

JUSTICE DATA
INTERFACE CONTROLLER
EXPANSION PROJECT

SYSTEM EVALUATION REPORT

NCJRS

JUL 12 1979

ACQUISITIONS

PRODUCED BY

PRC PUBLIC MANAGEMENT SERVICES, INC.
655 SOUTH HOPE STREET - SUITE 800
LOS ANGELES, CALIFORNIA 90017

FOR THE
LOS ANGELES COUNTY SHERIFF'S DEPARTMENT

UNDER CONTRACT NUMBER 25228 WITH THE
COUNTY OF LOS ANGELES

ORIGINALLY SUBMITTED: MAY 11, 1977
REVISED: JUNE 30, 1977
REVISION: 1

59315

TABLE OF CONTENTS

<u>Section</u>		<u>Page</u>
1.0	EXECUTIVE SUMMARY	1
1.1	Synopsis of the Expanded JDIC Project	1
1.2	Project Objectives	3
1.3	System Development	3
1.4	System Performance	4
1.5	Conclusion	6
2.0	PROJECT OBJECTIVES	9
2.1	JDIC Project History	9
2.2	Development of Objectives for Expanded JDIC	11
2.3	Analysis of Objectives	14
3.0	IMPLEMENTATION OF PROJECT OBJECTIVES	20
3.1	Selected Hardware Components	20
3.2	Software Design Considerations	23
3.3	Verification and Acceptance Tests	25
3.3.1	Initial Software Demonstration	26
3.3.2	Interim Software Demonstration	26
3.3.3	Functional Capabilities Demonstration	27
3.3.4	Operational Performance Demonstration	29
3.3.5	Problem Analysis	30
4.0	ONGOING SYSTEM PERFORMANCE	35
4.1	System Management Functions	36
4.2	System Utilization Review	37

TABLE OF CONTENTS -- Concluded

<u>Section</u>		<u>Page</u>
4.2.1	Message Count Statistics	41
4.2.2	Computer System Utilization	43
4.3	System Availability	45
4.4	Operational Time Benefits	47
5.0	CONCLUSIONS AND RECOMMENDATIONS	51
5.1	System Performance Conclusions	51
5.2	Recommendations	53
5.2.1	Evaluation Model	54
5.2.2	Evaluating Direct Benefits of the System	56
5.2.3	Statistics Report Improvements	57
5.2.4	Transaction Reponse Times	58
6.0	CONTINUING DEVELOPMENT	60
6.1	Regional Interface Project	61
	APPENDIX A CHRONOLOGICAL BIBLIOGRAPHY	62
	APPENDIX B LIST OF JDIC LOCATIONS	64
	APPENDIX C LIST OF MAJOR MILESTONES	68

1.0

EXECUTIVE SUMMARY

1.1

Synopsis of the Expanded JDIC Project

The JDIC System objectives were first articulated in a sequence of documents beginning in 1973 with the FAST Replacement Study* and continuing through a series of LEAA Grant Applications*, the Sheriff's Request For Proposal*, and the subsequent Systems Analysis Report* and System Design*. While the conceptual project goals and system objectives were established in the grant applications, the specific objectives for the Expanded JDIC Project emerged in the systems analysis process and documentation. The system which was created and implemented four years later as Expanded JDIC meets the goals and objectives set forth in these documents.

The Expanded JDIC System replaces the Sheriff's FAST Teletype Network and functions as a computer controlled message switcher and a data base interface providing extensive terminal features for all law enforcement agencies in the Los Angeles County region. As a message switcher it routes messages between terminals within the system and

*Note: Appended to this report is a detailed bibliography of the references and related documents, in chronological order.

between terminals and the CLETS network, utilizing either or both computers in the process. It performs this function, as all others, with the capability for sustained performance when a computer disk, tape drive, or terminal is inoperative. When the total system load is placed on a single computer, degradation of performance will not even be noticed by users at current traffic volumes.

The system has implemented a philosophy of simplifying data access procedures while maintaining the required level of security. Interface specifications of remote data systems and other telecommunications networks are made transparent to the user who interacts only with JDIC. With its extensive aids and editing functions, JDIC ensures an efficient interface with external systems, thereby minimizing the terminal operators' procedural requirements. The important net result of these features is that acceptance of the system by its users has increased their willingness to perform duties enhancing their operating efficiency levels.

This document summarizes the Expanded JDIC Project from the initial planning stages and evaluates its performance through the first few months of on-line operation.

Since the FAST Replacement Study in April, 1973, four years of careful planning, design, and development have resulted in a computerized system capable of handling today's increased message traffic with significantly easier operator procedures.

1.2

Project Objectives

The grant application for the JDIC Expansion Project defined objectives in terms of two parameters:

(1) Improved data handling capabilities, and (2) Enhanced system design features.¹

More specific primary objectives were later developed² to include such areas as (1) A point-to-point message processing capability to replace the FAST system, (2) A throughput capacity meeting the levels projected in the 1973 FAST Replacement Study, (3) Interface with other systems, and (4) An average 600 character-per-second sustained processing capacity. A more detailed list of project objectives is provided in Section 2.2 of this report.

1.3

System Development

The Expanded JDIC System was developed to meet the data communications needs of Los Angeles County law

¹First Year Grant, Attachment A, p. 10

²Request For Proposal, Section 4.

enforcement agencies¹ anticipated through 1980. These needs were documented in a system analysis study submitted and approved on June 30, 1975, which provided a detailed study of message volumes as well as an analysis of the problems and user requirements of the existing systems. The study estimated a peak load volume of 355,290 messages per day by 1980.² The study responded not only to the technical requirements of the JDIC enhancement, but also to the human engineering problems in the JDIC and FAST systems. Details of this analysis are provided in Section 2.3 of this report. Section 3 describes the implementation of these objectives and the extensive verification and acceptance tests that were developed to assess system performance.

1.4 System Performance

Section 4 addresses the performance of the Expanded JDIC System over its initial 3 month operational period (January through March 1977). At the time of this writing, the system is in its infancy and still growing. There are, however, several indicators of system performance that can be highlighted, and the major impact of initial operations assessed.

¹Appendix B (List of JDIC Locations).

²Systems Analysis Report, p. 9.

As shown in Figure 1-1, the present terminal configuration consists of 56 remote video terminals with 55 associated printers, plus 18 local video terminals in the Sheriff's Radio Center. Figure 1-2 depicts the data file interfaces available to these terminals. Approximately 27,000 messages are now being processed on the JDIC System alone (refer to Section 4.2). This activity includes both messages sent and received and represents a higher daily workload than the 1976 FAST System average of 20,893 messages per day (shown in Figure 4.2-1). Expanded JDIC was designed to accommodate a total of 293 terminals so its current configuration of 129 terminals represents only 44 percent of the planned load.

The FAST System is still being utilized, but at a significantly lower volume. As pointed out on the graph in Section 4.2, the combined daily average message load of the FAST System and Expanded JDIC has increased 78 percent over the previous daily average of the FAST System alone. This increased volume of activity has been effected with no increase in personnel or labor hours. Thus, this data represents a substantial increase in work performed with no increase in labor costs.

