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FEDERAL TELECOMMUNICATIONS MARKET

1988-1993

INPUT®

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Federal Telecommunications Market, 1988-1993

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Abstract

INPUT estimates that the federal government telecommunications market will increase from $3.5 billion in 1988 to $5.1 billion by 1993, at an average annual growth rate of 8%. This forecast reflects both a higher 1988 base market value and a higher growth rate than previously forecasted.

Most federal telecommunications expenditures remain concentrated in network services. However, agencies have experienced procurement problems in the current postdivestiture environment. Purchases have been delayed by reorganization issues and staff shortages as well as by a reluctance to accept new technology. Budget constraints under the Gramm-Rudman-Hollings Act will constrain future procurements, as will uncertainties surrounding the pending FTS 2000 program. The competitive outlook depends in large part on the resolution of these problems.

The report highlights major defense and civilian telecommunications initiatives scheduled for implementation over the next five years with special emphasis on systems such as GSA's FTS 2000 and DCA's Defense Switched Network. The report also examines the impacts of regulation, policy, and standards on future federal telecommunications acquisitions. Other major issues covered in the report include OSI standards, technological impacts, competitive trends, and industry reactions to GSA telecommunications initiatives.

This report contains 167 pages, including 52 exhibits.

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I Introduction

INPUT has prepared this revised report on telecommunications systems and services in the federal government as part of the Federal Information Systems and Services Program (FISSP).

Research for this revision is based upon new analysis of the INPUT Procurement Analysis Reports (PARs), and previous INPUT research conducted for the 1986-1990 and 1987-1991 Federal Telecommunications Market reports. Additional research included reviews of federal procurement documents and professional organization meeting minutes involving the FTS 2000 program, review of new federal information technology budget plans, and analysis of current prominent federal telecommunications issues in the trade press.

A Scope

The analysis in this report addresses those telecommunications systems and services programs listed in the OMB/GSA/NBS Five-Year Plan for government fiscal years (GFYs) 1988-1993, related federal agency long-range information resource management plans, and federal agency GFY 1988 and 1989 information technology budgets.

Earlier versions of the Federal Telecommunications Market report included data gained through interviews of various government and vendor personnel. Applicable elements of the interview data have been retained for the 1988 version.

The agencies selected for interviews were those identified as current users of telecommunications services or products. Major users of commercial leased telecommunications services were targeted for additional in-depth analysis. Contractors who were active in ongoing federal telecommunications programs, or listed as vendors of telecommunications services or products in INPUT's Vendor Analysis Planning Service data base for 1988, made up the list of vendors INPUT selected for interviews.

The period of interest for this report is GFY 1988 to 1993. Although GFY 1988 will be closed by the time this report is published, it will serve as the baseline for discussion of existing programs and as the point of departure for market forecasts.

B Methodology

INPUT analysts reviewed the OMB/GSA/NBS Five-Year Plan and the INPUT Procurement Analysis Reports for communications programs initiated during government fiscal years 1988-1993.

INPUT also examined agency A-11 submissions from calendar year 1988 for additional information on communications requirements embedded in distributed data processing and office automation programs.

The available agency long-range ADP plans for GFY 1988-1992 and 1989-1993 were also reviewed to identify plans for forthcoming major telecommunications systems and services contracts.

Annual reports from agencies with regulatory, standards, or policy roles were examined to determine future guidelines for federal telecommunications acquisitions.

For previous versions of the Federal Telecommunications Market report, INPUT developed questionnaires for interviewing both federal agency officials and telecommunications vendor executives. The agency questionnaire was designed to acquire information about plans for future use of telecommunications systems and services. The vendor questionnaire was designed to acquire current and future federal market plans from major players in the telecommunications industry. Both questionnaires included similar questions about contracting policy and preference, technical standards, and vendor performance perceptions. Copies of the agency and vendor (industry) questionnaires are included in Appendix F.

Federal agency officials selected for interviews included executives (policy), contracting officers (buyers), and program managers (users). Vendor representatives selected for interviews included company executives and high-ranking marketing personnel.

C Report Organization

This report is divided into five additional chapters, as listed below:

Chapter II—An Executive Overview summarizes the major points and findings in the report.

Chapter III—The Market Analysis and Forecast section includes INPUT's analysis of the telecommunications sectors of the Federal Information Technology Budget for fiscal years 1988 through 1993.

This section also addresses major market factors, agency forecasts, and vendor shares in various market segments.

Chapter IV—The Agency Requirements section provides commentary on key regulatory and policy agencies and on agency plans for acquiring telecommunications systems. This section also includes a discussion of current standards, protocols, and compatibility issues in the federal telecommunications market.

Chapter V—The Competitive Trends section provides analysis of the competitive environment in three key telecommunications market segments. This section also identifies the top five market leaders in each segment, and reviews the product mix in major federal contract awards over the past four years.

Chapter VI—The Telecommunications Opportunities section provides an agency-specific compilation of major federal telecommunications procurements scheduled for award in fiscal years 1989 through 1993.

Several appendixes are also provided:

- Interview Profiles
- Definitions
- Glossary of Federal Acronyms
- Policies, Regulations, and Standards
- Related INPUT Reports
- Agency and Vendor Questionnaires

II

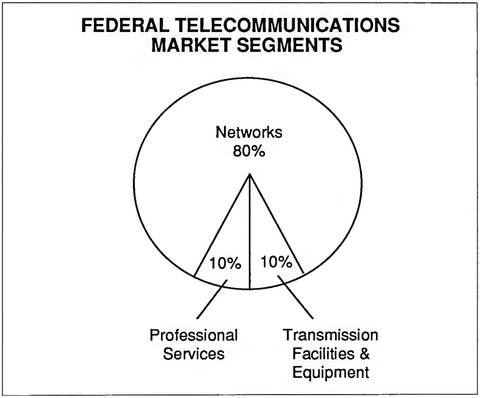
Executive Overview

A

Federal Telecommunications Market Segments

This market forecast focuses on several specific types of telecommunications systems and services commercially acquired by the federal government, as shown in Exhibit II-1:

EXHIBIT II-1



- Networks, such as common carrier, value-added, local area, and wide area, constitute about 80% of telecommunications procurements.

- Transmission facilities, such as cabling, switching equipment, and satellite ground stations, account for about 10% of annual expenditures.

- Professional services, such as network design, installation, and equipment maintenance, make up the remaining 10% of outlays.

The forecast also includes some telecommunications hardware and services acquired as part of other information technology programs, such as office automation and information systems, distributed data processing, and both C2 (Command and Control) and C3 (Command, Control, and Communications).

Local telephone service and the communications components of many intelligence and defense tactical/weapons systems are funded by the government outside of agency information technology budgets and consequently fall outside the scope of this market forecast.

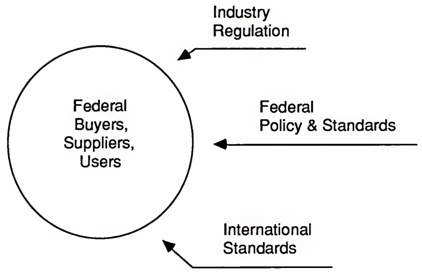
B

Market Environment

The federal telecommunications market is shaped by the procurement activities of the agencies and by a variety of regulatory, policy, and standards influences, as shown in Exhibit II-2. In the past year, procurement irregularities and problems have affected most major telecommunications procurements, causing numerous delays. As a result, some agency needs have gone unmet, and some approved funding has not been spent.

EXHIBIT II-2

FEDERAL TELECOMMUNICATIONS MARKET ENVIRONMENT



Most federal agencies are both direct buyers and users of telecommunications systems and services. Several agencies, however, function primarily as buyers or resuppliers of telecommunications resources for other agencies.

- GSA, through the FTS, WITS, ASP (now killed), and POTS programs,
- Defense Communications Agency (DCA),
- U.S. Army as executive agency for DoD part of WITS,
- U.S. Air Force and DoD executive agency for AUTOVON, and
- Defense Commercial Communications Office.

Other federal agencies influence the market primarily through regulation, policy, and standards activities. These agencies include the FCC, NCS, NTIA, NBS, OMB, and NSA. Since federal telecommunications access extends outside the government and across international boundaries, the market also is subject to external pressures from:

- International organizations such as CCITT, CCIR, ISO, and the ITU,
- National industry organizations such as NATA and ANSI, and
- PTT authorities in foreign countries.

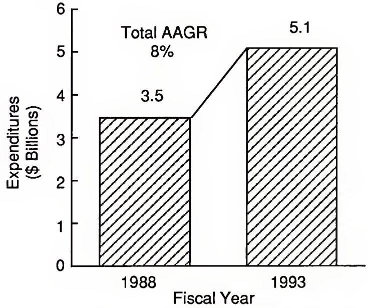
C

Market Forecast, 1988-1993

INPUT estimates that the federal government telecommunications market will increase from $3.5 billion in FY88 to $5.1 billion in FY93 with an average annual growth rate of 8%, as illustrated in Exhibit II-3.

EXHIBIT II-3

FEDERAL TELECOMMUNICATIONS MARKET FORECAST, GFY 1988-1993



Note: Dollars are rounded to the nearest $100 million.

This estimate reflects both a higher base (1988) market value and higher growth rate than previously forecasted. Many federal agencies reacted quickly to the effects of the AT&T divestiture by acquiring networks and

telephone systems in anticipation of future cost increases and mission requirements. Budget pressures, including those mandated through the Gramm-Rudman-Hollings Act, will constrain future procurements. A dramatic increase in DCA's budget, coupled with lesser but still significant decreases in other DoD agency budgets, has led to this sharp increase in INPUT's overall forecast.

Although most federal telecommunications procurement remains concentrated in network services, other market segments show significant growth trends. Replacement and lease-to-purchase conversion of existing communications hardware will spur capital investment through FY90. The above-mentioned procurement delays have caused a stretch-out of capital investment outlays.

