



04391  
Telecommunications  
Equipment

LAW ENFORCEMENT ASSISTANCE ADMINISTRATION (LEAA)

POLICE TECHNICAL ASSISTANCE REPORT

SUBJECT

Determination of Criminal Justice  
Telecommunications Requirements,  
Equipment Specifications, and an RFP  
for a Communications Switcher

REPORT NUMBER

77-097-178

FOR

State of Nevada  
Population 583,653 (1974 est.)  
Square Mile Area 110,540

NCJRS

JUN 9 1978

ACQUISITIONS

CONTRACTOR

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CONTRACT NUMBER

J-LEAA-002-76

DATE

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## I. INTRODUCTION

This brief review of requirements, specifications, and the Request for Proposals (RFP) for an intrastate criminal justice communications switcher was done in response to a request for technical assistance from the State of Nevada.

The consultant assigned to this project was Mr. Robert L. Sohn, and other personnel involved were:

Requesting Agency: Mr. James A. Barrett, Director  
Commission on Crime, Delinquency, and Corrections  
Carson City, Nevada

Approving Agency: Mr. Art Fuldner  
Communications Specialist  
National Criminal Justice Information and  
Statistics Service  
Law Enforcement Assistance Administration

Mr. Robert O. Heck  
Police Specialist  
LEAA Office of Regional Operations

During an on-site visit to Reno on December 18, 1977, switcher procurement was discussed with the following members of the state's Technical Subcommittee for Informations Systems:

Sgt. Robert Thimsen, Chairman  
Las Vegas Metro Police Department

Mr. Jack McNutt  
Nevada Commission on Crime, Delinquency, and  
Corrections

Mr. Stan Borek  
Washoe County Sheriff's Office

Mr. William L. Neitsch  
Clark County Data Processing

Mr. James A. Barrett

Mr. John Kelly  
Communications Division  
City of Reno

This meeting was most helpful in delineating the existing and proposed networks and traffic volumes. The following items were obtained either during the visit and during subsequent contacts with various members of the Commission and the Technical Subcommittee:

1. RFP for the Purchase of a Message Switching System, dated December 1977.
2. RFP for Lease or Purchase Computer Systems and Services, dated December 1, 1977.
3. Addendum to the Minutes of the September 30, 1977, meeting of the (Technical) Subcommittee, held in Reno, Nevada.
4. Notes re Estimated Charges for New Message Switcher Circuits, August 16, 1977.

Based on the traffic estimates presented in item 1, a throughput analysis was performed to determine the switcher response time required to handle peak loads within an acceptable utilization factor. This analysis is discussed below, under B. Switcher Throughput.

The current switcher RFP was reviewed in detail. Some difficulty was experienced with the format of the RFP in that a consistent approach was not followed; i.e., functional requirements were given in some instances and hardware specifications in others. Since complete rewrite was not possible in the time available, detailed comments on the existing RFP were provided. Consultant observations on the RFP are summarized in C. Review of RFP.

A cost estimate was made for a switcher of the type specified in the RFP to determine if adequate resources are available for the procurement; it is summarized under D. Cost Estimate. Comments on operational costs are also given below.

## II. ANALYSIS OF THE PROBLEM

### A. Traffic Loads

The estimated traffic loads for the switcher given in the RFP (item 1) were not verified but appear to be reasonable, with one or two exceptions. Specifically, NCIC traffic, which is estimated at 6,568 messages per day (plus an equal number of responses), is relatively high compared to national averages. A reasonable volume of traffic would be 500 per 1,000 population per year, or not over 1,000 messages per day. The large number of mobile digital terminals used by the Las Vegas Metropolitan Police Department account for much of the estimate, but the overall level seems high.

Conversely, traffic to DMV is relatively low compared to the NCIC rate. DMV currently charges 14 cents per query. If the charge were reduced or dropped as DMV becomes fully automated, DMV traffic could increase markedly. Hence, the proposed circuit loadings assume a continued policy of service charges by DMV.

### B. Switcher Throughput

A daily average switcher transaction volume of 32,900 was estimated for the new system. This estimate includes anticipated increases in traffic due to DMV access, enhanced NCIC access, and other increases. The design should maintain switcher utilization at 0.7 or less at peak traffic loads (estimated at twice the average), in order to statistically minimize input queue overload probabilities.

Thus using the equation:

$$RHO = E(n) * E(ts)$$

where

$RHO$  = System utilization

$E(n)$  = transaction arrival rate per second

$E(ts)$  = mean service time per transaction in seconds

with values of:

$$\begin{aligned} E(n) &= 2 (32,900) \text{ trans/day} \\ &= 0.762 \text{ trans/sec} \end{aligned}$$

$$E(ts) = 0.750 \text{ sec}$$

yields

$$RHO = 0.57$$

The State of Nevada further estimates that a 10 percent growth in traffic per year over the next five years will take place. This growth pattern suggests that the switcher should be capable of an upgrade to provide a mean service time per transaction of 500 to 600/msec.

Assuming that these traffic levels do come about, and that the above mean service times per transaction are realized, the switcher portion of the statewide network will not degrade overall network response times at user terminals. Queuing analysis was not carried out on other switching and data base computers to be included in the final state network.

