Technical Applications Development Strategy
Status Report Number 3

Submitted By
Pacific States Marine Fisheries Commission

April 2, 1997

Table of Contents

Introduction

In July of 1996, PSMFC received approval from the BPA project COTR to proceed with a strategy outlined in a paper titled 'Draft Technical Applications Development Strategy And Implementation Plan To Provide Platform Independent Access To StreamNet Data Products Through The World Wide Web (WWW) Service Of The Internet.'

The Technical Applications Strategy was divided into four phases:

1. Tabular data query system development,
2. Spatial data query system development,
3. Evaluation, recommendations, and purchase, and
4. Port all data, transfer all functions to new system

Phase I involved the development and implementation of an on-line query system for delivering StreamNet tabular data via the Internet. The prototype product for phase I was completed in August 1996. Following review, the product was incorporated into the StreamNet home page. The tabular data query system has been fully operational since that time. Several technical enhancements have been made to the system and new datasets have been incorporated as these became available.

Phase II involved a two-pronged evaluation of alternative means for managing and delivering spatial data via the Internet. BPA was a participant in phase II and produced a prototype query system using Arc-Info software. This product is currently available via the StreamNet and the BPA Environment home pages. The other alternative was originally planned as an evaluation of ESRI Spatial Data Engine (SDE) software. Based on preliminary investigations the decision was made to focus the evaluation on ESRI's Map Objects (MO) software rather than the SDE. To evaluate MO, StreamNet's programmer obtained a beta version of MO from BPA. StreamNet's programmer also attended an ERSI MO training course and conferred with both ESRI technical support personnel in Olympia and BPA staff with experience in MO. MO was then subjected to in-house testing. Based on this testing it was determined that MO is a viable alternative for providing ad hoc Internet mapping capability.

This paper is the third status report to be prepared during the execution of the Technical Applications Strategy. It presents finding as per Phase III of the Strategy. The reader is referred to status reports 1 and 2 for additional information regarding earlier phases of the investigation.

Phase III Update

PHASE III of the technical applications strategy reads '*Based on the experience acquired, function and performance evaluations, and recommendations developed during phases I and II of this proposal, make final recommendations for software/hardware environment for the StreamNet project. Purchase and install appropriate hardware and software based on*

recommendations.' Task 1 of this phase reads '*Produce detailed report describing outcome of Phases I and II of this proposal. Report will describe results of the various prototyping efforts, pros and cons of various approaches, and make final recommendations for software and hardware environment for the StreamNet project.'* Task 2 of Phase 3 is the purchase and installation of recommended hardware and software.

The remainder of this paper will serve as both the report describing the outcomes of Phases I and II and the recommendations for proceeding with hardware and software acquisition.

Overall Strategy Summary

There are several major components involved in the deployment of an interactive world wide web (WWW) set on the Internet that we have been exploring and prototyping. The chief requirements for the StreamNet application involve the delivery of data and cartographic products through an interactive, ad-hoc query system. The basic hardware components of the system are shown in figure 1. The key unknown to us at the beginning of this process was the delivery of ad-hoc mapping functions on the WWW. After many discussions, application prototyping, and application training, we are recommending the use of ESRI's Map Objects (MO) as the key tool to deliver ad hoc mapping (as opposed to ArcInfo and AML's). This decision is a sound one in terms of our application requirements (speed, multiple users, etc.). More importantly, MO integrates more seamlessly into our overall data management strategy. By using an MO application, we can provide mapping capabilities in conjunction with all of the stream based data in StreamNet, not just spatial coverages like species distribution. For data management purposes we concluded that it was essential to separate the data in StreamNet from the spatial or cartographic components used in generating maps and that, in this regard, the MO solution was clearly superior.