Professional services, although representing a small part of the market, will exhibit the most consistent growth with an AAGR of 12%, primarily to cover maintenance and training requirements for communications systems purchased in the last few years.

D

Technical Trends

With the variety of emerging telecommunications technologies, most federal agencies have adopted a "wait and see" attitude, preferring to see network service vendors assume the risks associated with new technology. Defense and other agencies with geographically dispersed or campus-type facilities are moving more rapidly to implement satellite, digital microwave, fiber optic, and teleconferencing facilities. As with most other highly technical areas, agencies are relying primarily on contractors to take advantage of the new technology.

Although voice/data integration appears to be the catch-phrase for new federal telecommunications initiatives, integration will be limited to circuit and switching hardware capabilities. Integrated workstations will come into increased general use in the early 1990s. Providing interconnections and, more importantly, interoperability for the diverse existing federal hardware inventory will be a continuing technical challenge.

The federal government will continue its migration toward full adoption and enforcement of international standards, centered around the OSI reference model, to resolve interconnection problems. The Government OSI Protocol (GOSIP) has been established as a standard to become effective in 1990.

Federal agencies are growing more concerned with telecommunications security and requiring end-to-end encryption even for systems that handle nonsensitive information. Passage of the Computer Security Act of 1988 has heightened this concern. Exhibit II-4 outlines the expected technical trends.

EXHIBIT II-4

TECHNICAL TRENDS

- Limited Acceptance of New Technology
- Integration of Voice and Data Transmission
- Interconnection and Interoperability Problems
- Migration to International Standards
- Emphasis on End-to-End Security

E
Issues and Problems

Federal agencies and the private sector experienced similar types of problems entering the post-divestiture environment, as shown in Exhibit II-5. The government encountered more and greater problems since it is the world's single largest customer for commercial telephone service. Procurement problems continue to aggravate the situation.

EXHIBIT II-5

AGENCY PROBLEMS AND ISSUES

- Post-Divestiture Service Problems
- Budget Constraints (Gramm-Rudman-Hollings)
- Reorganization and Staff Shortages
- Few Established Standards
- FTS 2000 Procurement Problems

Agencies expressed growing concern over budget impacts of the Gramm-Rudman-Hollings Act. The impact on telecommunications programs may be mitigated, however, by cost trade-offs between actual travel and "travel by telecommunications." INPUT has observed a more common problem of approved money not being spent.

Agencies remain unprepared for the staffing impacts of divestiture and FIRMR-mandated integration of voice and data communications organizations. Agencies believe they cannot compete with the private sector to recruit scarce, highly qualified telecommunications specialists. This problem is not limited to the telecommunications area. Rather, it pervades virtually all highly technical areas in the government.

Telecommunications standards, except those inherited from the Bell system, vary from agency to agency. Although NBS and NCS have promulgated some joint standards, many agencies are waiting for a more comprehensive industry consensus. Work is progressing on the adoption of standards through the cooperative efforts of industry and agency groups. Although GOSIP is scheduled to become mandatory in two years, INPUT expects TCP/IP systems to continue in government for several more years.

Bidder protests and congressional investigations have substantially changed the bidding conditions, award schedule, and competition for the FTS2000 procurements. These delays improve prospects for GSA approval of additional agency independent network acquisition requests. However, Congressional pressure to make FTS 2000 universally mandatory may limit the available waivers.

F Leading Agencies

Although all federal agencies buy some commercial telecommunications systems and services directly, the annual procurement by DoD and GSA exceeds the leased telecommunications systems and services expenditures of all other agencies combined (Exhibit II-6).

- The Defense Communications Agency FY88 budget has increased to $1.2 billion for leased telecommunications expenditures.

- The General Services Administration information technology budget for FY88 included over $624 million for leased telecommunications.

Nearly all of the major new telecommunications initiatives from FY88 through FY92 also come from DoD and GSA. Defense communications will evolve from existing facilities such as AUTOVON and AUTODIN to the new Defense Switched Network (DSN), or the FTS 2000 system, depending upon the success of DoD FTS wavier requests. Further, the Washington, D.C. DoD agencies are now finalizing the requirements for a new Washington area telecommunications system known as TEMPO.

On the civilian side of the federal government, the GSA is pursuing a nearly complete replacement of current telecommunications resources through the POTS, WITS, and FTS 2000 programs.

Of the major network programs initiated by individual civilian agencies, several have been awarded and the remainder are being held, pending FTS 2000 award. Some of the more recent civilian network services contract awards have come from the departments of Treasury, Interior, Energy, and Agriculture.

EXHIBIT II-6

LEADING AGENCY LEASED TELECOMMUNICATIONS BUYERS

- FY 1988 Leaders: DCA $1.2 Billion/GSA $624 Million
- Defense and GSA also Lead in Initiatives:
  - Defense Switched Network (DSN), TEMPO
  - POTS, WITS, and FTS 2000

G Vendor Competitive Outlook

Despite divestiture and increased market pressure, AT&T remains the dominant market force. In addition to protecting its existing market share, AT&T has been successful as a team member in several recent new network procurements. However, AT&T is being challenged by a variety of other firms seeking specific market niches in the government.

Aside from the provision of local voice service, the Regional Bell Operating Companies (RBOCs) may not be a significant force in the federal market during the next several years. The continued constraints of structural separation intended to prevent the RBOCs from bidding major federal procurements are being challenged in the courts.

Several telecommunications companies from outside the old Bell organization, especially those that provide switching equipment and specialized network services, have shown increasing success in the federal market. With the exception of its Rolm subsidiary, IBM has not been a major market force in federal telecommunications. Acquisitions and alliances can place the company in position to make a stronger, broader-based entry in the market.

The window of opportunity for smaller telecommunications companies will close much more quickly than it did for their counterparts in ADP systems and services. The two-prime-contract approach dictated for FTS 2000 and the increasing preference shown by federal agencies for systems integration vendors could lock out smaller vendors who do not have close ties to established prime vendors in the federal information systems and services market. The competitive outlook is detailed in Exhibit II-7.

EXHIBIT II-7

COMPETITIVE OUTLOOK

- AT&T Remains Dominant
- Questionable Federal Future for RBOCs
- Non-Bell Companies in Some Market Segments
- Threat of Stronger IBM Market Entry
- Shake-Out on the Horizon

H Recommendations

All telecommunications vendors need to invest more effort in understanding agency missions and the communications required. This understanding may be difficult to achieve, yet will be a key factor in successful bids for agencywide telecommunications systems that support more than one mission.

Since the government continues to experience a shortage of telecommunications expertise, vendors can improve their prebid positions by providing education, technology forecasts, and planning guidelines through high-level briefings and meetings with federal officials. This marketing effort, as opposed to selling, will be a critical element in enhancing federal presence.

Vendors need to provide total telecommunications solutions, including preimplementation planning and postimplementation continued service. Agency officials frequently voiced concern over vendors, particularly in the hardware area, that provided inadequate support after installation. As a result, federal buyers are placing increased emphasis on corporate stability and reputation for services.

Vendors must move quickly to establish a viable market presence in federal telecommunications. Recent rapid market growth, primarily in

reaction to the AT&T divestiture, will likely slow and networks and hardware acquired during the mid-1980s are not likely to be replaced before the 1990s. Exhibit II-8 lists INPUT's recommendations.

EXHIBIT II-8

RECOMMENDATIONS

- Understand Agency Missions and Communications Requirements
- Provide Education and Assistance to Potential Buyers
- Emphasize Total Solution, Corporate Stability, and Service
- Move Quickly to Establish Market Position and Share

III

Market Analysis and Forecast

Although the federal telecommunications market has shown signs of increasing volatility, INPUT continues to believe that it will show sustained growth well into the 1990s. Despite market growth in terms of spending (as discussed below), the number of distinct opportunities will probably decrease. Growth in some segments of the market will level off by 1990 but will be offset by new growth in other market segments.

This section of the report presents INPUT's forecast for growth of the federal telecommunications market with supporting analysis of individual market segments, the competitive environment, and the potential effects of federal policy and regulation during the forecast period.

A

Federal Market Forces through 1993

The interaction of six major factors, listed in Exhibit III-1, will drive the federal telecommunications market over the next five years. While some areas and agencies will grow fairly slowly, others will experience very sharp growth.

Despite the continuing implementation of the Gramm-Rudman-Hollings Act, INPUT believes that the effects of budget constraints will be mitigated somewhat in the federal telecommunications market segment. Budget reductions actually may increase federal dependence on telecommunications services. Teleconferencing and electronic message distribution will be emphasized to reduce travel and other costs.

Current agency network service contracts typically last seven to ten years and will not be terminated due to budget constraints. New and replacement network acquisitions, however, may be deferred if agencies can meet their telecommunications requirements through existing federal resources. At this writing, FTS2000 is delaying many initiatives, as agencies await its availability to meet their enhanced telecommunication needs.

EXHIBIT III-1

MAJOR FEDERAL TELECOMMUNICATIONS MARKET IMPACTS

- Budget and Deficit Reduction
- Policy and Regulation
- Electronic Data Interchange
- Agency Requirements and Buying Trends
- Technological Advances
- Vendor Competition

The higher-than-average level of capital investment in telecommunications equipment during the past few years will be reduced as agencies shift from straight purchase to lease-to-purchase or lease-to-ownership acquisition strategies. Capital investments will be spread over several years through GSA Investment Accounts and timed acquisitions. INPUT's analysis of recent agency budget submissions supports this finding. Since the AT&T divestiture agreement became effective, federal agencies have been reacting to its effects.

GSA has been experiencing a continuing series of well-publicized problems with its telecommunications procurements. The General Services Board of Contract Appeals (GSBCA) has reversed some awards. GSA has replaced several key officials, in part as a result of its procurement problems. The still new and untested market environment, created by the AT&T divestiture, has attracted sharp public, press, and agency scrutiny. INPUT expects both congressional and executive oversight organizations to continue exerting considerable pressure. More competition will likely result.

