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# UNIT 8 NEW BROADCASTING TECHNOLOGIES

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## 8.0 INTRODUCTION

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This unit discusses some of the recent developments that have revolutionised the state of Radio Broadcasting the world over. While the basic concept of radio transmission goes back to Marconi's experiment of sending radio signals through a wireless mode, radio broadcasting through medium wave has made tremendous progress. By making available the audio signals through simple and inexpensive radio receivers in the coverage area, these transmissions on a mode known as analog mode, have become very popular. However, the main constraints were a limited reach and the broadcast quality. The short-wave transmission carries the radio signals farther than the medium wave transmission but they suffer from degradation due to a number of reasons, such as, fading, distorted sound and noise. Therefore, the quality of radio transmission leaves much to be desired.

**Frequency Modulation (FM)** transmissions are in vogue in our country since 1977. FM is based on the principle of 'line of sight' upto a maximum of about 70 kms. This implies that FM transmission could reach long distances unless tall structures or hillocks obstruct the line of travel of the radio waves. FM transmissions have improved the quality of sound reproduction at the listener's end, but tall structures etc. can obstruct the line of sight, thus limiting their reach.

The transmission using communication satellites have increased the range of broadcasting beyond the shores of a country. Of late, introduction of transmission on a different mode known as the **digital mode** has revolutionized the field of broadcasting.

The digital transmission perhaps will leave behind the analog transmissions, including FM, in the years to come. The concept of Internet and its extreme popularity have opened another medium for radio transmissions. This unit will focus on these new technologies and innovations taking place in the area of radio broadcasting.

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## 8.1 OBJECTIVES

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After going through the unit, you will be able to:

- describe Digital Audio Broadcasting, Radio through Internet, Stereo FM and Sky Radio; and
- discuss the impact of new technologies in broadcasting.

## 8.2 DIGITAL AUDIO BROADCASTING

Digital Audio Broadcasting (DAB) is the new genre of Broadcasting which employs 'digital' techniques of transmission and reception. To understand what it means, let us first discuss the terms 'digital' and 'analogue' which you must have come across in other contexts too.

### 8.2.1 Digital Vs Analogue

Everything in nature- be it sounds or images, are originally analogue in nature, meaning that the natural sounds (and images) contain continuous variations of sound levels and pitch. Traditional techniques of sound recording and broadcasting too are analogue, as the original sounds with all their continuous variations get recorded and transmitted as such. Ideally speaking, analogue recordings should give us a perfect copy of the original sound. However, in practice, they suffer quality loss because of the fact that noise generated within the electronic processes of recording, reproduction, transmission and reception vitiates the purity of the original sounds and results in imperfect output.

Later day technological advancements gave birth to digital techniques of sound recording and, more recently, digital broadcasting. In 'digital' the original analogue sounds are first codified as a series of discreet electronic pulses called 'zeros' and 'ones', and then recorded. Thus, a digital recording contains not the analogue sound as such, but rather its clone in the coded form of ones and zeros. But what is the advantage of digital? The basic advantage lies in the fact that the digital signals are immune to noise and so can lend themselves to a much purer recording and reproduction. The gramophone records (LP disks) of yesteryears, the open spool audio tapes, audio cassettes are all examples of analogue while the audio CDs are digital. You can easily appreciate the difference in quality of the same song recorded on a cassette and on a CD. You will agree that the complex processes involved in converting the original analogue sounds to digital signals are worth it because of the superior quality that digital technology can offer.

### 8.2.2 DAB Vs Conventional Broadcasting

These conditions apply to broadcasting as well, that is, the processes of transmission and reception. All these years, what we have is analogue broadcasting – be it AM or FM, or be it in the medium wave, short wave or VHF/UHF band. FM broadcasts have much better technical quality, than AM, but they too are analogue and so are prone to the inherent limitation in technical quality.

DAB has evolved as an alternative system of sound broadcasting in the quest to deliver CD like quality of sound through radio. However, since the broadcast system involves both transmission and reception, both these ends have to be converted to digital for the system to function. That means, conventional radio sets, which can work only in analogue, have to be replaced by new digital radio sets. Obviously, it is a gigantic task to change millions of radio sets with new ones at one stroke, or to persuade the listeners to buy these new sets, when their present ones seem to be working alright for them! Therefore, the penetration of DAB in the developing countries has been quite slow, even though it has already gained foothold in advanced countries. In our country too, DAB is yet to make its mark for the same reason.

