



# Wireless Communication



**tutorialspoint**

SIMPLY EASY LEARNING

[www.tutorialspoint.com](http://www.tutorialspoint.com)



<https://www.facebook.com/tutorialspointindia>



<https://twitter.com/tutorialspoint>

## About the Tutorial

---

Wireless Communication is an advanced branch of communication engineering. This tutorial helps to develop an overview on the existing trends of wireless communication and the concepts related to it.

## Audience

---

This tutorial has been developed for the beginners to help them understand the basic concepts and developing trends of wireless communications.

## Prerequisites

---

This is a basic tutorial that any reader with a little knowledge of analog and digital communication can easily understand.

## Copyright & Disclaimer

---

© Copyright 2016 by Tutorials Point (I) Pvt. Ltd.

All the content and graphics published in this e-book are the property of Tutorials Point (I) Pvt. Ltd. The user of this e-book is prohibited to reuse, retain, copy, distribute, or republish any contents or a part of the contents of this e-book in any manner without written consent of the publisher.

We strive to update the contents of our website and tutorials as timely and as precisely as possible, however, the contents may contain inaccuracies or errors. Tutorials Point (I) Pvt. Ltd. provides no guarantee regarding the accuracy, timeliness, or completeness of our website or its contents including this tutorial. If you discover any errors on our website or in this tutorial, please notify us at [contact@tutorialspoint.com](mailto:contact@tutorialspoint.com)

## Table of Contents

---

About the Tutorial.....	i
Audience .....	i
Prerequisites .....	i
Copyright & Disclaimer.....	i
Table of Contents .....	ii
<b>1. WIRELESS – OVERVIEW .....</b>	<b>1</b>
<b>Features of Wireless Communication .....</b>	<b>1</b>
<b>Wireless – Advantages .....</b>	<b>2</b>
<b>2. WIRELESS – TERMS IN MOBILE TELEPHONY .....</b>	<b>4</b>
<b>3. WIRELESS – MULTIPLE ACCESS .....</b>	<b>7</b>
<b>Multiple Access Techniques .....</b>	<b>7</b>
<b>Frequency Division Multiple Access (FDMA) .....</b>	<b>8</b>
<b>Time Division Multiple Access (TDMA) .....</b>	<b>8</b>
<b>Code Division Multiple Access (CDMA).....</b>	<b>8</b>
<b>Space Division Multiple Access (SDMA).....</b>	<b>9</b>
<b>Spread Spectrum Multiple Access .....</b>	<b>9</b>
<b>4. WIRELESS – CHANNEL CHARACTERISTICS .....</b>	<b>11</b>
<b>Types of Paths.....</b>	<b>11</b>
<b>Characteristics of Wireless Channel.....</b>	<b>11</b>
<b>Path Loss .....</b>	<b>11</b>
<b>Fading .....</b>	<b>13</b>
<b>Interference .....</b>	<b>14</b>

5.	WIRELESS – TCP/IP .....	15
	<b>Comparison between OSI and TCP/IP Suite</b> .....	15
	<b>Layers in the TCP/IP Suite</b> .....	15
6.	WIRELESS – CELLULAR WIRELESS NETWORKS .....	18
	<b>Features of Cellular Systems</b> .....	18
	<b>Shape of Cells</b> .....	18
	<b>Frequency Reuse</b> .....	19
7.	WIRELESS – PROPAGATION LOSSES.....	21
	<b>Propagation Mechanisms</b> .....	21
	<b>Transmission Limitations</b> .....	21
8.	WIRELESS – TECHNIQUES .....	24
	<b>Equalization</b> .....	24
	<b>Diversity</b> .....	25
9.	WIRELESS – WAN.....	27
	<b>Fundamentals of WLANs</b> .....	27
	<b>WLAN Fundamentals</b> .....	27
	<b>Network Architecture</b> .....	29
10.	WIRELESS – BLUETOOTH .....	30
	<b>History of Bluetooth</b> .....	30
	<b>Piconets and Scatternets</b> .....	31
11.	WIRELESS – INTERNET .....	34
	<b>Satellite Internet</b> .....	34
	<b>Wireless Internet</b> .....	35

12. WIRELESS – WAP .....	37
The WAP Model .....	37
The WAP Protocol Stack .....	38
13. WIRELESS – SATELLITE COMMUNICATIONS.....	41
How a Satellite Works .....	41
Satellite Communication Basics.....	41
Earth Orbits.....	42

# 1. Wireless – Overview

Wireless communication involves the transmission of information over a distance without the help of wires, cables or any other forms of electrical conductors.