Electronic Data Interchange (EDI), while lagging behind the explosive commercial growth, will still grow sharply. This will drive up telecommunications traffic, while reducing agency personnel requirements. As more computers tie in directly with their federal counterparts, the volume of information exchange will continue to grow.

Some other factors will drive the federal telecommunications market:

- Agencies will become more demanding and sophisticated in their telecommunications requirements, either riding FTS2000 or, when appropriate, initiating their own requirements-type contracts.

- Technological advances will change the market character. For example, as better network management tools become available, agencies will come to expect the resulting economies and efficiencies.

- As with most other federal market segments, competition will become more intense. Since this market still shows some of the vestiges of monopoly, the increase in competition will be even more dramatic.

- Communications security requirements will likely increase as a result of the Computer Security Act of 1988, as well as other forces.

- Further, security considerations will likely prevent much interaction between local-area networks in DoD, at least in the near future.

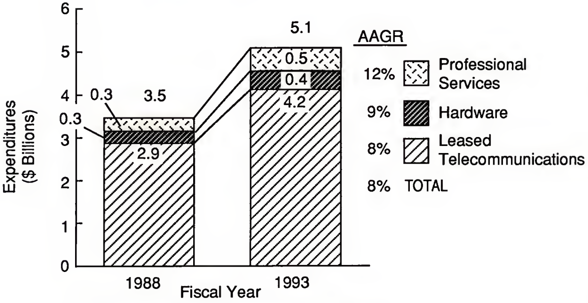
B

Forecast of Systems and Services

INPUT expects the federal telecommunications market to grow from $3.5 billion in FY88 to $5.1 billion in 1993. This represents an average annual growth rate of 8%, as shown in Exhibit III-2.

EXHIBIT III-2

FEDERAL TELECOMMUNICATIONS MARKET FORECAST, GFY 1988-1993



Note: Dollars are rounded to the nearest $100 million.

This market forecast combines several of the commercially defined systems and service modes described in Appendix B. Leased telecommunications include both networks and transmission facilities. The hardware category includes both communications devices and computer systems. The professional services category includes INPUT's five standard elements:

- Consulting
- Education and training
- Programming and analysis
- Operation and maintenance
- Systems integration

The forecast represents a major increase from that provided by INPUT in its previous telecommunications report. The change comes almost entirely from one line item in one agency's budget. The Leased Telecommunications Services line item changed drastically in the 43A submission of the Defense Communications Agency (DCA). Exhibit III-3 compares DCA's submissions in two successive years.

EXHIBIT III-3

DCA LEASED TELECOMMUNICATIONS SERVICES

FISCAL YEAR	SPRING 1987 SUBMISSION (000)	SPRING 1988 SUBMISSION (000)
1987	1,317	1,169,132
1988	1,621	1,203,280
1989	1,762	1,303,943

Sharp cuts in other defense telecommunications budgets compensated in part for this three- orders-of-magnitude increase at DCA. However, as shown later in this section, defense's telecommunications services budget increased by more than half a billion dollars. As a result, even though civilian agency budgets remained fairly static, the overall federal telecommunications budget increased sharply.

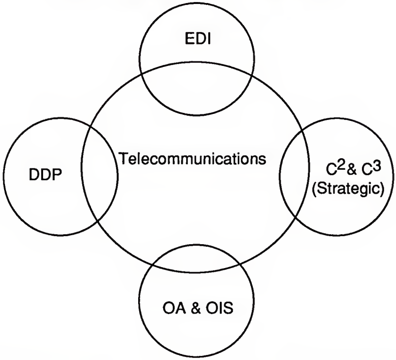
Growth in the overall professional services market is also driving the increase. Even though this represents the smallest portion of the telecommunications market, it continues to grow at the fastest rate. As noted below, a combination of various factors will open up more opportunities

for professional services vendors who focus on telecommunications. Further, as discussed later, some hardware buys have encountered procurement problems. As these problems are resolved, the government will increase the procurement of telecommunications hardware.

In addition, the forecast includes the integral communications components of hardware systems and professional services that support office systems, distributed data processing (DDP), and strategic C2 and C3 programs. As depicted in Exhibit III-4, INPUT included a percentage of the funding for these programs based on detailed analysis of the individual program telecommunications requirements. Electronic Data Interchange, as discussed in Section IV, will help drive up the use of telecommunication services.

EXHIBIT III-4

FEDERAL TELECOMMUNICATIONS - RELATED MARKET SEGMENTS



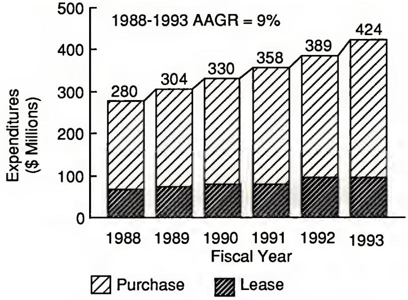
The large percentage of the market attributed to leased telecommunications services in Exhibit III-2 (83% in FY88, 81% in FY93) tends to obscure some important trends in the smaller segments. Despite an average growth rate near that of the overall federal telecommunications market, the hardware segment exhibits the greatest year-to-year fluctuation, as noted below. The professional services segment, although the

smallest of the three, exhibits the strongest, most consistent growth throughout the forecast period. This is also discussed below.

As shown in Exhibit III-5, INPUT expects steady growth in the hardware market, albeit starting at a slightly lower base than last year. The year-to-year reduction from FY87 to FY88 resulted from delays of approved procurements with approved funding. Many hardware buys, such as the GSA regional switch procurements, have been postponed by protests and administrative obstacles. Other programs have been put off pending the FTS 2000 award. Now agencies must accelerate purchases to realize the benefits of newer telecommunications technology.

EXHIBIT III-5

FEDERAL TELECOMMUNICATIONS HARDWARE MARKET FORECAST, GFY 1988-1993

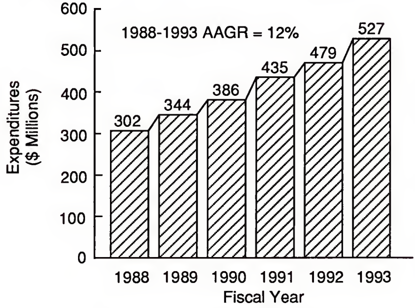


Note: Dollars are rounded to the nearest million.

INPUT estimates that the professional services segments of the federal telecommunications market will grow from $302 million in FY88 to $527 million in FY93, an AAGR of 12%, higher than the overall telecommunication growth rate. As seen in Exhibit III-6, year-to-year growth for professional services fluctuates somewhat but displays no decline throughout the forecast.

EXHIBIT III-6

FEDERAL TELECOMMUNICATIONS PROFESSIONAL SERVICES MARKET FORECAST, GFY 1988-1993



Note: Dollars are rounded to the nearest million.

- The combined effects of budget constraints on agency staffing and the shortage of in-house telecommunications expertise is expected to contribute to the growth of professional services throughout the forecast period.
- Growth in the FY88 through FY90 timeframe also will be driven by agency acquisition of maintenance services for the hardware purchased earlier.

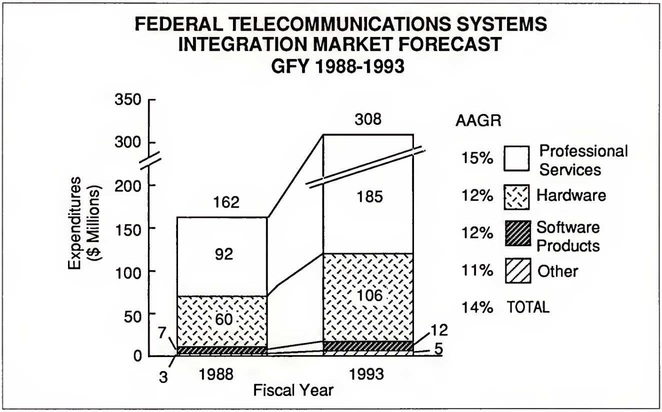
- The sharp increase from last year's forecast results from a rise of the leased telecommunications services segment as well as from growth in the overall professional services market.

As in most other information technology areas, agencies are reducing their own technical activities in network planning and management. Rather than just buying components, more agencies are procuring comprehensive solutions to their telecommunications needs.

Accordingly, with this release of the Telecommunications Market report, INPUT has developed a new forecast for systems integration for telecommunications. INPUT estimates that the systems integration portion of the telecommunications market will grow from $162 million in 1988 to $308

million in 1993, for an AAGR of 14%. Exhibit III-7 shows a detailed breakout of the various SI components.

EXHIBIT III-7



This forecast includes the four categories that INPUT includes in its overall government systems integration forecast. It assumes that FTS 2000 will be awarded during FY89. This will lead to significant upgrades in federal systems as individual agencies cut over to the new technology. The FTS 2000 vehicle will provide a key component of the overall telecommunications systems integration requirements.

As might be expected, professional services leads the growth rate, reflecting its sharp growth in both the overall telecommunications market and the overall systems integration market. The "other" service mode lags the growth rates, due to a relatively lower growth in the need for

- Site preparation
- Installation
- Test equipment and tools
- Documentations
- Test and acceptance.

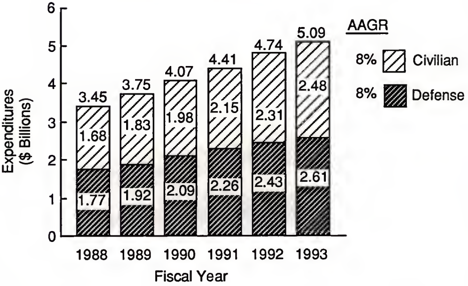
As the technology improves, agencies will not perceive as great a need for these products and services as they will for the larger categories.

