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**EPA/ADP Applications Guidance
to Hardware/Software Usage
Draft
Hardware/Software Usage Guidance Manual**

Prepared for

**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
NATIONAL DATA PROCESSING DIVISION**

**INFORMATION TECHNOLOGY ARCHITECTURAL SUPPORT
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SECTION 1 - INTRODUCTION

1.1 PURPOSE

The primary purpose of the Hardware/Software Usage Guidance Manual is to provide guidelines for selecting the most appropriate hardware and software for an automated system at EPA. These guidelines are based upon application characteristics defined during the second phase of the EPA system development process - the Preliminary System Design (see EPA System Design and Development Guidance, Volume B).

A secondary purpose is to identify the hardware and software packages which EPA has chosen to support as Agency standards. The use of standard packages for common applications supports the agency goal of providing optimum data sharing capabilities. While other software packages are available within various agency offices, the standard packages are the preferred tools, and will be the best supported packages in terms of overall EPA support, e.g. training classes. Standard packages are identified and described in Appendix C under EPA Software Descriptions.

A third purpose of this manual, referenced above, is to promote the goal throughout the agency of sharing data and providing agency-wide accessibility to data, regardless of where it is stored or maintained. Many users have taken advantage of the proliferation of microcomputers and software packages throughout the agency to develop individual systems in their office or departments, without taking into account the larger applicability of the information they have gathered. When using this manual to develop a new application, two of the first questions asked should be - who could use this data, and where should it reside in the first place? For example, an office may be developing an application that receives and analyzes data on chemical usage by local manufacturers. Initial volume estimates, defined usage requirements, and the local nature of the data might indicate an ideal application for the office's 286/386 PC. But if a wider audience or need for this information can be identified at the start, then a shared environment, based on the use of regional minicomputers or the 3090 or VAX mainframes at RTP, should be seriously considered for initial development.

1.2 BACKGROUND

The Environmental Protection Agency has diverse computer hardware, software, and communications configurations available to meet its automated data processing needs. Hardware options include two IBM 3090 mainframes, regional IBM 4381s, a VAX minicomputer cluster, VAXes in field laboratories, Prime office computers, IBM XT/AT - compatible and SUN 386i microcomputers, Tektronix graphics workstations, Apple Macintosh microcomputers, and various local area network options. Software options include a variety of programming languages, data base management systems, statistical packages, project management packages, word processing packages, graphics software, and retrieval packages.

A wide variety of applications for automated information systems exist in the agency. These range from applications for use by a single employee in one location, to national applications whose many users are geographically located throughout EPA Headquarters, EPA Regional offices, State offices, and the general public. Currently, no guidelines exist to help system managers determine which hardware/software platform would be best suited to a specific automated systems application. For any one application, a number of hardware/software options may be available. For this reason, it can be difficult for the system manager to choose the optimal hardware/software/communication configuration for a particular application.

1.3 USAGE

The following section describes how to use this manual within EPA's development life cycle methodology. This manual will be used during Phase II, Preliminary Design and Options Analysis, specifically section 2. At this point, the systems manager has defined the initial system requirements. Now the various hardware and software options which are available in the agency need to be looked at to select the most appropriate platform for this application. Given the wide range of hardware and software available, this manual provides a structured method to narrow those choices and provide selected options which will be subjected to further analysis in section 3, Options Analysis, in the Preliminary

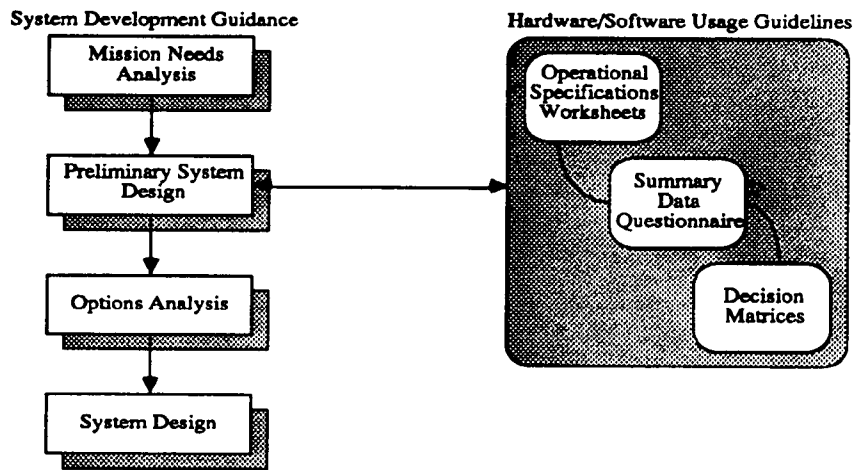


Figure 1.1 - Using the manual as part of the development life cycle

Design and Options Analysis Manual.

The following steps will guide the user through this manual:

- Step 1 - Complete each of the Operational Specifications Worksheets, following the instructions provided for each worksheet which include sample input data for guidance.
- Step 2 - Complete The Summary Data Questionnaire which summarizes data from the worksheets.
- Step 3 - Use the Decision Matrices. Select the specific application type from the list on page 17. Use the information from the Summary Data Questionnaire to “walk” through the matrix to the final decision box.

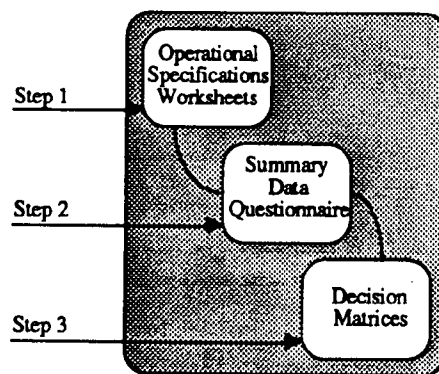


Figure 1.2 - There are three steps to using this manual

This manual cannot cover all the various system requirements or criteria that may arise. System designers are urged to contact the Program Systems Division (382-2374) of OIRM for assistance if needed as well as for review and approval of hardware and software selections made.

1.4 REFERENCES

The following material was reviewed in preparing this manual.

- o **EPA System Design and Development Guidance**

- Volume A: Mission Needs Analysis**

- Volume B: Preliminary Design and Options Analysis**

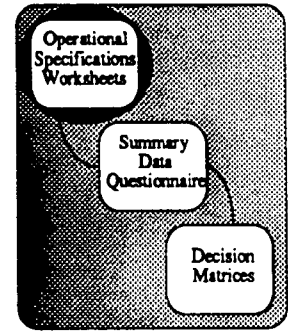
- Volume C: Systems Design, Development and Implementation**

- o **Total Component Report (CNFSOF99- 10/26/88).** A report from NDPD listing current hardware and software at all EPA offices and laboratories.
- o **EPA Office Information Technology Themes, Key Directions, and Functional Requirements (May 26, 1987),** American Management Systems, Inc.
- o **EPA Office Information Technology Strategy and Recommendations (July 20, 1987),** American Management Systems, Inc
- o **Overview of EPA's Information Technology Architecture, December 1988,** Viar and Company.
- o **EPA Site Coordinators Handbook.**
- o **EPA Local Area Network Technical Guidelines, Volumes I and II - January, 1988.**
- o **DataPro Directory of Software**
- o **DataPro Directory of Microcomputer Software.**

SECTION 2 - THE OPERATIONAL SPECIFICATIONS WORKSHEETS

2.1 PURPOSE

The Operational Specifications Worksheets have been developed to assist the system manager in translating the functional system requirements developed during the initial Mission Needs Analysis and Initial System Design into operational specifications. Operational specifications define the physical attributes of the proposed system. Checklists will be used to detail these requirements. Using this method, the logical design developed earlier is broken down by the data characteristics, general requirements, and system constraints to create a profile of the system. From this profile, the system manager will have a set of criteria which can define a number of acceptable hardware/software options to meet the stated needs. Any hardware or software selected for possible use will have to meet these minimum requirements to warrant further consideration.



There are four worksheets that will be used to define the system's characteristics: System Inputs, System Outputs, System Files, and General System Requirements. The contents and usage of each worksheet are detailed in Section 2.2, Filling Out the Worksheets.

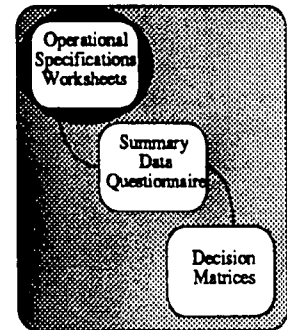
- o Complete each worksheet as much as possible following the instructions and examples provided for each worksheet.
- o Complete the Summary Data Questionnaire using information from the worksheets as input.

2.2 FILLING OUT THE WORKSHEETS

2.2.1 The System Inputs Worksheet

System input refers to the various sources of information which are entered into, and processed by, the proposed system. For example, system input may be customer account numbers and amounts for direct deposit contained on a computer tape to a bank, or responses to survey questionnaires which are received in hard copy form for data entry into the system.

The System Inputs Worksheet provides a place to gather and identify this information or data. The type of information to be entered in each column of the worksheet is described below. The worksheet, with sample entries, is shown in Figure 2.1.



<u>Column</u>	<u>Information to be Entered</u>
<u>Description</u>	<ul style="list-style-type: none">- A short description of the incoming information, for example:<ul style="list-style-type: none">- Financial Report Form 102- Regional Labs Survey Form- Payments, Direct Deposit File
<u>Media</u>	<ul style="list-style-type: none">- The physical means by which the information is received, for example:<ul style="list-style-type: none">- Hard Copy- Floppy Disks- Magnetic tape- Disk File
<u>Frequency</u>	<ul style="list-style-type: none">- The timeframe in which information is received: Daily (D), Weekly (W), Monthly (M), Semi-Annually (SA), Annually (A), On Demand (OD).
<u>Volume</u>	<ul style="list-style-type: none">- The number of records which will be received in relation to the timeframe stated above, for example:<ul style="list-style-type: none">- 500 (Survey Questionnaires)- 1,000 (Direct Deposits)- 50 (Field Surveys)

OPERATIONAL SPECIFICATIONS WORKSHEET

System Inputs

[illegible]

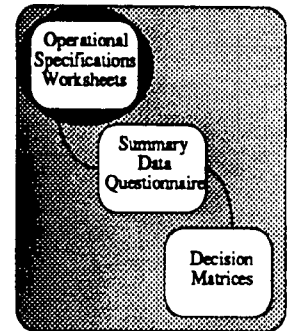
2.2.2 The System Files Worksheet

As used in this manual, system files are the logical data files or data stores that have been defined in the logical design and represented on the system's data flow diagrams or system flow charts. They are not the actual data base files that will be implemented with the system. On the System Files Worksheet, shown in Figure 2.2, you will identify the system files and estimate their size.

