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PRELIMINARY

NATIONAL LAW ENFORCEMENT TELECOMMUNICATIONS REQUIREMENTS

1200-133 January 7, 1974

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JET PROPULSION LABORATORY
CALIFORNIA INSTITUTE OF TECHNOLOGY
PASADENA, CALIFORNIA

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PREFACE

The National Law Enforcement Telecommunications System Requirements document presents a preliminary statement of user requirements projected through one decade. The requirements reflect an extension of present national law enforcement nets, plus the introduction of new classes of users and data types, such as the automated transmission of fingerprint data, and the use of computerized criminal histories in a fully operational mode. This statement of law enforcement communication requirements will permit effective network concepts and implementations to be developed and tradeoffs prepared to support decisions regarding plans and programs.

The LEAA and JPL recognize the urgent need for early publication of this document because many law enforcement agencies at all levels — local, state, and federal — have begun to develop information storage and retrieval systems and supporting data communication nets to enable their users to access data files and exchange administrative messages with other agencies. These efforts, which are encouraged by LEAA grants, conferences, and issuance of planning implementation guidelines, must be coordinated so that in the aggregate these independent efforts will be cost effective and will fully meet user needs and expectations.

It is recognized that this requirements document will be used by many organizations for their individual purposes: planning by specific user organizations, developing implementation plans or programs, and testing the effectiveness of regulatory practices, funding levels, and operation procedures. This document is intended to provide detailed information in a usable format to serve the needs of these various user and planning organizations.

Finally, this document is intended as a vehicle for user and planning organizations to communicate their future needs in more precise, quantitative terms. As this document is reviewed by representatives of the law enforcement community and their comments are received and evaluated, a

more precise statement of needs, problems, and issues will emerge so that, through a reasoned approach, a well tested and debated implementation program can be developed.

Enormous increases in technological capability, such as massive, low-cost information systems, easily accessible through nationwide computer/communications networks, will force decisions on the law enforcement community in the relatively near future. Early planning can well serve the community to better meet its needs.

FOREWORD

The following personnel contributed to preparation of this document:

J. E. Fielding, Traffic Modeling

S. D. Foulkes, Definition of User Community and New Requirements

R. Granit, New Requirements

R. L. Sohn, Traffic Modeling

The authors wish to extend their appreciation to R. M. Marx, Project Monitor, whose consultation and advice have been very helpful in conducting the requirements analysis, particularly in the area of new classes of users and new data types. We also wish to thank the members of the NALECOM Steering Committee for their careful review and helpful suggestions offered at the project review meeting on December 13, 1973.

1. SUMMARY

This document presents preliminary requirements for a National Law Enforcement Telecommunications system (NALECOM), based on analyses performed for the National Criminal Justice Information and Statistics Service, of the Law Enforcement Assistance Administration, United States Department of Justice. The results are summarized in the form of system origin-destination traffic load estimates for state-to-national and state-to-state communications through 1983. The results indicate that traffic can be expected to increase by a factor of 30 compared to present transaction levels.

The system requirements definition task was comprised of four elements:

1) Define the user community.
2) Perform an on-site survey of representative users.
3) Develop an analysis methodology and perform requirements analyses.
4) Prepare a statement of system requirements.

The user community was defined to include: law enforcement, courts, corrections, prosecution, and probation and parole; each function was classified as local/regional, state and federal. Other federal users were considered on a limited basis, and will be surveyed in more detail for the final requirements document.

An on-site survey of 24 representative user agencies was conducted by the Project SEARCH staff to acquire a data base for preparing traffic projections. Data acquired included: (1) information on existing or planned information and communication systems, (2) information required in performing criminal justice functions, (3) jurisdiction served, (4) number of terminals, and (5) current and projected traffic levels. Supportive data was obtained from the Uniform Crime Reports and state criminal justice master plans; valuable comments and data were received from informal contacts with the NALECOM Steering Committee and from various authorities in the criminal justice community.

Analysis methods were developed for application to the primary classes of communications traffic: (1) projections of present traffic, (2) estimates of extended uses (such as Computerized Criminal Histories and OBTS systems), and (3) new uses such as transmission of coded fingerprint data. Statistical analyses were performed on traffic data for existing nets to develop traffic growth models, for individual states, based on parameters such as population, crime rate, law enforcement personnel, and degree of system automation, all of which are shown to have a strong impact on traffic level. Growth rate is strongly correlated with existing traffic levels. Traffic estimates generated by the models are in reasonable agreement with actual data, and are appropriate for predicting growth trends.

A modified "gravity" model was developed to aid in generating interstate origin-destination traffic matrices in which traffic was varied with population and distance between states. Extended or basically new requirements and new users were analyzed on the basis of limited operational experience of various interstate and local agencies with new information systems, or on the basis of projected estimates of key variables such as criminal offenses, number of arrests and other factors.

The preliminary results of these analyses for the year 1983 are given in Table 1.1. Estimates of message volume in millions, average character length per message type, and average traffic load expressed in bits per second are shown for each usage category and separated into state-to-state and state-to-national communications. A brief statement about each usage category in Table 1.1 follows.

Estimates based on empirical models indicate that current types of traffic projected to 1983 (item 1) will constitute approximately 18.9% of the traffic load. Hence, new applications will account for 81.1% of the traffic, which represents a major increase in services supplied by a NALECOM type system. Use of current types of services will increase by a factor of 15 for state to-state traffic, (due in part to the recent LETS upgrade), whereas state-to-national traffic will increase by a factor of 4.8 over 1972 levels.

Table 1.1 Summary of NALECOM Traffic Projection for 1983*

Item	State-to-State 1983			National 1983			1983
	Message Volume - 10^6/Year	Average Characters/ Message	Average BPS	Message Volume - 10^6/Year	Average Characters/ Message	Average BPS	Total BPS (Averaged)
1. Current Uses Projected							
Inquiries	36.85	432	4,043	142.7	50	1,810	8,933
Responses				142.7	85	3,080	(18.9%)
2. Criminal Histories (Case III)**							
CH- Inquiries	1.7	70	30	3.7	70	66	
CH-"Hit" Responses	1.7	1,725	745	N/A	N/A	N/A	1,337
CS-Inquiries	3.1	70	55	6.8	70	121	(3.3%)
CS-"Hit" Responses	3.1	390	307	4.8 "Pointer Hit"	70	85	
"No Hit" Responses	N/A***	N/A	N/A	5.7	70	101	
Updates	N/A	N/A	N/A	3.1	70	55	
3. Fingerprints							
Booked Offenders				2.915	150,000 Bits	13,900	15,880
Latent Fingerprints				0.083	750,000 Bits	1,980	(33.5%)
4. Driver & Vehicle Records							
Inquiries	23.65	60	360				1,183
Responses	23.65	125	751				(2.5%)
Updates	1.42	200	72				
5. Criminal Justice Planners							
GMIS - Inquiries				0.060	70	1.06	63
- Responses				0.060	1,725	26.16	(0.1%)
NCJSDB - Inquiries				0.156	50	1.94	
- Responses				0.156	500	19.76	
NCJRS - Inquiries				0.052	50	0.68	
- Responses				0.052	1,000	13.18	
6. Organized Crime							
Information Dissemination	2.9	2,250	1,657	1.3	2,250	743	2,400 (5.1%)
7. Crime Laboratories							
Graphics	0.113	300,000	8,630	0.113	300,000	8,630	17,385
Data Transmission - Inquiries	0.021	100	0.52				(36.6%)
Responses	0.021	700	3.64				
Administrative Messages	0.247	432	27.1	0.226	432	24.8	
Total BPS (Averaged)			16,681 (35.2%)			30,659 (64.8%)	47,339

*Uses for Courts, Prosecution, and Corrections have been accounted for under the estimates for Computerized Criminal Histories and Criminal Justice Planners.
**See Section 7.1. (Note: CH refers to Criminal History and CS to Criminal Summary)
***Not Applicable

Traffic due to the use of Computerized Criminal Histories (CCH) was estimated by assuming a national "pointer index", with the actual CCH retained on file at the state of original jurisdiction (item 2). It was further assumed that state identification bureaus would be in operation and capable of servicing 50% of the requests directed to them. Based upon these assumptions, there will be 9.6 million interstate messages and 24.1 million state-to-national messages in 1983.

Based on the further development of digital encoding of fingerprints, coupled with the development of the Federal Bureau of Investigation's FINDER system for search and retrieval of encoded fingerprints data, transmission of fingerprint data is expected by 1983. Assuming that it will be technically feasible to transmit a set of fingerprints with 150,000 bits, transmission of slightly under 3 million sets in 1983 will account for 33.5% of NALECOM traffic. This estimate is based upon the existence of state identification bureaus with a capability to identify 50% of fingerprint requests.

All states are expected to develop driver and vehicle records, and that a law enforcement officer through his state identification bureau, will be able to access any other such bureau over NALECOM. These systems will generate approximately 49 million messages per year in 1983, which will account for 2.5% of the traffic. These messages are distinct from the messages related to the National Driver's Registry which is not considered a user of NALECOM because of federal legal restraints on the use of the Registry.

It is envisioned that criminal justice planners, administrators, and managers will utilize the national data banks containing information on offender based transaction statistics (OBTS), on research programs sponsored by the U.S. Department of Justice, and on the results of innovative law enforcement techniques. The traffic involved in this application has been assumed to be exclusively national and accounting for approximately 0.1% of the total traffic.

Another new use examined was the potential development of a national organized criminal information system similar to the one in operation in the New England states. Based upon the usage of the New England system and scaling it to a national level, it is predicted that such a use might account for 5.1% of the NALECOM traffic; but, it should be reiterated that this usage is highly speculative.

Finally, the use of NALECOM by crime laboratories for the preliminary transmission of specimen facsimilies among the state crime laboratories and the FBI criminal laboratory was examined. Written, pictorial and other specimens

are amenable to facsimile transmission and can support preliminary crime lab analyses prior to sending the actual specimen for examination; it is estimated that such use would account for 36.6% of the predicted traffic. This high percentage is due to the fact that the average facsimile would require approximately 100,000 characters for purposes of encoding and transmission.

It should be noted that although uses for courts, prosecution, and corrections do not explicitly appear in Table 1.1, these uses are accounted for in the estimates of Criminal Histories and Criminal Justice Planners.

The summary indicates that the average traffic load on NALECOM in 1983 will be 47,339 bits per second.* However, this estimate may be amended based on the results of continuing tasks outlined below.

Additional analysis will be performed in the following areas:

1) Federal Users — Careful review will be made of other potential federal users not considered herein. Also those interstate regional networks whose complete operational data were unavailable during this preliminary analysis will be analyzed.
2) National File System vs State Files — Additional analysis will be performed to assess the sensitivity of the traffic estimates to the assumption of state files with a national pointer index versus a national file system.
3) Sensitivity of Estimates — Estimates of new user requirements will be examined for sensitivity to changes in underlying assumptions.
4) Traffic Model Refinements — The effect of increased equipment automation, of the introduction of mobile terminals, of cost, and of urban versus rural usage will be explored through the traffic models.

*Bits per second results from the following conversion:

$$BPS = \frac{\text{Messages}}{\text{Year}} \times \frac{\text{Characters}}{\text{Message}} \times \frac{8 \text{ bits}}{\text{Character}} \times \frac{1 \text{ year}}{31,536,000 \text{ seconds}}$$

5) Traffic Dynamics — The effects of message queues (i.e., message delays or waiting) on the communications traffic will be analyzed to determine effects on system design requirements.
6) Privacy — The impact of citizens' right to privacy and supporting legislation thereto will be considered as it affects the building of files, the access to files, and the content of files.

2. INTRODUCTION

The National Law Enforcement Telecommunications System preliminary requirements document has been prepared for the National Criminal Justice Information and Statistics Service, Law Enforcement Assistance Administration, United States Department of Justice, in response to a statement of work which is in JPL Proposal No. 51-213A, dated June 12, 1973, and which has been incorporated into task order RD-152, Amendment No. 22 (basic) of contract NAS7-100 and the LEAA-NASA Interagency Agreement LEAA-J-IAA-037-73.

This document is a preliminary statement of National Law Enforcement Telecommunications System requirements, projected through one decade and encompassing the interstate, state-to-federal, and federal-to-federal agency transactions; transactions generated at local and regional levels captured by the national nets are included. The statement of user requirements encompases extensions of present national law enforcements nets, plus the introduction of new classes of users and data types, such as fully operational Computerized Criminal History (CCH) systems, automated transmission of encoded fingerprint data, and support of criminalistics and other elements and functions in the criminal justice system. Information presented in this document provides a basis for the design and development of NALECOM network concepts and implementation planning and programming. The results of the study are summarized in Chapter 1.

Chapter 3 states the purpose and scope of the user requirements analysis. Chapter 4 gives a statement of the problems encountered by the criminal justice community relative to the needs for new information systems, a brief description of existing information systems and national communications networks, several major new requirements that must be met by advanced system implementations in the coming decade, and the approach used in developing the statement of system requirements.

Chapter 5 briefly describes the user community in terms of types of agencies, e.g., police departments, prosecutors, courts, corrections and probation and parole, and hierarchy of users, local, regional, state, and federal.

Data describing the characteristics of the users are included to support correlations of traffic estimates with various parameters, such as crime rate, population, and other variables. Detailed information is given in Appendix D.

Traffic load estimates are presented in Chapter 6 for both interstate and state-to-federal communications projected to 1983. The estimates are based on traffic models based on NCIC and NLETS operational data, augmented by estimates of traffic against new information files, traffic generated by new users in the criminal justice community, and new types of data, such as image transmissions, and fingerprints. The number of characters per message can be expected to increase significantly as new information types are introduced onto the nets; projections of the increases in message lengths are included in the overall estimate. An important consideration relates to peak-to-average traffic loading values; estimates are included for this factor.

Chapter 7 discusses extended and basically new requirements, utilizing the operational experience of various agencies and estimates of key variables such as number of arrests, number of records in state and federal data files, and other factors. Numerous consultations with various user agencies provided valuable inputs to the analyses. A summary of total system traffic anticipated for NALECOM is given in Chapter 7 (see also Table 1.1, page 1-5).

Chapter 8 presents response time requirements, based on recommendations by the National Advisory Commission on Criminal Justice Standards and Goals. The requirements values reflect both officer safety criteria and maximum values for investigatory and identification functions.

Supporting data are given in the Appendices.

3. PURPOSE AND SCOPE OF THE USER REQUIREMENTS SPECIFICATIONS

3.1 Purpose

The primary purposes of the user requirements analysis are to

1) Estimate user needs for a 10-year planning horizon, and
2) Prepare a statement of present and future requirements of local, state, and federal law enforcement agencies for interstate telecommunications.

The major purpose of the user requirements task is to develop a statement of system requirements such that concepts and implementations of the NALECOM net can be developed to meet future user requirements.

Definitions of the user community were prepared to identify agencies in the law enforcement community and the characteristics of these users in terms of size, jurisdiction, number of law enforcement personnel, resources available to the agency, and functions for which the agency is responsible. A survey of the user agencies was made to acquire data on their present operations, and to determine their future needs and plans.

3.2 Scope

Certain assumptions have been made in formulating system requirements for NALECOM. These include the following:

1) NALECOM is a telecommunications network for:

   a) The exchange of criminal justice information among the states, the District of Columbia, and territories of the United States.

   b) The exchange of criminal justice information between the states, the District of Columbia and the territories of the

United States and the various Federal departments involved in law enforcement and criminal justice.

c) The exchange of criminal justice information between the states, the District of Columbia and territories of the United States and authorized Federal agencies, outside the criminal justice system, where the primary need for exchange is pursuant to criminal justice responsibilities.

d) The exchange of criminal justice information between the states, the District of Columbia and territories of the United States and criminal justice agencies in Canada and Mexico.[1]

2) It is assumed that NALECOM have the capacity to serve the needs of the major functions and agencies of criminal justice: law enforcement, courts, prosecution, probation and corrections, and others.

3) It is assumed that states and territories will exercise jurisdictional control over access to and use of information originating within their boundaries either through reciprocal agreement with other states and agencies and/or controlled access.

4) For traffic analysis purposes, each state is considered as a single "port" into the system. This does not preclude multiple terminals in a state, provided each terminal is controlled by the state authority.

5) Intrastate traffic will not be provided by the system, but will be considered in the requirements analysis to determine traffic volume captured by the national system.

6) It is assumed that the system will not impose constraints on data types or formats.

7) It is assumed that digital records, fingerprints, photographs and possibly other data types can be transmitted; video transmissions will not be considered initially.

8) A 10-year planning horizon is assumed.

[1] LEAA communication to P. J. Rygh, JPL NALECOM Project Manager, re scope of NALECOM study. November 9, 1973.

4. BACKGROUND

4.1 Problem Statement

Crime in the United States is a phenomenon of national concern. Crime rates have increased over the past decade making it necessary to initiate programs at all levels of government (local, state and federal) to deter crime and to improve the effectiveness of the criminal justice system. Greater resources are being made available to the system for more personnel, modernization of facilities and equipment, and introduction of new hardware and operations technology.

Along with many other sectors, the criminal justice system is experiencing an "information" explosion with a greatly increased capability to gather, process, and transmit information, and is experiencing steadily increasing pressures for more information and reduced response times. For the effective administration of justice, information must be made available rapidly on the identity, location, characteristics, and description of the offender. Improved officer safety and the increasingly stringent legal requirements to protect the rights of the individual place enormous demands on crime information systems and on communication nets supporting those systems. Information is required quickly and accurately not only for the apprehension of criminals but also because of the strong necessity to avoid the use of inaccurate information, which can have adverse reactions in the form of legal actions against the law enforcement community.

The complexity of the problem is placed in perspective by the sheer numbers of agencies that have the need to exchange information. LEAA has estimated that there are approximately 40,000 such agencies. This suggests a communication matrix of enormous dimensions, and one that will make it difficult to achieve response times within seconds and minutes instead of hours and days as is all too frequently the case with present facilities.

In response to the need for improved information systems, local, state, and federal law enforcement agencies have begun work on both specialized

information storage and retrieval systems and telecommunication system that will ensure user access to the information files and the exchange of administrative messages with other agencies. Thus far, these efforts are largely uncoordinated, and there is concern that the aggregate of new or expanded law enforcement telecommunications systems may not be fully cost-effective and may not fully meet the needs of the users.

In essence, the present interstate telecommunications systems must be modified or expanded to support larger traffic loads and the introduction of extended and new functions. Standards for establishing law enforcement telecommunication systems have not been completely defined. There are few existing provisions for handling data on organized crime or interfacing with crime labs. Furthermore, the introduction of new data transmission requirements, such as the transmission of fingerprint information, will greatly increase the loading on the present networks and will require substantial upgrades to maintain adequate performance.

In summary, the following general communications problems can be stated for law enforcement applications:

1) National telecommunications networks which can meet user requirements and constraints must be defined.
2) System implementation needs must be defined in terms of capacity, response time and operational dates.
3) The issue of privacy and security constraints on data handling has not been resolved; criminal histories and offender based transactions statistics pose particular problems in regard to file content, location and access.

The following sections address these problems and present them in terms of quantified user requirements.

4.2 Existing Information Systems and Communication Nets*

Basically, two major law enforcement information and communications networks are in use at the present time: the National Crime Information Center (NCIC) and the national Law Enforcement Teletypewriter Service (LETS). LETS provides a state-to-state administrative communication capability but has no central data files, whereas NCIC provides a state-to-national near-real-time access to data files on stolen vehicles, stolen property, wanted persons, and criminal histories. A brief review of these systems is given to provide the framework for traffic projections for the NALECOM system, although it is not necessarily intended that NALECOM will be a simple combination of these two existing nets.

4.2.1 NCIC

NCIC is a computerized information system established to provide a service to all law enforcement agencies at local, state, and federal levels. The system is essentially a computerized index to documented police information concerning crime and criminals of a nationwide interest. The FBI is responsible for operating NCIC; data files and supporting equipment are located in Washington, D.C.

The NCIC presently runs on an IBM 370 computer system with an IBM 2703 transmission control unit capable of handling 48 134.5-baud terminals, 140 110-baud terminals, and 12 2400-baud terminals. Practically all these terminals are in use at the present time, and the NCIC is in the process of an upgrade to accommodate additional traffic.

Eight data files make up the NCIC data bank, including wanted persons, stolen vehicles, stolen boats, stolen license plates, stolen articles, stolen guns, stolen or missing securities, and criminal histories. There were over 4 million data and index references as of 1972, and it is anticipated that a substantial increase in the criminal history file will be experienced over the next several years.

*More complete descriptions of existing nets are given in Appendix B.

A number of types of messages are permitted against each file including inquiries, tests, entries, clears, cancels, modifies, and locates. These message types are handled on line in real time; each receives a response from the computer on a one in, one out basis without priority.

The incoming messages are confined largely to inquiries (57%) and entries (8%). The average incoming message contains 50 characters, and the average outgoing message 85 characters. The latter can be expected to increase if the CCH files are built up at the national level since criminal history records typically contain several hundred characters per record.

The NCIC network was initiated in 1967, and transactions against the system in 1968 were approximately 7 million. The 1973 transactions are estimated at 37 million, based on June and July averages.

4.2.2 LETS

The second major national law enforcement net (LETS) consists of 9 circuits providing interstate communications to the 48 contiguous states. Each state has at least one entry point on the network; direct intra-circuit communication is possible without going through the central message switcher located in Phoenix. The LETS system does not contain an internal data base.

The basic types of information provided by LETS include

1) Persons of concern to criminal justice agencies.
2) Stolen vehicles and property.
3) Vehicle and driver's license data.
4) Road and weather conditions.
5) Administrative messages.

Approximately 4500 law enforcement agencies participate in LETS system at the present time, and the system handles approximately 2.5 million messages a year. The average message length handled by LETS is 432 characters per message.

The LETS system is being upgraded, and the network configuration is being changed from the circuit concept to a network in which all users have direct lines to the central message switcher. Initially, approximately half of the users will be provided with high-speed lines such that direct computer-to-computer interfaces can be accommodated. This new system came on line in late December, 1973.

Other major law enforcement nets have been implemented on a regional basis, such as the Kansas City, Missouri, ALERT System, Cincinnati CLEAR System, and several others. These nets provide service to many clients in the regions in which they operate and will be considered in the development of concepts for the NALECOM System.

4.3 Future Needs

The most difficult aspect of user requirements definition relates to the identification/quantification of growth factors, particularly those generated by new data types and users, or by new technology. A list of potential growth factors extracted from various master plans for criminal justice information systems prepared by state planning agencies is given in Table 4.1, page 4-7. These documents have been prepared in response to requests and guidelines by LEAA and are good examples of statements of needs and priorities developed by the state agencies. The list is divided into 2 main areas: (1) expanded access to existing data banks and (2) expanded data types, services, and users. Expanded access includes the installation of additional terminals and the increased use of criminal history records. Expanded data types include a full implementation of the CCH system, which includes OBTS, the latter being a major attempt to "instrument" the criminal justice information system by accumulating longitudinal traces of offenders in the system. Other new data types include fingerprint and other video transmissions, general support for crime analysis, resource allocation, and other services. Each item is considered for possible incorporation into NALECOM.

4.4 Analysis Methodology

The System Requirements Analysis Task is comprised of five elements:

1) Define the user community.
2) Perform an on-site survey of representative users.
3) Develop analysis methodology.
4) Perform requirements analyses.
5) Prepare a statement of system requirements.

Primary reliance was placed on the on-site surveys and informal contacts with many agencies and individuals in the criminal justice community to obtain realistic estimates of user requirements.

Initial activities were devoted to defining the user community which is comprised of all agencies involved in the several aspects of criminal justice, such as law enforcement, prosecution, courts, corrections, parole and probation and others. It has been estimated that there are over 40,000 such agencies in the United States, ranging from several large institutions in major metropolitan areas to single organizations in small communities. In defining the user community, the emphasis was placed on relating agency functions to the information needed to perform these functions. Information describing the user agencies and their jurisdictions (population served, number of law enforcement personnel, crime rate, and economic base) were obtained to support the analysis activities.

Subsequent to defining the user community, on-site interviews were conducted with a number of representative users to obtain data describing existing or planned information and communication systems, information types and message functions used in performing criminal justice functions, number of clients served, including the number of access terminals, and data relating to the volume of traffic against the information files. This information was combined with data contained in the Uniform Crime Reports, state criminal justice master plans, and other supporting documents to comprise a prime data base for development of user requirements. Many valuable comments and data were received from informal contacts with the SEARCH Ad Hoc Telecommunications Committee and from various authorities in the criminal justice community.

Table 4.1. Growth factors

- Expanded Access
  - Criminal Histories
    - Courts
    - Prosecutors
    - Probation/Parole
    - Corrections
  - Expanded In-Kind User Access (Added Terminals)
  - New Users
- Expanded Information Services
  - OBTS
  - Parole/Probation Data Centers
- Expanded Support Services
  - Crime Analysis
  - Organized Crime Information
  - Crime Lab and M.O. Support
- Expanded Identification Activities
  - Fingerprint Transmission and Identification
  - Video Transmission
- Reference Files

Methodologies were developed to utilize the functional descriptions and supporting data assembled through the field surveys and interviews, and to develop a statement of user requirements for the 1983 planning horizon. Analysis methods were developed for application to three primary classes of communication traffic: (1) projections of present traffic (as represented by existing nets such as LETS and NCIC), (2) estimates of extended uses (such as CCH and OBTS systems), and new uses (such as transmission of graphics and video data). To project traffic uses to 1983, statistical analyses were performed on traffic volumes on existing nets, resulting in traffic growth models on a state-by-state basis and reflecting parameters such as population served, crime rate, law enforcement personnel, and degree of system automation, all of which have a strong impact on traffic level. Growth per year is strongly correlated with existing traffic levels. Traffic estimates generated by the model are in reasonable agreement with actual data.

State-to-state traffic predictions were developed by a somewhat different technique: traffic between states was related to population and airline distance between states. The total was adjusted to agree with LETS actuals. The LETS upgrade, which is reaching completion, was accounted for by incorporating adjustments for the installation of automatic switchers in place of manual "torn tape" equipments; this upgrade is predicted to have a substantial impact on system loading.