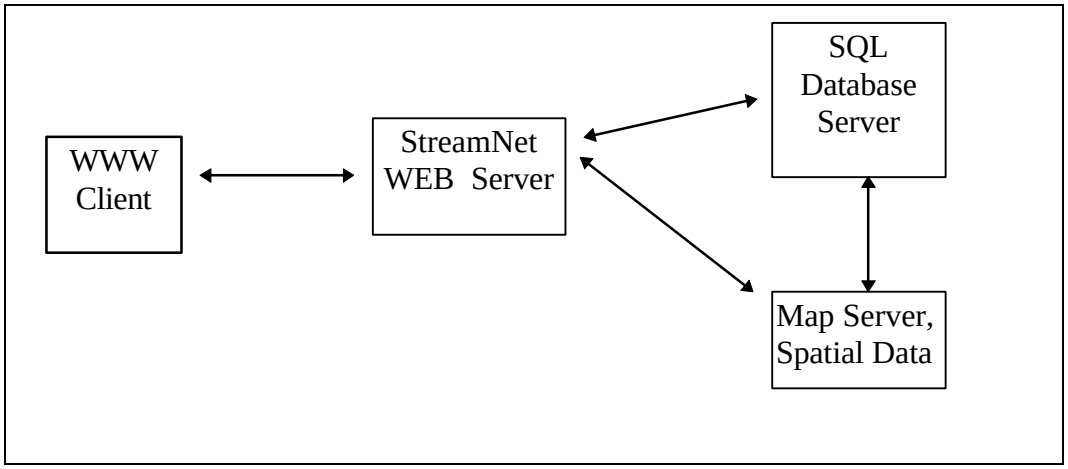

Figure 1. Basic components of WWW interactive, ad-hoc, data and map provider.

. Our choice of MO does not preclude BPA's continued development of the ArcInfo-based delivery system for use in its corporate GIS system. Nor does it preclude use of the BPA-developed ArcInfo system for future StreamNet applications. Continued development of both systems will serve the interests of both BPA and StreamNet as there are certain to be opportunities to share experiences and coding as our involvement in delivery of spatial data evolves.

Since the inception of our technical application strategy in July 1996 our knowledge of what it will take to create a fully functional system has increased dramatically. Furthermore, the software and hardware available to perform these functions has also changed, with every indication that it will continue to do so. Rather than try and fit this proposal into the context of our original strategy we are proposing to lay out the complete system design and our rationale for the design chosen. We have not performed an exhaustive systems analysis of every possible permutation of hardware and software. We feel that such an analysis would take an undue amount of time and would not generate enough new or valuable information to be warranted. We have explored in detail the major options available to us and are prepared to submit substantive recommendations and provide rationale for the following components:

- Web Server
- SQL Server
- Map Server

We have chosen the so called 'Wintel' (Windows, Intel) combination of products as the foundation for our application. There are several rationale for this including application requirements, ease of use and administration, and price/performance ratios. All of our recommendations include the use of Windows NT 4.0 operating system. NT 4.0 is a robust, scaleable operating system which continues to prove itself in the industry. Further, with recent advancements in SQL technology, the concern for compatibility among computer systems (in this case between PSMFC and BPA) is no longer a significant issue. NT systems using SQL can interact with UNIX systems and visa versa.

We did consider a system that would involve both NT and UNIX components, more specifically a UNIX SQL server and NT Web and Map servers. This was rejected as being overly complex while providing few advantages.

The remainder of this paper will be devoted to more detailed explanations of the 3 major platforms required for this applications, the web server, the sql server, and the map server.

Component: Web Server

Recommendation:

- **Hardware -** Four processor capable 200mz Pentium Pro (2 installed), with 256mg RAM, and a 3, 4gb RAID system.
- **Operating System** - MS NT 4.0 server
- **Software -** Microsoft Internet Information Server, 3.0, application tools (yet to be determined), ESRI's Map Objects Developer's Kit

Rationale:

The Web server component of our strategy is key in the delivery of both tabular and map products to the WWW. Our choice was largely driven by our selection of ESRI's Map Objects (MO) developer's tools for use in the development and implementation of the map application. MO is a set of developer's tools that can only be compiled into programs running on a Windows platform. The MO application requires an ISAPI or NSAPI compliant Web server of which there are only 2 presently -Microsoft's Internet Information Server (IIS) and Netscape Navigator. We felt that the integration of IIS into the NT operating system and also some potential integration to the SQL server were significant enough to warrant it's selection.

This system will be scaleable, allowing for the addition of 1 or 2 more processors and more memory if and when these are warranted. Total system cost, including hardware and software, will be approximately $28,000 (see system and budget details below in appendix A).

Component: SQL Server

Recommendation:

- **Hardware -** Four processor capable 200mz Pentium Pro (2 installed), with 256mg RAM, and a 3, 9gb RAID system.
- **Operating System** - MS NT 4.0 workstation
- **Software -** Microsoft SQL server 6.5 5 user license, SQL server Internet deployment license

Rationale:

Our decisions on the SQL server component of our strategy was not as clear-cut as for the web server. Our current web application utilizes an Ingres SQL installation running on a Sun Sparc machine (we are sharing the CWT installation). The on-line database is really only a 'copy' of the production database (currently managed in Microsoft Access) and the maintenance of the 2 systems has been difficult. Furthermore, performance of the Ingres platform has not been as good as expected and some notable features are missing in the Ingres software. Therefore, using the Ingres installation was viewed as only a stop gap measure while we developed our long term strategy.