1.5

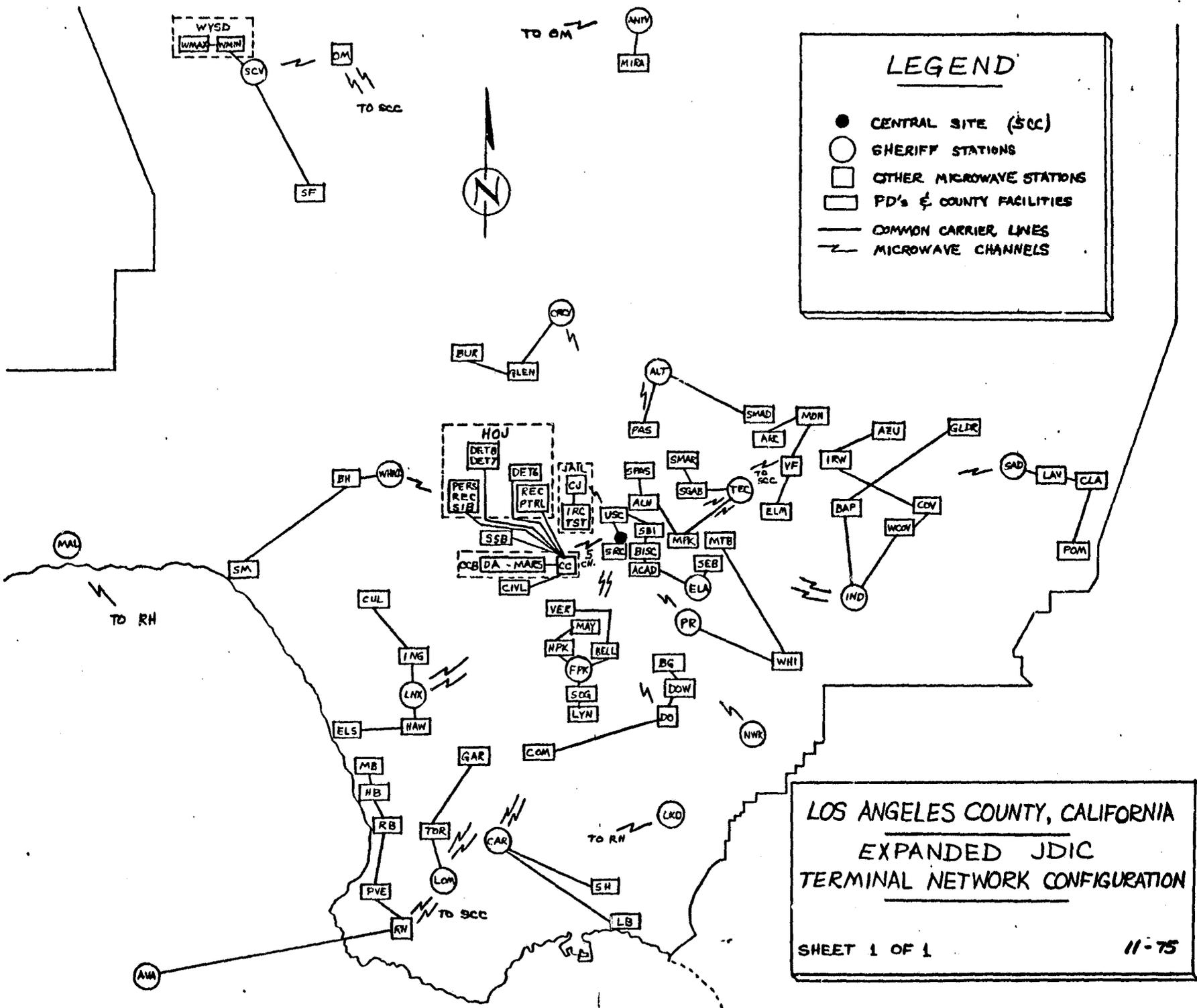
Conclusion

The Expanded JDIC System has met the major project objective of providing increased usage of available data base resources and system capabilities, thus providing a more comprehensive service with increased efficiency to the law enforcement community in Los Angeles County.

The complexity of any project of this scope necessarily means that a time span measured in years must be devoted to system development. The fact that Expanded JDIC was operational within days of the originally scheduled operation data can be attributed to the careful planning and design, as well close cooperation of the various parties involved, throughout all phases of the project.

As of this writing, system enhancements continue to expand the terminal network and provide additional capabilities to all system users. The effectiveness of the Expanded JDIC System will continue to increase as the system grows.

Figure 1-1
-7-



JDIC INTERFACES

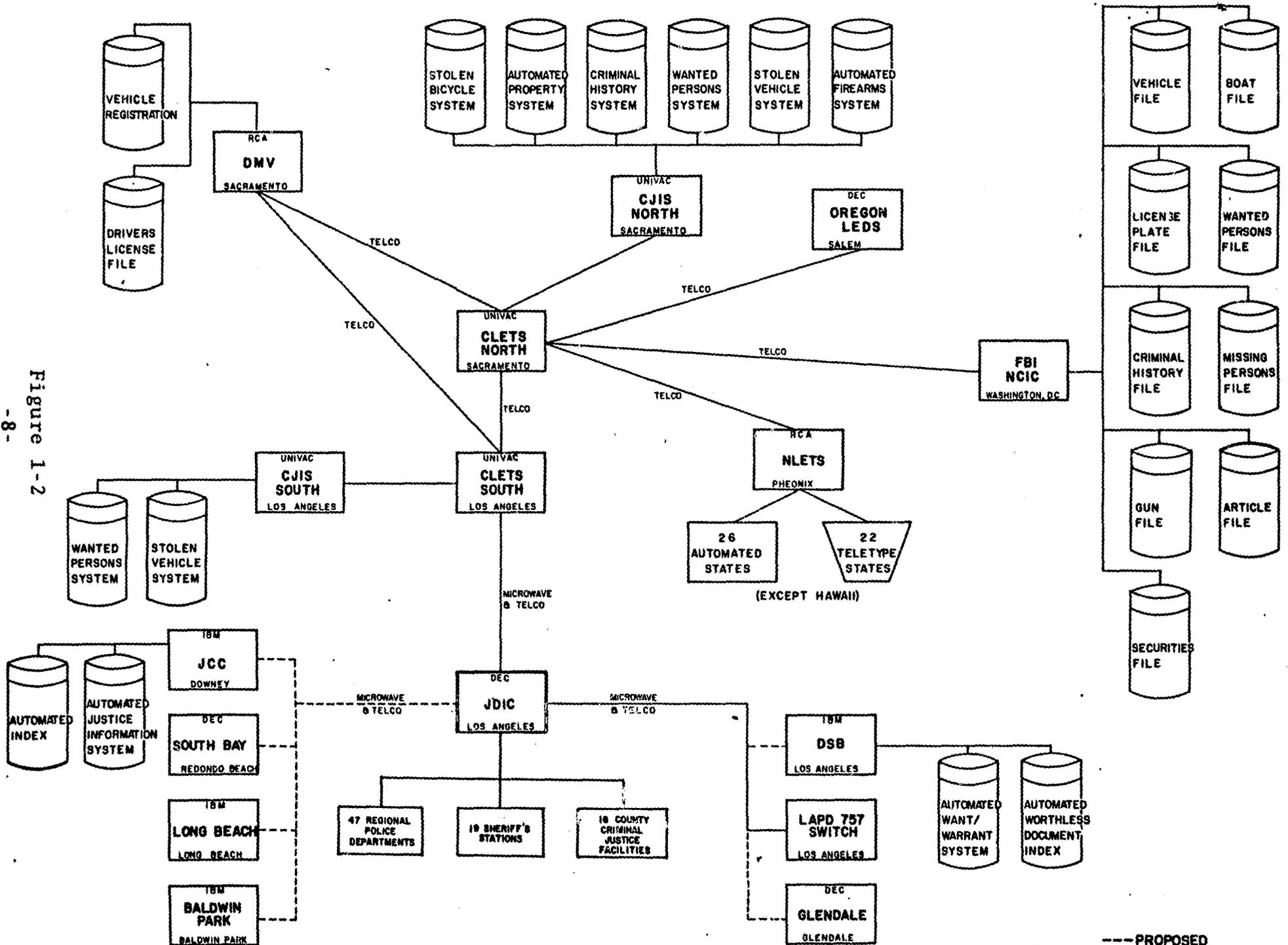


Figure 1-2
-8-

2.0

PROJECT OBJECTIVES

2.1

JDIC Project History

In order to effectively describe the formulation of the current project objectives, the environment and function of the system prior to enhancement must first be understood. The basic JDIC System was initially implemented in 1974 as a fairly sophisticated message-switching system providing the Sheriff stations and field units with an interface to the California Law Enforcement Telecommunications System (CLETS).¹ It was sophisticated in its technical application of computers and relatively high-speed data communications and interface capabilities with the Sheriff's Stations' CRT terminals. JDIC essentially augmented the Sheriff's radio communications system providing on-line inquiry information regarding such items as wanted persons, vehicles and stolen property.

JDIC operated side-by-side with a County-wide communications system implemented many years earlier by the Los Angeles County Sheriff's Department called the Fully Automated Switched Teletypewriter (FAST) Network. The FAST System was installed in 1963 with

¹"JDIC Baseline Specifications", Request For Propsoal, Appendix B.

a life expectancy of ten years.¹ It served as a major communications link for many diversified activities of the Sheriff's Department and the 49 municipal police departments in Los Angeles County. In 1973 the FAST System comprised approximately 140 Teletype terminals distributed throughout the County.

Interface was also provided to other regional teletype switches for accessing agencies outside the County FAST Network.

Functionally, the FAST Network provided both point-to-point message switching and data base access. Within the Sheriff's Department, the system was utilized to send many administrative messages and perform operational functions such as bookings, court list distribution, inmate movement notices, and crime reporting. In the local police agencies, FAST became a primary avenue for communication of information with CLETS and other agencies within the County.

After 1965, with the introduction of computerized data files at the local, state, and federal level, use of the FAST System underwent a dramatic change. Increased operational dependence upon those computerized files inundated the FAST Network with

¹FAST Replacement Study, p. 8.

an overwhelming demand for data access. The resultant overload manifested itself in severe delays and eventual total inaccessibility during periods of severe saturation. Engineering characteristics of the FAST Network were such that component expansion to sufficiently relieve critical saturation was economically unrealistic. A replacement system was desperately needed and fully justified.

