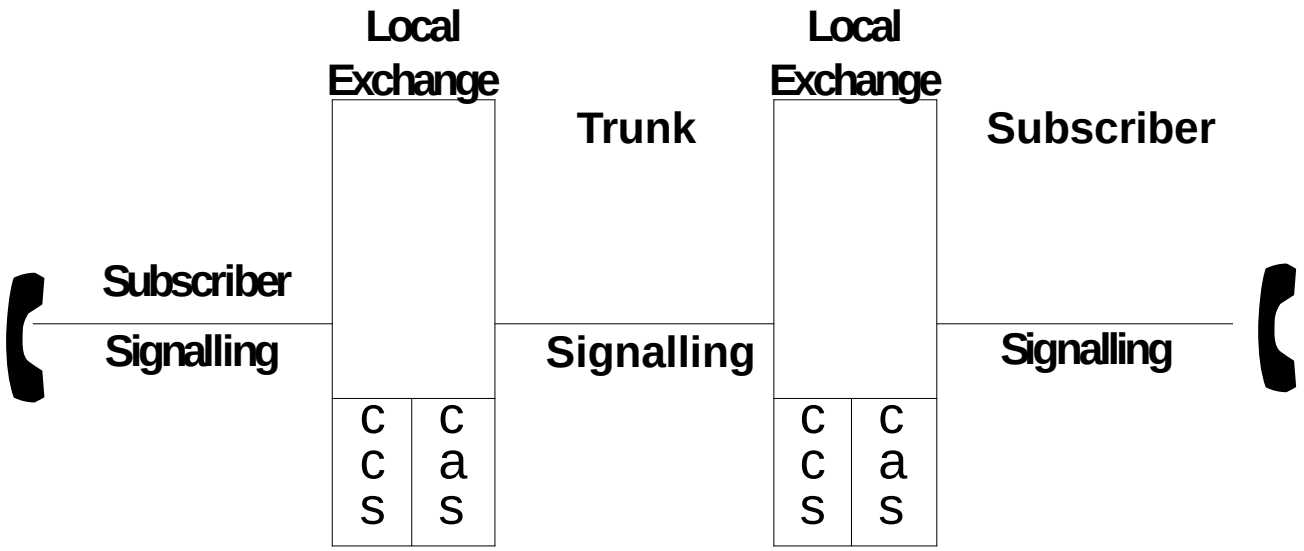
Asst. Lec. Marwa Mohammed

An Introduction to Signaling

- In a telephony context, **signalling** means the passing of information and instructions from one point to another relevant to the setting up and supervision of a telephone call.

By tradition, signalling has been divided into two types:

1. Subscriber signalling i.e. signallingbetween a subscriber terminal (telephone) and the local exchange
2. Trunk signalling i.e. signallingbetween exchanges

