

# AN INTERACTIVE MULTIMEDIA MUSIC REPOSITORY OVER THE INTERNET

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## ***Abstract***

*The aim of the Interactive Multimedia Music Repository project is to create a Malaysian music web site, one into which any Internet user may surf to discover the kinds of music found in the country. The repository serves as a source of Malaysian musical reference which also provides formal distance learning courses conducted on the same subject through the Internet. The multimedia information content implicit in such an application needs to be properly designed, implemented and managed for remote multimedia database access. The paper presents the criteria designed to guide the construction of the music repository database.*

**Keywords:** Internet, music, music repository, distance learning, database, World Wide Web

## **Introduction**

The Internet offers online access to information in rich formatted textual, visual and audio form from almost any location globally and is not bounded by time. Although the evolving Internet standards are still being defined, the demand for access is enormous (Salvail, 1996; Miller 1996). The information mix, graphically attractive presentation and the numerous Internet utility tools available make it the most inexpensive source of fast access to multimedia information. The Internet thus is a suitable *channel* for the collection, catalogue, storage and retrieval of musical references.

The IBM Digital Library (IBM, 1996) is a digital asset management system that provides end-to-end solutions for content owners to create or transform multimedia assets into digital form, with the capability to distribute multimedia content, search and access information, manage multimedia databases of any scale, and protect intellectual property. At the core of the library infrastructure are library search servers which manage catalog information and provide secured access to the objects held in the collection. The client application receives direct

access to the information requested from the collection regardless of where the data is stored.

Indiana University's School of Music Variations project (IBM, 1996) is a digital library project which focuses on the delivery of high fidelity audio over a local network, using a web browser interface on desktop personal computers to access the music library. Students and faculty are able to log on, look up and listen to reserve lists that are assigned in their coursework. The Variations project is being created on a network designed for real-time delivery of multimedia that incorporates Asynchronous Transfer Mode (ATM) technology, in which each client's workstation or small group of client workstations has its own dedicated network connection. With ATM, every client is ensure of access to the media on the server without interruption.

Drawing from the above project, the proposed web site is being developed to provide open access to Malaysian music resources and references. Users may register for formal distance learning courses on Malaysian music using the Internet. The courses to be conducted may provide a source of income to self-sustain the operation of the Internet server. This project is in line with the aspiration of the Malaysian government to promote the use of the Internet through the Multimedia Super Corridor (MSC) initiative, among which is the promotion of Malaysian culture and heritage, and the delivery of affordable education to the masses (Kramer, 1992). This paper summarizes the criteria designed in developing the music repository database.

## **Introduction to Malaysian Music**

Many researchers have published material on music in Malaysia (Tan, 1995 and 1990; Matusky, 1994; Mohd Ghouse, 1992; Ku Zam Zam, 1995), yet exactly what constitutes "Malaysian" music has yet to be defined and a comprehensive overview of all types of music prevalent in the country has yet to be presented. Perhaps this is because Malaysian music is still in a state of evolution. The definition of Malaysian music was proposed in (Ang, 1997) and the role of music in nation building in (Ang, 1996).

## **The Internet Application**

Present development of the music repository database, includes observation of 1. the criteria for selection, 2. technology trends (of the Internet in terms of user demand and availability of new related products), and the 3. support for satisfactory pedagogic requirements. The criteria for the client side and for administration of the music repository itself are summarized and presented in brief. (Swank, 1996; Wong, 1996; Date, 1990)

The choice of database are evaluated in terms of:

- *material* delivery, maintenance and management requirements
- *material* data type capability, i.e. file types, format, combinations thereof
- data meta description and maintenance
- database language, extension capabilities
- server side support applications, e.g. CGI scripts, *Java applets* library
- client side downloadable applications support, e.g. media player, standards and availability
- data structural consistency to standards that still provides an upgradable or migratory path when necessary
- database management features, e.g. statistical reports, user lockout
- data backup and disaster recovery options (include migratory ease)
- cost of implementation, that include (especially) license to use and limitations, e.g. maximum number of user connections per annum
- cost to users / consumers

For the client side or to the user, the following criteria are observed in designing the application:

- remote access, using standard TCP/IP protocols, e.g. http
- minimal fuss with foreign format types, i.e. the application will cause the browser to download or use the correct program to work with media files
- categorical access for the casual web browser and registered course user as well as for privileged users
- restricted (graded) access to higher course levels, include bookmarking features
- include course registration and course progression features, e.g. reminder for submission of assignment, Internet payment of fees
- modularity, e.g. any change of media file format is transparent to the user
- meta information (help and assistance features)
- secured course evaluation

The design of both the server and client applications need to take into account the impending switch to the new IP address format, i.e. from IPV4 to IPV6 (Bradner, 1995).

