

A top-down view of a white surface cluttered with various multimedia-related icons and hands interacting with technology. The word "MULTIMEDIA" is prominently displayed in the center in a large, bold, dark grey sans-serif font. Behind the text is a large, light grey circular graphic with a stylized, multi-segmented arrow pointing clockwise. Surrounding this central element are numerous icons: a laptop with an envelope icon, a smartphone, a tablet, a magnifying glass, a film strip, a camera, a person icon, a cloud, a document, a coffee cup, and a computer monitor with a cursor. Several hands are visible, some holding pens or pencils, others pointing at or touching the icons, suggesting active engagement with the multimedia environment. The overall composition is a vibrant and busy representation of digital media and user interaction.

Unit 15: Multimedia

- Definition - Classification - Multimedia application -Multimedia Hardware - Multimedia software - CDROM - DVD.
- Multimedia Audio: Digital medium - Digital audio technology - sound cards - recording - editing - MP3 - MIDI fundamentals - Working with MIDI - audio file formats - adding sound to Multimedia project.
- Multimedia Text: Text in Multimedia -Multimedia graphics: coloring - digital imaging fundamentals - development and editing - file formats - scanning and digital photography.
- Multimedia Animation: Computer animation fundamentals - Kinematics - morphing - animation s/w tools and techniques. Multimedia Video: How video works - broadcast video standards - digital video fundamentals – digital video production and editing techniques - file formats.
- Multimedia Project: stages of project - Multimedia skills - design concept - authoring - planning and costing –Multimedia Team. Multimedia-looking towards Future: Digital Communication and New Media, Interactive Television, Digital Broadcasting, Digital Radio, Multimedia Conferencing

What is Multimedia?

- The word multi and media are combined to form the word multimedia. The word “multi” signifies “many.” Multimedia is a type of medium that allows information to be easily transferred from one location to another.
- Multimedia is the presentation of text, pictures, audio, and video with links and tools that allow the user to navigate, engage, create, and communicate using a computer.



What is Multimedia?

- **Multimedia refers to the computer-assisted integration of text, drawings, still and moving images(videos) graphics, audio, animation, and any other media in which any type of information can be expressed, stored, communicated, and processed digitally.**



Categories of Multimedia

1. Linear Multimedia

- It is also called **Non-interactive multimedia**.
- In the case of linear multimedia, the end-user cannot control the content of the application.
- It has literally no interactivity of any kind.



Categories of Multimedia

1. Linear Multimedia

- Some multimedia projects like movies in which material is thrown in a linear fashion from beginning to end. A linear multimedia application lacks all the features with the help of which, a user can interact with the application such as the ability to choose different options, click on icons, control the flow of the media, or change the pace at which the media is displayed. Linear multimedia works very well for providing information to a large group of people such as at training sessions, seminars, workplace meetings, etc.



Categories of Multimedia

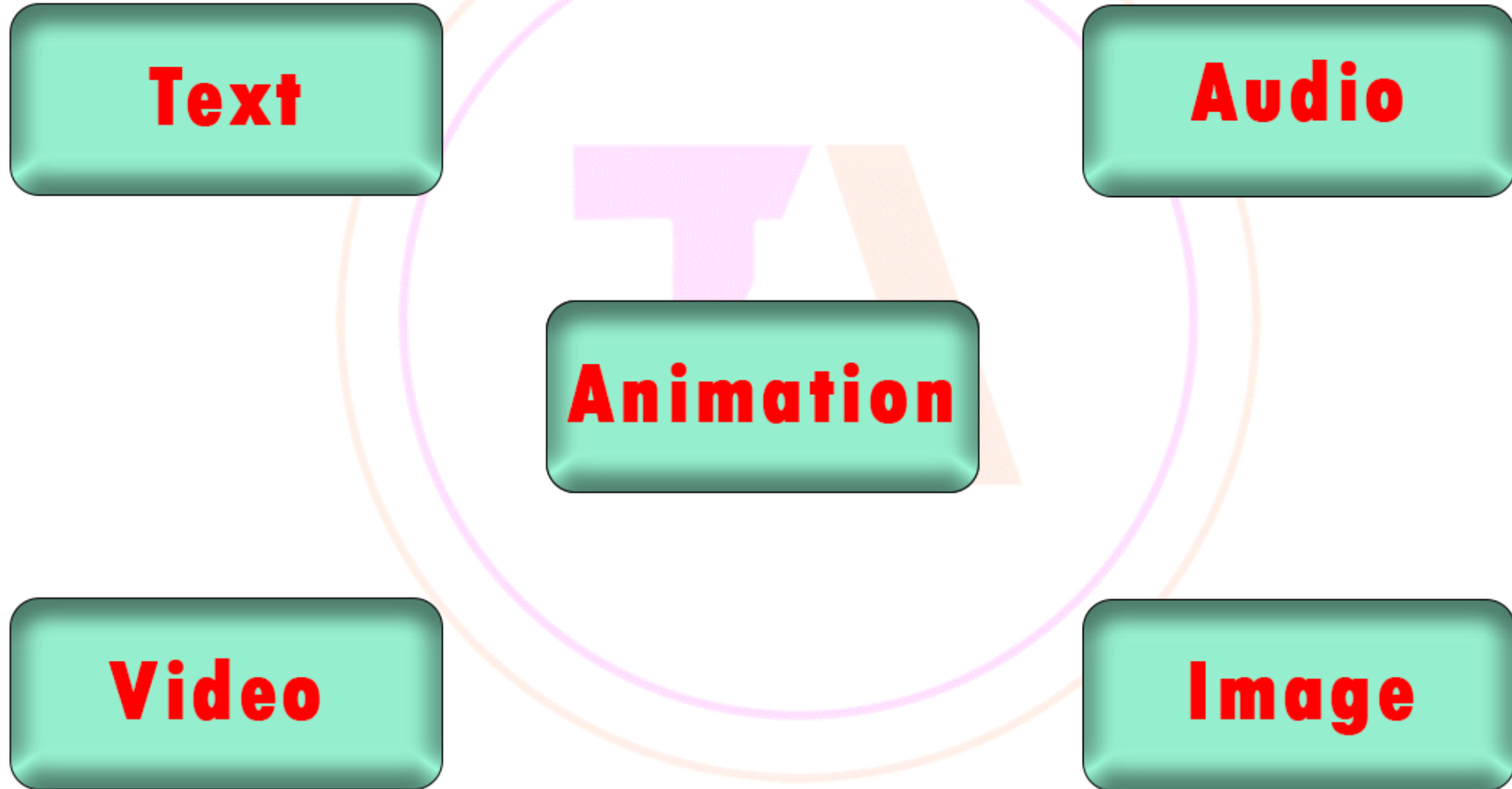
2. Non-Linear Multimedia

In Non-Linear multimedia, the end-user is allowed the navigational control to rove through multimedia content at his own desire.