2.2

Development of Objectives for Expanded JDIC

The objectives for the JDIC Expansion Project emerged from early concerns and studies of the FAST Network workload capacity and were developed through a process of iterations throughout the design of the system. While the emphasis of objectives remained one of increased message processing, in the course of formulating and reformulating, they were broadened considerably to include software considerations, reliability, and, most importantly, human engineering and operational considerations.

A FAST Replacement Study prepared in April, 1973, analyzed the FAST functions and measured the existing volume of traffic. The study estimated a 1973 daily workload of approximately 25,000

messages at an average throughput of approximately 114 characters per second.¹ It was felt that these figures represented the practical peak capacity of the system, and demonstrated that increased message traffic was required and would occur if the FAST system could process it. Supporting this were findings of lengthy response delays, frequent unavailability of free circuits to access the network, and reports that inquiries were not returned during periods of excessive congestion.²

The study hypothesized an anticipated processing requirement for a total replacement system of approximately 206,549 messages per day at an average rate of 566 characters per second.³

Results of the FAST Replacement Study were included as objectives in the subsequent grant applications submitted to the Office of Criminal Justice Planning, State of California, in June, 1974.

The grant defined project objectives in terms of two parameters:⁴

1. Improved Data Handling Capabilities, which essentially referred to an increased capacity to access data bases such as CLETS, and

¹FAST Replacement Study, p. 25.

²FAST Replacement Study, p. 9.

³Op. cit., p. 30.

⁴First Year Grant, p. 10.

2. Expanded JDIC System Design Features, which specified software for a format library capability.

In the Sheriff's Department Request For Proposal (RFP) to initiate the Expanded JDIC Project, issued in October, 1974, these objectives were expanded to include more detailed design parameters. In addition to the expansion of data base interfaces and a format library, the following concrete system objectives emerged:¹

- A point-to-point message processing capability to replace the FAST system and handle the anticipated increase in message traffic.
- Specific interface capability with the Los Angeles Automated Worthless Document Index (AWDI, Automated Want Warrant System (AWWS), and the Los Angeles County Justice Computer Center (JCC) for the Sheriff's Automated Justice Information System (AJIS) and Automated Index (AI) data bases.
- Indefinite period store and forward capability preventing loss of "undeliverable messages" due to terminal busy or inoperative status.
- A dual-processor load-sharing system with an automatic backup capability if one computer fails.
- Logging capability for all message traffic routed through the JDIC computers.
- Acquisition and installation of an additional 199 video terminals and 79 printers.
- Additional interfacing for 20 remote computers with expansion capabilities for up to 40 remote computers.
- A sustained processing capability of 600 characters per second.

¹Request For Proposal, pp. 11, 25, 58-59, Appendix E, p. 7.

In addition to these objectives, the RFP incorporated requirements for many software design features (such as acceptable capability to buffer, queue and store) and acceptability criteria.

2.3

Analysis of Objectives

Subsequent to the RFP and contractor selection, a study of the Sheriff's Command and Control System was conducted by Holmes and Narver, Inc.

This study included the Basic JDIC System and its associated terminals. A report entitled, Analysis and Recommendations for Latent Defects in the Sheriff's Command Control System was prepared in May, 1975, describing system problems and proposed solutions. Several of the problems had potential impact on the design of Expanded JDIC.

In particular, the Holmes and Narver report pinpointed areas of equipment unreliability in the original JDIC system. While the equipment did not include elements that the Expanded JDIC System would include or be responsible for, it did emphasize the critical need in such a public

safety system for selection of highly reliable equipment and effective maintenance procedures.¹ The report also indicated the ineffectiveness of redundant switching controllers when used with a common, non-redundant interface.² The recommendations included in this report became major considerations in the analysis and design of the Expanded JDIC System.

A major procedural objective defined in the RFP was the development and utilization of a systems analysis report as a specification of detailed system objectives.³ The Systems Analysis Report, approved by the County on August 8, 1975, served two critical functions for the project: It provided a detailed study of message volumes, and it analyzed the problems and user requirements of the existing systems. The result was a further clarification of needs and more specific definition of objectives to be met.

Specifically, the peak load message volumes were analyzed for 1975 and projected into 1980. The 1973 estimate of 206,549 messages per day (with all interfaces complete and all terminals installed)⁴

¹Latent Defects in the Sheriff's Command Control System, p. 30.

²Op. Cit., p. 20.

³Request For Proposal, pp. 41-42.

⁴FAST Replacement Study, p. 30.

was found to be reasonably accurate. The Systems Analysis estimated a peak load of 230,920 messages per day for 1975, increasing to 355,290 messages per peak day in 1980.¹ (It should be noted that a subsequent study performed for the County Data Processing Department in September, 1976, found these figures to be conservatively high, and postulated a more accurate 1980 peak load 12 percent less than the predicted figure, or 277,126 messages per day.²)

To develop this information, each participating agency was surveyed to collect data on those parameters which would affect the demand for services, as well as data on current functions and activity levels. By using known data base transaction functions, message lengths and related information, a model was developed,³ generating projected peak message and data requirements for every system function, by terminal location. This information was later utilized to make decisions regarding the JDIC system design and network configuration.

A second and equally important result of the systems analysis was the formulation of functional requirements. This part of the study addressed

¹Systems Analysis Report, p. 9.

²Load Analysis, p. 11.

³Systems Analysis Report, p. 119.

the needs of the user in terms of support considerations which optimize the effectiveness of the system. The functional analysis identified the services which the Expanded JDIC System would provide. Included in the analysis were the following areas of functional requirements:¹

- Basic terminal support.
- Software security check functions.
- Formatted displays.
- Terminal display control, including paging, saving and recalling messages.
- Print control.
- Administrative Messages: JDIC, CLETS, NLETS, Broadcast.
- Interfaces with the LAPD 757 (teletype switching network), CLETS, JCC, AWDI, and AWWS.
- Load sharing.
- Logging.
- Statistics report generation.
- System control and operation.
- Power failure, recovery and data integrity.
- Expandability.

The Systems Analysis Report responded not only to the technical requirements of the JDIC System (e.g., faster equipment, additional interfaces) but it also addressed the areas of security, reliability, and human engineering. Serious

¹Systems Analysis Report, p. 3.

problems facing terminal operators were addressed, such as the tremendous variation in formats from different data bases, inconsistencies in data field descriptors and content, and varying security measures.¹ As a result, the following human engineering objectives were developed and included for design consideration, principally affecting terminal operations:²

- Utilization of function keys to minimize operator keystrokes.
- Use of formatted, protected screens to minimize operator error.
- Optimum standardization of screen formats, independent of the data bases accessed.
- Combination of transactions on a screen to minimize the number of discrete transactions an operator must learn.
- Use of editing and minimal reasonableness checking by JDIC to minimize data base error messages.
- Use of descriptive error messages and cursor repositioning to aid in operator error correction.
- Use of "help" features to answer operator questions concerning data field usage, requirements or errors.
- Use of input recall and response recall keys to aid recovery from operator errors.
- Use of immediate positive response messages to each operator action, thereby providing operator assurance of system availability and responsiveness.
- Consolidation of related multiple responses into a single "transaction" for paging and recall purposes.
- Minimization of response times.

¹Op. Cit., p. 138.

²Systems Analysis Report, p. 138.

Upon completion and review by the project management, the Systems Analysis Report was finalized as the primary input for development of the detailed systems design.

3.0

IMPLEMENTATION OF PROJECT OBJECTIVES

After the Expanded JDIC Project objectives had been thoroughly defined, the system design specifications were developed to provide a working base on which to implement those objectives. This section summarizes the design of both hardware and software components of the system and provides results of the subsequent demonstrations proving the effectiveness of the design.

3.1

Selected Hardware Components

In order to meet the message throughput requirements and minimize response times, the Expanded JDIC central computer system was required to be relatively large, fast, and, most importantly, reliable and expandable. Two PDP-11/70 computer systems, manufactured by Digital Equipment Corporation, were selected to meet those requirements.¹ The two systems are identically configured, allowing full redundancy, with the exception of a single card reader connected to only one system as an input device for development purposes. The major features of these systems include:²

- 192K bytes of parity core memory, expandable up to two million bytes.
- 2K bytes of high-speed bipolar cache memory to allow fast access to repeatedly used memory locations.

¹System Design, p. 33

²Op. Cit., Section 3.1

- 88M byte capacity moving-head disk with a transfer rate of 806,000 bytes per second, expandable up to eight times the capacity.
- 1M byte capacity fixed-head disk with a transfer rate of 500,000 bytes per second, expandable up to eight times the capacity.
- Two 75 inch-per-second magnetic tape drives capable of 800 and 1600 bits-per-inch densities, expandable up to a total of eight drives per system.
- High-speed parallel data link between the two processor systems.
- Cross-connected watch-dog timers to provide notification of either system's failure.
- Microprocessor-controlled synchronous multiplexers to provide direct memory access (DMA) reception and transmission on 48 communications lines.

