REQUEST FOR PROPOSAL #701297

FOR

MULTIMEDIA OBJECT DATABASE MANAGEMENT SYSTEM

Issued by

WRIGHT STATE UNIVERSITY
Dayton, Ohio

In Conjunction With

OhioLINK

Sealed proposals will be received until July 30, 1997  3 p.m. Local time

Addressed to:

Wright State University
Purchasing Department
246 Allyn Hall
Dayton, Ohio 45435

Note:

1. Responses must be sealed and designated in the lower left hand corner "RFP No. 701297 -- due July 30, 1997"

2. A MANDATORY Proposers’ Conference will be held July 9, 1997. Written questions due June 30, 1997. (Ref. Section 4.2)

3. This bid will not be publicly opened.

4. Submit 1 clearly marked original and 10 copies of the proposal.
TABLE of CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Section 1 Description of OhioLINK</td>
<td>1</td>
</tr>
<tr>
<td>Section 2 Technical Requirements</td>
<td>1</td>
</tr>
<tr>
<td>.1 Contract and Cost Requirements</td>
<td></td>
</tr>
<tr>
<td>.2 Basic Database Design Facilities</td>
<td></td>
</tr>
<tr>
<td>.3 Object Databases</td>
<td></td>
</tr>
<tr>
<td>.4 Storage of Object Databases</td>
<td></td>
</tr>
<tr>
<td>.5 Database Queries and DBMS Interfaces</td>
<td></td>
</tr>
<tr>
<td>.6 Database Administration</td>
<td></td>
</tr>
<tr>
<td>.7 Performance Issues</td>
<td></td>
</tr>
<tr>
<td>.8 Hardware / Software Specifications</td>
<td></td>
</tr>
<tr>
<td>.9 Tools and Support for the DBA</td>
<td></td>
</tr>
<tr>
<td>.10 Vendor Qualifications</td>
<td></td>
</tr>
<tr>
<td>Section 3 Contractual Considerations</td>
<td>12</td>
</tr>
<tr>
<td>.1 evaluation of Vendor Proposals</td>
<td></td>
</tr>
<tr>
<td>.2 contract Negotiations</td>
<td></td>
</tr>
<tr>
<td>.3 observance of laws and regulations</td>
<td></td>
</tr>
<tr>
<td>.4 conditions</td>
<td></td>
</tr>
<tr>
<td>.5 publicity</td>
<td></td>
</tr>
<tr>
<td>.6 confidentiality</td>
<td></td>
</tr>
<tr>
<td>Section 4 Proposal Submission-Content and Format Requirements</td>
<td>14</td>
</tr>
<tr>
<td>.1 calendar</td>
<td></td>
</tr>
<tr>
<td>.2 questions and inquiries</td>
<td></td>
</tr>
<tr>
<td>.3 vendor incurred expenses</td>
<td></td>
</tr>
<tr>
<td>.4 rights reserved</td>
<td></td>
</tr>
<tr>
<td>.5 non-appropriation of funds</td>
<td></td>
</tr>
<tr>
<td>.6 modification or withdrawal</td>
<td></td>
</tr>
<tr>
<td>.7 format</td>
<td></td>
</tr>
<tr>
<td>.8 submission requirements</td>
<td></td>
</tr>
<tr>
<td>.9 Volume 1 Inclusions</td>
<td></td>
</tr>
<tr>
<td>Attachments</td>
<td></td>
</tr>
<tr>
<td>appendix A-1 What is OhioLINK</td>
<td></td>
</tr>
<tr>
<td>appendix A-2 Information to be Stored / Managed with DBMS</td>
<td></td>
</tr>
<tr>
<td>appendix A-3 Database Transaction Characteristics</td>
<td></td>
</tr>
<tr>
<td>appendix A-4 Software Architectures for DBMS Access</td>
<td></td>
</tr>
<tr>
<td>appendix A-5 OhioLINK/ OSC Deployment Environment</td>
<td></td>
</tr>
<tr>
<td>appendix A-6 QARnet Backbone Topology</td>
<td></td>
</tr>
<tr>
<td>appendix A-7 Search Volumes for OhioLINK Citation Databases</td>
<td></td>
</tr>
<tr>
<td>appendix B Vendor Identification Sheet</td>
<td></td>
</tr>
<tr>
<td>appendix C Vendor Response Form</td>
<td></td>
</tr>
</tbody>
</table>
Overview

OhioLINK seeks an information system to manage its anticipated collection of multimedia resources, including images, geographic data, numeric data, audio, video, and other types of information objects. This system is henceforth referred to as the DBMS.

As OhioLINK is seeking the ability to define new types of content objects and to associate appropriate methods with them, a solution which is based in whole or in part on an “object” based DBMS is being sought.

Object Definition: For the purpose of this RFP, an object is defined as a collection of attributes and methods where the attributes include both information content, e.g. an image, and associated descriptive information, e.g. the name of photographer. Attributes may either be primary database types, e.g. integers, or composite objects which may themselves be similarly constructed. The objects will also have methods associated with them. These methods may only be access methods (index and retrieval methods) or they may be information processing methods, e.g. re-scale an image. In traditional database terms, these methods might also be procedures or functions.

Vendors may propose any combination of types of solutions to satisfy this requirement for an “object” based DBMS, including object-oriented database management systems (OODBMS), object or extended relational database management systems (ORDBMS), or solutions involving the use of middleware and a relational database management system (RDBMS). Proposals can suggest the use of more than one type of DBMS; for example, a combined RDBMS and ORDBMS solution may be proposed.

A description of the objects to be managed with the DBMS and the anticipated database collections of these objects, including estimates of object and database sizes and numbers is presented in Appendix A-2. The anticipated distribution of transaction types (queries, updates, etc.) and their distribution over time is given in Appendix A-3. The evolving system architectures in which the DBMS will be implemented is described in Appendix A-4. The anticipated site for deployment for this software will be at the multimedia storage facility described in Appendix A-5. Appendix A-6 shows the topology for the state Internet network which will primarily be used for information transmission.

Vendors need not necessarily propose a mechanism for managing all of the types of objects described in Appendix A-2; however, more comprehensive solutions will be preferred.

Simultaneous with this RFP, OhioLINK is issuing an RFP for an image and multimedia access and management system. This will be a layer of software implemented on top of the DBMS that will manage the process of building databases in the DBMS acquired through this RFP. It will also provide the mechanism that will be used to structure the interaction between OhioLINK users and the images in this DBMS.

Some vendors may wish to submit a proposal for both pieces of software, or to partner with an image software vendor to provide that layer. Such proposals may be submitted as outlined in Section “4 Submission Requirements”. Each RFP component of the proposal will be evaluated separately to determine its ability to meet the requirement of the relevant RFP. To ensure that both pieces of software are compatible with each other even when supplied by different vendors, both RFPs require ODBC support.
If respondents to this RFP do not have any intention of providing a response to both of these RFPs, it is still recommended that the RFP for the image access and management system be obtained and consulted since it reveals one type of software environment that will be constructed on top of this DBMS.

