

Oracle *interMedia*: Managing Multimedia Content

An Oracle White Paper
March 2001

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Managing Multimedia Content

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Oracle *interMedia*: Managing Multimedia Content

INTRODUCTION

The recent explosion in the use of media-rich Internet applications has resulted in an appreciation for the value of multimedia content, and a realization of the challenges in managing that content. Emerging Web and e-commerce applications found in diverse areas such as retail sales, real estate, and Web publishing, need effective, efficient, and reliable management of multimedia content.

Managing multimedia content for such applications presents unique issues. Large, relatively unstructured media objects come in a wide variety of complex formats, and need to be associated with the appropriate application information. Loading large volumes of multimedia content into a management system requires: associating the correct metadata; indexing the content for search and retrieval; and, efficiently delivering the multimedia content.

Oracle *interMedia* enables Oracle9i to manage multimedia content (image, audio, and video) in an integrated fashion with other enterprise information. It extends Oracle9i reliability, availability, and data management to multimedia content in media-rich Internet applications. As an integral part of the Oracle9i database server, Oracle *interMedia* data benefits from all Oracle9i capabilities, including its speed, efficiency, scalability, security, and power. Businesses benefit from the ability to easily locate media content for reuse and repurposing, and from the fact that the traditional business information and media content are kept in synchronization.

Oracle *interMedia* provides a set of image, audio, and video object types sufficient for most common Internet application requirements, including the popular Web formats. These object types can be extended to support many application-specific requirements, for example:

- Additional and varied formats
- New compression and decompression schemes (codecs)
- Specialized indexes
- Custom query optimization and methods
- New data sources
- Specialized data processing algorithms

Applications can easily add multiple image, audio, and video columns, or mixed columns containing any of these types as objects, to existing and new relational tables.

Oracle *interMedia* enables open, standard SQL access using native image, audio, and video data type services, operators, and metadata management. It includes Internet support for popular Web servers and authoring tools. Applications can access Oracle *interMedia* using either or both relational and object interfaces. Database applications written in Java, C++, or traditional 3GLs can use Oracle *interMedia* through modern class library interfaces, or PL/SQL and Oracle Call Interface, (often referred to as OCI).

Oracle *interMedia* offers an array of utilities for loading multimedia content into application relational tables:

- Clipboard: A low-volume graphical utility
- API: An application programming interface
- Database table replication: Copying from one Oracle database into another
- Annotator: A sophisticated multimedia parsing utility
- SQL*Loader: A high volume, direct path bulk loader
- Oracle Internet File System

Oracle *interMedia* extracts metadata (information about the media) and associates it with the multimedia content in the media objects, at upload time. Downloading or delivery of all multimedia content in batch is supported, as is streaming of certain audio and video formats.

Oracle *interMedia* provides considerable flexibility in the storage of the actual media. While Oracle *interMedia* makes it possible for metadata and media to be stored together within the Oracle9i tablespace, it also provides for storage of the media outside the database making it possible to integrate archival storage. This results in considerable storage flexibility, though with some tradeoffs in security and manageability. The media can be easily imported and exported between Oracle9i and these sources. These media storage alternatives include the following:

- Binary large objects, or BLOBs, stored within the database
- File-based large objects, or BFILEs, stored in local operating system-specific file systems
- URLs containing image, audio, and video data stored on any HTTP server, such as the Oracle9i Application Server
- Specialized media storage servers

Application developers benefit from Oracle *interMedia* support within Oracle9i Application Server Portal and Oracle *interMedia* integration with Oracle JDeveloper, the application development environment for Oracle Java.

PRODUCT OVERVIEW

Multimedia Object Types

Oracle *interMedia* uses object data types, similar to Java or C++ classes, to describe image, audio, and video data. These object data types are called *ORDImage*, *ORDAudio*, and *ORDVideo*, respectively. An instance of these object data types consists of attributes, including metadata and the multimedia content, and methods. Multimedia content is the actual image, audio, or video data. Metadata is format information about the multimedia content, including information such as object length, compression or format, or application-provided information (for example, a singer's name for a digital audio song). Methods are procedures that can be performed on the object such as store, deliver, or extract metadata, and compress or convert image format.

Applications use Oracle *interMedia* by adding one or more multimedia columns (*ORDImage*, *ORDAudio*, or *ORDVideo*) to existing tables (figure 1), or by creating new tables with multimedia columns in them (see Figure 1). Any number of these columns can be added to a table, and in the simplest form, this represents the integrated management of relational and multimedia data.