To determine file sizes, use any information that has been gathered so far in the analysis stage, e.g., management projections and reports from current systems are valid data sources. If the information is not available, further analysis may be necessary.

The information to be entered in each column of the worksheet is described below:

<u>Column</u>	<u>Information to be Entered</u>
<u>File Name</u>	<ul style="list-style-type: none">- Enter the names of data stores from data flow diagrams or record names from entity-relationship diagrams. This type of documentation should have been completed for the initial system concept and the high-level logical design you are now working from.
<u>Number of Records</u>	<ul style="list-style-type: none">- Enter the number of records that would be in this file. File sizes should be an estimated maximum to be reached in a three to five year period.
<u>Storage</u>	<ul style="list-style-type: none">- The system storage requirements are determined by multiplying the number of records by the estimated characters per record.



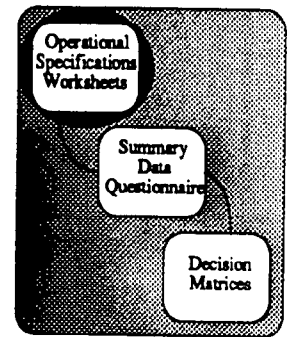
OPERATIONAL SPECIFICATIONS WORKSHEET

System Files

<i>File Name</i>	<i># of Records</i>	<i>Storage (Mb)</i>
Questionnaire File	8000	10
Deposit File	4000	5
Transactions	400	2
Master File	8000	18
Region File	50	.3
Total	20450	35.3

2.2.3 The System Outputs Worksheet

System outputs are the information that the system needs to produce. This information can be in the form of standard reports or screen displays for use by the end-users, or in the form of files that are used to interface with other systems. By understanding what the system needs to produce, you will have a better understanding of the technical abilities required of the selected hardware and software. The information to be entered on the System Outputs Worksheet, Figure 2.3, is described below.



<u>Column</u>	<u>Information to be Entered</u>
<u>Description</u>	- A short description of what is being produced. If it is a report, use its name; if it is a screen that you have developed, use its name. If it is a file being produced for another system, use the file name.
<u>Format</u>	- Report, Graph, Screen, Tape, Floppy, etc.
<u>Frequency</u>	- The timeframe in which information is produced: Daily (D), Weekly (W), Monthly (M), Semi-Annually (SA), On Demand (OD), etc.
<u>Volume</u>	- Estimate what it takes to create this output. If it is a report on all cases in a system, use the number of cases that you entered for the case file on the System Files Worksheet. If it is an electronic file to be transferred to another system, estimate the number of records in an average file. For example, the following worksheet indicates that the master menu is accessed 25 times a day, and 8000 records are read to create the weekly Deleted Records Report.

OPERATIONAL SPECIFICATIONS WORKSHEET

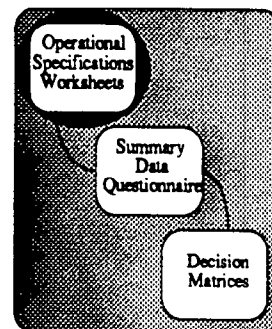
System Outputs

<i>Description</i>	<i>Format</i>	<i>Frequency</i>	<i>Volume</i>
Display Master Menu	Screen	Daily	25
Deleted Records Report	Report	Weekly	8000
Document File	Tape	Weekly	75
Display Account Information	Screen	Daily	50
Questionnaire Statistics	Lotus File	Weekly	3000

2.2.4 The General System Requirements Worksheet

General system requirements are items apart from the logical design of the system. They set constraints or limitations on the system. These could be security or response time requirements, limits on system access, etc. Look to the Mission Needs Statement to help in defining general requirements. Interviews with the client will help further. General system requirements cover a broad range of topics, such as:

- o Automated Interfaces
- o Productivity Goals
- o Response time
- o Compliance with Federal Regulations
- o Security and Privacy
- o System Constraints



A description of the information to be entered on the General System Requirements Worksheet, Figure 2.4, follows:

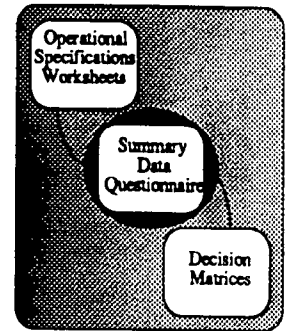
<u>Column</u>	<u>Information to be Entered</u>
<u>Description</u>	- Describe the requirement. Use as much space as needed.
<u>Priority</u>	- Numerically prioritize the requirements. This is very important, because for many systems, available solutions will not meet all requirements. Prioritized requirements will help to ensure optimal system function and performance.

OPERATIONAL SPECIFICATIONS WORKSHEET

General System Requirements

<i>Description</i>	<i>Priority</i>
Produce reports on-site	L
Allow users to update data on-line	H
Provide edit program for input tape	H
Data base will be accessed by 15 users	H
Need to exchange data with dBase III data base	M
User access/system priveleges controlled by application software	M

2.2.5 Summary Data Questionnaire



1. Who will be the audience for this system?

- ☐ National
- ☐ Regional
- ☐ Departmental
- ☐ Single User

2. Describe your environment:

- ☐ Laboratory
- ☐ Non-Laboratory

3. How many simultaneous users will the system have to support?

- ☐ 1 at a time
- ☐ 2-15
- ☐ 16-50
- ☐ > 50

4. **What is the maximum number of records that the system will have to manage or, what is the maximum amount of storage the system will use?

- ☐ < 10,000 records or 20 Megabytes of storage
- ☐ 10,000 < records < 50,000 or 100 Megabytes of storage
- ☐ 50,000 < records < 100,000 or 1 Gigabyte of storage
- ☐ > 100,000 records or > 1 Gigabyte of storage

5. What hardware do users have access to at your location?

- ☐ Macintosh
- ☐ PC
- ☐ LAN
- ☐ Prime
- ☐ VAX/VAX Cluster
- ☐ LMF/3090

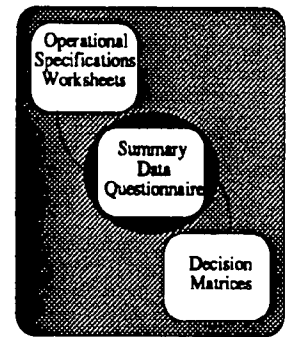
6. A. Is data accessed directly from other Agency Systems? If so, where does it reside:

- ☐ IBM 3090
- ☐ VAX Cluster
- ☐ LMF
- ☐ VAX
- ☐ Prime
- ☐ PC
- ☐ Other _____

**File sizes should be an estimated maximum to be reached in 3-5 year period.

B. If you have data coming from other Agency hardware, in what type of system does the data reside?

- ☐ ADABAS
- ☐ Focus
- ☐ Other Mainframe DBMS
- ☐ Prime Information
- ☐ dBase III



7. Report Requirements:

- ☐ Adhoc reports (random retrieval)
- ☐ Standard batch report runs (defined data paths)

8. Do you need specialized output devices?

- ☐ Graphics Printers
- ☐ Plotter
- ☐ Other _____

9. System Response:

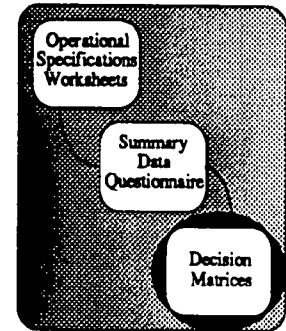
Reports: Onsite/Immediate ____
Batch/Overnight ____

On-Line Response Time in seconds: maximum ____

SECTION 3 - DECISION MATRICES

3.1 USING THE MATRICES

From the Mission Needs Analysis and Initial System Concept, the system manager has a general characterization of the application system to be developed. This would include the type and volume of data coming in, the kind of output desired, and general system requirements such as who can/will access and use the data, how much others can manipulate the data, security concerns, etc.



Although these ideas will be further refined during later stages of the system development cycle, enough information should be available now to determine the physical attributes of the proposed application. These attributes will allow the system manager to select the most appropriate software/hardware configurations to meet the design requirements. The Operational Specifications Worksheets were designed to focus and summarize the data gathered to date. This information, together with the answers from the Summary Data Questionnaire, will enable the system manager to use the decision matrices to select optimal development configurations.

The decision matrix approach was developed to reduce the complexity of the selection process. A separate matrix (or set of matrices) is provided for each type of application (e.g., statistical, spreadsheet, graphics, etc). For some applications, multiple software and hardware combinations can be considered. For others, there may be only a single software package, but multiple hardware platforms on which it could be implemented. And, in a very few cases, the choice of the appropriate selection is quite simple, because there is only one software package or one hardware platform available. For example, if the application is text searching, BASIS on the 3090 must be used; no other option is available. Similarly, if the system manager is interested in a CAD application, AUTOCAD, a PC-based application, is the only option. The system manager can quickly determine from the matrix in Appendix A if the requirements are such that the system configuration is limited to one option.

To use the matrices:

- o Select the type of application being developed from the following page.
- o Go to the appropriate matrix. Using information from the Summary Data Questionnaire, 'walk' through the matrix. For most of the matrices, there are several decision criteria illustrated along the borders of the matrix, with numbers or hardware/software choices listed in the intersections of the rows and columns which represent available option(s).
- o Once the system platform(s) have been identified, return to the Preliminary Design and Options Analysis Manual, part 3 - Options Analysis, to evaluate the identified options against requirements and continue with the Detailed Design phase.