Extended or basically new requirements and new users were analyzed on the basis of operational experience of various agencies and on estimates of key variables, such as number of arrests, previous history of the arrestee, and other factors. Fingerprint transmission by digital communication techniques tends to dominate new communication traffic volume requirements.

The requirements projections are summarized in tables and origin-destination traffic assignment matrices. Estimates of the number of characters per message are given to facilitate the analysis and planning for communications systems hardware.

Details of the system requirements analyses are presented in the following sections.

5. THE USER COMMUNITY

In specifying requirements for NALECOM, it was necessary to define the structure and organization of the community for which the system is intended. This section provides a brief overview of the components and functions of the criminal justice system, and indicates the manner in which the requirements analyses were related to the structure of the criminal justice system. A more complete description can be found in Appendix D.

Agencies within the criminal justice system are generally divided by type of function and geographic jurisdiction. These are not unique divisions, and a great deal of overlap exists. However, these divisions are somewhat useful in outlining the various components. The most common functional categories are:

1) Law enforcement.
2) Prosecution.
3) Adjudication (criminal courts).
4) Probation and parole.
5) Correctional institutions.
6) Other.

The "other" category is necessary to include such agencies as crime labs and various criminal justice commissions.

Geographically the system is divided by:

1) City.
2) County.
3) State.
4) Federal.

For our purposes the "city" and "county" classifications were grouped together into a "local" category. Thus, there are only 3 geographical divisions.

To completely understand the user community, we would need to contact each criminal justice agency in the U.S. individually. Since this is impractical, it was necessary to survey selected agencies in an attempt to obtain a representative sample. The actual sample was selected by the Project SEARCH staff* and includes only those agencies which currently have some type of information system. Thus, the sample is somewhat biased towards the medium to large agencies. However, there is no reason to believe that the needs of smaller agencies will be fundamentally different except for level of traffic volume.

Table 5.1 indicates the range of agencies surveyed, and gives the number of systems surveyed in each category.

No listings are presented under Prosecution or Probation and Parole because they were not expressly listed as applications of any system surveyed. However, it is safe to assume that the prosecutor is considered as part of the criminal court by most systems, and similarly probation, parole, and correctional institutions are combined under the term correction. With this assumption, the full range of agencies are covered by the sample.

*The Project SEARCH staff work was primarily accomplished by Public Systems, Inc.

Table 5.1 Information systems surveyed

Type of Agency Served	Local Jurisdiction	Statewide Jurisdiction	Nationwide Jurisdiction
Law Enforcement	8	10	3
Prosecution	-	-	-
Adjudication (Criminal Courts)	4	5	-
Probation and Parole	-	-	-
Correctional Institutions	4	5	-
Others	4	4	-

6. ANALYSIS AND PREDICTED GROWTH OF PRESENT SYSTEMS

6.1 NALECOM Network

The National Law Enforcement Telecommunications System (NALECOM), which is to provide for rapid interstate communication between criminal justice agencies, is envisioned as a combination of two functions: state-to-state communications including controlled automated access of state-based files, and state-to-national traffic with automated access of a central national crime data file. The states retain control over crime data and can determine which data can be given over to the central national file or retained within a state file.

Two alternative configurations can be postulated, but each has certain disadvantages. The first calls for all data banks to be maintained by the state of origin, plus a national "pointer" file. If a state seeks out-of-state information, it first locates the desired information through the "pointer" file and then queries that file for the information. The second alternative calls for a single national data file which contains complete information from all of the states. This eliminates the need for a "pointer" file; however, it is unlikely that all states will rely entirely on a national data bank since their own intrastate systems would necessarily duplicate many of the national data files; in addition, many questions remain regarding safeguards for sensitive information such as that contained in criminal histories.

NALECOM is expected to accommodate concepts involving both state and national crime data banks, using combinations of state-to-national and interstate communication links. Regional switching centers or concentrators may be used to facilitate network linkage, but regional data banks are not believed desirable or feasible.

Although NALECOM system analyses consider each state as a "port" into the system, several terminals may in fact constitute the "port," provided that all constraints imposed by the state relating to the exchange of information and access to the system are adhered to.

In order to develop traffic projections for NALECOM, it was found useful to utilize data from an existing state-to-national net (NCIC) and from a state-to-state net (LETS). Since its inception in 1967, NCIC has accumulated comprehensive data records on traffic volumes, providing an excellent data base for NALECOM state-to-national traffic projections. LETS has not monitored system traffic at a detailed level, and a less substantial data base is available for modeling state-to-state traffic.

Growth trends projected by the traffic models are believed reasonable since adjustments were incorporated for the anticipated jump in traffic due to system automation (available LETS data reflect the torn tape system which is currently being replaced).

6.2 State-to-National Traffic Modeling

6.2.1 Approach

NALECOM state-to-national traffic projections were estimated by developing correlations between transaction level and several independent variables including state population, crime rate, number of law enforcement personnel, and degree of automation. Traffic is predicted for each state and summed to give national totals. Yearly growth is correlated with the above variables and with transaction level. With the resulting regression coefficients, projections of future traffic can be made by first estimating traffic volume for each state for a given base year, extrapolating to the target year, and summing the values for all states to give total traffic to the national data file. The resulting estimate should anticipate major trends in state-to-national crime information traffic volume, although precise predictions obviously cannot be generated. The following sections describe the multivariate regression analysis techniques and present traffic predictions based on the resulting models.

6.2.2 Data Base

Table 6.1 summarizes data available on the NCIC state-to-national crime information net, including transactions by individual state for 1972, degree of

Table 6.1 State-to-national traffic modeling data base

State	Population (millions)	Crime Rate (per 100, 000 population)	Law Enforcement Personnel (per 1000 population)	1972 NCIC Transactions (per 1000 population)	Automated State Switching Service
Alabama	3.44	1840	1.700	99	Yes
Alaska	0.30	3130	2.460	389	No
Arizona	1.77	3750	2.570	393	Yes
Arkansas	1.92	1610	1.630	41	No (1973)
California	19.95	4610	2.680	159	Yes
Colorado	2.21	4050	1.990	224	Yes
Connecticut	3.03	2470	2.350	70	No (1973)
Delaware	0.55	3160	2.430	183	No
Florida	6.79	3920	2.480	305	Yes
Georgia	4.59	2470	1.780	155	Yes
Hawaii	0.77	3020	3.060	991	Yes
Idaho	0.71	2130	1.920	148	No
Illinois	11.11	2480	2.720	238	Yes
Indiana	5.19	2270	1.620	75	Yes
Iowa	2.82	1460	1.630	71	No (1973)
Kansas	2.25	2140	1. 800	228	Yes
Kentucky	3.22	1770	1.500	130	Yes
Louisiana	3.64	2470	2.380	150	Yes
Maine	0.99	1520	1.680	49	No (1973)
Maryland	3.92	3380	2.780	197	Yes
Massachusetts	5.69	3390	2.590	305	Yes
Michigan	8.87	3820	2.160	257	Yes
Minnesota	3.80	2260	1.650	35	No (1973)
Mississippi	2.22	1320	1.680	33	No
Missouri	4.68	2550	2.490	328	Yes

Table 6.1 (Contd)

State	Population (millions)	Crime Rate (per 100,000 population)	Law Enforcement Personnel (per 1000 population)	1972 NCIC Transactions (per 1000 population)	Automated State Switching Service
Montana	0.69	1930	1.940	233	No
Nebraska	1.48	1720	1.750	196	Yes
Nevada	0.49	4240	3.800	81	No
New Hampshire	0.73	1380	1.870	378	Yes
New Jersey	7.17	3030	2.820	106	No (1973)
New Mexico	1.02	3420	2.170	265	Yes
New York	16.19	3490	3.770	159	Yes
North Carolina	5.08	1930	1.770	56	Yes
North Dakota	0.62	1020	1.530	160	No
Ohio	10.65	2360	1.770	137	Yes
Oklahoma	2.56	2100	1.910	89	Yes
Oregon	2.09	3440	2.050	365	Yes
Pennsylvania	11.79	1780	2.120	77	Yes
Rhode Island	0.95	3270	2.260	145	No
South Carolina	2.59	2290	1.580	17	No (1973)
South Dakota	0.66	1280	1.540	105	No
Tennessee	3.92	2100	1.800	142	Yes
Texas	11.20	2660	1.900	193	Yes
Utah	1.06	2540	1.830	179	No
Vermont	0.44	1450	1.770	110	No
Virginia	4.65	2030	1.910	114	Yes
Washington	3.41	3160	1.970	189	Yes
West Virginia	1.74	1060	1.270	72	No
Wisconsin	4.42	1780	2.250	41	No (1973)
Wyoming	0.33	1910	2.010	235	No

automation of the state terminal, and additional data on crime rate, population and law enforcement personnel level. Automation is defined herein to indicate whether or not computer message switchers are available at the state terminal to interface with carrier lines to the NCIC. The rationale for this index of automation is as follows: rapid response to a query against a stolen vehicle/wanted persons file is essential in meeting an officer safety criterion: a response must be available to the officer in 1-2 minutes or less (see Chapter 8). Since most queries from the field involve at least one manual operation (i.e., one voice communication plus a terminal entry), response time constraints cannot be met if a second manual operation is introduced into the operation, such as a manual relay at the state terminal. Hence, systems which do not have automatic switching interfaces with NCIC probably do not meet service standards. Also, a high volume of queries cannot be accommodated with a double manual operation. Reference 1 lists the message switching configuration for each state and was used in establishing the level of automation; however, several errors have been noted in this document, and a more careful classification is being made. Also, many upgraded state systems are or have recently come on-line, and some states may be misclassified for this reason. Initial correlations, however, indicate a marked difference in NCIC traffic between the "have" and "have not" states.

Traffic growth data were obtained from NCIC records by individual states for the years 1971-1973 (June totals) and averaged to give yearly growth. These data were correlated with traffic levels, population, and degree of automation.

6.2.3 Trial Variables

Candidate independent variables were determined by graphing the raw data shown in Table 6.1 versus trial variables and by noting possible trends. If trends were identified, the variable was included in a formal regression analysis as described in the following section. The dependent variable in all cases was transaction level per 1000 population.

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1. Anon., 1973 Directory of Automated Criminal Justice Information Systems. Dept. of Justice LEAA, December 1972.

The first trial variable examined was crime rate which varies from 1, 020 serious crimes per 100, 000 population for North Dakota to 4, 610 per 100, 000 population for California (1972 Uniform Crime Report).[2] A serious crime is defined here in accord with UCR standards.* The scatter diagram given in Fig. 6.1 shows a significant correlation between transaction level and crime rate, and hence, crime rate is included as an independent variable in the regression analysis.

The level of automation was next tested as a trial variable and was noted to have a strong effect on transaction level, particularly for the less populous states. The variable was included in the regression analysis, although as noted previously, the data in Reference 1 may not be entirely accurate in regard to operational dates or the exact interpretation of "computer message switching"; these data are being verified. Population level also has a strong effect on transaction rate. The "super" states, California and New York, exhibit a lower than average transaction rate, whereas the small states (less than 2 million population) have higher than average but wide divergences in use rates. Population level and degree of automation were included in the regression analysis as independent variables.

The number of law enforcement personnel per capita is also a candidate independent variable since the number of transactions reflects the relative number of enforcement personnel. It was found that a relatively strong correlation exists between the number of enforcement personnel and crime rate (see Fig. 6.2), hence one or the other variable should be included in the regression model. Crime rate only was incorporated into the model.

Growth data were obtained by averaging transaction levels over the period 1971-1973. The values in percent growth per year appear to correlate with existing transaction level, population, and level of automation. Many of the states that did not have a computer message switching function at the state level

*Serious crimes include: criminal homicide, forcible rape, robbery, aggravated assault, burglary, grand larceny, and auto theft.

2. C. Kelley, "FBI Uniform Crime Report, 1972."

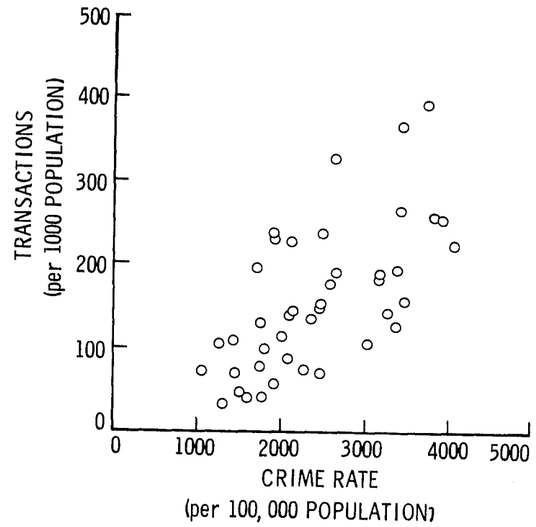


Fig. 6.1. Transactions vs crime rate

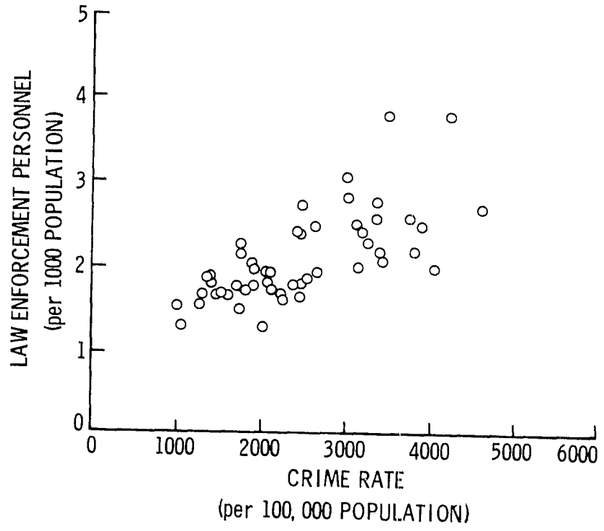


Fig. 6.2. Law enforcement personnel vs crime rate, 1972

had zero growth over the past few years. Matured systems such as Kansas City (Mo) ALERT II also show a leveling off over the time period of interest. A regression analysis was conducted to test these hypotheses.

6.2.4 Regression Analysis

A least squares technique was used to develop correlations between transaction level and growth rate as a function of the above independent variables. The usual procedures were followed in determining the best coefficients for the assumed model relations. The analysis of transactions levels will be discussed first.

Transaction levels per capita were assumed to be a function of population level, crime rate, law enforcement personnel per capita, and level of automation. The data of Table 6.1 were first segregated by level of automation, and curve fits were attempted for each grouping. The independent variables were introduced in first and second order terms. A constant term was allowed:

$$T = c_0 + c_1R + c_2E + c_3P + c_4R^2 + c_5E^2 + c_6P^2 + c_7RE + c_8RP + c_9PE$$

The sum of the squares of the residuals is

$$Q = \Sigma(T - \tilde{T})^2$$

Setting the partials of Q with respect to c_i equal to zero yields the appropriate set of equations for solution of the least squares coefficients. The sample deviation is

$$\text{s.d.} = \sqrt{\frac{s^2}{N - n}}$$

Where N is the sample number (50), and n the degrees of freedom (2).

The results of the analysis yield the following relations:

$$T = 0.0845R - 0.0026\ P \times R \qquad \text{(automatic message switching)}$$

where T = transactions per 1000 populaion
R = major crimes per 100,000 population
P = population in millions

and

$$T = 196.3 - 81.8P + 9.78P^2 \qquad \text{(non-automatic message switching)}$$

Graphs of these relations are presented in Figs. 6.3 and 6.4. Comparisons of actual versus predicted transaction rates are shown in Figs. 6.5 and 6.6 for automated and nonautomated message switching, respectively. The mean deviations are relatively high, but trends are reasonably well predicted.

Growth rates were correlated on a similar basis, but no significant dependence on crime rate or law enforcement personnel levels was found. However, a pronounced dependence on level of automation was apparent (see Fig. 6.8). The resulting relations are

Growth (% per year) = 34.62 - 0.0576T (automatic message switching)
= 24.46 - 0.0756T (non-automatic message switching)

where T = transactions per 1000 population. The relations are presented in Fig. 6.8, and the comparisons of actual to predicted growth rates are shown in Figs. 6.9 and 6.10 for automated and nonautomated message switching, respectively.

6.2.5 Predicted Growth in Total State-to-National Transactions

The relations derived in the preceding section have been used to predict state-to-national transactions for the 10-year planning horizon. The states that presently have automatic message switching for NCIC interface were assumed to increase traffic in accordance with the growth relationships given above. Transactions in 1983 for all such states are

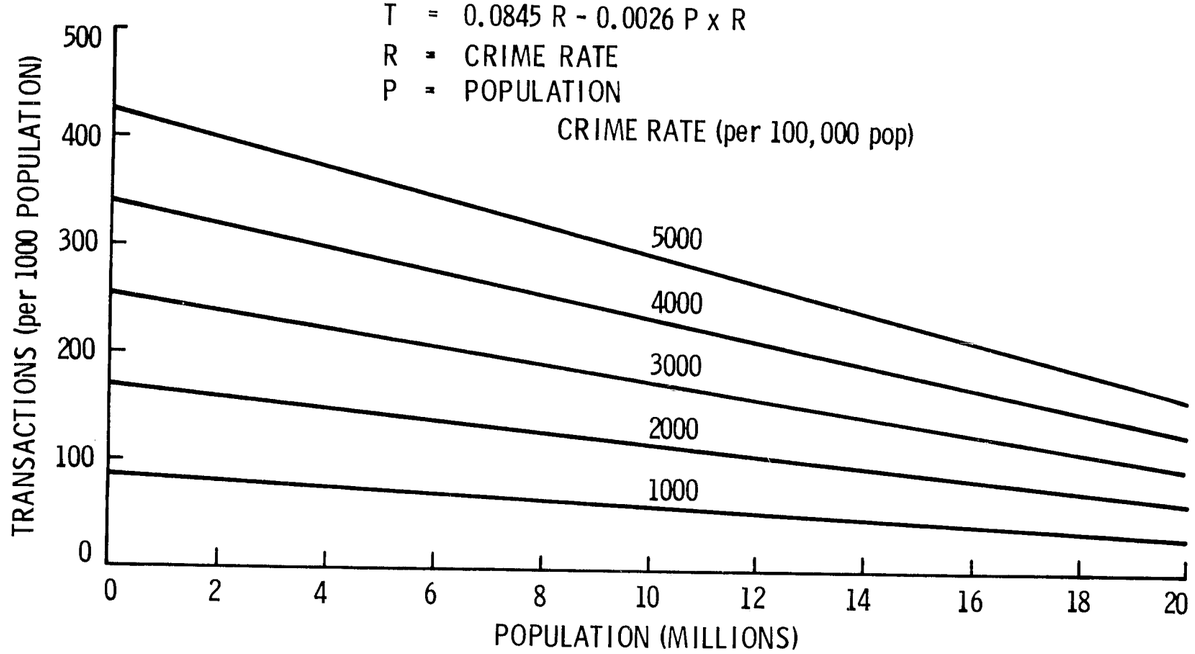


Fig. 6.3. Estimated state-national transactions, automated message switching, 1972

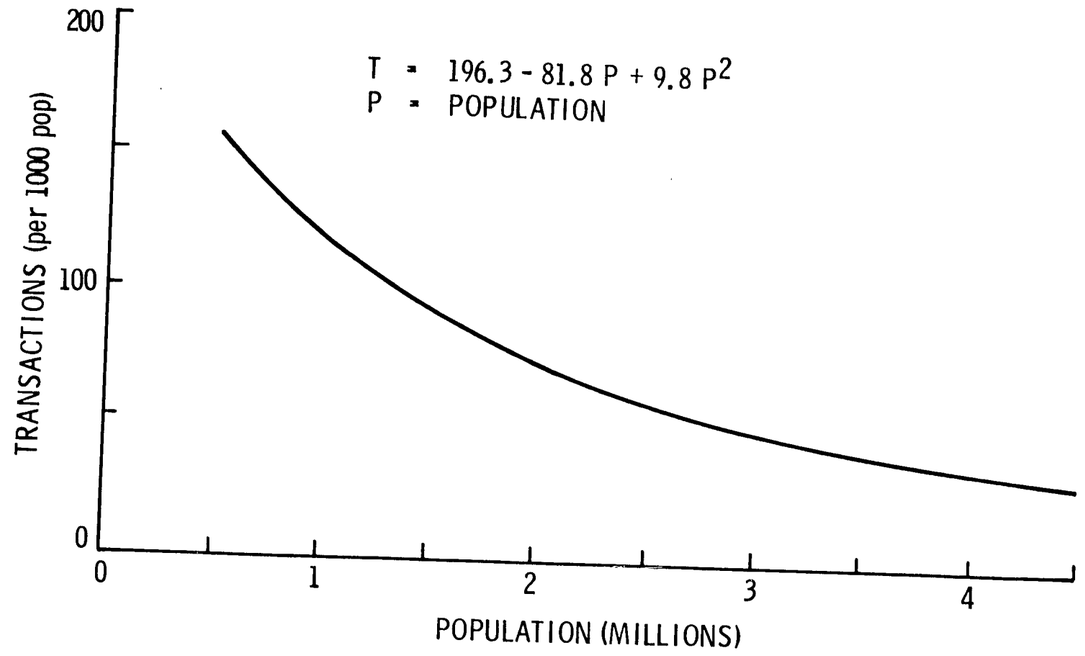


Fig. 6.4. Estimated state-national transactions, nonautomatic message switching, 1972

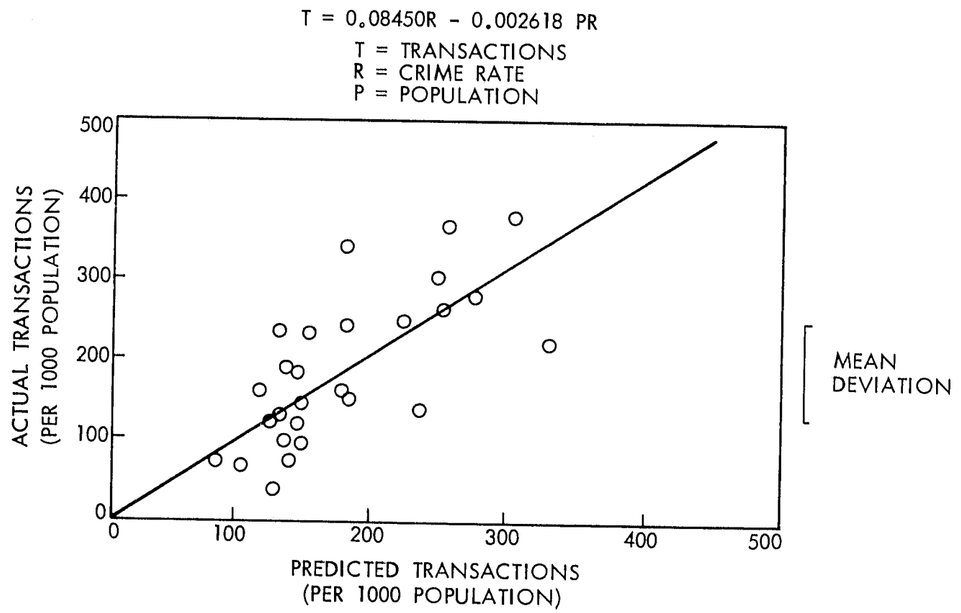


Fig. 6.5. Comparison of actual vs predicted state-national transactions, automatic message switching, 1972

$T = 196.3 - 81.8P - 9.78P^2$

T = TRANSACTIONS
P = POPULATION

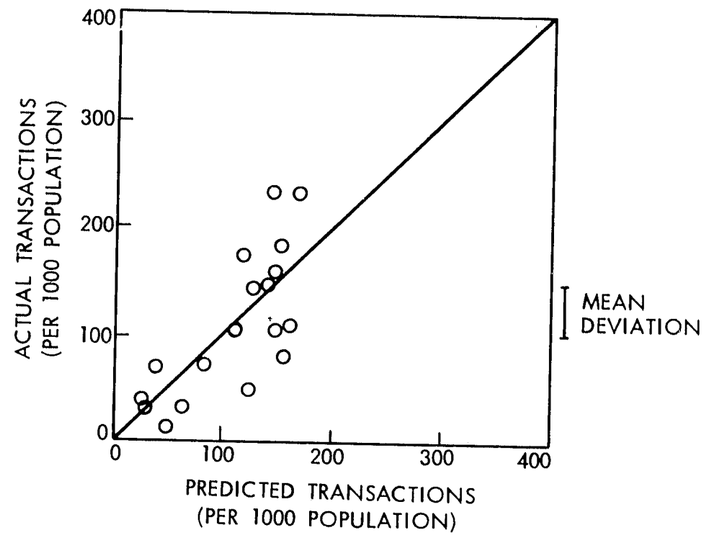


Fig. 6.6. Comparison of actual vs predicted state-national transactions, nonautomatic message switching, 1972