Course administration to include:

- support for submission or inclusion of new Malaysian musical materials, course topics and related mixed media files
- maintenance of course administrators, e.g. particulars and access for lecturers, examiners
- quality assurance and verification, even remotely for external auditors / moderators
- maintenance ease of course evaluation questions

- information on course modules, and relation of course modules
- course registration and course progression maintenance for users
- management information, e.g. on enrollment, access etc.
- possible technical support for registered users (e.g. via e.mail) requiring support - information database
- possible integration with existing administrative/management systems (e.g. data or file transfer of registered course user particulars)

The overall application design also considers the following in view of the distributed nature of the Internet. This is to cater for the sharing of the course with other course content providers, i.e. other Universities or similar institutions.

### **i. Distributed Internet data repository**

The application will cater for distributed databases through loosely coupled access (e.g. using http and CGI) to extend the course modules, contents and referrals. A means to filter (e.g. hypertext tags) and to reorganize content and media files may be necessary. The management of this design calls for a localized resource/course delivery module which may be tailored to meet local needs.

### **ii. Cooperative course programming and delivery**

This would be a top level module that draws data from participating Internet sources and provides a comprehensive resource/course delivery mechanism while maintaining the independent setup of the participating data sources. The module maintains the meta description of the course and logs shared user access to data sources.

Web server (serving http requests)							
Cooperative resource/course programming and delivery module							
music data source	music data source	music data source	music data source	music data source	music data source	music data source	music data source

Figure 1: Diagrammatic view of the *Cooperative resource/course programming and delivery* module

Figure 2 shows the system model which consists of database clusters. These are general components that construct the Malaysian music resources web site.

1. administration database maintains data pertaining to the operation of the web site which include data on materials submitted for publication on the Internet
2. web site users database maintains registered and guest users
3. database for logs, e.g. for access counters, errors, utilization statistics

4. website databank
5. CGI scripts databank, which include scripts for data search and to invoke *server-side include* (SSI) functions
6. general help text or meta information database
7. browser loadable programs databank, e.g. include compiled Java applets, platform specific media player programs
8. meta data database describes component contents of the system and resources for creating/formatting HTML pages
9. courses databank
10. examinations databank

