

United States
Environmental Protection
Agency

Office of Administration and
Resources Management
Architectural Management & Planning Branch
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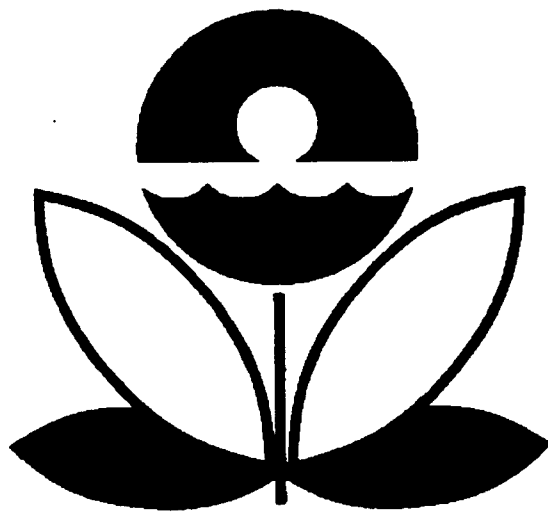
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Information Technology Architecture

Environmental Protection Agency

Information Technology Architecture



**Presented By
Architectural Management and Planning Branch
"EPA's Information Technology Experts"**

**National Data Processing Division
Research Triangle Park, North Carolina**

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Overview

This document provides a summary of the Environmental Protection Agency's (EPA's) current information technology architecture, its underlying principles, and its future enhancement efforts. The diagrams and text on the following pages form an overall picture on the Agency's information technology architecture and represents the decisions of IRM management. In addition to presenting the current architecture, the document reflects decisions and standards that are in the implementation process. Individuals involved in planning, implementing, and using the Agency's information resources will receive the greatest benefit from reviewing this document.

Section 1 - EPA's Current Architecture presents the Agency's architectural foundations, including the current hardware platforms, software tools, and data communications environment. The hardware platforms and software tools are linked in the architectural vision through the tier approach. The tiers are hierarchical - national resources and local/personal resources.

Section 2 - Acquisitions summarizes procurements that have recently been completed or procurements that are in process. The acquisitions represent the Agency's effort to implement and utilize the most modern technology to meet growing user demands.

Section 3 - Architectural Issues identifies areas of concern for information resource managers. The findings, recommendations, and limitations/actions proposed by the resolution team are described.

Section 4 - AMPB and the ITAS Contract provides a brief description of the Architectural Management and Planning Branch's (AMPB's) organization chart and the Information Technology Architecture Support (ITAS) contract, illustrating the team that coordinates the Agency's architecture development efforts.

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Section 1 - EPA's Current Architecture

Architectural Objectives

The initial objectives of the Agency's information technology architecture were developed by EPA Information Resources Management in 1984 as part of a modernization plan. Since initial development, these objectives have been periodically updated by the Office of Information Resources Management (OIRM) and the National Data Processing Division (NDPD). However, the fundamental objective of a multi-user, multi-platform, Agency-wide architecture has remained the cornerstone of the information technology development strategy.

The architecture consists of two major computing resources located at the National Computer Center (NCC) - the IBM mainframe and the DEC VAX cluster. The IBM platform, running the MVS/ESA operating system, supports the general user population with national applications and Agency databases. The DEC VAX platform, running the VMS operating system, is the primary resource supporting the computing and data storage needs of the research and laboratory community.

Minicomputers, LAN servers, and personal workstations bring computing resources directly to the user. MS/DOS and UNIX have been selected as the primary operating systems for desktop workstations.

The Agency complies with standards issued by several organizations including the National Institute for Standards and Technology (NIST). In an effort to conform to national standards, the Agency uses IBM's Systems Network Architecture (SNA) as the telecommunications architecture. SNA links IBM-compatible hosts at Research Triangle Park (RTP) and Cincinnati and provides terminal access to the hosts. VAX hosts are linked via the DECNET/X.25 architecture. ASCII interactive terminals access the IBM hosts at RTP through the X.25 protocol.

NIST has established the Government Open Systems Interconnection Profile (GOSIP), a federal standard for WANs. GOSIP promotes interoperability (the ability to transfer files, messages, and transactions) across heterogeneous vendor-specific computing platforms. The Agency is developing plans to implement the GOSIP standard on all of its major computing platforms.

Architectural Objectives

- Provide functions and capabilities required by Agency customers and anticipate their future needs
- Promote consistency with mainstream hardware/software platforms
 - IBM MVS/ESA and its successors as platforms for national production applications
 - DEC VAX/VMS for laboratory applications
 - MS/DOS and UNIX for desktop computing
 - Novell NetWare for Token Ring LANs to link PCs
 - DECNET and Ethernet LANs to link workstations in the laboratory environment
- Comply with FIPS and de facto standards to promote interoperability
 - SNA for IBM-compatible WANs
 - X.25 for connecting IBM, VAX, and other vendor processors
 - Comply with GOSIP Version 1 (FIPS 146) in the acquisition of all new computing platforms
 - MVS/ESA operating system for the IBM mainframe platform
 - VMS operating system for the DEC VAX platform
 - Novell operating system for Token Ring LAN file servers
 - UNIX operating system for imaging and geographic information system workstations
- Acquire and implement information technology components

Architectural Tiers

There are two levels or tiers of computing resources within the Agency. The tiers are distinguished by the relative power of the hardware platforms and the functions supported by their software tools.

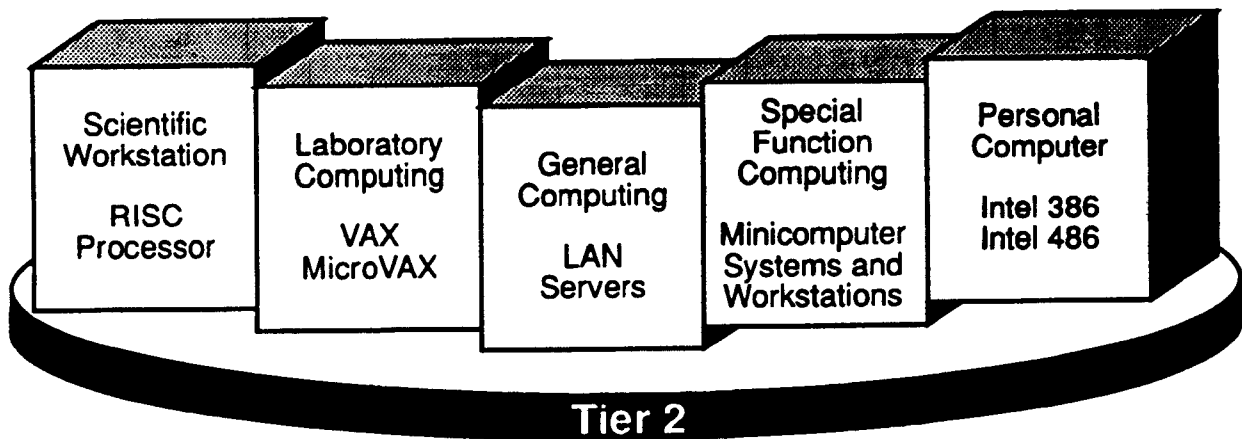
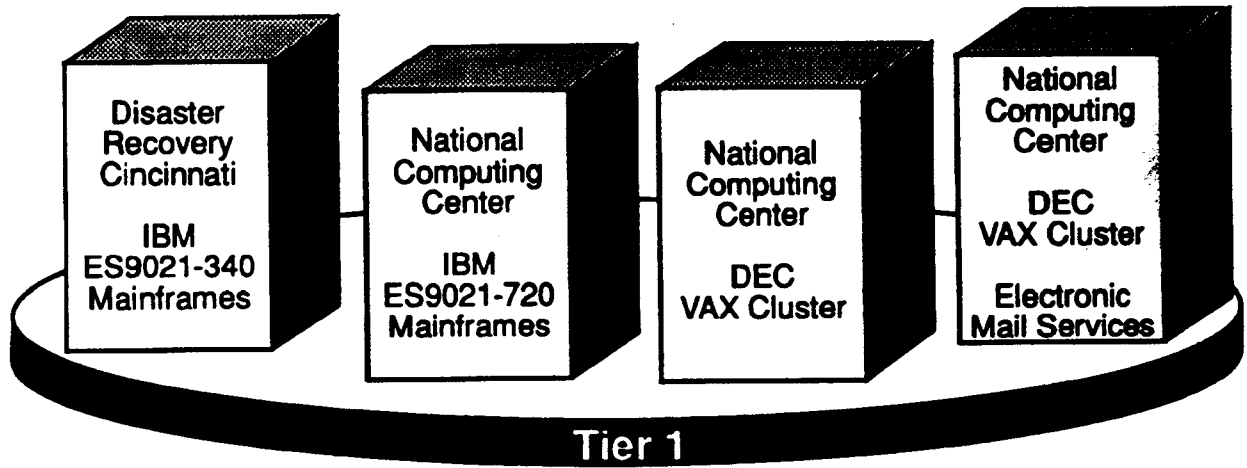
Tier 1 computing resources are national in nature and support the large processing requirements of users in both the administrative and scientific communities.

The IBM mainframe supports a significant portion of the Agency's national applications and databases. The critical nature of the mainframe's functions justifies the secondary mainframe located at a disaster recovery site in Cincinnati. The disaster recovery mainframe is capable of supporting the Agency's critical applications.