Type of Application:

Data Base Management

Laboratory -	Small	See Page 18
	Medium	See Page 19
	Large	See Page 20

Non-Laboratory -	Small	See Page 21
	Medium	See Page 22
	Large	See Page 23

Desktop Publishing	See Page 24
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Presentation Graphics

Charts	See Page 25
Drawing/Painting	See Page 26

Electronic Spreadsheet	See Page 27
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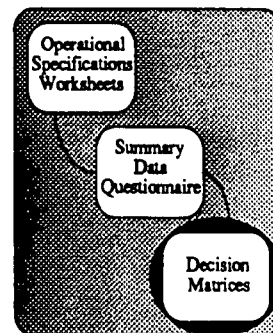
Statistical Analysis	See Page 28
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Computer-Aided Design	See Page 29
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Geographical Information System	See Page 29
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Text Searching	See Page 29
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Word Processing	See Page 29
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DATABASE MANAGEMENT

FOR LABORATORY ENVIRONMENTS

SMALL SYSTEMS - <50K RECORDS OR <100MB STORAGE

AUDIENCE		SINGLE USER	DEPARTMENTAL OR REGIONAL			NATIONAL
NUMBER OF USERS		1	2-15	16-50	>50	>1
LOCATION OF RELATED DATA	VOLATILITY					
PC	LOW OR MODERATE	2	3	3	4	4
	VOLATILE	2	3	3,4	4	4
	HIGHLY VOLATILE	2,3	3	4	4	4
VAX	LOW OR MODERATE	3	3	3	4	4
	VOLATILE	3	3	3,4	4	4
	HIGHLY VOLATILE	3	3	4	4	4
VAX CLUSTER	LOW OR MODERATE	3,4	4	4	4	4
	VOLATILE	3,4	4	4	4	4
	HIGHLY VOLATILE	4	4	4	4	4
NONE	LOW OR MODERATE	1,2	3	3	4	4
	VOLATILE	1,2	3	3,4	4	4
	HIGHLY VOLATILE	3	3	4	4	4

LEGEND

- 1 - dBase III - PC
- 2 - PC/Focus - PC
- 3 - Focus - VAX
- 4 - Focus - VAX CLUSTER

DATABASE MANAGEMENT

FOR LABORATORY ENVIRONMENTS

MEDIUM SYSTEMS - 50K - 100K RECORDS OR 100MB - 1GB STORAGE

AUDIENCE		SINGLE USER	DEPARTMENTAL OR REGIONAL			NATIONAL
NUMBER OF USERS		1	2-15	16-50	>50	>1
LOCATION OF RELATED DATA	VOLATILITY					
PC	LOW OR MODERATE	3	3,4	3,4	4	4
	VOLATILE	3,4	3,4	3,4	4	4
	HIGHLY VOLATILE	4	3,4	4	4	4
VAX	LOW OR MODERATE	3	3,4	3,4	4	4
	VOLATILE	3,4	3,4	3,4	4	4
	HIGHLY VOLATILE	4	3,4	4	4	4
VAX CLUSTER	LOW OR MODERATE	3,4	3,4	3,4	4	4
	VOLATILE	4	3,4	3,4	4	4
	HIGHLY VOLATILE	4	3,4	4	4	4
NONE	LOW OR MODERATE	3	3,4	3,4	4	4
	VOLATILE	3,4	3,4	3,4	4	4
	HIGHLY VOLATILE	4	3,4	4	4	4

LEGEND

- 1 - dBase III - PC
- 2 - PC/Focus - PC
- 3 - Focus - VAX
- 4 - Focus - VAX CLUSTER

DATABASE MANAGEMENT

FOR LABORATORY ENVIRONMENTS

LARGE SYSTEMS - >100K RECORDS OR >1GB STORAGE

AUDIENCE		SINGLE USER	DEPARTMENTAL OR REGIONAL			NATIONAL
NUMBER OF USERS		1	2-15	16-50	<50	>1
LOCATION OF RELATED DATA	VOLATILITY					
PC	LOW OR MODERATE	3,4	3,4	4	4	4
	VOLATILE	3,4	3,4	4	4	4
	HIGHLY VOLATILE	4	4	4	4	4
VAX	LOW OR MODERATE	3,4	3,4	4	4	4
	VOLATILE	3,4	3,4	4	4	4
	HIGHLY VOLATILE	4	4	4	4	4
VAX CLUSTER	LOW OR MODERATE	3,4	3,4	4	4	4
	VOLATILE	3,4	3,4	4	4	4
	HIGHLY VOLATILE	4	4	4	4	4
NONE	LOW OR MODERATE	3,4	3,4	4	4	4
	VOLATILE	3,4	3,4	4	4	4
	HIGHLY VOLATILE	4	4	4	4	4

LEGEND

- 1 - dBase III - PC
- 2 - PC/Focus - PC
- 3 - Focus - VAX
- 4 - Focus - VAX CLUSTER

DATABASE MANAGEMENT

FOR NON-LABORATORY ENVIRONMENTS

SMALL SYSTEMS - <50K RECORDS OR <100MB STORAGE

AUDIENCE		SINGLE USER	DEPARTMENTAL			REGIONAL			NATIONAL
NUMBER OF USERS		1	2-15	16-50	>50	2-15	16-50	>50	>1
LOCATION OF RELATED DATA	VOLATILITY								
PC/LAN	LOW OR MODERATE	1,2,3,4	3	3	6	5	5	5	6
	VOLATILE	3,4	3	3	6,7	5	5	5,6	6
	HIGHLY VOLATILE	5	5	5	7	5	5	7	6,7
LMF	LOW OR MODERATE	3,4	3,5	5	5	5	5	5	6
	VOLATILE	3,4	5	5	5	5	5	5	6
	HIGHLY VOLATILE	5	5	5	7	5	5	7	6,7
IBM 3090	LOW OR MODERATE	1,2,3,4	6	6	6	6	6	6	6
	VOLATILE	3,4,5	6	6	6	6	6	6	6
	HIGHLY VOLATILE	5,6	6	6	7	6	6	7	6,7
NONE	LOW OR MODERATE	1,2	3,4	3	5	5	5	5	6
	VOLATILE	1,2,3,4	3	3	5	5	5	5	6
	HIGHLY VOLATILE	3,4	5	5	7	5	5	7	6,7

LEGEND

1 - dBase III - PC
2 - PC/Focus - PC
3 - Focus - LAN

4 - dBase III - LAN
5 - Focus - LMF
6 - Focus - IBM 3090
7 - ADABAS - IBM 3090

DATABASE MANAGEMENT

FOR NON-LABORATORY ENVIRONMENTS

MEDIUM SYSTEMS 50K - 100K RECORDS OR 100MB - 1GB STORAGE

AUDIENCE		SINGLE USER	DEPARTMENTAL			REGIONAL			NATIONAL
NUMBER OF USERS		1	2-15	16-50	>50	2-15	16-50	>50	>1
LOCATION OF RELATED DATA	VOLATILITY								
PC/LAN	LOW OR MODERATE	3,4	3	3,5	5,6	3,5	3,5	5	6
	VOLATILE	3,4	3	5	5,6	3,5	5	5	6
	HIGHLY VOLATILE	5	6,7	6,7	7	5	5,6	7	7
LMF	LOW OR MODERATE	5	5	5	5,6	5	5	5,6	6
	VOLATILE	5	5	5	5,6	5	5	5,6	6
	HIGHLY VOLATILE	5	5	5,6	7	5	5,6	7	7
IBM 3090	LOW OR MODERATE	5	6	6	6	6	6	6	6
	VOLATILE	5	6	6	6	6	6	6	6
	HIGHLY VOLATILE	6	6,7	6,7	7	6,7	6,7	7	7
NONE	LOW OR MODERATE	3,4	3,4	5	6	3,5	5	6	6
	VOLATILE	3,4,5	3,4	5	6	3,5	5	6	6
	HIGHLY VOLATILE	5	6,7	6,7	7	6,7	6,7	7	7

LEGEND

1 - dBase III - PC
2 - PC/Focus - PC
3 - Focus - LAN

4 - dBase III - LAN
5 - Focus - LMF
6 - Focus - IBM 3090
7 - ADABAS - IBM 3090

DATABASE MANAGEMENT

FOR NON-LABORATORY ENVIRONMENTS

LARGE SYSTEMS >100K RECORDS OR >1GB STORAGE

AUDIENCE		SINGLE USER	DEPARTMENTAL			REGIONAL			NATIONAL
NUMBER OF USERS		1	2-15	16-50	>50	2-15	16-50	>50	>1
LOCATION OF RELATED DATA	VOLATILITY								
PC/LAN	LOW OR MODERATE		5	5,6	6,7	5	5,6	6,7	6
	VOLATILE		5	5,6,7	6,7	5	5,6,7	6,7	6,7
	HIGHLY VOLATILE		5,6	6,7	6,7	5,6	6,7	7	7
LMF	LOW OR MODERATE		5	5,6	6,7	5	6,7	6,7	6
	VOLATILE		5	5,6,7	6,7	5	6,7	6,7	6,7
	HIGHLY VOLATILE		5,6	6,7	7	5,6	6,7	7	7
IBM 3090	LOW OR MODERATE		6	6	6,7	6	6	6,7	6
	VOLATILE		6	6,7	6,7	6	6,7	6,7	6,7
	HIGHLY VOLATILE		6,7	6,7	7	6,7	6,7	7	7
NONE	LOW OR MODERATE		5	5	6,7	5	5	6,7	6
	VOLATILE		5,6	5,6	6,7	5,6	5,6	6,7	6,7
	HIGHLY VOLATILE		5,6,7	6,7	6,7	5,6,7	6,7	7	7

LEGEND

1 - dBase III - PC
2 - PC/Focus - PC
3 - Focus - LAN

4 - dBase III - LAN
5 - Focus - LMF
6 - Focus - IBM 3090
7 - ADABAS - IBM 3090

DESKTOP PUBLISHING

SOFTWARE PACKAGE	HARDWARE AVAILABLE	
	PC	MACINTOSH
ALDUS PAGEMAKER*	*	*
VENTURA PUBLISHER	*	

* Use PageMaker wherever possible

PRESENTATION GRAPHICS

CHARTS

SOFTWARE PACKAGE	RELATED DATA IS OR WILL BE LOCATED ON				
	SAS (ANY HARDWARE)	DBMS IBM 3090	PRIME INFORMATION	PC	MAC
CHART				*	
CRICKET GRAPH					*
INFO VERSAGRAPH			*		
SAS/GRAPH	*				
TELLAGRAF*		*			

** If a high volume of output is desired, use Tellagraf*

PRESENTATION GRAPHICS

DRAWING/PAINTING

SOFTWARE PACKAGE	HARDWARE AVAILABLE	
	MACINTOSH	PC
CRICKET DRAW	*	
DR. HALO III		*
DRAW APPLAUSE		*
FREELANCE PLUS		*
MAC DRAW	*	
MAC PAINT	*	

