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THE ALASKA EXPERIENCE

Douglas L. Mutter (Chief - Coordination of Technology Applications-
Alaska Department of Natural Resources -
Anchorage, AK)

Introduction

The Alaska Department of Natural Resources (DNR), is the third largest land management agency in the country and eventually will be directly responsible for 104 million acres of state land - an area about the size of California. DNR manages land, water, forests, grasslands, oil, gas, energy and hardrock minerals, parks, agriculture and related resource development activities. DNR is mandated by the legislature to offer 100,000 acres of state for disposal land. The department selects lands entitled to the state by the Statehood Act. It leases major oil/gas areas such as Prudhoe Bay, maintains surveillance over energy pipeline construction and operation and is developing large new agricultural resources. DNR operates one of the largest state park systems in the nation. DNR's jurisdiction in some areas, such as water resources and land recording, extends over the total 367 million acres of Alaska.

The amount of information it requires to manage these resources and to meet the mandates given DNR by the legislature and public, are significant. For example, there are currently over 200,000 case files, 3,000 active land lease applications, a backlog of 2,000 water use applications, over 10,000 mining case applications per year. Numerous other sales, leases, permits and activities are generating vast amounts of information and data that is required by decision makers and the public on a daily basis. Almost all information handling capabilities are backlogged at DNR at this time and are worsening each day.

In 1978, the Commissioner of DNR established the Alaska Land & Resources System (ALARS). The purpose of this project is to coordinate data processing activities within the department, establish a capital development program for automating information management and to better organize the way in which information is handled. From the beginning, the ALARS project has been as much an effort to provide an efficient and coordinated approach to data management as it has been to provide for the development of programs and the acquisition of computer hardware. Prior to receiving any funding for the project, DNR conducted a user needs survey, produced an analysis of existing systems, developed a conceptual design and established a first year workplan. These activities were completed in June, 1979 at the time the state legislature approved the first year's capital budget of \$ 1.7 million for implementing ALARS. A second year of capital funding at \$ 2.2 million has been secured and a proposal is before the

legislature for a 3rd year at the same funding level. In the meantime, the department has begun to develop a permanent support capability with an operating budget, permanent staff and a statewide terminal network.

The ALARS conceptual design focused implementation efforts into 3 areas of responsibility —

- 1 Land Administration
- 2 Resource Management
- 3 Departmental Management

These areas have been translated into an ALARS approach which includes the development of land activity based application systems, the use of data base management technology, the establishment of network resources and coordinating through the centralized ALARS staff and the acquisition of a geoprocessing capability. We have attempted to include user involvement at key points, to use the state's centralized data processing services and to acquire currently operating systems whenever they meet our needs to save time and money.

The land administration system is being constructed to manage land records, accounting, case tracking, etc., on the state's IBM 370/148. It will be accessible via a statewide telecommunications network. Land status graphics information will be produced and disseminated through microfilm aperture cards. DNR is now looking into the possibility of obtaining an automated drafting system to help speed the drafting of status plates and for producing COM for distribution. The resource information system will be a series of systems each built for specific purposes such as forest inventory, resource inventory, geological inventory, as well as generalized statewide data to be widely available over the terminal network. The ALARS staff will interrelate and integrate these activities as much as possible, while at the same time, meeting specific user needs. The general resource information system will relate computer mapping tabular land records information.

The Geoprocessor Decision

A major component of the resource information system element of ALARS is the geoprocessor (geographic information processor). This was identified through the user needs survey and in the conceptual design as a key system need. As the ALARS project has been unfolding, DNR has continued its efforts of statewide resource planning, regional planning and detailed site planning for land disposals, timber sales, agricultural projects, etc. At the same time, broad statewide policy research activities are being undertaken. All of these efforts could potentially benefit from computer mapping/geographic data manipulation capability.

The ALARS staff undertook extensive review of systems that could meet this geoprocessing need. This effort included visiting operational systems, attending meetings and conferences and reviewing numerous publications that compared systems. Based on the user survey, the ALARS staff review and discussions with system users elsewhere, a set of specific needs was developed which led to the creation of a request for proposals (RFP).