The VAX cluster serves the research and laboratory community and offers processing power that exceeds the local resources at most of the laboratory sites. While the VAX cluster supports many scientific computing requirements, the Agency has recently negotiated supercomputing resources from the Microelectronics Center of North Carolina (MCNC).

A separate VAX cluster provides Agency users with national electronic mail. DEC's ALL-IN-1 is an office automation system that provides electronic messaging, document transfer, and bulletin board services.

Tier 2 computing resources address the needs of specific locations, functions, and users. DEC VAX systems support the local needs of the laboratory and research sites in the Agency. Regional offices are supplied with LAN servers for processing regional and national applications. Special function minicomputers and workstations provide scientific platforms for Geographic Information Systems (GIS), Laboratory Information Management Systems (LIMS), and Image Processing Systems (IPS). In addition to these multi-user resources, tier 2 includes PCs that bring service directly to the user.



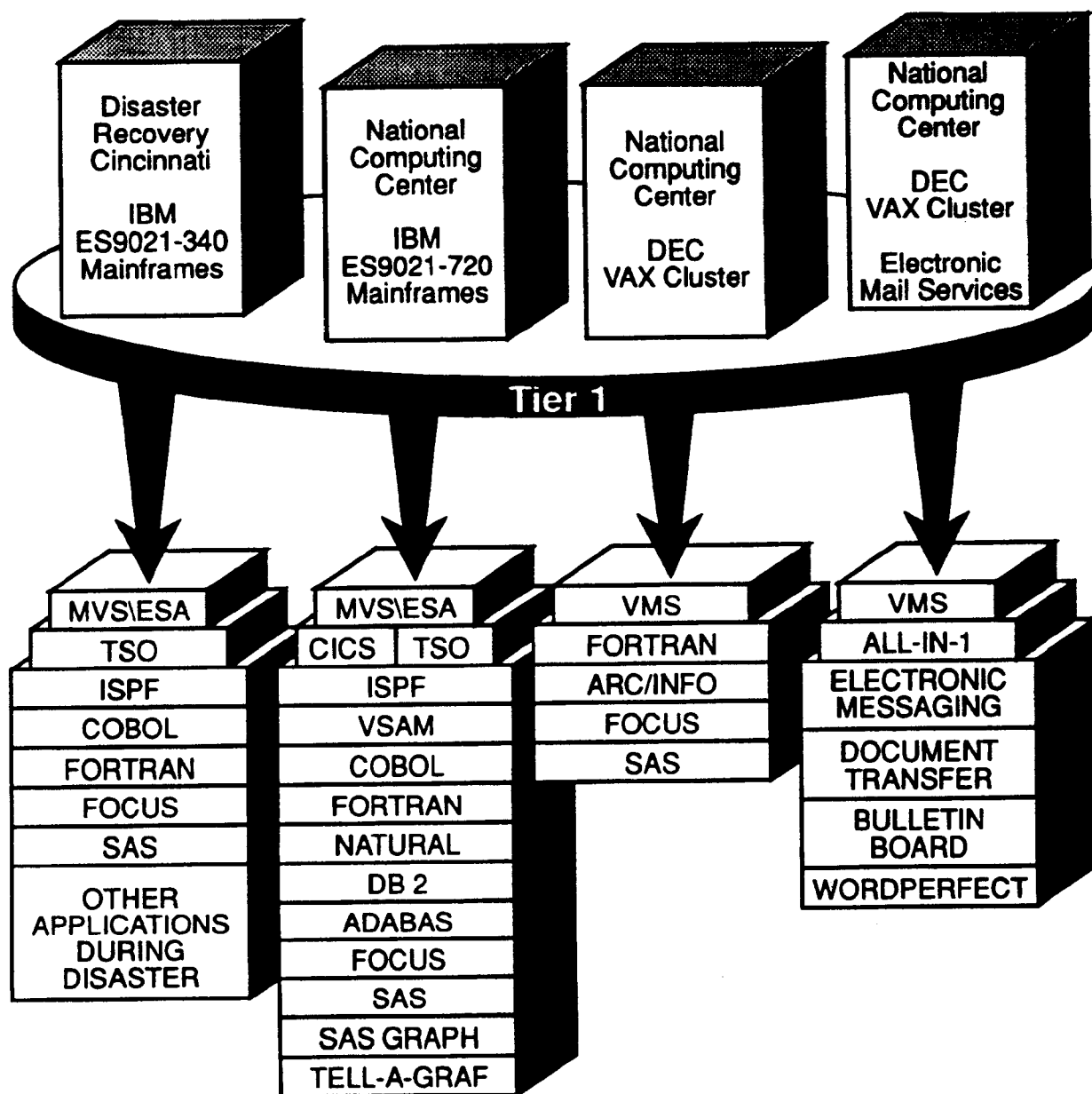
Tier 1 of the Architecture

The IBM host environment supports over 16,000 users for application development, transaction processing, national database applications, and file-oriented application systems. Information Builders Inc.'s FOCUS, a fourth generation language and database management system, is provided as a tool for end-user computing and small/simple applications. SAS is the Agency's approved software for statistical analysis and file management. SAS Graph and Tell-A-Graf are provided for graphics development and production. Programming languages such as C, FORTRAN, and COBOL may be used for application development.

The disaster recovery mainframe located in Cincinnati is configured with a limited set of the applications present on the mainframe host located at the NCC. The application support software residing on the disaster recovery mainframe includes SAS, FOCUS, and FORTRAN. All software tools required to run the Agency's critical applications are loaded onto the disaster recovery mainframe.

The VAX cluster utilizes many of the same software tools found on the IBM platform. The VAX cluster applications include FOCUS for database management and SAS and SAS Graph for statistical analysis and presentation. FORTRAN is available as the programming language on most of the tier 1 hardware platforms. ESRI's ARC/INFO allows the VAX cluster to process data in the Geographic Information System (GIS), which is present on tier 2.

A second VAX cluster has recently been installed to serve as the national electronic mail platform for the Agency. Residing on the VAX cluster is DEC's ALL-IN-1 office automation system. In addition to electronic messaging, ALL-IN-1 provides document transfer and bulletin board services.



Tier 2 of the Architecture

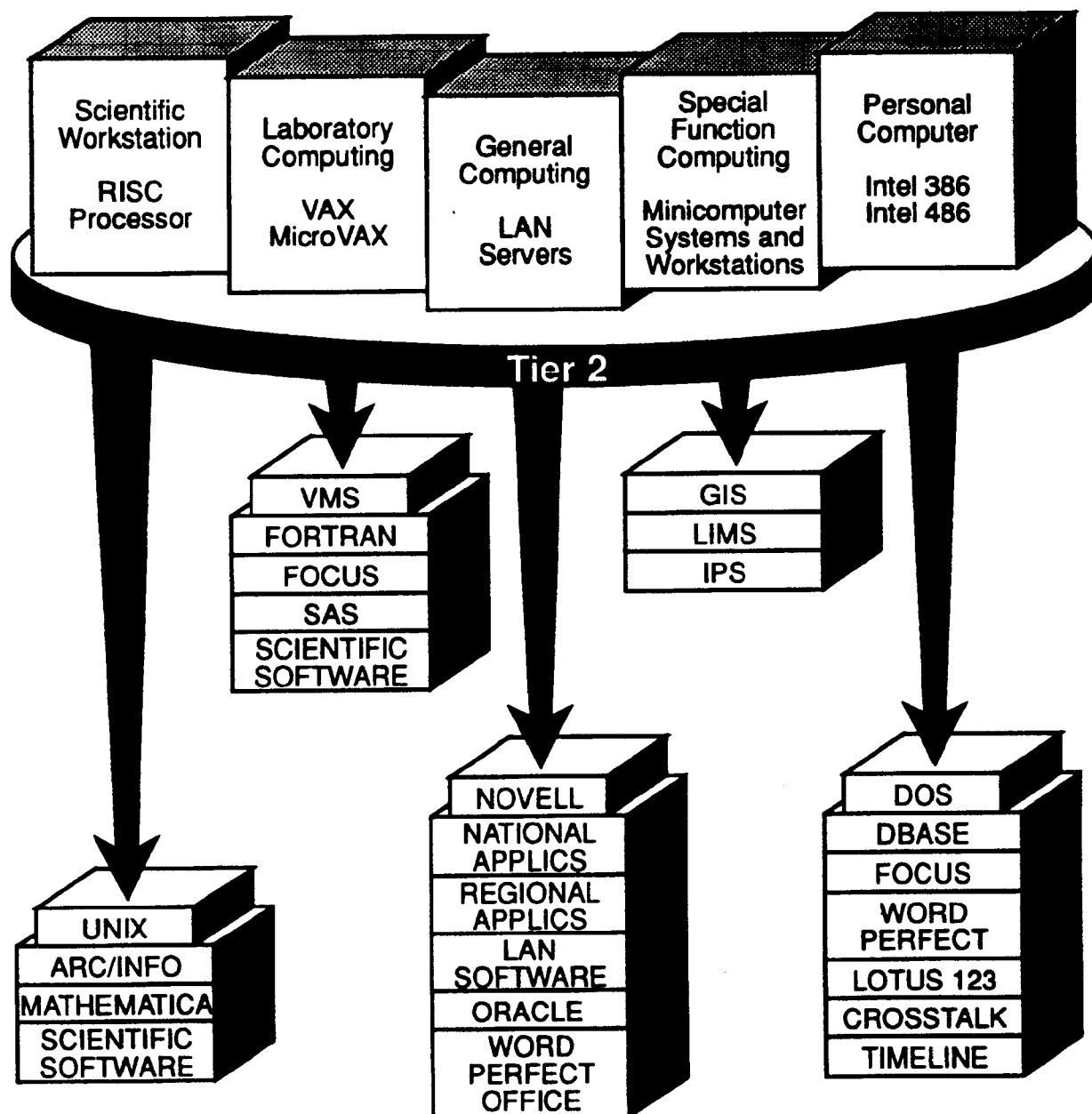
Tier 2 is becoming dramatically influenced by the large number of workstations and LANs within the Agency. The growth of LANs has prompted the implementation of the remote file server resource.

