Transformation coordinates for other two axes can be obtained with circular permutation of coordinate parameters x,y,z

Replacing $x \rightarrow y \rightarrow z \rightarrow x$

Equations for x axis as

$$y' = y\cos\theta - z\sin\theta$$

$$z' = y\sin\theta + z\cos\theta$$

$$x' = x$$

General Three dimensional Rotations:

When the object is rotated about an axis that is parallel to one of the coordinate axis, then the desired rotation can be obtained in following sequence

- Translate the object so that the rotation axis coincides with the parallel coordinate axis
- Perform the specified rotation about that axis
- Translate the object so that the rotation axis is moved to the original position.

When an object is rotated about an axis that is not parallel to one of the coordinate axis, then some additional transformations need to be performed.

- Translate the object so that rotation axis passes through the coordinate origin
- Rotate the object so that axis of rotation coincides with one of the coordinate axes.
- Perform the specified rotation about the coordinate axis.
- Apply inverse rotations to bring the rotation axis back to its original orientation
- Apply the inverse translation to bring the rotation axis back to its original position.

3. Discuss the visible surface detection methods in detail.

(NOV/DEC 2015,MAY/JUNE 2014, MAY/JUNE 2013)

Back Face detection:

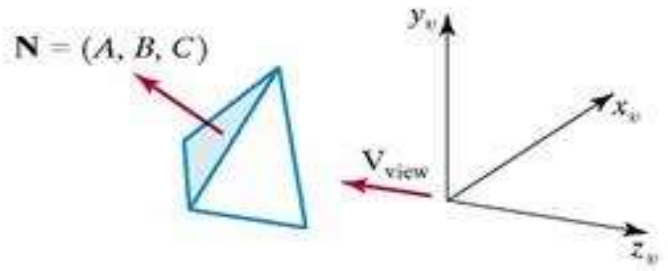
- A fast and simple object-space method for identifying the back faces of a polyhedron is based on the “inside-outside” tests.

- A point (x, y, z) is "inside" a polygon surface with plane parameters A, B, C, and D if When an inside point is along the line of sight to the surface, the polygon must be a back face
- This test can be done by considering the normal vector **N** to a polygon surface, which has Cartesian components (A, B, C).
- In general, if V is a vector in the viewing direction from the eye (or "camera") position, then this polygon is a back face if

  V.N > 0
- Furthermore, if object descriptions are converted to projection coordinates and your viewing direction is parallel to the viewing z-axis, then

  $V = (0, 0, V_z)$ and $V.N = V_Z C$
- In a right-handed viewing system with viewing direction along the negative Z_V axis, the polygon is a back face if $C < 0$.

  Also, any face cannot be seen whose normal has z component C = 0, since your viewing direction is towards that polygon.



A polygon surface with plane parameter $C < 0$ in a right-handed viewing coordinate system is identified as a back face when the viewing direction is along the negative z_v axis.

Figure 3.6 polygon surface with plane parameters

Depth Buffer Method:

- It is an image-space approach. The basic idea is to test the Z-depth of each surface to determine the closest (visible) surface.
- In this method each surface is processed separately one pixel position at a time across the surface. The depth values for a pixel are compared and the closest (smallest z) surface determines the color to be displayed in the frame buffer.
- It is applied very efficiently on surfaces of polygon. Surfaces can be processed in any order. To override the closer polygons from the far ones, two buffers named frame buffer and depth buffer are used.
- **Depth buffer** is used to store depth values for (x, y) position, as surfaces are processed ($0 \leq$ depth ≤ 1).
- The **frame buffer** is used to store the intensity value of color value at each position (x, y).
- The z-coordinates are usually normalized to the range [0, 1]. The 0 value for z-coordinate indicates back clipping pane and 1 value for z-coordinates indicates front clipping pane.

Algorithm

1. Initialize the depth and refresh buffer
   Depthbuffer (x, y) = 0
   Framebuffer (x, y) = background color
2. For each position on each polygon surface, compare depth values to previously stored values in the depth buffer to determine visibility.
   For each projected (x, y) pixel position of a polygon, calculate depth z.
   If Z > depthbuffer (x, y)
   set depthbuffer (x, y) = z,
   framebuffer (x, y) = surfacecolor (x, y)

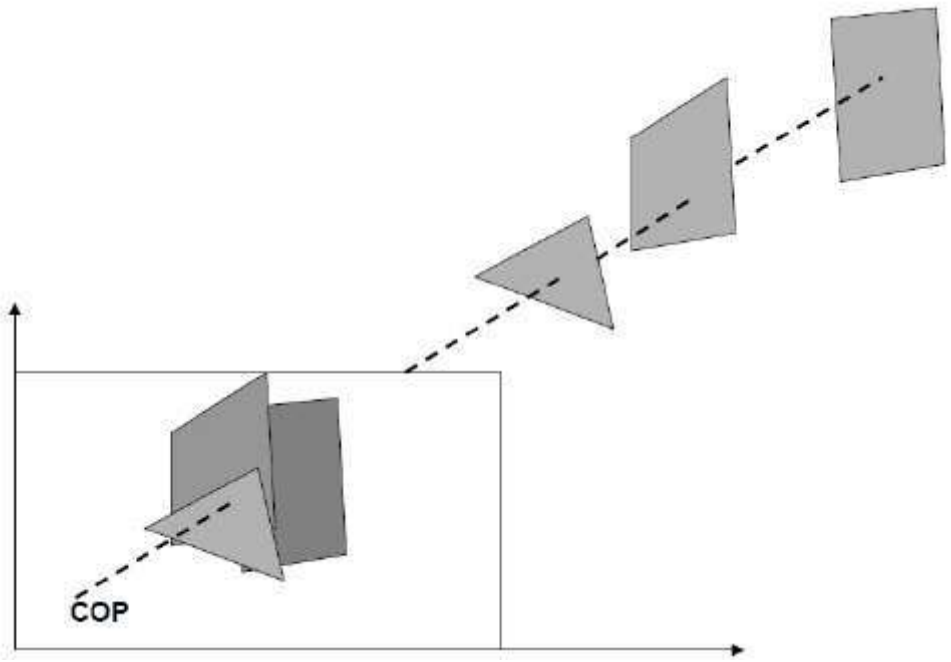


Figure 3.7 A view plane position

A buffer Method:

- The A-buffer method is an extension of the depth-buffer method.
- The A-buffer method is a visibility detection method developed at Lucas film Studios for the rendering system Renders Everything You Ever Saw (REYES).
- The A-buffer expands on the depth buffer method to allow transparencies. The key data structure in the A-buffer is the accumulation buffer.
- Each position in the A-buffer has two fields −
- **Depth field** − It stores a positive or negative real number
- **Intensity field** − It stores surface-intensity information or a pointer value

If depth >= 0, the number stored at that position is the depth of a single surface overlapping the corresponding pixel area. The intensity field then stores the RGB components of the surface color at that point and the percent of pixel coverage.