You may think that, under the circumstances, DAB is still a very far-fetched proposition and that the analogue broadcasting, with which we are quite familiar, will continue to rule the skies in the foreseeable future. That may not be quite true; DAB through satellite distribution is already around in the Asia-Pacific and African regions through a system called World Space radio. Through a network of satellites, this DAB system plans to cover the most populous portions of the entire globe. Other satellite-based DAB services are already operating in Europe and America, and more such services are sprouting in other parts of the world. Nevertheless, the main stumbling block at the present moment in the way of DAB is the high cost of DAB radio sets, which are as high as US \$ 50 per piece. This cost will come down sharply as mass production of the sets builds up in course of time.

### 8.2.3 International Standards for DAB

While international regulations in regard to a cut off date for analogue broadcasting and its replacement by DAB the world over may be impracticable, broad technical criteria have been laid down for a concerted growth of DAB. These criteria are to:

- provide stereo multi-channels with CD quality sound;
- perform better even in cases if there is obstruction in the path of transmission;
- be capable of utilizing common receiver for satellite and terrestrial DAB reception; and
- provide easier operation and transmitter power efficiency.

Digital broadcasting uses the compression technique by which the sound signals or programmes transmitted by conventional modes are compressed so that the same line or cable is able to accommodate and transmit more programmes at the same time. A system known as Digital System 'A' (based on Eureka 147 technology) has been recommended for DAB. MUSICAM (Masking-pattern-adapted Universal Sub-band Integrated Coding And Multiplexing) system is adapted for base band compression.

#### Check Your Progress: 1

- Note: 1) Use the space below for your answers. .  
2) Compare your answers with those given at the end of this unit.

1) What is analog broadcasting?

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2) What are the objectives of digital audio broadcasting?

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## 8.3 RADIO THROUGH INTERNET

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Before we discuss Radio through Internet, let us first understand what Internet is. Internet is the network of networks. You may ask what is a network? A network is an interconnection of two or more computers to share data. **Internet is a global network, which allows us to send and receive messages, and also to speak, on-line, and in real time to computers connected on the Internet.**

Basically, the information whether data, voice or picture, is converted to digital data and sent on land lines/satellites on the network. Any computer user with an Internet connection can download this information into the user's own computer. The Internet services are provided in our country by VSNL (Videsh Sanchar Nigam Limited) and a few other providers. Audio signals can also be converted into digital form and transmitted over the Internet. A user with a computer system can listen to this audio. Thus, the data transmission networks can be used for sending radio signals on the Internet. The Internet which is basically used for sending email file transfer or information exchange is being configured for telephony as well as transmission of radio and television signals.

### 8.3.1 Advantages of Internet Broadcasting

Any broadcaster would like to broadcast his/her programmes world-wide for 24 hours a day. Listeners would also like to have access to high quality programmes from all over the world at the time of their choice. You have studied the principles of radio transmission and you know that any transmission has a limited range and the quality in many cases depends on the distance to the transmitter. Internet broadcasting will help get over some of these problems. The advantages of Internet broadcasting are:

- **World-wide coverage:** The signals can be made available all over the world, wherever an Internet access is available. Generally, the quality is consistent throughout the world, but dependent on the quality of access technology, e.g. telephone based, dedicated leased line, cable based technology.
- **Programme availability:** In conventional broadcasting, once a programme is missed, it is missed for ever as far as the listener is concerned unless the programme is repeated. In Internet broadcasting, the programme is available on the Internet and a listener can access it anytime, anywhere.
- **Large number of channels:** The listeners can access a large number of radio channels available on the Internet, unlike in the conventional broadcasting where number of channels available is limited.
- **Less costly:** For a broadcaster, the expenditure to put radio programme on Internet is very low as compared to a conventional broadcast transmitter equipment. It takes less time to set up a transmission system and any Internet user can have access to the radio programme. The cost of transmission can be 10 times less than a FM transmitter.

### 8.3.2 Principle of Internet Operation

Internet was established basically for transmitting text. It makes use of Hyper Text Mark-up Language (HTML) and it links one document to another and from one site to another. Information concerning any particular item can be downloaded into one's computer from any site.