OhioLINK’s plans for deployment of this DBMS environment is expected to stimulate research interests in the area of human interface design, database theory, and other information management areas at its member institutions. It is also expected that there will be a need to distribute or replicate some content at member institutions. To facilitate these activities, OhioLINK seeks a proposal which addresses the availability and cost of providing all or portions of the DBMS software to OhioLINK member institutions.

Based on the responses received OhioLINK reserves the right to negotiate with one or more DBMS vendors for information systems to be used for management of some portion of OhioLINK’s content collections. Ref. Section 3- Award Process/Competitive Negotiations)
SECTION 1 - DESCRIPTION OF OHIOLINK

The Ohio Library and Information Network (OhioLINK) is an Ohio consortium of fifteen public universities, two private universities, the State Library of Ohio, and twenty-three technical and community colleges in Ohio. (Referred to throughout as member libraries or member institutions.) Beginning in 1995 the consortium was expanded to include additional members, specifically Ohio private liberal arts colleges. (Referred to throughout as participating libraries or institutions.) Currently 11 private colleges are included in the OhioLINK with more expected in the future.

Although the primary clientele for OhioLINK multimedia services will be faculty, staff and students, selected content will be made available to non-member institutions. For example, it is anticipated that OhioLINK will share some of its information with K-12 schools, public libraries, and government organizations throughout the State of Ohio. Other content may be made generally available on the Internet, at no charge.

Appendix A-1 identifies the total student population for all current OhioLINK member and participating institutions. Appendix A-1 also identifies other Ohio private colleges not currently in OhioLINK; these schools may or may not become OhioLINK participants in the future.

SECTION 2 - REQUIREMENTS

2.1 Contract and Cost Requirements (to be supplied as Volume I, Section D of Vendor’s response)

Vendor response to this RFP should clearly state your economic and contractual approach to licensing and ownership of the proposed solution. Vendor must supply the license terms around which this contract will be formed. OhioLINK is willing to negotiate the nature of the license or ownership of the DBMS (Ref. 3.2).

Pricing should be as modular as possible to facilitate a variety of situations. It should provide as much flexibility as possible for combinations of numbers of databases, database size, user capacity levels, number of processors on the DBMS server, and scope of user access.

Pricing should include all maintenance costs as well as the cost of all modules, tools, or other components of the proposed solution in addition to the core DBMS. This should include any previously developed and commercially available special multimedia object extensions to the DBMS which are resold by the vendor and have relevance to OhioLINK’s information collection plans. Pricing should also include any support, consulting services, training, or documentation costs recommended or required by the vendor.

The response should delineate all one time and ongoing costs of year 1 through year 5 and include the underlying assumptions the vendor has made to support these costs. It must be clear if any of the pricing is being applied against development of specific functional requirements not currently available.

The proposal should also include terms for allowing OhioLINK institutions to purchase separately the DBMS products.
2.2 Basic Database Design Facilities

2.2.1 DBMS Support for Objects

2.2.1.1 Object Inheritance

The DBMS must support inheritance by objects of both the attributes and methods of super classes of objects. Please specify whether single or multiple inheritance is supported.

2.2.1.2 Overloading / Polymorphism

The DBMS must support overloading or polymorphism of object methods.

2.2.1.3 Dynamic Binding

The DBMS must support dynamic binding.

2.2.2 Object Attributes

2.2.2.1 Primary Types and Composite Objects

A primary data type is a data type which is not itself composed out of a number of other DBMS data types, or created by software, e.g. a new blade, cartridge, or class, implemented by software added to the core DBMS.

The DBMS must support the storage of objects which may both be composed of primary data types and/or of other objects.

2.2.2.2 Primary Types

The DBMS must have basic data types including integer and floating point number, character, Boolean, and dates. Please specify all primary data types supported by the DBMS.
2.2.2.3 Objects Extensions (images, text, etc.)

For the DBMS, there must be object types, e.g. images, which can be used to extend the variety of data types supported by the core DBMS. Specify those objects currently available as well as the methods they implement including any indexing or access methods available for them other than those already included with the core DBMS. Identify the vendor for the object type if a third party.

2.2.2.4 Collections

For the purpose of this RFP, an array is defined as a collection of objects with an explicit ordering. Sets are collections without an explicit ordering. Bags are sets with duplicate members.

The DBMS must support collections of objects or primary data types including sets, bags, and arrays.

2.2.2.5 Domains

The DBMS must support domains where a domain is a fixed set of permissible values that may be entered for an attribute. Specify how domain control is implemented.

2.2.2.6 Integrity Constraints

The DBMS must support object integrity constraints, including uniqueness, referential integrity, and not-null constraints. Please specify any general provision for constraints offered by the DBMS or other specific types of constraints supported.

2.2.2.7 Limits on Numbers of Attributes

There must be few limits on the numbers of attributes of an object. Specify any limits, whether fixed, theoretic, or practical, on the numbers of attributes that an object may have.

2.2.2.8 Limits on Size of Attributes

There must be few limits on the size of an attribute. Specify any such limits, whether fixed, theoretic, or practical on the size of the attributes of objects.
2.2.3 Object Methods

2.2.3.1 Access Methods

The DBMS must support B-Tree and Hash indexes. Please state all of the types of access methods / indexing supported by the DBMS or available object extensions, e.g. R-Trees, Bitmaps, etc.

2.2.3.2 Triggers

The DBMS must support association of triggers with object attributes. Specify the type of actions or methods which can be initiated by a trigger.

2.2.4 Object Design and Development of New Object Types

2.2.4.1 Programming Languages

It must be possible to use C or C++ for developing new types of objects. Specify the programming languages which can be used for object development, and particular preprocessors, compilers, or other tools which are required for this development.

2.2.4.2 Definition of New Objects

It must be possible to use a language of the DBMS, e.g. SQL or OQL, to define new object types and to link programs which implement the object methods or attribute characteristics of the new object type with the DBMS.

2.2.4.3 New Programming Language Methods for Primary Types

It must be possible to create new methods which may be applied to objects or primary data types and implemented in a programming language. Specify the programming language and any particular compilers, preprocessors, or other development tools that are required for this purpose.

2.2.4.4 New Data Manipulation Language (DML) Procedures

There must be a facility for defining new methods which may be applied to primary data types or objects and implemented in the DML of the DBMS, e.g. SQL or OQL.
2.2.4.5 Tools for Creating and Modifying Object Designs

There must be a Windows95 tool for the Database Administrator with a graphical user interface that can be used for object design. This should support design of new objects, as well as browsing and editing of existing designs. Please describe the tools and specify the vendor if a third party.