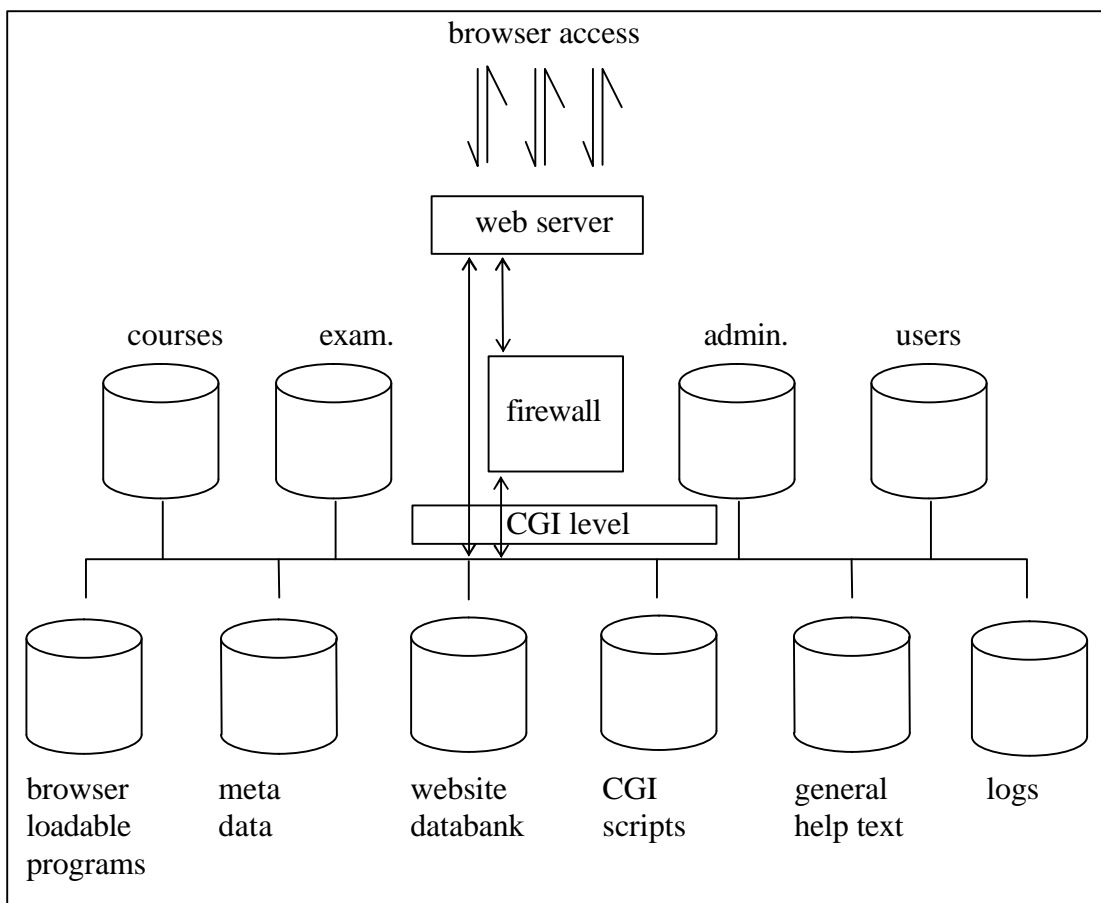


Figure 2: System model of the Malaysian music resources web site.

System security can be implemented at application level or through secured server access, i.e. using a *firewall* (Cooper, 1995). The web site databank (Figure 3) for example, is a repository that consist of files and databases which include the following:

- i. HTML text files
- ii. video and images files
- iii. audio files

- iv. quizzes database, contains quizzes called by CGIs linked from HTML pages
- v. external references database, i.e. a database describing external URLs which are updated periodically by a remote web site monitor robot

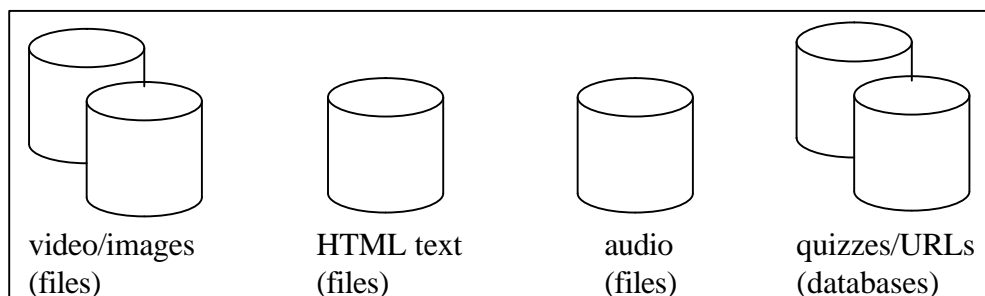


Figure 3. Website databank components.

The various format type files of the web site databank are described in the relevant meta data database. For example, the subject on *Asian musical instruments* may pull together HTML text, images and audio files found in the website databank or from other cooperative web sites. The meta data description of the files include file owner, author, file expiry date, access type, access chargeable code and subject code. A meta data file as exemplified, may be accessed by external participating web sites and may be used to compile a suitable HTML page using CGI script as when requested by a browser.

Instrument	Site alive check date	General URL	Image	Sound	Text	Chargeable Access	Cost per full page load
gong							
kompang							
pi pa							
saron							

Table 1: A meta data file sample table describing *Asian musical instruments*.

Course code	Course owner	Course URL	Course description	CD-ROM address	Site off-line indicator	Chargeable Access	Cost per full page load
	Middlesex						
	UCE						
	UPM						

Table 2: Meta data sample table on cooperative course delivery

## Summary

This paper has presented the impending project on the development of an Interactive Multimedia Music Repository of Malaysian music resources on the

Internet. Brief guidelines as to the criteria for development of the repository database and its supporting applications were presented as reference for similar projects. The *Cooperative course programming and delivery* approach is a formal method of presenting distributed data, owned by various sources, through restricted access of resource databases. While the *distributed Internet repository* is an approach to share public domain data through reformatting of HTML text using CGI at the server side before delivery to the client.



Figure 4: Sample screen copy of a music resource page tailored to local needs.

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