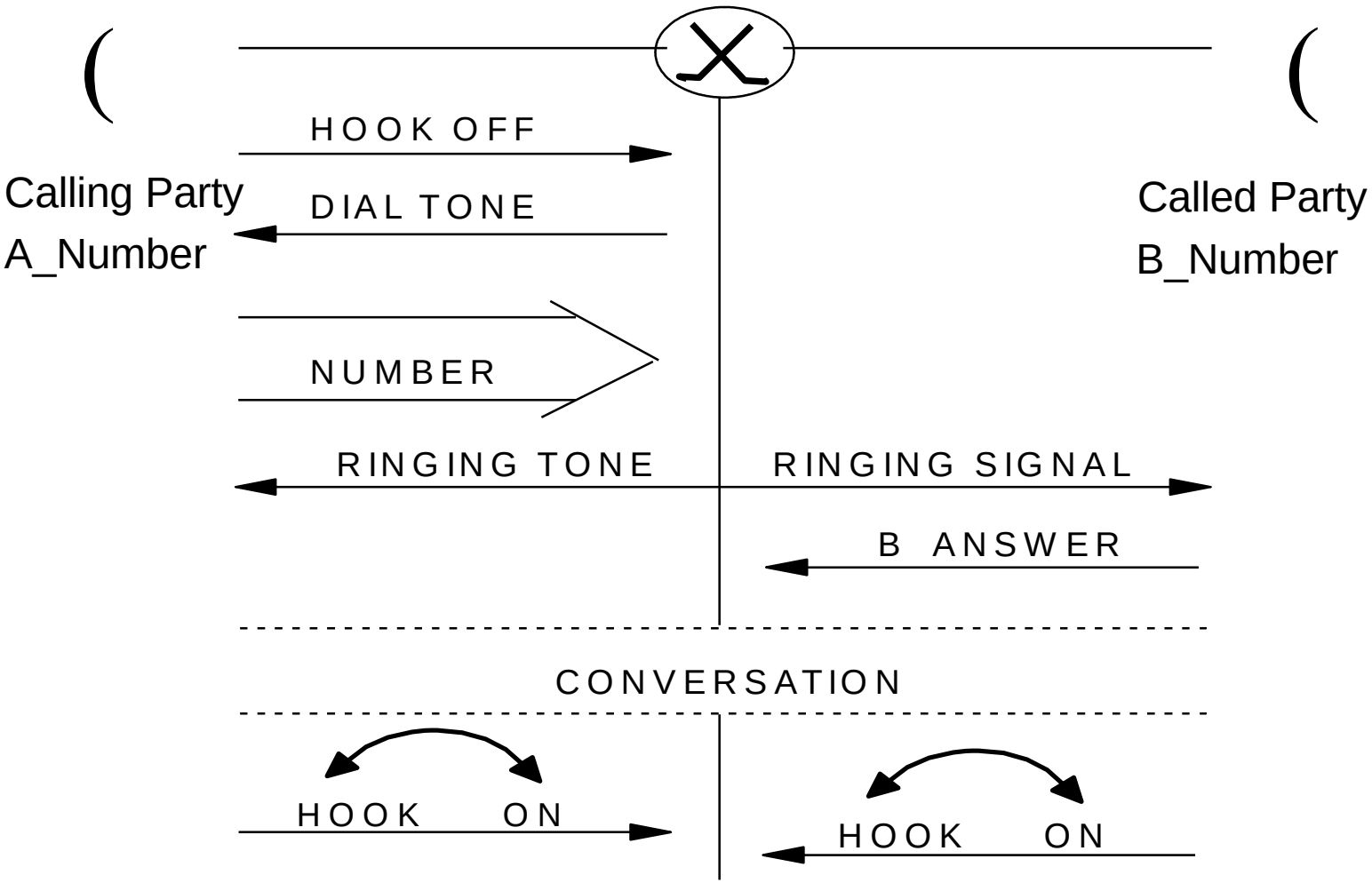


- Communication networks generally connect equipment such as telephones and fax machines via several line sections, switches and transmission media for the exchange of speech, text, and data.

- To achieve this, control information has to be transferred between exchanges for call control. Call control is the process of establishing and releasing a call. This is referred as signalling.

- Signalling is the process of generating and exchanging information among components of a telecommunication system to establish, monitor or release connections and to control related network and system operations.

Subscriber Signalling



Forms of Signalling

The information that must be transmitted between subscribers, and between switching centres falls broadly under three classes:

1. **Supervisory signals or line signals.**
2. **Routing signals or register signals**
3. **Management signals or inter-register signalling**

