NIT V HYPERMEDIA 9

Multimedia authoring and user interface − Hypermedia messaging − Mobilemessaging − Hypermedia message component − Creating hypermedia message −Integrated multimedia message standards − Integrated document management −Distributed multimedia systems.

5.1 Multimedia authoring and User Interface

Multimedia Authoring Systems

Multimedia authoring systems are designed with two primary target users:
They are

(i) Professionals who prepare documents, audio or sound tracks, and full motion video clips for wide distribution.

(il) Average business users preparing documents, audio recordings, or full motion video clips for stored messages' or presentations.

The authoring system covers user interface. The authoring system spans issues such as data access, storage structures for individual components embedded in a document, the user's ability to browse through stored objects, and so on.

Most authoring systems are managed by a control application.

Design Issues for Multimedia Authoring

Enterprise wide standards should be set up to ensure that the user requirements are fulfilled with good quality and made the objects transferable from one system to another.

So standards must be set for a number of design issues

1. Display resolution
2. Data formula for capturing data
3. Compression algorithms
4. Network interfaces
5. Storage formats.

Display resolution

A number of design issues must be considered for handling different display outputs. They are:

(a) Level of standardization on display resolutions.

(b) Display protocol standardization.

(c) Corporate norms for service degradations

(d) Corporate norms for network traffic degradations as they relate to resolution issuesSetting norms will be easy if the number of different work station types, window managers, and monitor resolutions are limited in number.But if they are more in number, setting norms will be difficult.Another consideration is selecting protocols to use. Because a number of protocols have emerged, including AVI, Indeo, Quick Time and so on.So, there should be some level of convergence that allows these three display protocols to exchange data and allow viewing files in other formats.

File Format and Data Compression Issues

There are variety of data formats available for image, audio, and full motion video objects.

Since the varieties are so large, controlling them becomes difficult. So we should not standardize on a single format. Instead, we should select a set for which reliable conversion application tools are available.

Another key design Issue is to standardize on one or two compression formula for each type of data object. For example for facsimile machines, CCITT Group 3 and 4 should be included in the selected standard. Similarly, for full motion video, the selected standard should include MPEG and its derivatives such as MPEG 2.

While doing storage, it is useful to have some information (attribute information) about the object itself available outside the object to allow a user to decide if they need to access the object data. one of such attribute information are:

(i) Compression type (ii) Size of the object

(iii) Object orientation (iv)Data and time of creation

(v) Source file name (vi)Version number (if any)

(vii) Required software application to display or playback the object

Service degradation policies: Setting up Corporate norms for network traffic degradation is difficult as they relate to resolution Issues:

To address these design issues, several policies are possible. They are:

1. Decline further requests with a message to try later.
2. Provide the playback server but at a lower resolution.
3. Provide the playback service at full resolution but, in the case of sound and full motion video, drop intermediate frames.

Design Approach to Authoring

Designing an authoring system spans a number of design issues. They include:

Hypermedia application design specifics, User Interface aspects, Embedding/Linking streams of objects to a main document or presentation, Storage of and access to multimedia objects. Playing back combined streams in a synchronized manner.

A good user interface design is more important to the success of hypermedia applications.

Types of Multimedia Authoring Systems

There are varying degrees of complexity among the authoring systems. For example, dedicated authoring systems that handle only one kind of an object for a single user is simple, where as programmable systems are most complex.

Dedicated Authority Systems

Dedicated authoring systems are designed for a single user and generally for single streams.

Designing this type of authoring system is simple, but if it should be capable of combining even two object streams, it becomes complex. The authoring is performed on objects captured by the local video camera and image scanner or an objects stored in some form of multimedia object library. In the case of dedicated authoring system, users need not to be experts in multimedia or a professional artist. But the dedicated systems should be designed in such a way that. It has to provide user interfaces that are extremely intuitive and follow real-world metaphors.

A structured design approach will be useful in isolating the visual and procedural design components.

TimeLine –based authoring

In a timeline based authoring system, objects are placed along a timeline. The timeline can be drawn on the screen in a window in a graphic manner, or it created using a script in a mann.er similar to a project plan. But, the user must specify a resource object and position it in the timeline.

On playback, the object starts playing at that point in the time Scale.

Fig:TimeLinebased authoring

In most timeline based approaches, once the multimedia object has been captured in a timeline,.it is fixed in location and cannot be manipulated easily, So, a single timeline causes loss of information about the relative time lines for each individual object.

Structured Multimedia Authoring

A structured multimedia authoring approach was presented by Hardman. It is an evolutionary approach based on structured object-level construction of complex presentations. This approach consists of two stages:

(i) The construction of the structure of a presentation.

(ii) Assignment of detailed timing constraints.

A successful structured authoring system must provide the following capabilities for navigating through the structure of presentation.

1.Ability to view the complete structure.

2.Maintain a hierarchy of objects.

3.Capability to zoom down to any specific component.

4.View specific components in part or from start to finish.

5.Provide a running status of percentage full of the designated length of the presentation. 6.Clearly show the timing relations between the various components.

7.Ability to address all multimedia types including text, image, audio, video and frame based digital images.

The author must ensure that there is a good fit within each object hierarchy level. The navigation design of authoring system should allow the author to view the overall structure while examining a specific object segment more closely.

Programmable Authoring Systems

Early structured authoring tools were not able to allow the authors to express automatic function for handling certain routine tasks. But, programmable authoring system bas improved in providing powerful functions based on image processing and analysis and embedding program interpreters to use image-processing functious.

The capability of this authoring system is enhanced by Building user programmability in the authoring tool to perform the analysis and to manipulate the stream based on the analysis results and also manipulate the stream based on the analysis results. The programmability allows the following tasks through the program interpreter rather than manually. Return the time stamp of the next frame. Delete a specified movie segment. Copy or cut a specified movie segment to the clip board . Replace the current segment with clip board contents.

Multisource Multi-user Authoring Systems

We can have an object hierarchy in a geographic plane; that is, some objects may be linked to other objects by position, while others may be independent and fixed in position".