The user can control the access of the application. Non-linear offers user interactivity to control the movement of data. For example computer games, websites, self-paced computer-based training packages, etc



Elements Of Multimedia



Components of Multimedia

1. Text

- **Characters are used to form words, phrases, and paragraphs in the text. Text appears in all multimedia creations of some kind. The text can be in a variety of fonts and sizes to match the multimedia software's professional presentation. Text in multimedia systems can communicate specific information or serve as a supplement to the information provided by the other media.**



Components of Multimedia

2. Graphics

- **Non-text information, such as a sketch, chart, or photograph, is represented digitally. Graphics add to the appeal of the multimedia application.**
- **In many circumstances, people dislike reading big amounts of material on computers. As a result, pictures are more frequently used than words to clarify concepts, offer background information, and so on. Graphics are at the heart of any multimedia presentation.**



Components of Multimedia

2. Graphics

- The use of visuals in multimedia enhances the effectiveness and presentation of the concept. Windows Picture, Internet Explorer, and other similar programs are often used to see visuals.
- Adobe Photoshop is a popular graphics editing program that allows you to effortlessly change graphics and make them more effective and appealing.



Components of Multimedia

3. Animations

A sequence of still photographs is being flipped through. It's a set of visuals that give the impression of movement. Animation is the process of making a still image appear to move. A presentation can also be made lighter and more appealing by using animation. In multimedia applications, the animation is quite popular. The following are some of the most regularly used animation viewing programs: Fax Viewer, Internet Explorer, etc.



Components of Multimedia

4. Video

Photographic images that appear to be in full motion and are played back at speeds of 15 to 30 frames per second. The term video refers to a moving image that is accompanied by sound, such as a television picture.

Of course, text can be included in videos, either as captioning for spoken words or as text embedded in an image, as in a slide presentation. The following programs are widely used to view videos: Real Player, Window Media Player, etc.



Components of Multimedia

5. Audio

Any sound, whether it's music, conversation, or something else. Sound is the most serious aspect of multimedia, delivering the joy of music, special effects, and other forms of entertainment. Decibels are a unit of measurement for volume and sound pressure level. Audio files are used as part of the application context as well as to enhance interaction.



Components of Multimedia

5. Audio

Audio files must occasionally be distributed using plug-in media players when they appear within online applications and webpages.

MP3, WMA, Wave, MIDI, and RealAudio are examples of audio formats. The following programs are widely used to view videos: Real Player, Window Media Player, etc.



Difference between Multimedia and Hypermedia

- **Multimedia:** It is type of information through electronic means, Internet. It comprised of graphics, text, videos, audios, animations, information on laptops and other similar devices. The elements of multimedia shows us quality pictures, animations, sounds, text information which directly impacts on the user's brain. Even we can perform editing on these different types of multimedia.




Difference between Multimedia and Hypermedia

- **Hypermedia:** It is an next version of hypertext which contains different forms of media like, graphics, text, audio, video and moving graphics etc. There is similarity in the structure of both hypermedia and hypertext. It has even more advanced features like clickable links in the web page. The common hypermedia link is image link which can take the user to the other page. It is used in a variety of applications from problem solving and qualitative research to electronic studying and sophisticated learning.


S.No.	Comparison	Multimedia	Hypermedia
1.	Basic	It represents the various forms of representing the information.	It is an extension of hypertext and not considered as text-based.
2.	Types available	Both linear and non-linear available.	Only non-linear available.
3.	Relation	It combines with hypertext to form a hypermedia.	It combines both hypertext as well as multimedia to represent information.
4.	Based on	It basically works on interaction and interactivity.	It is used for inter-connectivity among elements and also for the cross referencing.
5.	Requirements of hardware	It requires its own delivery system called as multimedia delivery system.	It provides the clickable links to increase capability.
6.	Information present	It is the combination of the media and content which stores the information in some form across the devices.	It is more contrasting in nature and used in non-linear data representation.





1. Multimedia : **Multimedia** means that computer information can be collect through audio, video, and animation etc. Multimedia use text, images, graphics are the major sources of the people. In 20th century people use motion pictures, radio, televisions. Multimedia is derived from two words “Multi”and “Medium”. Multimedia use to deliver information to user in digital form. Multimedia is a field with computer controlled combination of text, animation, audio, video, graphics, and other forms of media. It can be store information in digital form. Multimedia needs large space to store information.

