

## CHAPTER 3

### INTRODUCTION TO TELECOMMUNICATION SYSTEM

#### Wireless Telecommunication Concept and Application

Wireless Telecommunication has many advantage over wireline communication. Wireless telecommunication can reach remote area where wireline communication cannot, in term of financial feasibility. From its unique broadcasting characteristics, wireless telecommunication also provide much more coverage than wireline system.

Wireless system, in analog and digital form, currently applies to both voice and data communication. Example of wireless communication are mobile telephone system, TDMA rural telephone system, trunk mobile, etc. Wireless communication can be worked independently or integrated with wire line communication. To enable telecommunication service in the rural area, wireless sometimes need to work with wireline system; both of systems can communicate with each other via interfacing equipment.

#### Overview of the system configuration

Communication system consists of three main components which are transmitter, medium, and receiver.



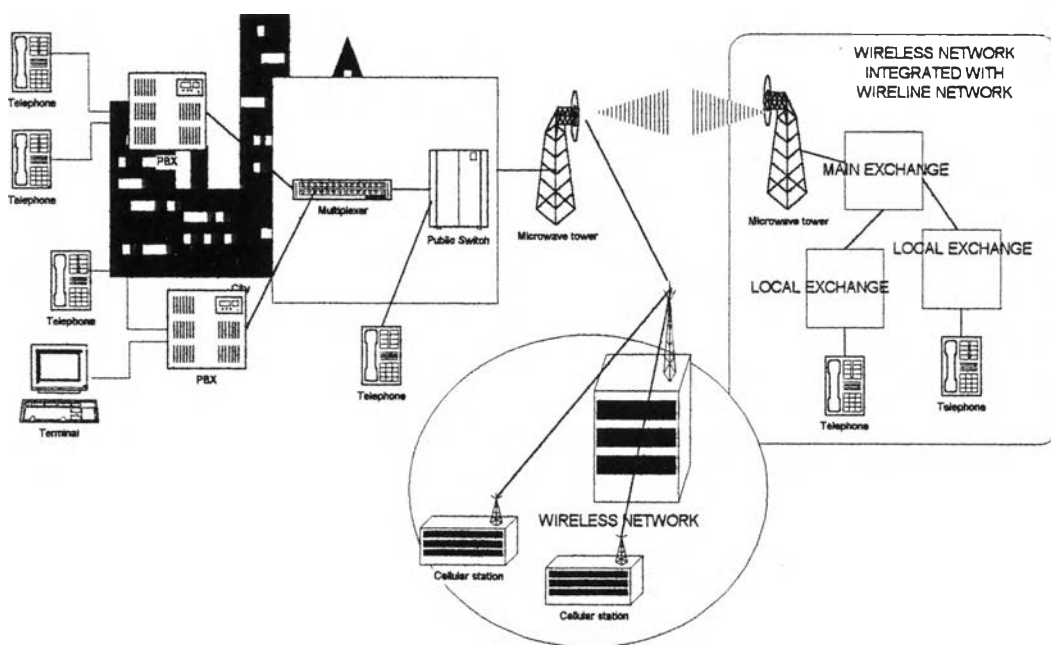
**FIGURE 3.1** Telecommunication system model

Figure 3.1 represents universal model of telecommunication. Transmitter is the originate source sending outgoing messages while receiver

is the destination source receiving incoming messages from transmitter. To send message from transmitter to receiver, it requires the medium to convey message between two sources. In two ways communication, sources must perform as transmitter and receiver simultaneously.

Figure 3.2 presents application of wireless network and the integration between existing telephone network and wireless network as well as the interfacing of wired and wireless equipment.

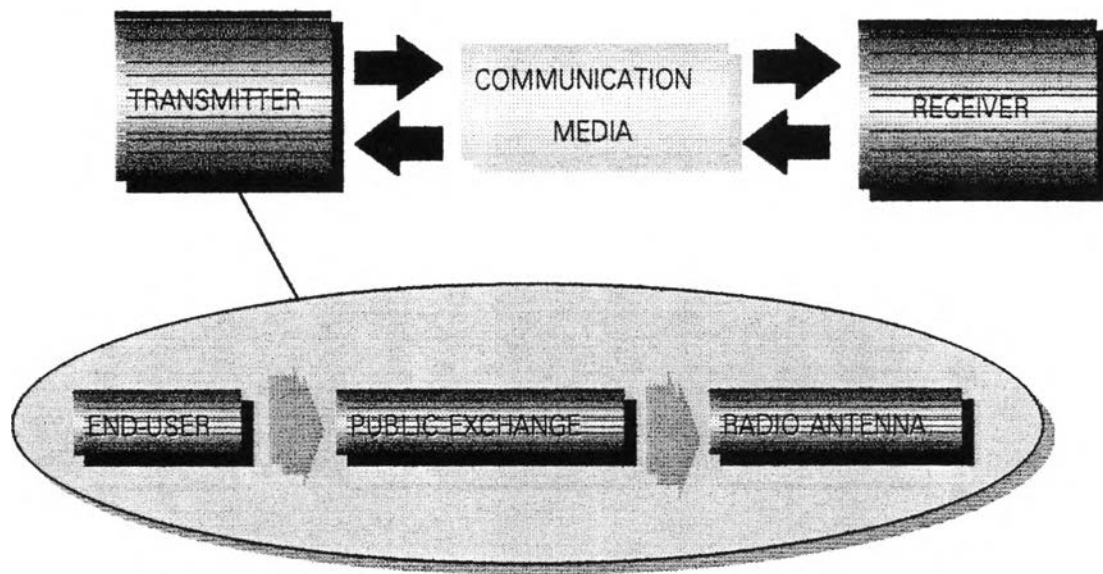
Compare to telecommunication system model, (A) represents transmitter, microwave and air represent media, and (B) represents receiver.