Procurement Process

Early in his administration, Governor Hammond issued an executive order prohibiting the development of numerous state computer data centers. Instead, he wished to develop centralized data processing functions at the two Division of Data Processing data centers in Juneau and Anchorage. The requirement for a geoprocessing capability, however, was considered to be specialized, and since the computer would be dedicated to geographic information analysis, it was approved for acquisition by DNR by the state administration. It is state policy that any contract over \$ 20,000 must be bid upon through competitive process based upon the RFP.

The RFP issued included some background on the project and outlined specific capabilities DNR needed for geoprocessing. Several broad functions were identified for the geoprocessor —

- Data Entry & Storage
- Data Retrieval
- Data Manipulation
- Alternative Testing
- Modeling
- Data Display
- Statistical Analysis
- Numerical Analysis

The specific planning and management uses were identified and included such things as map generation, integration of Landsat data and so forth. Functional requirements were identified including interactive digitizing (1 Station), interactive display and manipulation of a set of 3,000 polygons, polygon overlay and plotting. In order to plan for future integration, it was also a requirement that the geoprocessor be capable of communicating in some manner with the IBM 370 series computers.

Specific vendor proposal instructions were included in the RFP and specific evaluation criteria were listed. Part of the proposal evaluation process was a site survey. This involved a telephone survey of two sites

currently utilizing the proposed system. The sites were to be similar in nature to DNR's activities and situation. The objective of this requirement was to evaluate the performance of the vendor system in an operating environment similar to the one in Alaska.

The evaluation procedure for written proposals concentrated on an analysis of system functions, maintenance, equipment specifications and delivery date as specified in the RFP. Proposals that successfully passed the first review went into the site evaluation phase. Cost was evaluated during the process. Certain point values were allowed for the degree of satisfaction on each of these evaluation criteria. The vendor with the highest score, would be selected.

The list of system functions outlined in the RFP was identified as being mandatory, desirable or optional. The functions were specific in the area of data capture, data editing, data organization, data retrieval and display, software (analytic) capabilities and hardware/operating system features. Maintenance for the CPU, peripherals, and software was a factor that was specifically discussed in the proposal and considered to be an important evaluation criterion. It was required that none of the hardware be modified. The RFP ended with a list of general performance characteristics of the equipment that covered the digitizer, CRT display (graphic/alphanumeric), the central processor and the output systems. The delivery date was to be within 3 months of the award of the contract. A vendor list of some 39 companies was compiled and the RFP was sent to them. DNR received 4 serious responses. A final vendor was selected, that vendor being COMARC Design Systems of San Francisco.

A contract was signed which included specifications for such items as user and technician training at DNR, system installation documentation, hardware, software, maintenance, warranty, pricing, availability of source code, the acceptance test and a request for certain enhancements that were not available as standard components.

It may be apparent from the preceding that DNR was interested in obtaining a "turnkey" system. We asked for an integrated, operational turnkey system, the ability to interface with IBM 370 series computers, a flexible and expandable equipment configuration, interactive display, the ability to build a statewide geocoded data file for natural resource data, and that the system be minicomputer based. The intent was to quickly bring on line, an operational system.

The System

The initially purchased equipment included the following components —

- Talos BL660B backlighted 44 inch x 60 inch digitizer
- Two Tektronix 4014 graphic CRTs
- Tektronix 4631 CRT image hardcopy unit
- Data General Dasher 6053 alphanumeric CRT
- Data General S250 processor with 512K Bytes of memory
- Data General Dasher 6040 system console
- Data General 190 MB disc 6061
- Data General 6062 9 Track magnetic tape drive
- Zeta 3653SX 34 inch plotter
- Data General 4218 line printer
- Data General 34 inch chassis with line multiplexor for Communications
- An AOS RCX 70 IBM 3270 system emulator

Various software components included scaling and coordinate conversion, data manipulation and display for polygons, grids, lines and points, Fortran 5, sort/merge, editor and digitizing software.