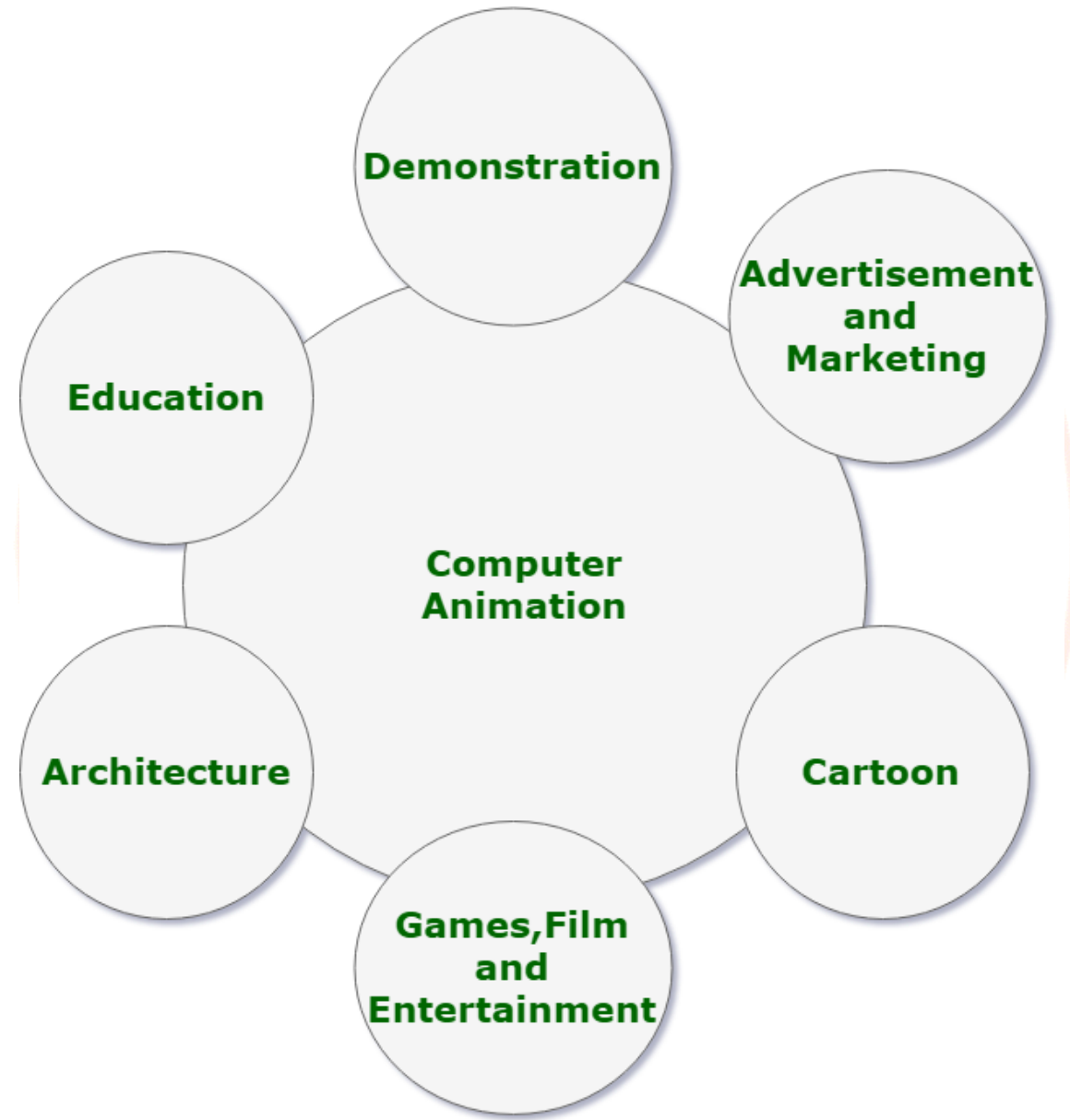
Where do we use multimedia:

- multimedia in business.
 - multimedia in schools.
 - multimedia at home.
 - multimedia at public places.
- 

2. Animation : Animation the process of designing, drawing, making layouts and preparation of presentation, through animation we can move pictures in motion, we can make video also. We can capture movements of pictures through mobiles, camera or any digital media. Animation are created from a sequence of still images, each image is slightly changes from previous one. Animation become very famous since 1950s. now days there are 2D animation movies and 3D animation movies. Through animation we can develop your web sides. Animation means putting life on non living things.

- **Types of animation:**
- poster
- Traditional animation.
- Stop motion animation.
- Motion graphics.
- Computer animation.
- 2D animation.
- 3D animation.







MP4	MP3
MP4 is a digital multimedia container format	Mp3 is an audio coding format
Extension used is .mp4	Extension used is .mp3
MP4 can handle a number of media, such as audio, image, video, text.	MP3 can handle only one type of media, which is an audio file.
Devices which are made for MP4 are both audio and video file players.	Devices that are made for MP3 are simply an audio file player.
MP4 is a compressing technology with decreasing the quality of audio and video both.	MP3 is also a compressing technology but without decreasing the quality.
MP4 is extended from Apple QuickTime .mov and MPEG-4 Part 12	MP3 is extended from MP2
It is new and released in 2003.	It is released in 1994.





GIF	PNG
It stands for <u>graphics interchange format</u> .	It stands for <u>portable network graphics</u> .
It supports <u>animations</u> .	It doesn't support animations.
MIME type is image/gif.	<u>MIME</u> type is image/png.
The file size is generally less.	The file size is large as compared to a GIF.
It supports one bit transparency in the images.	It supports transparency with an elegance.
The extensions used are .gif and .gfa.	The extension used is .png.
Mostly used when animation is needed.	It is mostly used in image creation.
It provides a limited color range of 256 colors.	It provides thousand of colors.
It supports layers and multi-paging.	While it does not supports layers and multi-paging.
It is best suited for screenshots, typography, etc.	It is suitable for small vectors, crispy edged visuals, logos, etc.





SVG	PNG
It stands for Scalable Vector Graphics .	It stands for Portable Network Graphics .
It is a vector image .	It is a raster image .
It's quality doesn't decrease on zooming.	Quality decreases on zooming.
It is made up of paths.	It is made up of fixed no of pixels.
SVG files are editable.	PNG files are not editable.
Extensions used is .svg.	Extension used is .png.
Mostly used for devices with high pixel density.	It is mostly used in image creation.
SVG files do support animation but not as readily as other file types like the AI Adobe Illustrator	PNG files don't support animation — unlike a similar raster-based image file, the GIF.
SVGs are far smaller in size than PNGs. SVG aren't likely to slow down your computer or website.	PNG file sizes are often large so that they can handle high resolutions.



Image file formats

- **GIF- Graphics Interchange Formats-** The GIF format was created by CompuServe.
- It supports 256 colors. GIF format is the most popular on the Internet because of its compact size.
- It is ideal for small icons used for navigational purpose and simple diagrams.
- GIF creates a table of up to 256 colors from a pool of 16 million.
- If the image has less than 256 colors, GIF can easily render the image without any loss of quality.