Remote file servers run the Novell NetWare operating system to support multiple users. The remote file servers support national and regional applications such as the Superfund Enforcement Documents Library System and the Personnel Information System utilized by Region 1. WASTELAN is a LAN-based national application for tracking hazardous waste sites. The Agency anticipates significant LAN-based application development on the remote file servers as they are fully implemented. In addition to environmental systems, the remote file servers support LAN-based office productivity applications such as WordPerfect Office.

DEC VAX and MicroVAX systems provide computing resources for the Agency's laboratories and research facilities. Many of the DEC systems are configured with FORTRAN for application development, SAS for statistical analysis, and FOCUS for database management. Many of the laboratories have developed scientific applications for the VAX and MicroVAX platforms.

Special function minicomputers and workstations provide the Agency with a platform for dedicated information systems. These computers support GIS, LIMS, and IPS.

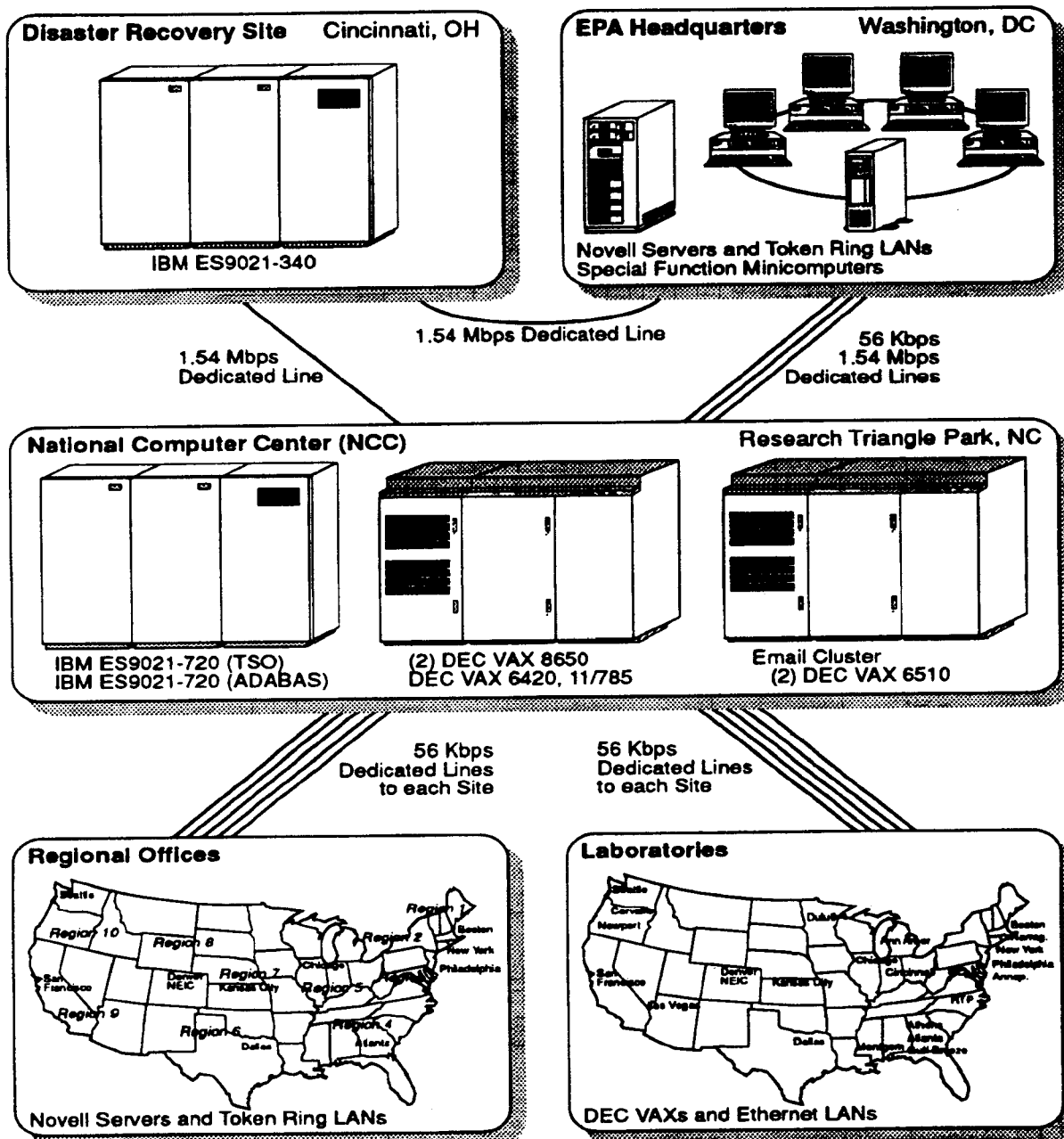
Workstations connected via Token Ring and Ethernet LANs link customers to more powerful processing platforms and facilitate the distribution of information. Departmental servers allow workgroups or teams to share common applications and frequently updated databases. The standard workstation is an Intel 386 machine. Intel 486 machines are available to meet users' high power workstation requirements and Reduced Instruction Set Computing (RISC) architecture workstations enhance scientific computing and graphics applications.