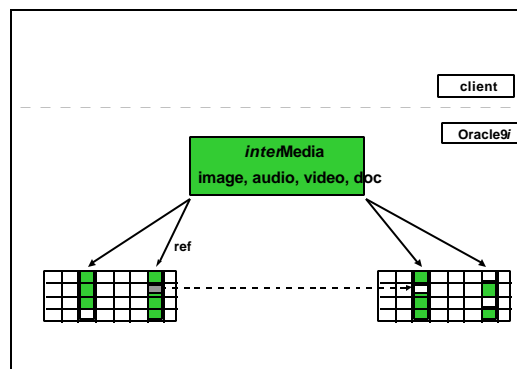


Figure 1: Multimedia Objects in Relational Table Columns

interMedia also includes an object data type known as *ORDDoc*. This multimedia column type can contain any mixture of *ORDImage*, *ORDAudio*, or *ORDVideo* objects, thus increasing the flexibility of its multimedia management capability.

Multimedia Objects Storage Model

The Oracle *interMedia* objects (*ORDAudio*, *ORDImage*, *ORDVideo*, and *ORDDoc*) have a common multimedia storage model. The multimedia component of these objects can be stored in the database, as a BLOB under transaction control. The multimedia component can also be stored outside the database, without transaction control. In this case, a pointer, under transaction control, is stored in the database, while the multimedia component is stored in an external BFILE (operating system flat file), at an HTTP server-based URL, on a specialized media server, or at a user-defined source on other servers. Multimedia content stored outside the database can provide a convenient

mechanism for managing large, or new multimedia repositories that reside as flat files on erasable or read-only devices. This data can be imported and exported between BLOBs and the external BFILE source at any time.

Object metadata and methods are always stored in the database under Oracle *interMedia* control. Whether multimedia content is stored inside or outside the database, Oracle *interMedia* manages metadata for all the multimedia object types, and automatically extracts that metadata for each type. This metadata includes the following:

- Data storage information including the source type, location, and name
- Data update time and format
- MIME media type (used in Web and mail applications)
- Image height and width, and image content length, format, and compression type
- Audio encoding type, number of channels, sampling rate, sample size, compression type, play time (duration), and description
- Video frame widths and heights, frame resolution and rate, play time (duration), number of frames, compression type, number of colors, bit rate, and description
- Select application metadata (for example, singer or studio names)

Relational Interface

Applications that already store multimedia content in BLOBs, rather than in Oracle *interMedia* objects, can still benefit from the features of Oracle *interMedia* through its *relational interface*. Most of the Oracle *interMedia* services are still available to the applications and can be applied to the multimedia content stored in BLOBs. Similarly, existing, more traditional applications such as human resources can also use this relational interface and benefit from all the Oracle *interMedia* services.

Image Object Type

Oracle *interMedia* image services support two-dimensional, static, digital images stored as binary representations of real-world objects or scenes, in most popular file formats and compression schemes. Image file formats provide a convenient means for an application to store an image in a flat file. By publishing the internal layout of such a file, it is possible to use it as an interchange medium between different applications.

A digital image consists of attributes that describe the characteristics of the image, and the image data itself (the digitized bits). The image data (pixels) can have varying depths (bits per pixel) depending on how the image was captured, and can be organized in various ways. The minimum attributes of an image include the following:

- Size (height in scan lines and width in pixels)
- Number of bits per pixel in each of the colors sampled

- Compression type
- Content format

The content format consists of the following:

- Monochrome or bit depth
- Sample model (Band Interleaved by Plane, Band Interleaved by Line, Band Sequential)
- Color model (Lookup Table, Direct), color space (GRAY, RGB)
- Special attributes such as alpha channel or transparency color

Image Formats and Compression Schemes

Oracle *interMedia* supports most popular desktop publishing image file formats, including: TIFF, JFIF (more commonly referred to as JPG), BMP, TARGA, EXIF, PCX, PICT, GIF, CALS, SUN RASTER, FPIX, PNGF, PPMF, PGMF, PBMF, WBMP, and RPIX.

Developers can easily store images created by applications without becoming experts in image file formats. Oracle *interMedia* does not require applications to convert files to and from an internal format for storage and retrieval, ensuring that performance is not degraded.

Oracle *interMedia* also extracts key image properties (multimedia metadata) automatically, and makes those properties available in the image or document object's data attributes, thus relieving application developers of the burden of learning subtle format variations. Because there are so many different image formats and many applications support only a subset of them, Oracle *interMedia* provides conversion between formats, on demand. For example, Oracle *interMedia* can convert images from other formats into WBMP, preparing them for use in mobile applications.