C
Agency Forecast

The federal telecommunications market forecast by agency is based on information from long-range plans, OMB A-11 submissions, the FY88 and FY89 budgets of the United States, and interviews with agency officials responsible for telecommunications programs. As shown in Exhibit III-8, INPUT estimates relatively equal growth in defense and civilian agencies, with defense spending slightly larger. This shift arises from the big increase in the DCA budget, discussed in the preceding section.

EXHIBIT III-8

FEDERAL TELECOMMUNICATIONS MARKET FORECAST DEFENSE AND CIVILIAN, GFY 1988-1993



1. Special Defense Considerations

INPUT regards the defense telecommunications forecast as a conservative estimate of the defense market for commercial systems and services. Base or facility communications, which are not acquired through agencywide programs, are usually not identified in agency information technology budget documents. This is particularly evident for recent telephone switching equipment and local service acquisitions at military bases. This situation may be changing somewhat, however, based on the most recent numbers.

Upgrades to base communications systems and local telephone service typically fall below budget reporting thresholds and may be funded through operation and maintenance budgets. All unclassified programs with a system life cycle cost of over $25 million will be reported by the military departments in response to Congressional Armed Services Committee Directives. This new reporting limit represents a significant change, equaling the previous one-year limit set for MAISRC review.

A significant amount of defense communications equipment funding is included in weapons programs and strategic systems. This funding is not regarded by DoD as part of the information technology budget. Other sources provide a general picture of the magnitude of the defense communications market. The defense budget for intelligence and communications missions is expected to exceed $33 billion by FY88 and has been growing since 1984 at an AAGR of 14.3%. The FY86 defense budget included over $8.2 billion for communications and electronics equipment. The FY87 defense appropriation for DCA included $10.8 million for acquisition of hardware in support of the Defense Switched Network (DSN).

2. Leased Telecommunications Procurement

Exhibit III-9 shows the current and forecast distribution of leased telecommunications service procurement by agency for major defense and civilian buyers. Several assumptions about the forecast must be noted for interpretation. Both the army and the navy rank in the top ten users of FTS as measured by interagency payments. For this forecast, however, all FTS expenditures are included in the civilian numbers since GSA ultimately acquires the commercial services to support FTS. The GSA forecast assumes replacement of FTS with FTS 2000 beginning in FY89 at an annual operating cost of approximately $400 to $500 million.

The Air Force forecast assumes that the service retains its status as executive agency for systems such as AUTOVON and AUTODIN/DDN. In the event that DSN is implemented before 1990 under DCA funding, the Air Force forecast would be reduced significantly. The large increase shown in the Treasury forecast reflects increased telecommunications use by IRS in support of the tax system redesign and electronic tax processing initiatives.

Although individual agencies may acquire new telecommunications services during the forecast period, new and replacement network acquisitions by defense and GSA are more prominent:

EXHIBIT III-9

LEASED TELECOMMUNICATIONS SERVICE PROCUREMENT BY AGENCY

DEPARTMENT/ AGENCY	$ MILLIONS	
	FISCAL YEAR 1988	FISCAL YEAR 1993
Defense		
OSD; Other DoD Agencies	1,233	1,923
Army	120	187
Air Force	115	171
U.S. Marine Corps	18	27
Navy	17	27
Civilian		
GSA	624	767
Treasury	166	258
Agriculture	80	130
Veterans Administration	60	85
Health and Human Services	53	72
Justice	40	49
EPA	27	40
NASA	24	34
Tennessee Valley Authority	21	28
Interior	20	26
Transportation	19	30
Commerce	19	28
Labor	12	19
FEMA	12	18

- Defense Switched Network
- FTS 2000
- Washington Interagency Telecommunications System (WITS) (GSA)

The defense and GSA networks may be used to satisfy individual agency requirements and reduce direct spending by the agencies for commercial telecommunications service.

While the agencies have been waiting on FTS 2000, many have increased spending on private networks. For example, recently the following increases were reported in private network spending:

- TVA—148%
- Justice—113%
- Treasury—75%
- EPA—68%
- Education—57%

INPUT expects this pattern to change directions once the FTS 2000 awards are in place.

D

Vendor Market Share and Competition

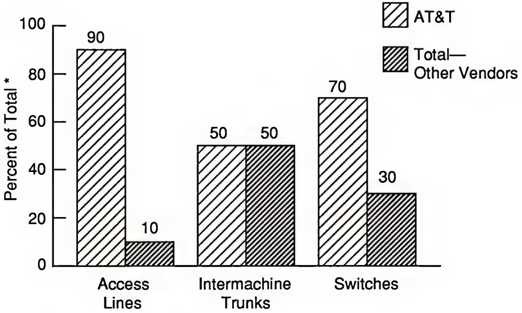
The current list of potential suppliers of telecommunications systems and services to the federal government has grown to nearly 3,000 companies. INPUT believes that the number of suppliers will diminish from FY88 through FY92 under the pressure of intense competition for the federal dollar. Smaller companies, including most "start-ups," will be unable to maintain a prime federal market presence because of the size and capitol-intensive nature of federal telecommunications programs. Federal agencies will show increasing preference for working with larger, established federal vendors acting as prime contractors or systems engineering and technical assistance (SETA) contractors.

AT&T's continued dominance of the federal telecommunications market will depend on the outcome of the FTS 2000 program. Exhibit III-10 compares AT&T's market share in the FTS arena with that of its competitors. AT&T retains 80% of the non-FTS long-distance service. AT&T's continued dominance of this market will directly depend on the outcome of the FTS 2000 procurement.

Although holding a dominant position, AT&T remains vulnerable in several specific market segments. Companies such as CONTEL, Rolm, and Northern Telecom will continue to make inroads in the hardware market segment. AT&T, however, remains one of the leading contenders for the FTS 2000 award. It was successful in its protest against GSA to have an amendment added to allow for a firm fixed-price tariff to be legally submitted.

EXHIBIT III-10

AT&T SHARE OF FTS SERVICE



* Service provided, not revenue generated

AT&T SHARE OF NON-FTS LONG-DISTANCE SERVICE

AT&T : 80%
Total Other Vendors: 20%

AT&T will face increasing competition from the Regional Bell Operating Companies (RBOCs) where regulation and RFP requirements permit, particularly in the provision of local telephone systems. Despite the diversification and expansion efforts, the RBOCs' share of the federal telecommunications market will grow only slowly from 1988 through 1993 unless there are substantial changes in the regulatory climate.

INPUT expects systems houses, experienced in the federal marketplace, to gain most in the federal telecommunications market. Agencywide network acquisitions have been awarded systems houses already, and other network procurements are likely to be suited to the expertise of systems houses.

INPUT believes that traditional Value-Added Network (VAN) vendors will be hard-pressed to expand their share of the market in the next few years. VAN vendors probably will retain existing market share due to the long-term nature of existing contracts and the proposed addition of the VAN services to GSA's TSP/MASC program. The distinction between VAN and common-carrier services is becoming blurred as traditional

long-haul communications carriers add features previously available only from VANs. Federal networks such as the Defense Commercial Telecommunications Network (DCTN), DSN, and FTS 2000 will offer services in direct competition with VANs.

E

Technological Impacts

As shown in Exhibit III-11, agency and vendor telecommunications are in remarkable agreement about the types of new technologies that will affect federal telecommunications planning and acquisition in the 1988-1993 timeframe.

EXHIBIT III-11

TECHNOLOGICAL IMPACT ON FEDERAL TELECOMMUNICATIONS

EMERGING TECHNOLOGY	IMPORTANT TO:	
	AGENCY	VENDOR
ISDN	X	X
Fiber Optics	X	X
Satellite Networks	X	X
Virtual Networks		X
Software-Defined Networks	X	
Chip-Level Protocol Implementation	X	X
Integrated Voice/Data/Video Transmission		X
Voice and Video Teleconferencing	X	
Digitized Voice		X
Voice Message Distribution	X	
LAN/PBX Hybrids		X
Workstation Processing	X	

Note: Table is ordered by number of times mentioned by vendors and agency officials. Blank entry indicates no mention.

Most of these emerging telecommunications technologies, specifically those perceived as most significant by vendors (ISDN and fiber optics), will play a major role in the federal market in the late 1980s and early 1990s.

Agencies and vendors generally agree on the timetable for these technologies to be adopted by the federal government. The reasoning behind the agreement, however, is decidedly different. Agencies want to avoid risk and stay a comfortable distance behind the leading edge of technology. Vendors believe that all telecommunications technology is moving in advance of user requirements (federal and private sector), with the lag particularly evident in the federal sector due to longer system life cycles.

Some federal agencies may be forced to adopt new telecommunications technology earlier in the 1990s. Agencies investing in supercomputer technology to meet high-volume data and computational requirements will encounter communications bottlenecks. Agencies with dispersed facilities in remote areas cannot meet existing communications requirements through land wire carriers alone and have turned to satellite, radio, and microwave technologies.

F

Policy and Regulatory Prospects

The Federal Information Resource Management Regulations (FIRMR) have been in effect for several years as the primary source of guidance for agency acquistion, management, and use of ADP and telecommunications systems. However, frequent changes in the FIRMRs have continued to complicate things. Actual merger of agency ADP and telecommunications functions has lagged and continues to be problematic.

Voice and data communications organizations have been merged in the Office of Information Resource Management (OIRM) only recently in most agencies. Some agencies are still reorganizing in response to policy and technology changes. These recent organizational changes have created some confusion over responsibilities; the confusion may be resolved only gradually over the next few years. The previously separate voice and data communications organizations typically employ different approaches to communications problems and in some cases are in open opposition with regard to solutions. Along with the organizational changes, budget planning and reporting are changing slowly to incorporate both voice and data communications program funding in agency information technology budgets.

DoD acquisition and management of telecommunications systems will continue to come under increased scrutiny from OMB and Congress during FY88 and FY89. The House Defense Appropriations Subcommittee has noted what it considers to be inadequate reporting and review of information technology programs by OSD. Both OMB and Congress seem skeptical about DoD use of the "mission critical" designation to

exempt systems from reporting and review under the Warner Amendment of the Paperwork Reduction Act (mini-Brooks bill). GAO reported early in 1987 that the Warner Amendment has not effectively improved the acquisition time, and OMB also continues to question DoD commitment to full and open competition for telecommunications acquisitions.