We need object data, and information on composing it. Composing means locating it in reference to other objects in time as Well as space.

Once the object is rendered (display of multimedia object on the screen) the author can manipulate it and change its rendering information must be available at the same time for display.If there are no limits on network bandwidth and server performance, it would be possible to assemble required components on cue at the right time to be rendered.

In addition to the multi-user compositing function A multi user authoring system must provide resource allocation and scheduling of multimedia objects.

Telephone Authoring systems

There is an application where the phone is linking into multimedia electronic mail application

1.Tele phone can be used as a reading device by providing fill text to-speech synthesis capability so that a user on the road can have electronic mail messages read out on the telephone.

2. The phone can be used for voice command input for setting up and managing voice mail messages. Digitized voice clips are captured via the phone and embedded in electronic mail messages.

3. As the capability to recognize continuous speech is deploy phones can be used to create electronic mail messages where the voice is converted to ASCII text on the fly by high-performance voice recognition engines.

Phones provide a means of using voice where the alternative of text on a screen is not available. A phone can be used to provide interactive access to electronic mail, calendar information databases, public information databass and news reports, electronic news papers and a variety of other applications. !ntegrating of all these applications in a common authoring tool requires great skill in planning.

The telephone authoring systems support different kinds of applications. Some of them are:

1.Workstation controls for phone mail.

2.Voice command controls for phone mail.

3.Embedding of phone mail in electric mail.

Hypermedia Application Design Consideration

The user interface must be highly intuitive to allow the user to learn the tools quickly and be able to use them effectively. In addition, the user interface should be designed to cater to the needs of both experienced and inexperienced user.

In addition to control of their desktop environments, user also need control of their system environment. This control should include some of the following:

- The ability to specify a primary server for each object class within a domain specified by the system administrative. A domain can be viewed as a list of servers to which they have unrestricted access.
- The ability to specify whether all multimedia -objects or only references should be replicated.
  The ability to specify that the multimedia object should be retrieved immediately for display versus waiting for a signal to "play" the object. This is more significant if the object must be retrieved from a remote server.
- Display resolution defaults for each type of graphics or video object.

Essential for good hypermedia design:

1.Determining the type of hypermedia application.

2.Structuring the information.
3.Determining the navigation throughout the application.
4.Methodologies for accessing the information.
5.Designing the user interface.

Integration of Applications

The computer may be called upon to run a diverse set of applications, including some combination of the following:

1.Electronic mail.
2.Word processing or technical publishing.
3.Graphics and formal presentation preparation software. .
4.. Spreadsheet or some other decision support software.
5.Access to a relational on object-oriented database.
6.Customized applications directly related to job function:

* Billing * Portfolio management * Others.

Integration of these applications consists of two major themes: the appearance of the applications and the ability of the applications to exchange of data.

Common UI and Application Integration

Microsoft Windows has standardized the user interface for a large number of applications by providing standardization at the following levels: Overall visual look and feel of the application windows

This standardization level makes it easier for the user to interact with applications designed for the Microsoft Windows operational environment. Standardization is being provided for Object Linking and Embedding (OLE), Dynamic Data Exchange (DOE), and the Remote Procedure Call (RPC).

Data Exchange

The Microsoft Windows Clipboard allows exchanging data in any format. It can be used to exchange multimedia objects also. We can cut and copy a multimedia objects in one document and pasting in another. These documents can be opened under different applications.The windows clipboard allows the following formats to be stored:

.:. Text Bitrnap
.:. Image Sound
.:. Video (AVI format).

Distributed Data Access

If all applications required for a compound object can access the subobjects that they manipulate, then only application integration succeeds.

Fully distributed data access implies that any application at any client workstation in the enterprise-wide WAN must be able to access any data object as if it were local. The underlying data management software should provide transport mechanisms to achieve transparence for the application.

Hypermedia Application Design

Hypermedia applicati'ons are applications consisting of compound objects that include the multimedia objects. An authoring applicationn may use existing multimedIa objects or call upon a media editor to CD create new object.

Structuring the Information

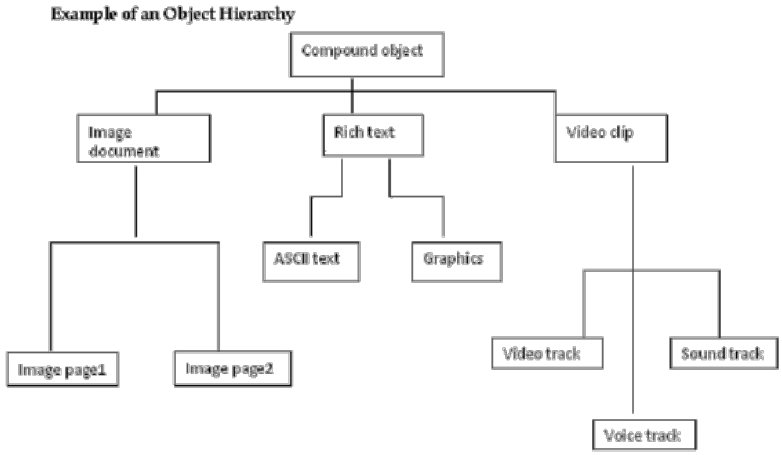
A good information structure should consist the following modeling primitives:

.:. Object types and object hierarchies.
.:. Object representations.
.:. Object connections.
.:. Derived connections and representations.

The goal of information Structuring is to identify the information objects and to develop an information model to define the relationships among these objects.

Types and Object Hierarchies

Object types are related with various attributes and representations of the objects. The nature of the information structure determines the functions that can be performed on that information set. The object hierarchy defines a contained-in relationship between objects. The manner in which this hierarchy is approached depends on whether the document is being created or played back.



Users need the ability to search for an object knowing very little about the object. Hypermedia application design should allow for such searches.

The user interface with the application depends on the design of the application, particularly the navigation options provided for the user.