Hardware Locations



Architecture Overview



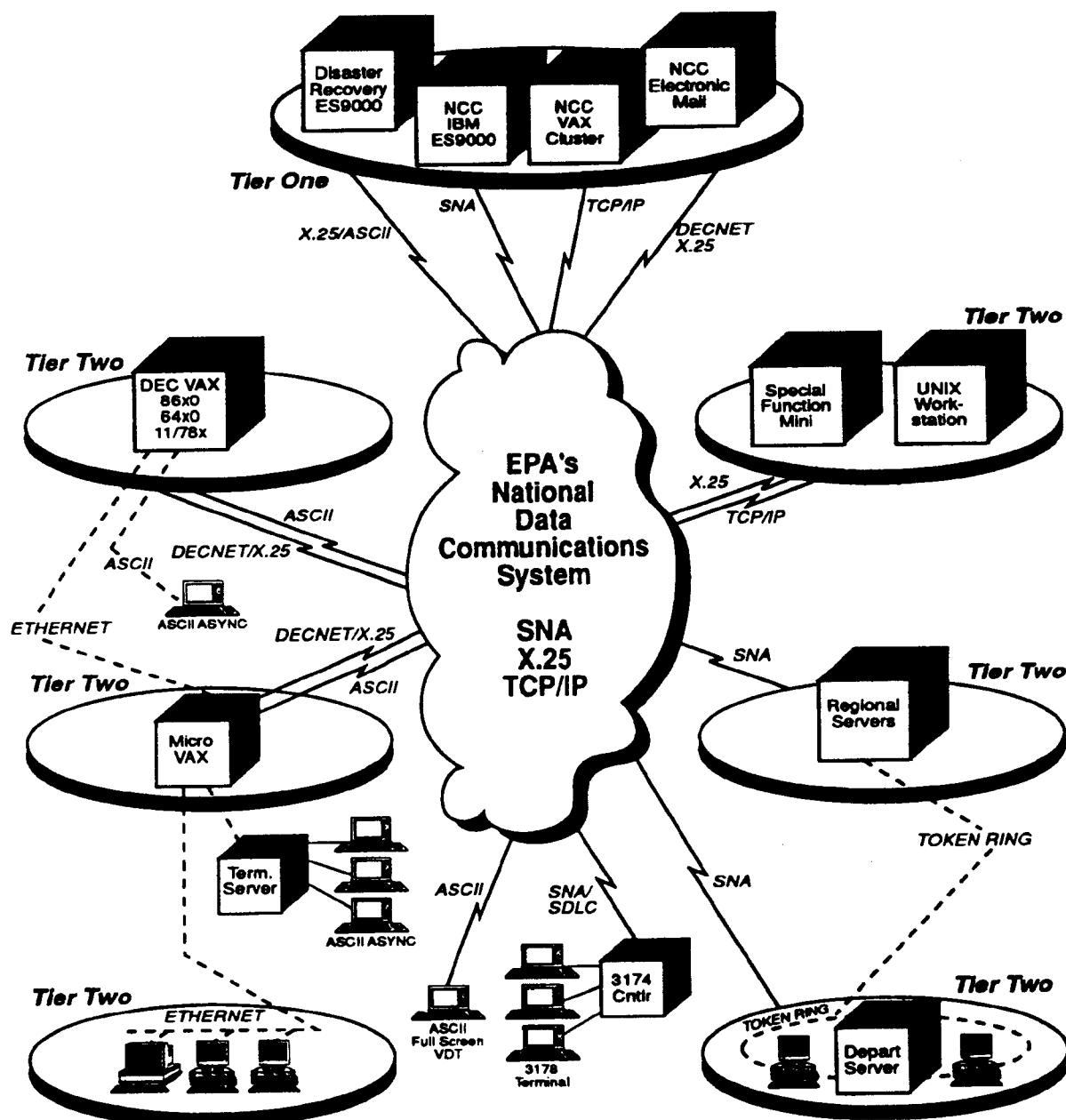
Data Communications

The Agency's data communications network serves EPA, state environmental agencies, other federal agencies, and commercial enterprises. To facilitate communication among these diverse organizations, the network supports interactive terminal access to tier 1 and tier 2 platforms for ASCII terminals and PCs. The network includes multiplexors and protocol conversion devices, communication controllers, X.25 switches and X.25 PADS. Some state IBM hosts are linked to the Agency's SNA logical network via the SNA Network Interconnect (SNI) feature. DEC-to-DEC communication is accomplished by DECNET architecture using X.25 as the transport protocol. DEC-to-IBM connectivity is provided via a DEC/SNA gateway at NCC.

Peer networking for remote PCs on Token Ring and Ethernet LANs is limited to a campus area environment. Wide area peer networking is planned for the future.

The network supports ASCII and SNA protocols for the IBM environment. The bulk data transfer feature of SNA is used for file transfer among IBM hosts. The Network Job Entry (NJE) component of SNA enables the transfer of batch jobs and print files among IBM hosts.

Data Communications



Wide Area Network

The Agency's data network provides access to users throughout the continental United States, Hawaii, Alaska, and Puerto Rico. The logical network consists of a backbone SNA network, an X.25 network, and a state network.

The network is evolving into a design that offers higher capacity and performance, greater reliability, and significant overall savings using FTS2000, the government's telecommunications system. The new network has the following design characteristics.

Each regional office and the Las Vegas laboratory is linked to the network with two 56 kbps circuits. The first circuit is primarily utilized for SNA traffic and links with NCC. The second circuit links the sites to Cincinnati and serves X.25 traffic. Should the NCC become incapacitated or should the primary circuit fail, SNA traffic to RTP can be switched to the second circuit. This disaster recovery back-up capability allows the regional offices to access the Agency's critical applications in Cincinnati when necessary.

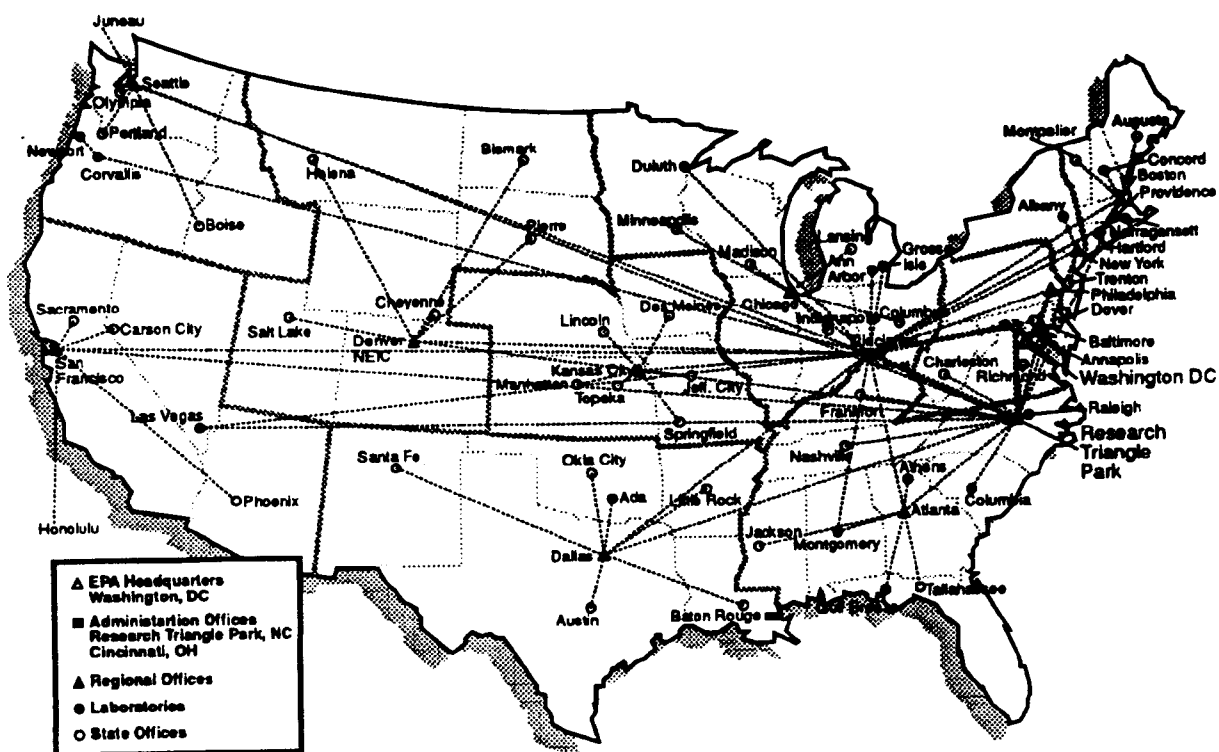
The NCC, Headquarters, and the disaster recovery site are linked through a T-1 triangle. The T-1 circuits permit high speed communication among the three major computing nodes.

All laboratory sites have 56 kbps access to Cincinnati. These circuits allow X.25 traffic to flow among the non-SNA platforms in the Agency.

These characteristics provide users with high speed connectivity among their terminals/workstations and remote processors. The lower cost of FTS2000 provides the Agency with an economically efficient network.

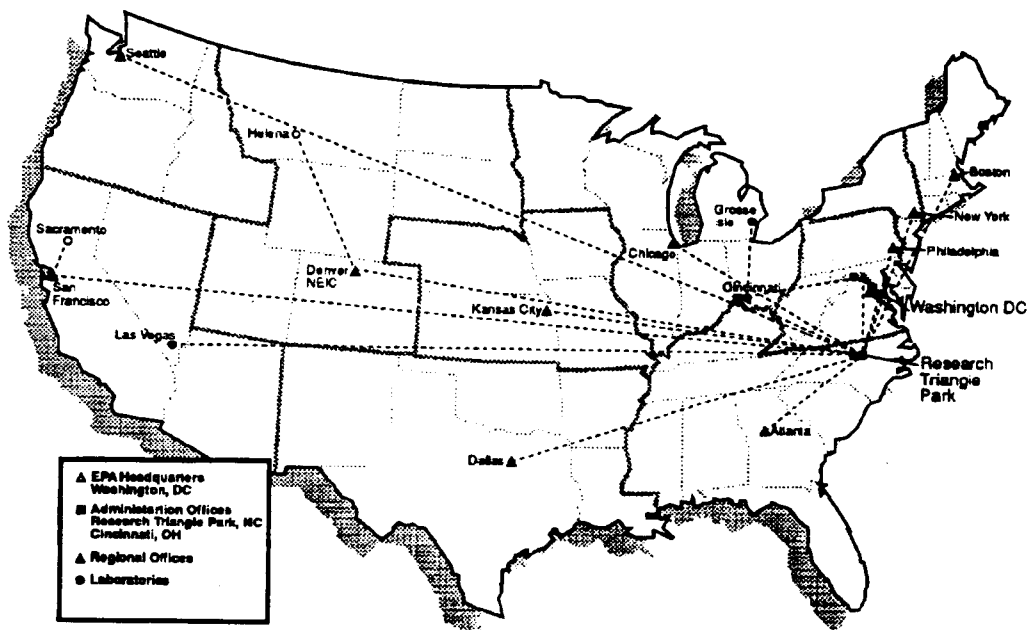
The three subnetworks that comprise the EPA National Data Communications System are described in the following pages.