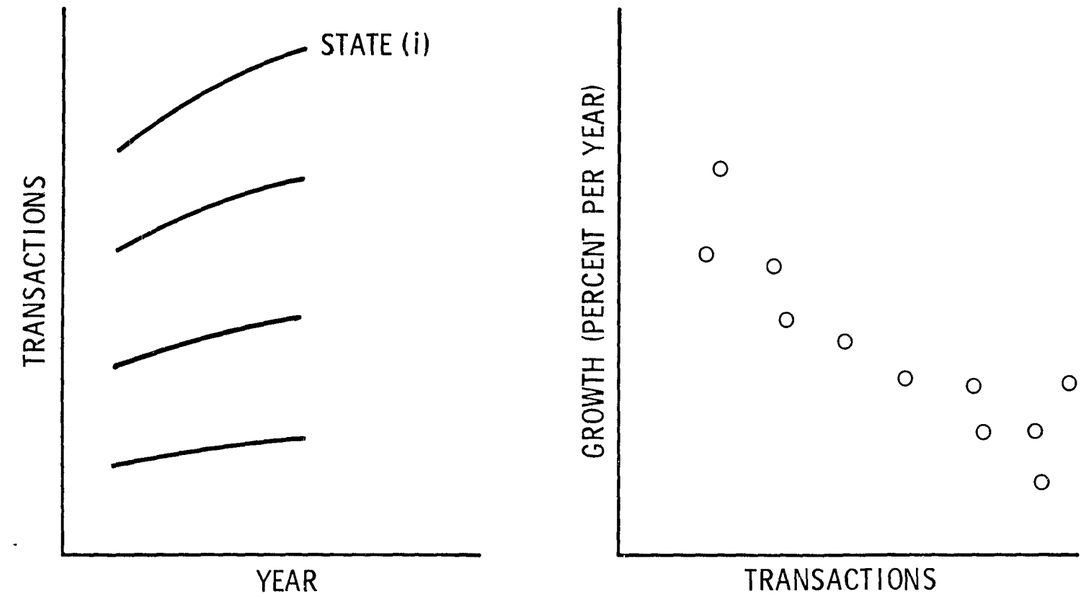


Fig. 6.7. Approach to growth modeling, state-national traffic

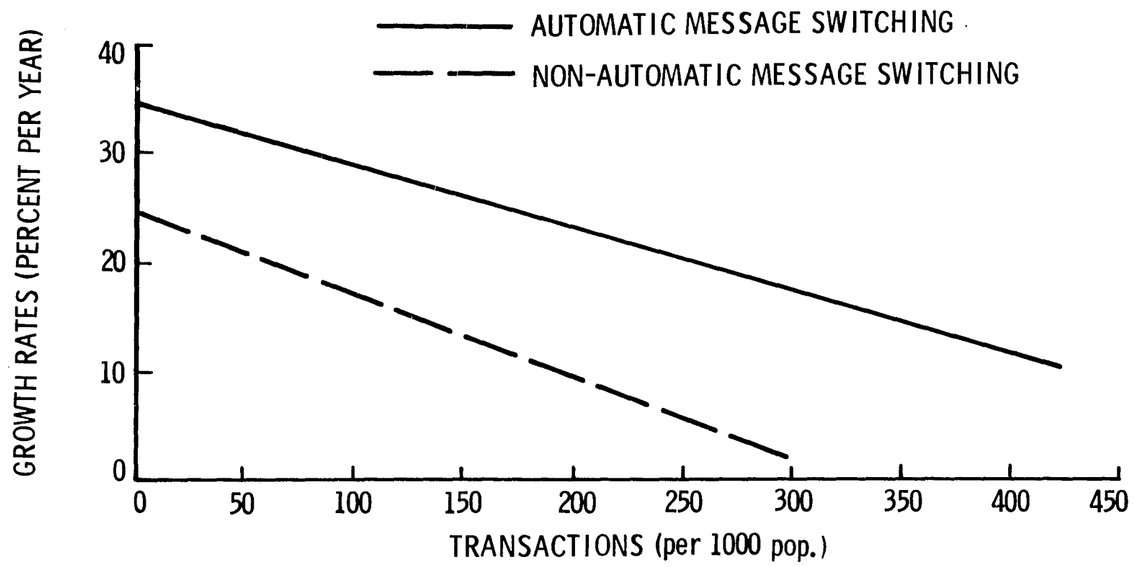


Fig. 6.8. Estimated state-national transactions and growth, 1972

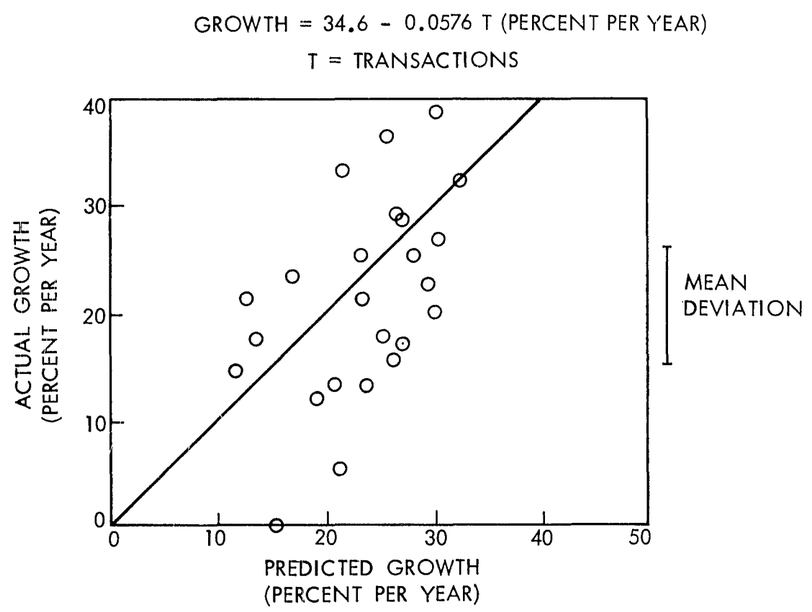


Fig. 6.9. Comparison of actual vs predicted state-national traffic growth, automatic message switching, 1971-1973

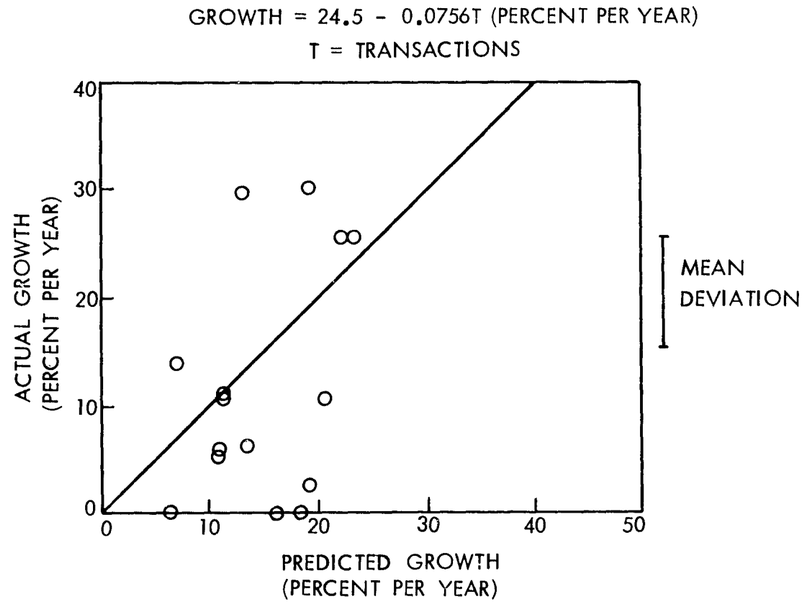


Fig. 6.10. Comparison of actual vs predicted state-national traffic growth, nonautomatic message switching, 1971-1973

$$\text{Transactions} = \sum_{i=1}^{m} T_{i,1} \prod_{j=1}^{n} [(1+G_{ij})] P_{i,1}$$

where $T_{i,1}$ = Transactions per capita for state (i) for 1972
G_{ij} = Growth rate for state (i) at transaction level T_{ij}
$P_{i,1}$ = Population of state (i) for 1972
i = State, i = 1, 2, ... m
j = Year, j = 1, 2, ... n

For states that do not now have automatic message switching interfaces with NCIC, an automated interface was assumed to be installed by 1976. Transaction levels were generated on this basis and projected to 1983 by the above algorithm. The totals for both classes of states were summed to give a traffic volume level for 1983 of 142 million messages. This result is approximately 45 percent greater than the value of 98.2 million messages obtained by a straight line extrapolation of 1968-1973 actuals. A comparison of estimates is given in Fig. 6.11. The higher value is assumed for the overall total traffic estimates that are given in Table A-1 of Appendix A.

Figure 6.12 illustrates a "ramp" growth in transaction level for the state of Missouri as reflected by the Kansas City ALERT II system. The growth curve as predicted by the foregoing model is shown for comparison, assuming that the system is upgraded from nonautomatic to automatic message switching in the second year. Although the comparison is favorable, similar ramp growths were not found in the NCIC data for individual states, and questions are raised as to the validity of comparing local or regional system startup growth trends to traffic buildup against NCIC files.

6.2.6 Comments

Several comments are offered regarding the regression analysis. First, it is noted that the variances are relatively large, as could be expected; near term trends are reasonably valid, however. The smaller states, in particular, are difficult to model (on a per capita basis).

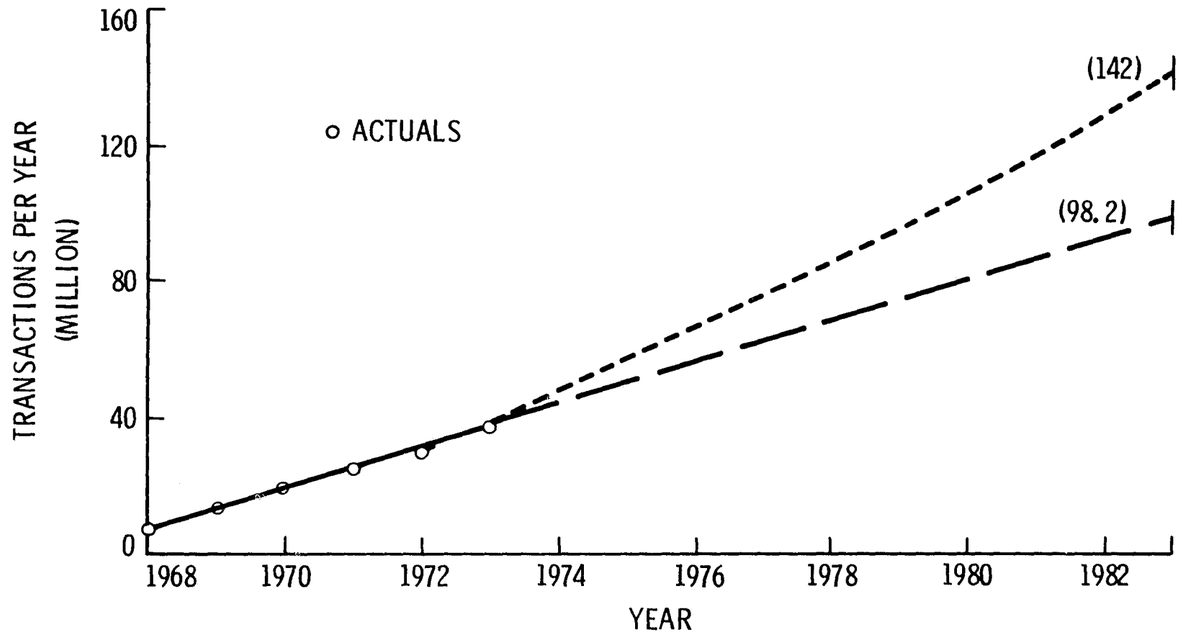
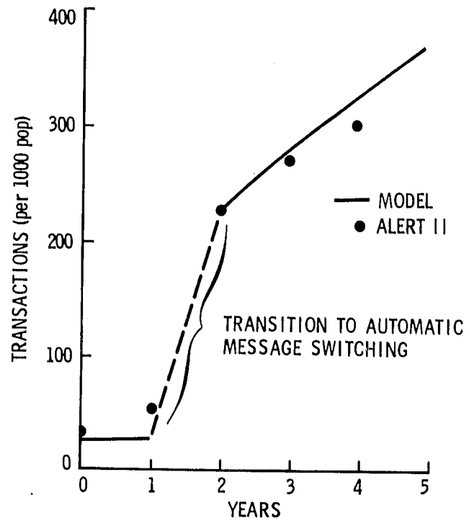


Fig. 6.11. State-to-national traffic predictions



The growth rate function is noted to depend on current transaction level only; other independent variables were rejected by the regression technique. This does not imply that population growth rate and crime rate increase are excluded, however; since the raw data were obtained from the average actual growth over the time period from 1971 to 1973, changes in crime rate and population are implicitly included in the raw data points. Extrapolations of future growth thus assume the same percent per year changes in population and crime rate. A second point to note in regard to growth rate is that transaction rates for all states will tend to asymptote to nearly equal values, which may or may not be valid.

Other approaches that may be explored in subsequent analyses of traffic models include correlations with the sizes of the various data files since presumably transaction rate is a function of completeness of the files, and therefore the hit rates. Another variable of interest is the percent of urbanized areas serviced by modern law enforcement communication nets since most of the

population is concentrated in such areas (over 70 percent). Because over 80 percent of the total population reside in states with automated message switching interfaces with NCIC, large increases in total traffic may not occur as nonautomated systems are upgraded.

6.3 Interstate Traffic Modeling

The national Law Enforcement Teletypewriter Service (LETS) was analyzed to gain insight into the state-to-state traffic component of the proposed NALECOM system. Unlike the state-to-national study, the proposed NALECOM system requires not only the traffic volume, but also a 50-state origin-destination matrix.

6.3.1 Modeling Approach

The increase in state-to-state traffic volume was estimated to increase on the basis of the prediction models presented in Section 6.2. A significant change in the base year projection was made, however, to account for the fact that the LETS historical data reflect traffic levels for an unautomated system. Hence, an adjustment was made on the basis of the unautomated versus automated prediction models in the base year projection to reflect upgrade to automatic switching and file access. Assuming 1972 traffic volume to be 6640 messages per day, * a value of 101, 000 messages per day was obtained for 1983 (36, 850, 000 messages per year).

Once traffic volumes were projected, an origin-destination matrix was needed to specify interstate traffic assignments. In order to generate this matrix, a modified gravity model was developed. The model assumes

1) Originating traffic volume is directly proportional to state population.
2) Destination traffic varies directly with the population of the destination state and inversely with the distance from the originating state.

*See Appendix B.

6.3.2 Originating Traffic

The traffic allocation model is developed as follows. For originating traffic, the number of messages is assumed to vary directly with the population of the originating state.

$$T_i = T\left(\frac{P_i}{P}\right)$$

where T_i = Traffic originating from state i
T = Total system traffic
P_i = Population of state i
P = Total population
i = 1, 2, ... N originating states

Unfortunately LETS did not maintain comprehensive records of its state-to-state transactions (O-D traffic); records are limited to the percentage of total traffic generated by each of the nine circuits (see Fig. 6.13).

Results obtained with the allocation model agree reasonably well with the available LETS traffic data (Table 6.2). The sparsely settled western states (Circuits 7 and 8) are underestimated by the model; Circuit (5), which is covered in part by the ALECS network, is overestimated.

6.3.3 Destination Traffic

Destination traffic allocation is estimated by assuming that message volume arriving at a state varies directly with its population and inversely with its distance to the originating state. The total traffic received by each state (T_j; j=1, 2, ...N) is calculated as follows:

Defining T_{ij} as traffic originating in state (i) and terminating in state (j), we can say

$$T_{ij} = T_i\left(\frac{P_j}{P}\right)\left(\frac{1}{r_{ij}}\ R_i\right)$$

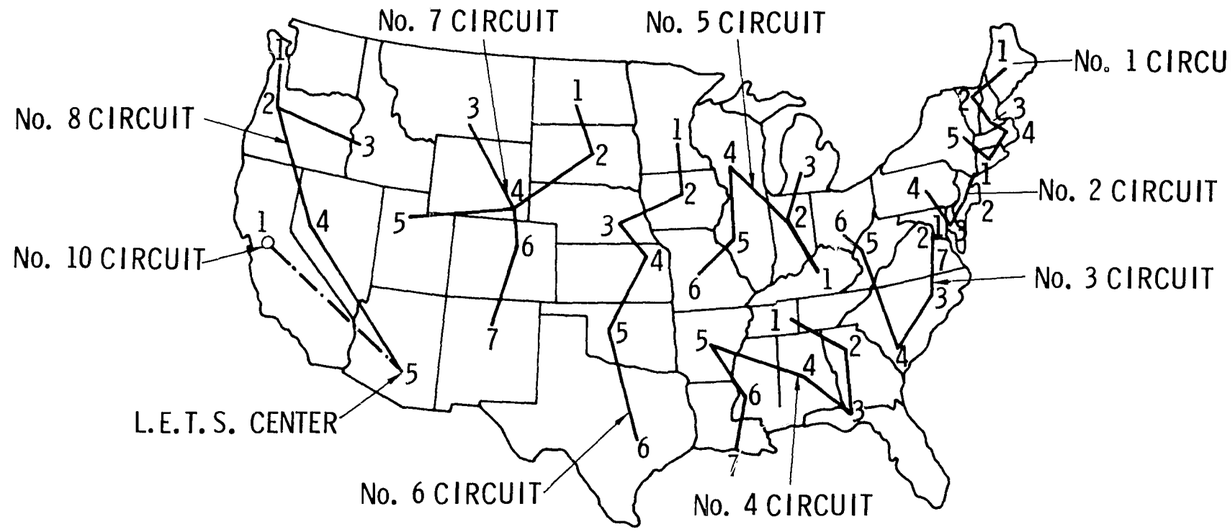


Fig. 6.13. Law enforcement teletypewriter service

Circuit	Messages Originated	
	Actual	Model
1	10.0%	10.5%
2	9.3	13.1
3	13.1	14.3
4	12.2	13.4
5	14.1*	18.0
6	11.6	12.1
7	7.5	3.9**
8	12.1	4.9**
10	9.2	9.9
	100.0%	100.0%

*ALECS Network not included.

**Rocky Mountain and Western States circuits.

Table 6.2. Comparison of actual and predicted messages originated LETS (state-state)

where: P_j = Population of state j

T_i = Total traffic that originates from state (i)

r_{ij} = Airline distance from terminal in state (i) to terminal in state (j)

R_i = Constant

The term $\left(\frac{P_j}{P}\frac{1}{r_{ij}}R_i\right)$ can be interpreted as the fraction of traffic originating in state (i) that goes to state (j). Keeping this interpretation in mind:

$$\sum_{j=1}^{N}\left(\frac{P_j}{P}\frac{1}{r_{ij}}R_i\right) = 1$$

for i = 1, 2, ...N

or

$$R_i = \frac{1}{\sum_{j=1}^{N}\left(\frac{P_j}{P}\frac{1}{r_{ij}}\right)}$$

for i = 1, 2, ... N.

Once the R_is have been calculated, the T_{ij} matrix can be constructed. The terms in a column of the O-D matrix will sum to the total transactions into a state:

$$T_j = \sum_{i=1}^{N} T_{ij}$$

for i = 1, 2, ... N.

Results of the analysis (O-D traffic assignment matrix) are given in Appendix A, Table A-2.

The values obtained using the above analysis were checked with the limited available LETS actuals by comparing traffic departing a circuit to traffic routed to other users on the same circuit, i.e., the ratio of intra to inter circuit traffic. The comparison is given in Table 6.3.

It is noted that the destination model assumes the number of messages transmitted to be independent of the number of messages received. Since obviously many messages are generated in response to queries, the assumption of independence reduces the model to a purely statistical fit of messages received.

The two NALECOM functions, state-to-state communication and state-to-national communications, are relatively independent. Thus, NALECOM traffic can be estimated by directly combining the projections of the two traffic types. However, these estimates have accounted for existing types of information transferred across the NALECOM network. The next chapter discusses new uses of the NALECOM network and assesses the impact on total traffic volume.

Circuit	Actual	Model
1	40%	32%
2	14	26
3	32	21
4	22	25
5	27	32
6	22	14
7	19	8
8	33	12
Average	27	24

Table 6.3. Comparison of actual and predicted intra-circuit traffic LETS (state-state)

6.4 Peak-to-Average Loading

The National Law Enforcement Telecommunications system has strict response time constraints (see Chapter 8) and thus cannot tolerate delays of more than a few seconds. These messages, in general, relate to greater police officer safety. Since officer safety is involved, NALECOM must have sufficient line capacity or queuing capacity to ensure that high priority messages will not encounter delays, even during peak hours.

To facilitate the capacity/queuing analysis, some measure of peak traffic flow is needed. A good system indicator is the peak-to-average traffic flow ratio. The following approach was used. NCIC provides hourly transaction numbers for each day of the week and for each of its users. Nine representative NCIC users were chosen, including:

1) Boston, Massachusetts, Police Department.
2) Minnesota Bureau of Criminal Apprehension.
3) Salt Lake City Department of Public Safety.
4) NCIC Albany, New York, State Police.

5) New York City Police Department.
6) Phoenix Highway Patrol.
7) FBI, Los Angeles.
8) Dade County Department of Public Safety.
9) Wisconsin Department of Justice.

For each user, the daily peak-to-average ratio was calculated by dividing the number of transactions that occurred during the busiest hour of a day by the average hourly transactions for that day. Thus for each user, there were seven ratios, one for each day of the week. The largest of the seven was chosen as the peak-to-average ratio. These ratios versus transactions per month are presented in Fig. 6.14 and indicate that as the number of transactions increases, the hourly peak-to-average ratios decreases. The peak-to-average ratio asymptotes to an approximate value of 2.

It is noted that although the peak-to-average ratio was calculated on an hourly basis, the allowable delay time will be only a few seconds. Unless the assumption is made that the mean arrival rate is constant over the hour under study, a queuing analysis will not yield accurate results. Accuracy would be improved if smaller than hourly time units were used in calculating the peak-to-average ratio. It is apparent that data relating to queuing procedures within the NCIC system would be helpful in determining actual delays. Such data will be sought in the follow-on studies.

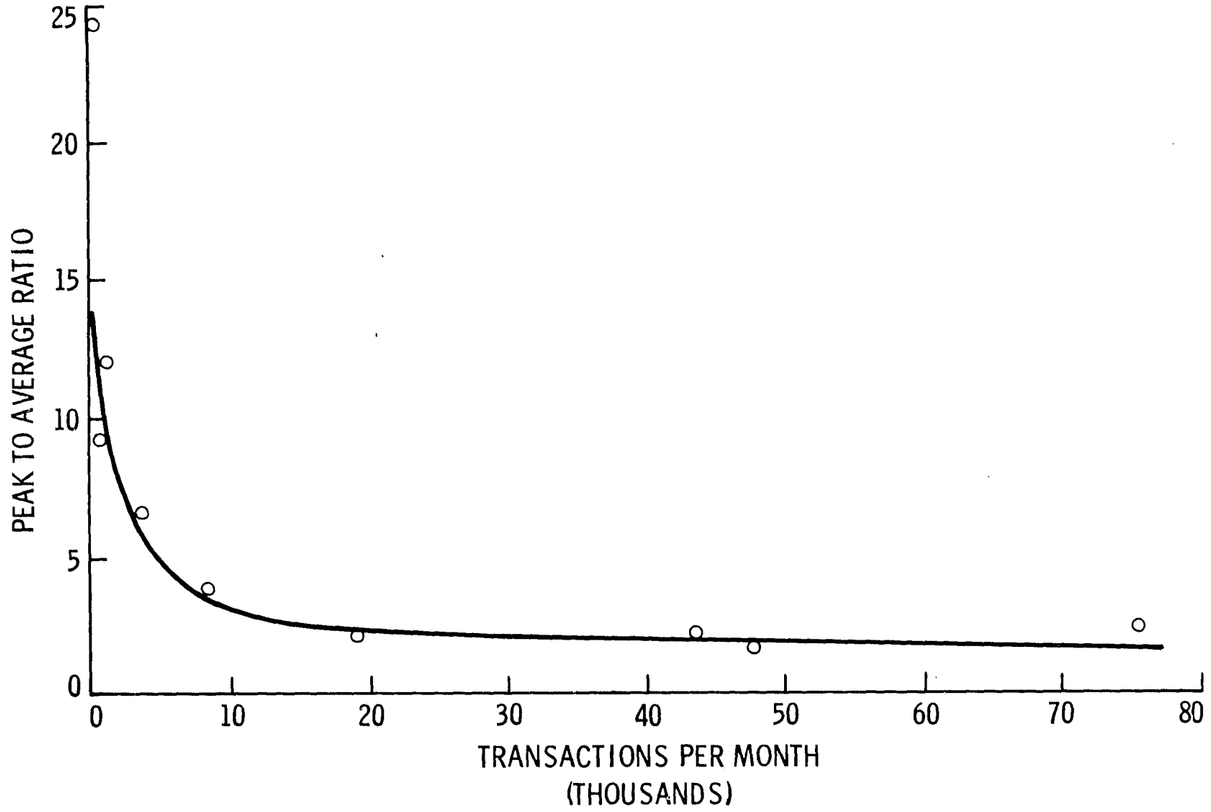


Fig. 6.14. Peak-to-average traffic loads (based on NCIC actuals)

7. ANALYSIS OF NEW SYSTEM REQUIREMENTS

7.1 Criminal Histories

The need for speedy and reliable background information on defendants and suspects within the Criminal Justice System is well known. Determining the correct charge, setting bail, and many other activities can be justly done only if the background of the person in question is known. To meet this need the concept of a computerized criminal history (CCH) was developed.

A national computerized criminal history (CCH) file has been under development for the last several years. This effort was highlighted by the Project SEARCH experiments and the establishment of a CCH file in the NCIC system. As it currently exists the CCH system is a centralized data file at the FBI into which the states place criminal records of offenders. Once in the file, any authorized terminal can access that record and retrieve a copy of the file. In most cases, a copy of the criminal history is not considered valid unless positive identification has been made (normally through the use of fingerprints) and thus the CCH record can be positively linked to the person in question. In this manner the transmission of CCH's and fingerprints are directly related (see Section 7.2 on fingerprints).

7.1.1 General Methodology and Assumptions

Current Computerized Criminal History files are maintained in a single centralized file at NCIC, and, thus, only state-to-national traffic exists. However, it is the stated policy of the FBI to encourage the creation of state held CCH files. Consequently the future CCH system will quite likely consist of some type of national file supplemented by or in conjunction with, state files. The exact structure of any future system is not clear and several alternatives are available. Consequently, we have examined four configurations that we believe cover the range of possibilities:

1) All files remain at the national level (no significant change).
2) Each state maintains its own files on single-state offenders within their state, with only multi-state offenders and a pointer in a national file.

3) All files are maintained at the state level with only a pointer at the national level.

4) All files are maintained at the state level with a pointer and a Criminal Summary (CS) file at the national level.