Notwithstanding the efforts of OMB, NBS, and NCS, comprehensive policy and federal telecommunications standards will not impact agency acquisitions until late in the 1980s and into the 1990s. Individual agencies may adopt standards in advance of governmentwide policy.

Most federal agencies appear to be ready to implement systems under GOSIP, the Government Open Systems Interconnect Profile. GOSIP is a subset of the International Open Systems Interconnect Communications standards. GOSIP will support interoperability and data exchange among different federal computer systems and communications networks. Agencies will use GOSIP to integrate their multivendor networks and systems.

In DoD, vendors face a potential dilemma. On the one hand, Deputy Defense Secretary Taft has specified GOSIP as a mandatory standard, beginning in 1990. However, several DoD agencies are showing reluctance to abandon the Transmission Control Protocol/Internet Protocol (TCP/IP) standard. Therefore, over the next few years, DoD will procure systems with either GOSIP and/or TCP/IP. Further, it is certainly possible that, even after 1990, TCP/IP will still be used. Communications vendors, therefore, must show a willingness to adapt to changing government requirements.

Congress has already passed several measures to increase agency awareness and formulate computer security policy. The Electronic Communications Privacy Act, which was made into public law in 1986, requires agencies and vendors to provide end-to-end security and effective encryption for federal telecommunications systems.

In January, 1988, Congress enacted the Computer Security Act of 1987 (PL 100-235). Among other things, this law specifically addressed the special requirements for the protection of computer systems. GSA recently issued preliminary guidelines for implementing the Act. In Section 4.4.3 of these guidelines, GSA provides some suggestions on communications security. However, INPUT believes that these are too brief to be of much use to the agencies, and INPUT expects more guidelines to be forthcoming.

The National Bureau of Standards will monitor and control the computer security program, while the National Security Administration will use its expertise to develop communication encryption techniques. There are several different levels of computer security to be executed under the

legislation. The first actions to be taken are administrative and physical security measures, such as locked storage in computer facilities. Later phases involve the advancement of new computer systems with built-in security systems.

In an innovative security approach, the National Security Agency (NSA) is sponsoring the Low-Cost Encryption Authentication Devices (LEADS) project. LEADS will allow DoD staff to insert cards with embedded microprocessors into reader devices. These devices will then encrypt the data before transmitting it over the DDN. NSA selected three companies to participate in the project.

- Codecard
- ACS Communications Systems
- Pailen-Johnson Associates

Each company will develop its own version of the smart card, with costs ultimately falling to five dollars each.

As will any other consumer, the federal government will be subject to regulatory actions taken as a result of the ongoing FCC Computer Inquiry III.

- Considering recent interpretations and court actions based on the Modified Final Judgement (MFJ), INPUT regards as unlikely the relaxation of the structural separation requirements in the near future.

- Federal agencies must balance between such regulatory restrictions and competition in contracting requirements when formulating acquisition plans.

- Given the long-term uncertainties of the regulatory climate, agencies must be prepared to modify acquisition plans with little or no advance notice in response to regulatory or tariff changes.

G

Summary and Conclusions

Based on the spring 1988 budget submissions, INPUT identified surprisingly sharp increases in government spending for telecommunications. This was particularly true for the DoD side of leased telecommunications services. The Defense Communications Agency showed a jump of $1.3 billion, not all of which was subtracted from the other DoD agency budgets. As a result, the AAGR has increased nearly a full percentage point over INPUT's previous forecast.

At this writing, the FTS 2000 award has been delayed until at least December 1988. Further, legislation is moving through Congress to mandate DoD's inclusion and participation. Therefore, although government spending may be rising, opportunities may not necessarily be

increasing. Rather, outside of FTS 2000, there will likely be fewer bidding opportunities. However, additional delays in the FTS 2000 award would increase pressure on agencies waiting to implement major systems. As a result, near-term bidding opportunities may appear, especially for companies that can provide a quick response to agency needs.

The long system life cycles for federal telecommunications systems will continue to provide a steady revenue stream for incumbents. Further, incumbents will continue to capitalize on extension and expansion opportunities for existing contracts. These include minor hardware and software additions for existing contracts.

As with other federal market segments, INPUT expects fewer but larger contracts. In addition to FTS 2000, system engineering and technical assistance (SETA) will become more common for new or replacement systems. The continuing shortage of in-house technicians will also increase opportunities for telecommunications hardware maintenance and consulting, particularly among high-technology systems.

The federal telecommunications market does present some substantial risks to balance against the opportunities. Most funding will continue to be concentrated in a relatively few large network procurements. Agencies have shown a preference, as exhibited in recent contract awards, for acquiring telecommunications service, directly or indirectly, through systems houses instead of larger established carriers. Also, budget constraints in other federal information technology market segments will foster competition for the more certain funding allocated to telecommunications programs.

Prevalent agency perceptions of the postdivestiture telecommunications market could cause additional difficulties for vendors. Since agencies meet telecommunications requirements primarily through the acquisition of services, the underlying technology—and any associated risk—should be borne by the vendor. This risk placement is true for other market segments as well. If agency requirements are satisfied through teaming or subcontracts, the prime contractor must assure total responsibility for quality and availability of service. Agencies believe that telecommunications vendors have over-built in terms of capacity and that transmission costs will stabilize or decline by 1990.

IV

Agency Requirements

As part of its research effort, INPUT interviewed federal officials responsible for agency telecommunications policy, planning, acquisition, management, and use. INPUT also contacted federal officials in agencies responsible for governmentwide regulations, standards, and policy. The views of these agencies, as listed in Exhibit IV-1, and the requirements of major user agencies are presented in the following sections of this report.

A
Key Players in Regulations, Standards, and Policy

Although the agencies described below are not major telecommunications users, their activities help to mold individual user agency telecommunications policy and plans.

1. Federal Communications Commission

The Federal Communications Commission (FCC) was established by the Federal Communications Act of 1934. Its mission includes regulation of interstate and international communications, scientific and technical support, and long-range policy and analysis. The FCC shares communications oversight with two other agencies.

- The FCC and the National Telecommunications and Information Administration (NTIA) jointly manage radio frequency assignment. NTIA has responsibility for federal radio frequencies, and the FCC handles the private sector.

- In times of national emergency, many of the responsibilities of the FCC transfer to the National Communications Systems (NCS).

The FCC affects the future of the federal telecommunications market through the continuing examination (Computer Inquiry III) of deregulation and of the effects and conditions of the AT&T divestiture. The Inquiry III proceedings have led to the establishment of nine points for Comparatively Efficient Interconnects (CEI). These points aim to promote standardized interfaces and common end-user access enhancement.

EXHIBIT IV-1

PRIMARY AGENCY ROLES IN FEDERAL TELECOMMUNICATIONS

- Regulation, Standards, and Policy
  - Federal Communications Commission (FCC)
  - National Telecommunications and Information Administration (NTIA)
  - National Communications System (NCS)
  - National Bureau of Standards (NBS)
  - National Security Agency (NSA)
  - Office of Management and Budget (OMB)

- Major Users
  - Air Force
  - Army
  - Navy
  - Energy
  - Agriculture
  - Health and Human Services
  - Veterans Administration
  - NASA
  - Commerce

- Major Buyers
  - Defense (Defense Communications Agency, Defense Commercial Communications Office)
  - GSA

The FCC has in the past participated in CCITT study groups to define ISDN standards. The FCC focuses on the standards that govern interfaces. The FCC also interacts with both domestic and international telecommunications agencies on spectrum management and interference.

2. National Telecommunications and Information Administration

The National Telecommunications and Information Administration (NTIA) was established as part of the Commerce Department in 1987 through a reorganization of the Office of Telecommunications Policy in the Executive Office of the President and Commerce's existing Office of

Telecommunications. NTIA serves as one of the President's principal advisors on telecommunications and information issues and provides assistance to other federal agencies in the areas of telecommunications planning, design, maintenance, and improvement.

NTIA sets federal telecommunications policy in three areas:

- Policies for which the government conducts its activities internal to the federal agencies
- Policies for industry and coordination of overlap between industry and agencies
- Policies for ISDN standards definition; working with the FCC and CCITT study groups

NTIA receives most of its sponsorship from DoD and in particular the army, DCA, and NCS. The NTIA also assists with maintaining a central point of contact for the DDN, thus assuring emergency preparedness. There is also ongoing cooperative work with NCS to develop federal modem and data encryption standards, including FED-STDs equivalent to the CCITT V.22bis, V.26, V.26vis, and V.32 standards and FED-STDs 1028 and 1029 for the application of DES to facsimile and digitized voice transmission. NTIA is not a decision-making body, but serves as a principal voice for the executive branch in domestic telecommunications policy that affects technical and economic advancement.

3. National Communications Systems

The National Communications System (NCS) and the Federal Telecommunications Standards Program were established in 1972. In addition to its aforementioned national emergency role in telecommunications, NCS develops the Federal Telecommunications Standards (FED-STDs), which are issued subsequently by GSA.

The ongoing NCS standards activities focus on two areas of concern to federal agencies:

- Interoperability of computer and communications systems

- Development of ISDN standards with CCITT with over 40% of available NCS manpower in the standards area committed to this effort

4. National Bureau of Standards

The National Bureau of Standards (NBS) as part of the Department of Commerce develops and issues the Federal Information Processing Standards (FIPS) under the provisions of Public Law 89-306 (the Brooks Act). Much of the actual development of the FIPS is done by the Institution of Computer Sciences and Technology (ICST) at NBS. In response

to the merging of communications and computer technology, standards development at NBS has increasingly involved joint efforts with NCS, such as the federal X.25 standard (FIPS 100, FED-STD 1041). NBS also works with DoD to develop MIL SPEC equivalents to the FIPS.