Object representations

Multimedia objects have a variety of different object representations. A hypermedia object is a compound object, consists of s~ information elements, including data, text, image, and video

Since each of these multimedia objects may have its own sub objects, the design must consider the representation of objects.

An object representation may require controls that allow the user to alter the rendering of the object dynamically. The controls required for each object representation must be specified with the object.

Object connection

In the relational model, the connections are achieved through joins, and in the object oriented models, through pointers hidden inside objects. Some means of describing explicit connections is required for hypermedia design to define the relationships among objects more clearly and to help in establishing the navigation.

Derived Connections and Representations

Modeling of a hypermedia system should attempt to take derived objects into consideration for establishing connection guidelines.

User Interface Design Multi media applications contain user interface design. There are four kinds of user interface development tools. They are

1. Media editors
2. An authoring application
3. Hypermedia object creation
4. Multimedia object locator and browser

A media editor is an application responsible of the creation and editing of a specific multimedia object such as an image, voice, or Video object. Any application that allows the user to edit a multimedia object contains a media editor. Whether the object is text, ~voice, or full-motion video, the basic functions provided by the editor are the same: create, delete, cut, copy, paste, move, and merge.

Navigation through the application

Navigation refers to the sequence in which the application progresses and objects are created, searched and used.

Naviation can be of three modes:

(i) Direct: It is completely predefined. In this case, the user needs to know what to expect with successive navigation actions.

Free-form mode: In this mode~ the user determines the next sequence of actions.

Browse mode: In this mode, the user does not know the precise question and wnats to get general information about a particular topic. It is a very common mode in application based on large volumes of non-symbolic data. This mode allows a user to explore the databases to support the hypothesis.

Designing user Interfaces

User Interface should be designed by structured following design guidelines as follows:

1.Planning the overall structure of the application

2.Planning the content of the application

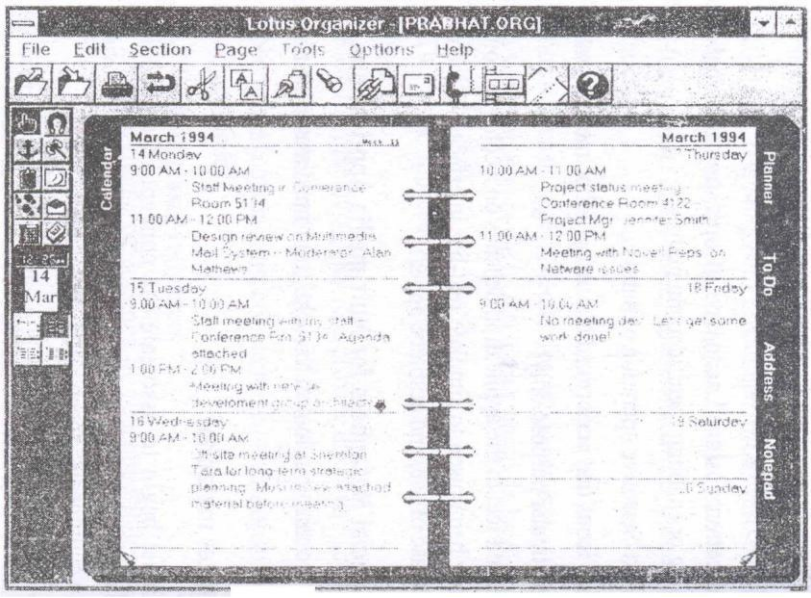
3.Planning the interactive behavior
4.Planning the look and feel of the application

A good user interface must be efficient and intuitive by most users.

The interactive behaviour of the application determines how the User interacts with the application. A number of issues are determined at this level.

They are Data entry dialog boxes

Application designed sequence of operation depicted by graying or enabling specific menu items Context-Sensitive operation of buttons. Active icons that perform ad hoc tasks (adhoc means created for particular purpose only)



A look and feel of the application depends on a combination of the metaphor being used to simulate real-life interfaces, Windows guidelines, ease of use, and aesthetic appeal.

Special Metaphors for Multimedia Applications

In this section let us look at a few key multimedia user interface metaphors.

The organizer metaphor

One must begin to associate the concept of embedding multimedia object in the appointment diary or notepad to get obvious view of the multimedia aspe.cts of the organizer.

Other use of multimedia object in an organizer is to associate maps or voice mail directions with addresses in address books.

The lotus organizer was the first to use a screen representation of the office diary type organizer

'Telephone Metaphor: The role of the telephone was changed b the advent of voice mail system. Voice mail servers convert the analog voice and store it in digital form. With the standards for voice ~ail file formats and digital storage of sound for computer. Now, computer system is used to manage the phone system. The two essential components of a phone system are speakers and microphones. They are included in most personal computers.

Figure 5.5 shows how a telephone can be created on a screen to make it a good user interface

The telephone keypad on the screen allows using the interface just as a telephone keypad is used. Push buttons in dialog boxes and function selections in memos duplicate the function provided by the keypad. Push buttons, radio buttons, list boxes, and data entry fields and menu selections allow a range of functionality than can be achieved by the telephone.

Aural User Interface: A Aural user interface allows computer systems to accept speech as direct input and provide an oral response to the user actions. Speech enabling is an important feature in this UI. To design AUI system first, we have to create an aural desk top which substitutes voice and ear for the keyboard and display and be able to mix and match them Aural cues should be able to represent icons, voice, menus and the windows of graphical user interface.

AUl design involves human perception, cagnitive science and psycho-acoutic theory. AUI systems learn systems to perform routine functions without user's feedback. An AUI must be temporal and use time based metaphors.

AUI has to address the following issues

1. Recent user memory
2. Attention span
3. Rhythms
4. Quick return to missed oral cues

The VCR metaphor: The User interface metaphor for VCR is to draw a TV on screen and provide live buttons on it for selecting channels, increasing sound volume and changing channel.

User interface for functions suchas video capture, channel play, and stored video playback is to emulate the camera, television and VCR on screen Fi5.6 shows all functions of typical video camera when it is in a video capture mode.

