AN INFORMATION SYSTEM FOR LAW ENFORCEMENT

LeRoy B. McCabe and Leonard Farr

System Development Corporation, Santa Monica, California

INTRODUCTION

The System Development Corporation (SDC), in conjunction with the Los Angeles Police Department (LAPD), conducted a System Design Study for Phase I of the LAPD Information System during the period of June, 1965, to January, 1966. The System Design Study was organized into two major activities—a System Analysis and a Phase I System Design. Each of these activities was further divided into major tasks which were performed by SDC and LAPD personnel working in close harmony.

The major product of the Systems Design Study was the documentation of a concept for the design and operation of an automated information system. This concept is detailed in the Operating System Description 1 for Phase I of the LAPD System. In support of this concept, other documented products resulting from the Study were the System Analysis, the Equipment Specifications,2 a System Development Plan,3 and a Glossary 4 of terms used in law enforcement and information processing. The evolutionary approach to system development was adopted; i.e., the System is to be designed and built in blocks or phases concentrating first on the most pressing operational needs.

The Phase I System was limited at the outset of the Study to the following applications:

- Crime and related reports.
- Want and warrant information.
- Field Interview information.

However, it was also possible for the designers to consider certain aspects of the arrest, booking, and jailing operations. Other critical operations such as personnel deployment and traffic enforcement were deferred to a Phase II effort.

This paper summarizes the results of the analysis and design activities by describing the most salient features of each. It discusses the implications for the Phase I System as a regional system and provides directions in which the LAPD System can expand to develop, ultimately, into a total law enforcement command and control system.

SYSTEM ANALYSIS

A System Analysis, ideally, is performed on the "entire" system and not a portion of the system. If allowed to proceed ideally, the analysis would encompass every aspect of a law enforcement operation. In adhering to the evolutionary approach, however, the System Analysis concentrated primarily on those Department operations within the bounds of the Phase I System, but also considered, in general, other operations with a view towards future applications.
The activities and documentation of the results of the System Analysis* were divided into four parts: a Configuration Analysis, a Report Forms Analysis, a Functional Analysis, and a Requirements Analysis. This documentation is quite extensive (some 800 pages) and is intended to establish a detailed and comprehensive understanding of the present LAPD information processing procedures. Understanding of current operations is essential to the success of subsequent design tasks.

All of these analyses were conducted jointly by SDC and LAPD personnel under the guidance and direction of SDC personnel. In preparation for each of the four separate analyses, a "Guide" was published for the benefit of LAPD personnel to acquaint them with the objectives and procedures involved in that particular analysis. These Guides and a three-day orientation period constituted the only formal training of LAPD personnel prior to their participation in the analysis activity.

Current LAPD Operations

The operations of the Los Angeles Police Department are typical of those of a large metropolitan department. The Department is organized primarily in decentralized field commands, housed in buildings located throughout the entire city. Responsibility for patrol effectiveness against the crime problem rests with the field division commander. Not all of his responsibilities, however, are confined to patrolling against known patterns of activity. Many of the actions of the individual patrol unit occur in response to requests for service through the central communications system. When an event occurs, in most cases, the central communications system receives a telephone call from a citizen. The officer receiving the telephone call decides that some action on the part of a field unit is necessary and a dispatcher selects the appropriate field unit and relays the call number and message to a radiotelephone operator.

The field officer often requests information on individuals or vehicles which he needs for his immediate decisions on action to be taken.* The central communications facility must be in constant contact with the information files of the Department. These files include both the kinds of information required in real time, such as warrants or wants for individuals; and the type of information with less critical time requirements, such as criminal records, crime reports, and investigator's follow-up reports.

The crime reporting process usually begins with the field officer. When an event occurs and the field unit arrives at the scene, the field officer will make a report of the crime. That report is then reviewed by his supervisor in the field division headquarters. The crime report becomes the basic information upon which detective follow-up is based. It is also used to prepare statistics for command and management purposes.

Investigative activities with respect to crime are also generally decentralized at the division level with the exception of a number of specialized details such as narcotics and abortion. Investigative activities involve the patrol, supervisory, and detective force in a significant information processing effort, especially to support crime pattern recognition. When a new crime occurs, the patrol commander would like to know if this crime is linked to previous crimes in his area or if, in fact, it is related to crimes that have occurred outside his area of cognizance. Patterns are maintained at the divisions by analytical officers with the aid of pin maps.