Image file formats

- **JPEG- Joint Photographic Experts Group- The JPEG format was developed by the Joint Photographic Experts Group.**
- **JPEG files are bitmapped images. It store information as 24-bit color.**
- **This is the format of choice for nearly all photograph images on the internet. Digital cameras save images in a JPEG format by default.**



Image file formats

- **PNG- Portable Network Graphics- PNG is the only lossless format that web browsers support.**
- **PNG supports 8 bit, 24 bits, 32 bits and 48 bits data types.**
- **One version of the format PNG-8 is similar to the GIF format. But PNG is the superior to the GIF.**



Image file formats

- **TIFF- Tagged Image File Format- The TIFF format was developed by the Aldus Corporation in the 1980 and was later supported by Microsoft.**
- **TIFF file format is widely used bitmapped file format. It is supported by many image editing applications, software used by scanners and photo retouching programs.**



Image file formats

- **BMP- Bitmap-** The bitmap file format (BMP) is a very basic format supported by most Windows applications.
- **BMP** can store many different type of image: 1 bit image, grayscale image, 8 bit color image, 24 bit RGB image etc. BMP files are uncompressed.



Image file formats

- **PDF- Portable Document Format- PDF format is vector graphics with embedded pixel graphics with many compression options.**
- **When your document is ready to be shared with others or for publication. This is only format that is platform independent.**



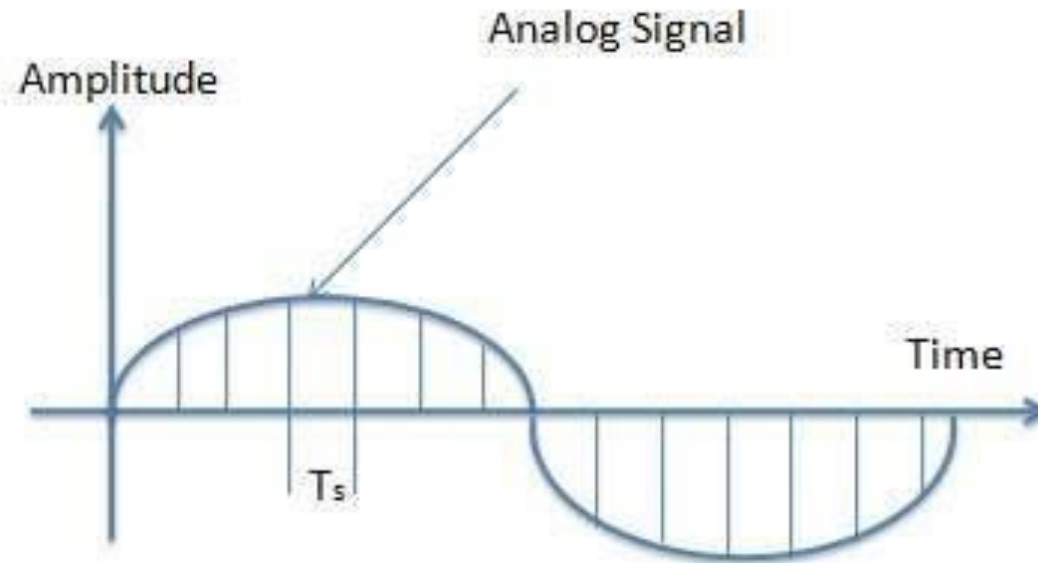
Image file formats

- **EXIF- Exchange Image File- Exif** is an image format for digital cameras.
- A variety of tags are available to facilitate higher quality printing, since information about the camera and picture-taking condition can be stored and used by printers for possible color correction algorithms.



Digitization of Sound

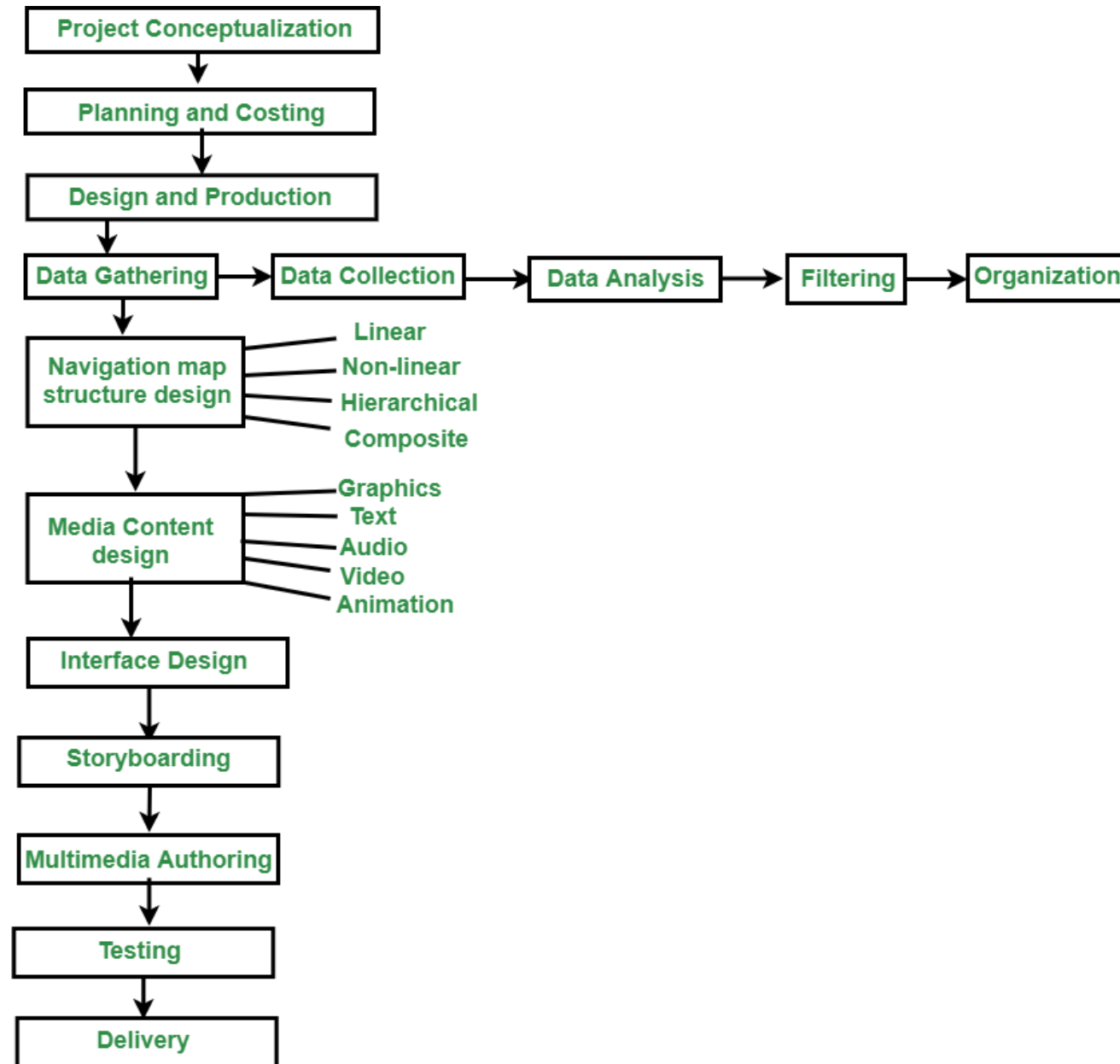
- Digitization is a process of converting the analog signals to a digital signal. There are three steps of digitization of sound.