Audio/Video Indexing Functions

Index marking allowed users to mark the location on tape in the case of both audio and video to which they may wish to fast forward are rewind.

Other form of index marking is time based. In his form the tape counter shows playtime in hours, minutes, and secondsfrom the time the counter was reset.

Three paradigms for indexing audio and video tapes are

Counter identify tape locations, and the user maintains index listingSpecial events are used as index markersUsers can specify locations for index markings and the system maintains the index.Indexing is useful only if the video is stored. Unless live video is stored, indexing information is lost since the video cannot be repeated.In most systems where video is stored, the sound and video streams are decompressed and managed separately, so synchronization for playback is important. The indexing information n\must be stored on apermanent basis.

Information Access:

Access structure defines the way objects can be accessed and how navigation takes place through the information objects.

The common forms of navigations for information access are:

Direct: Direct information accessis completely predefined. User must have knowledge about the object that need to be accessed. That information includes object representations in a compound object.

Indexed: Index access abstracts the real object from the access to the object. If the object ID of the object is an index entry that resolves to a filename on a specific server and disk partition, then the information access mechanism is an indexed mechanism. \

Random Selection: In this fonn, the user can pick one of several possible items. The items need not arranged in any logical sequence; and they need not to be displayed sequentially. The user need not have much knowledge about the infonnation. They must browse through the infornlation.

Path selection or Guided tour: In guided tour, the application guides the user through a predefined path acrosS a number of objects and operations. The user may pause to examine the objects at any stage, but the overall access is controlled by the application. Guided tours can also be used for operations such as controlling the timing for discrete media, such as slide show. It can be used for control a sound track or a video clip.

Browsing: It is useful when the user does not have much knowledge about the object to access it directly.

Object Display Playback Issues: User expects some common features apart from basic functions for authoring systems. And to provide users with same special control on the display/ playback of these objects, designer have to address some of these issues for image, audio and video objects.

Image Display Issues Scaling: Image scaling is performed on the fly after decompressio The image is scaled to fit in an application defined window at t:' full pixel rate for the window.The image may be scaled by using factors. For eg: for the window 3600 x 4400 pixels can be scaled by a factor of 6 x 10 ie.60 x 440 (60 times).

Zooming: Zooming allows the user to see more detail for a specific area of the image. Users can zoom by defining a zoom factor (eg: 2: 1,5: 1 or 10: 1). These are setup as preselected zoom values.

Rubber banding: This is another form of zooming. In this case, the user uses a mouse to define two comers of the rectangle. The selected area can be copied to the clipboard, cut, moved or zoomed.

Panning: If the image window is unable to display the full image at the ·selected resolution for display. The image can be panned left to right or right to left as wellas top to bottom or bottom to top. Panning is useful for finding detail that is not visible in the full image.

Audio Quality: Audio files are stored in one of a number of formats, including WAVE and A VI. Playing back audio requires that the audio file server be capable of playing back data at the rate of 480 kbytes/min uncompressed or 48 kbytes/min for compressed 8 bit sound or 96 kbytes/min for 16 bit sound.

The calculation is based on an 8 MHz sampling rate and ADCPM compression with an estimated compression ratio. 32 bit audio will need to be supported to get concert hall quality in stored audio. Audio files can be very long. A 20 minute audio clip is over 1 MB long. When played back from the server, it must be transferred completely in one burst or in a controlled manner.

Special features for video playback: Before seeing the features of video playback let us learn what is isochronous playback. The playback at a constant rate to ensure proper cadence (the rise and fall in pitch of a person's voice) is known as isochronous playback. But isochronous playback is more complex With video than It is for sound. .

If video consists of multiple clips of video and multiple soundtracks being retrieved from different servers and combined for playback by accurately synchronizing them, the problem becomes more complex.To achieve isochronous playback, most video storage systems

use frame interleaving concepts. Video Frame Interleaving: Frame interleaving defines the structure o;the video file in terms of the layout of sound and video components.

Programmed Degradation: When the client workstation is unable to keep up with the incoming data, programmed degradation occurs. Most video servers are designed to transfer data from storage to the client at constant rates. The video server reads the file from storage, separate the sound and video components, and feeds them as a seperate streams over the network to the client workstations. Unless specified by the user, the video server defaults to favoring sound and degrades video playback by dropping frames. So, sound can be heard on a constant basis. But the video loses its smooth motion and starts looking shaky. Because intermediate frames are not seen.

The user can force the ratio of sound to video degradation by changing the interleaving factor for playback; ie the video server holds back sound until the required video frames are transferred. This problem becomes more complex when multiple streams of video and audio are being played back from multiple source servers. .

Scene change Frame Detection: The scene we see changes every few seconds or minutes and it replaced by a new image.Even within the same scene, there may be a constant motion of some objects in a scene.

Reason for scene change detection: Automating scence change detection is very useful for browsing through very large video clips to find the exact frame sequence of interest. Spontaneous scene change detection provides an automatic indexing mechanism that can be very useful in browsing. A user can scan a complete video clip very rapidly if the key frame for each new scene is displayed in an iconic (poster frame) form in a slide sorter type display. The user can then click on a specific icon to see a particular scene. This saves the user a significant amount of time and effort and reduces resource load by decompressing and displaying only the specific scene of interest rather than the entire video.

Scene change detection is of real advantage if it can be performed without decompressing the video object. Let us take a closer-look at potential techniques that can be employed for this purpose.
Techniques:

(i) Histogram Generation: Within a scene, the histogram changes as the subject of the scene mover. For example, if a person is running and the camera pans the scene, a large part of the scene is duplicated with a little shift. But if the scene changes from a field to a room, the histogram changes quite substantially. That is, when a scene cuts over to a new scene, the histogram changes rapidly. Normal histograms require decompressing the video for the successive scenes to allow the optical flow of pixels to be plotted on a histogram. The foot that the video has tobe decompressed does help in that the user can jump from one scene to the nect. However, to show a slide sorter view requires the entire video to be decompressed. So this solution does not really of the job.