2.2.4.6 Dynamic Object Design Modifications

The DBMS should support dynamic modification to object designs, rather than requiring a database to be rebuilt when an object design is changed.

2.3 Object Databases

2.3.1 Object Identity

The system must have a mechanism for tracking the identity of each object in a database and distinguishing it from other objects in the same database. Please specify the method used to uniquely identify each object. Please specify the size in bytes of each object identifier.

2.3.2 Versioning

The system must support multiple versions for each object in the database. It must support access to specific object versions based on the sequence of their creation, e.g. the earlier versions of an object.

2.3.3 Limits on Numbers of Objects

The system must support storage of at least sixteen million objects in a database. Please specify any limits - whether fixed, theoretic or practical - on the number of objects that can be stored in a single database. Please specify whether the number of subcomponent object attributes within higher level objects in a database count against the limits on the number of objects in that database?
2.3.4 Database Catalog

The database catalog or other software mechanisms used to manage a collection of databases on an individual machine must be capable of recording information for at least 100 separate databases. Specify any limits - either fixed, theoretic or practical - on how many databases can be stored on one server.

2.4 Storage of Object Databases

2.4.1 Page vs. Object Server

The DBMS must use a page server architecture.

2.4.2 Database Storage

The system should provide OhioLINK an ability to control the size of page used to store database objects. Specify any of the system’s restrictions on page size.

2.4.3 Object Storage

2.4.3.1 External Storage

An external object is defined as an object stored in a file in its native format in a file system and identified within other objects or a database by its filename.

The DBMS must support external file-based storage of large objects.

2.4.3.2 Internal Storage

Internal objects are defined as binary large objects stored within the storage structure of the database.

The DBMS must support storage of binary large objects internally within database records.

2.4.3.3 Limits to Large Object Sizes

The DBMS must support large objects of at least 4 GB in size, e.g. satellite images or high-resolution scans of color maps. Please specify any size constraints on large objects whether internally or externally stored.
2.4.3.4 Large Object Pointers

The DBMS must have a mechanism for maintaining pointers into internal or external large objects in order to support methods which operate on only part of the object, for example partial retrieval of the contents of a large object.

2.4.4 Hierarchical Storage Management (HSM)

The DBMS must support the use of an HSM for storage of external objects. It should be possible to store all components of a DBMS in an HSM. Please specify any components of the databases or database catalog which can not be migrated by a HSM to near-line storage media.

2.5 Database Queries and DBMS Interfaces

2.5.1 Declarative Language

The DBMS must provide a declarative language for query, update, and administration of databases. Please specify the language used to provide this support, e.g. SQL or OQL, and the version supported.

2.5.2 Interactive or command line access

The system must have an user interface that supports interactive entry of commands to query, update, or administer databases.

2.5.3 Programming Language Interfaces

2.5.3.1 ODBC

The system must support ODBC. There must be ODBC drivers available for clients on platforms running Windows 95, Windows 3.1, Digital Unix, SGI IRIX, Solaris, AIX, and Macintosh System 7 operating systems or using JDBC. Please specify the version and level of ODBC implemented.

2.5.3.2 Embedded and Compiled Queries

The DBMS must support OhioLINK creation and compilation of programs which include embedded DBMS commands. Please specify the programming languages supported.
2.5.3.3 Other Interfaces

The system should have additional interfaces available, e.g. ODMG or CLI. Please specify any other programming language interfaces available for submission of DBMS commands.

2.5.4. Cursors

The DBMS must support cursors or another mechanism that can be used by a program to iterate through the objects in a result set. Specify for which interfaces, either declarative language or programming language, this mechanism is available.

2.5.5 ORB / DBMS Interface

OhioLINK seeks to migrate to deployment of its DBMS solution within a CORBA-based distributed systems architecture. It anticipates eventually employing the DBMS as part of the OMG (Object Management Group) CORBA (Common Object Request Broker Architecture) object persistence, query and collections services.

There should be an ORB vendor with whom the DBMS vendor has a strategic alliance. Specify how the DBMS complies with this requirement.

2.6 Database Administration

2.6.1 Support for Distributed And Replicated Databases

The DBMS must be able to support both distributed and replicated storage of database contents. Please specify how integrity is secured in event of a network or server failure. Specify the time delay before replication.

2.6.2 ACID Transactions

The system must support ACID (Atomic, Consistent, Isolated, Durable) transactions. Please specify how transactions are managed to provide this capability.

2.6.3 Recovery

The DBMS must have a mechanism to ensure successful recovery from failed transaction, system failures, or media failures. Please specify the mechanism used to accomplish this goal.
2.6.4 Security

The DBMS must support user name and password authentication for access to all database management, access, and system administration functions. Please specify the granularity with which security policies may be applied both in terms of DBMS functions, e.g. record revision, and in terms of database contents, e.g. at the database, object or attribute level.

2.6.5 Logging

The DBMS must support logging of database use. Please describe the logging facilities available.

2.7 Performance Issues

As OhioLINK is at the inception of its multimedia storage activities, it requires a DBMS solution which is scaleable and can grow in capacity along with its content acquisitions. OhioLINK intends to implement the DBMS on a server platform with a multi-processor architecture to which additional processors and memory can be added as needs increase. The DBMS may also be implemented on a share nothing clustered architecture.

Appendix A-3 gives a sense of the scope of what is imagined to be the level of usage experienced in a successful OhioLINK multimedia program. The solution proposed should anticipate growth of DBMS use to that level.

All speed and performance specifications noted below are as measured at a microcomputer physically located in the same computer center as the DBMS server and accessing the DBMS through the use of an ODBC interface.

2.7.1 Access speed

Access speed must average not more than five seconds for 95% of all database queries performed during peak loads. Maximum access speed must not exceed ten seconds for 95% of all searches performed during peak loads.

Please specify the server hardware needed to maintain this level of performance. Please also specify the additional hardware needed to maintain this performance with an additional 50 database connections, or a doubling of the size of the databases.
2.7.2 Multi-threaded architecture

The DBMS must be multi-threaded.

2.7.3 Multi-processor support

System performance must be scaleable. It’s performance must increase as additional processors are added.

2.7.4 Performance analysis and tuning utilities

There must be tools available for performance monitoring. Specify the third-party provider of these utilities if applicable.

2.7.5 Query optimization

The system must have a mechanism for optimizing query performance without programmer design of query evaluation. Please specify the method used for query optimization and how the optimizer adapts to exploit new access methods.

2.7.6 Object Clustering

The system must make it possible for the database administrator to cluster database objects into contiguous parts of disk space. Specify how the administrator can use object characteristics as the basis for clustering.