Wireless communication is a broad term that incorporates all procedures and forms of connecting and communicating between two or more devices using a wireless signal through wireless communication technologies and devices.

## Features of Wireless Communication

---

The evolution of wireless technology has brought many advancements with its effective features.

- The transmitted distance can be anywhere between a few meters (for example, a television's remote control) and thousands of kilometers (for example, radio communication)
- Wireless communication can be used for cellular telephony, wireless access to the internet, wireless home networking, and so on.
- Other examples of applications of radio wireless technology include GPS units, garage door openers, wireless computer mice, keyboards and headsets, headphones, radio receivers, satellite television, broadcast television and cordless telephones.



## Wireless – Advantages

---

Wireless communication involves transfer of information without any physical connection between two or more points. Because of this absence of any 'physical infrastructure', wireless communication has certain advantages. This would often include collapsing distance or space.

Wireless communication has several advantages; the most important ones are discussed below:

### Cost effectiveness

Wired communication entails the use of connection wires. In wireless networks, communication does not require elaborate physical infrastructure or maintenance practices. Hence the cost is reduced.

**Example** - Any company providing wireless communication services does not incur a lot of costs, and as a result, it is able to charge cheaply with regard to its customer fees.

### Flexibility

Wireless communication enables people to communicate regardless of their location. It is not necessary to be in an office or some telephone booth in order to pass and receive messages.

Miners in the outback can rely on satellite phones to call their loved ones, and thus, help improve their general welfare by keeping them in touch with the people who mean the most to them.

### Convenience

Wireless communication devices like mobile phones are quite simple and therefore allow anyone to use them, wherever they may be. There is no need to physically connect anything in order to receive or pass messages.

**Example** - Wireless communications services can also be seen in Internet technologies such as Wi-Fi. With no network cables hampering movement, we can now connect with almost anyone, anywhere, anytime.

### Speed

Improvements can also be seen in speed. The network connectivity or the accessibility were much improved in accuracy and speed.

**Example** – A wireless remote can operate a system faster than a wired one. The wireless control of a machine can easily stop its working if something goes wrong, whereas direct operation can't act so fast.

### Accessibility

The wireless technology helps easy accessibility as the remote areas where ground lines can't be properly laid, are being easily connected to the network.

**Example** - In rural regions, online education is now possible. Educators no longer need to travel to far-flung areas to teach their lessons. Thanks to live streaming of their educational modules.

### **Constant connectivity**

Constant connectivity also ensures that people can respond to emergencies relatively quickly.

**Example** - A wireless mobile can ensure you a constant connectivity though you move from place to place or while you travel, whereas a wired land line can't.

## 2. Wireless – Terms in Mobile Telephony

Among the various terms used in Mobile telephony, the most used ones will be discussed here.

**Mobile Station (MS):** The Mobile Station (MS) communicates the information with the user and modifies it to the transmission protocols of the air interface to communicate with the BSS. The user information communicates with the MS through a microphone and speaker for the speech, keyboard and display for short messaging and the cable connection for other data terminals. The mobile station has two elements Mobile Equipment (ME) and Subscriber Identity Module (SIM)

**Mobile Equipment (ME):** ME is a piece of hardware that the customer purchases from the equipment manufacturer. The hardware piece contains all the components needed for the implementation of the protocols to interface with the user and the air-interface to the base stations.



**Subscriber Identity Module (SIM):** This is a smart card issued at the subscription to identify the specifications of a user such as address and type of service. The calls in the GSM are directed to the SIM rather than the terminal.