We have evaluated two major products available for the NT platform - MS SQL Server and Oracle 7.3 Workstation Server. Based on this evaluation we have concluded that either

platform could serve the needs of our web site. Based on pricing differences (which are significant), ease of use, administration, startup times, and integration with the other components in our strategy, we have selected MS SQL server 6.5 as our server software.

This system will also be scaleable with the addition of 1 or 2 more processors and more memory. Total system cost, including hardware and software, will be approximately $23,000 (see system and budget details below in appendix A).

Component: Map Server

Recommendation:

- **Hardware -** Two processor capable 200mz Pentium Pro (2 installed), with 128mg RAM, 2 - 2gb and 1 - 9gb harddrives.
- **Operating System** - MS NT 4.0 server
- **Software -** ESRI's Internet Map Server for Map Objects (included with MO Developer's kit listed above)

Rationale:

Originally we had planned to house both the Web and Map tasks on one server. However, our consultations with ESRI and with users of similar systems have led us to conclude that there are significant administrative and performance advantages to separating these functions - hence, our decision to recommend a separate Map server.

The rationale for choosing ESRI's Map Objects was explained above. The Internet Map Server for Map Objects is the DLL which allows a MO application to deliver data to the web.

This system will be scaleable with the addition of more memory if necessary. Total system cost will be approximately $12,000 (see system and budget details below in appendix A).

Summary

We believe this proposal will result in a robust, fully featured web site capable of delivering ad-hoc data and mapping requests of StreamNet's data over the WWW. The system will be a high performance one which will be scaleable for future needs. Furthermore, the system will be extremely cost effective, both in terms of capital costs (entire system for approximately $63,000), and in terms of staffing needed to support such a complex application.

Appendix A. Detailed System Descriptions and Budget (modified 4/28/97*)

Component	Hardware	Cost	Software	Cost	
WEB SERVER	ALR Revolution Quad6 (4 Processor capable Pentium Pro (512K cache)	$16,569	MS Internet Information Server	$0	
	Redundant Power Supply		MO Developer's kit	$7,495	
	2 Processors Installed		Microsoft Visual Studio Enterprise 97	$1,395	
	16X SCSI CD-ROM		Borland Delphi Developer 2.0	$550	
	3 channel PCI Ultra RAID Controller with 16mb cache		Backup Software	$1,000	
	256 mb RAM				
	3, 4gb Ultrawide SCSI drives				
	Ethernet Pro 100 PCI Ethernet Adapter				
	1.44mb floppy drive				
	Keyboard, mouse				
	2 mb video card				
	15" monitor				
	MS NT 4.0 Server				
Subtotal		**$16,569**		**$10,440**	**$27,009**
SQL SERVER	ALR Revolution Quad6 (4 Processor capable Pentium Pro (512K cache)	$18,169	MS SQl Server 5 user, with documentation	$1,399	
	Redundant Power Supply		InterNet Deployment License	$2,800	
	2 Processors Installed				
	16X SCSI CD-ROM				
	3 channel PCI Ultra RAID Controller with 16mb cache				
	256 mb RAM				
	3, 9gb Ultrawide SCSI drives				
	Ethernet Pro 100 PCI Ethernet Adapter				
	1.44mb floppy drive				
	Keyboard, mouse				
	2 mb video card				
	15" monitor				
	MS NT 4.0 Server				
Subtotal		**$18,169**		**$4,199**	**$22,368**

MAP SERVER	ALR Revolution Quad6 (4 Processor capable Pentium Pro (512K cache)	$18,169	ESRI's Internet Map Server for MO (included with MO Developer's Kit)	$0	
	Redundant Power Supply				
	2 Processors Installed				
	16X SCSI CD-ROM				
	3 channel PCI Ultra RAID Controller with 16mb cache				
	256 mb RAM				
	3, 9gb Ultrawide SCSI drives				
	Ethernet Pro 100 PCI Ethernet Adapter				
	1.44mb floppy drive				
	Keyboard, mouse				
	2 mb video card				
	15" monitor				
	MS NT 4.0 Server				
Subtotal		**$18,169**		**$0**	**$18,169**
Grand Total		**$52,907**		**$14,639**	**$67,546**

*Total system price includes approximately $4,500 in contributed funding from non-BPA source.