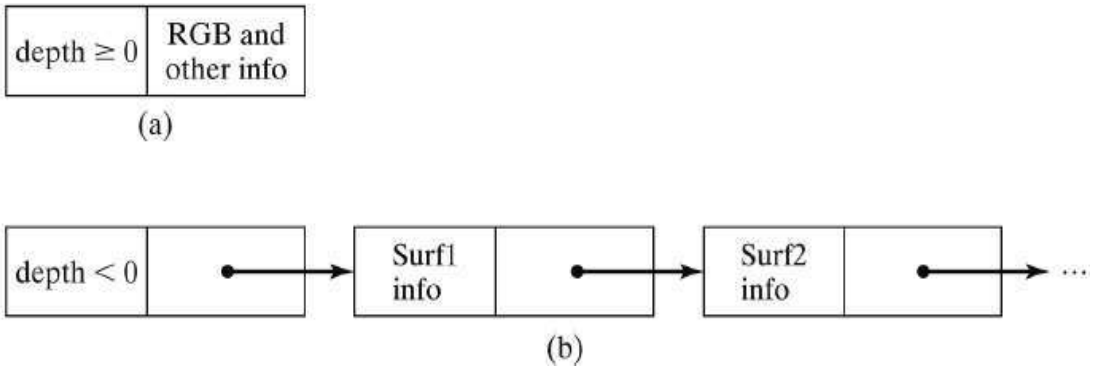


Fig.3.8 : Organization of an A buffer pixel position (a) Single-surface overlap (b) Multiple-surface overlap

- If depth < 0, it indicates multiple-surface contributions to the pixel intensity. The intensity field then stores a pointer to a linked list of surface data. The surface buffer in the A-buffer includes
  - RGB intensity components
  - Opacity Parameter
  - Depth
  - Percent of area coverage
  - Surface identifier

Scan line Method:

- It is an image-space method to identify visible surface.
- This method has depth information for only single scan-line. In order to require one scan-line of depth values, it is necessary to group and process all polygons intersecting a given scan-line at the same time before processing the next scan-line.
- Two important tables -edge table and polygon table**,** are maintained for this.
- **The Edge Table** − It contains coordinate endpoints of each line in the scene, the inverse slope of each line, and pointers into the polygon table to connect edges to surfaces.

- **The Polygon Table** − It contains the plane coefficients, surface material properties, other surface data, and may be pointers to the edge table.

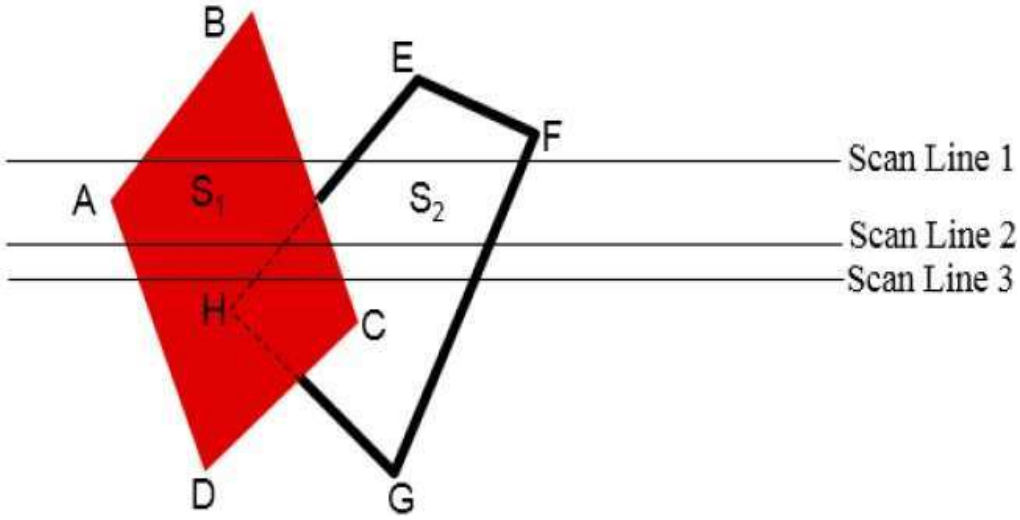


Fig.3.9 scan line intersecting a polygon surface

- To facilitate the search for surfaces crossing a given scan-line, an active list of edges is formed. The active list stores only those edges that cross the scan-line in order of increasing x.
- Also a flag is set for each surface to indicate whether a position along a scan-line is either inside or outside the surface.

Depth Sorting Method:

- Depth sorting method uses both image space and object-space operations. The depth-sorting method performs two basic functions
- First, the surfaces are sorted in order of decreasing depth.
- Second, the surfaces are scan-converted in order, starting with the surface of greatest depth.
- The scan conversion of the polygon surfaces is performed in image space. This method for solving the hidden-surface problem is often referred to as the painter's algorithm.

- The key difference between full motion video and viewer interactive video is that full motion video is a play back of stored video clips while viewer interactive video is a live. It may be possible to manage decompression and display of stored video clips more easily.
- Interactive Live video are the interesting applications used for direct interaction,medical application, manufacturing application and various process control application.
- Whereas full motion video are useful for for messagins, information dissemination.

Audio and Video Indexing.

Indexing is an important and complex subject for multimedia design. Marking a position is called Indexing. Audio and video indexing are used in full-motion video in a manner similar to any video sequence, i.e.,. just as it would in a home movie, taped performance and so on.

The needs of the application must be a strong consideration for the type of indexing provideq with the system.

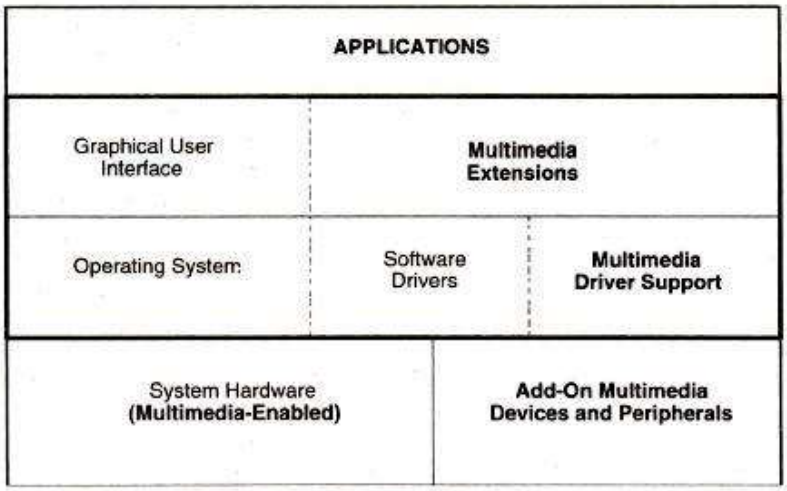
Key points for indexing of stored video clips:

* Indexing is useful only if the video is stored, indexing information is lost.
* When sound and video are decompressed and managed separately, synchronization is very important.
* Depending on the application, indexing information must be maintained separately for sound and video components of a video clip.