Classification

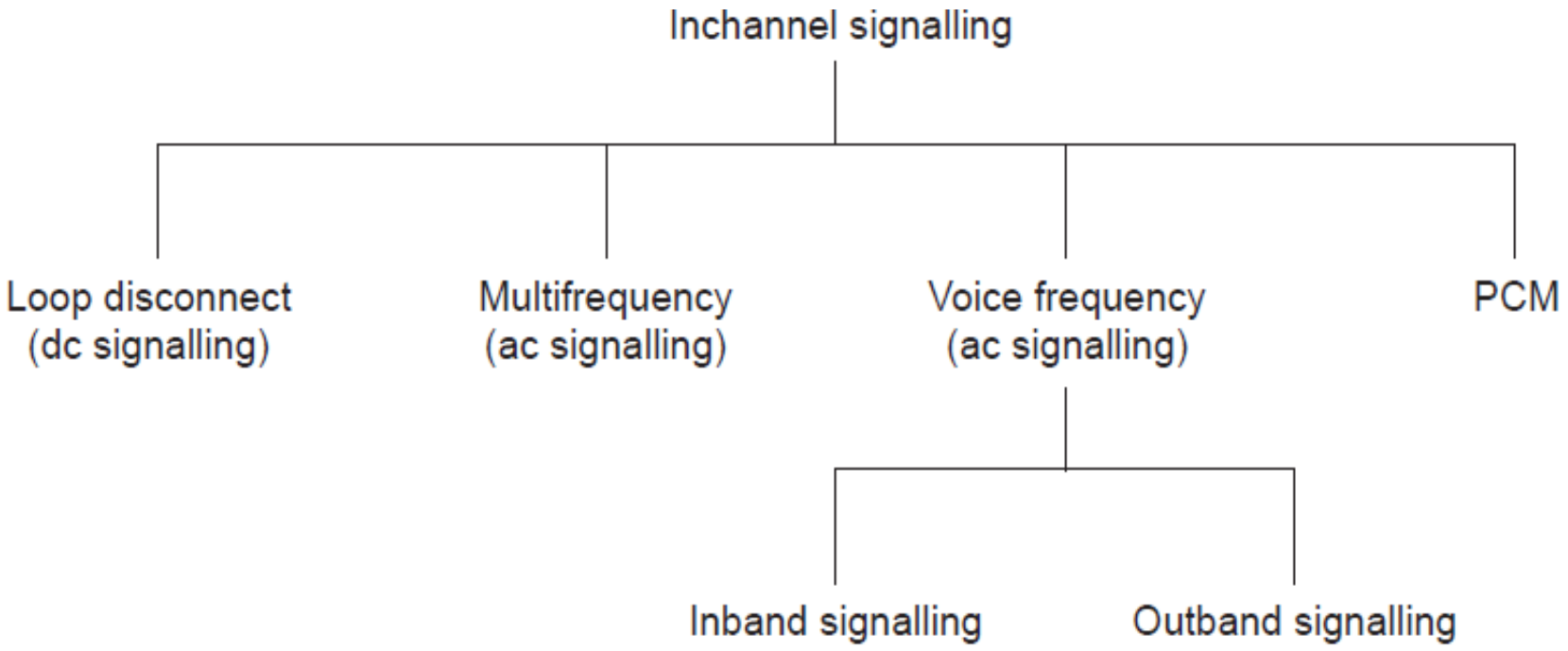
Traditional signalling uses the same channel to carry voice/data and control signals to carry out the path setup for speech or data transfer.

Hence basically, signalling technique is classified into:

1. Inchannel signalling or per trunk signalling (PTS).
2. Common channel signalling (CCS).

Classification cont.

The Inchannel signalling is classified further into four categories as shown in Fig. 1



Classification cont.

The common channel signalling (CCS) is classified according to the transmission of signals between exchangers. They are :

1. Associated signalling

2. Non-associated signalling

3. Quasi associated signalling

INCHANNEL SIGNALLING

Inchannel signalling is also known as per trunk signalling and it uses the same channel which carries user voice or data to pass control signals related to that call or connection. No additional facilities are required.

INCHANNEL SIGNALLING cont.

- The D.C. signalling is simple, cheap and reliable even for unamplified audio circuits.

- However, for amplified audio circuits, low frequency A.C. signalling may be adopted.