Wide Area Network



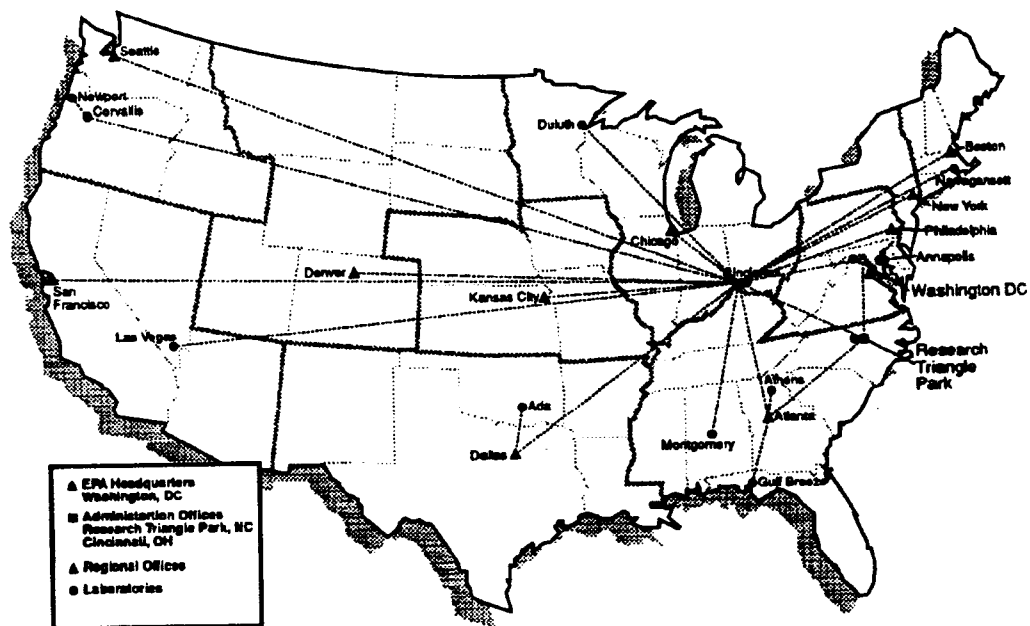
SNA Network

The Agency SNA network connects the Agency's headquarters, Cincinnati, and regional office facilities to the NCC. FTS2000 dedicated digital 56 kbps data circuits are used to connect IBM 3745 and IBM 3720 communications controllers located at each site. A triangle of Agency-acquired T-1 circuits links RTP, Cincinnati, and Headquarters in Washington, DC. The T-1 triangle serves as a "super backbone" and facilitates an alternative route for SNA and X.25 traffic as well as a dedicated high speed link to Cincinnati during disaster recovery operation. The SNA network provides NCC mainframe connection services for 3270 cluster controllers, SNA Remote Job Entry (RJE) workstations, and PCs attached to Token Ring LANs.



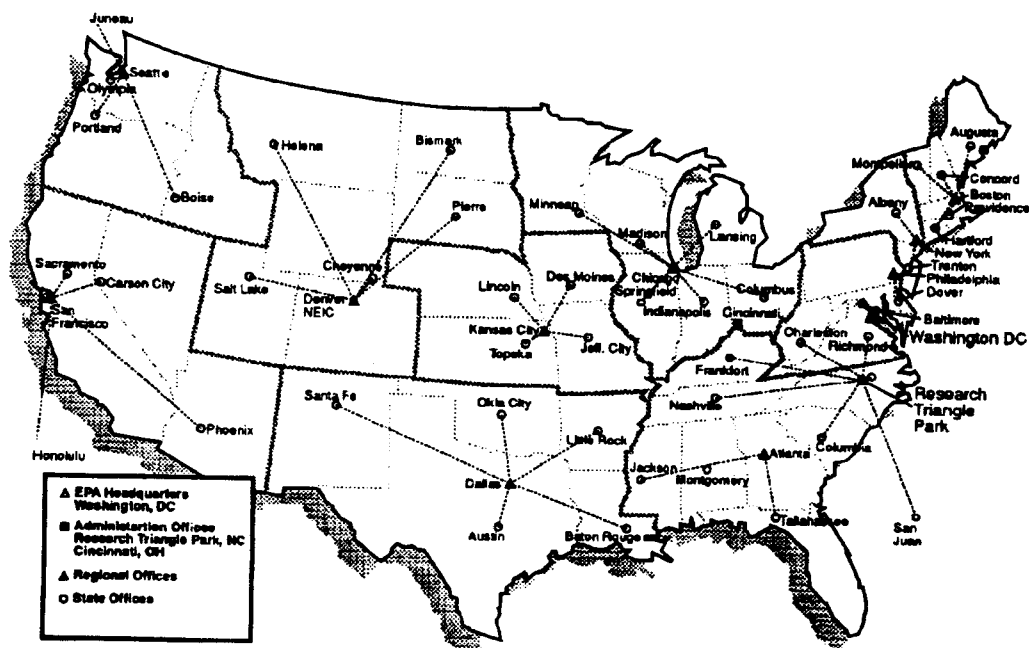
X.25 Network

The X.25 packet switching network connects the Agency's laboratory computers to the NCC. The X.25 network also connects the Agency's regional offices to the disaster recovery site in Cincinnati to provide alternative circuit routing for the regional offices. FTS2000 dedicated digital 56 kbps data circuits are used to connect Infotron X.25 packet switching equipment located at the major laboratories, EPA headquarters, and regional offices. The EPA X.25 network provides DEC-to-DEC host communications and support for the Agency ASCII (dial and dedicated) terminals via Packet Assemblers/Disassembler (PAD) connections. The packet switching network has connections to the FTS2000 packet switching network and the international value added network services provided by BT Tymnet.



State Network

The Agency's state network is a natural extension of the SNA and X.25 networks. Depending upon the requirements of the individual states, the Agency provides FTS2000 dial data services or FTS2000 analog leased line data service (16.8 kbps or less) to connect state-owned equipment to the EPA state network (SNA or X.25 networks). The Agency provides the protocol conversion service necessary to resolve any incompatibilities among state-supplied service and Agency application requirements.



Wide Area Network Standards

- U.S. ASCII asynchronous terminal communications
 - Migrating to a single Agency approach during FY91-92

- IBM protocols supported
 - SNA/SDLC PU.2, four 3270 terminals
 - PU.4, PU.5, four MSNF host-to-host SNA
 - SNA RJE and NJE
 - SNI gateway to state and foreign SNA networks
 - Bisynchronous RJE is being replaced by SNA

- X.25 packet switching networks, X.25 PAD functions, X.25 host
 - Functions migrating to full OSI compliant upper level protocols and FIPS 146 (GOSIP)

- DECNET DNA protocols over X.25

- PRIMENET X.25 related protocols over X.25 lower levels

- TCP/IP protocols for connectivity to both IBM hosts, DEC hosts, and the Internet

Local Area Network Standards

- IEEE 802.5 IBM Token Ring LAN media with upper layer protocols of:
 - Novell Advanced NetWare SPX and IPX protocols
 - IBM NETBIOS-related protocols for higher level connectivity
 - IBM SNA (PU.2 2.1) (LU.2 6.2)

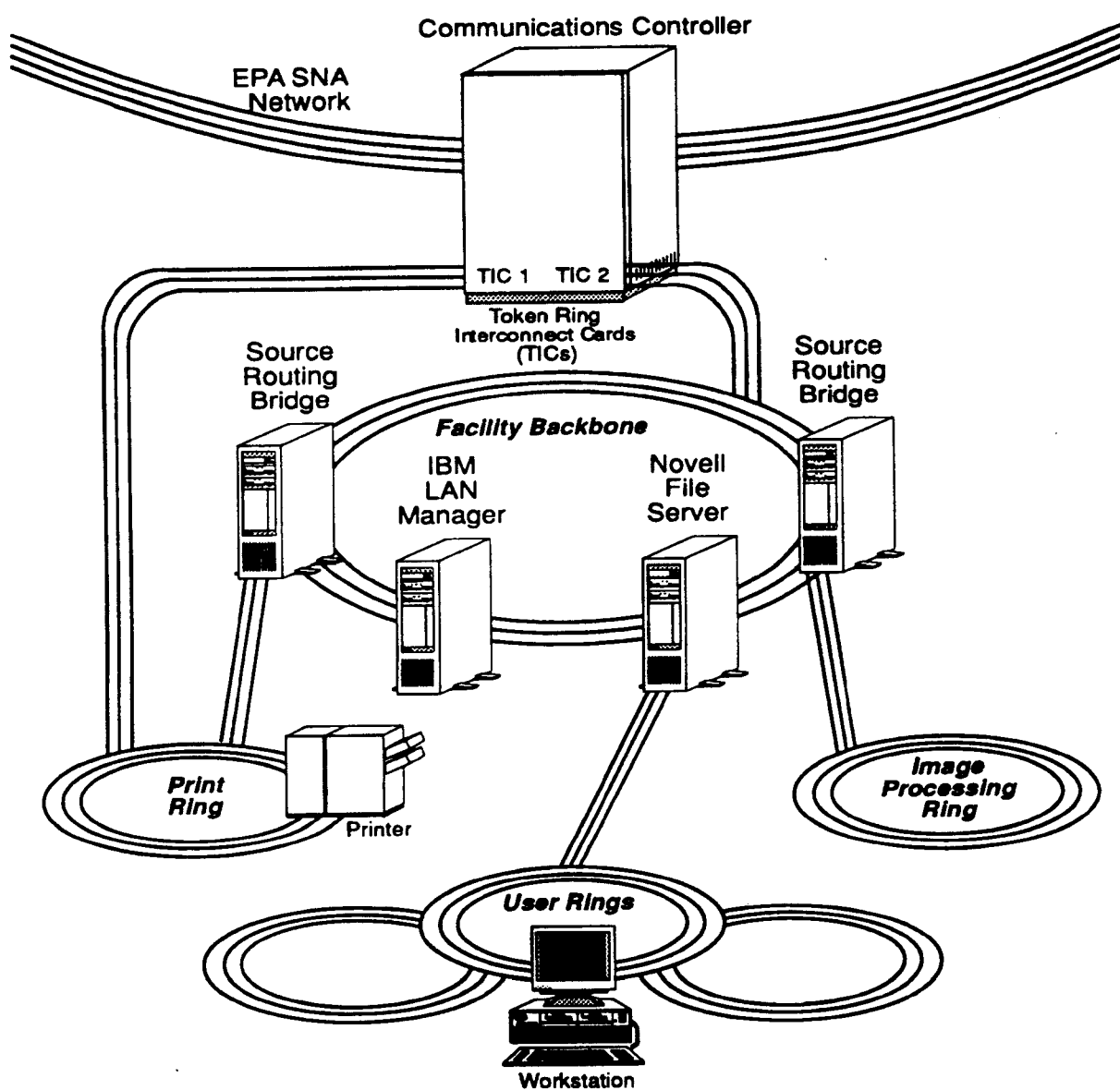
- IEEE 802.3 Ethernet LAN media with upper layer protocols of:
 - DECNET-related Ethernet protocols
 - Prime TCP/IP Ethernet protocols