While playing a significant role in determining the loadings on the communication links, we have assumed that the overall system configuration (including any of the 4 cases listed above) will not affect the total number of inquiries and updates being generated at the state and local levels. Thus, our basic methodology has been to estimate the total number of inquiries and updates to be generated and then examine each case to determine how and by whom these messages are received and acted upon.

7.1.2 Total Inquiries and Updates (State and Local)

We have assumed that regardless of the structure, there will be two types of inquiries generated:

1) Requests for a complete Criminal History (CH).
2) Requests for a Criminal Summary (CS).

We have further assumed that there will be one (1) inquiry for a CH for each arrest, to be used during the booking process and the determination of bail.[1] Due to the long delay associated with the criminal justice process it cannot be assumed that the record originally obtained at the time of arrest will be adequate throughout the process. Thus we will assume that there will also be a CH inquiry by the prosecutor for each arrest to aid in the decision as to whether or not to prosecute. An additional CH inquiry will probably be necessary for each case prosecuted for the preparation of a pre-sentence investigation by a probation officer. If the defendent is convicted and sentenced to some correctional program, there will be a need for CH's by various corrections agencies. Exactly how many inquiries will be made by corrections personnel is uncertain at this time. To estimate the expected traffic, however, we will assume an

1. For the purposes of this report "arrests" will include all arrests of persons over 18 years for all offenses reported in the UCRs except drunkenness.

average of three (3) CH inquiries per convicted defendent. In summary, we will assume two (2) CH inquiries per arrest; one (1) CH inquiry per case prosecuted; and three (3) CH inquiries per conviction. These estimates are quite possibly high in that the need for a criminal history at each point described above varies from case to case. Depending on the actual personnel involved a CH may or may not be requested. However, for the purpose of sizing a telecommunications system, these estimates should provide adequate upper bounds on CH inquiries.

In addition to CH inquiries we anticipate that information on criminal records will be needed in the course of investigations. Again no figures exist on which to estimate the expected traffic from such a use. Thus, we have assumed that a criminal summary (CS) will be adequate for this purpose and that there will be approximately two (2) CS inquiries per arrest made.

Obviously, the above assumptions are meaningless without some estimates of the number of arrests (up to 1983). Changes in crime definition, social values, and attitudes make any prediction of arrest trends somewhat tenuous. Thus, it was not felt necessary to develop a detailed model to predict the growth in arrests, and a simple linear extrapolation of current growth trends (1963 to 1973) was considered sufficient.[2] This extrapolation yielded 1975 and 1983 estimates of 4.3 million and 5.8 million arrests per year, respectively.[3]

To completely determine the total expected CH inquiries it is necessary to know the percentage of offenders actually prosecuted and the percentage convicted (and placed in custody or under supervision). Figures available on felony arrests indicate that 73% of all arrestees are actually prosecuted (for some offense) and 42% are convicted.[4]

The total number of state and local updates to be generated is somewhat more difficult to determine. Current update traffic on NCIC is probably not a

2. "Uniform Crime Reports," Federal Bureau of Investigation, 1963-1972.
3. See Appendix C for details of the extrapolation procedure.
4. International Synposium on Criminal Justice Information and Statistics Systems, Project SEARCH, "The Use of Offender-Based Transaction Statistics in Criminal Justice Planning," October 1972, p. 465.

good estimate due to its relatively small file size and the future inclusion of more data (for compatability with an OBTS system) in the CCH files. To estimate update traffic we will assume that for each major step in the criminal justice process there will be one (1) update. The major steps are:

1) Arrest.
2) Preliminary hearing.
3) Verdict.
4) Admission to corrections.
5) Probationary release.
6) Final release.

As discussed above, based on felony arrests, 73% of all arrestees are actually prosecuted (preliminary hearing), 47% are held to answer some charge (receive some verdict), and 42% are convicted of some offense (admitted to corrections).[5] We will assume that for each conviction there will be three (3) updates. Thus for each arrest we expect approximately 3.5[6] updates to be generated. Under the above assumptions we are able to calculate the expected total number of inquiries and updates to be generated. Table 7.1 summarizes these results.

Table 7.1. Total inquiries and updates to be generated by state and local agencies for 1978 and 1983 (millions per year)

	1978	1983
CH inquiries generated*	15.9	21.5
CS inquiries generated	8.6	10.6
Total inquiries generated	24.5	32.1
Updates	15.1	20.3

*CH inquiries per arrest = 2 + 1 x 0.42 + 3 x 0.42 x 0.90 = 3.7

5. Ibid.
6. Updates per arrest = 1 (arrest) + 1 x 0.73 (prelim. hearing) + 1 x 0.47 (verdict) + 3 x 0.42 (corrections) = 3.46 ≅ 3.5.

7.1.3 NALECOM System Traffic for Each of the Four Cases

Case 1 - All Criminal History (CH) and Criminal Summary (CS) Files at the National Level (No Change from NCIC)

We have assumed in this case that no state CCH files exist and thus all requests for criminal histories and summaries must be addressed to the national file.

State-to-National Traffic

State-to-national traffic should consist only of inquiries and updates, for the states do not have data files and thus cannot respond to inquiries (from anyone). Thus all inquiries and updates generated must go to the national level. The traffic volumes are identical to those in Table 7.1.

National-to-State Traffic

For Case 1 national-to-state traffic will consist only of responses to inquiries. Thus the total number of national-to-state messages (responses) should equal the number of inquiries. However, it is necessary to distinguish between "hit" (a criminal history or summary is found) and "no hit" (no record in the file) responses. In the former case the record itself will be sent, whereas in the latter case a "no record available" message is sent.

For the initial CH inquiry at the time of arrest we would expect the "hit" rate[7] to be equal to the percentage of offenders who are recidivists (65%).[8] Subsequent inquiries by prosecutions and corrections, however, will always receive "hits" because a CCH file will have been created on the offender. Thus the number of "hit" responses should equal 0.65 times the number of arrests plus 2.7 times the number of arrests.[9]

7. The percentage of inquiries for which a record is actually found and returned.
8. Op. cit., "Uniform Crime Reports," p. 36.
9. 2.7 x arrests equals the number of prosecutions and corrections CH inquiries.

CS inquiries, on the other hand, are, by assumption, the results of the various investigatory functions. Thus, we would expect far fewer "hits" because this system is used less discriminately than the CH files. Since no accurate figures are available, we can only say that the "hit" rate for CS inquiries should be lower than for CH inquiries, perhaps 25% to 50% lower. For purposes of this document, however, we will assume in all cases that the "hit" rates for CS and CH inquiries are equal to avoid underestimating the traffic volumes. Table 7.2 shows the 1978 and 1983 estimates for national-to-state traffic under Case 1.

Table 7.2. National-to-state traffic under Case 1 (millions per year)

	1978	1983
CH "hit" responses	14.4	19.5
CH "no hit" responses	1.5	2.0
CS "hit" responses	5.6	6.9
CS "no hit" responses	3.0	3.7
Total responses	24.5	32.1

State-to-State Traffic

Under this case there will be no state-to-state traffic. Figure 7.1 outlines the flow of messages under Case 1.

Case 2 - State Files on Single-State Offenders with a National Pointer and Multi-State Offender File

In this case we have assumed that the states maintain files on single-state offenders. Thus a state would first search its own CCH files before forwarding any inquiry to the national level. The national file would contain a pointer to the state files and hold all the records of multi-state offenders. A pointer at the national level is simply an index to state-held CCH files. For each record held by a state, the national pointer contains the name, identification data, and the state of record. In the event of a "hit" on the pointer file (indicating the transition of a single-state offender into a multi-state offender) the state currently holding the record would be requested to forward that record to the national file (and create a new multi-state offender record at the national level).

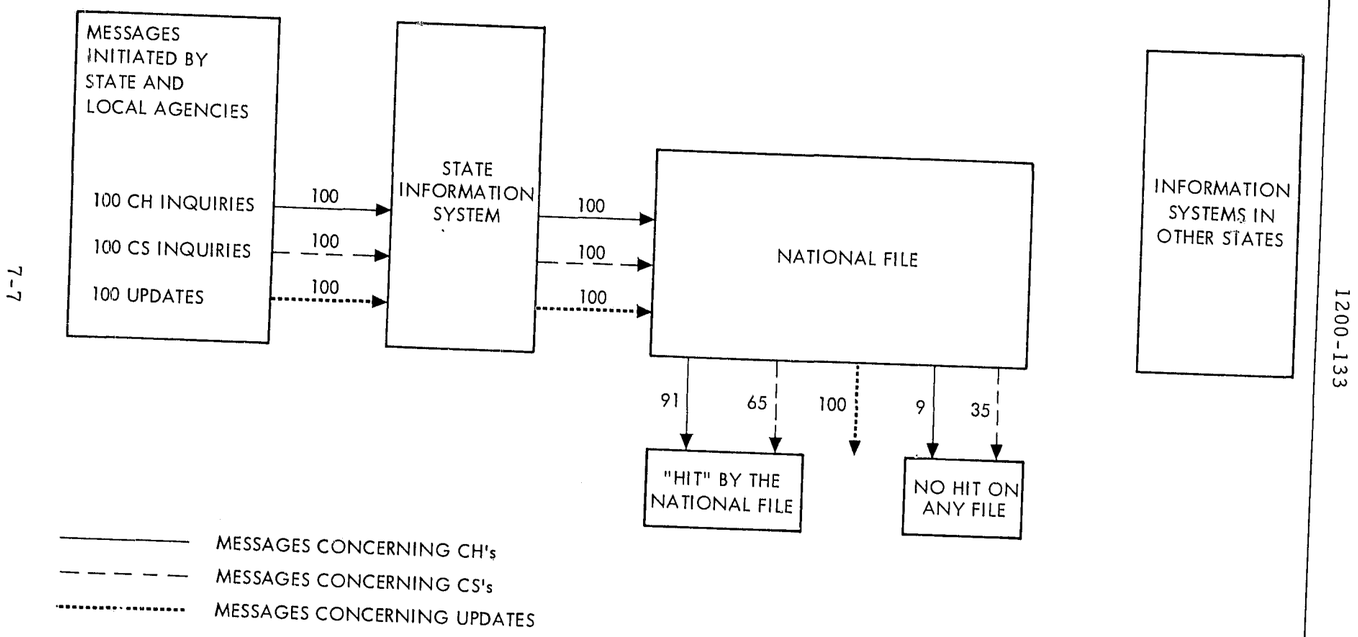


Fig. 7.1. The flow of messages under Case 1

This record would then be forwarded to the inquiring state along with a request to send their records on the individuals (to complete the national record).

State-to-National Traffic

State-to-national traffic under Case 2 will consist of inquiries (when no state file is located), updates, and responses (when a new multi-state offender file is created). An FBI study[10] done from 1970 to 1972 indicated that:

65% of all arrestees are repeat offenders.
44% of all repeaters are multi-state repeaters.
64% of all multi-state repeaters had records in only two (2) states.

If these percentages are assumed to be representative of the nation, the following figures can be derived:

29% of all arrestees are multi-state offenders.
36% of all arrestees are single-state recidivists.
35% of all arrestees are new offenders.
18% of all arrestees are recidivists with records in only two (2) states.[11]

All CS and CH inquiries will first be checked against the state files. Since all multi-state files will have been removed, those offenders with records in only one state will be "hit" at the state level. Thus 36% of all CS and CH inquiries will automatically be cut off by the states. Of the remaining 64%, 29% represent multi-state offenders and 35% are new offenders. For CS inquiries all 64% continue to the national level. However, for CH inquiries we will assume that one (1) inquiry per arrest will be national for new offenders and all other CH inquiries regarding new offenders will be stopped at the state level. With an average of 3.7 inquiries per arrest this means that approximately 27% of all new offender CH inquiries will be national. Since new offenders account for 35% of the total traffic, about 9% (0.27 x 0.35 = 0.094) of the total CH inquiries generated will be first-offender national inquiries. Combining this with multi-state

10. Op. Cit., "Uniform Crime Reports," p. 36.
11. The numbers have been rounded to maintain only the appropriate number of significant figures.

offender traffic gives 38% of the total CH inquiries generated continuing to the national level. The basic assumption is that once a state file is created further inquiries about that offender should be stopped by the State.

All updates for single-state offenders (36% of arrestees) would only reach the state level. In addition, new offenders (35% of arrestees) would only require one (1) update (for the pointer) per arrest. Thus, only 29% of all updates generated (from Table 7.1) plus one (1) per new offender arrest would be national updates under Case 2. This gives 5.9 million updates/year (0.29 x 15.1 + 0.35 x 4.3 = 5.9) and 7.9 million updates/year (0.29 x 20.3 + 0.35 x 5.8 = 7.9) for 1978 and 1983, respectively.

As discussed above, each time a new multi-state offender file is created, both states will be requested to forward their files to the national level. Thus there will be two state-to-national "responses" for each new multi-state file created at the national level. Unfortunately, the number of times we could expect this to occur is not available. However, the FBI study referenced earlier indicated that 18% of all arrestees have records in two (2) and only two (2) states. To obtain a rough approximation of the number of new multi-state files created, we will assume that all of the two-state recidivists are classified as such on the basis of the arrest in question (and thus a new file at the national level is created).[12] With 3.7 inquiries per arrest, the first inquiry represents 27% of the inquiries related to that arrest. If 27% of all inquiries are the initial inquiry (for a particular arrest) and 18% of the initial inquiries create a new national file (new multi-state offender), then 5% (18% x 27%) of all inquiries will create new national files. This would mean that 5% of the total CH inquiries would not be "hit" at the state file but would be "hit" at the national pointer and thus require the two states involved (the arresting state and the state identified by the pointer) to forward their records on that arrestee to the national file. Thus the total state-to-national responses should equal two times 0.05 times the number of CH inquiries generated. Table 7.3 shows the figures for state-to-national traffic under Case 2 for 1978 and 1983.

12. This is actually an upper bound, for in reality we would expect less than 18%. However, since no estimates exist, we will assume the larger figure.

Table 7.3. State-to-national traffic under Case 2 (millions per year)

	1978	1983
CH inquiries	6.0	8.2
CS inquiries	5.5	6.8
Total inquiries	11.5	15.0
Updates	5.9	7.9
"Responses" or CCH file transfers (twice the number of new national files created)	1.6	2.2

National-to-State Traffic

Under Case 2 national-to-state traffic will consist of responses to inquiries and requests for new files (new multi-state offenders). When an inquiry is received at the national level, one of three things occurs:

1) A "hit" on a multi-state offender record.
2) A "hit" on the pointer file.
3) No "hit."

Concerning the national-to-state traffic Case 2 strongly differentiates between CH and CS inquiries. When either inquiry (CH or CS) receives a "hit" on the multi-state offender file a "hit" response (of the appropriate type) is sent. However, "hits" on the pointer file ("pointer-hits") are treated differently according to the type of inquiry (CH or CS).

For CH inquiries, if a "pointer hit" is made, the state holding the record is requested to forward its file (as described above) to the national level. Once this file is received, the standard "hit" response (for CHs) is sent to the original requesting state. In addition, the requesting state is asked to forward its files to the national level as well (to complete the multi-state record). Thus, for a CH "pointer hit" two national-to-state "inquiries" are generated and one standard "hit" response is sent.

For CS inquiries, on the other hand, when a "pointer hit" is made, no new multi-state file is to be created (for, by assumption, no new arrest has been made). Thus, simpley a "pointer hit" response will be sent and it will be up to the requesting state to obtain the CS file. A "pointer hit" response simply informs the requesting state where the records on the individual in question are being held.

Based on the percentages given earlier, estimates of the traffic loads for each message type are calculated as follows:

1) CH "hit" responses (from the multi-state file) should occur on 29% of all CH inquiries generated.[13]
2) The number of national-to-state CH "inquiries" will be 0.10 (2 x 0.05) times the total number of CH inquiries generated.
3) CS "hit" responses (from the multi-state file) will equal 29% of all CS inquiries generated.
4) CS "pointer-hit" responses will be 18% of the total CS inquiries generated (by assumption).
5) The number of "no hit" responses will equal the total number of inquiries (reaching the national level) less the "hit" (for CH and CS) and "pointer-hit" (CS only) responses.

Table 7.4 shows the national-to-state traffic under Case 2 for 1978 and 1983.

Table 7.4. National-to-state traffic under Case 2 (millions per year)

	1978	1983
CH "hit" responses	4.6	6.2
CH "no hit" responses	1.4	2.0
CCH transfer requests	1.6	2.2
CS "hit" responses (multi-state file)	2.5	3.1
CS "pointer hit" responses	1.5	1.9
CS "no hit" responses	1.5	1.8

13. This includes those "hit" responses sent after a new file has been created ("pointer hit").

State-to-State Traffic

The only state-to-state traffic under Case 2 is to retrieve Criminal Summaries (CSs). Thus, there should be one state-to-state inquiry and "hit" response for each "pointer-hit" on the national-state traffic. The values are summarized in Table 7.5.

Table 7.5. State-to-state traffic under Case 2 (millions per year)

	1978	1983
CS inquiries	1.5	1.9
CS responses	1.5	1.9

An overall outline of the flow of messages under Case 2 is given in Fig. 7.2.

Case 3 - State Files with Only A "Pointer" at the National Level

Under Case 3 the states will be the repository of all files. When an offender is arrested all available files are transferred to that state; the national pointer indicates the new state of record; and inquiries by any other state (for criminal summaries) will be directed to that state. Thus all inquiries (both CH and CS) will first check the state file; if they are the state of record a response (of the appropriate length) will be sent. If no record is found (no "hit"), the inquiry will be forwarded to the national "pointer." If the "pointer" indicates that some other state has a file on the individual, the inquiring state will then initiate an inquiry to the appropriate state. For CH inquiries an arrest has been made (by assumption) and thus the inquiring state will become the state of record. CS inquiries, on the other hand, are for investigatory purposes (by assumption) and thus no transfer of records takes place.

State-to-National Traffic

For CH inquiries, after the initial inquiry (by the booking agency) the requesting state will become the state of record regardless of the past history

CONTINUED

1 OF 2

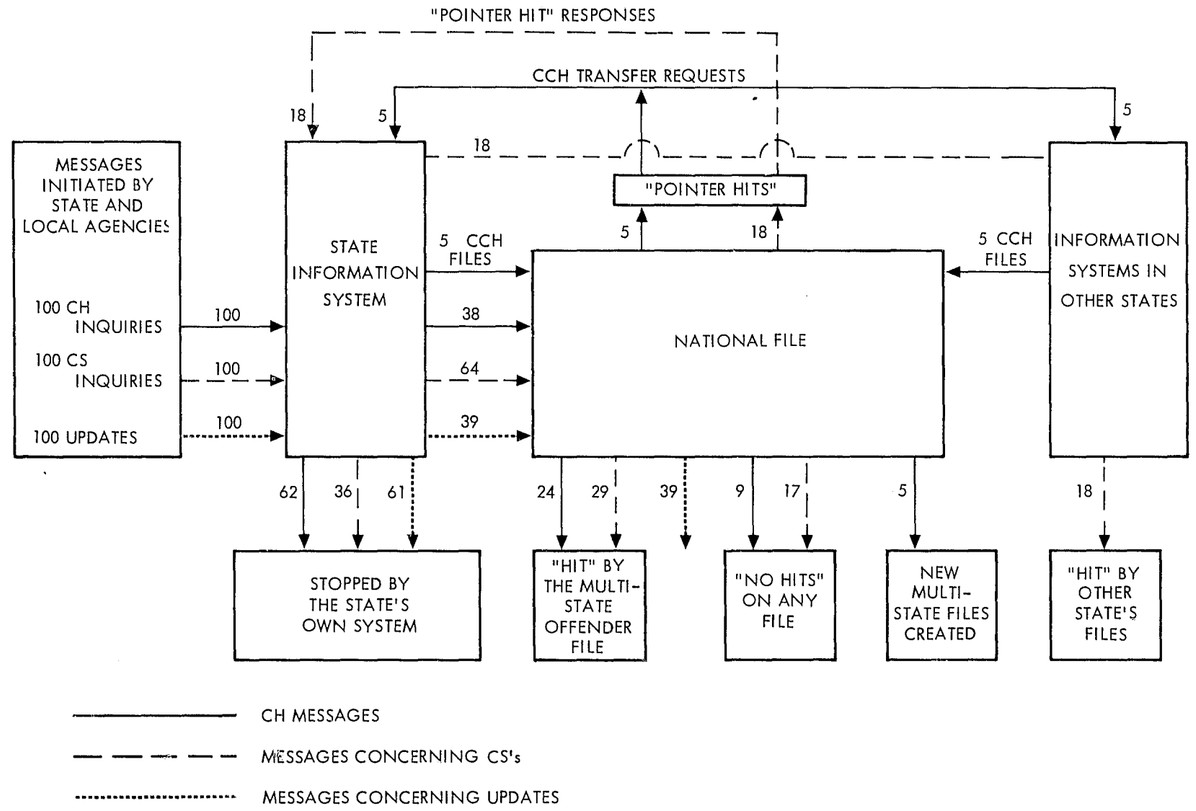


Fig. 7.2. The flow of messages under Case 2

of the offender. Consequently, all further inquiries during the course of the criminal justice process (by prosecutor, etc.) will be stopped at the state level. Therefore, to estimate traffic loads on a national network we need only consider the initial CH inquiry by a state. By assumption, then, the number of such "initial inquiries" would equal the number of arrests. However, since the inquiring state may already be the state of record not all the initial CH inquiries will be national. To estimate the number of CH inquiries not cut off by the state we will again use the fact that 36% of all offenders are single-state recidivists, 29% are multi-state recidivists, and 35% are new offenders.[14] All CH inquiries concerning single-state recidivists will be cut off along with a certain percentage of the multi-state recidivists. However, since we are unable to estimate the likelihood of a multi-state offender having a record in the inquiring state, we will assume that all such inquiries are national. Thus all the initial CH inquiries (one per arrest) with regards to new offenders (35%) and multi-state recidivists (29%) will be assumed to be national traffic. In other words, the number of national CH inquiries expected will equal 64% of total number of arrests made.

For CS inquiries we can only expect the inquiring state to be the state of record for single-state offenders and again some multi-state offenders. Since we cannot estimate the fraction of the multi-state offenders that will be cut off, we will assume an upper bound in which none will be cut off. Thus the number of National CS inquiries expected should be 64% of the total CS inquiries generated.

Since all files would be state-held, the only reason to update the national pointer is once for new arrestees or recidivists in a new state. As presented earlier, about 35% of all arrestees are new offenders and we estimated about 18% of all arrestees are new multi-state offenders (see page 7-7). Thus we would expect the number of national updates to be about 53% (35 + 18) of the total number of arrests made. Table 7-6 summarizes the estimates for state-to-national traffic under Case 3.

14. Op. Cit., "Uniform Crime Reports," p. 36.

Table 7.6. State-to-national traffic under Case 3 (millions per year)

	1978	1983
CH inquiries	2.7	3.7
CS inquiries	5.5	6.8
Updates	2.3	3.1

National-to-State Traffic

For each inquiry received at the national file either a "pointer-hit" or a "no hit" response will be returned. We will assume that 29% (the percentage of all offenders who are multi-state offenders) of all CS inquiries generated (at the local level) will receive a "pointer-hit" response from the national file. Similarly 29% of all the initial CH inquiries (by the booking agency) will receive national "pointer-hit" responses. Thus the total number of "pointer-hit" responses should equal 0.29 times the sum of CS inquiries (total generated) and initial CH inquiries (number of arrests). All other responses will be "no hit" responses. The results are summarized in Table 7.7.

Table 7.7. National-to-state traffic under Case 3 (millions per year)

	1978	1983
"Pointer-hit" responses	3.7	4.8
"No hit" responses	4.5	5.7

State-to-State Traffic

For every "pointer-hit" on the national file, there will be a state-to-state iniquiry and a response (see Table 7.8). An outline of the overall flow of messages is given in Figure 7.3.

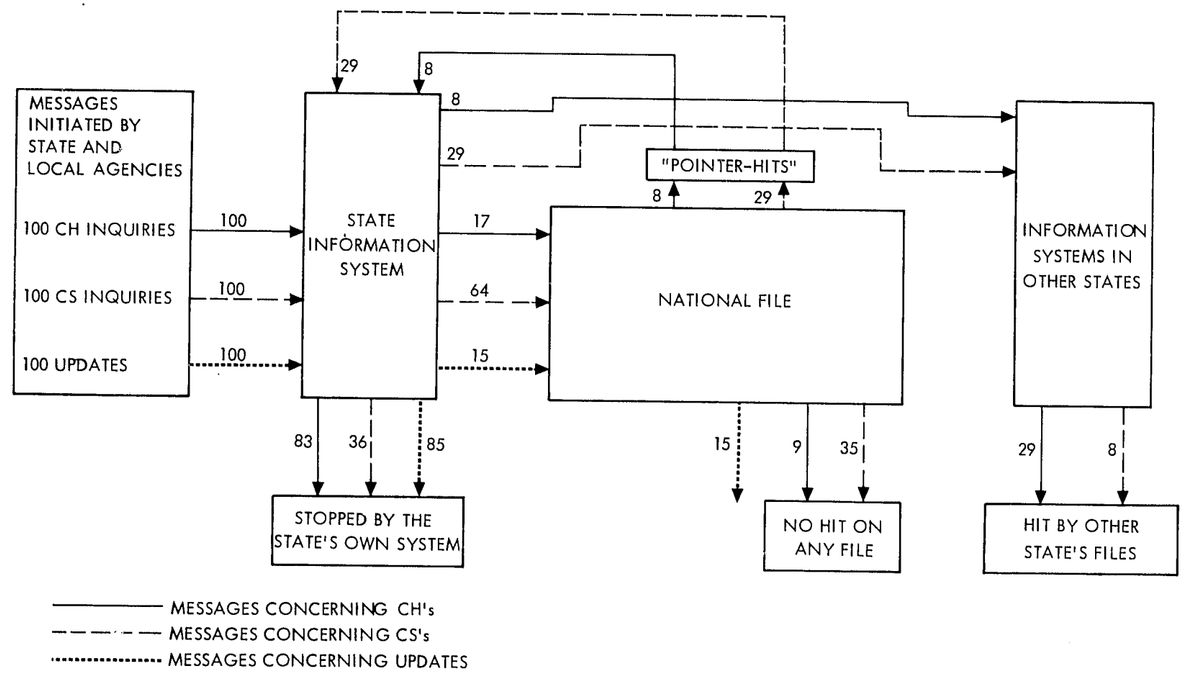


Fig. 7.3. The flow of messages under Case 3

Table 7.8. State-to-state traffic under Case 3 (millions per year)

	1978	1983
CH inquiries	1.2	1.7
CS inquiries	2.5	3.1
Total inquiries	3.7	4.8
CH responses	1.2	1.7
CS responses	2.5	3.1
Total responses	3.7	4.8

Case 4 - Complete State Files with a "Pointer" and a Criminal Summary (CS) at the National Level

The final case is essentially the same as Case 3 except that requests for CSs will be satisifed at the national level. Since all offenders will have a CS File at the national level, all updates will be national.