ELECTRONIC SPREADSHEET

RELATED DATA IS OR WILL BE LOCATED ON						
Suggested Spreadsheet Tool	SAS on IBM 3090 or VAX	Focus on IBM 3090 or VAX	Other DBMS on IBM 3090	Prime	Other (e.g. states)	PC
20/20				Prime		
FocCalc		IBM 3090 or VAX				
Lotus 1-2-3*	PC/LAN	PC/LAN	PC/LAN	PC/LAN	PC/LAN	PC/LAN
SAS/FSP	IBM 3090 or VAX					
Supercalc/MF			IBM 3090			

* EPA Standard

STATISTICAL ANALYSIS (SAS)

Audience	Single User		Departmental or Regional		National	
Number of Records or Amount of Storage	10,000 or 20 Megabytes		< 100,000 or 1 Gigabyte		> 100,000 or > 1 Gigabyte	
<div> <div>User Location</div> <div>Number of Users</div> </div>	Laboratory	Non-Laboratory	Laboratory	Non-Laboratory	Laboratory	Non-Laboratory
1 at a time	PC					
2 - 15			VAX	LMF	VAX Cluster	IBM 3090
16 - 50						
> 50			VAX Cluster	IBM 3090		

OTHER APPLICATIONS

	HARDWARE PLATFORM						
Type of Application	IBM 3090	LMF	DEC/VAX	Prime	PC	Macintosh	LAN
Computer Aided Design					Autodesk AutoCad2		
Geographical Information Systems			ARC/INFO	ARC/INFO	ARC/INFO		
Text Searching	BASIS						
Word Processing			WordPerfect		WordPerfect		WordPerfect

APPENDIX A - EPA HARDWARE/SOFTWARE MATRIX

EPA HARDWARE/SOFTWARE MATRIX

SOFTWARE/TOOL	HARDWARE ENVIRONMENT						
	IBM 3090	IBM 4381	DEC/VAX	PRIME	PC	MAC	LAN
COMMUNICATIONS SOFTWARE/CAPABILITIES							
3270 PC File Transfer	*	*			*	*	*
Arbiter	*				*		
Asynch ASCII	*		*	*	*	*	*
Crosstalk					*		
Doc/Net			*		*		
GNet II				*	*		
HASP	*	*	*	*	*		
Kermit	*		*	*	*	*	
Natural/Connection	*				*		
Novell Network					*		*
Primelink				*	*		
PrimeNet				*			
SAS/RLINK RTERM	*		*		*		
SNA	*	*	*	*	*	*	*
X.25	*		*	*	*	*	*
COMPUTER-AIDED DESIGN							
Autodesk AutoCad 2					*		
DATA BASE MANAGEMENT							
ADABAS, Software AG	*						
dBase III, Ashton-Tate					*		*
Focus, Information Builders	*	*	*		*		*
IDMS, Cullinet	*						
Prime Information, Prime Computer				*	*		
System 2000, SAS Institute	*						
DESKTOP PUBLISHING							
PageMaker, Aldus					*	*	
Ventura Publisher					*		
DEVELOPMENT SOFTWARE							
Basic (not ANSI Standard)					*		
COBOL	*			*	*		
Easytrieve Plus, Panosophic	*						
Fortran	*	*	*	*	*		
Natural, Software AG	*						
Pascal				*	*		
PL/I	*						
SAS, SAS Institute	*		*	*	*		
ELECTRONIC MAIL							
ELink				*			
VAX Mail			*				
ELECTRONIC SPREADSHEET							
2D/2D, Access Technology				*			
Excel, Microsoft						*	
FocCalc, Information Builders	*		*				
Lotus 1-2-3, Lotus Development					*		*
SAS/FSP, SAS Institute	*		*				
SuperCalc MF, Computer Associates	*						
GEOGRAPHICAL INFORMATION SYSTEMS							
ARC/INFO, ESRI			*	*	*		
UNIMAP, Uniras	*						

EPA HARDWARE/SOFTWARE MATRIX

SOFTWARE/TOOL	HARDWARE ENVIRONMENT						
	IBM 3090	IBM 4381	DEC/VAX	PRIME	PC	MAC	LAN

PRESENTATION GRAPHICS

Chart, Microsoft					*		
Cricket Draw, Cricket Software						*	
Cricket Graph, Cricket Software						*	
Dr. Halo III, IMSI					*		
Draw Applause					*		
Freelance Plus, Lotus Development					*		
Info Versagraph				*			
MacDraw, Apple Computer						*	
MacPaint, Apple Computer						*	
SASGraph, SAS Institute	*		*	*	*		
Tellagraf, Computer Associates	*			*			

PROGRAMMER PRODUCTIVITY AIDS/FACILITIES

COBOL Debugger	*						
EMACS, Prime Computer				*			
EVE/TPF			*				
FORTTRAN Debugger	*		*				
ISPF, IBM	*	*					
Librarian, ADR	*						
Turbo Pascal, Borland International					*		

PROJECT MANAGEMENT

Microsoft Project, Microsoft					*		
Tellaplan Expert, Computer Associates	*						
Timeline, Symantec					*		

STATISTICAL SOFTWARE

SAS, SAS Institute	*	*	*	*	*		
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TEXT SEARCHING

Basis, Information Dimensions	*						
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WORD PROCESSING

Displaywrite 4, IBM					*		*
Info-Text, Henco Software				*			
Lexitype, Lexitronics					*		*
MacWrite, Apple Computer						*	
MultiMate, Ashton-Tate					*		*
Text WP				*			
Word, Microsoft					*	*	*
Wordmarc, Marc International				*	*		
Wordperfect, Wordperfect Corp.			*		*	*	*
Wordstar, Micropro International					*		*

APPENDIX B - EPA HARDWARE LOCATION MATRIX

EPA HARDWARE LOCATION MATRIX

LOCATION	IBM 3090	IBM 4381	PDP 11/78X	VAX 8650	VAX 8600	MICRO VAX II	MICRO VAX 2000	PRIME
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Central Office

RTP	*	*	*	*	*	*	*	*
-----	---	---	---	---	---	---	---	---

Regions

Atlanta		*						*
Boston		*						*
Chicago		*						*
Dallas		*						*
Denver		*						*
Kansas City		*						*
New York		*						*
Philadelphia		*						*
San Francisco		*						*
Seattle		*						*
WIC/Headquarters		*				*		*

Laboratories

Ada, OK			*			*		
Annapolis, MD					*			
Athens, GA			*					
Chapel Hill, NC			*					
Cincinnati, OH		*	*					*
Corvallis, OR			*		*			
Duluth, MN			*					
Grosse Ile, MI						*		
Gulf Breeze, FL			*					
Las Vegas, NV			*			*		
Montgomery, AL			*			*		
Narragansett, RI			*					
Newport, OR						*		

APPENDIX C - EPA SOFTWARE DESCRIPTIONS

APPENDIX C - EPA SOFTWARE DESCRIPTIONS

C1. SOFTWARE DESCRIPTIONS

Appendix C provides short descriptions of the types of software and the software packages available and supported by the EPA. These descriptions are not meant to be inclusive. They have been written to provide EPA personnel with limited computer knowledge a general overview of the features of these packages. The descriptions can be used as a companion to the Hardware/Software Matrix in Appendix A. The Matrix lists the software available at EPA and the hardware that it is implemented on. The software descriptions are listed by category, in the order defined in the Hardware/Software Matrix.

C1.1 COMMUNICATIONS SOFTWARE

Communications software permits computers to exchange information. This exchange can take the form of a file transfer or a dialogue with an application system. Because the EPA has such a diverse suite of computers, there are many communications packages available to accomplish these tasks.

3270 PC FILE TRANSFER

3270 PC File Transfer enables a personal computer (PC) equipped with a 3270 emulation board to transfer files to and from an IBM mainframe computer. This capability is available for the PC or Macintosh. They can connect to the IBM 3090 in Research Triangle Park or one of the regional IBM 4381 (LMF) systems.

ARBITER

Arbiter is a software package which is installed on both mainframe computers and personal computers. It enables the personal computer to have access to mainframe disk space and applications using a 3270 emulation board or a modem. Arbiter provides three capabilities: a remote disk environment that makes mainframe disk space look like a personal computer hard disk, the ability to transfer files to and from the mainframe, and the ability to emulate a 3270 type terminal for access to mainframe applications.

ASYNCH ASCII

Asynchronous ASCII is a method of communication that enables a user to connect to a computer system as a dumb terminal. The terminal (or personal computer) and the host must be capable of supporting one of several American National Standards Institute (ANSI) Standards. The most common is X3.64 which is the description of a DEC VT100 or IBM 3100 terminal's display capabilities. Many communications packages for personal computers support a subset of X3.64. This allows a personal computer user to use application software on another computer.

CROSSTALK

Crosstalk is a communications package available for IBM-compatible personal computers. It gives PCs the capability of emulating an asynchronous ASCII terminal. Crosstalk allows the user to store telephone numbers and will dial-up computers automatically when directed. In addition, Crosstalk provides the ability to transfer files between the personal computer and another computer.

DEC/NET

DEC/NET is a generic term for Digital Equipment Corporation's networking products. EPA uses DEC/NET to connect geographically separated DEC computers, and to connect terminals and other devices on an Ethernet local area network. DEC/NET connects the DEC computers located at laboratories with DEC computers at RTP.

HASP

HASP (Houston Asynchronous Spooling Package) was one of the first remote communications packages developed on IBM mainframes which saw wide use. It provides the capability to transfer files among machines in a somewhat limited fashion. EPA has implementations of HASP on the IBM 3090, the IBM 4381s, the DEC VAX, the PRIME, and PCs.

KERMIT

Kermit is a file transfer protocol supported as a public service by Columbia University in New York. It allows a personal computer or Macintosh to emulate a VT102 terminal to connect to another computer running Kermit. To perform the file transfer, Kermit must be run on both computers. Files can then be transferred in either direction. The protocol checks for data errors and retransmits as needed automatically. The EPA has installed Kermit on the IBM 3090, the DEC VAX, and the Prime. Crosstalk can use the Kermit protocol as one of its file transfer options.