#### C. Review of RFP

The Request for Proposals was reviewed in detail. In its present form, the RFP is a mixture of functional requirements and detailed hardware specifications and should be changed to one or the other for convenience of bidders. Time did not permit a redraft of the RFP, and the review was limited to making detailed comments on the existing RFP. A copy of these comments is available from the consultant, or from Sgt. Thimsen, chairman of the Technical Subcommittee. The general nature of the comments was as follows:

1. In view of the limited funds available for this procurement and for system operation, the RFP must specify a minimal switcher capability. In addition, no features should be called for that require personnel support during operation, since this will increase operational costs markedly. Some suggestions were made to modify the RFP accordingly.
2. The use of long lists of "mandatory" and "desirable" capabilities is confusing to bidders. The "mandatory" items should be put in narrative form, and the "desirable" items deleted and replaced with a single section stating what general capabilities were desirable, beyond the "mandatory" items. Bidders would find this easier to respond to.
3. The RFP should be reformatted so that the RFP outline given initially is followed throughout. The paragraphs should be numbered for ease of reference.

In summary, a number of modifications should be made to the RFP as a minimum; if time permits, a more complete reformatting should be carried out.

#### D. Cost Estimate

Discussions with a number of typical vendors were carried out by telephone to determine the extent to which switching systems with the general characteristics sought could be provided within the existing funding.

Hardware estimates ranged from \$50,000 to \$70,000, leaving the remaining funds for software development. The respondents unanimously felt that vendors with existing software communications packages should be able to respond within funding limits, but that vendors that did not have available software, or software that could easily be modified to meet specified requirements, would not be able to respond.

It is estimated that several systems houses and hardware vendors would be able to respond to the RFP.

A cost estimate was made assuming representative hardware costs (see Table 1). If developed software is available, total procurement cost is estimated at \$161,000. The development of new software would increase total procurement costs to \$266,000.

Of equal concern to the State are operating costs for the switcher. Since a site has not been selected and operational functions not totally defined, firm estimates of operating costs cannot be made. However, it is suggested that operational costs be kept to a minimum by eliminating support functions wherever possible, such as rerouting of messages and notifying users of improper addresses, etc. In the latter case, for example, the user could be notified automatically that an invalid address has been used and to correct and retransmit.

It was recommended to the State that vendors be requested to estimate operational costs. In this way the selection board will have a number of operational modes and costs presented to them and will be in a better position to assess these costs and select a minimal cost mode.

Table 1 - Cost Estimate for State of Nevada Switcher

<u>Item</u>	<u>Dollar Cost in thousands</u>
1. Hardware	
1.1 Communications processor	32.00
o CRU 16 bit-word	
o 32 k words, 800 nanosec memory	
o Expansion to 65,536 words memory	
o Direct memory access	
o System protect	
o Hardware multiply/divide	
o Hardware program fill	
o Power fail safe/auto restart	
o Memory parity	
o Peripheral device controller	
o Console I/O controller (TTY)	
o 5,196,800 moving head disc	
o Two cabinets/cables	
1.2 Interval timer for processor, 50 sec	0.35
1.3 Ext. interrupt timer	0.24
1.4 Ext I/O interrupt	0.35
1.5 Ext. time of day, day of year coupler	0.58
1.6 Async RS232 controller console operator I/O	1.25
1.7 Console I/O KSR35	4.50
1.8 Async/synchronous comm multplr, 32 ch	1.60
1.9 32 async/sync comm channels (std. rates)	16.00
1.10 Mag tape dual unit with controller	27.20
1.11 Mag tape direct memory access	4.00
1.12 Time code generator (day/time of day)	5.00
1.13 Cabinet expansion/cables	2.00
	<hr/> 95.07
2. Software	
2.1 Operating sys training (2 wks)	0.80
2.2 Operating sys software (disc pack)	0.80
2.3 Operating sys utilities/diagnostics (disc pack)	0.80
2.4 Applications software <u>modified</u> for State of Nevada	35.00
- design, code, test, acceptance, document*	<hr/> 37.40
3. Total system	
Hardware	95.07
Software	37.40
	<hr/> 132.47
Site installation (2 mm)	6.00
Acceptance test, final report (2 mm)	8.00
	<hr/> 146.47
Fee (10%)	14.65
	<hr/> 161.12

\*If software is developed especially for State of Nevada, Item 2.4 will increase to \$140.000 (4 m yrs).



### III. FINDINGS AND CONCLUSIONS

The following conclusions can be drawn from the findings of the consultant's review:

1. Traffic estimates for NCIC appear somewhat high.
2. Loading on the proposed switcher does not exceed 57%. The switcher should be able to absorb projected growth for five years without exceeding a loading of 70%.
3. The RFP approach is a mixture of functional requirements and hardware specs. Also, the outline is somewhat inconsistent. The long list of "desirables" is confusing.
4. Operating costs and personnel requirements have not been estimated, although these are a primary concern.
5. Procurement costs are estimated at \$161,000, assuming that vendor software can be easily modified to meet the requirements. If new software must be developed, procurement costs would increase by about \$100,000.

#### IV. RECOMMENDATIONS

The following recommendations are made:

1. Review NCIC traffic estimates.
2. Incorporate comments on RFP. If time permits, reformat RFP using a functional requirements approach. Reduce or eliminate "desirables" and replace with one general statement.
3. Incorporate a request for estimates of operation personnel and costs in RFP, based on minimal functional requirements.
4. Approve LEAA procurement funds.



**END**