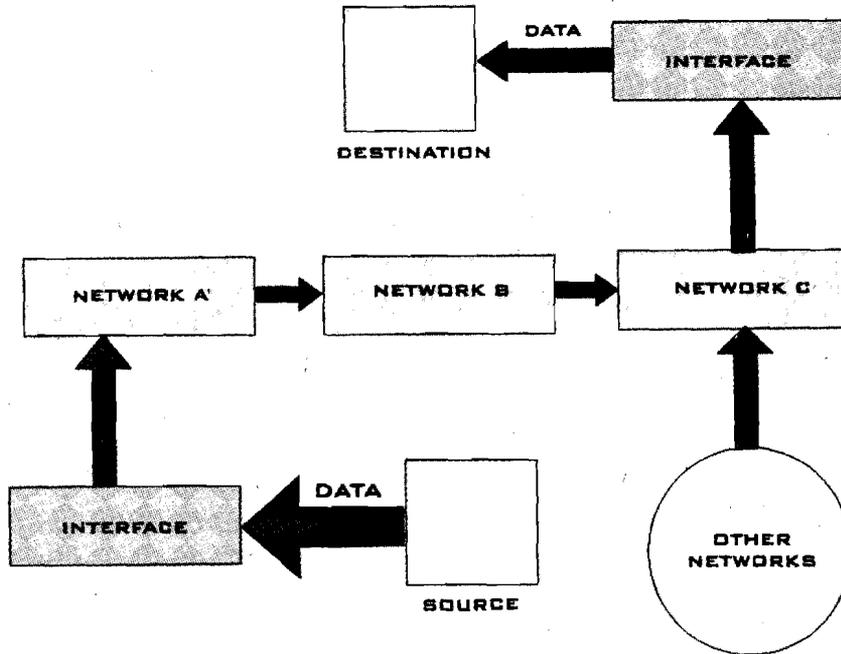
The Internet provides, besides texts, graphics and scanned images at the web sites. But, the access time required for such file could be 10 to 15 times more than that required for data files. But Internet is not designed to deliver isochronous, i.e., continuous time based information such as audio. Audio files have, therefore, to be downloaded, stored in computer's memory and then played back. Audio quality could be as good as that of a CD.

Rapid developments in the Internet technology have made it possible to have audio in real time over the ordinary telephone lines. **Real time** delivery means that the users do not have to wait for the whole file to be downloaded, the sound can be played back as it is delivered. Compression techniques are used to abridge the quantity of data to be transmitted. A number of proprietary systems have been developed. Some of these are *real audio*, *true speech*, *winplay 3*, etc. All of them utilize compression techniques to produce sound files, small enough to be transmitted in real time.

Several broadcasting organisations have set up their web sites on the Internet. All India Radio launched its on-line information service in text mode from May 2, 1996. It has also started its audio service.

### 8.3.3 A Typical Internet System

One can listen to an audio broadcast on the Internet. For this, one has to use the web browser, a software package that displays web pages containing text graphics, audio and video files and a software player. After accessing the World Wide Web, (a system for accessing information on the internet) one can go through the various radio services available and select the desired one.



A typical Internet system

Internet uses a method known as the Hyper Text Transfer Protocol (HTTP) for transport of information through the web. To fulfill a request from a client, the web server triggers a request to the server called the Real Audio Server, which then sends the requested material to the listener.

**Check Your Progress: 2**

- Note:** 1) Use the space below for your answers.  
 2) Compare your answers with those given at the end of this unit.

1) What is Internet?

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2) What are the advantages of Internet broadcasting?

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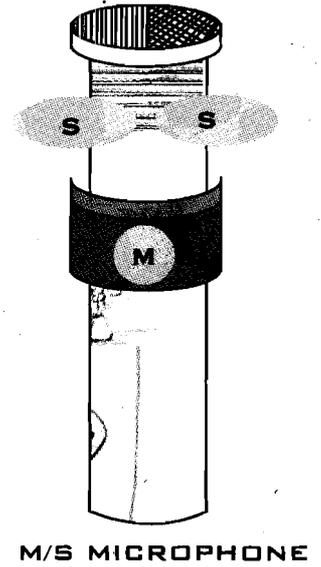
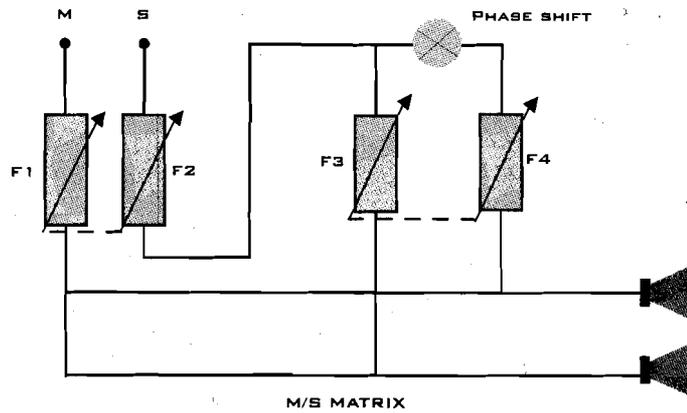
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**8.4 STEREO FM**