Multimedia Projects and its Stages

- **A multimedia project is a classic software project which is developed using multimedia technology with the specific aim of distributing information in an entertaining and compelling manner. Multimedia projects require creativity, artistic as well as programming skills. While developing the multimedia application, the professionals have to choose the hardware and software equipment and components a variety of software tools are available. Like all other projects, the multimedia project is also developed in stages.**





Multimedia Projects and its Stages

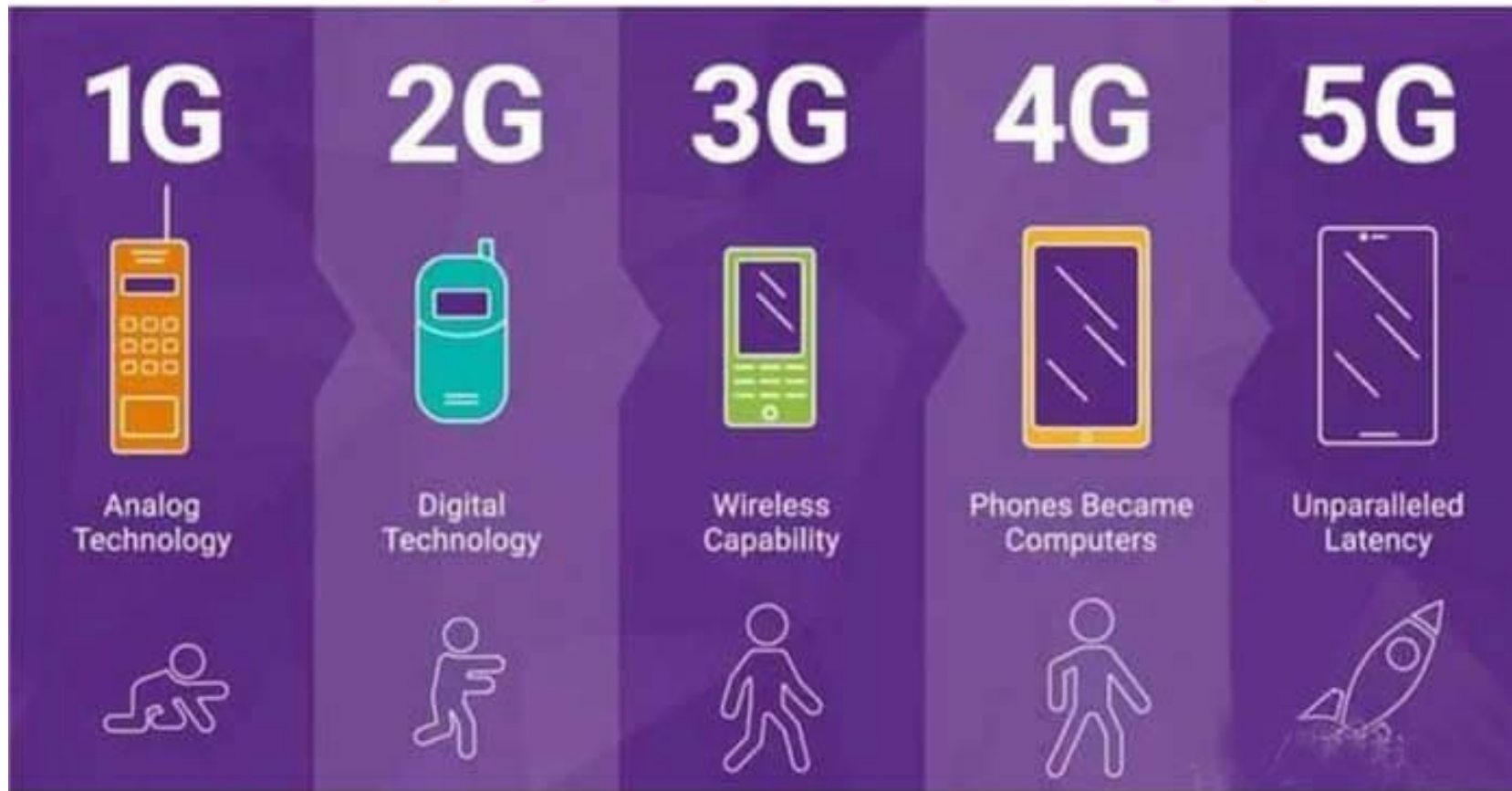
➤ **Following are the basic stages of multimedia project development.**

- 1. Project conceptualization**
- 2. Planning and Costing**
- 3. Design and Production**
- 4. Testing**
- 5. Delivery**