Technical and user-oriented training, of approximately 4 weeks duration was provided as part of the contract and was invaluable in assuring a quick start up for operational projects. Subsequently, the system has grown in use and major enhancements have occurred in software development and hardware acquisition. Additional hardware was purchased as follows —

- Another 190 MB Data General 6061 disc
- An additional 36 x 48 inch Talos 648B digitizer
- Two additional alphanumeric Dashers (6108)
- An additional 512KB of memory

The State's Department of Fish & Game has been working with ALARS staff to develop an auxiliary station in its department that will communicate with the centralized geoprocessor. An RJE capability for the IBM is being established. Other divisions within DNR are now being considered for remote data entry and display stations. We are in the process of obtaining additional geoprocessing software to further enhance DNR's geoprocessing capabilities. Major upgrades in the area of attribute handling have occurred and an interface established with USGS IDEMS.

The initial cost of the system including hardware, software, documentation, installation, training, etc., was \$ 300,000. The system was delivered and installed during December, 1979 and January 1980. An additional \$ 80,000 to \$ 100,000 has been spent since that time on enhancements and upgrades. Current staff support for the geoprocessor includes two Systems Analysts, a Programmer, a Data Control Specialist and 4 permanent Digitizers. Additional digitizing support is obtained through a college internship program. Applications and user assistance is the responsibility of three planners.

Considerations

The experience of preparing for, acquiring and operating a geoprocessing system has provided a perspective on several important considerations. Paramount among these, is to examine the current state policy on acquiring such a system and ensure that all procedures are followed and the appropriate officials spoken to in order to facilitate acquiring a computer system. Another consideration of course, is budget. The amount of money available to spend may determine whether or not a system is to be purchased or otherwise phased into operation. In Alaska, a key consideration has been the availability and cost of maintenance service for software and hardware. Without adequate support, one may end up with an expensive dust gatherer. The purchasing agency must have a commitment to continuing an operational system.

The location of the system is important to a state agency as diverse and scattered as is Alaska's DNR. For example, DNR has six different office locations in Anchorage alone. Installation is a factor to be considered. Certainly, part of the contract with the vendor should be to provide for adequate installation and acceptance testing of the system. Initial staff training is crucial. It is important to insure that staff is available to support the system and that they are trained in all aspects of its operation. User training should not be overlooked if the system is to be more than a "toy" for the programmers. Finally, delivery date is an item to consider. The urgency of an agency's need for a system will be an important determinant in the type of system acquired.

Several factors comprise the "untold story" of obtaining a geoprocessing system. Consider the following —

- Security — How will licensed documentation and sensitive data be stored?
- Standards/Procedures — The new geoprocessing center must have standards and procedures for operating the new system, user access, project control, etc.

- Training — Training is a continuing process for both operator and user. For example, DNR has put in more than 45 man weeks on operating staff training and some 900 man weeks of user seminars and training sessions in the past year.
- Environment — Preparing the room with proper power, air conditioning, humidification, static prevention, space, is important.
- Contract Negotiations — There are fine points in negotiating a contract for a GIS which should be discussed by the purchasing staff well before the contract negotiating phase.
- Starter Supplies — Obtaining extra paper, digitizing cursor, plotting pens, ribbon, etc., is something not to be overlooked if you expect to go into immediate operation.
- Support Staff — Being able to create positions and hire staff is sometimes a difficult aspect of state or federal governments. Staff should be hired well in advance of expected system delivery.

Summary

In summary, the events that led to establishment of the geoprocessor at DNR follow. The ALARS mandate was issued and a capital budget request made in the fall of 1978. The conceptual design and work plan was developed and presented in the Spring of 1979. An RFP was prepared and released in the Summer of 1979. The contract was developed and signed with the vendor in the Fall of 1979 and delivery of the system was made in December 1979. The system began operating in January, 1980 and a demonstration to the state legislature was made in February, 1980. There have been approximately 50 projects since that time with several enhancements over the past year. A major upgrade was made during Winter, 1980-1981. Early in 1981, the Department of Fish & Game obtained a remote unit to tie into the system at DNR. We are now considering the acquisition of an automated drafting system and an additional system for handling seismic data - both of which may tie into the geoprocessor.

DNR's geoprocessing system has been a highly successful segment of the ALARS project. No practice demonstration projects were done on the geoprocessor, it was delivered and began producing real management information within 2 months of delivery. It has been used for numerous major and minor projects ranging from site planning, subdivision layout, viewshed analysis, corridor analysis, subsurface analysis, management planning, timber harvest planning, to land status mapping. The system will continue to evolve and grow and become a major tool in the management of Alaska's resources.