**FIGURE 3.2** Wireless Telecommunication Network

### Main Components of Wireless Telecommunication

Figure 3.3 illustrates the details of the transmitter based on model of telecommunication in figure 3.1.



**FIGURE 3.3** Main components of wireless communication (taking into account the integrating with wired communication)

### End-user Components

End users can be telephone, radio telephone, terminal computer with modem and PBX. Telephone and radio telephone sets worked as the signal generating machine. PBX (Private Automatic Branch Exchange), is worked to enhance switching capability. Terminal computer with modem transfers digital signal to analog signal and sent through the analog telephone network.

### Public Exchange Components

The main components in the exchange are consisted of;

- Switching Equipment
- Coding and Decoding Equipment
- Modulating and Demodulating Equipment
- Concentrator
- Multiplexer and Demultiplexer

The main function of the public exchange, which generally consisted of wireless and wired communication equipment, are

- 1) Routing the incoming signal (call) to the appropriate destination by switching function
- 2) Processing signal including signal modulation and demodulation, signal coding and decoding for appropriate and effective transmission of signal in term of accuracy of information and quality of the signal, especially modulating signal on electromagnetic wave carrier for wireless application
- 3) Telecommunication resource management, especially channel and capacity management by multiplexing or concentrating many incoming signal with lower data rate or capacity into one higher capacity. This function lead to more efficient bandwidth allocation

In case of basic telephone, the signal shall be sent through the PBX and out routed to the responsible local public exchange through the telephone line. Signal shall be converted by signal processing equipment into suitable form.

After that many incoming signals shall be multiplexed together into higher bandwidth/capacity for cost-effective transmission and efficient telecommunication resource sharing before signal to be modulated with the carrier for sending signal in the electromagnetic wave form. Modulating the signal on various carrier frequency is the reason for the existing wide range of radio frequency.

In case of pure wireless network such as mobile or radio telephone network, the signal processing functions are featured in the mobile cell station for mobile telephone, and communication center for trunk mobile telephone application.

Many local exchanges are linked to main exchange, for example, many district exchanges are normally linked to provincial exchange. Usually, provincial or main exchange has more traffic handling capability than local exchange by employing higher capability equipment.

## **Radio Antenna Component**

For wireless communication, the very significant media are radio or microwave antenna and air interface. The antenna enable broadcasting capability of the signal, therefore, signal can be received with acceptable level of quality inside the coverage area of antenna.

For very long distance communication, the repeater which is also the antenna is generally employed. The main function of the repeater is to re-amplify the signal into the adequate power level to be re-transmitted again.

At the receiver side, the radio or microwave antenna is needed for detection of retrievable signal before sending the signal to the backward step of signal processing.

## Classification of Mentioned Inventory

Based on the main components of the wireless telecommunication stated above, the mentioned inventory can be classified by its function as presented in the following table:

Code	List of Mentioned Inventory	End-Users Equipment	Exchange Equipment					Distribution Frame	Antenna & Feeder
			Switching	Coder/ Decoder	Modulator/ Demodulator	Multiplexer/ Demultiplexer	Concentrator		
100 00 126	Multi-Access Rural Radio Telephone (Subscriber)	✓							
100 09 566	First Order Digital Multiplex Equipment 4W.E&M Sig					✓			
100 08 717	UHF Digital Radio Telephone Equipment 6Ch (Sub & Ex)			✓	✓	✓			
100 08 729	2GHZ Digital Microwave Radio Equipment	✓				✓	✓	✓	
100 35 661	Radio Set and Equipment for Microwave 13GHz 34MB	✓				✓	✓	✓	
100 09 571	Hardware for Maintenance Center								
100 36 457	34M Mux Equipment for NE 5530AA (2Sys / St)					✓			
100 08 721	Digital Speech Interpolation (System Line Double) 1 link			✓					
100 08 223	Digital Microwave Capacity 34MB with Multiplex Equipment	✓				✓		✓	
100 09 732	First Order Mux (N 500 series)					✓			
100 09 563	2GHZ Digital Microwave Radio Equipment (34 MBPS)	✓				✓	✓	✓	
100 09 567	140 MBPS Digital Mux Equipment (Full System)					✓	✓		
100 09 738	Digital Line Concentrator DCS-20 for 2MBPS PCM Transmission						✓		
100 09 280	Microwave Minilink Equipment 13 GHz 34MB	✓				✓		✓	