SMS are also stored in the SIM card. It carries every user's personal information which enables a number of useful applications.

**Base Station (BS):** A base station transmits and receives user data. When a mobile is only

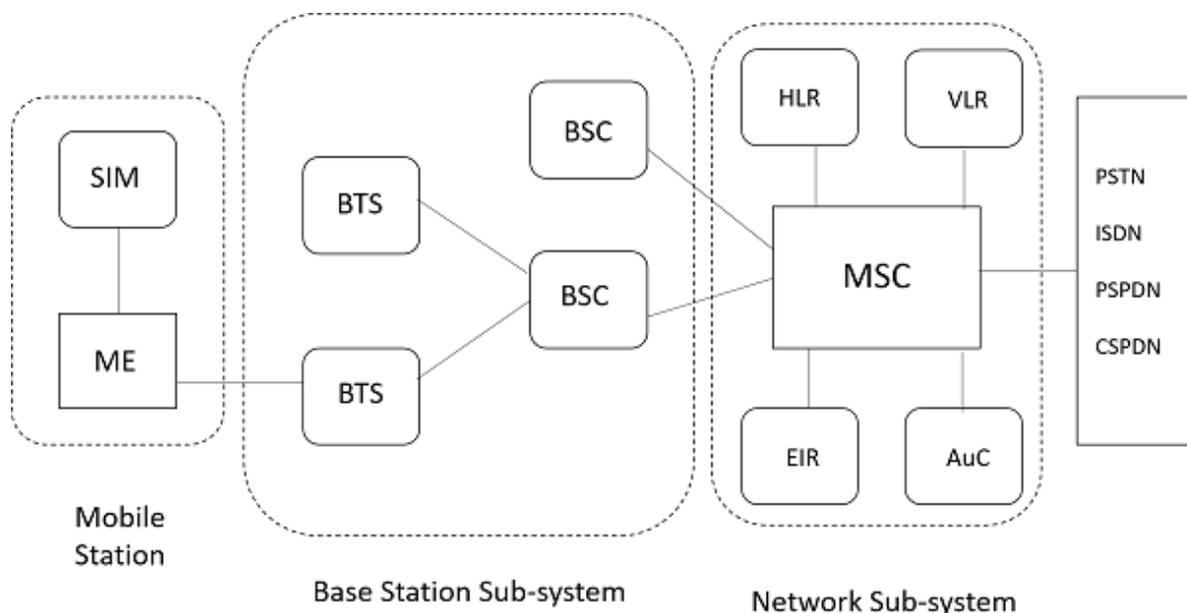


responsible for its user's data transmission and reception, a base station is capable to handle the calls of several subscribers simultaneously.

**Base Transceiver Station (BTS):** The user data transmission takes place between the mobile phone and the base station (BS) through the base transceiver station. A transceiver is a circuit which transmits and receives, i.e., does both.

**Mobile Switching Center (MSC):** MSC is the hardware part of the wireless switch that can communicate with PSTN switches using the Signaling System 7 (SS7) protocol as well as other MSCs in the coverage area of a service provider. The MSC also provides for communication with other wired and wireless networks as well as support for registration and maintenance of the connection with the mobile stations.

The following image illustrates the parts of different sub-systems. HLR, VLR, EIR and AuC are the sub-systems of Network sub-system.



**Channels:** it is a range of frequency allotted to particular service or systems.

**Control Channel:** Radio channel used for transmission of call setup, call request, call initiation and other beacon or control purposes.

**Forward Control Channel(FCC):** Radio channel used for transmission of information from the base station to the mobile

**Reverse Channel(RC):** Radio channel used for transmission of information from the mobile to base station.

**Voice Channel(VC):** Radio channel used for voice or data transmission.

**Handoff:** it is defined as the transferring a call from the channel or base station to another base station.

**Roamer:** A mobile station which operates in a service area other than that from which service has been subscribed

**Transceiver:** A device capable of simultaneously transmitting and receiving radio signals.

End of ebook preview

If you liked what you saw...

Buy it from our store @ <https://store.tutorialspoint.com>