NBS has been concentrating on the development of federal standards compatible with CCITT OSI recommendations. Despite a clear preference on the part of NBS officials for OSI standards, NBS cannot mandate federal agencies' compliance. Federal policy in such matters must be set by OMB and enforced by GSA.

NBS sponsors a number of vendor programs to promote commercial development and implementation of OSI-compatible systems. It holds OSI workshops, which are very successful. They are held four to five times a year, with over 150 individuals in attendance at each. MAP/TOP demonstrations that use communications protocols based on OSI standards (FIPS 107, IEEE 802.2 and 802.3) are organized by various Special Interest Groups (SIGs). OSINET, a packet-switched network for development and testing of OSI products, is complete and on-line. Participation thus far has included seventeen vendors and four government agencies.

Since 1986, NBS has been working with DCA to define OSI standards for DoD. The time frame for implementation of these standards is not fixed. NBS estimates at least a five-year effort to transition from current DoD standards such as TCP/IP to OSI. NBS is also completing the software for an electronic mail protocol in conjunction with the DCS for the ARPANET network.

At the request of the Department of Defense, the National Bureau of Standards (now changing its name to the National Institute of Standards and Technology) has established an accreditation program for private laboratories prepared to test the computer industry's implementation of numerous Defense Department telecommunications protocols. The program will accredit labs capable of performing tests in accordance with methods designated by the bureau. NBS will be certifying laboratories that can provide testing for three DoD protocols in particular: The Defense Data Network (DDN) X.25 link, the five DoD packet-switching high-level protocols, and the Autodin Mode protocol.

5. National Security Agency

Under National Security Directive 145, the National Security Agency (NSA) was delegated responsibility for governmentwide communications security. However, as previously stated, NBS has primary responsibility for implementing the Computer Security Act. Specific information about NSA activities is available only to cleared individuals and corporations.

NSA continues to seek vendor cooperation in the application of government cryptographic methods to commercial systems through the Commercial Comsec Endorsement Program (CCEP). NSA programs to certify trusted computer systems will influence the development of DoD communications systems such as DSN. DoD plans include the use of trusted software in programmable communications equipment such as digital switches.

6. Office of Management and Budget

The Office of Management and Budget (OMB) has taken a very active interest in the regulatory aspects of the telecommunications market and in federal agency plans for telecommunications systems. OMB has indicated interest in the cost savings aspect under its REFORM 88 initiative.

At one time OMB was perceived as opposed to the structure of GSA's FTS 2000 initiative. That stance has changed, but OMB has not clearly dismissed its concerns about some of the assumptions and projected benefits of the initiative. However, congressional pressure to implement FTS 2000 has largely eliminated OMB's reservations.

OMB has increased its monitoring for sole-source telecommunications procurements, some of which may be represented by the agencies as a continuation of existing (predivestiture) contracts. OMB foresees potential legal problems for the government if such procurements are permitted in a newly competitive market subject to CICA and public scrutiny.

B

Agency Plans

In the course of the research effort for this report, INPUT concentrated its interview efforts on two groups of agencies. Exhibit IV-2 identifies the leading users of leased telecommunications services as reflected in the agency FY87 and FY88 A-11 submissions to OMB. INPUT also looked at agencies represented on the GSA OIRM Interagency Telecommunications Committee and the WITS Implementation Committee.

EXHIBIT IV-2

LEADING LEASED TELECOMMUNICATIONS USERS

DEPARTMENT/ AGENCY	$ THOUSANDS	
	FISCAL YEAR 1988	FISCAL YEAR 1989
Defense		
OSD; Other DoD Agencies	1,233,463	1,338,379
Army	120,187	123,488
Air Force	114,673	124,316
U.S. Marine Corps	17,763	17,539
Navy	16,738	17,950
Civilian		
GSA	624,226	645,388
Treasury	166,149	175,349
Agriculture	80,101	86,600
Veterans Administration	59,587	61,950
Health and Human Services	52,863	57,092
Justice	40,064	51,890
EPA	26,641	28,181
NASA	23,575	24,753
Tennessee Valley Authority	20,978	22,656
Interior	19,643	20,731
Transportation	19,306	20,152
Commerce	18,522	19,145
Labor	11,716	12,252
FEMA	11,617	12,546

Source: FY 1988 Agency Submissions to OMB *Circular A-11, 43A*

The following sections of this report highlight specific major agency plans for new or expanded telecommunications systems and services and summarize agency requirements. Individual telecommunications programs are listed by agency in Chapter VI of this report.

1. Defense

The majority of Defense voice and data communications requirements have been satisfied in the past by the Automatic Voice Network (AUTOVON), Automatic Digital Network (AUTODIN), Automatic Secure Voice Communications Network (AUTOSEVOCOM), Defense Satellite Communication System (DSCS), and GSA's FTS. The Air Force acts as DoD Executive Agency for AUTOVON. The Army and the Navy rank among the top ten users of FTS.

Earlier in this decade, DCA began implementation of the Defense Digital Network (DDN) as a replacement for the hardened AUTODIN. The Defense Communications Agency initiated a major program, the Defense Switched Network (DSN), for Defensewide integration and replacement of existing network facilities. The FY86 defense appropriation included $10.8 million for DSN hardware acquisition, with similar amounts for FY87 and FY88. Full-scale implementation and transition, however, is not expected to occur until the mid 1990s.

DSN serves as an umbrella program to meet increasing DoD requirements for voice, secure voice, data, integrated voice/data, video, and conferencing telecommunications services. It applies both artificial intelligence and trusted software written in Ada to switching and network control systems. The DSN will service high-priority users via semi-independent service networks that are fully integrated. DSN may use a variety of transmission facilities, as listed in Exhibit IV-3.

DSN will be patterned on ISDN concepts using commercially compatible DoD higher level protocols. End-to-end security will be provided through both secure telephone units (STU-II and STU-III) and multilevel data security. Unlike AUTOVON and AUTODIN, DDN will be integrated with DSN in the mid 1990s. Exhibit IV-4 shows the projected transition.

In addition to DSN, individual services are replacing most base telephone systems. Specific funding and schedules for these acquisitions generally are not identified in agency planning and budget documents. Switches are being acquired in small quantities, although procurement irregularities are slowing this effort. The size of most procurements falls below DoD OMB A-11 reporting thresholds. Funding is being provided through O&M budgets.

EXHIBIT IV-3

DSN TRANSMISSION FACILITIES

- Satellite
- HF (300 km)
- Meteor Burst (1,500 km)
- Microwave Line-of-Sight (LOS)
- Millimeter Wave LOS
- Troposcatter (300 km)
- Fiber Optic Cable
- Metallic Cable

Source: DCA, *Defense Communications System in the Year 2000*

EXHIBIT IV-4

PROPOSED CHANGES TO THE DEFENSE COMMUNICATIONS SYSTEM

1985	POST-1990
• 71 Nodal Switches in AUTOVON	• Over 160 Nodal Switches in DSN
• 15 Autodin Switches	• Over 90 I-S/A AMPE Terminals
• 110 DDN Nodes	• Over 500 DDN Nodes

Source: DCA, *Defense Communications System in the Year 2000*

DoD continues to voice concern over the issue of computer security. The Computer Security Act of 1988 has heightened this concern. Programs are not being delayed to accommodate security measures, but future telecommunications opportunities related to computer security are foreseeable, including:

- Encryption of long-distance data that are needed to make the computer systems secure

- Program development and implementation of new software for secure systems that will not impact performance levels

- Assistance in developing Computer Security Plans for submission to NBS (now being renamed the National Institute of Standards and Technology)

2. GSA

GSA is the largest federal buyer and internal supplier of telecommunications services. Major existing and planned GSA telecommunications programs are listed in Exhibit IV-5.

EXHIBIT IV-5

GSA TELECOMMUNICATIONS PROGRAMS

- Current
  - Federal Telecommunications System (FTS)
  - Federal Secure Telecommunications System (FSTS)
  - Circuit Procurement
- New /Planned
  - Purchase of Telephone Systems (POTS)
  - Aggregated Switch Procurement (ASP) (Recently Terminated)
  - Washington Interagency Telecommunications System (WITS)
  - FTS 2000

The Purchase of Telephones and Services (POTS) procurements are designed to replace standard telephone line sets and key systems in federal agencies. Sixteen awards were completed in FY86 for nine of the ten regions. The procurement for Region One was incorporated into the Aggregated Switch Procurement.

The Aggregated Switch Procurement (ASP) program initially provided for a single acquisition of switching equipment in each GSA region to serve all federal agencies and provide access to the FTS 2000 network. ASP now leases the switches until replaced by FTS 2000.

Recently, GSA cancelled its Aggregated Switch Procurement (ASP), which the GSA had divided into four regional zones. The cancellation grew out of protests from two Western Regional Bell Operating Companies (RBOCs), with support from the GAO. The RBOCs had complained that GSA's zoning plan favored unregulated telephone companies. Now the GSA will acquire each switch individually.

The FTS 2000 program originally provided for the replacement of the FTS through a single contract with a prime services vendor. The vendor awarded the FTS 2000 contract would provide the federal government with six telecommunications services: switched voice, switched data, packet switching, video transmission, switched digital integrated, and dedicated transmission. GSA estimated the initial contract value of these services at between $400 and $450 million a year and possibly reaching as much as $25 billion over the ten-year period. GSA will neither lease circuits nor purchase hardware or facilities in support of FTS 2000.

Although the term of the initial FTS 2000 contract would extend over ten years, the contractors would be given no guarantee of system usage after the first three years. This schedule conforms with the length of FTS 2000 subscription agreements to be executed between GSA and individual agencies. The FTS 2000 program has been delayed by agency opposition, vendor complaints and protests, GAO audits, and congressional concerns. Although GSA has not commented formally, other program milestones are likely to slip correspondingly, extending full implementation well into the 1990s. At this writing, contract award is expected in December, 1988.