- IEEE 802.2 media access control layer compliant protocols

- TCP/IP support for IBM mainframe and VAX cluster connection to the Internet

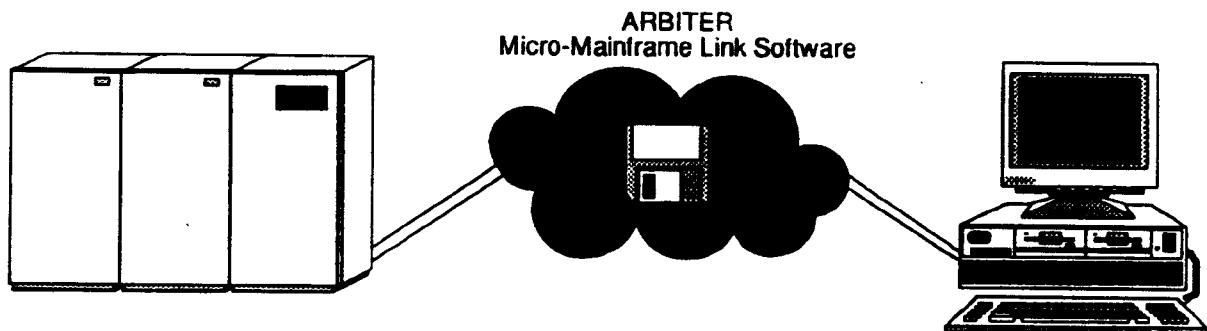
- TCP/IP support for connectivity to special function minicomputers and workstations

Regional Office LAN Connections



File Transfer

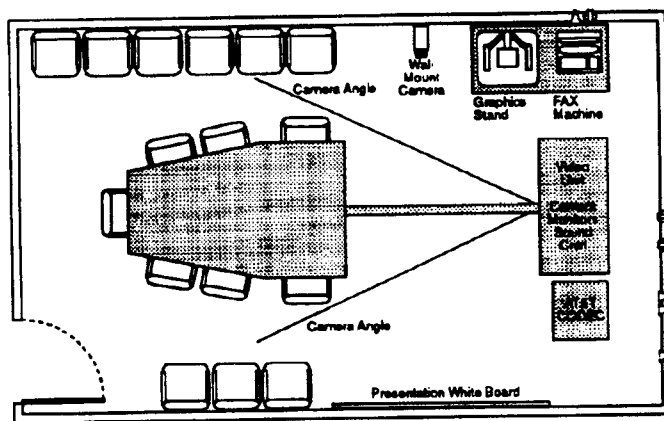
1. IBM Mainframe-to-File Server
 - ARBITER/POSTMAN, Micro-Mainframe Link Software
 - 3270 File Transfer
 - Kermit
2. VAX-to-VAX
 - DECNET/X.25
3. VAX-to-IBM
 - SNA Gateway
 - RJE, Distributed File Transfer, 3270 Emulation
 - NFS (Network File System)
4. VAX-to-PC
 - DECWindows
 - VAX to PCSA "LANWORKS"
 - Kermit
5. PC-to-PC in a Token Ring LAN
 - Novell NetWare
6. TCP/IP Platforms
 - FTP (File Transfer Protocol)
 - SMTP (Simple Message Transfer Protocol)
 - NFS



Video Teleconferencing

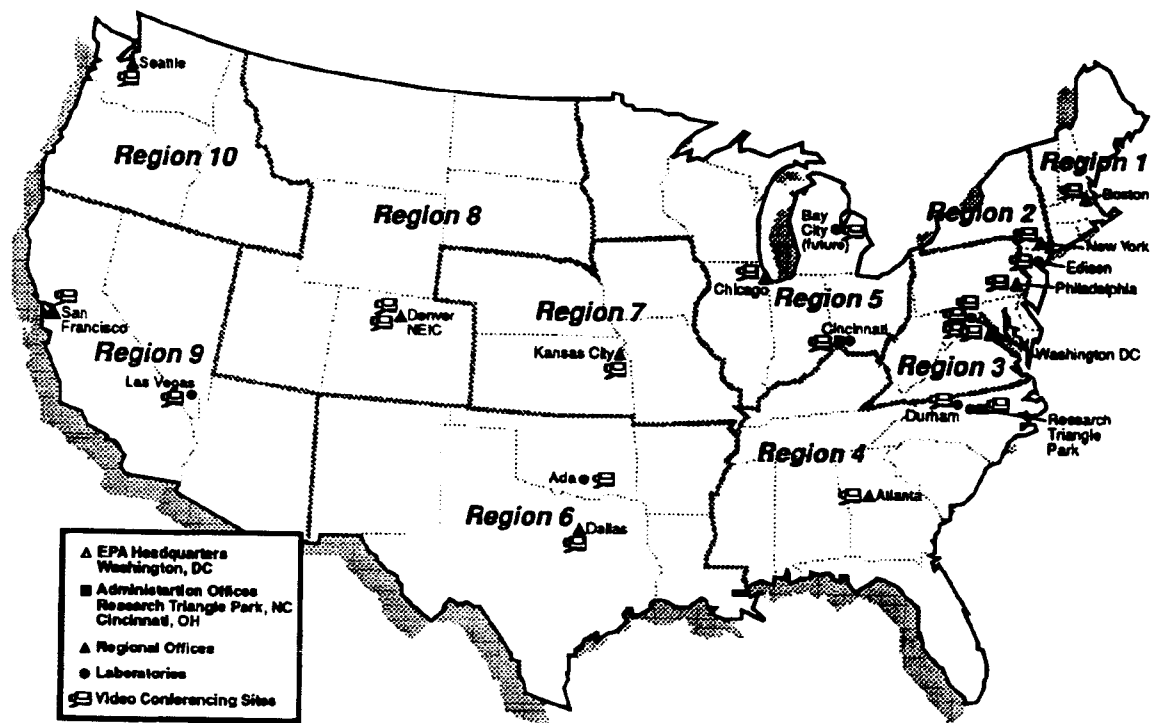
Video Teleconferencing is an electronic method of establishing a face-to-face meeting among work groups regardless of the distance separating them. It uses digital circuits provided by AT&T through the FTS2000 Network Service contract. Through a team effort between AT&T and NDPD, EPA established the first FTS2000 Video Teleconference network in the federal government on February 26 of 1990.

C-VTS uses advanced data communications techniques to encode live, color video, and audio into computer data. Each end of the circuit is equipped with an AT&T-provided Coder-DECoder (CODEC) that performs this function. The encoded video and audio is routed over the same FTS2000 network as other voice and data connections. At the distant end, the signal is decoded into the original video picture and sound. Any properly equipped EPA sites can be connected together upon request and may see and hear each other for the duration of the conference.



The EPA C-VTS pilot implementation that was conducted in FY90 included three sites - one at EPA Headquarters in Washington, DC and two in North Carolina. Sixteen sites were implemented during FY91 and four additional sites are identified for implementation during FY92 for a total of 23 sites. Eight of the EPA's 10

regional offices, several major labs, Headquarters, and the Administration Building in North Carolina are currently in service. Feedback to date indicates that EPA C-VTS is an effective method of conducting meetings and maximizing the use of employee time.



Installed Sites

Room 3307, Waterside Mall
 Director's Conf Room, Waterside Mall
 ERC, Waterside Mall
 Fairchild Bldg, Headquarters
 Mutual Building, OAQPS
 Administration Building
 NEIC, Denver
 ERT and ORD Laboratory
 ORD Laboratory
 ORD Laboratory
 ORD Laboratory
 Region 1 Office
 Region 2 Office
 Region 3 Office
 Region 4 Office
 Region 5 Office
 Region 6 Office
 Region 7 Office
 Region 8 Office
 Region 9 Office
 Region 10 Office

Washington D.C.
 Washington D.C.
 Washington D.C.
 Washington D.C.
 Durham, NC
 Research Triangle Park, NC
 Denver, CO
 Edison, NJ
 Las Vegas, NV
 Cincinnati, OH
 Ada, OK
 Boston, MA
 New York, NY
 Philadelphia, PA
 Atlanta, GA
 Chicago, IL
 Dallas, TX
 Kansas City, KA
 Denver, CO
 San Francisco, CA
 Seattle, WA

Future Sites

Judiciary Square
 ERC Laboratory

Washington D.C.
 Bay City, MI

Section 2 - Acquisitions

Recently Completed Acquisitions

Geographic Information System (GIS) Workstations

The GIS Computer Systems Acquisition provides a contract vehicle for acquiring hardware, system software, communications equipment/software, and utility software for the long-term implementation of GIS Agency-wide. The procurement is based on the ability to run ARC/INFO software from ESRI, Inc. on a UNIX platform. Data General will be providing the GIS workstations.