State-to-National Traffic

State-to-national traffic will be the same as in Case 3 (except for updates). Since there is a criminal summary at the national level we would expect the same number of updates as if the total file were national. Thus the number of national updates should equal the total number generated. (See Table 7.1.)

National-to-State Traffic

The absolute volume of traffic will be the same as in Case 3, only now CS "hit" responses will replace "pointer hit" responses to CS inquiries (see Table 7.9).

Table 7.9. National-to-state traffic under Case 4 'millions per year)

	1978	1983
"Pointer-hit" responses	1.2	1.7
CS "hit" responses	2.5	3.1
"No hit" responses	4.5	5.7

State-to-State Traffic

The only state-to-state traffic will be for the retrieval of criminal histories (CHs). Thus all the "pointer-hit" responses of Table 7.9 will generate CH inquiries and responses to another state (see Table 7.10). An outline of the flow of messages under Case 4 is shown in Fig. 7.4.

Table 7-10. State-to-state traffic under Case 4 (millions per year)

	1978	1983
CH inquiries	1.2	1.7
CH responses	1.2	1.7

7.1.4 Character Lengths of Each Message Type

As discussed on the preceding pages, there are 7 types of messages:

1) CH inquiries.
2) CS inquiries.
3) Updates.
4) CH "hit" responses.
5) CS "hit" responses.
6) "Pointer hit" responses.
7) "No hit" responses.

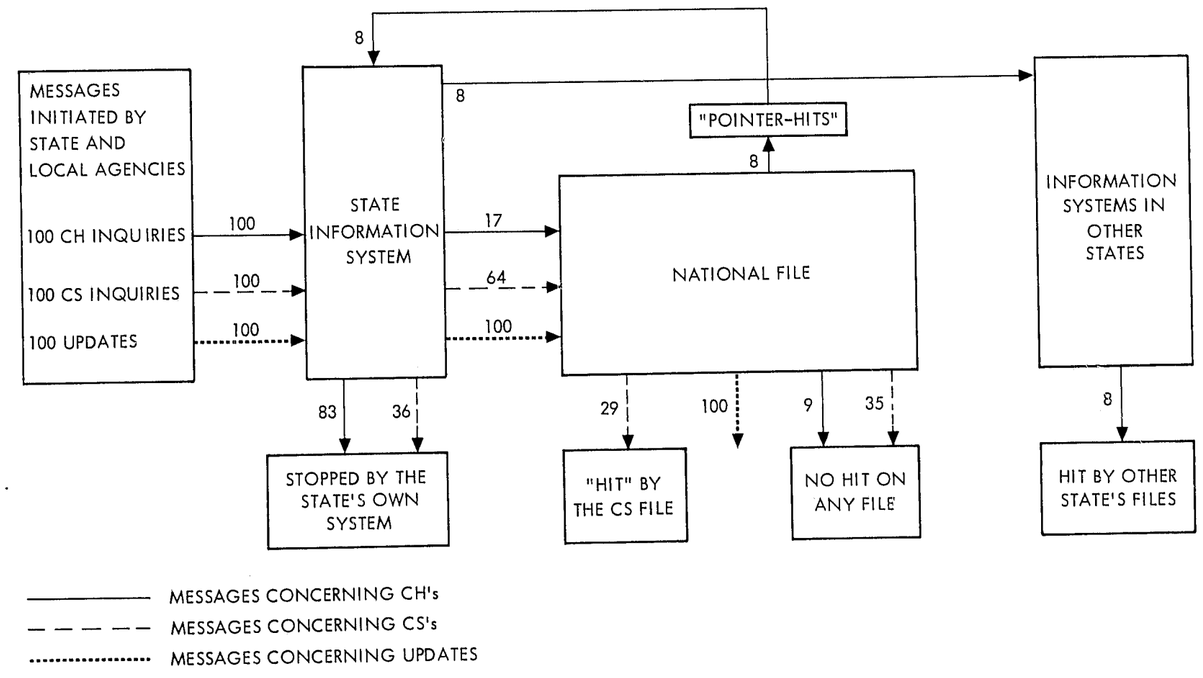


Fig. 7.4. The flow of messages under Case 4

Based on current NCIC message formats we estimate that CH and CS inquiries will be about 70 characters in length.[15] The length of update message depends on the type of file being updated (pointer or CH) and the particular section of the file to be updated (if it's a CH file). For CH files, the average section is 186 characters.[16] Thus we will assume the average CH update will be about 186 characters plus 70 characters for identification (256 total). No "pointer" system currently exists from which we can determine the character length of "pointer" updates. However, since it contains much the same information as an inquiry, we will assume "pointer" updates will be 70 characters in length.

CH "hit" responses will vary in length according to the number of arrests described in the file and how many steps in the criminal justice process were completed per arrest. NCIC formats allow 195 characters for identification, 206 for each arrest, 240 for the judicial process (plus 168 supplementary to the judicial section), and 119 for custody after conviction.[17] As discussed on page 7-4, 73% of all arrestees are actually prosecuted, 47% receive some verdict, and 42% are admitted to corrections. Thus, on the average, we would expect the file to contain 195 characters (for identification) plus 510 characters for each arrest.[18] The careers in crime study done by the FBI indicated approximately 3 arrests per offender.[19] Consequently we estimate approximately 1725 characters per CH "hit" response.[20]

CS "hit" responses are simply short summaries of the CH file. Although it does vary in length according to the number of arrests, CS "hit" responses are much less sensitive to this because only a summary is given. Based on

15. "NCIC CCH Message Keys," issued June 30, 1971, p. 22-23.
16. Ibid., pp. 2-2, 3-2, 4-2, 5-2. Based on total characters allowed per section. The smallest section has 119 characters and the largest 240 characters.
17. Ibid.
18. $206 + .73 \times 240 + .47 \times 168 + .42 \times 119 = 510.14 \cong 510$.
19. Op. Cit., "Uniform Crime Reports," p. 36. 65% have an average of 4 arrests and 35% only 1 arrest.
20. $195 + 3 \times 510 = 1725$.

examples of NCIC Criminal Summaries, about half the characters are for identification.[21] This indicates an average CS "hit" response of 390 (2 x 195) characters.

"Pointer hit" and "no hit" responses basically contain the same information as an inquiry plus one line giving the state of record or a negative response. Thus we will estimate the lengths of both of these responses to be 70 characters (the same as inquiries).

The above character lengths are based on current formats, but we will assume that these figures will remain constant over the next 10 years. Table 7-11 summarizes the results for computerized criminal histories.

21. Op. cit., "NCIC Message Keys."

Table 7.11. Summary of CCH traffic estimates

	State-to-State						State-to-National						National-to-State						Total Bits Per Second	
	1978			1983			1978			1983			1978			1983				
	Message Volume - 10^6/Year	Average Characters Per Msg.	BPS	Message Volume - 10^6/Year	Average Characters Per Msg.	BPS	Message Volume - 10^6/Year	Average Characters Per Msg.	BPS	Message Volume - 10^6/Year	Average Characters Per Msg.	BPS	Message Volume - 10^6/Year	Average Characters Per Msg.	BPS	Message Volume - 10^6/Year	Average Characters Per Msg.	BPS	1978	1983
Case (1) - National Files:																				
CH Inquiries							15.9	70	283	21.8	70	388	N/A	N/A	---	N/A	N/A	---		
CS Inquiries							8.6	70	153	10.6	70	188	N/A	N/A	---	N/A	N/A	---		
CH "Hit" Responses	NO TRAFFIC						N/A	N/A	---	N/A	N/A	---	14.4	1725	6309	17.5	1725	7668		
CS "Hit" Responses							N/A	N/A	---	N/A	N/A	---	5.6	390	555	6.9	390	684	8,262	10,349
"Pointer Hit" Responses							N/A	N/A	---	N/A	N/A	---	N/A	N/A	---	N/A	N/A	---		
"No Hit" Responses							N/A	N/A	---	N/A	N/A	---	4.5	70	80	5.7	70	101		
Updates							15.1	256	982	20.3	256	1320	N/A	N/A	---	N/A	N/A	---		
Total									1418			1896			6944			8453		
Case (2) - Natl. Multi-State File:																				
CH Inquiries	-0-	N/A	---	-0-	N/A	---	6.0	70	107	8.2	70	146	1.6	70	28	2.2	70	39		
CS Inquiries	1.5	70	27	1.9	70	34	5.5	70	98	6.8	70	121	-0-	N/A	-0-	-0-	N/A	-0-		
CH "Hit" Responses	-0-	N/A	---	-0-	N/A	---	1.6	1725	701	2.2	1725	964	4.6	1725	2015	6.2	1725	2717		
CS "Hit" Responses	1.5	39	149	1.9	390	188	N/A	N/A	---	N/A	N/A	---	2.5	390	248	3.1	390	307	3,449	5,098
"Pointer-Hit" Responses	N/A	N/A	---	N/A	N/A	---	N/A	N/A	---	N/A	N/A	---	1.5	70	27	1.9	70	34		
"No Hit" Responses	N/A	N/A	---	N/A	N/A	---	-0-	-0-	---	-0-	-0-	---	2.9	70	52	3.8	70	68		
Updates	N/A	N/A	---	N/A	N/A	---	5.9	256	450	7.9	256	514	N/A	N/A	---	N/A	N/A	---		
Total			176			222			906			1745			2370			3165		
Case (3) - Natl. Pointer:																				
CH Inquiries	7.2	70	128	1.7	70	30	2.7	70	48	3.7	70	66	N/A	N/A	---	N/A	N/A	---		
CS Inquiries	2.5	70	44	3.1	70	55	5.5	70	98	6.8	70	121	N/A	N/A	---	N/A	N/A	---		
CH "Hit" Responses	1.2	1725	526	1.7	1725	745	N/A	N/A	---	N/A	N/A	---	N/A	N/A	---	N/A	N/A	---		
CS "Hit" Responses	2.5	390	248	3.1	390	307	N/A	N/A	---	N/A	N/A	---	N/A	N/A	---	N/A	N/A	---	1,279	1,565
"Pointer-Hit" Responses	N/A	N/A	---	N/A	N/A	---	N/A	N/A	---	N/A	N/A	---	3.7	70	66	4.8	70	85		
"No Hit" Responses	N/A	N/A	---	N/A	N/A	---	-0-	-0-	---	-0-	-0-	---	4.5	70	80	5.7	70	101		
Updates	N/A	N/A	---	N/A	N/A	---	2.3	70	41	3.1	70	55	N/A	N/A	---	N/A	N/A	---		
Total			946			1137			187			242			146			186		
Case (4) - Natl. Pointer + CS:																				
CH Inquiries	1.2	70	21	1.7	70	30	2.7	70	48	3.7	70	66	N/A	N/A	---	N/A	N/A	---		
CS Inquiries	-0-	N/A	-0-	-0-	N/A	-0-	5.5	70	98	6.8	70	121	N/A	N/A	---	N/A	N/A	---		
CH "Hit" Responses	1.2	1725	526	1.7	1725	745	N/A	N/A	---	N/A	N/A	---	N/A	N/A	---	N/A	N/A	---		
CS "Hit" Responses	-0-	N/A	-0-	-0-	N/A	-0-	N/A	N/A	---	N/A	N/A	---	2.5	390	248	3.1	390	307	2,024	2,720
"Pointer Hit" Responses	N/A	N/A	---	N/A	N/A	---	N/A	N/A	---	N/A	N/A	---	1.2	70	21	1.7	70	30		
"No Hit" Responses	N/A	N/A	---	N/A	N/A	---	N/A	N/A	---	N/A	N/A	---	4.5	70	80	5.7	70	101		
Updates	N/A	N/A	---	N/A	N/A	---	15.1	256	982	20.3	256	1320	N/A	N/A	---	N/A	N/A	---		
Total			547			775			1128			1507			349			438		

N/A = Not Applicable

7.2 Fingerprint Transmission

Fingerprints are considered one of the most reliable means of distinguishing one person from another. With the growing volume of law enforcement data traffic (see Chapter 6) and the increased numbers of arrests annually, there is an increasing demand for faster and more convenient methods of evaluating fingerprints.

Currently, FBI fingerprint card identification procedure is based upon processing of cards received via the mail; there is no capability to receive or process cards on a real-time basis. Although, facsimile equipment has been used operationally for a number of years to transmit fingerprints from an arresting agency to a state identification bureau and, experimentally, to the FBI, when used on a limited scale involving only high priority cases, facsimile has been found to be both efficient and effective.

The primary limitation to expansion of existing facsimile systems lies in their long transmission times. Limited as they are by the bandwidth of the commercial telephone services, the most advanced facsimile systems would require at least 4 minutes to transmit a single standard fingerprint card with resolution sufficient for use in identification. To transmit any appreciable percentage of the fingerprint cards generated daily within the United States, a tremendous number of telephone lines and facsimile transmitters and receivers would be required.[22] However, the art of processing fingerprints has been enhanced by the development of automated systems based on advancements in the technologies of pattern recognition and data processing. Currently, the FBI is evaluating a system called FINDER[23] which is a fingerprint reader which operates upon inputs of quantized minutiae (ridge endings and forks) and ridge direction data from an inquiry print for registration, classification, and matching. In conjunction with this development, digital fingerprint processing significantly reduces the amount of information that must be processed.

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[22] "Satellite Transmission of Fingerprint Images: The Results of a Feasibility Experiment," Project SEARCH Technical Report No. 7, p. 5, 1972.

[23] "Automatic Fingerprint Identification," IEEE Spectrum, pp. 36-45, Sept. 1973.

Aside from conventional data-compression techniques that may be used to enhance whole-print transmission, studies indicate that considerable bandwidth reduction can be attained prior to transmission. That is, if minutiae encoding was done at the point of transmission, a whole fingerprint card could be reduced to 150,000 bits.

Although there will be no transmission of digital fingerprint data within the next few years because of the experimental status of above techniques and the time required for implementation of such new technologies, estimates for potential traffic for the years 1978 and 1983 are presented below.

The interstate transmission of fingerprints is associated with two specific activities:

1) Positive identification of booked offenders.
2) Identification of latent fingerprints found in the course of investigation.

Two cases will be examined. In Case 1, arrest data can be used to generate an initial estimate of traffic in fingerprint transmission for booked offenders. In the latter case, an extrapolation of current transaction levels can be utilized to generate estimates.

Case 1

Estimates are based upon the following assumptions: 1) each state will have its own Identification Bureau, and 2) only those prints which cannot be identified at the state level will be forwarded to the FBI. Furthermore, it is assumed that offenders under 18 years of age and most of the drunk and misdemeanor offenders will not have their cards forwarded to the FBI.

All other offenders will have a fingerprint card sent to the state identification bureau which should be able to identify approximately 50% of all the cards at the state level.[24] Therefore, the total number of fingerprint sets being

[24] "Design of a Model State Ident Section Bureau", Project SEARCH Technical Report No. 8.

transmitted to the FBI will equal 0.5 x A_i, where A_i is the estimated number of projected arrests for year(i)[25]. Initial estimates for 1978 and 1983 are shown in Table 7-12.

Case 2

Based on requests received by the Latent Fingerprint Section of the FBI in the years 1971 and 1970, there were 32,864 such cases in 1971 which represented an 8% increase over 1970. Assuming that there would be a constant growth in requests at the national level each year and that the increasing level of expertise at the state and local level would absorb any increased growth in requests at the local level, an initial estimate for the years 1978 and 1983 is shown in Table 7-12. It is assumed that on the average, latent fingerprints requests will occupy about 1/3 of an 8-1/2" x 11" page, and that they will be sent by facsimile at a scan rate of 200 x 200 per square inch or will require approximately 750,000 bits per transmission.

Table 7-12. Fingerprint transmission estimates

	1978	1983
Case 1. Booked Offenders		
Projected Arrests (A_i)	4,880,000	5,830,000
Proportion of Prints Sent to FBI	50%	50%
Total Fingerprint Requests to FBI	2,440,000	2,915,000
Bits per transmission	150,000	150,000
Average BPS Rate	11,639	13,900
Case 2. Latent Fingerprints	56,000	83,000
Bits per Transmission	750,000	750,000
Average BPS Rate	1,336	1,980
Total Average BPS (bits per second)	12,975	15,880

[25] See Appendix C

7.3 Courts and Prosecution

The data requirements of the courts and prosecution are considered jointly because of the similarity of their impact on any national telecommunications system.

With respect to courts, the information needs are primarily of an intrastate nature; however, those of an interstate or national nature would be the computerized criminal histories (CCH) of defendents, driving records of the defendents, statute and case law related to the offense, and criminal justice research data from other jurisdictions. CCH data transactions have been accounted for earlier (Section 7.1). Driver or vehicle related data would be available through the state Department of Motor Vehicles (DMV) and would be obtained on an interstate basis as discussed in Section 7.8.

A statute and case law retrieval system might require a state-to-national telecommunications capability. LEXIS, a privately contracted computer service, offers a computer assisted access to a national electronic law library. In the future, whether there would be a complete electronic law library within each state or only one complete library at the national level with state laws and cases at the state level is not clear at this time. However, initial indications are that the most frequent use of this system would be intrastate with a much smaller interstate demand unless due to cost there would be regional data banks.[26]

Use of a criminal justice data base would be from the standpoint of introducing new procedures or programs into the courts and prosecutor's offices in one jurisdiction based upon their history in another jurisdiction. Such data might be derived from the Grants Management Information System (GMIS), Offender Based Transactions Statistics (OBTS), Prosecutor's Management Information System (PROMIS), and other criminal justice data sources. The use of criminal justice data for planning, research, and program implementation purposes is discussed in Section 7.5.

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[26] Furthermore, it is doubtful whether such a proprietary system would be an allowable user candidate for NALECOM, and since there are no federally funded activities in this area, no estimates are included.

Other uses by the courts and prosecution would be largely of a management and/or administrative nature and therefore consist of local or intrastate transactions as pointed out earlier.

In summary, the transactions involving CCH and driving offense records have been accounted for in Sections 7.1 and 7.8; legal research transactions cannot be assessed at this time, and criminal justice data base uses are discussed in Section 7.5.

7.4 Corrections (Probation, Parole, Institutional Supervision)

Corrections in this discussion encompasses all agencies which have responsibility for supervising offenders, the term includes pretrial detention, probation, parole, and institutional supervision.

Correctional agencies will require detailed information and statistics for administrative and management functions, for research, for offenders accounting, and for other purposes. In terms of interstate or national information requirements, this activity would consist of computerized criminal histories, offender based transaction statistics (OBTS), and other criminal justice statistical data.

In terms of the demand for and updates of CCH's, the impact of corrections has been accounted for in Section 7.1. As to statistical and research data requirements, the impact of corrections has been accounted for in Section 7.5.

Any other impact on the network has been assumed to be nonexistent based on the research performed to date.

7.5 Criminal Justice Planning Information

"Criminal Justice Planners" as discussed here, will include planners and administrators at all levels and in all agencies of the Criminal Justice System. Although formal planning agencies are very important and require a great deal of information, most policy and procedural changes are made by agency administrators. Thus a system to provide planning information must insure that this information is made available to all types of agencies at all levels of the system.

There are currently three federal programs designed in part to disseminate criminal justice planning information:

Grants Management Information System (GMIS)
National Criminal Justice Statistics Data Base (NCJSDB)
National Criminal Justice Reference Service (NCJRS)

GMIS is a computer based information system designed to track the progress of the various programs funded by LEAA. The principal goal is to allow LEAA to more effectively distribute the funds they have available. The system includes the capability to search the data file, identify programs involving a particular subject area, and provide certain information on each program identified. Thus criminal justice planners and administrators could inquire as to what programs are currently going on regarding a particular subject (drug rehabilitation for instance) and receive a listing describing all such programs.[27]

GMIS is currently processing about 250 inquiries per week, of which about 50 are from LEAA's Washington Office.[28] Once the system is better known, they expect approximately 400-500 total inquiries per week (21,000 to 26,000 per year).[29] Character lengths per message (inquiry and response) are not known but are likely to be on the order of those for a criminal history (70 characters for an inquiry and about 1725 characters for a response).

Assuming the number of inquiries grows at a rate of 10% per year yields the estimates given in Table 7-13.

As currently planned NCJSDB will be a computerized statistical data base to provide "demographic data, crime statistics, and geographic information to facilitate analysis of the criminal justice system".[30] Since the system is still quite new and has few access terminals it is difficult to estimate the volume of

[27] "LEAA - GMIS", Information Systems Divisions, Office of Operations Support, Law Enforcement Assist. Ad. 1972.
[28] Telephone conversation with Lou Arnold of GMIS.
[29] Ibid.
[30] "Third Annual Report of LEAA", 1971, p. 101.

traffic to be expected. However, a major use of the system is expected to be in conjunction with the GMIS system to obtain relevant background data on areas where new programs are ongoing.[31] Thus we estimate 2-3 statistical inquiries for each GMIS inquiry or 800-1500 per week (42,000-78,000 per year). Character lengths for inquiries and responses are not available, however, "order of magnitude" estimates would be 50 characters for inquiries and 500 characters for responses.

To obtain message volume estimates for 1978 and 1983 we have assumed that the number of inquiries will grow at a rate of 10% per year.

NCJRS is a document retrieval system to assist criminal justice personnel and researchers in obtaining documents relevant to their activities. Currently the service contains documents generated throughout the criminal justice system including documents describing programs funded by LEAA and thus in the GMIS system. The NCJRS does not contain all criminal justice documents, but it is rapidly expanding. The system currently has an "on-line" access capability for a limited number of users (within NCJRS itself) with the majority of users accessing the system by telephone or mail. NCJRS currently receives 1,500-1,800 requests[32] for searches per month (18,000-22,000 per year). It can be assumed that at least this number would be received if "on-line" access were available.

Currently, NCJRS supplies the documents themselves to the requestor by mail. Consequently, the character length would be enormous. However, assuming only an Abstract is supplied, a typical response might be 1,000 characters.[33]

1978 and 1983 estimates are based on an assumed growth of 10% per year and are given in Table 7-13.

[31] Ibid.
[32] Telephone conversation with Mr. Murphy at NCJRS.
[33] Based on an example given in the NCJRS "Users Manual", 1972, p. 15.

Table 7-13 Traffic Volume Related to Criminal Justice Planners

YEAR	MESSAGE TYPE	VOLUME (messages/yr)	AVERAGE LENGTH (characters)	BPS
1978	GMIS			
	Inquiries	37,100*	70	.66
	Responses	37,100	1725	16.26
	NCJSDB			
	Inquiries	96,700**	50	1.23
	Responses	96,700	500	12.28
	NCJRS			
	Inquiries	32,200***	50	.41
	Responses	32,200	1000	8.18
1978 TOTAL				39.02
1983	GMIS			
	Inquiries	59,700	70	1.06
	Responses	59,700	1725	26.16
	NCJSDB			
	Inquiries	155,600	50	1.94
	Responses	155,600	500	19.76
	NCJRS			
	Inquiries	51,900	50	.68
	Responses	51,900	1000	13.18
1983 TOTAL				62.78

*23,000/yr used as a 1973 base figure
**60,000/yr used as a 1973 base figure
***20,000/yr used as a 1973 base figure

7.6 Criminalistics Information

Crime labs are playing an ever increasing role in criminal investigations. To what extent a telecommunication system can aid in this field is, however, difficult to determine. In most cases the mere communication of information is not sufficient and it is necessary to physically transport evidence to the lab.

In some cases, however, it would be desirable to obtain preliminary results quickly over a telecommunication system to establish grounds for holding a suspect until a complete analysis is available (e.g., handwriting or signature analysis). In addition, certain tests can be run remotely and the results transmitted to a crime lab (e.g., infrared spectrographic tests). Such applications have only recently begun to be developed and no such system actually exists on a large scale.

The system of crime labs currently envisioned is primarily state oriented. The aim is to develop state crime lab systems which will be capable of dealing with most cases. In addition, it is believed that each state system will develop some type of expertise in particular areas. Thus, in the future, interstate communications between crime labs in quite likely.

In the current state of development, it is impossible to accurately determine traffic loads related to crime labs. However, since this may be a significant load in the future we will attempt to establish upper bounds on the probable loads for three different types of interactions: 1) facsimile transmission, 2) data transmission, and 3) administrative messages.

7.6.1 Facsimile Transmission

To transmit one (1) 8-1/2" x 11" page by facsimile required approximately 300,000 characters (800,000 bits). Thus the number of such transmissions could significantly effect system loads. In FY 1971 the FBI crime lab received 291,000 specimens for examination.

The exact nature of these specimens is not known at this time and thus it is impossible to accurately estimate what percentage of these cases could use an interstate telecommunication system. To obtain a rough estimate, however, we will assume that certainly no more than half (50%) the cases sent to the FBI could be aided by a telecommunication system. In addition, since state labs will be developing their own specializations, we will assume half of these are state-to-state and half state-to-national. To estimate the expected number of cases in 1978 and 1983 we will further assume a growth rate roughly parallel to the growth in arrests (3.75% per year). Thus as an upper bound we estimate 188,300 and 226,500 cases will be handled in 1978 and 1983 respectively.[34] Assuming a fifty-fifty split between interstate and state-to-national yields the results shown in Table 7-14.