3.3 MULTIMEDIA SYSTEMS ARCHITECTURE

Multimedia encompasses a large variety of technologies and integration of multiple architectures interacting in real time. All of these multimedia capabilities must integrate with the standard user interfaces such as Microsoft Windows.

The following figure describes the architecture of a multimedia workstation environment. In this diagram.



The right side shows the new architectural entities required for supporting multimedia applications.

For each special devices such as scanners, video cameras, VCRs and sound equipment-, a software device driver is need to provide the interface from an application to the device. The GUI require control extensions to support applications such as full motion video

High Resolution Graphics Display

The various graphics standards such as MCA, GGA and XGA have demonstrated the increasing demands for higher resolutions for GUls.

Combined graphics and imaging applications require functionality at three levels. They are provided by three classes of single-monitor architecture.

(i) VGA mixing: In VGA mixing, the image acquisition memory serves as the display source memory, thereby fixing its position and size on screen:

(ii) VGA mixing with scaling: Use of scalar ICs allows sizing and positioning of images in pre-defined windows.

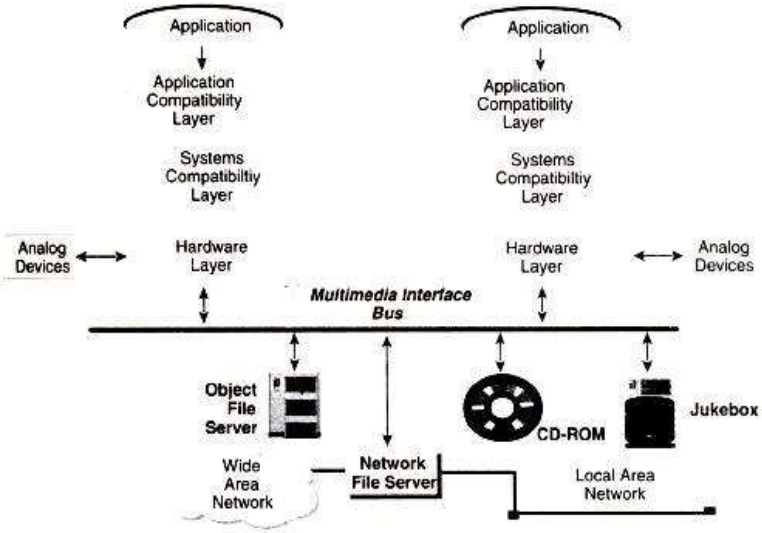
Resizing the window causes the things to be retrieved again.

(iii) Dual-buffered VGA/Mixing/Scaling: Double buffer schemes maintain the original images in a decompression buffer and the resized image in a display buffer.

The IMA Architectural Framework

The Interactive Multimedia Association has a task group to define the architectural framework for multimedia to provide interoperability. The task group has C0ncentrated on the desktops and the servers. Desktop focus is to define the interchange formats. This format allows multimedia objects to be displayed on any work station.

The architectural approach taken by IMA is based on defining interfaces to a multimedia interface bus. This bus would be the interface between systems and multimedia sources. It provides streaming I/O service"s, including filters and translators **Figure 3.4** describes the generalized architectural approach



Network Architecture for Multimedia Systems:

Multimedia systems need special networks. Because large volumes of images and video messages are being transmitted.

Asynchronous Transfer Mode technology (A TM) simplifies transfers across LANs and W ANs.

Task based Multi level networking

Higher classes of service require more expensive components in the' workstations as well as in the servers supporting the workstation applications.

Rather than impose this cost on all work stations, an alternate approach is to adjust the class of service to the specific requirement for the user. This approach is to adjust the class of services according to the type of data being handled at a time also.

We call this approach task-based multilevel networking.

High speed server to server Links

Duplication: It is the process of duplicating an object that the user can manipulate. There is no requirement for the duplicated object to remain synchronized with the source (or master) object.
Replication: Replication is defined as the process of maintaining two or more copies of the same object in a network that periodically re-synchronize to provide the user faster and more reliable access to the data Replication is a complex process.

Networking Standards:

The two well-known networking standards are

1. Ethernet
2. token ring.

ATM and FDDI are the two technologies which are going to be discussed in detail.

ATM:

- ATM is a acronym for Asynchronous Transfer Mode. It's topology was originally designed for broadband applications in public networks.
- ATM is a method of multiplexing and relaying (cell-switching) 53 byte cells. (48 bytes of user information and 5 bits of header information).
- It has been increasingly used for transferring real time multimedia data in local network at a speed higher than 100Mbits/sec. ANSI has adopted ATM as the cell switching standard.
- **Cell Switching:** It is a form of fast packet switching based on the us of cells. **Cells:** Short, fixed length packets are called cells.
- The ANSI standard for FDDI allows large-distance networking. It can be used as high-performance backbone networks to complement and extend current LANs.
- ATM provides high capacity, low-latency switching fabric for data. It is independent of protocol and distances. ATM effectively manage a mix of data types, including text data, voice, images and full motion video. ATM was proposed as a means of transmitting multimedia applications over asynchronous networks.

FDDI:

- FDDI is an acronym of Fiber Distributed Data Interface. This FDDI network is an excellent candidate to act as the hub in a network configuration, or as a backbone that interconnects different types of LANs.
- FDDI presents a potential for standardization for high speed networks.
- The ANSI (American National Standard Institute) standard for FDDI allows for single-mode fiber supporting up to 40 km between stations.
- It extends the current LAN speed from 100 Mbits/sec to several Gigabits per seconds, and large-distance networking.

Difference between ATM and FDDI

ATM	FDDI II
ATM pushes network speed as high as 622Mbits/sec	FDDI II pushes network speed as high as 100 Mbits /sec
ATM is capable of lower speeds at the workstations.It reduces number of devices protocol translation require for communication between local and wide area network	FDDI II does not allow a user to connect to the network at the spped required by the user, rather it requires the user to be capable of supporting the network speed.