The investigator relies heavily on the crime reporting process, especially when he is attempting to link up a series of cases in order to develop additional leads or suspects. When a suspect is apprehended for one particular offense, the investigator needs to be able to search his file for uncleared crimes that the suspect may possibly have committed. All these activities depend on an effective information system that can aid the processes of retrieval, analysis, correlation and dissemination.

Current LAPD Operational Problems

The Los Angeles Police Department, as do most metropolitan police departments, faces crime loads which are increasing at a faster rate than population in the urban areas. For example, during the period from 1954 to 1964, the City of Los Angeles experienced an increase in population of slightly over 23 percent while the total of all crimes reported to the Police Department, during the same period, increased over 120 percent.

* Los Angeles Police Department System Analysis, TM(L)-2497, Volumes 0 through 4, System Development Corporation, December 31, 1965. This document is releasable only through the Los Angeles Police Department.

* For example, in the City of Los Angeles alone there are over 600,000 inquiries from field officers each year relevant to possible stolen vehicles, with an additional 600,000 inquiries from field personnel relevant to individuals for whom warrants of arrest may be outstanding.
The growing operational load carries with it a significant requirement for processing of information concerning each event. The costs of the processing required to keep up this volume generally far exceed the limited financial resources of the metropolitan community. The inevitable result is that many types of information that would otherwise have operational value are not readily accessible to the Department.

The problems of sheer volume of information to be processed do not adequately describe the scope of the problems facing police departments. The patterns of crime have become more complex in type of event, modus operandi of the criminal, and the difficulties in matching a suspect with a given crime.

The greater mobility of the criminal, brought on by the increase in motor vehicles and freeways, has had serious impact on the nature of field operations. It is no longer possible to concentrate crime pattern recognition in a given field division. The criminal does not respect divisional boundaries. In fact, it is no longer feasible to attempt crime pattern analysis purely within the bounds of any single political entity. An obvious corollary of this problem is the effect on interagency communications and information processing within a given region. The police departments interacting with the Los Angeles Police Department need to have access to information contained in LAPD files, since they use those files for much of their information support. Similarly, the Los Angeles Police Department must have immediate access to information collected in neighboring police departments and in its large sister agency, the Los Angeles County Sheriff's Department. This requirement for interagency cooperation has been considered in the system design activity and is discussed later.

The general problems described above lead to specific needs of the Los Angeles Police Department. First, with respect to the processing of crime information, the essentially manual information handling techniques presently employed encourage duplication of files in an attempt to minimize information response time and do not contribute to effective correlation and retrieval of stored information. When compared to available electronic data processing capabilities, these manual techniques are outdated and stressed to a point that precludes accommodation of any increase in demands.

The general deployment of patrol forces is based on outdated statistics, weighing factors, and analytical techniques, many of which, due to lack of available advanced technological means, have not been adequately tested. It is highly desirable to deploy forces by means of immediate analysis of statistics that are current at the moment of deployment. This cannot be done utilizing present techniques, equipment and procedures.

Although these problems are expressed here in terms of the Los Angeles Police Department, they are also typical of every large metropolitan law enforcement agency and representative of problems encountered in those suburban areas which depend on the aggregation of services of many small police agencies.

SYSTEM DESIGN

Background and Objectives

The law enforcement needs in Los Angeles, especially with respect to information problems related to crime, were recognized several years ago. In 1963, the City undertook jointly with System Development Corporation a program of research and experimentation in the application of advanced computer techniques to the processing of crime data. The approach undertaken at that time emphasized "natural language processing." Rather than extend the errors and ambiguities of numerically coded crime data (as currently processed on punched cards), the computer was used experimentally to process and retrieve crime report information in its original English language form. A research and development program, conducted over an eighteen-month period, validated the concept that the computer could assist the investigator in crime pattern recognition, using this advanced approach.