2.7.7 System Tuning

It must be possible to control the system’s use of server resources including the number of threads, and memory use, both to enhance performance or control system load. Please specify the facilities of the system that can be monitored and the adjustments that can be made to manage load and performance.

2.8 Hardware / Software Specifications

2.8.1 Server Hardware

The DBMS must operate on UNIX servers. Specify the type of UNIX server on which DBMS software is developed first. Specify which server brands and operating systems are supported.
2.8.2 Server Clusters

The system should support deployment of the DBMS on a cluster of servers. Please specify the method in which it may be deployed in such an environment.

2.9 Tools and Support for the DBA

2.9.1 Support for DBA (Database Administrator)

There must be support available for the DBA in the form of training classes, online, written documentation, and telephone support. Please specify all of the forms of support available and any applicable hours of availability for that support.

2.9.2 WWW Interface Design

There should be vendor supplied or third party tools available for quick development of WWW interfaces for the DBMS. Please describe the tools available from the vendor.

2.10 Vendor Qualifications(to be supplied as Volume 1, Section F of Vendor’s response)

2.10.1 The proposer shall provide a brief description of the company, including history, and shall supply the same for its parent corporation. Included shall be a description of the company organization and staffing including the number, and functional organization of all staff assigned to DBMS applications, and brief resumes of key staff members.

2.10.2 Proposer shall demonstrate financial stability by submitting a combination of data which may include one or more of the following: sources and amounts of available financing, last annual report, statement of income and retained earnings for the last two years, statement of changes in financial position for the past two years, balance sheet for the past two years, certified public accountant opinions and contact information.

2.10.3 Proposer shall disclose any and all judgments, pending or expected litigation, or other real or potential financial reversals which might materially affect the viability or stability of the proposing organization; or warrant that no such conditions are known to exist.
2.10.4 Provide name, address, and telephone number of 3 buyers of systems similar in character, function, content, size, or design to the requirements of this RFP that the proposer has provided that OhioLINK may contact.

SECTION 3 - AWARD PROCESS/ COMPETITIVE NEGOTIATION

3.1 Evaluation of Vendor Proposals

This request for proposal is part of a competitive procurement process which helps to serve WSU's and OhioLINK's best interests. It also provides firms with a fair opportunity for their services to be considered. The process of competitive negotiation being used in this case should not be confused with the different process of competitive sealed bidding. The latter process is used where the goods being procured can be precisely described and price is generally the determinative factor. With Competitive Negotiation, however, price is not required to be the determinative factor, although it may be, and WSU has the flexibility it needs to negotiate with firms to arrive at a mutually agreeable relationship.

Responses to the RFP will be the primary source of information used in the initial evaluation process. Therefore, vendors are advised to be as complete as possible in their responses. However, OhioLINK reserves the right to:

1. award to the most responsive and responsible proposer, or to reject any or all proposals. OhioLINK is not necessarily bound to accept the lowest priced proposal submitted. If the lowest proposal is not the best proposal of value received for money expended, in WSU and OhioLINK's opinion, this Institution reserves the right to make the award in the best interest of OhioLINK. In making award, multiple factors may be considered including but not necessarily limited to: responsiveness to functional specifications, ease of implementation and expandability, scope of maintenance programs and associated costs, experience in providing similar services and requirements to other institutions or clients of similar size, location and ease of timely problem response, reference responses, record keeping practices, past experience with WSU and OhioLINK, willingness to enter into a contract term as specified under "Duration", organizational structure, and factors such as Proposer's integrity, and reputation will be considered;

2. visit or contact any current or past users of a vendor's services;

3. solicit information from any available source concerning any aspect of a vendor's response.

4. request trial access to vendor’s site as secondary step in the RFP vendor selection process.

In evaluating the responses to the RFP, WSU in conjunction with OhioLINK reserves the right to (1) accept or reject all or any part of any response, waive minor technicalities and select a vendor that best serves the interests of the OhioLINK institutions; (2) unless noted otherwise, use any or all of the ideas presented in proposals without limitation; (3) eliminate from consideration any vendor who does not follow the instructions outlined in this document; and (4) WSU will not consider any information contain in responses as "proprietary" unless those sections are clearly and specifically identified as such.

OhioLINK does consider compliance with all specifications of the RFP important, but seeks a vendor who will supply the best overall price/performance proposal for the requested services.

3.2 Contract Negotiations
It is the intent of WSU in conjunction with OhioLINK to award any contract resulting from this RFP to the vendor submitting the proposal that best serves the OhioLINK institutions on the basis of specification requirements, terms and conditions of the proposal, and costs. OhioLINK reserves the right to enter into negotiations with the most responsive RFP proposer for purposes of finalizing any resulting contract award.

WSU and OhioLINK reserve the right to request any desired change in the specifications after the RFP award but prior to the contract award. Any price changes resulting from a change in specifications shall be agreed upon in advance between OhioLINK and the Contractor and incorporated into the original contract.

WSU and OhioLINK also reserve the right to request any desired change in the specifications after the contract award. Any price changes resulting from a change in specifications shall be agreed upon in advance between OhioLINK and the Contractor. The Contractor shall be furnished a supplement upon which both parties agree to and which shall in no way invalidate or make void the terms of the original contract not modified by such change.

Duration and Effective Date of Contract. The contract period shall be effective from date of contract award. OhioLINK reserves the right to negotiate an appropriate contract period based on the specific relationship to be contracted with the vendor.

Contract. The award documents shall be a contract incorporating by reference the terms and conditions of the Request for Proposals and the contractor's proposal as negotiated. The contract shall be awarded by the WSU Purchasing Department in conjunction with OhioLINK.

Consent for Advertising. The selected contractor shall not use the name of OhioLINK or any OhioLINK library or institution in advertising without first obtaining written consent from OhioLINK and the Institution. (Ref. 3.5)

3.3 Observance of Laws and Regulations

In performing the services required under this contract, contractor and its subcontractors will be required to comply with all applicable federal, state, and local laws, statutes, ordinances, and regulations, and Wright State University policies.

This includes but is not limited to obtaining at its own expense requisite permits, licenses, and certifications; observing all requirements related to fair and minimum wages including conditions of employment; not discriminating against any employee or persons, on account of race, color, sex, handicap, religious creed, ancestry, age, or national origin; and remaining at all times in compliance with all executive orders issued, or that may be issued, by any level of governmental agency with regard to equality of opportunity including those dealing with affirmative action.

3.4 Conditions

Any conditions which the vendor wishes to stipulate other than those included in this RFP must be specifically stated in writing in the vendor's cover letter (see 4.9.2). If the vendor cannot accept a provision of the RFP, it must state in the same letter the number and title of the unacceptable provision.