7.6.2 Data Transmission

The only crime lab data transmission system currently in existence is the New York State spectrographic data file. This system is used in identifying unknown substances. The New York system was utilized on approximately 30 to 40 cases per month (360-480 per year) with about 3 searches per case (110-1400 searches per year).[35] To translate this into a national figure is tenuous, however, a rough estimate based on relative populations[36] would indicate about 12,000 to 16,000 transactions per year. Assuming this volume increases with the arrest rate (3.75% per year) gives 1978 and 1983 estimates of 16,800 and 20,500 respectively.[37] Estimates of the character length per message (inquiry and response) are based on a sample output from the New York system.[38] In this example there were about 100 characters of input and about 700 characters of output. We will assume the New York system will remain in operation and thus all traffic will be state-to-state.

[34] Based on 145,500 (291,000 x 0.5) cases/year in 1971.

[35] International Symposium on Criminal Justice Information and Statistics Systems, "Pilot Computerized Infrared Data File for Forensic Science Laboratories," October 1972, p. 393.

[36] Statistical Abstract of the U.S., 1971, p. 201.

[37] Using a base figure of 14,000 trans/year.

[38] Op. cit., International Symposium on Criminal Justice Information and Statistics, p.399. Inquiry length was determined by adding up all other characters indicated as "operator entries", all other characters were counted as output.

Table 7-14 Traffic Related to Criminalistics Laboratories

YEAR	MESSAGE TYPE	VOLUME (messages/yr)	AVERAGE LENGTH (characters)	AVERAGE BPS
1978	Facsimile Transmission			
	Interstate	94,150	300,000	7,174.23
	State-National	94,150	300,000	7,174.23
	Data Transmission			
	Interstate-Inquiry	16,800	100	.43
	-Response	16,800	700	2.99
	State-National	-0-	-0-	-0-
	Administrative Messages			
	Interstate	205,100	432	22.51
	State-National	188,300	432	20.66
1978 TOTAL				14,395.05
1983	Facsimile Transmission			
	Interstate	113,250	300,000	8,629.65
	State-National	113,250	300,000	8,629.65
	Data Transmission			
	Interstate-Inquiry	20,500	100	.52
	-Response	20,500	700	3.64
	State-National	-0-	-0-	-0-
	Administrative Messages			
	Interstate	247,000	432	27.10
	State-National	226,500	432	24.85
1983 TOTAL				17,315.41

7.6.3 Administrative Messages

The number and length of such messages cannot realistically be estimated. However, to place a "first guess" upper bound on the traffic we will assume one (1) administrative message for each data transmission (inquiry-response) and two (2) for each facsimile transmission. The character length will be assumed to be the same as current administrative messages on NLETS (432 characters).[39]

[39] NLETS data estimate.

7.7 Organized Crime Intelligence Information

The need to combat organized crime on an interstate basis has been known for some time. Thus the exchange of information pertaining to organized crime activities between the states and perhaps the federal government would be quite useful. Although some pilot systems have been developed recently, no nationwide system currently exists. At the present time it is impossible to meaningfully speculate as to how a nationwide system might develop.

In both California and New England intelligence systems are currently being developed. However, no data is available on the California system and the New England system is in the process of reorganization. The New England system currently disseminates information to the six states in the area on a regular basis and to other states on occasion. They are currently handling about 200 formal communications per month (2,400/year) and about 40 informal messages per day (14,600/year). The distinction is not completely clear but generally formal messages are prepared and set out to all concerned parties by mail. Informal messages are more likely to be over the phone to check or confirm information. On the average both types of messages would average about 1-1/2 typed pages.[40]

To obtain a rough estimate of the potential NALECOM traffic in organized crime intelligence information, we will assume that the New England data will be typical of interstate traffic. Based on relative populations[41] we could expect 2.9 million/year (17,000 x 17.2) interstate transactions. Assuming approximately 1,500 characters per typed page (double spaced) yeilds about 2,250 characters per message. Due to the rapidly changing nature of these systems no estimates of future growth are possible. In addition, there is some question as to whether or not intelligence information will continue to be transmitted at all. Thus for our purposes we will assume that the above estimates will apply to 1978 and 1983.

[40] All information pertaining to NECOIS was obtained through a telephone conversation with Ted Finegan of NECOIS in Massachusetts.

[41] New England represents 5.8% of the U.S. population.

Estimates of national-to-state traffic can be obtained from the FBI's current dissemination of organized crime intelligence information. In FY 1971, 340,451 items of organized crime intelligence information were distributed to the states by the FBI.[42] Character lengths per message are assumed to be the same as in the New England system.

To obtain a rough estimate of the traffice volume we will assume that the growth rate between 1970 and 1971 will continue (12% per year).

Table 7-15 Traffic Volume Related to Organized Crime

YEAR	MESSAGE TYPE	VOLUME (messages/year)	AVERAGE LENGTH (characters)	AVERAGE BPS
1978	Interstate National-State	2.9 million .75 million*	2,250 2,250	1,657.35 428.63
1978 TOTAL				2,085.98
1983	Interstate National-State	2.9 million 1.3 million	2,250 2,250	1,657.35 742.95
1983 TOTAL				2,400.30

*340,000/year was used as the base level in 1971.

7.8 Driver and Vehicle Records

Currently, there is not a national vehicle registry nor is the National Drivers Register[43], which is administered by National Highway Traffice Safety Administration, accessible by law enforcement agencies. However, the American Association of Motor Vehicle Administrators (AAMVA), an association of state and provincial officials responsible for the administration and enforcement of motor vehicle and traffic laws in the United States and Canada, is currently sponsoring several programs which may have an impact on NALECOM.

[42] "Attorney General's First Annual Report", U.S. Government Printing Office, 1972, p.198.

[43] Public Law 89-563, 89 Stat. 730, Title IV, Sec. 402 specifically limits the Register's use to licensing activities only.

Among these programs are the following:

1) A project to develop a model registration and certificate of ownership data bank.
2) A project to develop a state-oriented Model Motorist Data Base.
3) A pilot project to implement an interstate data net with the capability of instantaneous interjurisdictional data transmission relative to vehicles and drivers.

The proposed scope of these projects includes the development of automated data processing procedures adaptable to state vehicle administrative functions in the field of vehicle registration and certificate of ownership, drivers licensing, motor vehicle inspection, highway safety and accident statistics, and motorists financial responsibility and other vehicle reciprocal agreements. These procedures are projected for communication between all states on a systems network, enabling message switching and interfacing with other computers as the need arises (i.e., NCIC and the National Drivers Register) for overall coordinated unity and intercommunication.

Although department of motor vehicle usages of NALECOM is excluded,[44] if the state files suggested by AAMVA are developed (currently 35 states maintain licensing and registration data on computer systems)[45], it could be accessed on an interstate basis by out-of-state criminal justice agencies.

Transactions would be those engendered by automobile and license plate thefts, vehicle use in perpetration of a felony, and moving traffic citations to out-of-state drivers (i.e., prior to an officer making a pullover, he will want to know whether the vehicle is stolen, who is the vehicle owner, and whether the driver is wanted). NCIC files would be able to address the first and third questions, but prior to the pullover, the name of the registered owner of the out-of-state car would have to be run against the data files of the registering state

[44] Letter regarding NALECOM Scope from Lloyd A. Bastian, Acting Director, Systems Development Division, National Criminal Justice Information and Statistics Service, dated November 9, 1973.

[45] 1972 Director of Automobile Criminal Justice Information System. U.S. Department of Justice, December 1972, PD-35.

before an NCIC check of the owners name is possible if data on the vehicle is not already in the NCIC file.

In estimating the interstate traffic which might be generated under the above system, the following assumptions are made: (1) all out-of-state vehicles and drivers will be checked at both NCIC and the state of origin, (2) 50% of the queries against NCIC vehicle and license files are made on out-of-state vehicles or plates,[46] and (3) present transaction rates against NCIC files is representative of transactions in 1983.[47]

Based on an analysis of current NCIC transaction data, approximately 1/3 of all transactions are against the vehicle/license plate files. The projected state-to-national traffic in 1983 will be 142,000 transactions (see Section 6.2). Applying the 1/3 estimate of vehicle/license plate queries as a base for predictions, it would appear that there will be approximately 47,300,000 queries expected in 1983. From this estimate, it has been assumed that 1/2 will trigger interstate queries so that 23,650,000 vehicle/license plate queries would be expected to occur. Since state-to-national traffic was presented earlier in Section 6.2, only interstate traffic projections are shown in Table 7-16.

Table 7-16 Estimated Interstate Driver/Vehicle Record Traffic

Year	Message Type	Volume	Average Length (Characters)*	Total Bit Requirement (8/character)	Average BPS Rate
1978	Inquiry	14,170,000	60	6.80×10^9	216
	Response	14,170,000	125	14.17×10^9	450
	Update	850,000	200	0.17×10^9	43
				21.14×10^9	709
1983	Inquiry	23,650,000	60	11.35×10^9	360
	Response	23,650,000	125	23.65×10^9	751
	Update	1,420,000	200	0.28×10^9	72
				35.28×10^9	1183

*Average message length estimates were compiled from the National Highway Traffic Safety Administration and the American Association of Motor Vehicle Administrators.

[46] Estimate based on telephone survey of five largest state users.

[47] This estimate will be an upper bound since transactions against other files will probably grow faster than vehicle file use.

7.9 Video Circuits

Presently, the criminal justice purposes which may require the use of video circuits are in the area of training, education, and trial court procedures. However, the cost of utilizing video circuits in terms of capital costs and operating costs are significant.[48] Therefore, additional analysis is required of alternative methods to disseminate video data from the standpoint of cost and effectiveness before a definite estimate can be made for telecommunications requirements due to video usage.

It should be noted that with respect to training and education, the response time requirements are not urgent since scheduling can be made in advance to coincide with low-demand periods based on prior historical use patterns. Since scheduling is a factor in this application, the dissemination of video tapes is a viable, and a cost-competitive alternative which should be considered.

With respect to use of video in the courts, current uses have primarily consisted of local closed-circuit applications and video tapes of witness testimony and depositions. The frequency of interstate use of such techniques is not presently under active consideration by jurisdictions[49] which have used such applications.

A summary of total system traffic anticipated for NALECOM in 1983 is shown in Table 1.1.

[48] Satellite Transmission of Fingerprint Images, Project SEARCH Technical Report No. 7, Chapter 3.

[49] Based on discussion with a number of State Court Administrators.

8. RESPONSE TIME REQUIREMENTS

Overall response times from the time the user requests information until he receives information should be compatible with those specified in Table 8.1. Since the response times quoted will necessitate intrastate transmission functions as well as the functions of the national net, no more than 5 to 10% of the total allotted response time should be consumed by the national net. The values given are those developed by the National Advisory Commission on Criminal Justice Standards and Goals, and represent the best available values for response times.

The response times in Table 8.1 suggest 3 priorities for messages: (1) the highest priority for activities involving officer safety, (2) a lower priority for time-limited investigatory functions such as person identification, and (3) routine messages of low priority and no specified time constraint. Category (2) priority is now dictated by statutory regulations in many cases, and can be expected to be controlled more closely in the future.

Table 8.1 Response Time Requirements*

User	Maximum Delay
1. For users engaged in unpredictable field activity of high potential danger (e.g., vehicle stop)	120 seconds
2. For users engaged in field activity without exposure to high potential danger (e.g., checking parked vehicles)	5 minutes
3. For users engaged in investigatory activity without personal contact (e.g., developing suspect lists)	8 hours
4. For users engaged in postapprehension identification and criminal history determinations	4 hours

*"Criminal Justice System", National Advisory Commission on Criminal Justice Standards and Goals. 23 January 1973.

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APPENDIX A.

PROJECTIONS OF PRESENT USE TRAFFIC THROUGH 1983

A.1 State-to-National Traffic Projections

Table A-1 presents projections of state-to-national traffic estimates based on models described in Section 6.2, through 1983. The projections based on the key variables which includes degree of automation, population, crime rate, number of law enforcement personnel per capita, and base year (1972) transaction levels are given for each state. The traffic values are given in units of transactions per year where a transaction is defined as an incoming message (query, update, etc.) plus the response to the incoming message.

The average number of characters per message (c/m) is noted to be 50 c/m for incoming traffic and 85 c/m for responses. The response c/m values can be expected to increase as traffic builds up against the Computerized Criminal History (CCH) files; CCH traffic is estimated separately in Chapter 7.1, and hence, the above values for c/m are applicable for 1983 transactions.

A.2 State-to-State Traffic Projections

Table A-2 presents projections of state-to-state traffic estimates based on estimation techniques (described in Section 6.3), through 1983. The estimates are given in the form of an origin-destination matrix and represent messages (not transactions) from the originating state to the destination state.

The average number of characters per message is estimated at 432, the value currently experienced by the LETS network.

Table A-1. State-to-national traffic projections (1983)
(transactions per year in millions)

State		Transactions	State		Transactions
Ala	1	2.074	Mont	26	.370
Alk	2	.211	Neb	27	1.176
Ariz	3	2.198	Nev	28	.575
Ark	4	.867	NH	29	.856
Calif	5	12.899	NJ	30	4.286
Colo	6	1.937	NM	31	.955
Conn	7	1.732	NY	32	13.083
Del	8	.367	NC	33	2.534
Fla	9	7.073	ND	34	.256
Ga	10	3.313	Ohio	35	7.334
Ha	11	.603	Okla	36	1.507
Id	12	.397	Ore	37	2.381
Ill	13	9.584	Pa	38	6.570
Ind	14	2.826	RI	39	.610
Iowa	15	1.512	SC	40	1.268
Kan	16	1.890	SD	41	.298
Kent	17	2.143	Tenn	42	2.742
La	18	2.611	Tex	43	8.980
Ma	19	.478	Utah	44	.601
Md	20	3.175	Ver	45	.220
Mass	21	3.758	Va	46	3.002
Mich	22	7.736	Wash	47	2.654
Minn	23	1.854	WV	48	.646
Miss	24	.994	Wisc	49	2.197
Mo	25	4.816	Wy	50	.181

Table A-2 STATE-TO-STATE TRAFFIC PROJECTIONS, 1983, (Messages per Year)

STATE ORIGIN		DESTINATION 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
ALA	1	0	208	2356	9432	17991	3674	5618	1332	73227	56965	332	762	37127	18726	6929
ALK	2	776	0	611	495	8798	816	682	123	1510	1047	181	372	3040	1355	863
ARIZ	3	5028	346	0	3727	64333	3641	2980	596	9478	6344	594	2196	14302	7564	5339
ARK	4	10022	139	1856	0	13097	3261	2857	627	14286	11183	216	577	31823	11809	6484
CALIF	5	55576	7249	93713	38310	0	92015	38730	7396	106566	72254	11002	51395	210079	99429	61373
COLO	6	6114	360	6739	5108	43908	0	3685	727	11006	7862	488	2396	27874	10687	9512
CONN	7	3336	107	829	1597	7401	1315	0	2290	6737	5293	152	325	11829	6939	2523
DEL	8	762	18	157	337	1362	250	2207	0	1543	1274	27	59	2483	1547	498
FLA	9	92904	508	5636	17059	43500	8392	14391	3420	0	96570	944	1922	74531	38413	14731
GA	10	54637	266	2852	10694	22297	4532	8531	2135	73067	0	419	960	51441	29029	9109
HA	11	2190	316	1836	1344	23345	1937	1689	316	4389	2883	0	732	7435	3347	2006
ID	12	1485	192	2004	1058	32210	2804	1066	202	2798	1950	216	0	6137	2562	1889
ILL	13	34131	741	7885	27531	62135	15399	19309	3988	54004	49304	1036	2996	0	152250	64139
IND	14	13903	267	2632	8250	21362	4768	9674	2006	22478	22470	376	976	122959	0	14263
IOWA	15	6926	229	2501	6100	19739	5714	4247	969	11607	9494	304	969	69746	19205	0
KAN	16	6304	198	2467	7011	17799	5902	3162	656	10379	8148	264	954	43162	12988	17351
KENT	17	10732	157	1571	5202	12665	2723	5596	1390	16950	19362	229	567	50322	51485	5980
LA	18	27178	282	3807	16134	26718	5677	5810	1283	43152	25067	474	1117	42000	18370	8995
MA	19	1592	63	452	798	4147	712	7456	676	3214	2440	97	182	5333	3253	1307
MD	20	6535	152	1292	2864	11124	2069	14832	14024	13095	11110	222	487	21293	13579	4190
MASS	21	7709	268	2015	3735	18159	3170	79286	4202	15651	12027	378	796	27238	15600	5931
MICH	22	21111	602	5361	12890	45484	9857	20120	4215	36721	32733	803	2124	166048	109321	29781
MINN	23	9107	409	3732	6811	32085	9229	7212	1405	15965	12904	501	1630	69021	25538	29850
MISS	24	19572	149	1921	12175	13796	3038	3330	748	24605	16850	242	589	27270	11854	5425
MO	25	14711	317	3779	16780	28315	7699	6629	1424	22961	19532	454	1318	157769	35978	29285
MONT	26	1595	200	1636	1144	20210	3044	1198	226	2992	2120	198	1989	7049	2921	2249
NEB	27	3818	142	1758	3618	13219	4715	2205	447	6478	5046	190	662	26570	8425	15129
NEV	28	680	82	1247	477	49719	1114	468	89	1297	884	117	784	2622	1106	776
NH	29	958	31	230	423	2081	364	7085	436	1727	1334	43	91	3137	1793	697
NJ	30	10954	300	2440	5036	21363	3890	54927	17271	22058	17900	432	938	37529	22969	7691
NM	31	2926	149	4593	2459	20179	7807	1596	319	5312	3657	231	901	11526	4527	3534
NY	32	31013	1026	7870	15193	70356	12644	313707	19097	61687	49046	1427	3115	116098	68575	24791
NC	33	17566	276	2557	6396	21265	4025	14701	4947	36666	33395	421	919	42574	26700	8002
ND	34	1497	109	953	1118	8874	2373	1159	220	2714	2033	120	519	8159	3219	3037
OHIO	35	28981	593	5388	14565	44830	9327	25560	6422	50265	49921	826	2026	147747	146277	23593
OKLA	36	9024	246	4052	11385	25077	8155	3823	797	15027	10849	377	1156	37253	13380	10608
ORE	37	3783	719	4560	2583	106186	5515	2845	535	7233	4991	728	4989	15020	6423	4457
PA	38	21330	540	4508	9830	39056	7319	58737	24575	41840	35649	772	1726	76718	49494	15172
RI	39	985	33	251	472	2256	395	13691	595	2004	1545	46	98	3440	1984	743
SC	40	14251	147	1457	4085	11785	2275	5861	1606	30814	32429	230	505	24017	14408	4453
SD	41	1628	97	1033	1295	8775	3067	1144	222	2904	2185	116	498	9270	3472	3823
TENN	42	24219	225	2464	11154	19089	4217	6607	1580	31330	39818	340	845	69448	38574	10087
TEX	43	53911	1331	23879	47488	143563	32516	20426	4283	95977	60992	2292	5873	148866	60699	37591
UTAH	44	2513	227	4245	1882	38382	6940	1667	322	4676	3262	295	2793	10492	4269	3304
VER	45	594	22	163	299	1488	262	3315	275	1182	920	30	66	2275	1298	502
VA	46	10958	217	1918	4435	16255	3053	15488	7176	22189	19432	323	708	32109	20656	6168
WASH	47	6727	1480	7387	4576	144421	9544	5203	973	12892	8933	1275	7831	27090	11623	9054
WV	48	4751	90	749	2051	6210	1251	3880	1120	8472	8921	117	275	17031	13565	2870
WISC	49	9973	321	3011	7108	25185	6036	7768	1583	17048	14592	419	1211	107630	40244	26029
WY	50	795	48	792	652	5772	6614	500	98	1432	1033	64	335	3770	1445	1326

Table A-2 (Cont'd)

STATE		16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
ALA	1	5846	14535	21439	1533	10232	9661	22841	7429	18175	15929	776	3366	495	1267	15758
ALK	2	657	903	839	229	997	1267	2454	1258	524	1296	367	472	225	172	1630
ARIZ	3	4882	4542	6408	930	4319	5389	12375	6496	3806	8731	1697	3307	1935	725	7489
ARK	4	6909	7487	13524	916	4765	4975	14819	5904	12014	19307	591	3390	369	664	7699
CALIF	5	51302	53317	65509	12415	54117	70743	152952	91354	39819	95293	30545	36223	112377	9555	95516
COLO	6	9109	6137	7446	1141	5392	6612	17818	11170	4696	13855	2463	6918	1348	996	9313
CONN	7	1742	4501	2722	4265	13793	59026	12929	3494	1837	4263	346	1155	202	6216	46931
DEL	8	348	1078	579	372	12570	3015	2610	656	397	983	63	225	37	369	14222
FLA	9	12211	29126	43188	3927	26012	24889	50405	16545	28989	31406	1939	7246	1106	3237	40257
GA	10	7249	25153	18921	2254	16694	14459	33967	10019	15009	20285	988	4267	616	1891	24697
HA	11	1616	2049	2468	552	2292	3125	5731	2695	1487	3242	638	1106	565	419	4101
ID	12	1543	1497	1716	342	1486	1943	4478	2590	1065	2730	1884	1137	1110	263	2628
ILL	13	36796	62657	30458	5165	30647	31385	165151	51762	23220	157042	3151	21534	1762	4261	49629
IND	14	8942	51771	10758	2326	15784	14517	87813	15467	8173	28923	1054	5515	597	1967	24531
IOWA	15	16085	9450	7093	1258	6558	7431	32210	24343	5036	31698	1093	13333	564	1015	11060
KAN	16	0	7051	7251	935	4940	5555	19387	11290	5095	31009	923	14191	512	752	9266
KENT	17	4828	0	7278	1453	11144	9290	35876	7670	5640	15045	603	2918	352	1241	16417
LA	18	8524	12496	0	1661	9678	10181	24461	9375	39406	20616	1108	4760	742	1346	15635
MA	19	901	2044	1361	0	4435	21386	6278	1869	906	2142	194	606	113	3728	10819
MD	20	2926	9640	4876	2728	0	21044	22401	5466	3373	7504	515	1890	305	2637	75998
MASS	21	4110	10029	6408	16433	26287	0	29240	8299	4291	9931	846	2737	495	27599	73683
MICH	22	16619	44904	17835	5589	32417	33875	0	41096	12820	45501	2352	11211	1271	4702	54191
MINN	23	12834	12735	9066	2207	10491	12736	54489	0	6244	26020	1936	11048	914	1760	18253
MISS	24	5089	8225	33474	940	5688	5792	14936	5485	0	13412	594	2777	334	766	9069
MO	25	26558	18820	15019	1905	10851	11496	45465	19604	11513	0	1414	12015	903	1553	17736
MONT	26	1760	1681	1799	386	1659	2182	5234	3249	1135	3150	0	1347	621	297	2943
NEB	27	14928	4483	4259	662	3356	3892	13758	10223	2925	14757	743	0	382	529	5693
NEV	28	653	656	805	149	657	854	1891	1026	491	1196	415	464	0	115	1158
NH	29	472	1137	718	2431	2795	23417	3444	972	482	1138	97	316	56	0	7556
NJ	30	5329	15457	9574	7243	92717	64201	40758	10351	5354	13350	995	3489	595	7759	0
NM	31	3581	2679	3845	490	2365	2862	7254	3988	2327	5826	819	2385	607	395	4057
NY	32	16966	43643	25449	39168	121485	356193	132720	34799	17248	41349	3335	11242	1927	55986	369785
NC	33	5864	21532	11452	3421	40252	23725	37304	9795	8048	15428	958	3670	584	3013	48825
ND	34	2026	1761	1608	368	1626	2088	5110	5397	1057	3541	726	1765	259	287	2872
OHIO	35	15351	95697	21408	6402	52357	41363	190561	28645	15723	43900	2179	9749	1246	5594	76873
OKLA	36	14755	7930	12947	1133	5985	6751	19434	9730	9300	22676	1168	7129	737	907	9991
ORE	37	3578	3789	4313	923	3909	5213	11281	6190	2665	6682	3055	2589	2808	707	6956
PA	38	10376	33654	16332	10409	202112	79802	87129	20202	11321	26570	1839	6764	1073	10382	294759
RI	39	516	1285	812	1614	3592	43958	3681	1031	544	1252	104	342	61	2352	10632
SC	40	3399	12175	7728	1479	12708	9790	18545	5205	5550	9091	522	2074	324	1261	17746
SD	41	2665	1890	1789	356	1647	2048	6324	5718	1181	4237	639	2573	258	280	2872
TENN	42	7868	34249	14581	1778	12366	11193	36066	10224	12608	25765	884	4471	532	1488	18786
TEX	43	38968	38256	100015	6061	31974	36270	89210	39521	51045	77194	5619	22184	4036	4832	53345
UTAH	44	2844	2491	2994	527	2371	3020	7302	4297	1853	4905	1951	2093	1341	409	4151
VER	45	340	908	501	1422	1818	7063	2581	721	337	919	70	229	40	1640	4622
VA	46	4387	15613	7764	3250	70947	23689	31395	7909	5414	11412	744	2795	446	2985	60110
WASH	47	6375	6838	7601	1597	7106	9548	20594	11370	4718	11962	5800	4641	3866	1297	12682
WV	48	1985	12556	3224	529	9564	6202	16586	3462	2366	5563	292	1242	171	820	12454
WISC	49	11274	17249	9150	2265	12009	13417	100944	36291	6553	29666	1368	9077	710	1952	20334
WY	50	1202	822	944	155	727	898	2455	1621	611	1839	372	963	177	122	1260