It was also recognized that a future operational system for the LAPD and/or a regional law enforcement complex would envision inputs and inquiries to a central area-wide file from remote stations in field locations. Therefore, in addition to exploring natural language retrieval, this early SDC-LAPD Project also tested the concept of computer time-sharing. The term "time-sharing" is used here to denote the concept of the simultaneous use of a central computer by multiple users, each operating a different computer program, communicating data and instructions to the machine from remote locations, and receiving on-line responses. Each user has his own input/output device such as a teletypewriter or graphic display on television-type cathode ray tubes.
In June, 1965, after this early experimentation the City of Los Angeles contracted with System Development Corporation to undertake a design effort, applying these concepts and research results to the first phase of an information system to serve the Los Angeles Police Department. This system design effort concluded in January, 1966.

A summary statement of the initial objectives of the system design effort, in light of the problems previously outlined, includes:

(1) Achievement of more financially economical means of processing increasingly larger amounts of information presently associated with crime and related reports, wants and warrants, and field interviews.

(2) Minimizing the time required to process and communicate the information relevant to crime and related reports, wants and warrants, and field interviews.

(3) Maximizing the accuracy, relevancy, availability and effective utilization of crime, wants and warrants, and field interview information.

The Phase I System is described below in terms of the inputs, processing, and outputs available to system users. However, the following are some of the System’s key characteristics:

(1) The System is based on the operation of a general purpose digital computer.

(2) Information input to the computer will be entered by telephone through a centralized conversion pool.

(3) All information will be reviewed first on a division level, and then by a command inspection activity that will provide centralized control over inputs to the System.

(4) Access to the System will be time-shared by means of keyed display devices.

**Phase I System Applications**

Figure 1 and the following discussion summarize the applications encompassed by the Phase I System:

(1) The processing of crime data on a City-wide basis, including field reporting of events in remote locations; entry into a central computer file for correlation with similar data; dissemination of abstracts back to the field location both automatically and upon demand; the production of the management reports to be used for evaluation and deployment of manpower; assistance to the investigator in retrieving relevant crime data; and the automatic dissemination of information to concerned county and state agencies about the crime activities, stolen property, individuals and vehicles involved.

(2) The maintenance of a real-time inquiry system for warrants and other wanted individuals.

(3) A total inventory and processing of arrest and booking information, maintaining up-to-date information on individuals who have been arrested by the Los Angeles Police Department. This system will be compatible and communicate directly with the arrest and jail system of the Los Angeles County Sheriff.

(4) The incorporation of data on persons contacted in the field and the correlation of these data with possible crime occurrences in the same area. These field interview data are currently collected by patrol officers throughout the City, but have limited application because of the difficulty of correlating and retrieving information from the manual system. With the new system, these data would be available, on either automatic or request basis, for computer retrieval and matching with selected crimes. This will be accomplished within the system by a series of computer programs referred to as PATRIC (Pattern Recognition and Information Correlation). As information from the various System inputs is stored in the PATRIC Index, the PATRIC retrieval and correlation function will automatically operate upon, correlate and output those particularly similar events that

From the collection of the Computer History Museum (www.computerhistory.org)
appear to be related. The results can be dispatched automatically to the concerned investigators at the beginning of each day for their evaluation.

Inputs, Conversion and Review

The primary information accepted by the Phase I System will include:

1. Event Reports and related follow-up reports (all crime information).
2. Contact information derived from field interviews and arrests.
3. Booking and release information within the City Jail System.
4. Want and warrant information derived from the receipt, registration and processing by the Department of
all parking warrants, felony and misdemeanor warrants, and felony wants. Included in this category are all local and other agency warrants and warrants. In all instances, however, a copy of the warrant must be physically in the possession of the Department or a reasonable justification for a want from another agency must be present.

With the exception of hard-copy warrant information, the primary mode of reporting will be by telephone to the Conversion Center. A Cue Sheet will be used by the reporting officer to assist him in organizing and specifically noting information collected at the scene of an event, during a contact (field interview or arrest), or in the booking process. The objective of the Cue Sheet is to systemize and reduce the amount of reporting without degrading the quality of information.

Information reported by telephone will be recorded at the Conversion Center in the Department by a device controllable from any telephone. Hard-copy information (e.g., wants) will be converted directly. Event and Contact Reports will be converted without delay by transcription personnel situated at keyed display consoles in the Conversion Center. The use of the keyed display consoles will allow conversion personnel to edit the data (for conversion and format errors) prior to the insertion of the data into the appropriate System storage area. Corrections and other similar modifications will be made at the console. The reports are then passed by the System to the Division Reviewer for correction or modification, and approval prior to their entry and availability in the System. Arrest and crime reports (i.e., event reports) concerning individuals and crimes in the City but prepared by other law enforcement agencies will be processed into the System in the same manner as LAPD-collected information.