RPIX is the uncompressed Oracle *interMedia* raw pixel format that makes it easy to access individual pixels for image processing. In addition, the RPIX format can be used as a gateway to import certain proprietary and foreign image formats into Oracle *interMedia*. A proprietary or foreign image format can be easily converted to the documented RPIX format by using methods to pass the image format attributes to Oracle *interMedia*. Once these attributes have been passed, Oracle *interMedia* can process the image, storing, retrieving, and applying image manipulation and conversion methods as needed.

Oracle *interMedia* can read and write image data at a variety of bit depths, including monochrome (1 bit), 2, 4, 8, 12, 16, 24, 32, and 48 bits.

Because storage space required for digital images can be large, compression schemes are available to squeeze an image into fewer bytes. Lossless compression schemes squeeze an image so that when it is decompressed, the resulting image is bit-for-bit identical with the original. Lossy compression schemes do not result in an identical image, but the changes may be imperceptible to the human eye.

Oracle *interMedia* supports the most popular and efficient compression schemes, including the following:

- CCITT G3 / G4 run-length Huffman encoding scheme, used for bitonal document images
- ISO/CCITT JPEG encoding scheme used for photographic (continuous tone) images
- Lossless RLE (for all practical purposes, a compression scheme)

Oracle *interMedia* shields application developers from the complexities of compression technology by allowing them to simply request that images be compressed or decompressed, on demand.

In addition to metadata parsing, format conversion, and compression, Oracle *interMedia* provides a set of server-based manipulation functions, including scaling and cropping, useful in preparing image data for general purpose viewing, or input to another process. With these basic functions, preparation of preview or thumbnail images is straightforward. More specialized or sophisticated image processing can be performed by the application developer through an interactive graphical user interface.

Audio and Video Object Types

Oracle *interMedia* audio and video services provide the foundation for digital audio and video data in Oracle9i databases. Digitized audio/video consists of the data (digitized bits) and the attributes that describe and characterize the data. The minimum collection of attributes includes the following:

- Source type, location, and name
- Description
- File format
- MIME media type
- Encoding type
- Number of audio channels
- Sample/frame rate and sample/frame size
- Frame resolution and total number of frames
- Number of colors
- Bit rate
- Compression type
- Duration

These data attributes describe or characterize the data as it was recorded or produced by the digital recording device.

The audio and video formats supported by Oracle *interMedia* target Internet, rather than broadcast applications.

Audio Formats

Oracle *interMedia* manages industry-standard audio data stored in AIFF, AIFF-C, AUFF, WAV, MPEG I, MPEG II, MPEG III, and RealNetworks audio formats. It automatically extracts metadata information from these formats, and stores it as attributes of the Oracle *interMedia* audio object (ORDAudio) or document object (ORDDoc). The audio data can be stored either locally in Oracle9i, or referenced from external sources, described previously under *Multimedia Objects Storage Model*.

Video Formats

Oracle *interMedia* manages industry-standard video data stored in QuickTime, AVI, and RealNetworks video formats. It enables applications to store metadata information as attributes of the Oracle *interMedia* video object (ORDVideo) or document object (ORDDoc). Again, the video data can be stored either locally in Oracle9i, or referenced from external sources.

Where support is defined by the preceding interchange format standards, Oracle *interMedia* recognizes compression schemes, including ADPCM and MULAW for audio and AVI Indeo for video.

On-Demand Audio and Video Formats

Oracle *interMedia* effectively operates with streaming servers, such as the RealNetworks server, to deliver select formats of audio and video, in streaming mode. If the audio or video data is stored in the streaming server, Oracle *interMedia* can supply the application with connection information for the streaming server, and a *pointer* to the data in the server. The RealNetworks server can also deliver audio or video data stored in Oracle *interMedia*. The client goes to the Oracle9i database server to get the location of the Oracle *interMedia* audio or video object, passes the location to the RealNetworks streaming server, which then connects to Oracle9i, retrieves the requested multimedia content from the Oracle *interMedia* object, and streams it back to the client.

If a streaming server is unavailable, Oracle *interMedia* can deliver the multimedia information directly to the client in *download and play* mode using the Oracle Net (formerly called SQL*Net) protocol. The entire audio or video clip is sent to the application, which then launches the appropriate player.