Benefits of Shared media Networks:

- Ease of installation
- Lack of common equipment
- Connectionless operation
-

Difficulties of Shared Media Networks:

- Wiring existing buildings
- Fault isolation

3.4 EVOLVING TECHNOLOGIES FOR MULTIMEDIA SYSTEMS

Multimedia applications use a number of technologies generated for both commercial business application as well as the video game industry.
Let us review some of these technologies in this section.

1.Hypermedia documents

Hypermedia documents are documents which have text, embedded or linked multimedia objects such

3.6MULTIMEDIA DATA INTERFACE STANDARDS

3.6.1File Formats for Multimedia Systems:

(i) Device-independent Bitrnap (DIB): This file format contains bit map, color, and color paJlette information.

(ii) RIFF device Independent Bitrnap (RDIB): Resource Interchange File Frmat **(RIFF)** is the standard file format defined for Microsoft Windows and OS/2. It allows a more complex set of bit maps than can be handled by DIB.

(iii) **Musical Instrument Digital interface (MIDI):** This is the interface standard for file transfer between a computer and a musical instrument such as a digital piano. It is also, used for full-motion video and voice-mail messaging systems. It has the advantage of ready availability of MIDI device controller boards for personal computers.

RIFF Musical Instrument Digital Interface

A MIDI format within a RIFF envelope provides a more complex interface.

Palette File Format (PAL) An interface that allows defining a palette of 1 to 256 colours in a representation as RGB values.

Rich Text Format (RTF) This file format allows embedding graphics and other file formats within a document. This format is used by products such as Lotus Notus. This format is also the basis for the use of OLE.

Waveform Audio File Format (WAVE) A digital file representation of digital audio.

Windows Metafile Format (WMF) This is a vector graphic format used by Microsoft Windows as an interchange format.

Multimedia Movie Format (MMM) This is a format used for digital video animation.

Apple's Movie Format This format was defined as the standard for file exchange by Quick Time enabled systems.

Digital Video Command Set (DVCS) This is the set of digital video commands simulating VCR controls.

Digital Video Media Control Interface Microsoft's high level control interface for VCR controls, including play, rewind, record and so on.

Vendor - Independent Messaging (VIM) Developed by a consortium of Vendors providing a standardized format for cross-product messages.

Apple's Audio Interchange File Format Apple's standard file format for compressed audio and voice data.

SDTS GIS Standard The Spatial Data Transfer Standard (SDTS) is designed to provide a common storage format for geographic and cartographic data.

3.6.2 VIDEO PROCESSING STANDARDS

INTELS DVI

DVI is an achronym of Digital Video Interface.

DVI standard is to provide a processor independent specification for a video interface. That video interface should accomodate most compression algorithms for fast multimedia displays. An example of custom-designed chip which supports DVI is Intel's i750 B. This chip is designed for enhancing low-end, software based PC video.

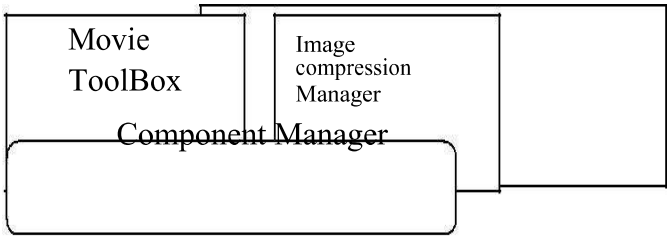
Advantages of the DVI Chip

(i) It can operate software video processing real time. (ii) It can share the processing with the host CPU. (iii) It can handle additional vector-quantization-type algorithms in conjunction with host processing. DVI silicon chip relies on a programmable video processor. It gives potential to DVI chips to run a range of compression algorithms.

APPLE QUICK TIME

Quick Time standard is developed by Apple Computer. It is designed to Support multimedia applications. It is integrated with the operating system. Quick time refers to both the extensions to the Mac Operating system and to the compression/decompression functionality Of the environment. Quick Time is designed to be the graphics standard for timebased graphic data types.

Quick Time's definition has been extended to include (i) System Software, (ii) File Formats, (Hi) Compression! decompression algorithms, (iv) Human Interface Standards.
Figure Shows the components in the Quick Time Architecture.



Quick Time adjust automatically to the hardware being used by the user. MPEG is another competing standard which is comparitively higher-end, hardware-assisted standard. It can produce better resolutions at faster rates.

MICROSOFT AVI

A VI is an achronym for Audio Video Interleave Standard. It is similar to Apple's Quick Time. It offers low-cost, low-resolution video processing for the average desktop user. It is a layered product. A VI is scalable. It allows users to set parameter such as window size, frame rate, quality and compression algorithm through a number of dialog boxes. AVI-compatible hardware allows enhancing performance through hardware-accelerated compression algorithms such as DVI and MPEG. A VI supports several compression algorithms

3.7 Multimedia Databases

Images, sounds and movies can be stored, retrieved and played by many databases. In future, multimedia databases will bcome a main source of interaction between users and multimedia elements.

Multimedia storage and retrieval Multimedia storage is characterized by a number of considerations. They are:

(i) massive storage volumes
(ii) large object sizes
(iii) multiple related objects
(iv) temporal requirements for retrieval

Massive Data Volumes

A single multimedia document may be a combination of different media Hence indexing of documents, fi lms and tapes is more complex. Locating massive data volumes requires searching through massive storage files.
Locating and indexing systems can be understood only by a few key staff personnel. Hence it requires a major organizational eff0l1 to ensure that they are returned in proper sequence to their original storage location.

storage technologies

There are two major mass storage technologies used currently for storage of multimedia documents.

(i) Optical disk storage systems. (ii) High-speed magnetic storage.

Advantages of Optical disk storage systems:

(i) Managing a few optical disk platters in a juke box is much simpler than man;lging a large magnetic disk farm. (ii) Optical disk storage is excellent storage system for off line archival of old and infrequently referenced documents for significant periods of time

Multimedia object storage

Multimedia object storage in an optical medium serves its original purpose, only if it can be located fast and automatically. A key issue here is random keyed Access t6 various components of hypermedia database record. Optical media providcs very dense storage. Speed of retrieval is another consideration.
Retrieval speed is a direct result of the storage latency, size of the data relative to display resolution, transmission media and speed, and decompression efficiency. Indexing is important for fast retrieval of information. Indexing can be at multiple levels.
Multimedia document retrieval
The simplest form of identifying a multimedia document is by storage platter identification and its relative position on the platter (file number). These objects can then be grouped using a database in folders (replicating the concept of paper storage in file folders) or within complex objects representing hypermedia documents.