NATURAL/CONNECTION

Natural/Connection runs on the personal computer and works with **NATURAL** running on the mainframe. It allows the PC to exchange data with the mainframe while maintaining security and data integrity. It formats data downloaded from the mainframe for personal computer use and will reformat the data for later uploading to the mainframe. It also allows users to develop **NATURAL** mainframe applications on the personal computer for transfer to, and use by, the mainframe.

NOVELL NETWARE

Novell Netware is the network operating system used on the IBM Token-Ring network at EPA. It allows personal computers connected to the network to share files, printers and access to mainframe computers.

PRIME/LINK

Prime/Link is a software package which provides virtual disk space on the Prime minicomputer for personal computers.

PRIME/NET

Prime/net is the network operating system which connects the various administrative Prime terminals on the Prime Ethernet LAN. It provides file sharing, print sharing, and electronic mail.

SNA

IBM's System Network Architecture (SNA) is the communications architecture used by EPA to link the Agency's token-ring LAN's, LMF's and IBM 3090 mainframe together.

X.25

X.25 is a data communications standard which defines the procedures for the exchange of data between devices in a packet-switching network. At EPA, X.25 is used for connection to the Prime office automation systems, and to interconnect the VAX laboratory systems running DEC/NET.

C1.2 COMPUTER AIDED DESIGN

Computer aided design programs are tools that are used for technical design and drafting. EPA supports only one CAD product, described below.

AUTODESK AUTOCAD 2

AutoCad is the EPA standard for computer-aided design software. It is a general purpose design and drafting program that runs on any of the Agency IBM compatible personal computers. Digitizing Tablets, a graphics input device that allows a user to trace a drawing on a flat surface while data coordinates are being reflected on the computer, are often used with this program.

C1.3 DATA BASE MANAGEMENT

Data base management programs allow virtually unlimited amounts of data to be stored, easily retrieved, modified, sorted and printed. The EPA has several data base management systems (DBMS) available for use. The decision of which DBMS is best for a given application is based on the audience for the data, the volume of data, the use of the data, and the number of simultaneous users.

ADABAS

ADABAS is installed on the IBM 3090. It is a relational data base management system with several utility programs. ADABAS supports concurrent batch and on-line processing. It features data compression, separation of physical data storage from representation of logical relationships in the data base, a comprehensive security system and automatic restart/recovery capabilities. ADABAS is an EPA standard DBMS targeted for use in high volume environments.

DBASE III+

dBase III+ is a powerful relational data base management system for use on personal computer systems and local area networks. It is the EPA standard for personal computer data base applications. It features a menu interface, compatibility with many other PC programs, data security, a report generator, a programming language, and a host programming language interface.

FOCUS

Focus is a user-oriented 4GL and data base management system. It combines an English-like language with a data base that supports both relational and hierarchical structures. It is also a standard DBMS for EPA. Because Focus is implemented on the IBM 3090, VAX cluster, LMF, LAN and PC's, it is the best DBMS choice where data is distributed among many locations or where the system may need to be transported across different hardware platforms. It is limited by not being a good choice for high-volume transaction systems.

IDMS

IDMS is a network and relational data base management system for large scale systems. It features a fourth generation data manipulation language for developing on-line systems, and a data dictionary. It is often used for large systems that require high throughput without ad-hoc reporting needs. Although IDMS is available on the IBM 3090, ADABAS is the preferred tool for this type of application.

PRIME INFORMATION

Prime Information is a distributed data management and applications development environment for the Agency's Prime computers. It is a fourth generation, relational-based DBMS that provides users with all the tools necessary to define and manage data bases and write application software.

SYSTEM 2000

System 2000 is available on the IBM 3090 at RTP. It is DBMS software that offers integrated tools for data management including interactive query/update, an integrated data dictionary, report writing, relational data base access, high-volume batch and interactive production processing, accounting, data recovery and conversational building of data bases. Potential system developers are discouraged from using this older DBMS product.

C1.4 DESKTOP PUBLISHING

Desktop Publishing software is used for page layout where text and graphics need to be mixed in the same document. The use of desktop publishing software has grown rapidly in the last few years as hardware and software capable of producing quality documents has become more accessible and prices have decreased.

PAGEMAKER by ALDUS

PageMaker is a desktop publishing package which is available on both personal computers and Macintosh systems. It is capable of combining text and graphics and provides a great deal of versatility in producing page layouts including choices of fonts and multi-column page layouts. If possible, use PageMaker for desktop publishing needs.

VENTURA PUBLISHER

Ventura Publisher is a desktop publishing system for IBM-compatible personal computers. Users can select preferred combinations of pull-down and pop-up menus. Many functions are selectable either by the mouse or by simple keyed commands. It allows color printing on Postscript-compatible printers, or printing of separations on any black-and-white printer.

C1.5 DEVELOPMENT SOFTWARE

This section consists of programming languages and application development tools for use in a variety of environments.

BASIC

The Basic Programming language is delivered as part of DOS by IBM on the personal computer. It is also available as a stand-alone product for the personal computers. It is not an ANSI standard and should not be considered for application development.

COBOL

COBOL is a language designed for business application usage. It is the dominant language for business applications. The language was designed to be self-documenting by using English-like procedural statements. COBOL is available on the IBM 3090, Prime, and IBM PC compatibles.

EASYTRIEVE PLUS

Easytrieve Plus is an information retrieval and data management system designed to serve the needs of both the information center and application development center environments that runs on the IBM 3090 at RTP. Its capabilities include automatic report composition and label creation. Its design allows users to access data from almost any file structure or data base including, VSAM, IDMS and flat files.

FORTRAN

FORTRAN was one of the first computer languages developed and is intended for mathematical and scientific applications. It is available on all EPA systems except the Macintosh.

NATURAL

Natural is a comprehensive, fourth generation language that provides facilities for advanced application development. These facilities include: intelligent source, screen design, report and global data editors, structured syntax, an interactive compiler and a library maintenance system. EPA uses Natural for programming ADABAS DBMS applications on the IBM 3090.

PASCAL

Pascal is a multi-purpose, structured language offering globally optimized object code. All implementations of Pascal within the Agency conform to ANSI standards. The language is implemented on two platforms: Prime and IBM PC compatibles.

PL/I

PL/I is a programming language developed initially by IBM. It was intended to combine the best elements of COBOL and FORTRAN. PL/I is a powerful language that is often used for software development on IBM mainframes. It is available within EPA on the IBM 3090.

SAS

SAS, which stands for Statistical Analysis System, provides the ability to perform a wide variety of analyses on a data base. This data base must be in SAS format or extracted from another data base management system into a "flat" file and fed to SAS for the analysis.

C1.6 ELECTRONIC SPREADSHEETS

Electronic spreadsheets gained popularity on personal computers due to the ease with which information could be entered into the spreadsheet and then manipulated. Spreadsheets are available on a wide range of computers at the EPA. Choosing the best spreadsheet will be based upon personal preference and the location of data that will be imported into the spreadsheet.

20/20

20/20 is a multiuser, integrated spreadsheet for the Agency's Prime computers. It combines a spreadsheet with graphics, data base management, and project modeling. It can transfer data to and from many other programs, including data bases and word processing programs. It features a 1,000 x 8,192 cell spreadsheet and can share spreadsheet information with Lotus 1-2-3.

EXCEL

Excel is a spreadsheet for the Macintosh which includes business graphics and data base. Excel's spreadsheet is 16,384 rows by 256 columns. Its major features include ease of use and rapid model creation through the use of Macintosh's visual interface; advanced formatting for on-screen viewing and for printing; graphics with custom built-in formats; spreadsheet linking; automatic recording of macros; selective recalculation; 2 way file interchange with Lotus 1-2-3 worksheets; and compatibility with Chart files on the Macintosh.

FocCalc

FocCalc is a full function spreadsheet that is fully integrated with the Focus 4GL and data base system. With it, the user can place Focus report writing (table) requests directly into the spreadsheet cells and automatically populate the spreadsheet with data. Users can directly access and combine data from Focus files or any file in the data center which can be read by Focus. If you have a Focus data base and need to view that information in a spreadsheet, this is the spreadsheet of choice.

LOTUS 1-2-3

Lotus 1-2-3 is the Agency standard spreadsheet program for the IBM-compatible personal computer. It combines spreadsheet analysis, graphics, and information management capabilities into one program. 1-2-3's spreadsheet capabilities let users enter numbers, text, or formulas into a network cell so that, by changing the contents of certain cells, users can perform a set of calculations automatically. Users can also copy ranges of cells, insert or delete rows and columns, change the output format of a range of cells or the width of a column of cells. The size of the spreadsheet is 2,048 rows by 256 columns with a half megabyte model capacity.

SAS/FSP

SAS/FSP, available on the IBM 3090 at RTP and the lab VAX's, offers interactive procedures for data entry, data editing and query. Screens can be defined to enter data into SAS data sets for data management, analysis and reporting. SAS/FSP provides a full-featured spreadsheet tool for use with SAS data sets. SAS/FSP software is a part of the SAS system, an integrated data analysis system.

SUPERCALC MF

SuperCalc/MF, available on the IBM 3090 at RTP, is an electronic spreadsheet and decision support system for financial modeling and analysis. Functions include generation, consolidation, and presentation of reports; sales projections; and preparation of divisional and departmental plans, and other large corporate financial projects. It offers menu-driven access to existing data bases; automated up- and down-loading of microcomputer spreadsheets; micro-to-mainframe bridge, and link between dissimilar micros running incompatible spreadsheets.

C1.7 GEOGRAPHICAL INFORMATION SYSTEMS

Geographical Information Systems (GIS) are computer-based systems that combine geographic and cartographic capabilities with data base management capabilities. GIS enable users to enter, manipulate and display spatial data easily and considerably faster than any previous methods have allowed. Geographic files can be overlaid with thematic information (e.g., population, superfund sites, geologic formations, land use, etc.) to enhance program management, analysis, and decision making.

ARC/INFO

ARC/INFO, EPA's standard geographic information system (GIS) software, provides the functionality for managing, analyzing, and displaying spatial data. It integrates a cartographic system with a relational DBMS. This integrated structure facilitates the handling of the two generic classes of spatial data: cartographic data describing the location and topology of point, line and polygon features; and attribute data describing these features. Publication quality maps can be produced with ARC/INFO's display capabilities including symbol sets, fonts, lines, and shade patterns. Reports can be generated using ARC/INFO's DBMS capabilities.