Multimedia Content Upload

Oracle *interMedia* provides a number of ways to upload multimedia content into Oracle9i databases (see Figure 2):

- SQL*Loader: Loads large quantities of multimedia content very efficiently, using direct path access
- Replication from another Oracle9i database: Keeps databases, such as those used for production and deployment, synchronized

- PL/SQL procedures: Often used as an alternative to SQL*Loader
- Clipboard: An Oracle *interMedia* utility that can take content from disk files, URLs, and capture devices and upload it
- Annotator: A sophisticated, low-volume loader, that understands various multimedia formats; extracts format and application metadata and puts both in the database, along with the multimedia content
- Oracle Internet File System

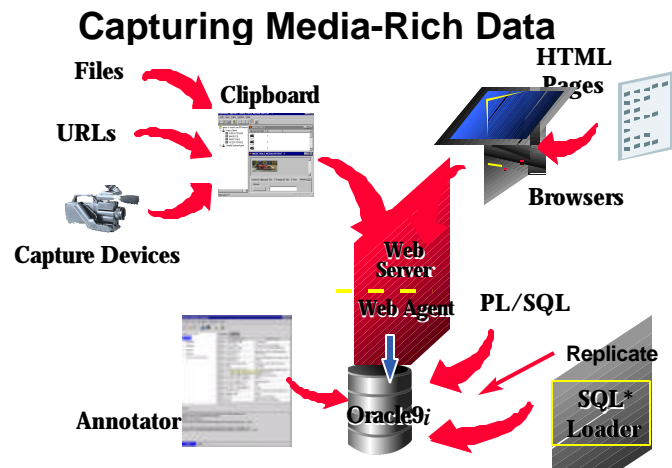


Figure 2: Upload Mechanisms

When multimedia content is uploaded into Oracle *interMedia* by Annotator or one of the other mechanisms, and has the `setProperty` method invoked, the application metadata is parsed. This metadata may include valuable application information, such as the name of the song writer for a digital audio clip, or the names of the actors for a video clip that can be used to locate those clips later. For this reason, Oracle *interMedia* stores the application metadata either in a fixed schema (that is, table columns), or as an XML document.

The textual metadata can be indexed and searched by Oracle Text. By storing this application metadata and multimedia content together in the ORDDoc object, text search can be applied across all multimedia object types.

Multimedia Content Storage

BLOBs, BFILEs, and URLs represent pointers to multimedia storage (see Figure 3). BLOBs are used to store multimedia within the database, in the local database tablespaces, optimizing space and providing efficient access.

Depending on size, BLOBs may or may not be physically co-located with other row data. A locator may be stored in the row as a pointer to the actual location of the BLOB value (up to 4 gigabytes) stored in other tablespaces.

The Oracle *interMedia* storage model includes a common set of operations for multimedia content:

- BLOB operations: Load, fetch, and delete multimedia content

- External operations: Open, close, trim (clip), read/write a buffer, store in a temporary BLOB, import/export between the external source and a BLOB
- Other operations: Extract multimedia metadata, set storage metadata, perform data manipulation, and pass commands to external data storage

Multimedia Content Access

Traditional queries on associated relational data are the primary means of locating multimedia content. Once located, Oracle *interMedia* multimedia content can be accessed using SQL or PL/SQL through ORDIImage, ORDAudio, ORDVideo, and ORDDoc object types.

Where available, the traditional relational information can be supplemented by application metadata carried by the multimedia content, and parsed by Oracle *interMedia*. Relational queries are the primary means of locating the multimedia content, but now it is the application metadata that serves as the means of location.

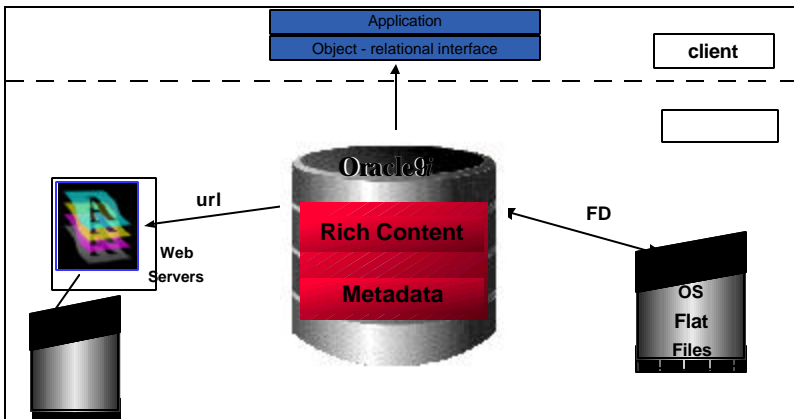


Figure 3: Storage Alternatives

Multimedia Content Delivery

Oracle *interMedia* also offers content-based retrieval on digital images. Content-based retrieval searches a database for an image that looks like another image (that is, has the same general colors, shapes, and so forth). The Oracle *interMedia* content-based retrieval is well-suited to matching real-world objects and scenes. It is not intended for highly specialized pattern recognition such as fingerprint or facial recognition, or medical imaging.