In addition to the computer equipment above, the load-sharing requirement of Expanded JDIC necessitated the use of extensive line switching and patching facilities at the central site. The Cooke Engineering Company remote control programmable digital switches were selected to provide the ability to switch communications lines from one system to the other under computer control.¹

Due to the magnitude and complexity of the Expanded JDIC communications network, extensive line diagnostic features were designed into the system to allow fast, accurate diagnosis of communications problems. Hardware selected to provide these capabilities included:²

¹System Design, pp. 51-53.

²Op. Cit., p. 94.

- ICC Modem 24LSI 2400 bps synchronous modems with remote test and loopback features controlled from the central site.
- ICC Model 70 Multipoint Tester to test and monitor the performance of remote modems and communications lines.
- ICC Model 220 Transmission Test Set to check line error rates.
- Cooke Engineering Company EIA Test Panel and Analog/Digital Monitor to test and monitor the performance of central site modems and computer interface equipment.
- Spectron Datascope data monitor to visually display the information being transmitted or received on any line.

Although many basic features of video terminals and printers had been identified as a result of previous analysis and system design efforts, a multitude of terminals met those basic requirements. Therefore, an RFP for Computer Terminals was issued to 237 known terminal vendors¹ in June, 1975. An extensive analysis of the resultant proposals culminated in September, 1975, when PRC/PMS selected the General Electric TermiNet 120 as the recommended printer, and both the Omron 8025 and Zentec 9003 as recommended video terminals.² Both of these video terminals were user-programmable intelligent units with substantially identical features and costs. After further negotiations with Omron and Zentec, the

¹Terminal Recommendation, Attachment I.

²Op. Cit., p. 4.

Zentec 9003 CRT was selected by the Sheriff's Department and purchased as the video terminal. The General Electric TermiNet 120 Printer was selected as the hard-copy terminal for the Expanded JDIC System. The initial configuration included 56 video terminals and 55 printers.

The hardware components selected for the Expanded JDIC System thus provided a reliable and readily expandable system capable of meeting the system objectives.

3.2

Software Design Considerations

In order to take advantage of the sophisticated hardware features selected, while meeting the letter and intent of the project objectives, significant decisions were made concerning the software design.

A general-purpose executive operating system was designed to perform task management and memory management functions, including system data and program protection.¹ The design took advantage of all the available features of the PDP-11/70 and its memory management system.

¹System Design, p. 95.

A strong philosophy of functional isolation produced separate independent communications I/O and protocol routines.¹ The communications I/O routines were designed to take advantage of available device characteristics, while the protocol routines handled communications functions independent of the interface device.

Disk I/O routines were optimized to minimize head movement and the technique of allowing data to remain in core memory as long as possible was designed to minimize the number of required disk reads.² The faster-access fixed-head disk was utilized to store the format library and Help text to minimize the response time when a terminal operator requests one of those functions.

Finally, software for the intelligent video terminals was designed to take advantage of the features of the particular terminal and further reduce response times and operator errors. Most notably, extensive data editing capabilities³ were designed into the terminal software so that invalid data within a formatted screen would be detected in "real time," thereby reducing the error recovery time as well as the total transmission and message processing time.

¹Op. Cit., p. 94.

²Op. Cit., p. 130.

³Terminal Design, p. 64.

Throughout the system design and implementation phases, close contact was maintained between the involved departments of Los Angeles County, PRC/PMS, and the ultimate users of the system at the law enforcement level. Terminal users were consulted by the Sheriff's Department to determine the best layouts for formatted screens, for site preparation and terminal installation. The County Department of Communications was instrumental in optimizing the network of multi-point communications lines and evaluating the technical features of terminals and other equipment. The County Department of Data Processing provided full-time support to software implementation, and the Sheriff's Department provided the necessary management coordination during all phases of project development and implementation. Without such cooperation, a system of this complexity could not have been built.

3.3

Verification and Acceptance Tests

Four separate demonstrations were conducted to verify system performance and reliability. These demonstrations were designed to provide assurance that the system was capable of achieving the project objectives.

3.3.1 Initial Software Demonstration

The first demonstration was conducted in May, 1976. Its purpose was to demonstrate the main function of the system, message switching.¹

The successful performance of that demonstration required almost all of the core resident system routines, including the executive operating system, the communications director, input and output services, and the message formatting module. While the demonstration itself was extremely simple and easily verified, a great deal of complex and important software was necessarily created to support it.

3.3.2 Interim Software Demonstration

The second demonstration was conducted in August, 1976. Its purpose was to verify data base access through CLETS from one of the Expanded JDIC video terminals.² The procedure required calling up a formatted screen on the terminal, entering appropriate data for a Driver History inquiry, and receiving the requested information from California DMV.

The additional software required to support this demonstration included the two most important

¹Initial Software Demonstration Procedure, p.1.

²Interim Software Demonstration Procedure, p.1.

and complex protocol modules, namely the Zentec terminal handler and the CLETS handler, plus portions of the CLETS message reformatting routines and the software for the programmable video terminals. The demonstration, therefore, verified approximately 80 percent of the Expanded JDIC System software.

3.3.3

Functional Capabilities Demonstration

The functional capabilities of Expanded JDIC were demonstrated through a series of detailed procedures conducted through December, 1976, and January, 1977. A total of over 1,000 separate functions were demonstrated, ranging in complexity from verification of terminal keyboard operation to power-fail recovery and automatic line switching during load-sharing.¹

Included in the Functional Capabilities Demonstration was a peak-load message processing demonstration based on the projected 1980 peak hour processing requirements.² An interface demonstration with CLETS was conducted in December, 1976, as four separate tests. Hardcopy terminal output, system console logs, printer logs and queue message

¹Functional Capabilities Demonstration Procedures, pp. 5-6.

²Functional Capabilities Demonstration Procedures, p. 41.

counts were utilized to validate the findings. The measured message volume of the demonstration indicated that the peak load criterion of 11,656 messages per hour per processor was exceeded by processing an average of over 200 CLETS messages per minute, which translates to 12,000 messages per hour.¹

A similar demonstration, independent of CLETS, was conducted to verify total message throughput capability equal to the projected 1980 peak load estimate of approximately 2,500 characters per second on each computer.² Twenty video terminals generated administrative messages to a total of forty printers at predetermined rates, resulting in an average of 2,520 characters per second on each computer, creating a full system total of 5,040 characters per second.³

This full series of demonstrations not only provided verification that the system was operating according to the design parameters, they also provided a forum for discussing and improving various system functions. Throughout the Functional Capabilities Demonstration, operations which failed to produce the expected results were analyzed and reprogrammed, and the demonstrations

¹Op. Cit., p. 109.

²System Design, p. 75.

³Functional Capabilities Demonstration Procedures, p. 111.

were repeated. The ultimate outcome was that the Functional Capabilities Demonstration verified that all features of the system were functioning at a level that met or exceeded specifications and that the project objectives, including emphasis on human engineering, had produced a system that was ready to be used operationally by law enforcement agencies throughout Los Angeles County.

3.3.4

Operational Performance Demonstration

Following the verification of all system functions, a 30-day Operational Performance Demonstration was performed. With the entire system under County operation, users were allowed to utilize the system during their normal course of work.

This demonstration was conducted from January 17, through February 16, 1977. An overall system availability criterion of 90 percent was established for this demonstration (90 percent translates into a maximum of 72 hours downtime).¹ During the 30-day period, the calculated system availability was 97.3 percent. Less than 20 hours of actual downtime occurred as measured by the agreed upon formula developed during the JDIC System Design.² The demonstration was therefore deemed very successful, and the system has remained in constant use since its conclusion.

¹System Design, p. 78.

²Ibid.

3.3.5

Problem Analysis

During the Operational Performance Demonstration, users were requested to report all problems, no matter how insignificant, to JDIC management for recording. A total of 253 problem reports were submitted. For each problem, corrective actions were suggested and if the problem could not be immediately solved, diagnostics and further investigation were initiated.

Of the 253 reports, thirty-eight were duplicate reports of previously noted problems and seven were only questions regarding operation of the system or terminals. The remaining 208 problems are categorized in Figure 3.3-1.

Less than half (97) of the problems were of a serious nature. These were hardware failures, mainly in remote terminals, and problems that required corrections to the system software.

Following the demonstration period, the County Department of Communications (DOC) performed an extensive analysis of the sixty-one hardware failures.¹

¹"EJDIC Hardware Failure Analysis", Memo #EJDIC 203, Department of Communications, Engineering Branch, March 9, 1977.