- The Voice Frequency signalling is used when FDM (Frequency Division Multiplexing) transmission systems are used, because low frequency signalling and D.C. signalling cannot be provided.

- This Voice Frequency signalling may be In-band or Out-band.

In-band Signaling

In-band voice frequency uses the same frequency band as the voice, which is 300-3400 Hz, which has to be protected against false operation by speech. One such instance took place when a lady's voice which has generated a tone at around 2600Hz lasting for a duration of 100ms was detected as the line disconnect signal due to which her calls were frequently being disconnected in the middle of her conversation. Such problems precluded the in-band signalling during the speech phase.

The advantages of In-band signalling are:

- The control signals can be sent to every part where a speech signal can reach.
- The control signals will be independent of the transmission systems as they are carried along with the speech signals.
- The Analog to digital and Digital to analogy conversion processes will not affect them.

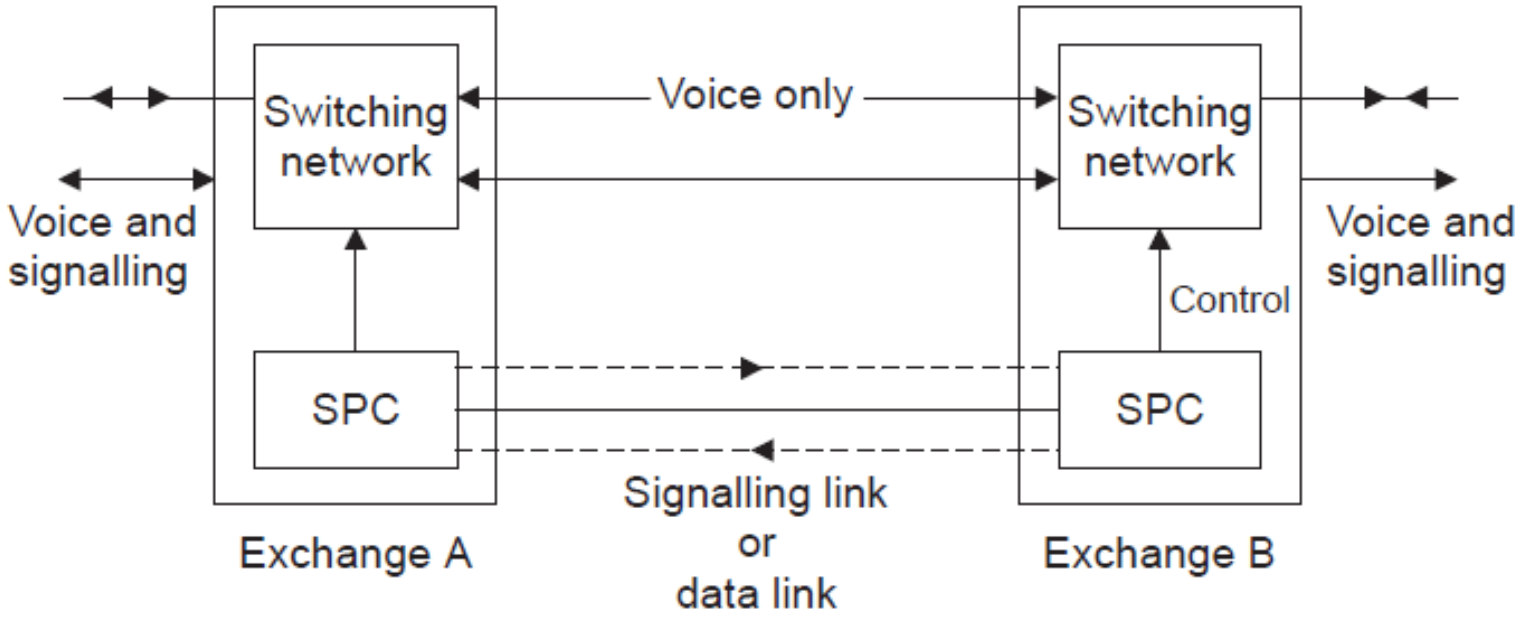
Out-band Signaling

The out-band signalling uses frequencies which are above the voice band but below the upper limit of 4000 Hz of the nominal voice channel spacing. The signalling is done throughout the speech period and thus continuous supervision of the call is allowed. Extra circuits are needed to handle the extremely narrow band width of this signalling, due to which it is seldom used.