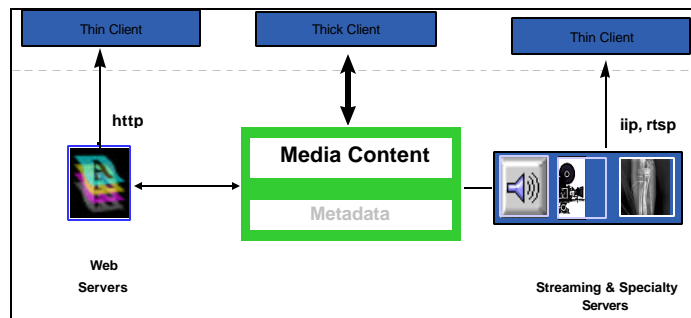


Figure 4: Multimedia Content Delivery Alternatives

The data types can always be delivered from the database to the client in batch, synchronous mode. For some data types, more specialized delivery services are available (see Figure 4). For certain audio and video formats, the media object types can be delivered in an isochronous or stream fashion, making it possible to play it as it arrives using the RTSP protocol. Similarly, images can also be delivered using special protocols such as IIP. Oracle *interMedia* support for these special protocols is through peer-level servers from third party partners such as RealNetworks.

Development Environments

Oracle *interMedia* is accessible to applications through both relational and object interfaces. Database applications written in Java, C++, or traditional 3GLs can interact with Oracle *interMedia* through modern class library interfaces, or PL/SQL and OCI. These applications can easily add image, audio, video, and document columns to store objects in existing and new relational tables. Applications can use Oracle *interMedia* to query and retrieve multimedia content in the same manner as any other relational data.

Through Java class libraries, Java clients can retrieve multimedia objects in JDBC result sets and send them to a browser. These same clients can use the Java Advanced Imaging (JAI) package used by Oracle *interMedia* to perform sophisticated, client-side image processing. Thick clients can also use a Java Media Framework (JMF) player to play, upload, and download audio or video clips from Oracle *interMedia*.

Oracle *InterMedia* / BC4J Integration

Developers can now use a Java IDE, Oracle JDeveloper, to write Java applications using Oracle *interMedia* objects. A distinguishing feature of JDeveloper is Oracle Business Components for Java (BC4J). The Oracle *interMedia*/BC4J Integration Package includes the Oracle *interMedia* BC4J domain classes and a set of utility classes.

The domain classes are wrappers of the Oracle *interMedia* Java client classes and inherit all the underlying multimedia retrieval, upload, and manipulation methods. The Oracle *interMedia* Business Components domain classes support the Business Components framework APIs, and provide built-in, integrated multimedia capabilities. The utility classes support the retrieval, rendering, and

uploading of multimedia content. For example, any application can use the OrdLoader class to facilitate uploading multimedia content into the database.

Oracle *interMedia* & Oracle9I Application Server Portal

Oracle9I Application Server Portal provides a way to create objects that capture, act upon, and display data from an Oracle table or view. Oracle9 iAS Portal components can be connected together to create Web applications that can be applied directly to enterprise databases. Two components that are predefined are *forms* and *reports*.

Oracle9 iAS Portal *form* component lets applications interact with relational and multimedia content – they can add, query, update, and delete Oracle*interMedia* objects stored in Oracle9*i* databases.

Oracle9 iAS Portal *report* component displays dynamic data in a columnar report format using a Web interface. Reports built with Oracle9 iAS Portal can display information stored as an Oracle *interMedia* object type and when needed, provide buttons to play back audio or video media. Reports containing these objects can also be used as portlets.

PRODUCT ARCHITECTURE: THREE TIERS

The Oracle *interMedia* architecture is best explained against a typical three tier architecture as depicted in figure 5.