The capability to access objects using identifiers stored in a database requires capability in the database to perform the required multimedia object directory functions. Another important application for sound and full motion video is the ability to clip parts of it and combine them with another set.
Indexing of sound and full-motion video is the subject of intense debate and a number of approaches have been used.

Database Management Systems for Multimedia Systems
Since most multimedia applications are based primarily on communications technologies, such as electronic mail, the database system must be fully distributed. A number of database storge choices are available.
The choices available are:

* Extending the existing relational database management systems, (RDBMSs) to support the various objects for multimedia as binary objects.
* Extending RDBMSs beyond basis binary objects to the concepts of inheritance and classes. RDBMSs supporting these . features provide extensions for object-programming front ends and/or C++ support.
* Converting to a full fledged object oriented database that supports the standard SQL language.
* Converting the database and the application to an objectoriented database and using an object-oriented language, or an object-enabled SQL for development.

Multimedia applications combine numerical and textual data, graphics from GUI front-ends, CAD/CAM systems and GIS applications, still video, audio and full-motion video with recorded audio and annotated voice components. Relational databases, the dominent database paradigm, have lacked the ability to support multimedia databases. Key limitations of relational database systems for implementing multimedia applications stem from two areas: the relational data model and the relatIonal computational model.
RDBMSs have been designed to manage only tabular alphanumeric forms of data (along with some additional data types stored in binary form such as dates).

RDBMS Extensions For Multimedia
Binary Large Object (BLOB) is a data type which has been adapted by most of the leading relational databases. BLOBs are used for objects such as images or other binary data types.
The relational database is extended to access these BLOBs to present the user 'with a complete' data set.
Extended relational databases provide a gradual migration path to a more object-oriented environment.
Relational database tables include location information for the BLOBs which may be stored outside the database on separate image or video servers. Relational databases have the strength of rigorous set management for maintaining the integrity of the database
Object-Oriented Databases for Multimedia
In object databases, data remains in RMS or flat files. Object databases can provide the fastest route to multimedia support. Object programming embodies the principles of reusable code and modularity. This will ease future maintenance of these databases.
Object database capabilities such as message passing, extensibility, and the support of hierarchical structures, are important for multimedia systems.
We can develop the application fastest class definitions. ODBMSs are extensible. They allow incremental changes to the database applications.
Extensibility: Extensibility .means that the set of operations, structures and constraints that are available to operations are not fixed, and developers can define new operations, which can then be added as needed to their application.
Object-oriented software technology has three important concepts. They are:
Encapsulation: It is the ability to deal with software entities as units that interact in pre-defined and controllable manner, and where the control routines are integral with entity.
Association: It is the ability to define a software entity in terms of its di fferences from another entity.
Classification: It is the ability to represent with a single software entity a number of data items that all have the same behavior and the same state attributes.
Object orientation helps to organize the software in a more, modular and re-usable manner.
Encapsulation allows for the development of open systems where one part of the application does not need to know the functioning of other part. It also provides autonomy; **Autonomy** means we can interface to a variety of external programs can be built in one class of objects and the storage of the data in another class of objects.
Database Organization for Multimedia Applications
Data organization for multimedia systems has some key issues. They are:
(l) Data independence (2) Common distributed database architecture

(3) Distributed database servers· (4) Multimedia object management.

Data Independence

Flexible access by a number of databases requires that the data be independent from the application so that future applications can access the data without constraints related to a previous application.

Key features of data independent designs are:

1.Storage design in independent of specific applications.

2.Explicit data definitions are independent of application program.

3.Users need not know data formats or physical storage structures.

4.Integrity assurance in independent of application programs.

5.Recovery in independent of application programs.

Distributed Data servers : Distributed database servers are a dedicated resource on a network accessible to a number of applications. The database server is built for growth and enhancement, and the network provides the opportunity for the growth of applications and distributed access to the data.

Multimedia Object Management

The object management system must be capable of indexing, grouping and storing multimedia objects in distributed hierarchical optional storage systems, and accessing these objects on or keyed basis.

The design of the object management system should be capable indexing objects in such a manner that there is no need to maintain multiple storage copies.

Transaction management for Multimedia Systems

Multimedia transactions are very complex transactions. We define a multimedia transaction as the sequence of events that starts when a user makes a request to display, edit, or print a hyper media document. The transaction is complete when the user releases the hypermedia document and stores back the edited versions or discards the copy in memory (including virtual memory) or local storage .

In most simple applications based on text and textual or numeric data a transaction managed generally by the server that provides the storace for the data.

Even these transactions becomes more complex when data has to be retrieved from multiple data servers that can be accessed simultaneously by a large number of users.

Conflicts arise when two users attempts to read from and write to same data record.

A multi-phase commit methodologies are used to address conflicts in relational database.

Multimedia Database	**Conventional Database**
A **Multimedia database** (**MMDB**) is a collection of related multimedia data.	A **relational database management system** (**RDBMS**) is a database management system (DBMS) that is based on the relational model
A Multimedia Database (MMDB) hosts one or more multimedia data types[3] (i.e. text, images, graphic objects, audio, video, animation sequences.	Each database is a collection of tables, which are called relations, hence the name "relational database
Multimedia data consists of a variety of media formats or file representations including TIFF,BMP, PPT, IVUE, FPX, JPEG, MPEG, AVI, MID, WAV, DOC, GIF, EPS, PNG, etc.	relational model contains the following components: • Collection of objects or relations • Set of operations to act on the relations • Data integrity for accuracy and consistency
• Multimedia database consume a lot of processing time, as well as bandwidth.	Extremely fast retrieval times for multi-user, transactional environment. • Ease the use compared to other database systems
Examples of multimedia database application areas: • Digital Libraries • News-on-Demand	examples of relational database system • process control • internet service management • spacecraft control system

• Video-on-Demand • Music database • Geographic Information Systems (GIS) • Telemedicine	• network management system

useful only for video captured using very high resolution cameras.

Zooming:

Zooming implies that the stored number of pixels is greater than the number that can be displayed in the video window . In that case, a video scaled to show the complete image in the video window can be paused and an area selected to be shown in a higher resolution within the same video window. The video can be played again from that point either in the zoomed mode or in scaled to fit window mode.

Three Dimensional Object Display and VR(Virtual Reality)

Number of 3D effects are used in home entertainment a advanced systems used for specialized applications to achieve find Ine results.

Let us review the approaches in use to determine the impact 0 multimedia display system design due to these advanced systems.