	HARDWARE FAILURES	SOFTWARE RELATED PROBLEMS	MINOR SERVICE OR ADJUSTMENT	OPERATOR ERROR & OTHERS	TOTALS
Video Terminals	11	10	27	9	57
Printer Terminals	22	9	30	17	78
Modems	7	0	1	0	8
Communication Lines	17	0	0	3	20
Computer Equipment	4	3	3	2	12
General Problems	0	14	0	19	33
TOTALS	61	36	61	50	208

Figure 3.3-1 Problem Analysis

As shown in Figure 3.3-1, printer problems were most numerous during the demonstration period. Of a total of seventy-eight reported printer problems, twenty-two were due to hardware component failures. While this number is relatively high (it is twice the number of video terminal failures), the DOC report showed that these failures corresponded to a calculated printer availability of 97.38 percent.

Thirty other printer problems were corrected with only minor service, such as replacing the ribbon or turning the unit off and back on. Seventeen reported printer problems were determined to be operational errors, such as printer off-line, out of paper, or paper loaded incorrectly.

There were fifty-seven problems reported with the video terminals. As can be seen from Figure 3.3-1, only eleven of these were hardware failures, representing an equipment availability of 99.47 percent as calculated in the DOC analysis. Software errors accounted for another ten problems, mainly with the RTO terminals in

the Sheriff's Radio Center. Of the remaining problems, twenty-seven were corrected by resetting the terminal or loading fresh software into its memory, and nine were due to operational errors or undetermined conditions that "did not exist" when investigated further.

Of the eight modem problems, one was due to an unplugged power cord and the other seven were hardware failures, resulting in a modem availability of 99.27 percent as calculated in the DOC analysis.

Although there were four hardware failures in the central site computer equipment (disk and multiplexers), the system availability was 100 percent because the redundant configuration enabled all terminals and lines to remain in full service. Three other minor problems (noisy tape drives, burned out indicator lamp, worn printer ribbon) were corrected while the equipment remained in service. There were three software-related problems and two operational problems with the computer equipment.

Of the twenty communication line problems, seventeen were line or equipment failures.

(The DOC report broke these down further into ten Telephone Company and seven microwave problems). The other three problems "cleared themselves," possibly due to weather conditions or telephone company actions.

The remaining thirty-three problems were not related to specific items of equipment.

These included fourteen software problems with the CLETS interface programs, format files, disk utilization, and error handling routines. Nineteen reports were due to miscellaneous problems encountered by terminal operators, such as slow DMV responses, incorrect usage of formats or terminal modes, and "lost" messages which were later explained by program aborts or power failures.

As operators became more familiar with their equipment and the system operation, the operational errors diminished significantly. The users' complaints and reported problems, however, serve as the primary source of data for locating and resolving software errors, and will remain an invaluable tool for measuring system effectiveness and redefining operational procedures and training methods.

ONGOING SYSTEM PERFORMANCE

Previous sections of this report discussed the development and implementation of objectives for the Expanded JDIC System. The formal demonstrations described in Section 3.3. showed that the system was capable of meeting those objectives, but the true test of its merit comes in an assessment of its utilization.

The environment in which the Expanded JDIC System currently functions is one in which the system is relatively new to its users, having been available consistently only since mid-January, 1977. In addition, the FAST teletype system has continued to operate alongside the JDIC terminals for accessing CLETS and NLETS. One result of this newness is that a history of utilization statistics has not yet been established as a basis for evaluating Expanded JDIC.

The terminal configuration since mid-1976 has consisted of 74 video terminals and 55 printers. Incremental installation of terminal equipment was required because of grant funding periods. Training courses for operators were begun in November, 1976, at which time the system was

available on a part-time unscheduled basis as final system checkout was being conducted. However, utilization statistics for the system were not collected until the start of the Operational Performance Demonstration in January, 1977.

4.1

System Management Functions

Two basic tools have been available for ongoing assessment since the start of the Operational Performance Demonstration: (1) all users' complaints and suggestions received for consideration by the Sheriff's Department management personnel, and (2) system generated statistical information on utilization for periodic evaluation.

Project staff meetings are scheduled monthly to review and discuss the system utilization statistics. Basically, the system statistics produced by JDIC are of two types: on-line and off-line. The on-line statistics are oriented toward active system monitoring by the computer operator while the off-line statistics are intended for use in long-range planning and permanent configuration balancing. Off-line statistics provide management with an understanding of the type and frequency of

system use, by terminal, as well as an indication of line loading and hardware errors. This off-line program is capable of:

- Summing hourly statistical records developed by the JDIC System across any time/date range.
- Summing the message activity records recorded on the JDIC System logs across any time/date range.

Currently, the program is preparing statistics on a monthly basis. Except by special request, two basic reports are produced regularly:

- Summary reports containing message input and output by terminal or line as well as counts of line transmission errors occurring in both input and output modes of operation.
- Summary reports of the message counts (both input and output) for each terminal reported by message type as well as the average message length.

4.2

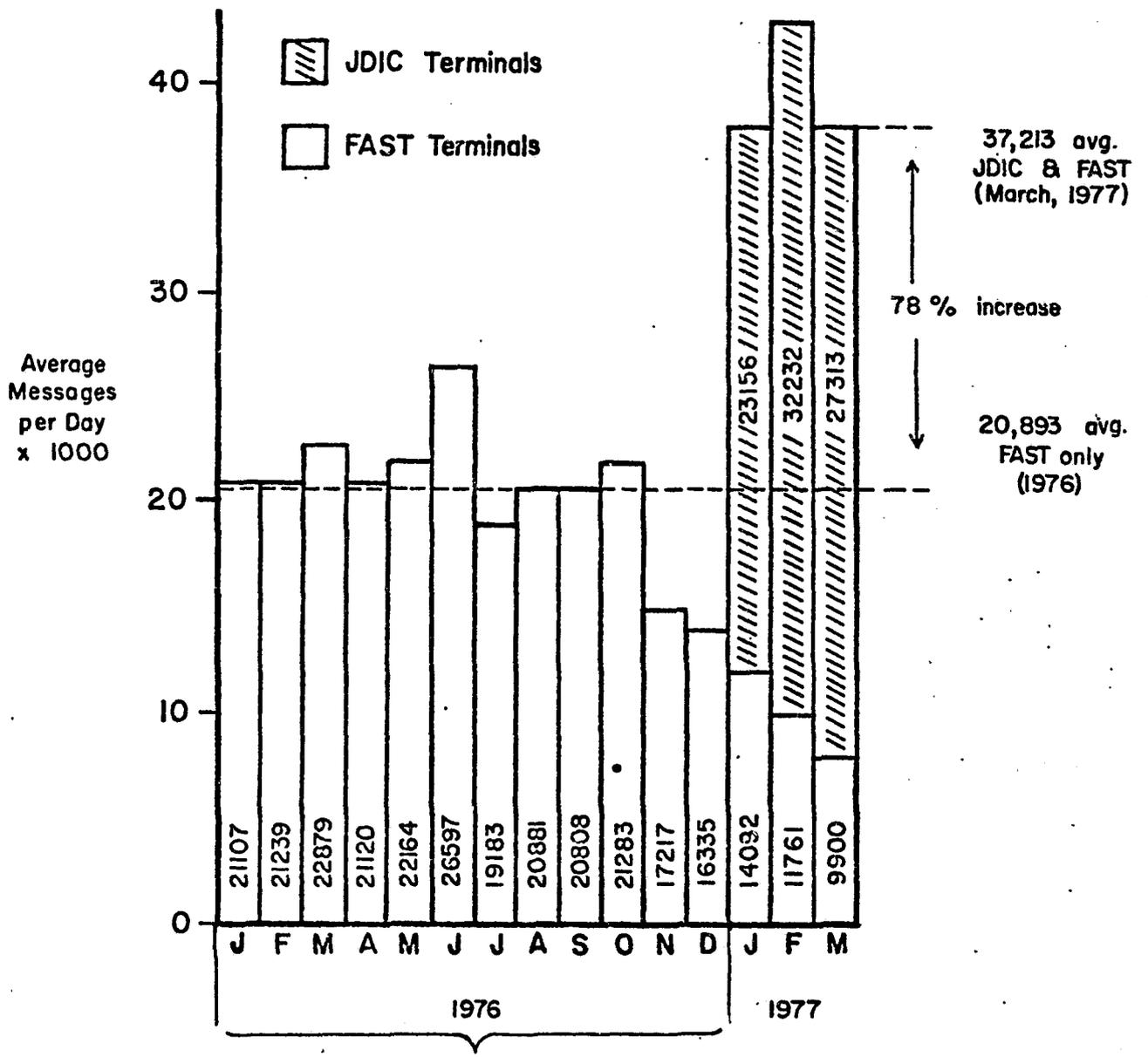
System Utilization Review

Statistical data generated to date have shown a rather wide variation in the daily averages of processed messages. These variations can be attributed to the combination of two major factors: (1) increased terminal usage as users became more confident in using the system and more familiar with its capabilities, and (2) several software changes to the message logging procedures as inconsistencies were detected and subsequently corrected.