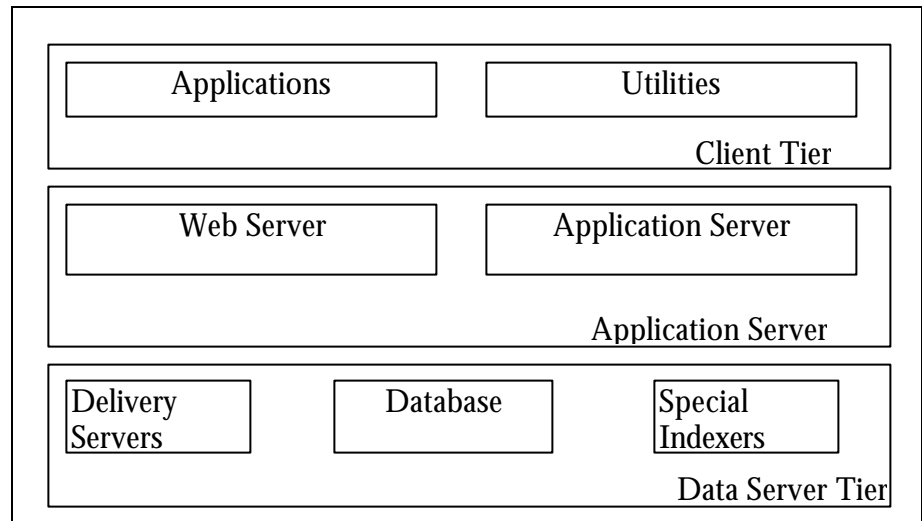


Figure 5: Three Tier Architecture

Data Server Tier

In the first (foundation or data server) tier (figure 6), within the Oracle9i database, are tables that contain *media columns*. The arrow to the right points to *externally referenced media (files)*.

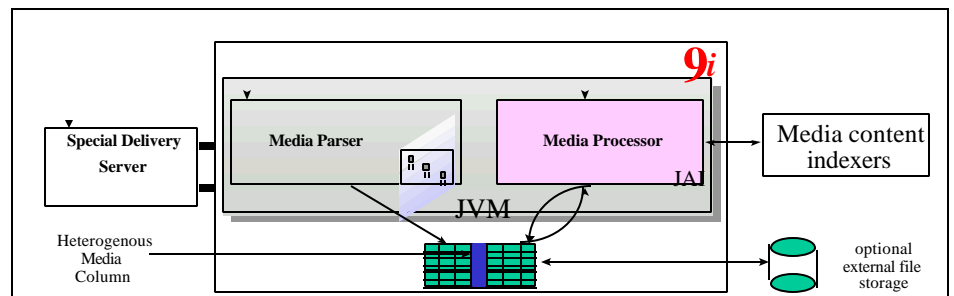


Figure 6: Data Server Tier

Above that arrow, still within the Oracle9i database (figure 6), are two boxes: the *media parser* and the *media processor*. The parser takes multimedia content and parses out the format and application metadata when that content is entered into the database. The media processor, primarily based upon the Java Advanced Imaging (JAI) engine, supports the processing of images within the database. Both the parser and processor are written in Java, and run within the Oracle9i Java Virtual Machine (JVM).

To the left of the Oracle9i database (figure 6) are the *special delivery servers*. These servers, connected by plug-ins, get the multimedia content out of the database and deliver it to thin clients (typically). The RealNetworks G2 streaming server is a good example of a special delivery server.

To the right of the Oracle9i database (figure 6) is a box labeled *media content indexers*. These indexers perform functions such as speech recognition and building a speech-to-text time base for the specialized multimedia content.

Application or Web Server Tier

In the middle tier (figure 7.), is the *Web server*. It is here that Oracle *interMedia* provides access class libraries. In the case of JDBC, these are Java classes for efficient retrieval of multimedia content from the database, and delivery of it to Web browsers.

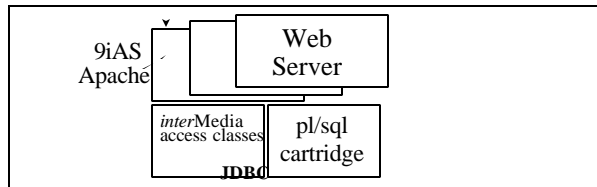


Figure 7: Data Server Tier

Client Tier

At the third (or top) tier (figure 8), Oracle *interMedia* includes three components:

1. *Clipboard*, two versions: NT utility and browser-based
2. *Annotator*
3. *Business Components for Java (BC4J)*

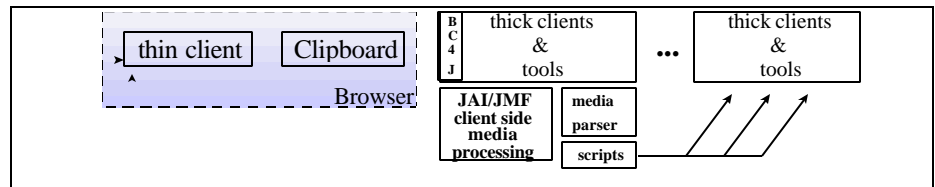


Figure 8: Client Tier

Clipboard: NT Utility and Browser-Based

The Clipboard component has two versions. The first version is an NT utility for browsing, uploading, and downloading multimedia content between the database and local files. The second version is browser-based, and therefore portable across platforms. The second version provides a hierarchical file-oriented view of Oracle *interMedia* multimedia content.