Table A-2 (Cont'd

STATE		31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
ALA	1	1709	33619	19891	907	34968	7016	1941	29440	1668	14661	1093	27550	30432	1331	753
ALK	2	329	4191	1118	249	2654	722	1326	2715	211	569	247	968	2832	454	106
ARIZ	3	5724	18203	5968	1233	13972	6722	4735	12826	903	3199	1490	5981	28799	4796	443
ARK	4	1526	17500	7298	720	18674	9466	1336	13927	850	4466	924	13482	28484	1059	403
CALIF	5	36636	237048	71079	16716	169307	62054	160635	161848	11876	37694	19317	67493	251876	63175	5863
COLO	6	7588	22808	7202	2393	18726	10552	4466	16238	1114	3894	3427	7983	30542	6115	553
CONN	7	553	201985	9390	417	18319	1765	822	46515	13769	3581	456	4464	6848	524	2496
DEL	8	106	11850	2984	76	4436	355	149	18757	567	946	85	1029	1384	97	200
FLA	9	3936	84839	50027	2086	76945	14824	4466	70776	4306	40219	2474	45217	68736	3141	1900
GA	10	2049	50995	34436	1181	57772	9091	2330	45588	2510	31999	1407	43444	33022	1656	1119
HA	11	990	10204	2989	490	6576	1935	2339	6794	523	1562	515	2554	8535	1033	254
ID	12	1025	6579	1926	613	4762	1751	4736	4484	375	1013	651	1872	6458	2881	163
ILL	13	6189	115695	41892	4545	163879	26628	6720	94032	5355	22714	5723	72623	77290	5107	2651
IND	14	1963	55190	21318	1448	131035	7724	2321	48993	2494	11065	1731	32578	25438	1678	1222
IOWA	15	2064	26864	9603	1840	28457	8245	2168	20222	1258	4590	2566	11471	21212	1749	636
KAN	16	2256	19715	6800	1324	19973	12371	1878	14918	942	3771	1930	9651	23720	1624	465
KENT	17	1155	34930	17097	788	95251	4552	1361	33129	1606	9249	937	28765	15944	974	756
LA	18	2847	34971	15612	1236	32745	12663	2661	27604	1743	10078	1523	21027	71568	2010	806
MA	19	297	44085	3920	231	8020	915	466	14409	2938	1579	248	2100	3552	289	1872
MD	20	982	84111	27647	629	40348	2972	1215	172112	3885	8350	706	8984	11527	802	1472
MASS	21	1334	308060	20356	1009	39817	4188	2024	84988	59393	9036	1097	10158	16334	1276	7143
MICH	22	3916	132978	37090	3422	201364	13967	5074	107372	5761	17634	3925	37920	46023	3574	3024
MINN	23	2855	46240	12899	4002	42662	9273	3693	33017	2141	6564	4707	14257	27346	2789	1121
MISS	24	1464	20134	9320	689	20442	6950	1397	16254	993	6148	854	15445	31028	1057	460
MO	25	3143	41396	15323	1982	48919	16283	3003	32717	1958	8637	2628	27068	40238	2399	959
MONT	26	993	7434	2119	905	5407	1868	3058	5042	305	1104	882	2069	6522	2125	184
NEB	27	1530	13923	4477	1213	13343	6287	1429	10229	658	2421	1960	5769	14204	1257	329
NEV	28	487	2873	864	215	2068	788	1879	1969	143	458	238	832	3133	976	70
NH	29	152	41084	2194	117	4569	477	233	9370	2696	978	127	1145	1846	146	1408
NJ	30	1647	278660	36501	1209	64478	5410	2353	273199	12515	12691	1340	14856	20933	1528	4073
NM	31	0	9797	3245	732	8012	5464	1933	7044	493	1790	961	3604	19673	2152	236
NY	32	5279	0	83798	4085	182984	16861	7853	452702	62112	32532	4455	42540	64495	5022	31674
NC	33	1762	94469	0	1147	71313	5194	2277	91259	4224	36747	1316	21936	24844	1537	1721
ND	34	705	7307	2036	0	5749	1759	1090	5022	349	1050	2132	2100	5416	869	180
OHIO	35	3878	164398	63561	2897	0	14236	4903	168375	7173	29592	3342	55473	50237	3417	3464
OKLA	36	4104	23506	8567	1371	22092	0	2556	17738	1146	4917	1868	11659	56767	2278	555
ORE	37	2200	17491	5032	1357	12156	4094	0	11772	873	2630	1407	4703	15796	4107	436
PA	38	3086	368066	73609	2282	152372	10344	4297	0	14603	25068	2548	30459	39398	2833	6012
RI	39	166	39765	2693	125	5111	526	250	11499	0	1043	136	1297	2057	159	761
SC	40	1016	34280	38413	618	33534	3716	1244	32458	1717	0	721	14831	15309	856	732
SD	41	836	7192	2108	1924	6006	2163	1020	5060	344	1104	0	2308	6103	914	175
TENN	42	1850	40538	20738	1119	58840	7969	2012	35701	1931	13413	1362	0	28242	1477	899
TEX	43	19323	123956	47333	5915	107382	78194	13619	93058	6170	27901	7333	56933	0	11156	2921
UTAH	44	2374	10281	3121	994	7787	3345	3774	7135	507	1664	1159	3173	11892	0	252
VER	45	109	27087	1460	96	3298	340	167	6323	1017	594	93	907	1300	105	0
VA	46	1315	88273	71271	903	60344	4520	1760	121285	4289	16213	1024	14739	17735	1174	1686
WASH	47	3727	32038	9085	2529	22060	7156	6243	21446	1597	4726	2566	8431	27401	6714	801
WV	48	532	24060	14124	371	53905	1949	672	27652	1089	5910	430	9318	7213	464	493
WISC	49	2295	50242	14735	2209	59468	9303	2820	38252	2271	7430	2636	17512	25156	2076	1180
WY	50	755	3105	960	384	2534	1274	615	2198	151	515	570	1054	3703	815	75

Table A-2 (Cont'd)

STATE		46	47	48	49	50
ALA	1	13925	2870	6545	10769	525
ALK	2	1040	237E	417	1307	124
ARIZ	3	5201	6715	2203	6938	1116
ARK	4	6057	2071	3002	8156	457
CALIF	5	64207	191239	26595	94527	11943
COLO	6	6456	6766	2969	10846	7265
CONN	7	11690	1316	3175	4982	196
DEL	8	5220	237	883	978	37
FLA	9	35776	6963	14808	23356	1200
GA	10	23686	3650	11788	15113	654
HA	11	2709	3583	1065	2985	281
ID	12	1754	6499	739	2548	431
ILL	13	37512	10610	21569	106940	2298
IND	14	19489	3676	13875	32263	708
IOWA	15	7835	3430	3953	28097	875
KAN	16	6613	2928	2949	13128	855
KENT	17	14649	2151	12772	13752	400
LA	18	12508	4105	5631	12539	790
MA	19	4288	750	1329	2539	106
MD	20	57585	1933	8416	8282	306
MASS	21	24018	3245	6817	11559	473
MICH	22	36877	8109	21113	100747	1498
MINN	23	12165	5938	5847	48036	1312
MISS	24	7409	2164	3511	7619	427
MO	25	13394	4706	7079	29585	1121
MONT	26	1946	5082	828	3638	505
NEB	27	4029	2242	1942	9992	721
NEV	28	780	2265	325	1055	160
NH	29	2568	374	765	1354	54
NJ	30	53103	3756	11927	15263	578
NM	31	2862	2718	1256	4224	853
NY	32	103484	12591	30579	50147	1891
NC	33	84221	3599	19094	14795	589
ND	34	1884	1778	845	3937	418
OHIO	35	63557	7789	61550	53220	1396
OKLA	36	7387	3921	3452	11531	1082
ORE	37	4597	54647	1902	6257	834
PA	38	115602	6853	28573	30979	1088
RI	39	3219	401	885	1448	58
SC	40	20028	1957	7780	7799	330
SD	41	1938	1628	882	4239	560
TENN	42	16466	3157	10075	16624	611
TEX	43	39928	20680	17606	48121	4330
UTAH	44	2818	5401	1208	4234	1017
VER	45	1690	269	536	1005	39
VA	46	0	2793	14514	11888	450
WASH	47	8333	0	3444	11414	1460
WV	48	13388	1065	0	5813	194
WISC	49	13990	4503	7416	0	925
WY	50	866	942	385	1513	0

APPENDIX B.

DESCRIPTIONS OF EXISTING LAW ENFORCEMENT INFORMATION - COMMUNICATIONS NETS

B.1 National Crime Information Center (NCIC)

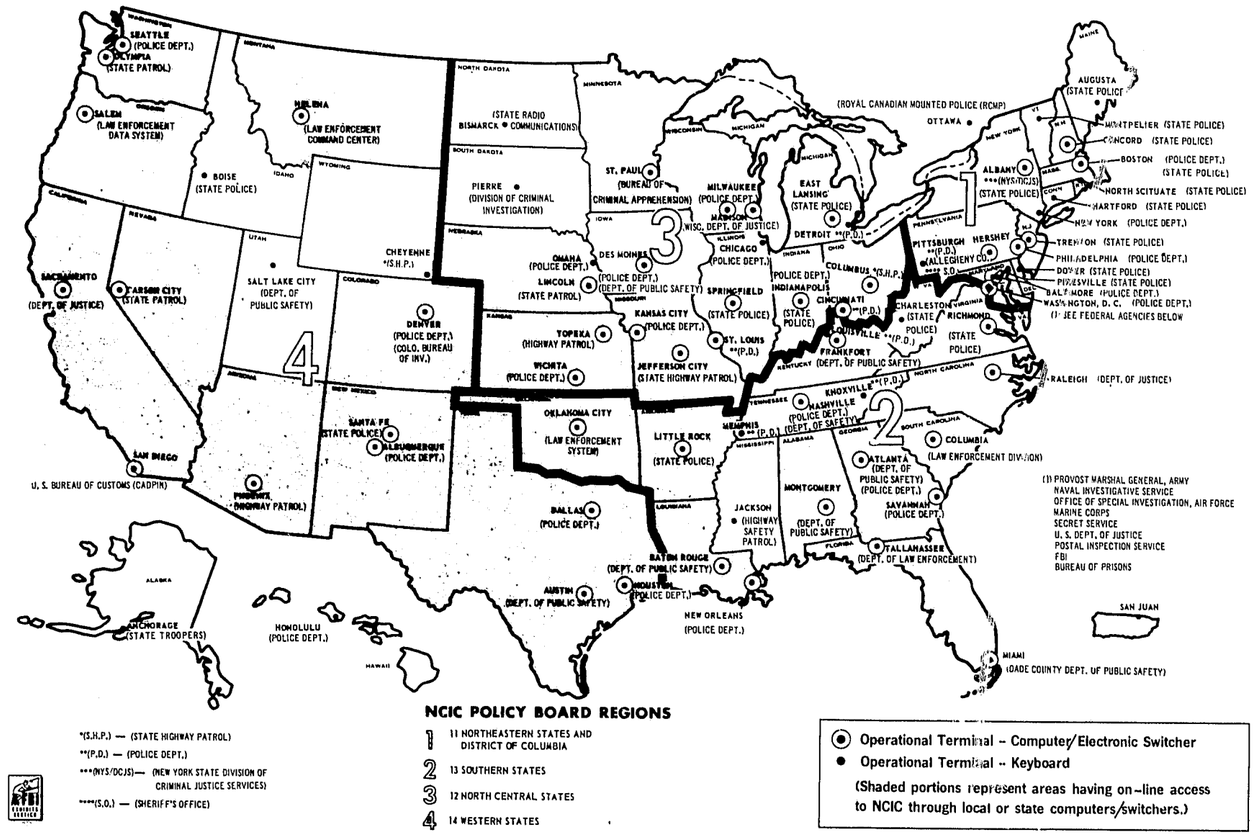
A brief description of the NCIC net is given in Chapter 4.2. Additional information is given in this appendix.

Map 1 displays NCIC users as of June 1973. Information from the central data files in Washington, D.C., is available to each user through a dedicated carrier line. Communication between individual users is not possible on the present NCIC net, i.e., NCIC does not provide a message switching service.

In some cases, the users, presented in Map 1, actually represent several individual agencies that have access to NCIC. For example, the Tallahassee FCIC Terminal in Florida serves the Florida Highway Patrol along with a number of local police and sheriff's departments throughout Florida. In addition, many states have more than one terminal in the state with direct connection to NCIC.

B.1.1 Traffic and Records

A major user requirements analysis task using NCIC actuals as a data base involved the projection of state-to-national traffic. Table B.1 is an example of the data available for this purpose and presents figures representing traffic coming into NCIC from the New York State Police for the month of July 1972; similar data are available for each of the 160 NCIC users. Also presented is the amount of traffic separated out by message function and data type and separated out by hour of the day. For purposes of predicting traffic, monthly totals were used. Peak-to-average values were obtained from the hour-of-the-day tables. Message distribution functions were derived from the traffic values by message function and file type. The number of records in each data file are given below (June 1, 1973).



Map 1. NCIC network

Table B.1 Typical NCIC Data Formats

CHICAGO, ILL. POLICE DEPT. — JULY REPORT

MESSAGE KEY		AVERAGES BY MESSAGE KEY SUN	MON	TUE	WED	THUR	FRI	SAT	DAILY AVG	MONTHLY TOTAL	TIME INTERVAL	AVERAGES BY TIME INTERVAL SUN	MON	TUE	WED	THUR	FRI	SAT	DAILY AVG	MO. TOTAL
EV	EP EF									1	0000-0100	14	20	28	11	16	17	16	17	533
EA	EAA				153	54	54		34	1045	0100-0200	32	27	38	21	37	46	39	34	1037
EL											0200-0300	31	37	47	36	30	32	35	35	1087
EC	ERG		9	13	20	14	11		9	274	0300-0400	42	34	40	52	30	50	36	40	1251
EW	ET		1	2	1	1	2		1	29	0400-0500	19	25	26	46	45	29	50	34	1051
EN			1	1	2	1	1		1	24	0500-0600	14	18	21	22	40	28	33	25	77
ES	ESS									1	0600-0700	15	23	15	19	21	9	23	18	557
EB											0700-0800	8	6	11	16	15	11	13	12	362
QV		68	115	98	116	108	104	64	95	2936	0800-0900	6	16	8	21	14	23	3	12	386
QA		1	3	1		1	1	1	1	37	0900-1000	14	31	33	24	50	23	8	25	781
QQ		24	21	20	20	23	17	18	20	635	1000-1100	10	71	42	41	86	77	15	47	1467
QW		396	505	523	516	547	519	583	511	15841	1100-1200	10	63	65	64	66	36	12	46	1432
QS											1200-1300	16	48	60	66	57	26	11	41	1280
QE											1300-1400	14	42	45	78	32	57	27	41	1276
ZV		13	41	20	27	30	19	22	25	764	1400-1500	11	39	35	80	41	47	25	38	1156
ZA		1	31	48	28	37	62	1	28	857	1500-1600	17	29	39	45	44	48	29	35	1081
ZQ		12	67	102	100	57	91	22	61	1903	1600-1700	19	31	47	59	56	58	50	41	1277
ZW		1	5	5	7	20	26	4	9	278	1700-1800	36	50	56	75	49	78	55	56	1732
ZS											1800-1900	35	52	67	61	38	53	71	54	1664
ZE											1900-2000	38	50	53	44	44	41	49	46	1412
XV	XP XF										2000-2100	35	50	41	43	46	46	49	44	1362
XA	XAA				1		1			10	2100-2200	46	48	46	49	36	56	65	50	1547
XL											2200-2300	41	52	35	56	52	61	59	51	1575
XG	XRG		6	2	4	8	3		3	91	2300-2400	50	52	60	51	51	66	69	57	1760
XW	XT						1			3										
XN																				
XS	XSS																			
XB																				
LV	CP CF																			
LA	CAA				4	4	1		1	33										
LL																				
LG	CRG		1	2	7	3	2		2	61										
LW	CT		3	1	1	2	3		1	36										
LS	CSS																			
LB																				
LV	LP LF																			
LA	LAA																			
LL																				
LG																				
LW	LT									2										
LS	LSS																			
LB																				
MV	MP MF									1										
MA	MAA																			
ML																				
MG	MKG				1	1	1	1	1	16										
MW	MT				1	3		1	1	19										
MN																				
MS	MSS						3			12										
MB																				
REJ		59	104	119	102	83	92	104	94	2919	SYSTEM REJECT PERCENTAGE								4.5%	
REJ UN FILE			1	1	7	5	3		2	64	YOUR REJECT PERCENTAGE								10.4%	
DAILY TOTALS		2872	4574	3835	4462	4001	4053	4095	900	27892										

Type	Number and Percent (millions)
1. Stolen Securities	1.40 (32.5%)
2. Stolen Motor Vehicles	.83 (19.1%)
3. Stolen/Mission Guns	.60 (14.0%)
4. Stolen Articles	.76 (17.5%)
5. Wanted Persons	.13 (3.1%)
6. Stolen License Plates	.27 (6.2%)
7. CCH	.32 (7.4%)

B.1.2 Message Formats

There are eight data files making up the NCIC data bank. They are

1) Wanted persons.
2) Stolen vehicles.
3) Stolen boats.
4) Stolen license plates.
5) Stolen articles.
6) Stolen guns.
7) Stolen or missing securities.
8) Aliases.

There are six message types that may be used against each file on the NCIC system. They are

1) Inquiries.
2) Entries.
3) Clears.
4) Cancels.
5) Modifies.
6) Locates.

A description of the purpose of each of these messages follows:

1) Inquiry - To request a search of an NCIC file against information available to the inquiring agency.

2) Entries - To (1) place a new record in a file or (2) enter alias(es) and/or other additional identifiers as a supplemental record to an active wanted person record.

3) Clears - To record recovery of stolen/missing property or apprehension of a wanted person on file in NCIC; may be made only by agency originally entering the record.

4) Cancel - To cancel an entire record in any file or to cancel alias(es) and/or identifiers in a supplemental record previously added to a wanted person record. Records may be canceled only by the agency which originally entered the record. Entire records should be canceled only for reasons other than recovery of property or apprehension of a wanted person, i.e., record was later determined to be invalid, withdrawal of prosecutive action, etc.

5) Modify - To add data to, to delete data from, or to change a portion of data which is part of an active NCIC record; may be made only by agency which originally entered record.

6) Locate - To indicate (until the originating agency clears the record) that the property has been located or the person apprehended. This message is sent by an agency other than the originating agency which has located stolen/missing property or wanted person on file in the system. The record, including located information, will remain in file until the agency which originally entered the record transmits a "clear" message.

Table B.2 presents the total NCIC transaction breakdown by file type (vehicles/plates, wanted person, etc.) for June of 1972. In addition, the total NCIC query transaction breakdown is shown. Over 60% of all transactions were inquiries out of which 56% of these inquiries were on vehicles/plates or wanted persons.

Table B.2 NCIC Traffic by File
June 1972

a. All activity against each file during the month.

File	Average Daily Number of Transactions	Percentage
Vehicles/plates	46,793	51.6
Wanted persons	30,820	34.0
Articles	3,997	4.4
Guns	3,126	3.4
Securities	952	1.0
Boats	56	.1
*(Rejects)	5,019	5.5
Total	90,762	100.0

b. Average daily number of Q(inquiry) transactions against each file.

File	Average Daily Number of Transactions	Percentage
Vehicles/plates	29,069	32.1
Wanted persons	22,359	24.6
Articles	2,199	2.4
Guns	1,662	1.8
Securities	449	.5
Boats	19	.0
Total	55,756	61.4

*A reject, although not a specific message type itself, results whenever an incorrect or faulty message is sent by a terminal user.

B.1.3 Message Frequency Distributions and C/M

An analysis of message frequency distributions and characters per message is required to provide a data base for network simulations to test the degree of contention for line access at nodes, queue size, storage requirements, and possible need for prioritization. Initial frequency distributions and C/M analyses have been prepared and are presented in the accompanying tables.

Queries require fewer characters than entries as appropriate identifiers only are placed in the message. Responses to entry, cancel, clear, modify, and locate messages are short acknowledgements that the message has been received and processed. There are two possible responses to an incoming query. The first and by far the most common is a NO RECORD response which requires approximately 50 characters. The second is a positive response or a "hit" which constitutes a considerably longer response. The length of this response is variable with the type of file (vehicle, person, boat, etc.). Tables B.3 and B.4 present the matrix of message lengths by message type and file for incoming and outgoing messages, respectively. These data can be combined with the observed frequencies for each type of message to arrive at an average value of C/M for all transactions. Tables B.5 and B.6 present the message frequency distributions and average C/M values.

Table B.3. Characters per message into NCIC

	Wanted					
	Vehicle	Article	Person	Security	Gun	Boats
Entry	72	74	237	132	66	98
Modify	48	46	94	55	46	47
Locate	46	52	60	53	46	46
Cancel	41	47	61	48	41	41
Clear	54	60	63	61	54	54
Query	41	47	52	49	38	34
Test Query	41	47	51	49	38	34

Table B.4. Characters per message out of NCIC

	Wanted						
	Vehicle	Article	Person	Security	Gun	Boat	Reject
Entry	35	39	39	47	36	37	
Modify	28	28	46	28	28	28	
Locate	28	36	47	34	28	28	
Cancel	28	34	59	34	28	28	
Clear	27	33	45	33	27	27	
Query	67	47	60	47	32	42	
Test Query	67	47	60	47	32	42	
Reject							26

Table B.5. Message distribution, messages sent to NCIC (% total traffic/number of characters per message)

TYPE / FILE	VEHICLE	ARTICLE	WANTED PERSON	SECURITY	GUN	BOAT	REJECTS	TOTAL
ENTRY	1.5/72	1.0/74	.3/237	0/132	.3/66	.0/98		3.3/87
MODIFY	0/48	0/46	0/94	0/.55	0/46	0/47		0/59
LOCATE	0/46	0/52	0/60	0/53	0/46	0/46		0/46
CANCEL	.1/41	0/47	0/61	0/48	.3/41	0/41		.4/40
CLEAR	.9/54	.1/60	.2/63	0/61	.0/54	0/54		1.0/56
QUERY	35.0/41	1.1/47	44.0/51	0/49	1.4/38	.1/34		81.6/46
TEST QUERY	2.2/41	.3/47	.9/51	0/49	.4/38	0/34		3.8/43
REJECTS							9.6/48	9.6/48
TOTAL	39.7/43	2.5/59	45.4/52	.1/67	2.6/43	.1/40	9.6/48	100/48

Table B.6. Message distribution, messages sent from NCIC (% total traffic/number of characters per message)

TYPE / FILE	VEHICLE	ARTICLE	WANTED PERSON	SECURITY	GUN	BOAT	REJECTS	TOTAL
ENTRY	1.5/35	1.0/39	.3/39	0/47	.4/36	0/37		3.3/37
MODIFY	0/28	0/28	0/46	0/28	0/28	0/28		0/32
LOCATE	0/28	0/36	0/47	0/34	0/28	0/28		0/28
CANCEL	.1/28	0/34	0/59	0/34	.3/28	0/28		.4/30
CLEAR	.9/27	.1/33	.2/45	0/33	0/27	0/27		1.2/20
QUERY	35.0/67	1.1/47	44.0/60	0/47	1.4/32	.1/42		81.6/62
TEST QUERY	2.2/67	.3/47	.9/60	0/47	.4/32	0/42		3.8/60
REJECTS							9.6/26	9.6/26
TOTAL	39.7/64	2.5/43	45.4/60	.1/46	2.6/32	.1/42	9.6/26	100/57

B.2 Law Enforcement Teletypewriter Service (LETS)

The national Law Enforcement Teletype Service (LETS) consists of nine circuits providing interstate communications to the 48 contiguous states (see Map 2). Each of these 48 states has at least one entry point on the LETS network (see Table B.7). Direct intracircuit communication is possible without going through the central message switcher located in Phoenix, Arizona. However, if an entry point in one circuit wishes to communicate with an entry point in another circuit, the message is routed through the central message switcher. There is only one line per circuit going into the central message switcher. Currently, LETS operates with half-duplex circuits.

Out of the 52 LETS terminals, 45 are located in state capitols, 5 are located in cities which are not state capitols, and 2 are located in Washington, D.C. Only two states, New York and Illinois, have more than one terminal.

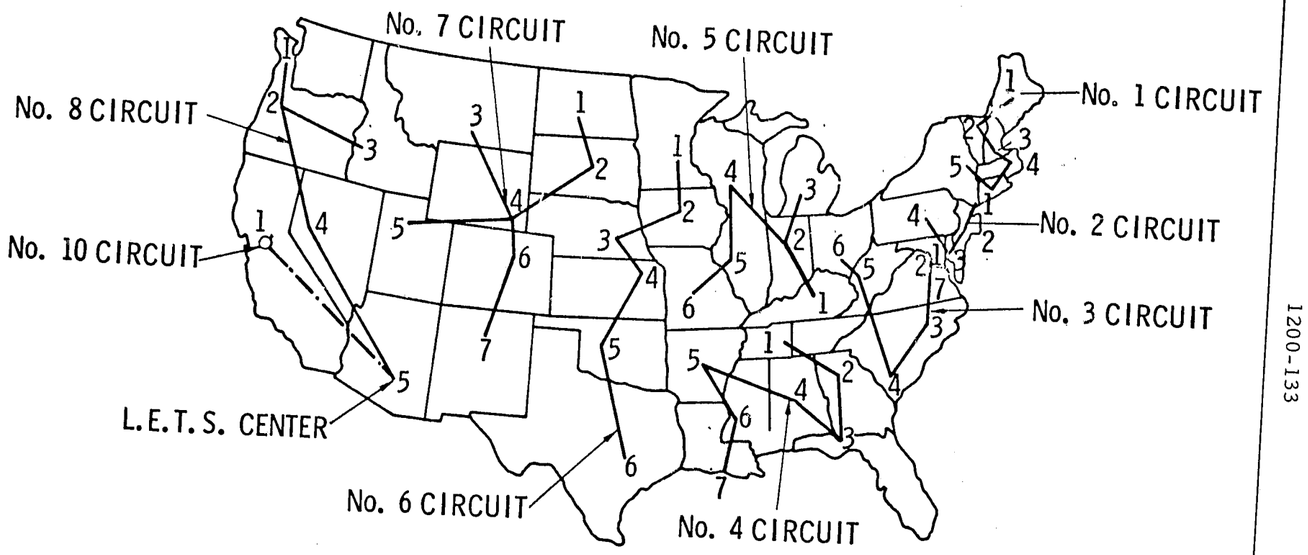
It should be noted that the LETS system is now undergoing an upgrade. The network configuration is being changed from the nine-circuit concept to a network in which all terminals have a direct line to the central message switcher. This new system is scheduled to be in operation by December 24, 1973.