Planar Imaging Technique: The planar imaging technique, used in computer-aided tomography (CAT Scan) systems, displays a twodimensional [2D] cut of X-ray images through multidimensional data specialized display techniques try to project a 3D image constructed from the 2D data. An important design issue is the volume of data being displayed (based on the image resolution and sampling rate) and the rate at which 3D renderings need to be constructed to ensure a proper time sequence for the changes in the data.

Computed tomography has a high range of pixel density and can be used for a variety of applications. Magnetic resonance imaging, on the other hand, is not as fast, nor does it provide as high a pixel density as CT. Ultrasound is the third technique used for 3D imaging in the medical and other fields. .

5.2 HYPER MEDIA MESSAGING

Messaging is one of the major multimedia applications. Messaging started out as a simple text-based electronic mail application. Multimedia components have made messaging nuch more complex.

We see how these components are added to messages.

5.2.1 Mobile Messaging

Mobile messaging represents a major new dimension in the users interaction with the messaging system. With the emergence of remote access from users using personal digital assistants and notebook computers, made possible by wireless communications developments supporting wide ranging access using wireless modems and cellular telephone links, mobile messaging has significantly influence messaging paradigms.

Handheld and desktop devices play an important growth area for messaging, require complementary back-end services to effectively manage communications for large organizations.

Hypermedia messaging is not restricted to the desktops; it is increasingly being used on the road through mobile communications in metaphors very different from the traditional desktop metaphors.

5.2.2 Hypermedia Message Components

A hypermedia message may be a simple message in the form of text with an embedded graphics, sound track, or video clip, or it may be the result of analysis of material based books, CD ROMs, and other on-line applications. An authoring sequence for a message based on such analysis may consist of the following components.

1. The user may have watched some video presentation on the material and may want to attach a part of that clip in the message. While watching it, the user marks possible quotes and saves an annotated copy.
2. Some pages of the book are scanned as images. The images provide an illustration or a clearer analysis of the topic
3. The user writes the text of the message using a word processor. The text summarizes the highlights of the analysis and presents conclusions.

These three components must be combined in a message using an authoring tool provided by the

messaging system. The messaging system must prompt the user to enter the name of the addressee forthe message.

The message system looks up the name in an online directory and convert it to an electronic addresses well as routing information before sending the message. The user is now ready to compose the message. The first step is to copy the word processed text report prepared in step 3 above in the body area of the message or use the text editor provided by the messaging system. The user then marks the spots where the images are referenced and uses the link and embed facilitites of the authoring tool to link in references to the images. The user also marks one or more spots for video clips and again uses the link and embed facilities to add the video clips to the message.When the message is fully composed, the user signs it (electronic signature) and mails to the message to the addressee (recipient). The addressing system must ensure that the images and video clips referenced in the message are also transferred to a server "local' to the recipient.

Text Messages

In earlier days, messaging systems used a limited subset of plain ASCII text. Later, messaging systems were designed to allow users to communicate using short messages. Then, new messaging standards have added on new capabilities to simple messages. They provide various classes of service and delivery reports.

Typical Electronic mail message

Other capabilities of messaging systems includ~ a name and address directory of all users accessible to the messaging system.

Rich-Text Messages

Microsoft defined a standard for exporting and importing text data that included character set, font table, section and paragraph formatting, document formatting, and color information-called Rich Text Format (RTF), this standard is used for storage as well as Import and export of text files across a variety of word-processing and messaging systems.

When sections of this document are cut and pasted into another application, the font and formatting information is .retained. This allows the target application to display the text m the nearest equivalent fonts and formats.

Rich-text messages based on the RTF formats provide the capability to create messages in one word processor and edit in another at the recipient end. Most messaging systems provIde richtext capability for the field of a message.

Voice Messages

Voice mail systems answer telephones using recorded messages and direct the caller through a sequence of touch tone key operations until the caller is connected to the desired party or is able to leave a recorded message.

Audio' (Music)

The Musical Instrument Digital interface (MIDI) was developed initially by the music industry to allow computer control of and music recordings from musical instruments such as digital pianos and electric keyboards. MIDI interfaces are now being used for a variety of peripherals, including digital pianos, digital organs, video games with high-fidelity sound output, and business presentations.

Full-Motion Video Management

Use of full-motion video for information repositories and memos are more informative. More information can be 'conveyed and explained in a short full-motion video clip than can be conveyed In a long text document. Because a picture is equivalent to thousand words.

Full Motion video Authoring System

An authoring system is an important component of a multimedia messaging system. A good authoring system must provide a number of tools for the creation and editing of multimedia objects. The subset of tools that are necessary are listed below:

1. A video capture program - to allow fast and simple capture of digital video from analog sources such as a video camera or a video tape. .

2. Compression and decompression Interfaces for compressing the captured video as it is being captured.
3. A video editor with the ability to decompress, combine, edit, and compress digital video clips.
4. Video indexing and annotating software for marking sections of a videoclip and recording annotations.

Identifying and indexing video clips for storage.

Full-Motion Video Playback Systems

The playback system allows the recipient to detach the embedded vIdeo reference object, Interpret its contents and retrieve the actual video clip from a specialized video server and launch the Playback application. A number of factors are involved in playing back the video correctly.

They are:

1.How the compression format used for the storage of the video clip relates to the available hardware and software facilities for decompression.

2.Resolution of the screen and the system facilites available for managing display windows. The display resolution may be higher or lower than the resolution of the source of the video clip. 3.The CPU processing power and the expected level of degradation as well as managing the degraded output on the fly.

4.Ability to determine hardware and software facilities of the recipient's system, and adjusting playback, parameters to provide the best resolution and perfonnance on playback.

The three main technologies for playing full motion video are microsoft's video for windows: Apple's Quicktime, and Intel's Indeo.

Video for Windows (VFW): It is the most common environment for multimedia messaging.

VFW provides capture, edit, and playback tools for full-motion video. The tools provided by VFW are: The VidCap tool, designed for fast digital video capture.

The VidEdit tool designed for decompression, edition, and compressing full-motion digital video. The VFW playback tool.

The VFW architecture uses OLE. With the development of DDE and OLE, Microsoft introduced in windows the capability to link or multimedia objects in a standardized manner. Hence variety :;windows based applications can interact with them. We can add full-motion video to any windows-based application with the help of VFW. The VFW playback tool is designed to use a number of codecs (software encoder/decoders) for decompressing and playing video files. The default is for A VI files.

Apple's QuickTime

An Apple QuickTime product is also an integrated system for playing back video files. The QuickTime product supports four compression methodologies.