Annotator

The Annotator component is a utility that parses application metadata and uploads the multimedia content and metadata into the database. Annotator is

available as a Java client and as a Java bean, so it can be integrated into customer or partner applications and used in various script-based languages.

Business Components for Java (BC4J)

The Business Components for Java (BC4J) make it simple for developers who use the Oracle JDeveloper environment to generate media-rich applications. Developers can easily create reusable modules that render and display multimedia content.

Figure 9 puts the entire architecture together and focuses on the interconnects between the three tiers.

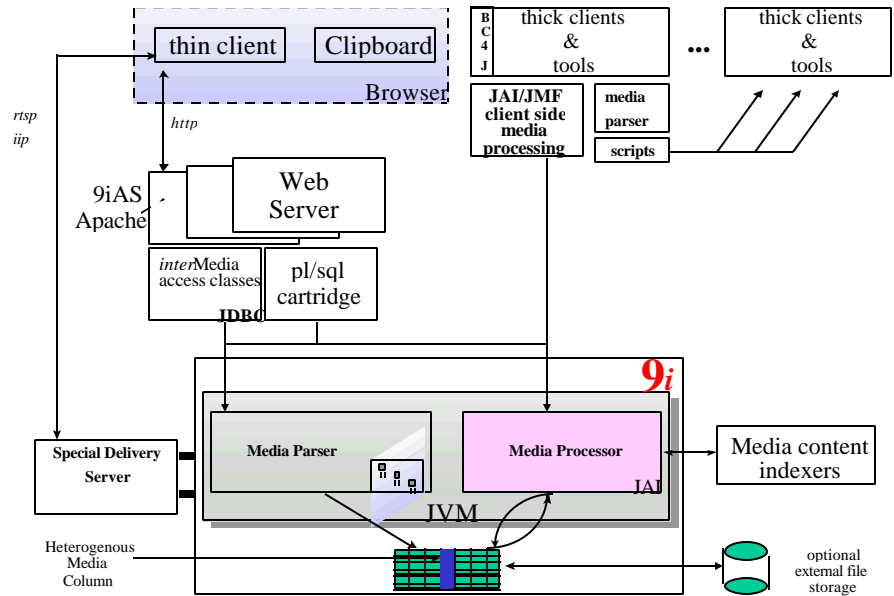


Figure 9: Complete Architecture

INTERNET INTEGRATION

Oracle *interMedia* Clipboard enables Web authoring tools to locate, retrieve, and use content from the database. During the Web page design, Oracle *interMedia* Clipboard can drag and drop multimedia content from the Oracle9i database onto an HTML page. It automatically creates a URL link consisting of a SQL query that points to the multimedia content in the database.

When a user visits the published Web page, Oracle *interMedia* Clipboard executes the SQL query, thus retrieving the multimedia content from the database, and returns the MIME type and the multimedia content for display by the Web browser.

Oracle *interMedia* Internet facilities enable transaction control over multimedia content in Web pages. Because Oracle *interMedia* provides a late-binding feature, the most current version of the multimedia content is dynamically available whenever the Web page is visited.

Oracle *interMedia* is well-suited for the emerging dynamic Web page world. *First*, it integrates management of the multimedia content with the relational decisional data used when an application chooses what content to include in a Web page. *Second*, Oracle *interMedia* provides easy-to-use, highly efficient Java classes for middle-tier query, retrieval, and output of multimedia content. *Finally*, Oracle *interMedia* is already integrated with some of the leading dynamic Web page composition tools that use ASPs and JSPs, such as Macromedia Ultradev.

EXTENSIBILITY

Extensibility is a central component of the Oracle *interMedia* architecture. This feature assists customers and partners to meet their application-specific data needs. For each of the data types, image, audio, video, and document, customers and partners can create custom-tailored plug-ins to support additional formats, new digital compression and decompression schemes (codecs), specialized indexes, custom query optimization and methods, external multimedia content sources, and even specialized data processing algorithms.