The FTS 2000 procurement was dealt a serious blow when AT&T filed a formal protest with GSA in May 1987. AT&T charged that the General Services Administration was discriminating against it by allowing an amendment to the FTS 2000 proposal to require regulated carriers to obtain a waiver of certain FCC pricing requirements before placing a bid.

AT&T and GSA resolved the protest by modifying the amendment to include either a firm fixed price or a firm fixed-term tariff. The firm fixed-term tariff must include fixed rates and a waiver by the firm or

subcontractor of its right to initiate any tariff increases except as spelled out by the contractor. The service provider must also provide separate accounting procedures to assure that other rate payers are not exposed to risks of FTS 2000 revenue.

The General Services Administration in mid-September, 1987, responded to congressional pressure and withdrew the original RFP to revise it for the award to be split between two vendors. The two contracts will be awarded on an approximately 60/40 allocation of the $450 million minimum guarantee revenue. The government intends to have separate Service Oversight Centers (SOC) to handle each contract.

The effect of these changes in the procurement has been lengthy delays and complications to the operation of the federal telecommunications network. It is still not certain as to which federal agencies may abandon the FTS 2000 procurement to pursue their own individual agency network. However, congressional pressure will likely limit the waivers allowed by GSA.

The Washington Interagency Telecommunications System (WITS) program is similar in concept to FTS 2000 but targeted for the special requirements of the Washington, D.C. metropolitan area. The basic thrust of the WITS program is replacement of existing local service to the federal agencies in the capital from Centrex to an integrated voice/data network.

GAO has recommended that the Washington-area telecommunications services undergo close scrutiny by GSA to assure that independent PBX equipment and Centrex services acquired by the individual agencies be interoperable with the major areawide WITS network. WITS will serve as a gateway to the FTS and other intercity services. The digital network will provide basic integrated voice and data services, dedicated data transfer, network call transfer, and several PBX-type features. The original WITS committee report recommended inclusion of DoD facilities within the acquisition and implementation of the Washington-area system. DoD has not cooperated in the WITS effort and apparently will acquire Washington local service outside the scope of the WITS program.

3. Department of Energy

The Department of Energy (DOE), in addition to being one of the largest civilian users of commercial telecommunications service, relies heavily on contractor support to meet telecommunications requirements, including planning, implementation, operation, and maintenance.

By agreement with GSA, DOE has acquired a backbone communications network (OPMODEL) linking its facilities primarily through satellite circuits. The current contract includes options to expand the OPMODEL

network to 24 fixed and one mobile ground station. Operations have begun that handle voice/data traffic between four sites. Although departmentwide telecommunications services are planned and acquired centrally, individual facilities retain the responsibility for local and on-campus communications.

DOE recently acquired the telecommunications systems for its two Washington headquarters locations. DOE is planning to consolidate the nationwide data communications circuits into the OPMODEL satellite system and a terrestrial T-1 Carrier Network. In addition to the departmentwide networks, individual closed networks service specific mission requirements and support scientific informational and computational facilities, such as the National Magnetic Fusion Energy Computer Center (NMFECC) at Lawrence Livermore National Laboratory.

4. Department of Agriculture

Department of Agriculture's (USDA) data communications requirements have been met via a department network (DEPNET). USDA plans to expand DEPNET's capabilities to accommodate the short and long-distance data requirements of all USDA agencies. Although the OIRM retains departmentwide telecommunications policy and planning authority, local telecommunications services and equipment are being upgraded through decentralized procurement at 16,000 USDA field offices.

USDA has planned its own Washington-area telecommunications systems (AWATS). AWATS, if fully implemented, would connect 18,000 lines in 200 buildings at 12 separate locations in the Washington, D.C. metropolitan area. Phase I of AWATS—a local area network for local data transfer within the four-building Agriculture complex in downtown Washington, D.C.—is completed. Subsequent project phases are placed on hold pending department review.

5. Veterans Administration

The Veterans Administration (VA) assumed responsibility for the GSA Advanced Records System (ARS) in January 1984. This system, now called the Veterans Administration Data Transmission System (VADATS), links over 250 VA sites through a value-added packet-switched network.

VADATS has been enhanced continuously since 1984, but will be replaced with an integrated data communications utility. Individual VA facilities are responsible for local telecommunications service and equipment. These facilities have acquired new switching equipment at a rate of between 15 to 20 sites per year. The VA is enthusiastic about FTS 2000 and will use the system for voice communications and some data communications should FTS 2000 prove to be more economical than commercially leased services.

6. NASA

NASA telecommunications programs are divided functionally between two program managers. Space systems include telemetry, launch, and landing capabilities. Traditional telecommunications include local and long distance, voice, and data services.

NASA has acquired contractor services to support its traditional telecommunications requirements for both voice and data. FTS 2000 is planned for communications outside the NASA network. Although telecommunications planning and funding are centrally controlled, each NASA center retains responsibility for providing its own local telecommunications service.

Implementation of the Program Support Communications Network and installation of advanced local-area networks will provide broader capabilities of telecommunications systems throughout NASA and NASA headquarters. INPUT's Market Analysis Report on NASA provides more-detailed information on its telecommunications plans and programs.

7. Summary of Agency Plans

With only a few exceptions, agencies have centralized planning and acquisition of telecommunications services within the OIRM. Although separate voice and data communications offices exist in approximately 50% of the agencies, integration of these offices is imminent.

Agencies that have contracted for departmentwide networks rely on the network service contractor for network control. A majority of the other agencies contacted by INPUT have network control centers for all or selected portions of their telecommunications systems. Several of these network control centers, notably those in NASA and TVA, are contractor operated. Specific future network control center requirements are listed in Exhibit IV-6.

DoD organizations have operated under a congressional "buy-not-lease" directive since 1984 and have limited choices for acquisition methods. As shown in Exhibit IV-7, civilian agencies cited leasing as the preferred method for acquisition of telecommunications hardware and software. Agencies also noted lease-to-purchase or lease-to-ownership as viable options, especially if budget constraints force them to limit or defer capital investment expenditures in the year to procurement.

Agencies plan to meet their telecommunications requirements in a variety of ways, as shown in Exhibit IV-8. Many agencies will use more than one source of supply. Integrated systems will be acquired from contractors in most cases. Although over half of the agencies contacted use VAN services, no agency projected an increase in the use of VAN service if GSA were to make VANs available through the TSP MASC.

EXHIBIT IV-6

FUTURE NETWORK CONTROL CENTER REQUIREMENTS

- Upgrades to Three VA Network Control Centers
- Service Oversight Center for GSA's FTS 2000 and WITS
- Treasury
- State
- HUD (Part of the Capacity Replacement Program)

EXHIBIT IV-7

CIVILIAN AGENCY LEASE/PURCHASE PREFERENCES

FACTOR	PREFERENCE RANK*
• Lease	1
• Lease-to-Purchase or Lease-to-Ownership	2
• No Preference	3
• Outright Purchase	4

*Rank based on frequency of mention by respondents

EXHIBIT IV-8

AGENCY METHODS FOR ACQUIRING NEW OR ENHANCED TELECOMMUNICATIONS SERVICE

METHOD	RANK*
Buy Common-Carrier Service	1
Buy Integrated Systems	2
Buy Components and Use a Design or Integration Contractor	3
Buy VAN Service	4
Use GSA or DCA-Sponsored Facilities	5
Buy Components and Integrate In-House	6

*Rank based on frequency of mention by respondents.

Updated 1987

The majority of the agencies are currently using or have plans to implement local-area networks (LANs). Several of the agencies procured their LANs locally at each site, and some of the sites have multiple LANs rather than just one. The federal agency users are requiring that more computing power be made available within each work group and across different work groups.

At present, the general data and administrative applications are supported by the LAN services. Within five years the technical and scientific applications will be more developed. The existing LAN networks in the agencies use the Ethernet bus and IBM token ring topologies, which are becoming partial or semi-de facto standards, along with the proprietary networks established by multiple vendors. LAN usage has increased because agencies perceive LANs as highly effective and cost efficient, as compared to the wide-area networks. Exhibit IV-9 lists the major local-area networks for key agencies as proposed by the agencies in their Information Technology Systems Budget Submissions.

EXHIBIT IV-9a

LOCAL-AREA NETWORKS FOR MAJOR AGENCIES

DEFENSE AGENCY	NETWORK	FUNDING ($ Thousands)	FISCAL YEARS
Air Force	Local-Area Network, Headquarters AFLC	108,954	1988-1992
Air Force	Local On-line Network Systems (LONS)	18,340	1988-1992
Air Force	Initial Distributive Network for MACs Information Processing System	123,125	1988-1992
Air Force	MAC Information Systems Internetting	25,567	1988-1992
Air Force	Medical Materiel Management System On-line (MMMS-OL)	5,809	1988-1992
Air Force	Micro Computers for Cadet Dormitories and Local-Area Network (MID-LAN)	8,653	1988-1992
Army	Inspector General Network—Hardware	4,895	1988-1991
Navy	Pacific Missile Test Center—Local-Area Network (LAN)	22,155	1988-1992
Navy	Naval Aviation Depots—Local-Area Network	5,560	1988-1992
Navy	U.S. Naval Academy Data Network	5,712	1988-1992
Defense Communications Agency	Local-Area Networks and Interfaces for WIS Requirements	4,649	1989-1990
OSD	Policy Secure O/A LAN	64,204	1988-1992
OSD	OSD Secure LAN	11,620	1988-1992