EVOLUTION OF WIRELESS TECHNOLOGIES 1G TO 5G





History of wireless technology

- **Marconi, an Italian inventor, transmitted Morse code signals using radio waves wirelessly to a distance of 3.2 KMs in 1895. It was the first wireless transmission in the history of science. Since then, engineers and scientists have been working on efficiently communicating using RF waves.**
- **The telephone became popular during the mid of 19th century. Due to wired connection and restricted mobility, engineers started developing a device that doesn't require a wired connection and transmits voice using radio waves.**





Key features (technology) of the 1G system

- **Frequency 800 MHz and 900 MHz**
- **Bandwidth: 10 MHz (666 duplex channels with a bandwidth of 30 KHz)**
- **Technology: Analogue switching**
- **Modulation: Frequency Modulation (FM)**
- **Mode of service: voice only**
- **Access technique: Frequency Division Multiple Access (FDMA)**





2G – Second generation communication system GSM

- **The second generation of mobile communication systems introduced a new digital technology for wireless transmission, also known as Global System for Mobile Communication (GSM). GSM technology became the base standard for further development in wireless standards later. This standard was capable of supporting up to 14.4 to 64kbps (maximum) data rate, which is sufficient for SMS and email services.**





2G – Second generation communication system GSM

- **Code Division Multiple Access (CDMA) systems developed by Qualcomm were also introduced and implemented in the mid-1990s. CDMA has more features than GSM regarding spectral efficiency, number of users, and data rate.**





➤ **Key features of the 2G system**

- **The digital system (switching)**
- **SMS services are possible**
- **Roaming is possible**
- **Enhanced security**
- **Encrypted voice transmission**
- **First internet at a lower data rate**

➤ **Disadvantages of the 2G system**

- **Low data rate**
- **Limited mobility**
- **Less features on mobile devices**
- **Limited number of users and hardware capability**





3G – Third-generation communication system

- **Third-generation mobile communication started with the introduction of UMTS – Universal Mobile Terrestrial / Telecommunication Systems. UMTS has a data rate of 384kbps, and it supports video calling for the first time on mobile devices.**
- **After the introduction of the 3G mobile communication system, smartphones became popular across the globe. Specific applications were developed for smartphones that handle multimedia chat, email, video calling, games, social media, and healthcare.**