UNIMAP

Unimap is an interactive, menu-driven, color contour mapping and modeling system. It maps complex regular and irregular data sets. It produces visualization of data in a wide variety of map formats: scatter plots, 2D grids, 2D color shaded contour, multiple 2D projections, 3D color shaded contour, 3D with 2D projection, 3D bar maps and 4D mapped data display. Unimap resides on the IBM 3090 at RTP.

C1.8 GRAPHICS

Graphics packages have become more popular in recent years. This is probably because powerful computer hardware has decreased in price, making the use of graphics less costly. The EPA supports a variety of graphics packages. Choosing the best one for an application will depend on the type of output expected. One package may be the best for developing organizational charts while another is better for developing screen or slide shows.

CHART

Microsoft Chart is a presentation quality business graphics program for designing customized charts and graphs on IBM compatible personal computers. In Chart, data is entered, edited and formatted directly on the screen. Data may also be imported from programs such as dBase III and Lotus 1-2-3. Graphics created by this program can be displayed in a variety of documents, including Microsoft Word and Wordperfect.

CRICKET DRAW

Cricket Draw is an object-oriented drawing program for the Macintosh that takes advantage of the graphics capabilities of Postscript printers. The package consists of two integrated programs: a drawing window and a Postscript language editor. The user has control of object and text design such as rotating, tilting, shadowing and tinting.

CRICKET GRAPH

Cricket Graph is a high performance graphing program for use in business, engineering, and science. It offers 12 graph types, full text editing capabilities, export to page layout and word processing programs, and the ability to import data from spreadsheets, data bases, etc. Cricket Graph runs on the Apple Macintosh.

DR. HALO III

Dr. Halo III is a paint program and a raster editor for IBM compatible personal computers. Using the picture menu, users can draw, paint, move, cut and paste, and rubberstamp images. These functions, combined with the choices of colors, patterns, symbols, line widths, type faces, and air brush densities allow users to design high-quality images.

FREELANCE PLUS

Freelance Plus is a complete graphics package for IBM compatible personal computers. It integrates charting, graphics, editing, freehand drawing, symbol libraries, diagrams, maps and word slides that can be used for presentations and reports. Users may import data from packages like Lotus 1-2-3 or Symphony.

MACDRAW

Macdraw is a custom graphics program for the Macintosh. It allows users to design forms and technical illustrations, prepare slide presentations, customize graphs and charts, create floor plans and maps. Using the mouse, the user can draw circles, rectangles, arcs, straight lines and freehand sketches. Text may be added for labels and captions.

MACPAINT

MacPaint, available on the Macintosh, allows users to draw any number of shapes or designs and transfer the exact graphics contents of the screen to a printed report. Using the mouse, users select lines, rectangles, circles, or draw freehand shapes. Users can also choose a number of paintbrush sizes and shapes, a paint can to fill in blank portions of a screen, a spray paint can, and any of 38 different shades.

SAS/GRAPH

SAS/Graph is an information and presentation color graphics tool. It produces charts, plots, and maps in a variety of colors and patterns. Graphics components can be created, stored in an on-line catalog, and retrieved as needed and combined with other graphics. SAS/Graph is a part of the SAS system, an integrated software system providing data management, analysis and presentation. SAS/Graph is available for use in the IBM 3090, VAX, PRIME and PC environments.

TELLAGRAF

Tellagraf is a presentation quality graphics system for the IBM 3090 that generates both one-time ad-hoc charts or high-volume production graphics. It charts data from multiple sources: data bases, financial systems, spreadsheets, and reports. Graphs include tailor bar, line, pie, word charts, and tables. It is an English-language, conversational program that produces output on paper, overhead transparencies, 35mm slides, or CRT screens.

C1.9 PROGRAMMER PRODUCTIVITY AIDS

The EPA supports a variety of productivity aids for programmers. These aids consist of "debugger" programs which allow programmers to step through a program to determine its actions more precisely, text editors, menu systems, and library capabilities to allow release management.

COBOL DEBUGGER

The COBOL debugger allows a programmer to step through his COBOL code and see the results after the execution of each statement in order to determine what is causing an error in the output.

EMACS

The EMACS editor is a full screen editor with windowing capabilities. EMACS is supported by EPA on PRIME systems.

FORTRAN DEBUGGER

A FORTRAN debugger allows a programmer to step through a FORTRAN program in order to determine which instruction is causing an error in the program. It is supported by EPA on the IBM 3090 and the DEC VAX systems.

ISPF

The Interactive Structured Programming Facility (ISPF) consists of a set of menu screens which are individually configured for each programmer. The facility contains the ability to access system queues; compile, link, and execute programs; a full screen editor; and a split screen capability. It is available on the IBM 3090 and the IBM 4381 systems.

LIBRARIAN

Librarian is a source management system for the IBM 3090. It allows the EPA to manage and audit its catalog of software. In addition, Librarian's Change Control Facility provides a methodology for managing the program update cycle.

TURBO PASCAL

Turbo Pascal is a complete Pascal development environment for IBM PC compatibles, including a compiler and debugger.

C1.10 PROJECT MANAGEMENT TOOLS

Project Management tools allow a manager to enter the events, milestones, and resources necessary to complete a project. The software will calculate the time and cost of doing the project. The EPA supports tools which are available on the IBM 3090 and on a personal computer. Please note that the use of a project management tool on a specific machine does not imply that the project must be developed on that machine.

MICROSOFT PROJECT

Microsoft Project is a scheduling and reporting tool for managers that runs on IBM compatible personal computers. It creates schedules using a row and column format just like a spreadsheet. Gantt charts showing task durations and PERT chart showing project flow are created and automatically updated. Project data may be exported directly to packages such as Lotus 1-2-3 or dBase III.

TELLAPLAN EXPERT

Tellaplan Expert, available on the IBM 3090 at RTP, is a full-featured project management tool. With it a manager may use 'what if' capabilities to evaluate project alternatives, and calculate and visually represent critical paths, dependencies, and slack/float time. Functions included are Gantt charts, PERT/CPM in two formats (activity-on-arrow and activity-on-node), work breakdown structures, costs, and resource and tabular reporting capabilities.

TIMELINE

Timeline is a project planning and tracking tool that runs on IBM compatible personal computers. Using Gantt, PERT and resource histogram charts, the user can enter an unlimited number of tasks, dependencies, resources and cost categories. It can print summary, detail and periodic reports for tasks, resources and costs, or select portions of the project for custom reports. Project data may be exported directly to packages such as Lotus 1-2-3 or dBase III.

C1.11 STATISTICAL SOFTWARE

There is one product supported by EPA to perform statistical analysis. It is considered the superior product in the industry and is widely used.

SAS

The Statistical Analysis System (SAS) is used to perform data analysis. The SAS system also has a data base capability and graphical output capabilities. It is available on every piece of hardware supported by the EPA except the Macintosh.

C1.12 TEXT SEARCHING

There is only one text searching system as such supported by the EPA. In this context text searching is more than matching a string of characters, but also contains some capability to perform context searches of the text.

BASIS

BASIS (Text Information Management System) is used for the retrieval, manipulation, and storage of full-text, bibliographic and numeric data in either batch or on-line-mode. The major functional capabilities of BASIS include: term and phrase searching via inverted indexes, variable length data elements and records, full thesaurus capabilities and on-line sort.

C1.13 WORD PROCESSING SYSTEMS

The EPA supports a variety of word processing systems but encourages and supports the use of WordPerfect as the standard.

DISPLAYWRITE 4

DisplayWrite 4 is an advanced word processing program for the personal computer that supports general correspondence, multiple-page documents, technical documents, and statistical tables. Edit, insert, delete, move, copy and merge functions are supported. Hyphenation and spelling are checked automatically via a built-in

dictionary. Automatic footnote processing and outline/section numbering are supported.

LEXITYPE

Lexitype is a full-featured word processor with integrated math, sorting, communications, and form letter merge packages that runs on IBM compatible personal computers. Lexitype became popular at EPA as Lexitron word processing machines were phased out of the Agency and personal computer's became the standard office automation tool. Lexitype allowed users to use the personal computer's without being retrained in a new word processing package.

MACWRITE

MacWrite is a word processing tool available for the Apple Macintosh line. It offers a variety of fonts, sizes, and typesyles. There is editing via insert text, edit by any text length, and search and replace whole or partial words. Special features included are page location recorded on a vertical elevator, compatibility with graphics from other Macintosh programs, the option to save a document as text only, and an undo function.

MULTIMATE

MultiMate is a powerful, easy-to-use word processor for IBM compatible personal computers that allows a wide range of users to produce professional looking documents. It features a spell checker, thesaurus, auto-hyphenation, context sensitive help, line and box drawing, and list management capabilities. There is a direct dBase merge, plus easy import from Framework, RapidFile and Master Graphics files.

WORD

Microsoft Word is a full-featured word processing package available for both IBM-compatible personal computers and the Apple Macintosh. Its features include spell-check, thesaurus, spreadsheet-link, forms support, macros, style sheets, glossary, print-merge, foot/endnotes, redlining, outline processor, lines, boxes and borders.

WORDMARC

WordMARC consists of two word processing programs. WordMARC Author is a simple package suitable for memos, letters and relatively unsophisticated reports. WordMARC Composer is a sophisticated package which allows header, footers, etc. for more complicated documents. It also has a capability to handle mathematical equations.

WORDPERFECT

WordPerfect Version 5 incorporates word processing features with graphic import capabilities. It allows the user to create professional looking documents featuring columns, footnotes/endnotes, macros, merge, speller, thesaurus, and many others. WordPerfect is the EPA standard for word processing, and is available for IBM-compatible personal computers, the Apple Macintosh, and the DEC/VAX environment.

WORDSTAR PROFESSIONAL

WordStar Professional offers IBM-compatible PC users a range of word processing capabilities from creating, editing and proofreading documents to merging data and producing tables of contents and indexes. In addition to WordStar, the Professional package includes MailMerge a text- and data-merging program; CorrectStar, a spelling checker; and StarIndex, an index/table of contents builder.

APPENDIX D - EPA HARDWARE DESCRIPTIONS

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D1. EPA HARDWARE ARCHITECTURE

EPA has an extensive ADP environment consisting of mainframes, minicomputers, microcomputers, and terminals located throughout the agency. In addition, EPA has a nationwide data communications network in place which enables EPA users throughout the country to access EPA computers and data. Figures D.1 and D.2 depict the agency's hardware and data communications configurations.