Intel's Indeo

Indeo is a digital video recording format. It is a software technology that reduces the size of un compressed video files through successive compression methodologies, including YUV sub sampling, vector quantization, Huffman's run-length encoding, and variable content encoding. Indeo technology is designed to be scalable for playing back video; It determines the hardware available and optimizes playback for the hardware by controlling the frame rate. The compressed file must be decompressed for playback. The Indeo technology decompresses the video file dynamically in real time for playback. Number of operating systems provide Indeo technology as standard feature and with other software products (eg. VFW).

5.2.3Hypermedia Linking and Embedding

Linking and embedding are two methods for associating multimedia objects with documents.

This topic deals with

- Linking as in hypertext applications. Hypertext system associate keywordsin a document with other document.
- Linking multimedia objects stored separately from the document and the link provides a pointer to its storage.

and databases on a local server and easily query, exchange, and update that information in an interoperable networked environment.

The X 500 directory structure is described in the CCITT standard known as Data Communications Network Directory, Recommendations X·500-X·521, 1988.

5 X·500 Directory System Architecture

Directory System Agents carryout updates and management operations. X ·500 defines a structured information model, an objectoriented model and database schema.

The X ·500 architecture is based on a number of models, as follow'>:

The information model: It specifies the contents of directory entries, how they are identified, and the way in which they are organized to form the directory information base.

The Directory model: It describes the directory and its users, the functional model for directory operation, and the organization of the directory. .

The security model: It specifies the way in which the contents of the directory are protected from unauthorised access and authentication methods for updates.

The X 500 directory system is designed to be capable of spanning national and corporate boundaries.

X 500 Directory System Components: All information in an X 500 database is organized as entries in the Directory-Information Base(DlB). The directory system provides agents to manipulate entries in the DIB.

X 500 directories consist of the following basic components:

1. **Diretory Information Base (DIB)**; The DIB contains information about users, applications, resources and the configuration of the directory that enables servers to locate one another.

2. **Directory User Agents (DUA)**: A DUA issues inquiry and update requests, and accesses directory information through the directory access protocol.

3.**Directory Service Agents (DSAs)**: DSAs cooperate with one another to resolve user requests over a distributed network. They interact through a specialized protocol called a directory system protocol.

5.6 Integrated Document Management

It is for managing integrated documents.

Integrated document Management for Messaging Specialized messaging system such as Lotus Notes provide Integrated document management for messaging. The user can attach embed or link a variety of multimedia objects.

When document is forwarded to other users, all associated multimedia objects are also forwarded and avaiiable to the new receivers of the forward message.

Integrated Document management for Messaging:

Specialized messaging systems such as Lotus Notes provide integrated document management for messaging. This means the user can attach , embed, or link a variety of multimedia objects such as graphics, images, audio and video.This also implies that when the document is forwarded to other users all associated multimedia objects are also forwarded and available to the new recipients.

Multimedia Object Server and Mail Server Interactions:

The mail server is used to store i'lll e-mail messages. It consists of a file server with mail files for each user recipient. This file server act as a mail box.

All received mail is dropped in the user's mail file. The user can review or delete these mails. When mail messages include references to multimedia objects, mail file contains only link information.

5.7 DISTRIBUTED MULTIMEDIA SYSTEMS

5.7.1.Components of a Distributed multimedia systems:

If the multimedia systems are supported by multiuser system, then we call those multimedia systems as distributed multimedia systems.

A multi user system designed to support multimedia applications for a large number of users consists of a number of system components. A typical multimedia application environment consists of the following components:

1. Application software.
2. Container object store.
3. Image and still video store.
4. Audio and video component store.
5. Object directory service agent.
6. component service agent.
7. User interface and service agent.
8. Networks (LAN and WAN).

Application Software

The application software perfom1s a number of tasks related to a specific business process. A business process consists ofa series of actions that may be performed by one or more users.

The basic tasks combined to form an application include the following:

(1) Object Selection - The user selects a database record or a hypermedia document from a file system, database management system, or document server.

(**2) Object Retrieval-** The application ret:ieves the base object.

(**3) Object Component Display -** Some document components are displayed automatically when the user moves the pointer to the field or button associated with the multimedia object.

(4) User Initiated Display - Some document components require user action before playback/display.

(5) Object Display Management and Editing: Component selection may invoke a component control subapplication which allows a user to control playback or edit the component object.

Document store

A document store is necessary for application that requires storage oflarge volume of documents. The following describes some characteristics of document stores.

1. Primary Document Storage: A file systems or database that contains primary document objects (container objects). Other attached or embedded documents and multimedia objects may be stored in the document server along with the container object.

2. Linked Object Storage: Embedded components, such as text and formatting information, and linked information, and linked components, such as pointers to image, audio, and video. Components contained in a document, may be stored on separate servers.

3. Linked Object Management: Link information contains the name of the component, service class or type, general attributes such as size, duration of play for isochronous objects and hardware, and software requirements for rendering.

Image and still video store

An image and still video is a database system optimized for storage of images. Most systems employ optical disk libraries. Optical disk libraries consist of multiple optical disk platters that are played back by automatically loading the appropriate platter in the drive under device driver control.

The characteristics of image and still video stores are as follows:

(i) Compressed information (ii) Multi-image documents

(iii) Related annotations (iv) Large volumes

(v) Migration between high-volume such as an optical disk library and high-speed media such as magnetic cache storages(vi) Shared access: The server software managing the server has to be able to manage the different requirements.

Audio and video Full motion video store

Audio and Video objects are isochronous. The following lists some characteristIcs of audio and full-motion video object stores:

(i) Large-capacity file system: A compressed video object can be as large as six to ten M bytes for one minute of video playback.

(ii) Temporary or permanent Storage: Video objects may be stored temporarily on client workstations, servers Providing disk caches, and multiple audio or video object servers.

(iii) Migration to high volume/lower-cost media: migration and management of online storage are much of greater importance and more complex than of images.

(iv) Playback isochronocity: Playing back a video object requires consistent speed without breaks. Multiple shared access objects being played back in a stream mode must be accessible by other users.

Object Directory Service Agent

The directory service agent is a distributed service that providea directory of all multimedia objects on the server tracked by that element of the directoryy service agent.

The following describes various services provided by a directory service Agent.

(1) Directory Service: It lists all multimedia objects by class and server location.

(2) Object Assignment: The directory service agent assigns unique identification to each multimedia object.

(3) Object Status Management: The directory service must track the current usage status of each object.

(5) Directory Service Domains: The directory service should be modular to allow setting up Directory Service Server Elements: Each multimedia object server must have directory service element that reside on either server or some other resources.

(6) Network Access: The directory service agent must be accessible from any workstation on the network.