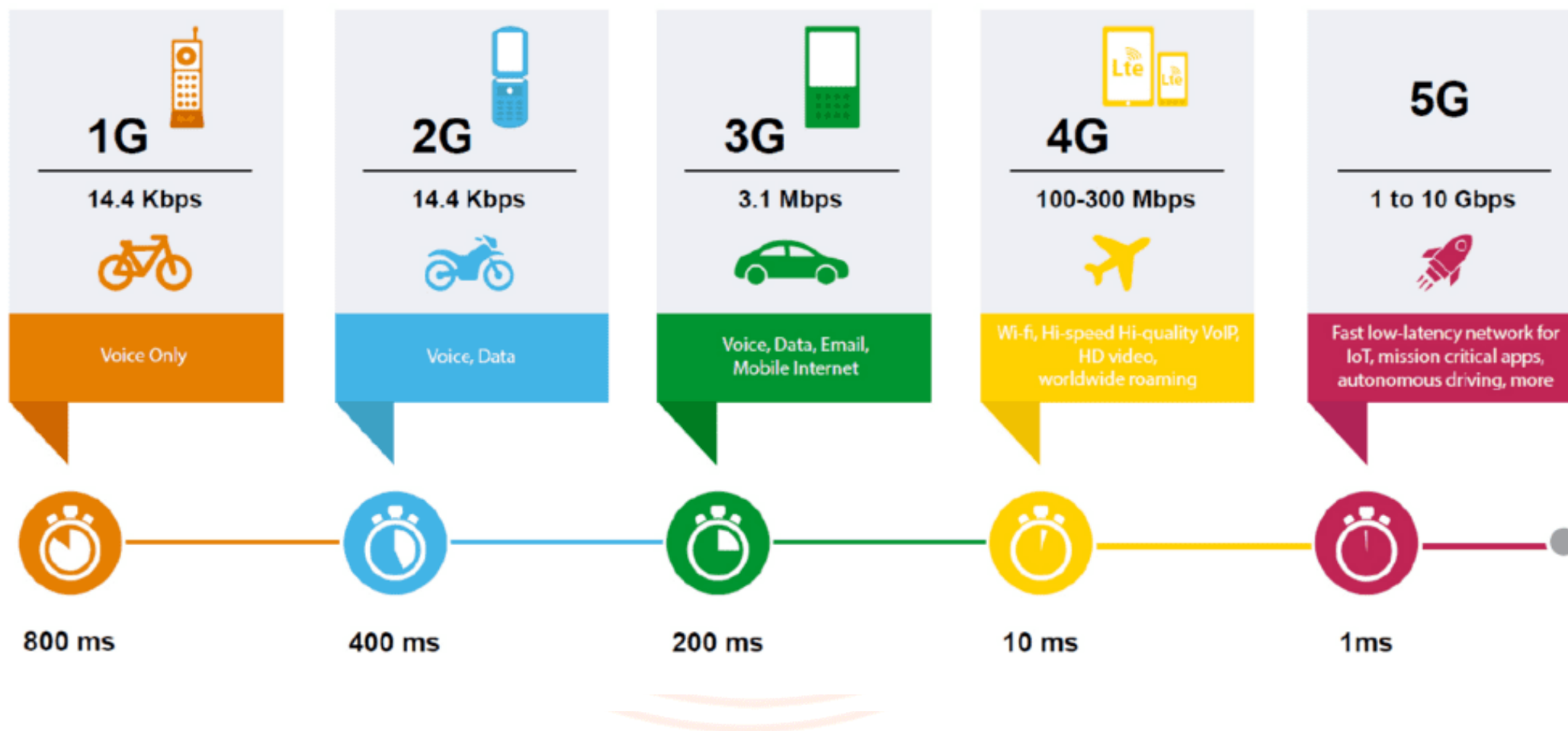
➤ **Key features of the 3G system**

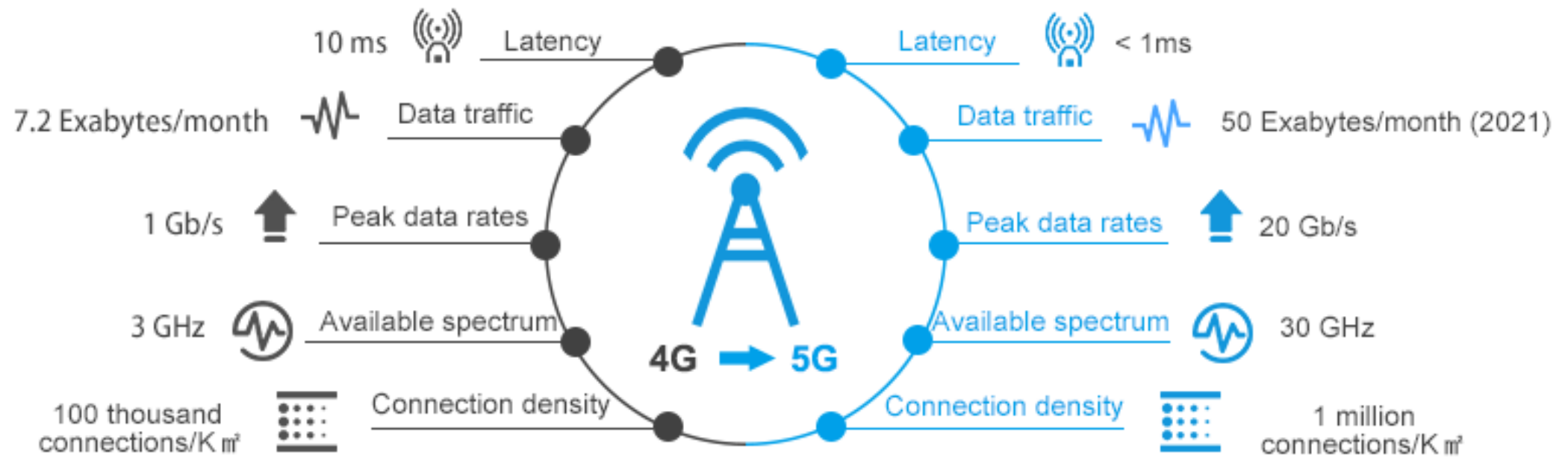
- **Higher data rate**
- **Video calling**
- **Enhanced security, more users, and coverage**
- **Mobile app support**
- **Multimedia message support**
- **Location tracking and maps**
- **Better web browsing**
- **TV streaming**
- **High-quality 3D games**





EVOLUTION OF 1G TO 5G



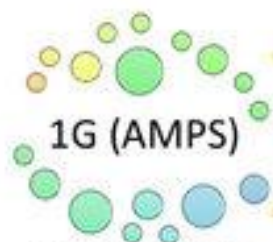


Comparing 4G and 5G

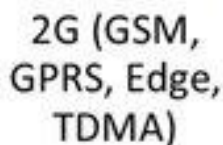
6G (6th generation mobile network)

- **Successor of 5G.**
- Ability to use **higher frequencies** (Sub-6 GHz and 95 GHz to 3 THz (Terahertz)) with **greater speed** (Up to 1,000 Gbps) and **lower latency** (1 millisecond).
 - **Significance:** Support **high-performance computing, edge computing, Technology Convergence** etc.
- Department of Telecommunication (DoT) launched **Bharat 6G Alliance (B6GA)**.
 - B6GA is a **collaborative platform comprising public and private companies**, academia, research institutions, and Standards development organisations.





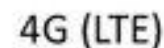
- Data Rate: 2.4 Kbps
- Applications: Voice



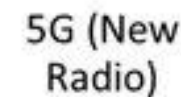
- Data Rate: 50 Kbps
- Latency: 300 ms
- Applications: Voice, Text



- Data Rate: 21 Mbps
- Latency: 100 ms
- Applications: Voice, Multimedia



- Data Rate: 100 Mbps
- Latency: 10 ms
- Mobility: 350 Km/h
- Applications: Voice, Mobile TV, Mobile Internet



- Data Rate: 20 Gbps
- Latency: 1 ms
- Mobility: 500 Km/h
- Applications: Wearable devices, IoT, Smart Cities



- Data Rate: >1 Tbps
- Latency: 10-100 μ s
- Mobility: >1000 Km/h
- Applications: Tactile Internet, Space Tourism, Automated cars





Comparison of Wi-Fi generations

	Wi-Fi 4	Wi-Fi 5	Wi-Fi 6/6E	Wi-Fi 7
Peak Speed	600 Mbps	7 Gbps	9.6 Gbps	36 Gbps
Frequency Bands	2.4 Ghz, 5 Ghz	5 Ghz	2.4 Ghz, 5 Ghz	2.4 Ghz, 5 Ghz, 6Ghz
Key Advances	Introduced MIMO (Multiple Input, Multiple Output) technology for improved data transfer rates and reliability.	Introduced wider channels, MU-MIMO (Multi-User-MIMO) , and Beam-forming for increased data transfer speeds and better handling of multiple devices.	Introduced features like OFDMA (Orthogonal Frequency Division Multiple Access)	Key features include backward compatibility, multi-link operation (MLO), and support for wider channels (up to 320MHz) and Adaptive puncturing technology
Launch	2009	2013	2019	2024 (Expected)

S.NO.	CELLULAR	WI-FI
1	Cellular plan are attached to the device that uses cellular signal to connect to the internet.	Wi-Fi is a local area networking technology that uses radio waves to provide high-speed internet access to mobile devices enabled with Wi-Fi.
2	Cellular refers to a mobile network which is distributed over a wide area.	Wi-Fi is a critical element and a crucial wireless networking technology based on the IEEE 802.11 standards.
3	Cellular has no limit in the range.	Wi-Fi has a limited range.
4	Mobile technology is the technology used for cellular communication.	Device can use the Wi-Fi standard to broadcast and receive information.
5	Cellular has a data plans with limited consumption.	Wi-Fi has no limit on how much data you can use in a day or a month.
6	Cellular network are relatively slow in terms of speed and reliability.	Wi-Fi are faster than Cellular Network..