Booking information will be transmitted by either teletype or telephone at the point of booking to the central transcription pool in the Conversion Center. Booking and release information will be converted immediately for dissemination. The System will respond by printing the booking (or release) information at the appropriate points (division of booking, Central Jail) on the Department Teletype system in a sufficient number of copies for the booking process. Multiple copies may be produced on formsets, depending on the eventual use of the printed booking report. Figure 2 depicts the major equipment components in the Phase I system.

Information concerning the service or attempted service of warrants will also be inserted into the System. If a warrant has actually been served, this action will be reflected through the booking process. If an attempt has been made to serve a warrant but it was not served, the reasons for non-service will also be entered into the System. As each attempt is made, the reason for non-service and the number of attempts will be recorded in the want and warrant file.

As Event and follow-up reports are reviewed and approved at the field division level, they will be automatically displayed (by type of crime) on one or more of the keyed display consoles in the Command Inspection area (Figs. 1 and 2). The report of each type of crime is then inspected by Command Inspection specialists who will make appropriate corrections or modifications and request additional information from the concerned divisional personnel when necessary. Command Inspection specialists will review the report contents to derive the appropriate MO when necessary, make investigation assignments when required, evaluate the completeness of information, and assign the principal crime in those Event Reports describing multiple crimes. When satisfied that all Event Report requirements have been met, Command Inspection will release the information into the System.

**Outputs for Line and Management**

The retrieval function will provide the user with a means for searching the total collection of crime and related information contained in the system and present him with organized responses. The correlation of information, such as people's names and descriptions, locations of crimes, descriptions of vehicles and methods of operation, will be a prime capability of the retrieval function. A copy of any specific report based on its identification number can also be obtained by the user if he desires.

For example, if a user is looking for a certain type of crime report, he might include in his request a description of a suspect (with or without a specific name), the specific MO known to be associated with the suspect and, perhaps, a partial vehicle description. The computer would then search its total data base and refer to all reports (whether derived from
Another capability of the retrieval function will be the automatic correlation of information in older reports with that included in selected new event reports. In addition, if desired by a particular investigating officer, a check can be made against contact reports based on time and location (as well as suspect description) to determine if any field interviews were conducted at approximately the same time and in the same general location. Thus, each investigating officer can be provided with all possible relevant information on the crime or crimes he is investigating.

The overall retrieval function, including both the automatic and special request modes, is referred to as PATRIC (Pattern Recognition and Information
Correlation). The following hypothetical situation is an example of the PATRIC operation:

- A "window smash" burglary occurs at 1:00 a.m. at Wilshire and Fairfax. Witnesses describe the perpetrator as a male caucasian, 5'9" tall, wearing light clothing. The field officer completes the report and the information is entered into the System.
- Approximately an hour later at 2:00 a.m. at Westwood and Pico, in an adjacent division, a person fitting the same description is stopped and interviewed by other field officers. A Contact Report (field interview) is completed and entered into the System. The additional name and address information is now on file.
- At 2:30 a.m. the same suspect, in the Venice Division, is arrested and booked for being intoxicated. His name, physical description and other pertinent data are inserted into the System.

From the time the Event Report entered the System, PATRIC has been automatically correlating it with other similar events in the System files. The results will arrive on the concerned investigator's desk the next day and may include the following correlated information:

1. A window smash occurred at 1:00 a.m. at Wilshire and Fairfax; the suspect was a male caucasian, 5'9" tall, wearing light clothing;
2. At 2:00 a.m., at Westwood and Pico, a male caucasian, 5'9" tall, wearing light clothing, and named John A. Doe was interviewed and released;
3. The Warrant File has been automatically searched, and there is no want or warrant on file in that name for the stated date of birth;
4. John A. Doe has had several Contact Reports made on him at various locations within the last three months;
5. John A. Doe has been arrested and booked before;
6. All these events took place within a 2 to 3 hour time period and within a radius of 10 miles from the initial event;
7. A John A. Doe is now in custody at Venice Division jail awaiting arraignment on a drunk charge.