- **Component Service Agent**
- **A service is provided to the multimedia used workstation by each multimedia component.**
- **This service consists of retrieving objects, managing playback of objects, storing objects, and so on.**
- **The characteristics of services provided by each multimedia component are**

1. **object creating service: It obtains a identification for creating a new object from the directory service agents and provides user interfaceservice agent access for storing the new object.**
2. **playback service : It provides services like play, seek,search ,copy, delete and so on.**
3. **component object service agent :This is the code that provides these services for specific object type such as vide component.**
4. **service agents on servers : multiple component agents may co resident on a server if the server stores multiple component object.**

   and
5. **multifaceted services – (multifaceted services component objects may exist in several forms, such as compressed Or uncompressed).**

- **User Interface Service Agent**
- It resides on each user workstation.
- It provides direct services to the application software for the management of the multimedia object display windows, creation and storage of multimedia objects, and scaling and frame shedding for rendering of multimedia objects.
- The services provided by user interface service agents are
- windows management: creates a new window for multimedia object when invoked and registers it. handles messaes for that window.
- object creation and capture: requests component service agent to set up a new object and captures and stores new object.
- object display and playback: sets up object for decompression, scales and adjusts frame speed for display or playback of object.

5.7.2 Distributed client server operation

The agents so far we have discussed combine to form a distributed client-server system for multimedia applications. Multimedia applications require functionality beyond the traditional client server architecture.

Most client-server systems were designed to connect a client across a network to a server that provided database functions. In this case, the client-server link was firmly established over the network. There was only one copy of the object on the specified server. With the development of distributed work group computing, the picture has changed for the clients and servers. Actually in this case, there is a provision of custom views in large databases. The advantage of several custom views is the decoupling between the physical data and user.

The physical organization of the data can be changed without affecting the conceptual schema by changing the distributed data dictionary and the distributed data repository.

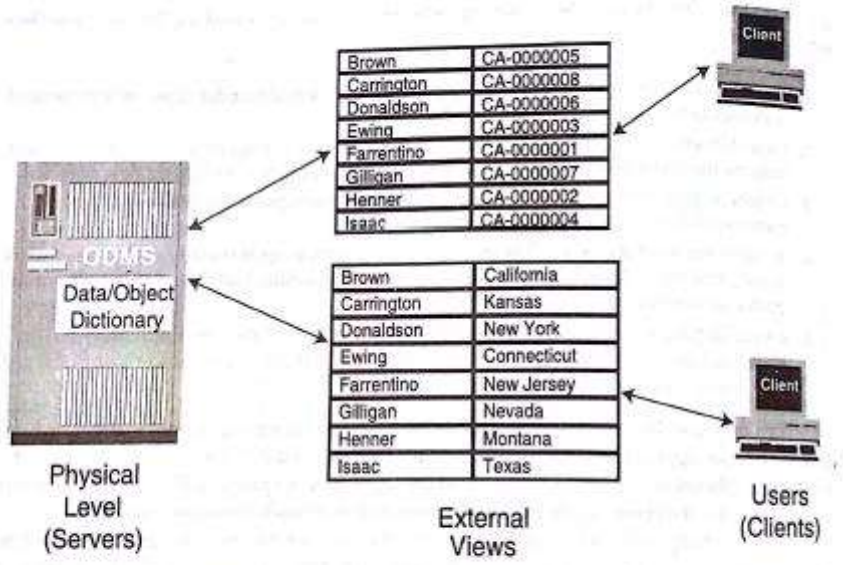


Fig. 10–1 Client-Server Custom Views in Large Databases

Clients in Distributed Work Group Computing

Clients in distributed workgroup computing are the end users with workstations running multimedia applications. The client systems interact with the data servers in any of the following *ways*

1. Request specific textual data.

Blender is a powerful, open-source 3D computer graphics software suite that is used for a wide range of creative tasks, including 3D modeling, animation, rendering, video editing, and more. Below is a detailed overview of Blender:

1. History and Background:

- Blender was created by Ton Roosendaal in 1995 and has since evolved into a robust and versatile 3D content creation tool.

- It was initially developed as an in-house application by the Dutch animation studio NeoGeo and later released to the public as open-source software under the GNU General Public License (GPL).

2. Key Features:

- 3D Modeling: Blender offers a comprehensive suite of modeling tools for creating 3D objects, characters, and environments. It supports various modeling techniques, including mesh modeling, subdivision surfaces, and sculpting.

- Animation: Blender provides a powerful animation system that includes keyframe animation, rigging, character animation, and physics simulations. It is widely used in the animation industry for both 2D and 3D animations.

- Rendering: Blender includes an advanced rendering engine called Cycles, which allows for high-quality, physically-based rendering. It also features Eevee, a real-time rendering engine, for interactive viewport rendering.

- Texturing and Materials : Users can create realistic materials and apply textures to 3D objects. Blender supports PBR (Physically-Based Rendering) workflows and has a node-based shader editor.

- Sculpting : Blender's sculpting tools enable artists to create highly detailed models and characters with dynamic topology and multi-resolution sculpting.

- Simulation : It offers robust simulation capabilities, including fluid, smoke, cloth, and particle simulations. These are essential for creating realistic effects in animations.

- Video Editing : Blender has a full-fledged video editor with features like cutting, splicing, transitions, and even compositing. This makes it a complete solution for video post-production.

- Python Scripting : Blender is highly extensible, and many of its features can be controlled and extended using Python scripting. This allows for custom tools, automation, and integration with other software.

- Game Engine (Blender Game): While Blender's internal game engine was discontinued, Blender has integration with external game engines like Unity and Unreal Engine.

- Add-ons and Customization : Blender's functionality can be extended through add-ons created by the community. Users can tailor their Blender experience to fit their specific needs.

- Community and Support : Blender boasts a vibrant and active user community that provides tutorials, documentation, and support through forums and social media. It is known for its passionate and dedicated user base.

- Blender is widely used in various industries, including animation, film production, video game development

3. Industries and Use Cases:

architecture, product design, and scientific visualization.

- It is used to create 3D models, visual effects, architectural renderings, character animations, and more.

4. Licensing:

- Blender is released under the GNU General Public License (GPL). This means it is free to use, modify, and distribute. It is a genuinely open-source software.

5. Compatibility:

- Blender runs on multiple operating systems, including Windows, macOS, and Linux. It also supports a wide range of 3D file formats, making it compatible with other 3D software.

6. Updates and Development:

- Blender receives regular updates and improvements. The Blender Foundation, a non-profit organization, manages the software's development and oversees the community of developers and users.

Blender's combination of a rich feature set, open-source nature, and an active community has made it a popular choice for artists, animators, and designers looking for a versatile and cost-effective 3D content creation tool. It is known for its flexibility, versatility, and the wide range of creative possibilities it offers to its users.