EPA's computing architecture is a three tier configuration. Each tier addresses the specific functions and capabilities required by different user groups within the agency. The tiers are briefly described below.

Tier 1 is the platform for applications that have large data storage requirements or data that needs to be shared with a national audience. It consists of the IBM 3090, the VAX cluster, and the E-mail Prime. All these computers are located at RTP, North Carolina. Tier 1 is also for applications which use mainframe specific software such as ADABAS or BASIS. The IBM 3090 is for large applications that are non-scientific in nature. The VAX cluster, connected to the laboratory sites nationwide using DEC/NET, is for scientific computing. The Primes are used as an E-MAIL host over PRIME/NET.

The Tier 2 platform contains the regional and laboratory hardware. It consists of IBM 4381s, VAX 78X and 86XX series computers, and eventually, an additional midframe computer currently under procurement. The 4381s, also called "Logical Mainframes," act as gateways to the 3090. They also provide the power and storage capacity of a mainframe for large regional applications. Each LMF site links to the IBM 3090 using IBM Systems Network Architecture (SNA). The VAX systems are located at laboratory sites and are used for scientific computing. They are linked to each other and the VAX Cluster at RTP via DEC/NET using the X.25 communications protocol. The new midframe will complement the LMF and VAX systems in the regions, laboratories, and Headquarters environments. It will provide for specific dedicated applications, such as GIS.

Tier 3 is the Agency's end-user environment. It consists of 3270 terminals, ASCII terminals, personal computers, Macintoshes, and local area networks (LANs). The EPA standard local area network for administrative and non-scientific professional functions is a token-ring network. On the token-ring, users can share EPA standard software such as WordPerfect, Lotus 1-2-3, PC SAS and dBASE III+. For laboratories, the standard local area network is Ethernet. It is used to connect personal computers, Macintoshes, and ASCII terminals to VAX computers.

D2. EPA HARDWARE DESCRIPTIONS

D2.1 MAINFRAMES

D2.1.1 The IBM 3090

The IBM 3090 is a mainframe computer which is capable of supporting large applications and many simultaneous users. The number of users supported depends on the application, but this system is capable of supporting hundreds to thousands of users at a time. It is commonly accessed through use of a 3270-type terminal or a personal computer with a 3270 emulation card. It may be accessed from any of the regions through the IBM SNA network.

D2.1.2 Logical Mainframes (LMFs) - 4381

The Logical Mainframe (LMF) provides EPA Regional offices and major field sites access to the resources of the IBM 3090. The LMF is an IBM 4381 which acts as a gateway, or front-end processor, to the 3090. It is also used for the development and support of large regional applications.

EPA COMPUTING ARCHITECTURE

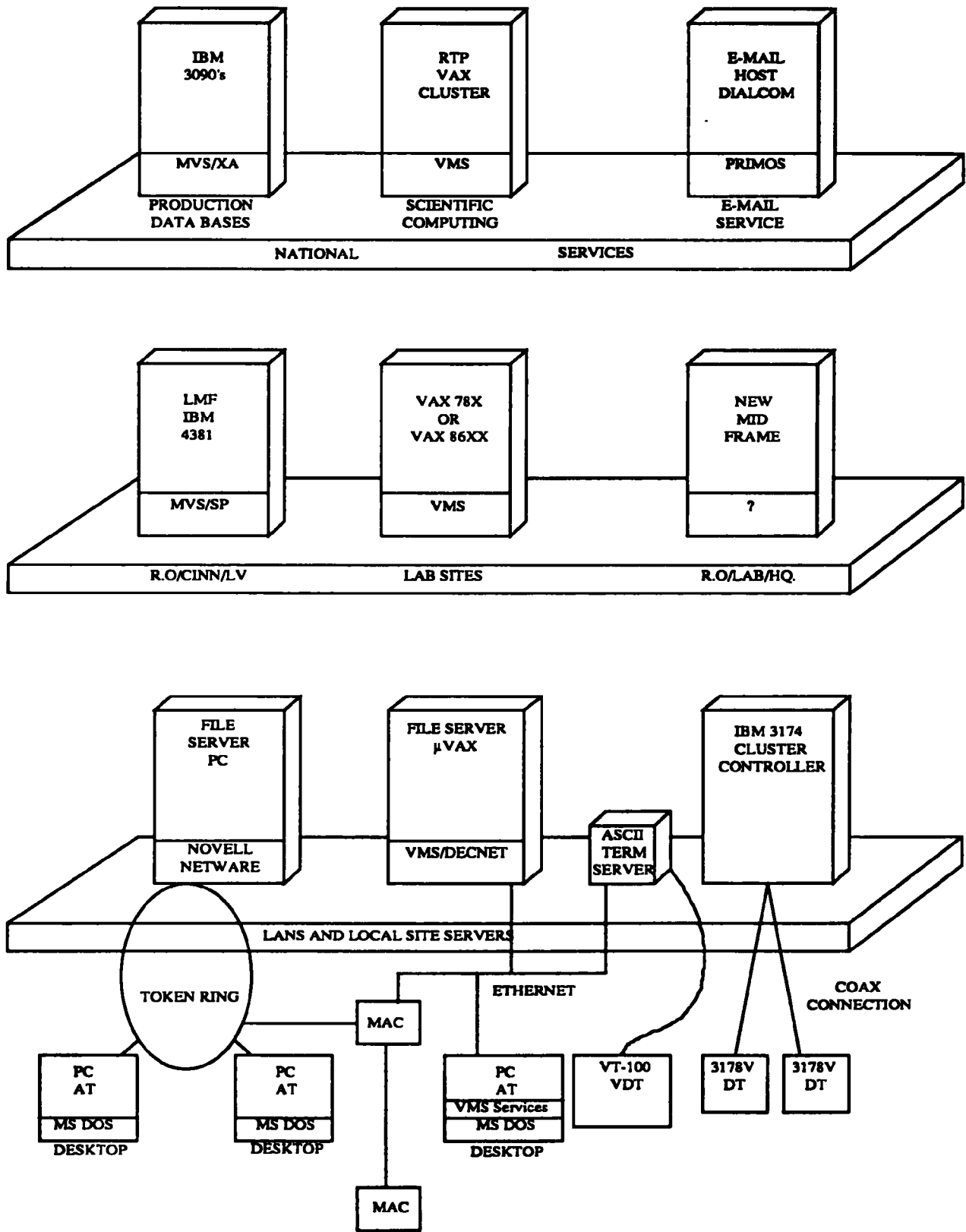


Figure D.1 - EPA Hardware Configuration

EPA DATA COMMUNICATION ARCHITECTURE

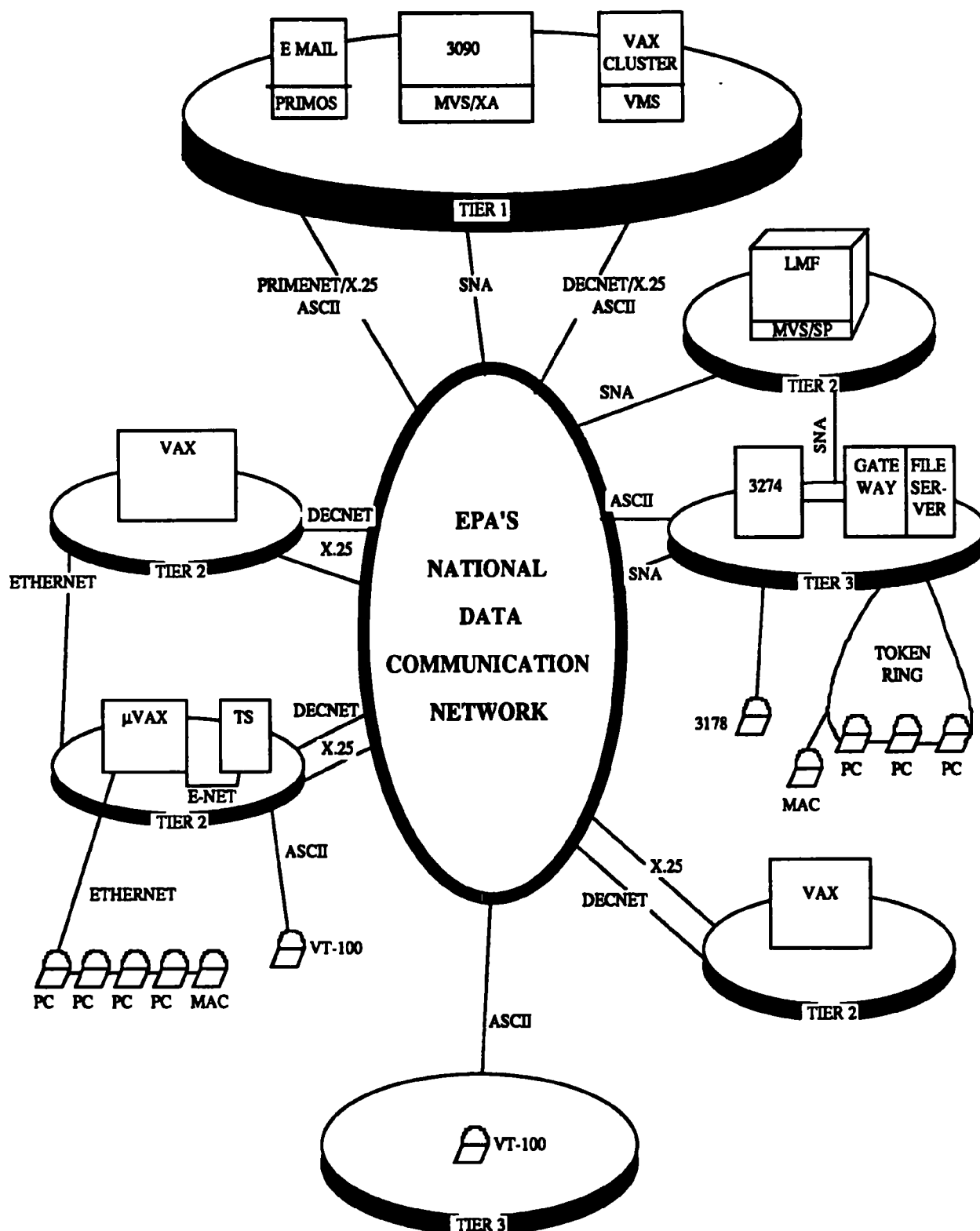


Figure D.2 - EPA Communications Configuration

D2.2 MINICOMPUTERS

D2.2.1 DEC/VAX Environment

The VAX family of processors ranges from high capacity mid-range systems to multi-user microcomputer systems. Agency laboratories use the VAXs for scientific data collection, computing, and analysis. The X.25 network links all the laboratory VAXs to the NDPD VAX cluster and to each other. A strength of the VAX line is the high degree of compatibility between processors. Software developed for one machine may easily be transported and installed on another member of the VAX family. This provides the capability of easily upgrading system capacity when necessary. The VAX processors provide multi-user support ranging from 12 to 100 users depending upon the size of the processor.