In addition to data type extensibility, it is possible to create a more complex object that contains one or more multimedia objects of type `ORDImage`, `ORDAudio`, `ORDVideo`, and `ORDDoc`. For example, a music CD object might consist of an image object containing the CD cover illustration, a series of audio objects containing the tracks of the CD, and a video object containing the associated music video.

EXAMPLE APPLICATION

Consider for example the case of a system integration house which developed a web based image data management product for use in the professional imaging sector and by organizations with massive amounts of image based data. The system provides customers with a platform that enables them to better manage, market, and exchange their image assets.

The basis for the solution is Oracle9i with Oracle *interMedia* and Oracle Text. Oracle *interMedia* and Oracle Text are used to store, index, and retrieve all of the image and associated textual data. Oracle *interMedia* is also being used for storage of some affiliated audio and video data.

All multimedia objects are stored in the database. In the system integrator's words. Storing them in the database offers the following advantages:

- Better security
- Greater control (resizing, manipulating)
- Ensure the images are in sync with the relational data. The images exist (if stored in a file system they can be deleted without deleting the corresponding data from the database)

- Easy to extract statistics on usage

The customer used several Oracle technologies to optimize performance. These include standard storage options such as NOCACHING and NOLOGGING, the cost based optimizer, locally managed table spaces (separate one for the images), and object replication.

Currently the database contains approximately 30 GB of which 25 GB are JPEG images. The main table containing the images holds 20,000+. Within this, the size of web Images range between 30KB and 80KB, thumbnails are between 1.5KB and 10KB, and optionally stored originals images in either TIFF or JPEG and vary in size from as low as 50KB up to 80 MB.

Advantages for Image Solution

The web based image data management solution that uses Oracle *interMedia* and Oracle9i Text can provide a rich sensory experience, powerful search capabilities, and extraordinary convenience to a large market of customers giving the system a distinct competitive advantage. The system's main assets are of course the images, and the traditional relational (business) data.

Placing all these assets in the same database management system reduces administration and training costs, and increases system reliability, availability, and scalability. Most important, it creates opportunities for multimedia information sharing, redirection of that information, and integration of the multimedia data with traditional relational data and other operational applications that manage the system's business.

Oracle *interMedia* allows Internet content to benefit from advanced database technology services. *For the first time*, the security, administrative controls, performance, scalability, and open access of professionally managed enterprise information systems is available to multimedia data used by corporate Web sites and media-rich applications.

Oracle *interMedia* can integrate and manage enterprise multimedia content, (with support for dozens of popular file formats and compression schemes) as columns in tables of traditional relational data, *AND* the multimedia content of application Web pages.

As an example of this integration a simple design for our web based image data management system might include tables that provide information about the following:

- *thumbnails*: contains all application meta data such as stock photo id, photographer, when taken, caption, category, the thumbnail image
- *high resolution image*: stock photo id and hi res image
- *pricing*: stock photo id, pricing, legal Ts&Cs

- *royalty*: stock photo id, owner, royalty payment

Advantages for Customer

Customers can search for multimedia content in the same fashion as they search for traditional relational data. For instance, customers can search for images by a unique image name or key, by photographer, or by category. In addition, customers can use Oracle *interMedia*'s powerful image content based retrieval capability to search for 'similar' images recursively through the database. And once a customer has found an image of interest, they can simply click on it and see the full resolution image.

Advantages for Application Developer

Because Oracle *interMedia* is tightly integrated with Oracle's Java IDE tool, jDeveloper, and with Oracle9i Application Server Portal, it is easy to quickly develop and deploy media rich applications.

In addition Oracle *interMedia* includes powerful tools such as the Annotator, the Clipboard, and the Internet File System which make it easy to upload media content into the database, extract application meta data such as a caption, and then browse it. It's also possible with the Oracle *interMedia* clipboard to build dynamic, media rich web pages.

SUMMARY

Oracle *interMedia* is a set of services that facilitate the management of multimedia content in an integrated fashion with other enterprise information. With Oracle *interMedia*, multimedia content can be managed as easily as traditional relational data. Oracle *interMedia* lets Internet content benefit from advanced database technology services.

With Oracle *interMedia*, *for the first time*, the security, administrative controls, performance, scalability, and open access provided by Oracle9i for professionally managed enterprise information systems is available to multimedia content stored in corporate Web sites and media-rich applications.



Oracle *interMedia*: Managing Multimedia Content
March 2001

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