Since MPEG and JPEG encoded video uses DCT coefficients, DCT quantization analysis on uncompressed video or Audio provides the best alternatives for scene change detection without decompressing video

The efficiency can be managed by determining the frame interval for checks and by deciding on the regions within the frame that are being checked. A new cut in a scene or a scene change can be detected by concentrating on a very small portion of the frame

The scene change detection technology as is the case with video compression devices as well as devices that can process compressed video, the implementations of scene change detection can be significantly enhanced.

Video scaling, Panning and Zooming:

Scaling:

Scaling is a feature since users are used in changing window sizes. When the size of the video window is changed, scaling take place.

Panning: Panning allows the user to move to other parts of the window. Panning is useful incombination with zooming. Only if the video is being displayed at full resolution and the video

window is not capable of displaying the entire window then panning is useful. Therfore panning is 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 [20] 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.

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.

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.

5.3 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.

Pratap

To : Karan

Copy to: Madhan Date : 01 Jan'07

subject: WISHING A HAPPY NEW YEAR

Hai Karan,

I wish you a very bright and prosperous new year. - Pratap Delivery notification: Normal Priority: High

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 ofVFW. 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).

Hypermedia Linking and Embedding

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

Linking Objects

When an object is linked, the source data object, called the link source, continues to stay whenever it was at the time the link was created. This may be at the object server where it was created, or where it has been copied.

Only reference is required in the hypermedia document. The' reference is also known as link. This link reference includes information about the multimedia object storage, its presentation parameters, and the server application that is needed to dIsplay/play or edit it. When this document is copied, the link reference is transferred. But the actual multimedia document remains in its original location. A linked object is not a part of the hypermedia document and it does not takeup storage space within the hypermedia document. If the creator, or authorised user edits the original stored multimedia object, subsequent calls to the linked object bring the copy.

Embedded Objects

If a copy of the object is physically stored in the hypermedia document, then'the multimedia object :3 said to be embedded. Any changes to the original copy of t4at object are not reflected in the embedded copy. When the hypermedia document is copied, the multimedia object is transferred with it to the new locations.

Graphics and images can be inserted in a rich-text document on embedded using such techniques as OLE Voice and audio components can be included in a text message; or they cim be part of a full voice-recorded message that has embedded text and other components.

5.4 Creating Hypermedia Messages

Hypermedia message is a complex collection of a variety of objects.

It is an integrated message consisting of text, rich text, binary files, images, bitmaps. voice and sound, and full motion video. Creating of a hypermedia message requires some preparation. A hypermedia report is more complex. It requires the following steps:

1. Planning
2. Creating each component
3. Integrating components

The planning phase for preparing the hypermedia message consists of determining the various sources of input. These can include any of the following:

1. A text report prepared in a word-processing system.
2. A spreadsheet in a spreadsheet program.
3. Some diagrams from a graphics program. 4 .. Images of documents.
4. Sound dips.
5. Video clips.

We should determine which components are required for the message, in what sequence should they be, and where in the text report they should be referenced. The length of each component should be determined. Careful planning is necessary to ensure that the capabilities of the messaging system are used appropriately.

Each component must be created using the authoring tool provided by the application used for creating it. All applications Involved in creating various components must have common formats to allow combining these various components. The various components must be authored, reviewed, and edited as needed, checked for smooth flow when the user launches an embedded object and stored in the final format in which it will become a part of the hyperrnedia message. The final step in this process is mailing the hypermedia message.

5.5 Integrated Multimedia Message Standards

Let us review some of the Integrated Multimedia MessageStandards in detail.

Vendor Independent Messaging (VIM)

VIM interface is designed to facilitate messaging between VIM. enabled electronic mail systems as well as other applications. The VIM interface makes mail and messages services available through a well defined interface.

A messaging service enables its clients to communicate with each other in a store-and-forward manner. VIM-aware applications may also use one-or-more address books.

Address books are used to store information about users, groups, applications, and so on. **VIM Messages:**

VIM defines messaging as a stored-and-forward method of application-to-application all program-to-program data exchange. The objects transported by a messaging system are caIled messages. The message, along with the address is sent to the messaging system. The messaging system providing VIM services accept the responsibility for routing and delivering the message to the message container of the recipient.

Message Definition:

Each message has a message type. The message type defines the syntax of the message and the type of information that can be contained in the message.

A VIM message consists of message header. It may contain one or more message items. The message header consists of header attributes: recipient address, originator address, time/date prior

A message item is a block of arbitrary-sized (means any size) data of a defined type. The contents of the data block are defined by the data-item type.

The actual items in a message and its syntax and semantics are defined by the message type. The message may also contain file attachments. VIM allows the nesting of messages; means one message may be enclosed in another message.

A VIM message can be digitally signed so that we can ensure that the message 'received is without any modification during the transit.

Mail Message: It is a message of a well-defmed type that must include a message header and may include note parts, attachments, and other application-defined components. End users can see their mail messages through their mail programs.

Message Delivery: If message is delivered successfully, a delivery report is generated and send to the sender of the message if the sender requested the d~livei-y report. If a message is not delivered, a non-delivered report is sent to the sender.

A message that delivered will be in a message container will be marked as 'unread', until the recipient open and read it.

Message Container: Multiple users or applications can access one message container. Each message in a message container has a reference number associated with it for as long as the message remains stored in the message container.

VIM Services: The VIM interface provides a number of services for creating and mailing a message. Some of them are:

.:. Electronic message composition and submission.

.:. Electronic message sending and receiving.

.:. Message extraction from mail system.

.:. Address book services.

MAPI Support (Multimedia Application Programmable Interface)

MAPI provides a layer of functionality between applications and underlying messaging systems. The primary goals of MAPI are: Separate client applications from the underlying messaging services. Make basic mail enabling a standard feature for all applic·ations. Support message-reliant workgroup applications.