Both of these in-band and out-band voice frequency signalling techniques have **limited information transmission capacity**. In order to provide enhanced facilities, common channel signalling is used.

COMMON CHANNEL SIGNALLING

The rapid development of digital systems paved way for the new signalling system called common channel signalling. Instead of using the same link for signalling information and message as in Inchannel signalling, the common channel signalling (CCS) uses a dedicated line for the signalling information between the stored program control elements of switching systems.



COMPARISON BETWEEN IN CHANNEL & COMMON CHANNEL SIGNALLING

IN-CHANNEL	COMMON-CHANNEL
•Trunks are held up during signalling	•Trunks are not required for signaling
•Interference between Voice and Control Signals may occur	•No interference since the voice and control channels are separate
•Separate signaling equipment is required in each trunk hence expensive	•Only one set of signaling equipment is required for a large group of trunk circuits hence economical
•Can be misused by customers since it is easy to mimic voice signaling	•Control channel is in-accessible to users
•Signalling is relatively slow	•Signalling is much faster
•Speech circuit continuity is assured when signaling is received	•State of speech circuit not automatically assured
•It is difficult to change signals or add new signals	•There is flexibility to add new signals or change existing signals

Type of Common Channel Signalling

A caller's ability to talk with someone in any part of the world almost instantly and clearing the path after the conversation instantly depend on the capability of the network. The concept of CCS has been extended in mid 1960's to improve the network capability.

There are tow type of CCS:

1. signallingSystem-6 (SS6)
2. signallingSystem-7 (SS7)

signallingSystem-6 (SS6)

- The first signalling system developed is called as signalling system number 6 (SS6).
- SS6 was introduced in the 1970s as an early CCS method for telecommunication trunks between international switching centres (ISCs).
- SS6 used a fixed-length signal unit (28-bit signal units).
- The first development of the SS6 in North America was used in the U.S. on a 2400 bps data link. Later these links were upgraded to 4,800 bps.
- SS6 networks are very slow.

Signalling System-7 (SS7)

- Signalling system 7 (SS7) was first defined in 1980, with revisions in 1984 and 1988.
- SS7 is a high-speed communication network. Except in North America, SS7 is referred to as a common channel inter office.
- One of the most significant reasons, the carriers employs this system is to save time and money on the network.
- The SS7 is a global standard for telecommunication.
- The standard defines the procedures and protocols by which network elements in the PSTN transfers information over a digital signalling network to effect wireless (cellular) and wireless call setup, routing and control.

SS7 signalling Between Exchange

- A common channel signalling system, optimized for digital networks, it allows direct transfer of call information transfer between exchange processors.
- Comprising a number of layered and modular parts, each with a different function, it is a powerful general-purpose signalling system capable of supporting a range of applications and administrative functions, including:

- ISDN (integrated services digital network)
- Intelligent networks (INS)
- Mobile services (e.g. cellular radio)
- Network administration, operation and management

Advantages of Using SS7

SS7 has several advantages compared with traditional signalling systems. Some obvious advantages are the following:

- **FAST -** the time for call set up is reduced to less than one second in most cases.
- **HIGH CAPACITY -** each signalling link can handle the signalling for several thousand simultaneous calls.
- **ECONOMICAL -** much less signalling equipment is required, compared to traditional signalling systems.
- **RELIABLE -** by using alternate signalling routes, the signalling network can be made very secure.
- **FLEXIBLE -** the system can contain many more signals, for example, and can be used for other purposes than telephony.