A third less significant factor which may have contributed to a decline in messages after the first few months is the fact that users were initially performing many "test" and experimental transactions in order to determine for themselves the capabilities and features of the system. This self-training is inevitable and even desirable in a new system that is to be used as an important tool in the real day-to-day work of the user. Such usage of the system, however, declines rapidly as the newness wears off.

While the system utilization statistics presented in Figure 4.2-1 must be viewed with these anomalies in mind, they are still representative of the general use of the system. For comparison with FAST System usage, the latest available JDIC statistics are believed to be the best representation of average use.

The data show that a major percentage of L.A. County's law enforcement data inquiry/response activity has already shifted from teletype to Expanded JDIC. As Figure 4.2-1 indicates, an average of approximately 27,000 messages are now being processed daily on the system. This activity includes both messages received and sent, and represents a higher daily average



Total daily average for 1976
 $7,646,983 / 366 = 20,893$

Figure 4.2-1
 Daily Average Message Count

workload than the FAST system over the previous year. As the graph in Figure 4.2-1 shows, the combined JDIC and FAST workload represents approximately a 78 percent increase in total daily message processing over the 1976 daily average of FAST alone. While this workload falls far short of the projected workload of 206,546 messages anticipated in the 1973 FAST Replacement Study, it must be remembered that the JDIC System volume includes only approximately 44 percent of the proposed number of terminals. In addition, the current volumes do not include two critical local information files, namely the Los Angeles City (AWWS, AWDI) and JCC (AJIS, AI) data bases.

That the JDIC System is being accepted as a useful data base accessing device is demonstrated in the continuing decrease in FAST traffic since November of 1976. That systems daily average message count has dropped from 21,000 to less than 10,000 in this time period. The consistent drop in each of the five months since JDIC became operational can only be attributed to a preferred usage of the JDIC terminals, since both terminals are available for agencies accessing the CLETS network.

4.2.1

Message Count Statistics

Figure 4.2-2 shows summary data for the March, 1977 terminal activity extracted from the JDIC monthly statistics printout.

As shown, JDIC System statistics are broken down by message type, based on transaction codes used. Thus, the number of administrative messages per month are readily available as are entry, inquiry, and update totals for each of the CLETS files (driver, vehicle, persons, property, etc.). The average message length is provided for each message type, so that character-per-second throughputs may be calculated.

As shown in Figure 4.2-2, a total of 846,703 messages were processed in the one-month period. Major activities included JDIC administrative messages -- 30,359 screen messages transmitted between terminals plus approximately 161,622 printer terminal messages (including terminal screen to printer functions), Department of Motor Vehicles driver (52,030) and vehicle registration inquiries (122,159), CJIS Stolen Vehicle inquiries (119,319) and Criminal History file inquiries (18,103).

Total Report for Period 03/01/77 to 03/31/77

MESSAGE TYPE	MONTHLY		TOTAL	
	SENT FROM # MSGS.	TERM. LGTH.	SENT TO # MSGS.	TERM. LGTH.
JDIC ADMIN	191,981	622	30,359	252
LAPD ADMIN	452	866	7	197
NLETS ADMIN	782	471	13	560
DRIVER	409	79	1	158
VEHICLE	1,539	69	66	183
TOTAL	2,730	186	80	244
CLETS ADMIN	7,604	371	9,500	883
DRIVER - DMV	52,030	41	54,800	576
VEHICLE - DMV	122,159	26	39,256	323
VEHICLE - INQUIRY	119,319	48	109,993	353
- ENTRY	4,664	107	0	0
- UPDATE	3,169	65	8,571	93
PERSONS - INQUIRY	10,083	86	10,359	280
- ENTRY	757	165	0	0
- UPDATE	851	79	747	105
PROP - INQUIRY	2,548	61	4,063	172
- ENTRY	2,932	112	0	0
- UPDATE	157	49	4,555	87
FIREARMS - INQUIRY	3,514	47	3,568	289
- ENTRY	3,217	998	0	0
- UPDATE	376	48	3,615	129
BICYCLES - INQUIRY	1,573	55	0	0
- ENTRY	729	81	0	0
- UPDATE	159	60	0	0
SECURITIES - INQUIRY	158	61	6,761	255
- ENTRY	45	104	0	0
- UPDATE	1	92	736	98
BOATS - INQUIRY	79	44	0	0
- ENTRY	14	107	0	0
- UPDATE	3	58	0	0
CRIM. HIST. - INQUIRY	18,103	79	10,127	381
TOTAL	354,082	51	266,661	387
MISCELLANEOUS	351	47	0	0
TOTALS	549,596	266	297,107	373
TOTAL MSGS. PROCESSED	846,703	304		

Figure 4.2-2
JDIC Monthly Terminal Statistics.

4.2.2

Computer System Utilization

System statistics are also produced for disk, tape and CPU link activity. Disk activity statistics are useful in analyzing the effectiveness of the aging list, a technique which satisfies some disk requests from core avoiding disk access time.¹

Since these statistics also include error percentages for the peripheral devices, they provide a check on maintenance scheduling as well.

March, 1977, disk activity statistics showed that 6,616,577 read requests were made for the moving-head disk. Of this number, 2,288,342 reads were made from the disk itself; the remaining 4,328,255 (65 percent) were serviced from the computer core buffers. While this fairly high percentage can be expected to decrease as more terminals are added and buffer space is diverted to terminal management, the statistic is an important performance measurement parameter.

The same report shows a total of 9,850,720 read requests for the fixed head disk. This disk unit holds all the screen formats and application programs, and acts as a buffer for input messages.

¹System Design, pp. 130-131

As an indication of the magnitude of this figure, 9,850,720 corresponds to 3.68 requests per second when averaged over the entire month. During peak periods, the frequency of requests could easily be expected to be thirty times this average, which would approach the physical limitation of the equipment (118 reads per second¹) if all requests were required to be read from the disk.

Only 913,600 requests (9 percent) were actually read from the fixed-head disk. The remaining 8,937,120 requests (91 percent) were satisfied from core memory, indicating a highly successful (and necessary) application of the buffer aging technique.

Magnetic tape unit statistics for March, 1977, indicate that 839,406 write operations were performed and eight errors occurred, for an error rate of less than .001 percent.

The CPU link between the two computers supports routing of administrative messages between terminals, passing of various system messages such as terminal and line status changes, and occasional inter-system routings for CLETS

¹Avg. access time = 8.5 msec (PDP-11 Peripherals Handbook, RJS04 Disk) = 117.6 accesses per second.

responses. The CPU link statistics therefore provide an indirect measure of system activity. In March, 211,814 messages were passed between the two systems.

Statistics are also provided for system memory buffer utilization. These buffers serve as working space for the actual programs as well as buffer space for messages, and thus provide a critical parameter of system utilization. Currently, buffer sampling shows a utilization of approximately 19 percent, indicating that the system has more than enough memory for the current configuration. As additional terminals are added, requiring more memory for terminal tables, and message volumes increase, the memory utilization percentage can be expected to increase dramatically. As utilization exceeds 50 percent on this sampling basis, additional memory may be required.

4.3 System Availability

Formal procedures were established for the development and processing of JDIC problem reports for the 30-day Operational Performance Demonstration.¹ These reports were designed to include both hardware and software problem descriptions, and

¹Implementation Plan, p. 84.

were used as the basis of calculating system availability. As noted in Section 3.3.4, the calculated availability during the first thirty days of operation was 97.3 percent. This calculation was based upon the periods of unavailability of vendor-supplied equipment, i.e., failures of communications facilities for which the County was responsible did not affect the availability figures. Furthermore, unavailability due to scheduled testing and maintenance was not included in the calculation.

Since the conclusion of that demonstration, a similar availability statistic has been calculated by calendar month to include all system equipment, including County-supplied facilities, and to account for all periods of unavailability, scheduled or unscheduled.

The calculated system availability for April, 1977, was 99.9 percent, a truly impressive figure, and a substantial improvement over the first thirty days, considering what is included in this calculation. The Expanded JDIC System has thus far exceeded the acceptable availability standard of 90 percent¹ by any method of calculation.

¹System Design, p. 78.

Operational Time Benefits

The Expanded JDIC System proposed to sophisticate and augment the services of the Los Angeles County Sheriff's Department and to extend those services to other law enforcement agencies in the Los Angeles County Region. Its realization, according to the grant application, would "eliminate many peripheral problems that (had) occurred due to the absence of system capabilities..."¹ Its end result was seen as greater usage of available system resources and therefore a more comprehensive service for the community and increased police effectiveness.

The problem of accessing several different data systems has generally been one of memorizing a variety of differing code structures and procedural operations. CLETS alone is generally considered a fairly demanding system to access by a terminal operator. Training and extensive experience are critical to the development of a good operator. A well trained, effective operator is a much appreciated commodity in any department.