MAPI Architecture: MAPI Architecture provides two perspectives (i) A client API

(ii) A service provider interface. The Client API provides the link between the client applications andMAPI. The service provider interface links MAPI to the messaging system.

The two interfaces combine to provide an open architecture such that any messaging application can use any messaging service that has a MAPI driver. MAPI drivers are provided by microsoft or third party developers.

Telephony API (TAPI)

TAPI standard has been defined by Microsoft and Intel. The telephone can be used for reading e-mail as well as for entering e-mail messages remotely.

X 400 Message Handling Service

The CCITT X 400 series recommendations define the OSI message handling system, (MHS).

The MHS describes a functional model that provides end users the ability t6 send and receive electronic messages. In the as I, an end user is an originator. He composes and sends messages.

Receiver is the one who receives messages. A User Agent (UA) is an entity that provides the end user function for composing and sending messages and for delivering messages. Most user agent implementations provide storage of mail, sorting directories, and forwarding.

A Message Transfer Agent (MTA) forwards messages from the originator UA to another MT A. A number of MTAs are combine to form Message transfer System (MTS).

The MTAs in an MTS provide message routing services at intermediate nodes in a WAN.

Figure below shows the overall X 400 architecture and the relationships between the components.

X·500 Directory System Standards

The X·500 is the joint International Standard Organization

CCITT standard for a distributed directory system that lets users store information such as addresses 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.

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

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.

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.

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 *w3fs*.

1. Request specific textual data.
2. Request specific multimedia objects embedded or linked in retrieved container objects.
3. Require activation of a rendering server application to display/ playback multimedia objects.
4. Create and store multimedia-objects on servers.

Request directory information. on locations of objects on servers

Servers in Distributed Workgroup Computing

Servers are storing data objects. They provide storage for a variety f object classes, they transfer objects on demand on clients. They rovide hierarchical storage for moving unused objects to optical_ isk lirbaries or optical tape libraries. They provide system dministration functions for backing up stored data. They provide le function of direct high-speed LAN and WAN server-to-server ~ansport for copying multimedia objects.

Middleware in Distributed Workgroup Computing

The middleware is like interface between back-end database and font-end clients.The primary role of middleware is to link back end database to front end clients in a highly flexible and loosely connected network nodel. Middleware provides the glue for dynamically redirecting client requests to appropriate servers that are on-line.

Multimedia Object Servers The resources where information objects are storedareknown as servers. Other users (clients) can share the information stored in these resources through the network.

Types of Multimedia Servers Each object type of multimedia systems would have its own dedicated server optimized for the type of data maintained in the object. A network would consist of some combination of the following types of servers.

(1) Data-processing servers RDBMSs and ODBMSs. (2) Document database servers.

(3) Document imaging and still-video servers. (4) Audio and voice mail servers.

(5) Full motion video server.

Data base processing servers are traditional database servers that contain alphanumeric data. In a relational database, data fields are stored in columns in a table. In an object-oriented database these fields become attributes ofthe object. The database serves the purpose of organizing the data and providing rapid indexed access to it. The DBMS can interpret the contents of any column or attribute for performing a search.

Mass Storage for Multimedia Servers

RAID(Redundant Arrays of Inexpensive Disks)

In terms of redundancy,RAID provides a more cost effective solution than disk mirroring.

RAID is a means of increasing disk redundancy, RAID systems use multiple and potentially slower disks to achieve the same task as a single expensive large capacity and high transfer rate disk.

In RAID high transfer rates are achieved by performing operations in parallel on multiple disks. There are different levels of RAID available, namely disk striping(level 0), disk mirroring(level 1, Bit interleaving of date(level 2), Byte interleaving (level 3), sector interleaving(level 4), and block interleaving(level 5)RAID technology is faster than rewritable optical disk and high data volumes can be achieved with RAID. RAID technology provides high performance for disk reads for almost all types of applications.

Write Once Read Many Optical Drives: (WORM)

WORM Optical drives provide very high volumes of storage for very low cost. Some important characteristics of WORM optical disks are:

- Optical drives tend to be slower than magnetic drives by a factor of three to four. .
- WORM drives can write once only; typically 5-10% of disk capacity m left free to provide for changes to existing information.
- They are useful for recording informations that would not change very much. They are virtually indestructible in normal office use and have long shelf lives.
- They an be used in optical disk libraries (Juke boxes). A Juke box may provide anywhere from 50-100 disk platters with two or more drives.
- These characteristics make optical disks ideal candidates for on-line document

images (which change very little once scanned and do not have an isochronous requirement) and archived data.

Rewritable Optical Disks:

Rewritable optical drives are produced by using the technologies like magneto-optical. It has the advantage ofrewritability over the WORM where rewritable is not possible. It can be used as primary or secondary media for storage of large objects, which are then archieved. (Placed where documents are preserved) on WORM disks.

If it is used as primary media, it should be accompanied by highspeed magnetic disk cache. This is to achieve acceptable video performance.

Optical Disk Libraries:

Optical disk libraries are nothing but juke boxes. Work disks and rewritables can be used in optical disk libraries to achieve very high volumes of near-lines storage. Optical disk libraries range from desk top juke boxes with one 5' 1/4" drive and I O-slot optical disk stack for upto lOG Bytes of stroage of large libraries using as many as four 12" drives with an 80-s10t optical disk stack for upto terabytes of storage. The disadvantage of optical disk library is the time taken for a platter to be loaded into a drive and span to operating speed.

Network Topologies for Multimedia Object Servers

A number of network topologies are available Network topology is the geometric arrangement of nodes and cable links in a network. We still study three different approaches to setting up multimedia servers.

(i) **Centralized Multimedia Server**: A centralized multimedia object server performs as a central store for multimedia objects. All user requests for multimedia objects are forwarded by the applications to the centralized server and are played back from this server. The centralizedserver may serve a particular site of the corporation or the entire enterprise. Every multimedia object has a unique identity across the enterprise and can be accessed from any workstation. The multimedia object identifier is referenced in every data that embeds or links to it.