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The radio receivers, cassette recorders and even TV receivers normally reproduce **monophonic sound**, meaning one dimension in sound, i.e., the depth. In monophonic sound, we can make out which sources are closer to the microphone and which are farther. But, we cannot make out if the source is to the left or right of the microphone. In other words, in mono, one can recreate only one dimension sound. **Stereophonic system** uses more than one channel of sound information making it possible to create a two-dimensional sound. The stereo adds another dimension - direction of the sound. It takes advantage of the delay in arrival of the sound at the two ears or the difference in intensity.

Stereophonic sound uses more than one channel of information to create the sensation of spatial distribution of sound. In this system, more than two channels can be used, however, two-channel system have been standardized. With two channels a two-dimensional sound can be created. If one draws an imaginary line between the two loud speakers in a stereo system, it will appear as if the sound sources are located at varying points on this line. The depth of sound is also reproduced as in a stereo system. While listening to a stereo music concert the listeners feel that they are actually listening a concert in an auditorium or concert hall enjoying the actual performance of the main and accompanying artistes.



**Stereo FM**

With the privatisation of FM waves in the recent past and consequent entry of the multiple broadcasters in different cities, each vying with each other to provide hi-fi music to the listeners, stereo FM has become increasingly commonplace in the urban radio landscape.

**Stereo Recording Techniques**

For a proper stereo recording, the sound pick-up should provide intensity and time difference clues to the two stereo channels. There are a number of techniques for stereo recordings.

In X/Y Stereo technique two cord mics are used. If Hyper Cardioid mics are used, the recordings in X/Y technique can be utilized both in mono and stereo mode and are considered suitable for broadcasting. The schematic diagram of a typical stereo microphone is shown in the figure above.

In certain techniques of recording a single coincident microphone pair may not be adequate, and additional mics may have to be used to highlight certain specific instruments. The additional mics are placed appropriately between the two sides of the stereo.

**Check Your Progress: 3**

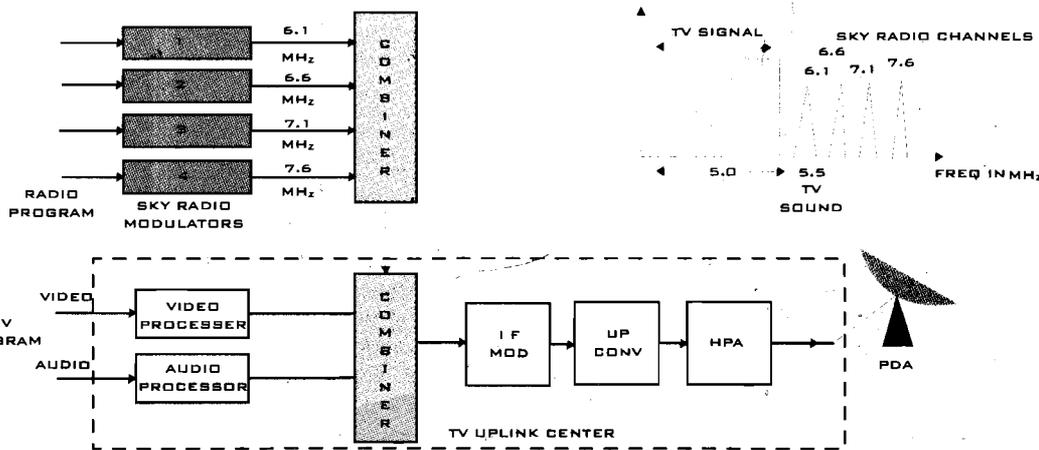
- Note:** 1) Use the space below for your answers.  
 2) Compare your answers with those given at the end of this unit.