Q. _____ is basically a form of pictorial presentation.

- A. Photography**
- B. Animations**
- C. Drawing**
- D. Creativity**





Q. Each _____ represents a particular colour.

- A. Frame**
- B. Character**
- C. Pixel value**
- D. None of the above**





- ✓ In the context of digital images, each pixel represents a tiny element or point in a grid, and it is the smallest unit of information in the image. The pixel value refers to the color or intensity of that particular pixel.
- ✓ Digital images are made up of a combination of pixels, and each pixel has a specific color or grayscale value assigned to it. These values are often represented using numerical codes, and the combination of all the pixel values in an image determines its overall appearance.
- ✓ Therefore, in the given statement, "Each pixel value represents a particular color" indicates that the color of an image is determined by the values assigned to each pixel in the image grid.





Q. Audio compression can be used for_____.

- A. voice and data**
- B. video and voice**
- C. speech or music**
- D. picture and colors**





Q. In Real Time Interactive Audio Video, Jitter is introduced in real - time data by delay between _____.

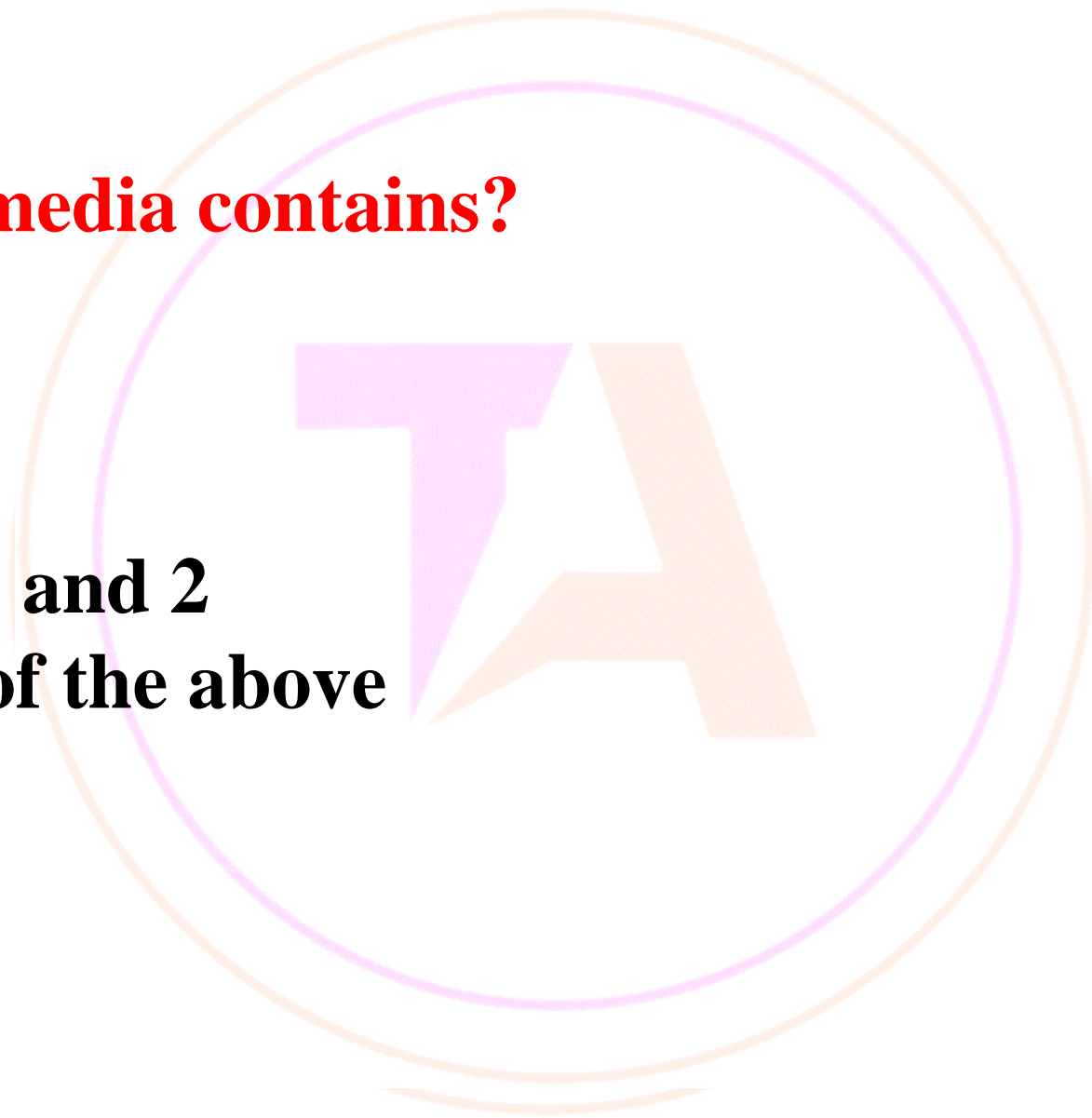
- A. pixels**
- B. layers**
- C. frames**
- D. packets**





Q. Multimedia contains?

- A. Audio**
- B. Video**
- C. Both 1 and 2**
- D. None of the above**





Q. Which principles are used in digitization of multimedia content?

I. Sampling

II. Quantization

A. Only II

B. Only I

C. Neither I nor II

D. Both I and II





Sampling and Quantization are two principles that are used in the digitization of multimedia content :-

- ✓ **Sampling is the process of converting an analog signal, such as an audio or video signal, into a digital signal. This involves taking periodic snapshots or samples of the analog signal at regular intervals, and converting each sample into a digital representation, typically using pulse code modulation (PCM).**
- ✓ **Quantization is the process of representing the digital samples of the analog signal with a finite set of discrete values, rather than a continuous range of values. This process involves assigning a numerical value to each sample, based on the amplitude of the sample. The resolution of the quantization process is determined by the number of bits used to represent each sample, with more bits providing higher resolution and higher quality.**





Q. Drawing, photographs, movies and simulation comes under the category of :

- A. Animation**
- B. Image**
- C. Graphics**
- D. Text**