Dedicated Multimedia Servers: This is the approach where a video server is on a separatededicated segmentIn this approach, when a workstation dumps a large video, the other servers on the networks are not affected. Provides high performance for all local operations. The isochronocity of the objects is handled quite well in a dedicated mode.
Disadvantage of this approach is that the level of duplication of objects.

Distributed multimedia servers:

In this approach multimedia object servers are distributed in such a manner that they are placed in starategic locations on different LANs.They are replicated on a programmed basis to provide balanced serviceto all users.

Multiserver Network Topologies

To distribute the full functionality of multimedia network wide there are vareity of network topologies available. ' The primary topologies are Traditional LANs (Ethernet or Token Ring Extended LANs (Using network switching hubs bridges and routers). ' High speed LANs (ATM and FDDI II). WANs (Including LANs, dial-up links-including ISDN T1 and T_3 lines-etc.). ' I

Traditional LANS (Ethernet or Token Ring) Ethernet:

Ethernet: It is a Local Area Network hardware, communication, and cabling standard originally developed by Xerox corporation that link up to 1024 nodes in a bus network. It is ahigh speed standard using a baseband (single-channel) communication technique. It provides for a raw data transfer rate of 10 Mbps, with actual throughput in the range of 2-3 Mbps. It support a number of sessions ina mixof live video, audio electronic mail and so on.

Token Ring: It is a Local Area Network architecture that combines token passing with a

hybrid star/ring topology. It was developed by IBM. Token Ring Network uses a multistation Access unit at its hub ..

ATM (Asynchronous Transfer Mode)

It is a network architecture that divides messages into fixed size units (called cells) of small size and that establishes a switched connection between the originating and receiving stations.

A TM appears to be a potential technology for multimedia systems for connecting object servers and user workstations. ATM is actually a good candidate for two reasons: as a hub and spoke teclmology, it adapts very well to the wiring closest paradign; and it allows workstations to operate at speeds defined by the workstation. Figure 5.12 below illustrates LAN topology using an A TM Switching System.

FDDI II (Fiber Distributed Data Interface II)

It is a standard for creating highspeed computer networks that employ fiber-optic cable. FOOl II operates exactly like token ring, . with one difference: FOOl employs two wires through all the hosts in a network.

FOOl II is a single media LAN and its full bandwidth supports all users.

FOOl II appears to be a very useful high-speed technology for connecting servers on an additional separate network and providing the dedicated high bandwidth necessary for rapid transfer and replication of information objects. Figure 5.13 shows a multiievel network based

WANS (Wide Area Network)

This includes LANs, dial up ISDN, T1 (1.544 Mbits/sec) and T3 (45.3 Mbits/sec) lines and regular telephone dial-up lines. The two big issues here are:

- :. W ANs may have a mix of networking and communication protocols.
- :. WAN has a variety of speeds at which various parts of it where it communicates.

Protocol Layering: Layering helps to isolate the network from the . application. Layering of protocols started with the release ofthe ISO model.

Distributed Multimedia Databases:

A multimedia database consists of a member of different types of multimedia objects. These may include relational database records, object-oriented databases with objects for alphanumeric attributes, and s:orage servers for multimedia objects such &s images, still video, audio, and full-motion video. Itis feasible to include an image or a video object as a binary large object (BLOB) in a relational database. It is also feasible to include such an object as an attribute in an object.

Database Organization for Multimedia Applications

Optical disk storage technology has reduced the cost of multimedia document storage by a significant factor. Distributed architectures have opened the way for a variety of applications distributed around a network accessing the safe database in an independent manner. The following discussion addresses some key issues of the data organization for multimedia systems.

Data Independence: Flexible access to a variety of distributed databases for one or more applications requires that the data be independent from the application so that future applications can access the data without constraints related to a previous application. Important features of data independent design are:

1. Storage design is independent of specific applications.
2. Explicit data definitions are independent of application programs.
3. Users need not know data formats or physical storage structures .
4. Integrity assurance is independent of application programs.
5. Recovery is independent of application programs .

Common Distributed Database Architecture: Employment of Common Distributed database architectured is presented by the insulation of data from an application and distributed application access.

Key features of this architecture are:

1.The ability for multiple independent data structures to co-exist in the system (multiple server classes).

2.Uniform distributed access by clients.

3.Single point for recovery of each database server. 4.Convenient data re-organization to suit requirements. 5.Tunability and creation of object classes. 6.Expandibility.

Mnltiple Data Servers: A database server is a dedicated resource on a network accessible to a number of apphcations, When a large number of users need to access the same resources, problem arises

This problem is solved by setting up multiple data servers that have copies of the same resources,

Transaction management for Multimedia Systems

It is defined as the sequence of events that starts when a user makes a request to create, render, edit, or print a hypermedia document. The transaction is complete when the user releases the hypermedia document and stores back any edited versions or discards the copy in memory or local storage.

Use of object classes provides an excellent way for managing and tracking hypermedia documents, Given that all components of a hypermedia document can be referenced within an object as attributes, we can find a solution for the three-dimensional transaction management problem also in the concept of objects.

Andleigh and Gretzinger expand on the basic concepts developed for the object request broker (ORB) by the Object Management Group (OMG) and combine it with their transaction management approach.

Managing Hypermedia Records as Objects

Hypermedia records or documents are complex objects that contain multimedia information objects within them, A hypermedia document can be stored in a document data base, as a BLOB in a relational database, or in an object-oriented data base. A Hyper media document may contain multimedia objects embedded in it as special fields.

Object linking and embedding: OLE provides an object oriented framework for compound documents. When a user double cliks or click on an icon for an embedded object, the application that created the object starts, and allows the user to view andor the object .

Managing Distributed Objects: We see the nature of communication between servers and the managing of distributed objects.