With the JDIC System reformat ability and carefully designed human engineering factors, the need for extensive training and experience is greatly decreased. The JDIC computer performs a great

¹System Design, pp. 241-243.

number of interpretory and logical tasks which relieve the operator of the requirement to memorize a plethora of different codes and procedural steps. Common English terms are utilized throughout the formatted displays. Help instructions,¹ displayed guides, and indications of available options are provided to minimize the necessity of consulting user manuals. Single function keys perform tasks which previously required lengthy and detailed sequences of steps.

The effects of these built-in human engineering features are that unskilled personnel can be effective terminal operators without lengthy training periods. For example, a detective, untrained in CLETS data file usage, can display a vehicle or criminal history format, fill in the blanks, request Help if required, and in a matter of seconds walk away with the desired information.

With such relative ease of operation, a greater number of transactions will be performed, since personnel no longer consider it a tedious or time-consuming task to obtain detailed information which is desired but not immediately required.

¹System Design, pp. 241-243.

As shown on the graph in Section 4.2, the combined daily average message processing of the FAST System and Expanded JDIC has increased 78 percent over the previous daily average of the FAST System alone. This increased volume of activity has been effected with no increase in personnel or labor hours. Thus, this data represents a substantial increase in work performed with no increase in labor costs.

This increased productivity has been attained with only 74 of the projected 202 video terminals in the Expanded JDIC System. Additional time savings are being accumulated because JDIC operators no longer have to wait for an open line to CLETS before entering a message or inquiry. Many agencies had reported excessive delays, citing examples of as much as an hour during busy periods.¹ An estimated loss of approximately 68,000 hours per year were attributed to line congestion and complexity of Teletype formats.²

Data are not available from CLETS showing operator error rates for FAST teletype terminal transactions, or the time absorbed in correcting these errors,

¹FAST Replacement Study, p. 9.

²Op. Cit., p. 34.

However, the JDIC System minimizes such errors through its use of formatted screens and Help instructions, and facilitates error correction with informative error messages and the requirement for correction of only erroneous data. With the addition of the AWWS, AWDI, and JCC interfaces, the ability of JDIC to further meet operator's needs will eliminate memorization of field sequences and differing codes while decreasing errors and simplifying error recovery on those systems.

Numerous personnel from several agencies have remarked on the ease of operation of the system and its utilization by relatively inexperienced personnel for a variety of functions. On site observations on many occasions have noted detectives virtually standing in line to use a single JDIC terminal. One police department alone consistently averages over 1,000 message transactions per day on a single JDIC terminal located near the radio dispatcher. Expanded JDIC has provided law enforcement personnel with a new convenient method of communicating and accessing information which has and will continue to enhance their performance.

5.0

CONCLUSIONS AND RECOMMENDATIONS

5.1

System Performance Conclusions

Three months of statistics generated for the current terminal configuration demonstrate that JDIC is being overwhelmingly accepted as a successor for the FAST Teletype system. As shown in the graph in Section 4.2, FAST workload volumes have steadily decreased, and the JDIC workload has exceeded that of FAST's previous year's daily average.

It should be kept in mind that the current JDIC configuration consists of only 129 video and printer terminals of the planned total of 293. The current workload, therefore, is less than half (44 percent) of the load that can be reasonably expected when the additional terminals have been installed.

Furthermore, with the future addition of JDIC interfaces to the Los Angeles AWWS and AWDI systems and the County's AJIS and AI systems, the workload of the system can be expected to increase dramatically, as traffic for these systems shifts from FAST to JDIC within a few days of their availability through JDIC.

The increased workload placed on JDIC in the future will inevitably result in some degree of degradation in performance. In particular, the addition of new terminals to an existing polled multi-point line will increase the response times for all terminals on the line by a proportional amount. This degradation may not be noticed by terminal operators. However, average response times are not expected to exceed the design objective of four seconds¹ when the proposed terminals are added. If this occurs, however, additional lines may be added or existing lines upgraded to reduce response times back to original specifications.

The message processing capabilities of the system have been designed and tested to exceed the expected peak loads for 1980 (refer to Section 3.3.3). The present system, therefore, can be expected to handle the increased workload anticipated with the planned network expansion.

As stated in Section 4.3, the system availability for the current configuration was calculated at 99.9 percent for the month of April, 1977. While this same high level of availability cannot

¹System Analysis Report, p. 182.

realistically be expected each month, the reliability of the equipment has been clearly demonstrated.

With the addition of more terminals, this calculated availability should not be drastically affected, since it is a percentage of terminal down-time or unavailability rather than the total number of unavailable hours accumulated for all terminals. If adequate spare parts and maintenance personnel are maintained for the increased number of terminals, the system availability can be expected to remain well above the acceptable level of 90 percent.¹

Additional possibilities for expansion and enhancements to the system will inevitably arise in the future. The conclusion drawn from Expanded JDIC's present performance is that it has met its technical objectives of availability and performance, and has established itself as a suitable and acceptable base for such expansion.

5.2

Recommendations

A major consideration in any system is the question of effectiveness. The JDIC System promises considerable savings in the time through increased

¹System Design, p. 78.

productivity. Some of the recommendations below propose methods for collecting and analyzing data and information that could be utilized to develop statements of the system's impact on user productivity. Other recommendations describe system management procedures which may be used to improve operating efficiencies or user acceptance. Some of these recommendations emerged during the project implementation, others during the performance demonstrations, and still others have become apparent in the daily operation of the system.

5.2.1

Evaluation Model

There is an interest within the Sheriff's Department to perform an evaluation of JDIC on a regular basis. That interest should be encouraged through the development of a formal evaluation model. Since the JDIC System is now operational, some evaluation procedures are automatically excluded, such as before-and-after comparisons, using a control group of users. On the other hand, there is a wealth of information within the system that can be employed to evaluate system usage and effectiveness. The evaluation could become a useful, in-depth case

study on the utility of JDIC. Some of the available statistics have been presented in this report. However, there are many more avenues of evaluation that could be explored.

It would be interesting, for example, to see how the usage of JDIC increases and the usage of the FAST system decreases. Observations in this regard have been made in this report (refer to Section 4.2). The trend is clearly toward an increase in JDIC usage -- a phenomenon that can be attributed to the improved system design and human engineering factors of the system.

As a further evaluation, a more detailed analysis can be made in the future to determine which functional areas within the Sheriff's Department and other agencies are utilizing JDIC to perform more of their work. Users with low message volumes can be contacted to determine if they are having specific problems in using JDIC. More generally, a written questionnaire can be periodically distributed to all applicable units to determine advantages, disadvantages and problem areas they perceive in the system. User information from such surveys is particularly important in developing future system enhancements.

5.2.2

Evaluating Direct Benefits of the System

There is another area of interest on which data are currently lacking: the end results of the inquiries performed through the system. With increased usage, there should also be an increase in the number of "hits". Unfortunately, no information is currently available showing the ultimate outcome of the inquiries made. It may be possible to obtain this information from the data base systems. In addition, many individual departments collect statistics on the numbers of arrests, stolen vehicles reported and recovered, missing persons reported and found, and crimes solved. Any increased percentages of these figures that can be attributed to the use of JDIC will represent direct benefits of the system to the population of the Los Angeles County Region.

There is also a desire to determine the cost effectiveness of JDIC. This is clearly the most difficult area to assess. The ultimate worth of the system will come only after many years of use and even then it may be impossible to judge its cost benefits in monetary terms. In this report we have, however, commented on some of the time savings that have occurred with JDIC. The use of function keys,

formatted displays, and Help instructions have all contributed to the time savings. Succinctly stated, we repeat that the combined daily average message counts of JDIC and FAST show a 78 percent increase over the previous year's average, with no increase in labor costs.

Comparisons can be made of the amount of time required to enter common entries and updates, the error rates for transactions, and error correction times for both the JDIC and FAST systems. These statistics will provide indicators of performance increases resulting from system changeover. Such measures are, in effect, "soft" cost savings since they represent increased productivity with no increase in expenditure.

5.2.3

Statistics Report Improvements

Currently, the statistics reports which are being produced on a monthly basis contain anomalies that affect their utility on a direct comparison basis with the FAST statistics. Print commands that are issued from video terminals to produce a hard copy of the screen contents should either be categorized separately or not at all. A clear, understandable distinction should also be made

between such terms as messages and transactions, since JDIC often concatenates multiple transaction responses into a single "message" for operator convenience.

Another recommendation which is presently being considered by the Sheriff's Department is the establishment of alternative processing facilities for the reports. Since the system must process a large number of records from the log tape (approximately 850,000 per month presently), report generation takes a considerable time. Under the current system, the reports are generated on one of the JDIC processors while the other processor assumes the full on-line workload. If the programs were written in a higher level language (e.g., COBOL, FORTRAN) the log tapes and programs could be run on an alternate processor, such as the County's System 370, at a faster rate. This ability would become more beneficial as the workload increases and the single-system configuration is more critically felt.