3.5 Publicity

No announcement concerning OhioLINK's selection of a vendor and/or awarding of a contract as a result of this RFP may be made by the vendor without the prior written approval of OhioLINK. (Ref. 3.2)
3.6 Confidentiality of Vendor Responses

All proposals will be available for review by any representative of OhioLINK or member and participating institutions.

SECTION 4 - PROPOSAL SUBMISSION - CONTENTS AND FORMAT REQUIREMENTS

Wherever the following terms appear, they shall have the meanings set forth opposite each.

WSU or Institution: The Board of Trustees of WRIGHT STATE UNIVERSITY, Dayton, Ohio as fiscally responsible for OhioLINK.

OhioLINK: Ohio Library and Information Network.

Contractor: The party awarded the contract, its heirs, executors, administrators, successors or assignees.

Vendor or Proposer: Any firm or individual invited by the Purchasing Department, who submits a proposal to fulfill the conditions and terms of this invitation to bid.

4.1 Calendar of Events

<table>
<thead>
<tr>
<th>Date</th>
<th>Event Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>June 6, 1997</td>
<td>RFP mailed to vendors</td>
</tr>
<tr>
<td>June 30, 1997</td>
<td>Questions due regarding RFP, submitted by vendors (see Section 4.2)</td>
</tr>
<tr>
<td>July 9, 1997</td>
<td>MANDATORY Proposers' Conference-Attendance is required. Failure to attend will result in disqualification from further consideration (see Section 4.2)</td>
</tr>
<tr>
<td>July 30, 1997</td>
<td>RFP responses due from vendors</td>
</tr>
</tbody>
</table>

ESTIMATED DATES:

<table>
<thead>
<tr>
<th>Date</th>
<th>Event Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>August 31, 1997</td>
<td>Semi-finalists selection</td>
</tr>
<tr>
<td>September 1997</td>
<td>Semi-Finalists presentations and trial access</td>
</tr>
<tr>
<td>October 15, 1997</td>
<td>RFP Award</td>
</tr>
<tr>
<td>December 15, 1997</td>
<td>Contract Award</td>
</tr>
</tbody>
</table>

4.2 Questions and Inquiries

If additional information is necessary to assist the vendor in interpreting and responding to the technical and functional aspects of this RFP, questions will be accepted and responses coordinated by David Barber. All questions for interpretations or clarifications to be addressed at the proposers' conference MUST be submitted in writing prior to the close of business June 30, 1997 to:

David Barber
Director, New Services Development
OhioLINK
2455 North Star Road
Columbus, OH 43221
THE MANDATORY PROPOSERS' CONFERENCE WILL BE HELD AT 10 AM, JULY 9, 1997 AT OHIOLINK, SUITE 300, 2455 NORTH STAR RD., COLUMBUS, OHIO 43221.

Oral communications with WSU, OhioLINK, member or participating institutions' employees shall not be binding on WSU and shall in no way excuse the vendor of its obligations as set forth in this RFP.
If additional information is necessary to assist the vendor in interpreting administrative or procedural aspects of this RFP, questions will be accepted and responses coordinated by:

Sharon Murray  
Wright State University  
Purchasing Department  
246 Allyn Hall  
3640 Colonel Glenn Highway  
Dayton, OH 45435  
phone: (937) 775-2411

Certain general questions may be answered by telephone, but all substantive questions must be submitted in writing. Answers to submitted written questions will be provided to all vendors.

4.3 Vendor Incurred Expenses

OhioLINK is not responsible for any expenses incurred by a vendor in preparing and submitting a response to this RFP.

4.4 Rights Reserved

4.4.1 OhioLINK reserves the right to award to the most responsive and responsible Proposer, or to reject any or all proposals and is not necessarily bound to accept the lowest proposal submitted. If the lowest proposal is not the best proposal in OhioLINK’s opinion of value received for monies expended, this Institution reserves the right to make the award in the best interests of OhioLINK. In making award, evidence of Proposer’s capability to perform a contract of this size, organizational structure, and factors such as Proposer’s service, integrity, reputation and past performance will be considered.

4.4.2 OhioLINK also reserves the right to negotiate any final details necessary to arrive at a mutually agreeable contract.

4.4.3 OhioLINK reserves the right to request any desired change in the specifications after the same shall have been put under contract. Any price changes resulting from a change in specifications shall be agreed upon in advance between OhioLINK and the Contractor. The Contractor shall be furnished a supplement agreed upon which both parties agree to and which shall in no way invalidate or make void the terms of the original contract not modified by such change.
4.5 Non-Appropriation of Funds

In the event that funds for this project are not appropriated or are withdrawn, OhioLINK reserves the right to cancel, without penalty, any contract award resulting from this request.

4.6 Rules for Modification or Withdrawal of Responses

No modifications may be made by vendors to responses to the RFP after they are submitted. However, any vendor may withdraw its response at any time.

4.7 Format of Vendor's Response

Vendor responses must be submitted as specified below. Contents and materials must be clearly marked. Vendors are encouraged to submit additional narrative information, materials, and documents in support of a proposal.

4.8 Submission Requirements

4.8.1 Materials are to be submitted on letter size (8 1/2 x 11) paper and must be presented in loose-leaf notebooks (or in other binders which permit easy photocopying, disassembly, and re-assembly of sections of the response, as desired).

4.8.2 The vendor response sections required in specifications 4.9.1 through 4.9.6 must be included in the order specified and clearly identified in a single volume (volume number 1). Any supplemental materials (e.g. materials submitted to provide additional information) must be included in a second, separate volume (volume number 2) and must be clearly labeled and numbered to correspond to any relevant sections in the RFP.
4.8.3 In order to facilitate the review process, one clearly marked original response and ten (10) copies of the proposal must be submitted as stipulated below. NOTE: Copies should be sent with the original response. No telefacsimile will be accepted. Sealed responses designated in the lower left hand corner RFP No. 701297 must be received by July 30, 1997, 3 p.m. Local Time. The original proposal package should be addressed to:

Wright State University  
Purchasing Department  
ATTN: Sharon Murray  
246 Allyn Hall  
3640 Colonel Glenn Highway  
Dayton, OH 45435

4.8.4 Deadline. To be considered for selection, proposals must be received in the WSU Purchasing Office by the designated date and hour. The official time used in the receipt of proposals is that time on the automatic time stamp machine in the Issuing Office. Proposals received in the Purchasing Office after the date and hour designated are automatically disqualified and will not be considered. WSU is not responsible for delays in the delivery of mail by the U.P.S., postal service, private couriers, or the intra-university mail system. It is the sole responsibility of the proposer to insure that its proposal reaches the Purchasing Office by the designated date and hour.

4.8.5 Combined Proposals For.

RFP #701297 Multimedia Object Database  
RFP #701397 Image and Multimedia  

Note: PROPOSERS MUST RESPOND TO EACH REQUEST FOR PROPOSAL INDEPENDENTLY

- However, proposers are encouraged to offer incentive for award of both projects to one contractor.