Interserver communications: Object replication , object distribution, object recompilation and object management and network resources are some of the design requirements that play a role in defining interserver The following lists the types of communications that one server may make to another server:

1. Obtain a token from an object name server for creating a new multimedia object; the object is not accessible by others users until complete and released.
2. Search the object class directory for the current locations of that object and the least expensive route for accessing it.
3. Perform a shared read lock on the object to ensure that it is n archived or purged while it is being retrieved.
4. Replicate a copy of the object; update the object name server directory.
5. Copy an object for non-persistent use.
6. Test and set an exclusive lock on an object for editing purposes'
7. create new versions.
8. Pause the retrieval of an object to support a user action or to pace the retrieval to the speed supported by the network.
9. A Sound server architecture is necessary for providing these services in a fully

distributed environment.

Object Server Architecture

Figure describes an object server architecture that can support multimedia applications for a large

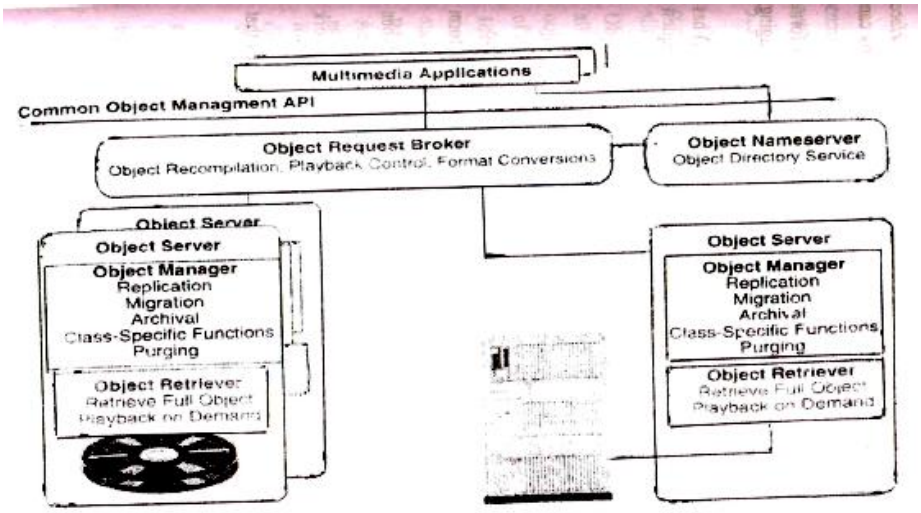


Fig. 5.14: Object Server Architecture

The architecture describes the logical distribution of functions. The following lists the key elements of this architecture:

Multimedia Applications -Common Object Management API.Object Request Broker. Object Name Server -Object Directory Manager -object Server -Object Manager.Network Manager . Object Data Store. Any multimedia application designed to operate on the common object management API can function in this architecture

The common object management API is a programming interface definition that provides a library of functions the applications can call.

The common Broker Architecture API provides a uniform interface to all applications and a standardized method for managing all information objects in a corporate network.

A common Object Request Broker Architecture (CORBA) h been defined by a Object Management Group. An object request broker performs the following functions:

(i) Object recompilation.

(ii) Playback control.

(iii) Format conversions.

The object name server provides an object directory service. The object directory manager may exist in a distributed form within an object server. The object directory manager updates the object directory when changes take place.The object server is a logical subsystem in the network responsIble for storing and retrieving objects on demand. The object manager consists of a number of object classes that performs a number of specialized services. They are: Object retrieval. (ii) Replication(Ui) Migration. (iv) Transaction and Lock Management. (v) User Preferen'ce. (vi) Versioning. (vii) System Administration. (ix) Archival. (x) Purging. (xi) Class-Specific functions.

Identification method: Objects can be distinguished from one another in many potential ways. Identification of objects in a persistent state is different from non-persistent objects. At the highest level, persistent objects are distinguished by the class of objects. Andleigh and Gretzinger defined a rule for unique object identification as follows:

ROLE: An object must have an identifier that is unique in a time dimension as well as with location such that it cannot be modified by any programmed action. An alternative approach

is to divide the network into domains and have a name server in each domain be responsible for assigning new object IDs for all objects created in that domain. An object identification algorithm can be made unique by combining several of the following components.

.:. Network domain name. --Address and server ID of the name server node.--A time stamp of creating time.-- An object class identifier.

Object Directory services

A multimedia object directory manager is the name server for all multimedia objects in a LAN. It has an entry for every multimedia object on all servers on the LAN, or in a domain if a LAN or WAN is subdivided into domains. The object directory manager manages changes to the object directory resulting from object manager actions.

Multimedia Object Retrieval

The multimedia object manager performs the functions of managing all requests from the multimedia applications for retrieving existing multimedia objects *01'* storing new or edited multimedia objects created by the user. In systems actively designed using an object request broker, this request is channeled through the object request broker. Data structure maintained by the multimedia object manager:

Database Replication Techniques In the simplest fonn of data management, the databases are set up as duplicates of the databases. Database duplication ensures that the multiple copies are identical.

There is an approach to allow each copy of the database to be modified as needed and to synchronize them by comparing them and copying the changes to all other database copies on a very frequent basis, this process is called replication.

Types of Database Replication: There are eight types of modes available. They are: Round Robin replication.2.Manual replication. (Hi) Scheduled replication. (iv) Immediate replication. V)Replication-on-demand. Vi) Predictive replication. Vii) Replication references. Viii)No replication. **Object**

Migration Schemes

Optimizing Object Storage A number of techniques are available for optimizing data storage for multimedia objects. Let us consider the three design approaches

1. **Optimizing Servers by Object Type:**

   The mechanism for optimizing storage is to dedicate a server to a particular type of object. The object server may ne designed to provide specialized services for specific object classes related to rendering

2. **Automatic Load Balancing:** It can be achieved by programming the replication algorithm to monitor use counts for each copy of a replicated object.

3. **Versioned Object Storage:**

   The storage problem will be more complex if multiple vcrsions need to be stored. Hence, we should follow the technique which is based on saving changes rather than storing whole new objects. New versions of the object can be complex objects,.