- 1) How is stereo sound different from mono sound?  
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- 2) Can you produce a stereo sound through by using just one microphone?  
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## 8.5 SKY RADIO

Broadcasting organizations across the world are increasingly turning to satellite networking and distribution. Before the advent of communication satellites, the broadcasting organizations were using short wave transmission for networking. The national news bulletins and national programmes of All India Radio originated from Delhi were relayed by other stations in different regions of the country through short wave transmission from Delhi. However, the quality left much to be desired. A satellite system is capable of providing a better alternative for the distribution of programmes carrying signals originated by radio stations.

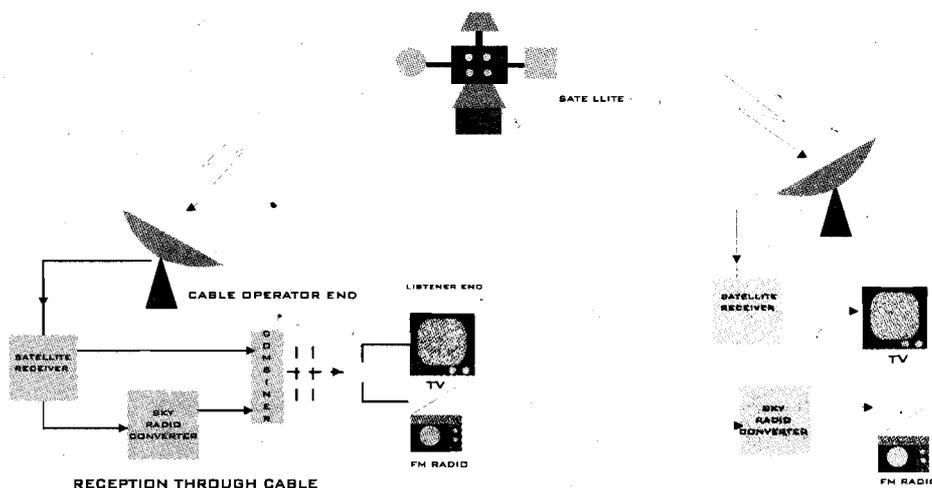
Satellites have transponders to carry television and radio programmes. Radio stations which originate programmes uplink them to the satellite and they are simultaneously down-linked by the relaying stations. As the satellite remains stationary relative to any point on the earth's surface, the ground-based receiving antenna, once it has been aligned correctly for receiving programmes from the satellite, does not normally require any further adjustment during the service period. As the signals in the satellite communications system, which comprises a number of dish-shaped antennae for receiving and transmitting are in the microwave frequency range, there is minimum chance of interference. This arrangement has removed the long standing complaints of radio listeners about unsatisfactory relay of national/regional programmes and news bulletins.



Sky Radio transmitter

There is a considerable migration of people from one part of the country to other. In the national capital of Delhi and other cities there are millions of people from different regions. They would like to listen to radio programmes and news from their state capitals. This felt - need of minority communities gave birth to 'Sky Radio'.

Doordarshan Kendras situated in several state capitals have the facility for satellite uplinking to enable their relay centers carry their programmes. AIR centres at state capitals can uplink their programmes to the satellite through a sub-carrier available with the TV carrier on the satellite.



Typical receiver set

With the help of a Sky Radio converter, the Sky Radio channels can be converted to FM band which can be received through a conventional FM radio receiver. This arrangement can be utilized by a cable operator for distributing the sky channels on the cable network. The audio signals can then be received through an FM radio receiver. Sky Radio in our country is still in its infancy. High power communication satellites having the capacity to operate on 1.5 Gigahertz can facilitate direct reception of radio on Digital receivers. M/s World Space of USA is already operating several radio channels which are received directly through digital radio receivers having 10 cm Disc Antenna.

**Check Your Progress: 4**

- Note:** 1) Use the space below for your answers.  
2) Compare your answers with those given at the end of this unit.

1) How is radio networking done using the satellite?

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2) What is Sky Radio?

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## 8.6 LET US SUM UP

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Radio broadcasting started as a simple ground wave propagation with amplitude modulation (AM) in medium wave, and then short-wave propagation with a limited quality objective. The stereo FM was a quantum leap and many have started expecting stereo quality transmissions from their broadcast centres. In the mono sound broadcast, only one dimension of the sound, i.e., the depth of the sound is perceived. The stereo adds another dimension—the direction of the sound. It takes advantage of the delay in arrival of the sound at the two ears or the difference in intensity. The Frequency Modulation (FM) technique ensures a better quality as compared to the amplitude modulation (AM) technique, although it needs larger bandwidth and is strictly a line of sight propagation.