- Such “alternate” proposals should be clearly marked as follows:

“Alternate: Combined Proposal for Award of RFP #701297 and #701397”

Alternate proposals shall be submitted with each individual RFP response. The same bidders’ list will be utilized for both projects. Any “alternate combined proposals” will be evaluated and given equal consideration.

Determination of proposal to be in the best interest of OhioLINK will be made solely by OhioLINK in conjunction with WSU.

4.9 SECTIONS TO BE INCLUDED IN VOLUME NUMBER 1

4.9.1 Vendor Identification Sheet (label as A)  
Copy and complete this identification sheet (see Appendix B).

4.9.2 Cover Letter (label as B)
A brief cover letter on vendor stationery must be included with the RFP response. It must (1) state that the RFP has been read and agreed to; (2) include all exceptions which the vendor wishes to note (see 4.3); and be signed by an individual authorized to negotiate with OhioLINK.

4.9.3 Vendor Response Forms (label as C)

(see Appendix C).

4.9.4 Vendor Implementation and Development Plan (label as D)

Provide a narrative description of how and in what time frame the responses to 5.9.3, Appendix C will be implemented and/or developed to effect a transition from OhioLINK’s current environment to the vendor’s proposed solution.

4.9.5 Cost Information (label as E)

Provide detailed prices and licensing terms for your proposal including all ongoing licensing fees through year 5 as detailed in Section 3.1.

4.9.6 Vendor Qualifications (label as F)

Provide required, verifiable evidence of the qualifications of the staff and organization as detailed in Section 2.12.
Appendix A-1  What is OhioLINK?
Appendix A-2

Information to be Stored / Managed with the DBMS

Description of OhioLINK Objects and Object Types

Most OhioLINK databases will be collections of objects with two types of attributes: the first is the multimedia content and the second type of attribute is descriptive information about the multimedia content. The latter type of attributes are often referred to as cataloging or metadata.

Thus, a digital image object as stored in a database by the DBMS might have attributes which are the textual representation of the name of the photographer of an image and an associated image file stored in a file system which is the image taken by the photographer. In some cases, the multimedia content may be stored internally within an object, instead of in a file in the file system. For example, while the original image taken by the photographer might be stored as a high resolution image in a distinct file, a thumbnail version of the image might be stored internally within the storage structure organized by the DBMS.

These objects will have specific behaviors or methods associated with them. The methods might be of many different kinds. Some methods will be the indexing mechanisms used to efficiently retrieve the objects from the database. Other methods might exist to transform objects, perhaps to change the format of an image file, calculate a value based on an object, or create a printed representation of the object.

Descriptive Attribute Characteristics

The standards for description of information content used in the library and data archive worlds typically specify the creation of collections of metadata attributes about content objects where:

1. metadata attributes may be repeated an indeterminate number of times, e.g. there might be any number of subject descriptors associated with an object.
2. individual attributes may be of an indeterminate length.
3. an ordered relationship may exist among attributes.

Content Attribute Characteristics

Accompanying the descriptive attributes will be specialized multimedia content. Examples of the types of content objects OhioLINK plans to store as well as the methods and access or indexing needs associated with these objects are given below.

For all OhioLINK multimedia types, the ability to associate methods with an object is expected to be independent of the storage location of the content. It is still desired that it be possible to perform methods on content whether stored in a record or in a file.

Type 1: Text

Several types of text will be acquired by OhioLINK. There may be ASCII text, PDF, or SGML. Multi-byte, UNICODE text may also be acquired. There will be large text files that need to be stored as a separate object/file. Much of the descriptive metadata about multimedia objects will also be text.
Full-text indexing of these items within the scope of the database is planned. Wherever text is stored, phrase and keyword searching will be implemented. Keyword searching of the textual components of database objects is expected to be the primary means by which OhioLINK users find multimedia content. Few functions or methods are currently planned for implementation with these text objects. One method may be the conversion of SGML to HTML.

**Type 2: Images**

OhioLINK is in the process of developing a statewide image database utility for all of its member institutions. This image database is expected to hold any conceivable type of image, e.g. x-rays or TIFF images. The variety of these types of databases is expected to require multiple image databases for different subject areas. It is also expected to cause the need for storage internal to the record of derivative versions of arcane format imagery, e.g. a GIF thumbnail version of a digitized photograph, as well as external storage of the image from which those derivative images are created.

Implementation of content-based image retrieval such as that created by Excalibur and Virage is planned. The methods or operations that OhioLINK will need to be able to perform on these images includes such functions as associating a digital watermark with an image, conversion of images from one file format to another, re-scaling of images, selection of a part of an image, and possibly other image processing routines.

**Type 3: Numeric Data**

Although much OhioLINK numerical data will map itself to the standard normalized relational data structure, some specialized numeric data file types are expected. Visualization is a method that is expected to be a general need for all numeric data types. Numerical databases will vary considerably in their format, some will be very wide with 1000+ attributes while others will be very long. OhioLINK's needs in this area are very much like other data warehouses. Bitmapped indexes and other specialized data warehouse retrieval methods are expected to be important for this content.

There are two specialized forms of numeric databases that will also be supported:

a. **Time Series**

OhioLINK will be acquiring economic and scientific data which represents time series. These will be accessed by searching for particular data value(s) for a given period or periods. There may be methods needed to perform various functions on these time series such as changing the period of the time series, or creating projections.

b. **Multidimensional Arrays**

Scientific data sets will be acquired which represent multidimensional numeric arrays. It is anticipated that the chief operations to be performed on these will include searching for specific values and selecting a one or two dimensional component of the total data.

**Type 4: Vector Data Structures**

Two or three dimensional content objects which are made up of points, lines, areas, surfaces, and potentially also associated information about their topology (the spatial
relationship of one geometric object to another), and that may have attributes associated with one of these geometric entities, are a part of OhioLINK information management plans. Specific plans and requirements exist for geographic data, but future storage of chemical structure data, CAD drawings, and other related objects can be anticipated. In general, as with numeric data, visualization is expected to be a problem for all forms of vector content. Another general problem with retrieval of objects or object components based on spatial queries.

a. Geographic Data

This is the data used to constitute a map: lines, areas, surfaces, etc. It is typically used with GIS (Geographic Information Systems) software, but may be managed within a DBMS. It is OhioLINK's plans to acquire this digital geographic data during the next year. The data will be provided in the form of ARC/INFO data files.

The interface between the WWW and DBMS storage is expected to be the ESRI (www.esri.com) Spatial Database Engine (SDE) and Arc/View Internet Map Server. To serve as the underpinnings of OhioLINK GIS data management, a DBMS must be compatible with the ESRI SDE, or the vendor must be able to propose an alternative solution which is similarly able to receive ARC/INFO or ARC/VIEW input. Nonetheless, there is a requirement for DBMS support of vector data types to support CAD drawings and other vector objects, besides GIS files.