DEC Scientific Hardware/Software

The expanding requirements for processing power in the research and laboratory communities prompted the acquisition of new DEC hardware and software. A contract has been awarded to Digital Equipment Corporation to supply the Agency with upgrades, new hardware, and software. The contract is effective for five years and a separate maintenance contract will be effective for an additional three years.

SQL/RDBMS on LANs

The SQL/RDBMS architectural issue lead the Agency to examine and procure software for the LANs. The contract to provide SQL/RDBMS software was recently awarded to Oracle.

In Process Acquisitions

Agency Workstations

The Agency is conducting a competitive acquisition to provide workstations, LANs, associated hardware, software, and services for the next five years. The current interim contract will expire in February of 1992 and requires the completion of this long-term solution to the Agency's workstation demands. The proposals have been technically evaluated and final offers are under review. The contract award is scheduled to be made in the first quarter of FY92.

RDBMS for Scientific Computing

Data management is of prime importance to the scientific community. The goal of this project is to provide the scientific users in the Agency with a procurement vehicle for a comprehensive database management system that is compatible with DEC, UNIX, and DOS platforms. The system is to include a database engine and fourth generation language tool suite. A requirements analysis was completed and the RFP was issued in the first quarter of FY91. The final award for this procurement is scheduled for sometime during the second quarter of FY92.

High Speed Printers

The printing requirements of the Agency have grown significantly. To meet end-user demand, procurement activities are being conducted for the acquisition of high speed non-impact printers to meet the distributed printing requirements of the Agency. These procurement activities began in FY91 and RFP release is expected in December of 1991.

High Performance Computing

The initial steps toward the acquisition of high performance computing resources are completed. The RFP was finalized and issued in July of 1991. Evaluations are currently taking place and a contract award is estimated for the third quarter of FY92. The first of two high performance computers is to be installed at a new EPA Research Center in Bay City, Michigan. The second high performance computing system is to be installed at RTP, North Carolina.

International Network Access

This project will acquire the services required to provide the Agency with international telecommunications resources. The Agency will provide computing resources to international environmental management efforts. Proposals are due in December of 1991.

Section 3 - Architectural Issues

During the last year, NDPD reviewed seven strategic architectural issues.

- LAN as a National Application Platform
- SQL/RDBMS
- Logical Mainframe Futures (LMF) and Regional Servers
- Email and Document Distribution
- Common User Interface (CUI)
- AS/400 Utilization
- Information Resources Management (IRM) Training

An additional issue has been added this fiscal year to examine the role of UNIX within the Agency.

For each of the above issues, a project team composed of representatives from NDPD, OIRM, and other appropriate EPA offices and regions was established to study the impact of each issue on the future vision of information resources in EPA. Detailed workplans for each issue were then established so that progress could be easily tracked.

Evaluating these strategic architectural issues has allowed the Agency to take a proactive approach to harnessing computing technology for the benefit of EPA. This review has resulted in standard guidance to assist regions, program offices, etc. on a variety of technical decisions. These standards will facilitate the management of information and reduce maintenance requirements for information systems. Standards are ultimately helpful to data integration efforts by providing a common basis for all Agency participants.

LAN as a National Application Platform

Description: The integration of PCs, LANs, and LAN file servers offered the Agency an alternative to the traditional host processor platform for application processing. However, the Agency had not established the criteria for discerning which applications required a host vs. LAN environment. The Agency studied and evaluated the feasibility of using LANs as platforms for supporting national applications.

Findings: LANs can serve effectively as national application platforms. (National applications are Agency resources that are mission critical, involve significant data sharing, and are widely utilized.) National applications are ideal for LANs when they are reliable and when timely access is achieved. Effective data management and application performance must be unimpaired by the limitations of LAN technology.

Recommendations: National applications require an Agency-managed LAN utility complimentary but separate from user LANs. The organizational responsibilities to support LANs as national application platforms must be defined. National applications should be managed through their life cycle to support IRM objectives and information requirements. Management of the applications must be in accordance with federal and Agency IRM policy. EPA's System Design and Development Guidance should be updated to incorporate LANs as architectural platforms. LAN guidance must respond to changes and advances in information technology.

Initiatives/Actions: Activity is now underway to complete the policies and procedures that are necessary to implement EPA's LAN infrastructure for national applications.

SQL/RDBMS

Description: Two closely related areas experiencing rapid advances in the information systems industry are client server technologies and RDBMS. SQL has become the standard method for defining and manipulating data in a relational database environment. The Agency assessed the impact of SQL and RDBMS as maturing technologies to decide whether the Agency should commit resources to acquire, implement, and utilize this technology.

Findings: The relational model has significant inherent strengths that make it the driving force behind the current development of almost all database management systems. Furthermore, SQL standardization is allowing vendors of relational technology to make their products compatible in a distributed environment that extends across all hardware platforms. SQL/RDBMS utilization in a networked environment provides organizations with significant improvements in decision support, workgroup productivity, performance, connectivity, and data integration. Integrating environmental data using RDBMS technology should allow managers, planners, scientists, and users to incorporate previously inaccessible data into their analyses. RDBMS technology will also enable a distributed data model for the Agency.

Recommendations: SQL/RDBMS technology should be implemented on three independent platforms in the Agency. The platforms include the mainframe, the Novell LAN file servers, and the scientific processing platform. In order to strengthen competition, the selections should be related but not dependent.

Initiatives/Actions: The IBM software product DB 2 is being implemented on the EPA mainframes and will fully support RDBMS applications in FY93. A competitive procurement was completed for the Novell file servers. Oracle was selected and implementation planning has begun. A competitive procurement for RDBMS on the scientific platform is in progress.

LMF Futures and Regional Servers

Description: The IBM 4381 minicomputers or LMFs in each EPA region did not reach high utilization levels because of the advent of PCs and PC LANs. As a result, the LMFs were targeted for removal. With the exception of VAX minicomputers and the proposed AS/400 computers for image processing, the Agency has backed away from the use of minicomputers. The goal of this study was to examine the role of minicomputers in the Agency's future computing architecture.

Findings: There is continuing regional interest in local processing and the number of national and mission critical applications running in the regions is likely to increase in the future. The primary technical consideration was the replacement equipment for the LMF. The major choices were LAN servers or the AS/400, both of which are being evaluated separately as strategic architectural issues 1 and 6 respectively.

Recommendations: The long-term future of the Agency would be better served by a transition from the LMF technology to LAN servers in the regional offices.

Initiatives/Actions: The applications that were resident on the LMFs were transferred to the Agency's mainframe or the regional LANs. The regional LANs were strengthened with additional hardware and software. The LMFs have been removed. The initiative is now operational.

Email and Document Distribution

Description: Since 1983, EPA has provided computer-based messaging to its employees, affiliates, and contractors. This messaging, known as Email, uses a centralized mail architecture. Regardless of destination, all messages are routed through the central mail service. The major advantages of this central architecture are the reliability of its message delivery, the ease of message addressing, the overall ease of system management, and the maintenance of the mail directory. The Agency evaluated the efficiency and effectiveness of this architecture as services expanded to include more document distribution and heavier utilization of premium services, such as access to the Commerce Business Daily (CBD).

Findings: Email is critical to the Agency's business and ease of use is vital to everyone. The cost for providing Email through an outside service is expected to increase significantly, but the Agency can meet its Email requirements and reduce Email costs through an in-house solution. With the growth of LANs and the availability of LAN software, use of LAN-based Email systems is inevitable; however, current LAN systems alone cannot adequately support the Agency's Email requirements.

Recommendations: A three-phase approach is recommended for improving Email. By March of 1992, Phase 1 should maintain the centralized system architecture, replace purchased Dialcom service with DEC's ALL-IN-1 installed on Agency equipment, and build a foundation for inter-system messaging. By FY92/93, Phase 2 should integrate IBM 3270-based Email software, select Agency LAN Email software, provide acquisition vehicles, resolve and test X.400 capability with LANs, and gradually integrate LAN users with ALL-IN-1. Phase 3 should support user movement to LAN-based Email systems.

Initiatives/Actions: The conversion of Email from Dialcom to DEC's ALL-IN-1 occurred in August of 1991 and training has been provided for users. Work on Phases 2 and 3 is now being performed. The emphasis is being placed on the integration of LANs into the Email architecture.

Common User Interface

Description: Currently, the Agency develops applications for a variety of processing platforms and terminals. Each combination of platform and terminal presents a different interface to the user. The information systems industry is changing and developing CUI standards that cross platforms and hardware types. The Agency evaluated the emerging standards to determine which ones should be adopted and how many standards would be supported, as well as to identify standards for such items as function keys, menus, and help screens.

Findings: A CUI will significantly reduce the learning curve for new users of applications. There are two primary CUI standards - the Apple Corporation standard and the portion of IBM's Systems Application Architecture (SAA) that deals with common user access. The Apple Corporation standard is proprietary, but IBM SAA's open standard is available to all vendors.