In the analysis of LETS traffic, the following statistics were available:

1) Total yearly traffic in messages.
2) Percent of traffic originating from each circuit.
3) Percent of intracircuit traffic for each circuit.

Table B.8 is an example of the data available from LETS. The first column of the table presents the total number of messages received (RC) by the central message switcher from each circuit during the second quarter of 1972. The second column records the number of messages transmitted between stations on the same circuit (OL) for the first quarter of 1972.

The number of characters per message observed on LETS is 432.



Map 2. Law enforcement teletypewriter service

Table B.7. National law enforcement teletype system

State	Relay Center	Type
Alabama	Montgomery	ST
Arizona	Phoenix	DPS
Arkansas	Little Rock	SP
California	Sacramento	HP
Colorado	Denver	SPAT
Connecticut	Hartford	SP
Washington, D.C.	Washington, D.C.	PD
Delaware	Dover	SP
Washington	NCIC	
Florida	Tallahassee	HP
Georgia	Atlanta	SPAT
Idaho	Boise	SP
Illinois	Springfield	SP
Illinois NATB	Chicago	NATB*
Indiana	Indianapolis	SP
Iowa	Des Moines	DPS
Kansas	Topeka	HP
Kentucky	Frankfort	SP
Louisiana	Baton Rouge	SP
Maine	Augusta	SP
Maryland	Pikesville	SP
Massachusetts	Boston	SP
Michigan	East Lansing	SP
Minnesota	St. Paul	HP
Mississippi	Jackson	SFP
Missouri	Jefferson City	HP

HP - Highway Patrol
SPAT - State Patrol
SP - State Police
SFP - Safety Patrol
ST - State Troopers
DPS - Dept. of Public Safety

Table B. 7 (Contd)

State	Relay Center	Type
Montana	Billings	HP
Nebraska	Lincoln	SFP
Nevada	Carson City	HP
New Hampshire	Concord	SP
New Jersey	Trenton	SP
New Mexico	Santa Fe	SP
New York	Albany	SP
New York	New York City	PD
North Carolina	Raleigh	HP
North Dakota	Bismarck	HP
Ohio	Columbus	SP
Oklahoma	Edmond	DPS
Oregon	Salem	SP
Pennsylvania	Harrisburg	SP
Rhode Island	Providence	SP
South Carolina	Columbia	HP
South Dakota	Pierre	SP
Tennessee	Nashville	HP
Texas	Austin	DPS
Utah	Salt Lake City	HP
Vermont	Montpelier	SP
Virginia	Richmond	SP
Washington	Olympia	SP
West Virginia	Charleston	DPS
Wisconsin	Madison	SP
Wyoming	Cheyenne	SPAT

HP - Highway Patrol
SPAT - State Patrol
SP - State Police
SFP - Safety Patrol
ST - State Troopers
DPS - Dept. of Public Safety

Table B.8. LETS traffic statistics (second quarter, 1972)

Circuit	Received Messages	On-Line Messages
1	35,934	24,437
2	44,595	10,189
3	53,056	25,023
4	58,653	16,105
5	62,916	23,294
6	56,940	15,572
7	38,198	8,971
8	51,394	24,940
10	54,211	--
Total	455,888	148,528

B.3 Florida Crime Information Center

The Florida Crime Information Center (FCIC) is a good example of a regional system that is linked to the National Crime Information Center. Throughout the state, FCIC presently has terminals in 80 sheriff's stations, 144 police stations, 42 Florida Highway Patrol stations, 17 Florida Department of Law Enforcement offices, and 16 other criminal justice agencies.

The inquiry cycle* is as follows:

1) Information request. Initiated by the field officer via radio transmission to a dispatcher.
2) Inquiry. Formulated by dispatcher who transmits from his computer teleprocessing terminal to FCIC via high-speed telephone lines.

*The only exception to this inquiry cycle is when mobile terminals are used. These terminals came into existence in 1973 and allow the field officer to transmit his message directly to the computer. Mobile terminals are now being used by the Palm Beach Sheriff's Department (17 mobile terminals). The Kansas City Alert System is also using 15 mobile terminals.

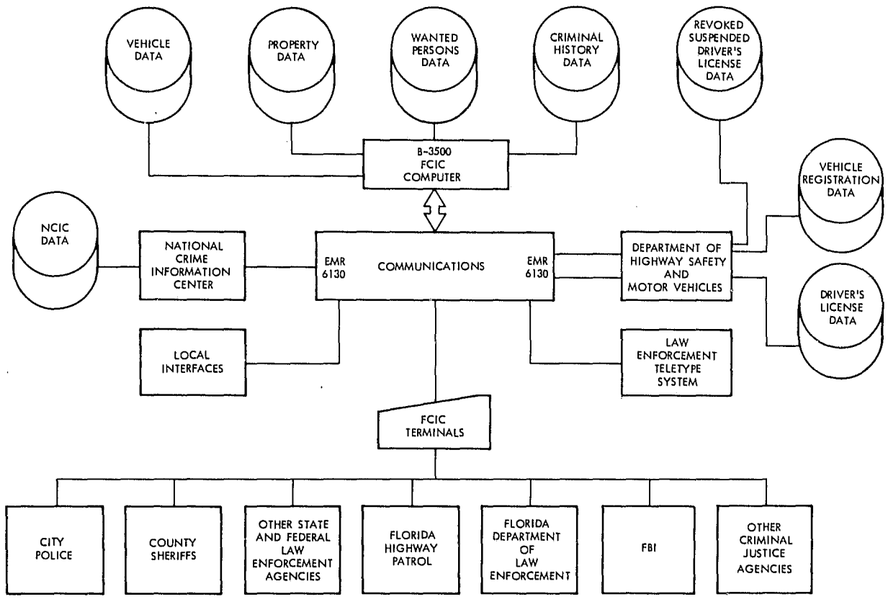
3) Response. Constructed by FCIC after scanning its data base and automatically checking NCIC or other interfaced files, if applicable, and transmitted to the dispatcher.
4) Reply. Formulated by dispatcher and transmitted, via radio, to field office.

Map 3 represents the FCIC network and shows that FCIC allows local criminal justice agencies in Florida access to NCIC, LETS, Department of Highway Safety and Motor Vehicles, and FCIC data banks.

B.4 Kansas City ALERT

The Kansas City ALERT network is another example of a regional system that has direct interface to NCIC. It serves 22 Police Departments, 6 Sheriffs, the Kansas City FBI, the U.S. Postal Inspector, 2 Sheriff's Patrols, the Municipal Court, the Jackson County Prosecutor, and the Jackson County Juvenile Court. In addition to having direct interface with NCIC, Kansas City ALERT is also connected to 40 state police computers and 15 major city police computers as well as having direct computer interface to the Missouri Highway Patrol system called Missouri Uniform Law Enforcement System (MULES). Inquiries on the Kansas City ALERT system are made in similar manner as on the FCIC network.

Data similar to that available from NCIC is available from the ALERT net and provides a valuable basis for traffic modeling. Traffic is recorded by data type and message function for each terminal. In addition, information is available on the traffic against the NCIC files.



Map 3. Florida crime information center

APPENDIX C

PRELIMINARY ARREST PROJECTIONS TO 1983

Some of the inherent limitations in predictive statistical techniques are the inability to quantify and/or identify those parameters which will be influential upon the variable of interest (in this instance, arrests). Specifically, when dealing with societal behavior, the changing social standards, both legal and moral, will have significant impact upon law enforcement, as well as all criminal justice agencies in the discharge of their duties. In the year following the Miranda vs. Arizona Case (384US436, 1966), which dealt with interrogations and confessions, significant impact upon the manner in which law enforcement agencies could interrogate offenders occurred. During the current session of the United States Supreme Court, a case challenging the Miranda Decision may be taken under submission of the Court; if so, depending upon the decision, there may be significant impact once again upon the criminal justice process.

Changes are added which might arise due to the following issues: (1) the balancing of the rights of an individual to his privacy against the rights of society to be protected; (2) the review of search and seizure laws by the California Supreme Court; (3) the impact of the "energy crisis" upon legislation which may identify activities which will be considered criminal acts in the future, but are not now so considered; and (4) gun control legislation, as well as any number of changes which might occur during the next 10 years.

Before embarking upon any time-consuming attempt to develop a factorial analysis or a stepwise multiple regression technique to predict future arrests, a careful review of the above mentioned limitations must be made. It was decided, therefore, that before performing extensive technical analysis, a simple linear regression would be performed on arrest data published in the Uniform Crime Reports from 1963 through 1972. The actual arrests listed represented those reported to the FBI less those for juveniles and those for minor offenses. Results of the regression reflect an approximate growth rate in arrests of interest on the order of 3.75% per year, which would be equivalent to

5,833,210 arrests in 1983. At the 95% confidence level, this estimate would range from 5,283,351 to 6,383,069 arrests.

Table C-1. Results of a linear regression of arrest data

Year	Actual Arrests (Y)	Linear Predicated Arrests (Fit)	Difference (R = Y-Fit)	Standard Deviation (S = SD of Fit)	95% Confidence Limits (C = 1.96 * S)
1963	2, 230, 398	2, 028, 088	202, 310	95, 007	186, 213
1964	2, 287, 045	2, 218, 344	68, 701	80, 577	157, 930
1965	2, 447, 778	2, 408, 601	39, 177	67, 767	132, 823
1966	2, 410, 904	2, 598, 857	-187, 953	57, 667	113, 027
1967	2, 695, 654	2, 789, 113	- 93, 459	51, 885	101, 694
1968	2, 781, 042	2, 979, 369	-198, 327	51, 885	101, 694
1969	2, 984, 773	3, 169, 625	-184, 852	57, 667	113, 027
1970	3, 438, 124	3, 359, 881	78, 243	67, 767	132, 823
1971	3, 691, 891	3, 550, 137	141, 754	80, 577	157, 930
1972	3, 874, 499	3, 740, 393	134, 406	95, 007	186, 213
1973	0	3, 930, 649	0	110, 424	216, 430
1974	0	4, 120, 905	0	126, 467	247, 875
1975	0	4, 311, 161	0	142, 926	280, 135
1976	0	4, 501, 418	0	159, 672	312, 958
1977	0	4, 691, 674	0	176, 624	346, 183
1978	0	4, 881, 930	0	193, 727	379, 706
1979	0	5, 072, 186	0	210, 945	413, 453
1980	0	5, 262, 442	0	228, 252	447, 374
1981	0	5, 452, 698	0	245, 629	481, 432
1982	0	5, 642, 954	0	263, 062	515, 601
1983	0	5, 833, 210	0	280, 540	549, 859

APPENDIX D

USER AGENCY CHARACTERISTICS

This section outlines the various components of the criminal justice community and briefly describes the activities performed. The section also discusses the sample of users selected by the project SEARCH staff.

D. 1 Outline of the Criminal Justice System

Agencies within the criminal justice system are generally divided by type of function and geographic jurisdiction. These are not unique divisions, and a great deal of overlap exists. However, these divisions are somewhat useful in outlining the various components. The most common functional categories are:

1) Law enforcement.
2) Prosecution.
3) Adjudication (criminal courts).
4) Probation and parole.
5) Correctional institutions.
6) Other.

The "Other" category is necessary to include such agencies as crime labs and various criminal justice commissions, etc.

Geographically the "system is divided by:

1) City.
2) County.
3) State.
4) Federal.

Quite often, however, "city" and "county" are grouped together into a "local" category and are not considered separately. The "local" category will be used here with only minor exceptions.

D. 1. 1 Law Enforcement Agencies

Law enforcement agencies constitute the largest and most visible component of the criminal justice system. At the local level, these would be the city police, the county sheriff, and the coroner. State-wide law enforcement agencies are highway patrols, state police, or departments of public safety.

The local law enforcement agency is primarily responsible for

1) Detecting deviant or criminal behavior.
2) Preventing such behavior if possible.
3) Apprehending offenders if a violation occurs (when either observed by an officer or reported to him).

In addition, these agencies are quite often asked to intervene in a wide variety of non-criminal activities, such as family disputes, civil defense, rescue, and other emergency situations. While officially classified as a law enforcement agency, the county coroner is primarily an investigator. His investigations are restricted to those cases involving the death of a human being and generally are concerned only with the cause of death.

In the United States in 1970, there were approximately 14, 603 local law enforcement agencies. Exactly 4, 356 of these were in states with populations of 10 million or more (6 states) and 10, 790 in states of 3, 000, 000 or more (24 states).

State law enforcement agencies are generally of two types: a state police with general police powers to enforce all state laws (22 states), or a highway patrol which specializes in the operation of vehicles on public highways (26 states, Alaska and Hawaii not included). Each state, however, has a slightly different assignment of responsibility although most emphasize one of the two aforementioned types. In other states, there is a state coroner's office which

replaces the county coroner. Thus, the number of state law enforcement agencies per state varies from 1 (13 states) to 33 (Kansas) with the mean being 4, but the median about 2.

D. 1. 2 Prosecution

At the local level, the criminal prosecutor is generally the county district attorney. Many cities have city attorneys but only in very large cities do they handle criminal cases to any extent. The primary responsibilities of the district attorney are to investigate and prepare cases for prosecution and, when necessary, present these cases in court. In the vast majority of cases, the prosecution is allowed to decide whether or not to prosecute. If he decides to prosecute, however, he cannot take the case directly to court. First, he must obtain a grand jury indictment or hold a preliminary hearing before a judge (the defendant can, of course, waive his right to a preliminary hearing). If the judge or grand dury agrees that there is sufficient evidence for a trial, the defendant is "held to answer" to the charges filed against him.

In most criminal cases today, the formal criminal procedure is only partially carried out and plea bargaining takes place. The prosecutor's role in this process is one of a principal negotiator. With the unofficial concurrence of the judge, the prosecutor and the defense attorney (or sometimes the defendant himself) agree on a lesser charge and sentence in exchange for a guilty plea. While strictly unofficial, this process is so widespread that it must currently be considered as part of the prosecutor's job.

The state prosecutor is normally referred to as the state attorney general. In states where the county district attorney prosecutes the criminal cases, the state attorney general plays a small role in the prosecution of criminal cases. However, in some states there is a state prosecutor in each county or Judicial District who essentially replaces the county DA and prosecutes all the criminal cases. In operation, there is very little difference between the two systems.

There are 8, 501 prosecutor's offices in the U. S.; of these, 7, 868 are at the local level and 633 at the State level. These figures are somewhat inflated in that over 5, 000 of these offices are at the city or township level and thus play

a small role in the criminal justice process (felony cases). Of the 8, 501 agencies, 6, 349 are located in the 24 largest states.

D. 1. 3 Adjudication (Criminal Courts)

The local judicial system is normally divided into courts of "inferior" jurisdiction and courts of "general" jurisdiction. Courts of "inferior" jurisdiction are police courts, magistrates' courts, peace courts, recorders' courts, mayors' courts, city courts, justice courts, and municipal courts. These courts hold preliminary hearings on serious cases (felonies) and render final disposition for minor offenses (traffic violations and most misdemeanors).

Courts of general jurisdiction include county courts, superior courts, supreme courts (N. Y.), district courts, or circuit courts.* These courts are considered the highest courts of original jurisdiction within the state system. They conduct trials on all major offenses (felonies), disposing of these cases, and also can hear appeals from "inferior" courts on misdemeanor cases.

The next level in the state judicial system is normally a court of appeals with either multicounty or statewide jurisdiction. In most states, there are two levels of appeal, the first being to a district court of appeals, and the second to a state supreme court or court of last appeal. Unless a ruling involves the U. S. Constitution, it cannot be appealed beyond the state supreme court. If proper grounds are presented, certain decisions can be appealed directly to the U. S. Supreme Court.

There are 13, 235 state and local courts in the U. S. Out of these, 9, 897 are in the 24 largest states. Almost 50% (6, 248) of the courts are at the county level, and about 13% (1, 690) at the state level.

D. 1. 4 Probation and Parole

Both probation and parole have two major concerns:

*Unfortunately many of these names conflict with federal court designations but they are in no way related.

1) The decision to parole or place on probation.
2) The supervision of those on parole or probation.

In the first case, probation and parole are quite different; whereas in the latter case, they are very similar and often identical.

Whether or not a defendant is placed on probation is determined by the sentencing authority, usually the trial judge. He bases his decision on his observations in court and a "presentence investigation" report prepared by a probation officer.

Whether or not an imate is paroled, however, is determined by the state parole board. The board's decision is based on a report prepared by the staff at the inmate's institution and a personal "interview." In addition, a parole officer may prepare a report on the inmate's background or the presentence report can also be used. Once the decision is made (in both parole and probation), there is very little review and no avenues for appeal.

The supervisory aspects of probation and parole, on the other hand, are quite similar. The probationer or parolee is required to meet periodically with the supervisor (usually a parole or probation officer but sometimes a private "sponsor"). In addition, other "conditions" are also generally included in the probation or parole agreement. If any violation of the conditions occurs, the officer can recommend that probation or parole be revoked, and the defendant sent to jail. In such cases, the time served on parole or probation is generally not counted towards the completion of a jail term.

Although quite similar in many ways, there are significant differences between probation and parole. The former is normally used with first offenders and minor offenses. In some cases, probation may be accompanied by a short (a few months) jail term. Parole, on the other hand, is used only for serious offenders. Inmates in county jails (sentence of less than 1 to 2 years) are generally not eligible for parole. Since longer terms are usually served in state prisons, parole is normally a state function.

There are 2, 445 probation offices in the U. S., 1, 867 at the local level. The number of probation officers per office varies from over 2, 000 for large agencies like Los Angeles to 1 or 2 officers in small agencies. The caseloads per officer also vary a great deal. Roughly two-thirds of the probation officers (assigned to adult felons) have caseloads of over 100 with some approaching 300. In addition to his supervisory work, probation officers are asked to perform up to 14 presentence investigations per month.

D. 1. 5 Correctional Institutions

Correctional institutions generally refer to county jails and state and federal prisons. Municipal jails are usually "holding areas" where defendants are held for trial.

In addition to county jails, at the local level, there are a wide variety of honor camps, detention camps, road crews, etc. which also serve as adult correctional institutions. The degree of freedom allowed the inmate also varies widely according to the type of institution.

At the state level, there are a wide variety of institutions ranging from maximum security prisons to conservation camps and vocational centers. To properly assign a convicted defendant to the institution which will best suit him, various classification methods are in use. In almost all cases, inmates are separated according to age and length of term. In some states, special diagnostic techniques are used. The general procedure in most states is that, based on the presentence report, the judge assigns the defendant to an institution. Once the inmate arrives at the insitution, he is assigned to a particular program within the institution. In a few states, all convicted defendants are first sent to a "reception center" where they are interviewed and tested to determine the best institution and program. The inmate is then transferred to the proper institution.

There are currently 4, 435 state and local adult correctional institutions in the U. S. with 3, 024 of these run by county governments. There are about 400 state institutions, and an unknown number of city jails and police "holding tanks."

D. 1. 6 Institutions for Juveniles

In addition to adult correctional institutions, all states have institutions for "delinquent" children. These are usually called detention homes, juvenile halls, training schools, or youth camps. The reasons for sending a juvenile to one of these institutions ranges from simply being "neglected" to committing murder. In most states, it is assumed that a juvenile is incapable of committing a crime, and thus no "criminal" record is maintained. It is commonly felt that "labeling" a juvenile a "criminal" will adversely affect rehabilitation.

D. 1. 7 Other Types of Agencies

There are a great many agencies which play a part in the criminal justice process but do not fit into any of the previously described categories. These would include:

1) Crime labs.
2) Police academies.
3) County marshals.
4) Criminal mental hospitals.
5) Legislative committees.
6) Planning agencies.
7) Executive departments.

These are not described, but are identified as distinct parts of the criminal justice community and potential users of a NALECOM system.

D. 2 A Sample of Users

To completely understand the user community, we would need to contact each criminal justice agency in the U. S. individually. Since this is impractical, it was necessary to select assorted agencies in an attempt to obtain a representative sample. The actual sample selected by Project SEARCH staff includes only those agencies which currently have some type of information system. Thus, the sample is somewhat biased towards the medium to large agencies. However, there is no reason to believe that the needs of smaller agencies will be of a fundamentally different type but rather only on a different scale in terms of volume.

Figure D.1 indicates the range of agencies which were surveyed. The numbers in the boxes indicate the name of the information system surveyed as listed in Table D.1. No listings are presented under Prosecution or Probation and Parole because these were not expressly listed as applications of any system surveyed. However, it is safe to assume that the prosecutor is considered as part of the criminal court by most systems, and similarly probation, parole, and correctional institutions are combined under the term correction. With this assumption, the full range of agencies are indeed covered by the sample.

Agency	Local	State*	Federal
Law Enforcement	5, 9, 10, 14, 15, 16, 17, 20	1, 2, 6, 7, 8, 11, 12, 13, 18, 19	22, 23, 24
Prosecution			
Adjudication (Criminal Courts)	10, 14, 20, 21	2, 6, 11, 13, 18	
Probation and Parole			
Correctional Insitutions	10, 17, 20, 21	6, 11, 13, 18, 19	
Others	14, 16, 20, 21	2, 8, 13, 19	

*State Jurisdiction, as used in this figure, implies that the system is designed to be used by all the agencies in the state, not just those designated "state agencies" (e.g., state police, etc.).

Fig. D.1. Agencies surveyed

Table D.1. Survey List

1. ACIC - Arizona Crime Information Center
   Contact: Curt Baer, Data Processing Manager
   P.O. Box 6638, 2010 W. Encanto Blvd.
   Phoenix, Arizona 85008

2. CLETS - California Law Enforcement Telecommunications System
   Contact: Henry P. Gietzen, Sr. D.P. Systems Analyst
   7171 Bowling Drive
   Sacramento, California 95823

3. CJIS - California Justice Information System
   Same as CLETS

4. AMIS - Automated Management Information System
   Same as CLETS

5. AWWS - Automated Want/Warrant System
   Contact: Antonio Miera, Asst. Chief Data Services
   200 North Spring Street, Rm. 400, City Hall East
   Los Angeles, California 90012

6. NYSIIS - New York State Identification and Intelligence System
   Contact: Adam D'Alessandro, Dept. Dir., Sys. Dev. & Opn.
   Exec. Park - Stuyvesant Plaza
   Albany, New York, 12203

7. NYSPIN - New York Statewide Police Information System
   Contact: Fred Frank, Director, Electronic Data Processing
   St. Campus, Public Security Bldg.
   Albany, New York 12226

8. LEIS - Law Enforcement Information System
   Contact: Mike Stewart, UCJIS Coordinator
   304 State Office Bldg.
   Salt Lake City, Utah 84114

9. SKA - Sea King Alert
   Contact: Maj. Harvey Hallom
   Wash. S.P.
   General Administration Building
   Olympia, Washington 98504

10. CJIC - Criminal Justice Information Control
    Contact: George Vandermate, Gen. Serv. Agency
    Data Processing Center
    1555 Berger Drive
    San Jose, California 95112

Table D. 1. (Contd)

11. FCIC - Florida Crime Information Center
Contact: Emory B. Williams, Dir., Div. of Crim. Ident. and Information
P.O. Box 1489
Tallahassee, Florida 32302

12. LEIN - Law Enforcement Information Network
Contact: David R. Fergason, Dir., Data Processing Division
Michigan State Police
714 South Harrison Road
East Lansing, Michigan 48223

13. MINCIS - Minnesota Crime Information System
Contact: Michael J. Stump, Maj. System Mgr.
5th Floor Centennial Bldg.
St. Paul, Minnesota 55101

15. PIN - Police Information Network
Contacts: Shig Naito, Data Processing Supervisor
Art Dahl, Director of the Data Center
Gordon Milliman, Spec. Cons. for Data Proc.
1221 Oak Street
Oakland, California 94612

16. PSIS - Public Safety Information System
Contact: George M. Medak, Proj. Dir., Public Safety Demo. Prl
444 West Ocean Blvd. - Suite 808
Long Beach, California 90802

17. AJIS - Automated Justice Information System
Contact: Capt. James White, LASD Records Bureau
211 West Temple Street, Rm. 376
Los Angeles, California 90012

18. NJCIS-PhII - New Jersey Statewide Comm. Information System
Contact: Lt. Ronald E. Ayres, Asst. Dir.
P.O. Box 1453 E. State Street
Trenton, New Jersey 08607

19. MILES - Maryland Inter-Agency Law Enforcement System
Contact: Col. Robt. Lally, Sec., Public Safety/Correctional Services
Executive Plaza - 5th floor
Cockeysville, Maryland 21030

20. CLEAR - Regional Crime Information Center
Contact: Andrews O. Atkinson, Supt., RCIC
138 East Court Street
Cincinnati, Ohio 45202

Table D. 1 (Contd)

21. PCS - Philadelphia Courts System
Contact: Larry P. Polansky, Chief Deputy Court Admin.
City Hall Rm. 370, Court Admin.
Philadelphia, Pennsylvania 19107

22. NHTSA - National Highway Traffic Safety Administration
Contact: Brian Connell, Dir., Natl. Driv. Register
400 - 7th Street S. W.
Washington, D. C. 20590

23. NCIC - National Crime Information Center
Contact: John Cary, Spec. Agt. x 2628
Dennis G. Lofgren, Spec. Agt. NCIC-3117RB
Federal Bureau of Investigation
9th Street and Pennsylvania Avenue
Washington, D. C. 20535

24. NLETS - National Law Enforcement Teletype System
Contact: Sgt. George Falter
P.O. Box 6638, 2010 W. Encanto Blvd.
Phoenix, Arizona 85008

NASA — JPL — Coml., L.A., Calif.

END