5.2.4

Transaction Response Times

As system workload increases, measures of transaction response times will become more important as an indicator of throughput capacity and user

service. At present, such measures could also be important to the reconfiguration of multi-dropped lines, since particularly active terminals should be omitted from such lines when they begin to impact others' performance.

An on-line measurement of response times by the system may be prohibitively expensive and self-defeating.¹ However, some methods of simulating the JDIC System on another computer are being investigated by the County Department of Data Processing. Such a simulation may be able to forecast response times under various line configurations and provide recommendations of additional lines or computer hardware.

¹System Design, pp. 38-39.

6.0

CONTINUING PROJECT DEVELOPMENT

6.1

Regional Interface Project

As mentioned earlier, the Expanded JDIC System is still incomplete. The full terminal configuration, as originally planned, has yet to be installed. Additionally, the planned interface to local automated data files and local communications systems have not yet been implemented. However, at this writing work is progressing towards completing the system as planned.¹ This work is being accomplished in accord with the original plan and all work to date, is proceeding on schedule.

The JDIC System, as being implemented and coordinated by the Sheriff's Department, has been funded through various LEAA grants. In September, 1976, the Sheriff's Department received funding approval for an additional LEAA grant titled, "Regional Interface Project (REGINT)". This project will allow the Sheriff's Department to complete the remaining JDIC System tasks including

- 1) Implementation of a universal remote computer interface with computer systems in Long Beach PD, Glendale PD and South Bay Regional Communications Authority,
- 2) Implementation of a JDIC/AJIS, AI

¹Figure 1-2, JDIC Interfaces.

interface; 3) Implementation of a JDIC/AWWS, AWDI interface; and, 4) The full terminal configuration, as originally specified, installed County-wide.

With additional funding from the REGINT grants, the Sheriff's Department immediately entered into contract negotiations to procure and install 40 more video terminals and 17 printers. This contract was approved and those terminals scheduled for installation by August, 1977. Concurrently, another contract was negotiated and approved to accomplish the remote police department computer interface. That effort is scheduled for completion in November, 1977. Additionally, a third contract is currently being prepared to affect the JDIC/AJIS, AI interface with the County's computer center in Downey.

Thus, the Expanded JDIC System remains in a continuing state of development to accomplish all of those objectives originally set forth at the onset of the project; and, as each new data file is integrated into the JDIC System, an additional terminal requirement is mandated to accomplish the workload created. The JDIC System is, therefore, a dynamic one which may be expected to continually expand to meet the needs of law enforcement in Los Angeles County.

APPENDIX A

CHRONOLOGICAL BIBLIOGRAPHY

Report on FAST System Replacement Study, Los Angeles County Sheriff's Department, Technical Services Division, Los Angeles, April, 1973.

First Year Grant for JDIC Expansion Project, #23034, Office of Criminal Justice Planning, Sacramento, June 25, 1974.

Second Year Grant for JDIC Expansion Project, #23033, Office of Criminal Justice Planning, Sacramento, June 25, 1974.

Request for Proposal to Design, Fabricate, and Install the JDIC Expansion Project, Los Angeles County Sheriff's Department, Los Angeles, October, 1974.

Proposal for JDIC Expansion Project, #M15560, Planning Research Corporation, Los Angeles, November, 1974.

Proposal Evaluation Report for the JDIC Expansion Project, Report #ATR-75(7499)-1, The Aerospace Corporation, El Segundo, CA; December, 1974.

Analysis and Recommendations for Latent Defects in the Sheriff's Command Control System, NSS 8242.1, Holmes and Narver, Inc., Anaheim, CA; May, 1975.

Expanded JDIC Contract, #25228, Los Angeles County Sheriff's Department, Los Angeles, CA; May 13, 1975.

Computer Terminals RFP, PRC Public Management Services, Los Angeles, June, 1975.

Expanded JDIC Systems Analysis Report, Rev. 1, PRC Public Management Services, Los Angeles, August 8, 1975.

Expanded JDIC Terminal Recommendation, PMS-0032, PRC Public Management Services, Los Angeles, September 10, 1975.

Expanded JDIC System Design, PRC Public Management Services, Los Angeles, revised November 26, 1975.

Expanded JDIC Implementation Plan, PRC Public Management Services, Los Angeles, November 26, 1975.

Expanded JDIC Terminal Design, PRC Public Management Services, Los Angeles, revised February 10, 1976.

Expanded JDIC Initial Software Demonstration Procedure, PRC Public Management Services, Los Angeles, March 8, 1976.

Third Year Grant for JDIC Expansion Project, #27298, Office of Criminal Justice Planning, Sacramento, April 6, 1976.

Expanded JDIC Interim Software Demonstration Procedure, PRC Public Management Services, Los Angeles, July 9, 1976.

Expanded JDIC System Load Analysis, PRC Public Management Services, Los Angeles, September 14, 1976.

Expanded JDIC Functional Capabilities Demonstration Procedures, PRC Public Management Services, Los Angeles, November 4, 1976.

APPENDIX B

EXPANDED JDIC TERMINAL LOCATIONS

Los Angeles County Sheriff's Stations:

Altadena Station
Antelope Valley Station
Avalon Station
Carson Station
City of Industry Station
Crescenta Valley Station
East Los Angeles Station
Firestone Station
Lakewood Station
Lennox Station
Lomita Station
Lynwood Station
Malibu Station
Norwalk Station
Pico Rivera Station
San Dimas Station
Santa Clarita Valley Station
Temple City Station
West Hollywood Station

Sheriff's Facilities:

Biscailuz Center
Inmate Reception Center
Civil Division
Hall of Justice Jail
L.A. Medical Center Jail Ward
Mira Loma Facility
Sybil Brand Institute
Wayside Honor Rancho - Maximum
Wayside Honor Rancho - Minimum
Patrol Headquarters
Management Staff Services Bureau
Information Bureau
Scientific Services Bureau
Special Enforcement Bureau
Transportation Bureau
Records Bureau
Communications Center
Computer Room
Narcotics Bureau
Detective Division Headquarters

Other County Departments:

District Attorney
Marshal

Municipal Police Departments:

Alhambra P.D.
Arcadia P.D.
Azusa P.D.
Baldwin Park P.D.
Bell P.D.
Bell Gardens P.D.
Beverly Hills P.D.
Burbank P.D.
Claremont P.D.
Compton P.D.
Covina P.D.
Culver City P.D.
Downey P.D.
El Monte P.D.
El Segundo P.D.
Gardena P.D.
Glendale P.D.
Glendora P.D.
Hawthorne P.D.
Hermosa Beach P.D.
Huntington Park P.D.
Inglewood P.D.
Irwindale P.D.
La Verne P.D.

Long Beach P.D.
Manhattan Beach P.D.
Maywood P.D.
Monrovia P.D.
Montebello P.D.
Monterey Park P.D.
Palos Verdes Estates P.D.
Pasadena P.D.
Pomona P.D.
Redondo Beach P.D.
San Fernando P.D.
San Gabriel P.D.
San Marino P.D.
Santa Monica P.D.
Sierra Madre P.D.
Signal Hill P.D.
South Gate P.D.
South Pasadena P.D.
Torrance P.D.
Vernon P.D.
West Covina P.D.
Whittier P.D.

APPENDIX C

MAJOR MILESTONES, EXPANDED JDIC PROJECT

September 1972	FAST Replacement Study Initiated
April 1973	FAST Replacement Study Completed
June 1974	First Year JDIC Grant Accepted by County
October 1974	JDIC Request For Proposal Let
January 1975	PMS Selected as JDIC Vendor
May 1975	County/Vendor Contract for Expanded JDIC Finalized and Approved
June 1975	Terminal Request For Proposal Approved by County
June 1975	Second Year JDIC Grant Accepted by County
July 1975	System Interface Grant Accepted by County
August 1975	System Analysis Report Approved by County
October 1975	Terminal Selection Approved by County
November 1975	Central Computers Installed and Tested
December 1975	JDIC System Design, Site Preparation Requirements and Implementation Plan Approved in Critical Design Review.
April 1976	Third Year JDIC Grant Accepted by County
May 1976	First Terminals Installed at Remote Locations
June 1976	Initial Software Development Demonstrated
September 1976	Interim Software Development Demonstrated
September 1976	Last Terminal Installed at Remote Location
November 1976	First Year Regional Interface Project Accepted by County

January 1977 Functional Demonstration of Expanded
February 1977 Operational Demonstration Approved by
March 1977 First Terminal Additions to the JDIC Sys
 under the Regional Interface Project Gran
May 1977 Approved Contract to Develop an Universal
 Computer Interface with the JDIC System

se¹

END