The entering of Compact Disc into the audio market has increased the expectation of the radio listeners. The Digital Audio Broadcast (DAB) provides the answer. The analog audio signal is digitized and this facilitates the accommodation of a number of channels/messages on a single cable/line.

The Internet is becoming extremely popular all over the world. Through a computer and telephone connection, one can have access to the vast amount of data. Radio programmes can also be converted into digital bit streams and transmitted on the Internet. People all over the world can have access to these programmes and listen to them at their convenience.

Sky Radio enables radio programmes to be transmitted alongside television programmes utilising the spare bandwidth in the satellite transponder. With inexpensive equipment, radio programmes can be received alongwith the television programmes.

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## 8.7 GLOSSARY

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<b>Browser</b>	:	A client program (software) that is used to search through information provided by a specific type of server.
<b>COFDM</b>	:	Coded Orthogonal Frequency Division Multiplexing
<b>Computer Networking</b>	:	Computers at various centers interlinked or linked to the computer at headquarters for easy exchange of information.

<b>Gateway</b>	:	A computer that connects one network with another when the two networks use different protocols.
<b>HTTP</b>	:	Hypertext Transfer Protocol. The method by which World Wide Web pages are transferred over the network.
<b>Hypertext</b>	:	A system of writing and displaying text that enables the text to be linked in multiple ways, available at several levels of details. Hypertext documents can also contain links to related documents such as those referred to in footnotes. Hypermedia can also contain pictures, sound, video.
<b>Internet Protocol (IP)</b>	:	The transport layer protocol used as a basis of the Internet IP enables information to be routed from one network to another in packets and then reassembled when they reach their destination.
<b>Monophonic</b>	:	A single 50 Hz to 15 KHz audio made up of the entire voice and music information spectrum.
<b>MUSICAM</b>	:	Masking Universal Sub-band Integrated Coding And Multiplexing
<b>RN Channels</b>	:	Radio Networking Channels.
<b>SCA</b>	:	Subsidiary Communications Authorisation
<b>Server</b>	:	A computer that provides a service to other computers on a network. An Archie server, for example, lets people on the Internet use Archie.
<b>WAN</b>	:	Wide Area Network. Any Internet or network that covers an area larger than single building or campus.
<b>WWW</b>	:	World Wide Web. A system for accessing information on the Internet.

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## 8.8 CHECK YOUR PROGRESS: POSSIBLE ANSWERS

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### Check Your Progress: 1

- 1) A type of recorded sound source that produces a sound wave to the original wave. In sound engineering analog refers to a series of sound waves that closely resemble the sound waves of the original.
- 2) The objectives of Digital Audio Broadcasting are to:
  - provide stereo multi-channels with CD quality sound;
  - perform and better even in multi path-shadow environment;
  - utilise common receiver for satellite and terrestrial DAB reception;
  - provide easier operation and transmitter power efficiency; and
  - provide signal in mobile applications, such as, car radio, etc., without multi-path interference problems.

### Check Your Progress: 2

- 1) The Internet is a network of networks. Internet is a global network which allows one to send and receive messages online and in real time on computers connected through the internet.
- 2) The advantages of internet broadcasting include world-wide coverage, accessibility of the programme at the time of choice of the listeners, availability of a large number of channels and low cost of operations.

**Check Your Progress: 3**

- 1) In monophonic sound system, one can create only depth in sound, i.e., one can make out which sound sources are near to microphones and which farther. But one cannot make out if the sound source is left or the right of the microphone. Stereophonic system, on the other hand, uses more than one channel of sound information, i.e. direction to create the illusion or sensation of spatial distribution. With this, it will be possible to create a two-dimensional sound.
- 2) Stereo sound cannot be produced using just one microphone as we need two channels of information.

**Check Your Progress: 4**

- 1) Radio stations originating programmes can uplink them to the satellite. The relay stations are equipped with down-load facilities. This facilitates networking at the regional and national levels.
- 2) Sky radio is the system of broadcasting by which the listeners could directly receive programmes from the satellite either through a cable operator or an FM receiver fitted with sky radio converter.