The standard operating system for the VAX processors is VMS. This operating system provides an environment which will support interactive time-sharing, batch applications, and on-line program development. A UNIX based operating system, ULTRIX-32, is available to support application software requiring a UNIX environment.

VAX processors at RTP are linked together in a special configuration called a cluster. The cluster architecture allows up to 16 processors to be connected together using special hardware called a star coupler. In the VAX cluster, processing power is shared between processors and each processor has access to common data storage. The cluster architecture allows the total processing power to be increased simply by adding another VAX computer. The cluster also allows sharing of specialized hardware and software between many users.

VAX-11/750

The VAX-11/750 is the midrange member of the VAX family. It can support a maximum of 64 users. This model is the smallest member of the VAX line which can be added to a VAX cluster. (This restriction is removed with version 5 of the VMS operating system.)

VAX-11/780

The VAX-11/780 meets the needs of users with large data bases and extensive processing requirements. It can support up to 100 concurrent users. The VAX-11/780 supports a complete line of peripheral devices. It is compatible with DEC's Digital Network Architecture, Digital Storage Architecture, and the VAX cluster architecture.

VAX-11/785

The VAX-11/785 is an upgraded version of the VAX-11/780 and is available in the same configuration. The VAX-11/785 has more processing power, higher throughput, and supports more users.

VAX 8600

The VAX 8600 is the most powerful processor in the VAX line. This processor is over 4 times more powerful than the VAX-11/780. The 8600 supports high speed processing for large applications. The VAX 86XX series cluster at NDPD is capable of supporting hundreds of users and is used to process high-level, scientific applications.

MicroVAX II

EPA laboratories use the MicroVAX for data acquisition. The MicroVAX II has half the power of the VAX-11/780. It is also the lowest priced processor in the VAX line which uses Q-Bus architecture. This machine provides a migration path to the VAX architecture while protecting an existing investment in Q-Bus peripherals. The MicroVAX II may be used alone or be connected to a network or VAX cluster via Ethernet.

MicroVAX 2000

The MicroVAX 2000 is a low priced processor with the same performance as the MicroVAX II. The MicroVAX 2000 will not support the Q-Bus architecture, but may participate in a VAX cluster and personal computer local area networks. This processor will support up to 12 concurrent users and provides time sharing support.

D2.2.2 Prime Environment

The EPA uses Prime minicomputers at the regional level to support the Agency's office automation functions - especially E-mail. The Prime environment is not focused on the development of customized application programs. Each Prime can support from 16 to 128 simultaneous users. The Primes are linked via the Primenet network over local area network and WAN segments. Documents, files, and printing can be moved from system to system easily.

D2.3 MICROCOMPUTERS

D2.3.1 IBM-Compatible

IBM-compatibles, as defined here, are microcomputers such as the IBM PC-XT or the PC-AT. These machines provide the platform for software services such as word processing, spreadsheet analysis, and project management tools. The processors in this category are single user desktop machines. They may be customized to meet specific computing needs of a user by installing specialized software packages. These machines are frequently connected to larger systems to access common data files or specialized software tools.

D2.3.2 Desktop Publishing

The Macintosh line of microcomputers is the Agency standard for Desktop Publishing applications. The Mac Plus and the Mac SE are similar to the IBM PC-AT in computing power. The Macintosh's user-friendly graphical interface and support for postscript laser printers make these machines ideal for desktop publishing, drawing, and painting applications. The more powerful Mac II is also well suited to publishing tasks although the enhanced computing power is not required to support this application.

D2.3.3 High Performance Workstations

High performance workstations meet the needs of applications requiring powerful processors. High performance workstations are used as local area network file servers, high performance graphics workstations, sophisticated CAD/CAE workstations, and where multi-tasking, multi-user capabilities are needed. Processors in this category are based upon the Intel 80386, the Motorola MC 68020, and the Motorola MC 68030. Microcomputers available at EPA in this class are the IBM PS/2 model 80, the Sun 386i, and the Mac II.

D2.4 COMMUNICATIONS

A key element of the Agency's communications philosophy is that users have access to all computing resources transparently. Users do not need to understand the physical location of computing resources. This communication plan supports both the IBM SNA and X.25 environments. SNA is the network architecture for communication between the Agency's mainframes and remote sites. The X.25 network supports VAX communications and sites not requiring the full range of mainframe support.

Local Area Networks (LANs) are used to provide data and peripheral sharing between users within a department, or regional office. Users on a local area network may share printers, modems, software, and access to Agency mainframes and VAXs. Local area networks can be connected together by a bridge. A bridge is software that runs on the file server or a workstation that permits communication between local area networks. Gateways give multiple users on a local area network access to mainframe computers or VAXs.

D2.4.1 IBM Environment

The IBM communications environment centers around the SNA communications protocol. SNA is the protocol used to access the first tier IBM mainframes as well as the second tier LMF machines. Users needing access to the computers on these tiers would first access the National Data Communications Network which connects these platforms via SNA. The SNA architecture supports the LU6.2 protocol which forms the basis for IBM's Advanced Program to Program Communications facility (APPC). APPC allows personal computers to communicate with the mainframe as a peer rather than a dumb terminal. APPC is IBM's basic building block for developing distributed

applications.

D2.4.2 VAX Environment

Ethernet is the local area network used by EPA to connect personal computers and terminals to VAX computers. This is a bus architecture implemented on coaxial or fiber optic cable. Ethernet provides the platform on which DEC/NET is run. DEC/NET is the generic term for VAX communications software. DEC/NET provides connectivity between DEC computers in much the same way that SNA is used in the IBM environment. DEC/NET is also used on the X.25 network to connect all Agency VAX computers.

D2.4.3 Prime Environment

Ethernet is also used in the Prime environment to connect personal computers and terminals to prime computers. Prime/Net is the communication software used to implement connectivity over Ethernet. Prime/Net offers network services which include disk and printer sharing, E-mail, and remote login. Prime devices connect to the National Data Communications Network using Prime/Net.

D2.4.4 Personal Computer Environment

Personal Computers in non-laboratory environments at EPA are connected using the IBM token-ring local area network. It provides the same type of services to the user as Ethernet does in laboratory environments. The network operating system on the Agency token-ring local area networks is Novell's Advanced Netware. This software provides the ability for sharing of software, storage devices, printers, and mainframe connectivity.

D2.4.5 Macintosh Environment

Macintosh microcomputers are connected using PhoneNET. PhoneNET is implemented using twisted pair cabling or phone line connections. The network operating system which runs on PhoneNET is Appletalk or TOPS. TOPS is a sophisticated network operating system which allows the sharing of files between personal computers, Macintoshes, and UNIX systems. Appletalk is the network operating system that is provided by Apple with Macintosh computers.

**APPENDIX E - SAMPLE OPERATIONAL SPECIFICATIONS WORKSHEETS
AND
SUMMARY DATA QUESTIONNAIRE**

OPERATIONAL SPECIFICATIONS WORKSHEET

System Inputs

[illegible]

OPERATIONAL SPECIFICATIONS WORKSHEET

System Files

<i>File Name</i>	<i># of Records</i>	<i>Storage (Mb)</i>
<i>Total</i>		

OPERATIONAL SPECIFICATIONS WORKSHEET

System Outputs

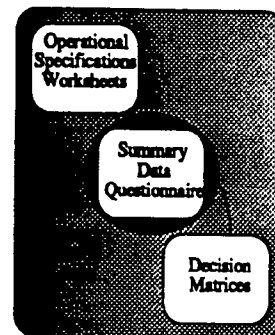
[illegible]

OPERATIONAL SPECIFICATIONS WORKSHEET

General System Requirements

[illegible]

SUMMARY DATA QUESTIONNAIRE



1. Who will be the audience for this system?

- ☐ National
- ☐ Regional
- ☐ Departmental
- ☐ Single User

2. Describe your environment:

- ☐ Laboratory
- ☐ Non-Laboratory

3. How many simultaneous users will the system have to support?

- ☐ 1 at a time
- ☐ 2-15
- ☐ 16-50
- ☐ > 50

4. **What is the maximum number of records that the system will have to manage or, what is the maximum amount of storage the system will use?

- ☐ < 10,000 records or 20 Megabytes of storage
- ☐ 10,000 < records < 50,000 or 100 Megabytes of storage
- ☐ 50,000 < records < 100,000 or 1 Gigabyte of storage
- ☐ > 100,000 records or > 1 Gigabyte of storage

5. What hardware do users have access to at your location?

- ☐ Macintosh
- ☐ PC
- ☐ LAN
- ☐ Prime
- ☐ VAX/VAX Cluster
- ☐ LMF/3090

6. A. Is data accessed directly from other Agency Systems? If so, where does it reside:

- ☐ IBM 3090
- ☐ VAX Cluster
- ☐ LMF
- ☐ VAX
- ☐ Prime
- ☐ PC
- ☐ Other _____

**File sizes should be an estimated maximum to be reached in 3-5 year period.

B. If you have data coming from other Agency hardware, in what type of system does the data reside?

- ☐ ADABAS
- ☐ Focus
- ☐ Other Mainframe DBMS
- ☐ Prime Information
- ☐ dBase III

7. Report Requirements:

- ☐ Adhoc reports (random retrieval)
- ☐ Standard batch report runs (defined data paths)

8. Do you need specialized output devices?

- ☐ Graphics Printers
- ☐ Plotter
- ☐ Other _____

9. System Response:

Reports: Onsite/Immediate ____
Batch/Overnight ____

On-Line Response Time in seconds: maximum ____