Type 5: Streaming Video / Audio

It is anticipated that as network capacities increase to better support high quality video and audio transmissions, OhioLINK will begin to store and distribute this information. It is intended to that the DBMS will be used to manage this information as well. When audio and video access is deployed, video or audio searching facilities will also be used if available.

Predicted Sizes for Selected OhioLINK Databases

The following are some estimated sizes and numbers of multimedia objects for databases which may be developed by OhioLINK in the next few years.

1. Images*

For these images, it should be expected that every image will be accompanied by a 10 KB collection of textual information.

<table>
<thead>
<tr>
<th>Databases</th>
<th># of objects</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Art Works</td>
<td>100,000</td>
</tr>
<tr>
<td>2. Historical Photographs</td>
<td>100,000</td>
</tr>
<tr>
<td>3. Maps / Satellite Images</td>
<td>1000</td>
</tr>
<tr>
<td>4. Manuscripts / historic documents</td>
<td>100,000</td>
</tr>
<tr>
<td>5. Biology Specimens</td>
<td>100,000</td>
</tr>
<tr>
<td>6. Medical Specimens</td>
<td>1000</td>
</tr>
<tr>
<td>7. Geology Specimens</td>
<td>10,000</td>
</tr>
<tr>
<td>8. General Reports and Documents</td>
<td>100,000</td>
</tr>
</tbody>
</table>
This may be a database of images and also text produced by OCR.

9. Literary Documents 100,000

* - With the exception of satellite and map images (.5 GB / image), and the images of textual material (1 MB / image) most databases are expected to have images of around 5 MB in size.
2. **Numeric Data**

30 databases with objects varying between 125 bytes and 2000 bytes and between 1000 and 10 million objects. These databases will have objects with between 100 to 1000 attributes.

3. **Vector Data**

Ten databases most of approximately 1 GB in size, but with two databases up to at least 15 GB in size.
Appendix A-3 Transaction Characteristics

The following is a description of the transaction characteristics anticipated for OhioLINK databases. In addition, previous OhioLINK experience with the volume of and timing of queries for existing OhioLINK databases are described.

1. Updates

Updates to OhioLINK databases will be almost statistically insignificant compared to the volume of queries. In this way, what is being created is almost akin to a commercial data warehouse. When updates occur, several update scenarios can be anticipated: 1.) updates will be made on a batch basis, probably at night; 2.) selected individuals will type in individual database records; 3.) databases will be tied to a specific data collection which is acquired and converted into database form on a one-time basis and then is not revised or altered.

Update types 1 and 3 are expected to predominate. Only image databases are likely to be the subject of update type 2 and even those databases will experience significant batch updates. This traditional form of updating a database will involve selected imaging projects from whose staff one or two people will be selected whose responsibility will involve keying records and uploading images to create new image database entries.

2. Queries

The databases are expected to be used almost entirely for execution of user queries. Retrieval of information from OhioLINK databases is not expected to be characterized by any one type of query. OhioLINK users have made heaviest use of keyword full-text queries of other OhioLINK resources. Consequently, these type of queries are expect to predominate. Browsing of an index may follow an initial query of this type.

Past OhioLINK Experience with Query Volumes and Timing

It is anticipated that a successful multimedia program will probably be characterized by the same kind of volume and timing of user activity now experienced with OhioLINK citation databases. We routinely track weekly searches on all of our citation databases. Each count is a new search entry by a user. Subsequent limitations or movements through various summary or record screens are not included here. The charts A-7 tracks weekly search activity for all OhioLINK bibliographic citation databases.

We do not routinely track hourly search traffic. What data we have looked at indicates a strong and continuous plateau of use throughout the mid morning to mid-to-late afternoon, declining into the evening. In general, a peak day may be about 20% of the week and a peak hour about 12% of a day.

Our simultaneous user data is taken by regularly obtaining snapshots of VT-100 sessions on the machines. It is thus an approximation of peak usage only. Actual peaks are probably slightly higher. We do not have extensive histories.
Appendix A-4

Software Architectures for DBMS Access

The following is a description of the system architectures in which OhioLINK expects to implement its DBMS. It identifies the principle functions that need to be performed in relation to this content, the source of the software to be used to perform those functions, and the interconnections among this software. Two probable stages of architecture are outlined. The first is based on currently standard WWW software and ODBC connections to a DBMS, the latter is based on a CORBA / Java architecture. The timing of the transition to the new architecture is currently unknown.

Stage One Architecture: ODBC & the WWW

Chart A: The Basic Information Management Architecture

In this architecture, there are three principal components. First, there is the DBMS which is used for storage of information objects. Second, there are processing tools. These are the software used to convert information from one format to another, visualize data, apply digital watermarks to images, among other functions. Finally, there are also the interface programs that manage the interaction between the remote WWW browser user and the other software components.
 Interface Programs
These programs will connect to the DBMS and retrieve or add content. Each program is likely to be designed to meet the unique interface requirements of a particular type of information, e.g. geographic data or images. They will create the HTML documents needed for display or content or entry of a query. In addition, they will take charge of organizing and storing any user session information that is required for interaction with the DBMS. The interface programs may also directly connect to processing tools. Some tools will be implemented external to the DBMS and so the interface programs will need to communicate with them to organize performance of selected processing tasks.

OhioLINK anticipates that these interface programs will interact with the WWW server either through the use of a CGI script or a server API, e.g. Netscape's NSAPI. The interface programs will initially access DBMS functions through an ODBC interface. OhioLINK is issuing an RFP for an imaging interface simultaneously with this DBMS RFP.

Processing Tools
Although as has been noted, these will sometimes be directly accessed through interface programs, the principal location for use of this functionality will be within the DBMS. Rather than OhioLINK write software which implements the methods which are associated with a particular object, OhioLINK would prefer to link commercial software packages that perform specialized functions into the DBMS. These software packages may be programming libraries, software programs with formal APIs, or software programs which can be operated in batch or command line modes.

DBMS
The DBMS provides the locus for the storage of information objects and the implementation of their methods. It provides both standard relational database query and retrieval functionality as well as special indexing based on unique forms of content. The DBMS will implement an ODBC interface that will permit another software provider of the interface program to write a WWW user interface for the database.

Stage Two: JAVA / CORBA Integration of Information Resources
Simultaneous to the development of the interface programs for individual types of DBMS content, it is expected that OhioLINK will begin to move toward development of a CORBA-based integrating framework for its information resources, both those in the DBMS and in other systems.