Recommendations: The Agency should prepare to adopt CUI standards to provide guidelines to developers and programmers of EPA applications. The guidelines should define a standard layout for both text and graphics interfaces. These guidelines should provide the basis for a common user interface and common user actions that will produce the benefits attributable to these standards.

Initiatives/Actions: A detailed review of CUI both inside and outside EPA has been completed. The Agency is in the process of fully adopting the standard.

AS/400 Utilization

Description: With the award of the image processing contract, there was a potential for an infusion of IBM AS/400 systems into the EPA. Given the possibility that these systems might have more capacity than would be required for image processing, EPA initiated (1) an examination of the IBM AS/400's role in EPA's computing architecture, (2) an analysis of directions for the integration of image and non-image applications, and (3) the development policies for

AS/400 usage within EPA. Issues identified as relevant to these three strategic issues were researched and a consensus was built among project team members.

Findings: While the IBM AS/400 has served adequately as the introductory platform for EPA's imaging program, several factors identified in the research reduced the attractiveness of the IBM AS/400 as the sole long-term image processing platform for EPA. With the recent emergence of PC LAN-based imaging systems, there is little continuing justification to use a different hardware architecture solely to support imaging.

Recommendations: In view of the preliminary research results, the AS/400 will probably not be a significant component of the EPA architecture outside image processing.

Initiatives/Actions: The issue has been completed and the AS/400 is being used to support image processing.

IRM Training

Description: As the Agency continues to expend enormous resources to acquire or enhance its computing architecture, it must also find ways to maintain the dynamism of an aging workforce and to improve the educational preparation of all workers. To address these needs, the Agency examined the environments of EPA and the most promising technological tools and methods that would create the training system capabilities needed for the future.

Findings: To meet future employee skill and information needs, training will have to be available on demand at any site for multiple purposes and audiences. This will require centralized planning and centralized delivery. It must demonstrate a measurable impact on job performance while controlling costs. The majority of training should be delivered at the worksite, embedded in systems with individualized help and training sessions. The amount of formal classroom training will be reduced and selected specifically for programs such as the introduction of major new automated systems. It will become more efficient to bring the training to the students by means of distance learning technology either at workstations or at centralized training facilities.

Recommendations: The EPA should develop embedded training in major information systems in order to increase training at the workstation levels. EPA must place a high priority on establishing guidelines for new training technologies and employee training methodologies, as well as expanding training staff skills to exploit the power of individualized, interactive media. EPA should look to a centrally managed system of career-long tracking for employee development and a comprehensive evaluation monitoring system that will link training effectiveness and job performance. To fully implement an integrated training system, EPA should consider a reassessment of the role of training and the level of advocacy within the organization and, most important, the creation of a commission to oversee the various initiatives that will be required.

Initiatives/Actions: The Agency's senior management is in the process of reviewing the recommendations and making an implementation selection.

UNIX

Description: EPA has accepted the UNIX operating system as a step toward vendor independence in its procurement process. This architecture issue, which began in FY92, will address the major issues involved in the Agency's implementation of UNIX.

Section 4 - AMPB and the ITAS Contract

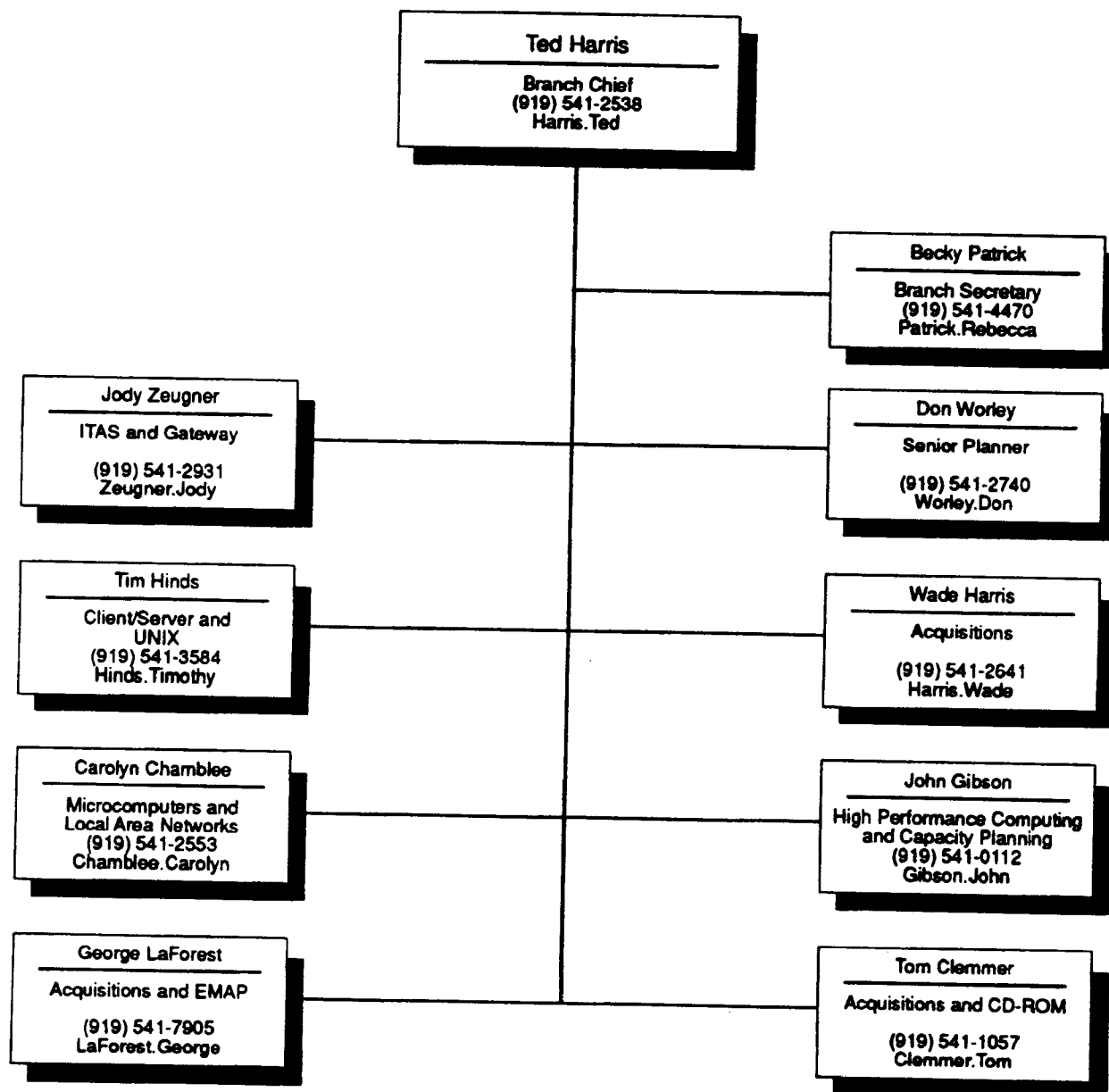
Architectural Management and Planning Branch

The Architectural Management and Planning Branch (AMPB) of the National Data Processing Division (NDPD) is the agent of change in the information technology environment of the Environmental Protection Agency (EPA). AMPB works closely with the Office of Information Resources Management (OIRM) at Headquarters, information system managers in program offices, regional offices, and laboratories to identify needs and develop new architectures on which the Agency's data systems are implemented. Key functions performed by AMPB include:

- Planning for Agency-wide computers, software, and telecommunications resources
- Determining the Agency's communications system needs
- Performing technology assessments and assisting Agency IRM management in establishing architectural standards
- Conducting Agency-wide needs analysis for information technology systems
- Conducting Agency-wide acquisitions of information technology resources
- Supporting NDPD in the management and modernization of information technology platforms and networks that are operated or supported by NDPD
- Assisting OIRM in generating system development guidelines, specifically the platform selection guidelines for national data systems

The organization chart on the next page identifies the specific roles of the technology managers in AMPB. In addition to these government employees, AMPB uses the resources of the ITAS contract with Viar & Company, Inc. and the Program Support contract with UNISYS to accomplish its mission.

AMPB Organization



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Information Technology Architecture Support Contract

The Agency has contracted with the ITAS contract team (Viar & Company, Inc., Technology Planning and Management Corporation (TPMC), and MNG and Keane, Inc.) to provide professional service. These services are acquired under the technical direction of the NDPD's AMPB.

The ITAS contract team provides Agency-wide support in performing the following.

- Management requirements and feasibility studies
- Systems design
- Systems evaluation
- Architectural strategy and planning
- Acquisition support
- Telecommunications network planning and design
 - Data networks (WAN and LAN)
 - Voice networks
 - Videoconferencing systems
- Capacity planning and performance management
- ADP resource management support
- Telecommunications resource management

In addition, the contract provides for the acquisition of national experts in several information technology areas (e.g., database management systems, optical disk technology, voice/data communications, distributed processing, CASE tools, etc.). The ITAS contract permits limited acquisition of hardware and software to perform technology assessments, pilot evaluation programs, and prototype development.

Ted Harris, AMPB Chief, acts as the contract project officer and performs technical and administrative management for the contract.

This document will be updated on a periodic basis as architectural strategies evolve and are approved by our IRM managers. Your comments on this document are appreciated. Please direct them to Ted Harris (FTS 629-2538 or Email ID: Harris.Ted).