The rest is left to the investigator. He may make additional requests of the System for clarification of certain data or he may disregard the information.

Statistical summaries of crime activities for the City will be available periodically or on demand. Because Event Reports will be processed into the System shortly after the collection of the information, the current status of criminal activity will be available almost immediately. A major function of the Command Inspection operation is to assure the Department's current awareness of the citywide crime situation. Event Reports concerning special occurrences (such as reports involving a shooting) will be brought not only to the immediate attention of the Command Inspection personnel, but also to other Department personnel whose action is required. Special listings of abstracts or reports will be provided either in response to a standing request or by special query. By using the statistical analysis function in the System, requests can be made for special summaries or even more involved statistical analysis of information contained in the various files of the System. In most instances, statistical summaries presently prepared for or by the various divisions will be produced by the System automatically or on request. Aside from the major reports (Event and Contact) resulting from the collection of crime and related information, the System will derive and produce numerous other reports and summaries such as the Jail Population and Crime Abstracts. Information will be as current as the most recently inserted data.

THE PHASE I SYSTEM AS A REGIONAL SYSTEM

The expansion of the Phase I System for use as a regional information system for law enforcement agencies in the greater Los Angeles area is not only feasible, but reasonable. Some requirements for the implementation of such a concept include:

1. The need for increased random access computer storage capacity.
2. The requirement for at least one keyed display console or teletype-writer to be located at each participating agency. Additional input-output
equipment may be required depending on input volume and query rate.

(3) The need to establish efficient data conversion procedures on the part of the participating agencies.

(4) The requirement to specify the degree of interagency access to information in the data base.

The most immediate question is that of wants and warrants. The Municipal Court and the Los Angeles County Sheriff's Department, as well as LAPD, have been considering warrant processing requirements. Additional interactions among concerned agencies will be required to determine the ultimate regional system configuration.

Provision has been made in the design for the interaction of the LAPD System with other City, County, and State information systems. When the LAPD System becomes operational, an interface will occur with the Police Information Network (PIN) of Alameda County and the AUTO STATIS (Automatic Statewide Auto Theft Information System) operation of the California Highway Patrol. Contemplated systems of other agencies, with which the LAPD System may have to interface, include the National Crime Information Center, the Department of Motor Vehicles, the Bureau of Criminal Identification and Investigation, and other agencies such as the Municipal Court and the Los Angeles County Sheriff's Department.

Regardless of whether a regional system is developed, agencies presently receiving information from the LAPD will receive that information in the form of automatically produced reports in a format acceptable to them, or if desired, in the form of magnetic tape containing the information.

FUTURE ANALYSIS, DESIGN, AND DEVELOPMENT

The ultimate goal of the joint LAPD-SDC study team is to analyze all information processing tasks now being performed in the LAPD. The evolutionary development of the system will insure the LAPD of an early operational capability that will solve some of its immediate problems while analysis and design activities continue on future phases of the system. This approach also allows for the gradual phase-out and transition from the existing manual system, thus helping to introduce features of the automated system to operating personnel. Most important, the capability for responding to new or changing operational requirements will be maintained.

Problems in implementation and operations will also be somewhat minimized by the evolutionary approach. By automating only a few elements at a time, for example, training for and transition to the new system will be eased. However, there are also some problems associated with this evolutionary development. They stem from the faulty assumption that succeeding phases are independent and can be dealt with separately when, in fact, each of the phases must be analyzed and designed with the objectives of the entire system at the forefront of the activity.

Management must select the elements to be included in each phase, basing its decision on such factors as cost, ease of implementation, resulting cost savings, increased effectiveness and general desirability, just as it did for Phase I.

Although the full range of capabilities has not as yet been determined—special studies are required before specific applications can be selected—there are a number of suggested applications to be included in succeeding phases.

It is expected that Phase II will computerize additional arrest report activities, daily field activity reports, traffic accident reports, traffic enforcement selective deployment, officer deployment and car plan generation.

A capability offering great promise—fingerprint identification, storage and retrieval—will be included in Phase III together with property reports and a pawnbroker cards file.

Finally, during Phase IV, personnel, training, motor transport, and supply and equipment records can be processed and maintained by the automated system. These non-law-enforcement applications can be considered independently of the information system described here, but they are included for the sake of completeness in the system analysis and design.

REFERENCES