OhioLINK will acquire a CORBA 2.0 compliant ORB. It will also develop a framework for integration of multiple information resources. Multiple ORBs will be deployed. Java versions of an ORB will be downloaded to the user's desktop. There will also be ORBs on OhioLINK servers with which these Java ORBs will communicate.

The types of database query and retrieval functions provided by the older architecture will be re-implemented through the use of Object Query and Object Collection services.

In this environment, it is also expected that there will be a new function for a DBMS. It will become a means for implementing the Object Persistence Service. A DBMS will be needed to provide a mechanism for persistent storage and caching of search results and information objects on servers or desktops at OhioLINK member institutions. The use of a JAVA implementation of a DBMS will be used to create this persistent store. It is expected that for these user selected information objects the same interfaces and
interfaces capabilities will need to be provided as are provided for other content stored on OhioLINK’s servers.

Chart B: Shifting Implementation of Methods in a CORBA Environment

In this new environment, the ORB becomes the mechanism for linking the user or processing tools with the DBMS. In this new architecture, the software previously providing the user interface is expected to become transformed into a layer of software which implements display methods for stored objects, and into some part of the code which forms the interface between the user and the ORB services.
Appendix A-5  OhioLINK / OSC Deployment Environment

Description of the Components of the OhioLINK/OSC Facility

The OhioLINK/ OSC facility includes the following components.

**OSC/OhioLINK Facility**

![Diagram of the OSC/OhioLINK Facility]

**Cray J90 Fileserver**

Provides powerful, high speed connections to attached disk arrays and the tape silo system. It also provides the CPU capacity needed to support the GigaRing.

**GigaRing**

The scaleable GigaRing channel, is a channel that provides high-bandwidth connections to a wide array of I/O nodes, including network, disk and tape nodes. GigaRing supports the most widely used industry-standard networking protocols, including HIPPI, FDDI, Ethernet, and ATM. The GigaRing also allows connectivity to a variety of disk and tape products through industry-standard interfaces.

This equipment will provide OhioLINK with a high speed dedicated channel (more than 1 Gb/s) for transmission of data between storage devices, OhioLINK servers, and the Internet.
DCE / DFS Environment

This is the Distributed Computing Environment (DCE) and the Distributed File System (DFS) created by the OSF/XOpen Group. These are an industry-standard, open set of technologies and specifications which provide for distributed access to files in a secure environment.

Disk Arrays

These are RAID and non-RAID magnetic disk devices attached to the Cray J-90 fileserver and OhioLINK servers.

IBM Tape Silo

This is a robotic tape silo system capable of storing approximately 19 Terabytes per silo cabinet. Each cabinet can have up to four tape drives. The silo supports use of Magstar magnetic tapes. It provides a capacity for duplication of tapes for offsite storage. The silo system also provides an error checking capacity that will automatically check tapes for wear and data errors, transferring data to new tapes when required.

OhioLINK Server Cluster

This is one or more OhioLINK servers. These servers may or may not be operated as a cluster. They provide the location for operation of OhioLINK software and have a connected disk array. Software on these clusters may include database management systems, middleware, and other tools for information processing and communication. No brand of server has yet been selected.

Databases

These are an unspecified number of databases of OhioLINK information. The databases may be made up of records with integral storage of metadata and data or pointers to data stored in files in the OSC filesystem.

Hierarchical File System (see diagram below)

This is an implementation of a hierarchical file system. It migrates files from the OhioLINK server cluster to the Cray fileserver and nearline storage in the tape silo depending on the usage of the files. Policies can be set to determine the frequency of use that determines file migration. The system used will not use a proprietary file system for storage of information on the media which it manages. Files maintain their same name despite migration. Current plans are to use the Cray/SGI DMF hierarchical file system.
OSC/OhioLINK Logical Facility Diagram

- OSC Hierarchical File System
- OhioLINK Server Storage
- Cray Disk Array
- Tape Silo
- Offline Tape

Migration of seldom used files
DFS or NFS
Migration of frequently used files

OhioLINK Server Cluster
VENDOR NAME:

VENDOR ADDRESS:

The complete RFP response must have the following sections clearly labeled and organized according to the instructions in Section 5 and on this sheet.

Please indicate that the following have been included and sign the bottom of this form.

A. Vendor Identification Sheet
   This sheet, labeled A.

B. Cover Letter
   Signed letter, labeled B (See Section 4.9.2)

C. Vendor Response Forms
   Labeled C (See Section 4.9.3 & Appendix C)

D. Vendor Implementation and Development Plan
   Labeled D, includes all responses to 4.9.3 & Appendix C

E. COST Information
   COST sheets, labeled E (See Section 4.9.5)

F. Vendor Qualifications
   Labeled F (See Section 4.9.6)

I certify that all of the above items have been submitted with this RFP response.

Signed: ____________________________  Date: ____________________________
APPENDIX C
VENDOR RESPONSE FORMS
INSTRUCTIONS FOR COMPLETING THE VENDOR RESPONSE FORMS

Answers are required for specifications listed in section 2. Vendor will complete the following response form for each item and provide corresponding commentary as noted below.

1. STATUS RESPONSES

These require the use of the following codes:

A = AVAILABLE

  Definition: Vendor can currently meet this requirement.

PA = PARTIALLY AVAILABLE

  Definition: The Vendor can meet the requirement partially or with a slight variation or has plans to implement in the near future. Please specify any variance from the requirement.

NA = NOT AVAILABLE

  Definition: The Vendor can not meet this requirement.

2. COMMENTARY

Comments or explanations to any responses must be numbered to correspond to the specification or section to which it refers and presented in numerical order.

Comments and explanations are required for all Sections marked M, HD, or D.
APPENDIX C
VENDOR RESPONSE FORMS

This form must be completed indicating for those RFP sections listed the vendor's status (A = Available, PA = Partially Available, and NA = Not Available). In all cases, the vendor should include comments to provide maximum clarification of function, delivery, cost or timing.

Requirements in each section are noted as informational (I); must (M), a mandatory requirement; or as highly desired (HD); or desired (D).

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<th>Required Status</th>
<th>Status Response</th>
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<td>(A  PA  NA)</td>
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2.5.3.1 M
2.5.3.2 M
2.5.3.3 D
2.5.4 M
2.5.5 HD

2.6
2.6.1 M
2.6.2 M
2.6.3 M
2.6.4 M
2.6.5 M

2.7
2.7.1 M
2.7.2 M
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2.7.4 M
2.7.5 M
2.7.6 M
2.7.7 M

2.8
2.8.1 M
2.8.2 HD

2.9
2.9.1 M
2.9.2 HD

RESPONSES TO SECTION 2.10 ARE TO BE INCLUDED IN RESPONSE SEPARATELY - SEE SECTION 4.9.6 AND APPENDIX B FOR INSTRUCTIONS

2.10.1 M
2.10.2 M
2.10.3 M
2.10.4 M