Continued

EXHIBIT IV-9b

LOCAL-AREA NETWORKS FOR MAJOR AGENCIES

CIVILIAN AGENCY	NETWORK	FUNDING ($ Thousands)	FISCAL YEARS
Agriculture	Network for Headquarters and Field, Agricultural Research Service	1,500	1988-1989
Agriculture	Information and Management Network; Cooperative State Research Service	400	1988-1993
Agriculture	Distributed Processing Hardware; U.S. Forest Service	63	1988-1993
Agriculture	Automate Office Operations in National Agriculture Statistics Service Office	475	1988-1993
Agriculture	Local-Area Network for USDA Headquarters	426	1988-1993
Agriculture	Local-Area Network for USDA Headquarters, Working Capital Fund	3,890	1988-1993
Agriculture	Data Communications Network; Soil Conservation Service	1,086	1988-1993
Energy	Integrated Communications Network, Oak Ridge Complex	21,277	1988-1991
Energy	Communications Network, Sandia National Laboratory	5,375	1988-1993
Energy	Local-Area Network; Mound Facility	2,506	1988-1993
Energy	Secure Communications Network, Bettis Atomic Power Laboratory	3,677	1988-1993

Continued

EXHIBIT IV-9c

LOCAL-AREA NETWORKS FOR MAJOR AGENCIES

CIVILIAN AGENCY	NETWORK	FUNDING ($ Thousands)	FISCAL YEARS
HHS, Public Health Service	Ethernet Local-Area Networks	1,517	1988-1989
HHS, National Cancer Institute	Support for NCI Local-Area Networks	1,873	1988-1993
HHS, Social Security Administration	Field Offices Local-Area Network (LAN)	9,801	1988-1993
Interior, Bureau of Indian Affairs	ODS Local-Area Network and Telecommunications Network Management	2,300	1988-1993
Justice, Civil Division	Civil Division LANs	11,155	1988-1993
Justice, Office of Justice Programs	Office Automation Local-Area Network	1,713	1988-1993
Labor, Employment, and Training Administration	Implementation of New Office Automation Technology	4,224	1988-1991
Treasury	Secret Service Integrated Network	40,322	1988-1993
Treasury	Integrated Telecommunications Network	359,171	1988-1993
Transportation	Acquisition of LAN for Headquarters DoT	2,000	1989 only

Some agencies are using LANs in innovative and creative ways. The Department of Energy has applied LAN technology to meet its security needs. At its Idaho National Engineering Laboratory, Energy uses LAN-based video imaging technology to keep out intruders with stolen or forged identification. Equipment records visitors' pictures as they enter a building. The digitized images form a data base that is linked to a LAN file server, and through this to a verification system.

Agencies anticipate dramatic changes in the mix of voice/data and analog/digital communications during the next five years, as shown in Exhibit IV-10. From 1988 through 1993, data traffic will increase at a much greater rate than will voice traffic, with the relative proportions of voice and data traffic favoring data in the 1990s. Some agencies also noted a requirement for higher data speed and increased accuracy in future communications networks. The growing popularity of facsimile equipment will also lead to more data traffic.

EXHIBIT IV-10

PERCENTAGE DISTRIBUTION OF TELECOMMUNICATIONS TRAFFIC*

	CURRENT	FUTURE (1990)
Voice	70	40
Data	30	60
Analog	70	50
Digital	30	50

*Updated 1987

C

Agency Issues

1. Special Agency Communication Requirements

Agencies have identified computer security and privacy as the most signification problems they face. The passage of the Computer Security Act has heightened concerns. The huge expense and staff training needed to implement security measures are burdening some agencies. Other agencies are concerned with the level of privacy and security attainable for highly sensitive documents. Defense agencies are faced with implementation of defense-wide integration and replacement of existing network

facilities that will have end-to-end security. Secure telephone units and multilevel data security are to be provided.

Agencies consider satisfying interoperability as important to their present telecommunications needs and to making a graceful transition to future technological needs. Many agency officials expect their specific agency requirements to be satisfied through agencywide or governmentwide telecommunications initiatives.

Compatibility and interoperability requirements can sometimes lead to procurement problems. For example, at this writing, the Defense Telephone System (DTS) is trying to upgrade area administrative telecommunications facilities. However, most potential bidders consider the specifications to be favoring the incumbents, AT&T and C&P Telephone (a subsidiary of Bell Atlantic). C&P's ownership of Pentagon wiring, apparently necessary under the current compatibility approach, may limit competition and possibly delay the procurement.

2. GSA Telecommunications Initiatives

GSA examined agency requirements and enlisted agency participation in the planning of the FTS 2000 and WITS programs. Nonetheless, many agencies wonder whether these programs will resolve, create, or perpetuate telecommunications problems. Agency officials expressed concern over the cost of GSA telecommunications services. The current FTS billing method is considered to be unsatisfactory, and GSA has been unable to provide anything other than overall cost guidelines for the new programs. Many agencies fear that FTS 2000 budget expenses will not be properly managed.

Some agency telecommunications experts doubt that GSA and the vendor community can deliver all of the services specified for FTS 2000 and WITS. In addition, as schedules for both programs have slipped, critical agency programs have been delayed. In particular, individual agency programs to supply local and long-distance communications have been delayed in the procurement process, pending evaluation of FTS 2000 and WITS against agency requirements.

FIRMR Bulletin 20 established a schedule for agency review and commitment to FTS 2000. Congressional concerns about the perceived limits to competition of the proposed ten-year contract may further delay the procurement process.

The potential for problems does not end once an agency commits to the use of FTS 2000 or WITS. As GSA has noted, transition to these services will be a critical segment of each program. Although much of the burden for transition planning and continuation of service will be placed on the prime contractor, individual agencies will foot the cost of transi-

tion. Agencies also have responsibility for ensuring that agency telecommunications systems, such as PBX and terminal equipment, meet the FTS 2000 interface specifications.

3. Other Agency Issues

Many federal buildings and facilities are of considerable age and not constructed to accommodate modern telecommunications cabling schemes. Federal agencies have explored "smart building" technology for new facilities, but have not resolved the problems with upgrading existing facilities. Short-term solutions such as cabling in surface-mounted conduit will prove inadequate and insufficiently flexible for future integrated voice/data telecommunications systems.

D

Standards and Compatibility

Agency policymakers and planners face increasingly complex choices regarding the selection and enforcement of telecommunications standards. Such standards, however, are a key element of agency strategies to achieve interconnection and interoperability for existing and planned systems.

The federal inventory of voice and data communications hardware is extremely diverse, including equipment from every major manufacturer, as well as many other suppliers. Even individual agencies or bureaus use equipment of various makes and models. Despite recent modernization efforts, a significant proportion of the federal inventory consists of older equipment that cannot support newer standards. Federal requirements for full and open competition inhibit agencies from solving compatibility problems by standardizing on any given vendor's architecture.

Telecommunications standards are established through consensus of federal regulatory and standards organizations, industry organizations such as ANSI and IEEE, and the vendor community. Progress toward development of OSI standards is being realized through the recent cooperation of U.S. industry and governmental efforts.

There is increased pressure to adopt or, as a minimum, provide interfaces for international standards. Work on protocol testing and development has heightened. Although NBS and NCS have published joint telecommunications standards, these are not comprehensive with respect to the vast number of choices in the marketplace. The federal standards derived from international or industry standards are not up-to-date in some cases and represent only a subset of the source standards.

OMB is considering mandating the use of OSI-compatible systems throughout the federal government. The issuance of a governmentwide policy for OSI would help to aggregate the market and establish consistency with commercial product development.

The National Bureau of Standards will continue to issue Federal Information Processing Standards (FIPS) for OSI. The FIPS would include protocol specifications, conformance tests, and user assistance directed to the federal agencies. It is anticipated that within two to five years FIPS would be released for all seven protocol levels. The OSI mandate realistically could not be made retroactive to cover existing federal systems due to size and lifecycle considerations. Notwithstanding these difficulties, NBS estimates indicate that 70-80% of new-system acquisitions in the early 1990s will be OSI compatible. NBS regards vendor supply as the major constraint on the growth of this federal market segment.

Although DoD initiated federal use of TCP/IP, other agencies now using it include the VA, the Census Bureau, and the intelligence community. It has been estimated that TCP/IP products are offered by more than 160 vendors, including Apple, IBM, Digital, and AT&T. Recently, the National Science Foundation (NSF) adopted TCP/IP for its supercomputer networks. Given its widespread popularity with both users and vendors, many agency executives expect it to continue in use even after official federal adoption of the GOSIP standard.

The Defense Communications Agency (DCA) and the National Bureau of Standards are the first two agencies planning to participate as members of the Corporation for Open Systems (COS), a nonprofit research and development consortium to promote OSI standards. The Defense Department's joining the COS benefits its direct involvement with OSI protocol tests, especially in the area of computer security. Government membership, as planned by the NBS, would foster greater interaction among users and vendors to accomplish an easier transition to OSI through greater interoperability of existing networks.

Also in the standards conformance, development, and testing arena, the Defense Communications Agency (DCA) has selected the Navy's Regional Data Automation Center, (NARDAC) as the official test bed for gateway software connecting TCP/IP and OSI-based networks. OSI is the International Standards Organization's protocol suite designed to link dissimilar computers and networks, formally known as the Open Systems Interconnection suite. This collection of standards is slated to replace the DoD's TCP/IP under the new governmentwide standard GOSIP, the Government OSI Profile.

Federal agencies are adopting at least a subset of the OSI reference model for data communications. Of five network protocol categories, only packet switching, based on X.25, shows any growth. Use of older protocols such as ASCII and IBM BSC drops off dramatically, with IBM SNA/SDLC maintaining some popularity.

Several agencies have responded to the absence of comprehensive federal telecommunications standards by establishing agency standards,

usually in conjunction with departmentwide network acquisitions. For example, the Veterans Administration Data Transmission Service (VADATS) has been enhanced through the inclusion of a packet-switched value-added network. Through specialized hardware and software, VADATS supports a variety of protocols on the underlying packet-switched architecture:

- Asynchronous TTY (ASCII)
- IBM 3270 BSC
- IBM 3780 BSC
- X.25
- IBM SDLC (in testing).

The VA has accommodated existing protocols but requires X.25 interfaces for new mainframe and local-area network acquisitions. The X.25 standard is recommended for minicomputer and PBX acquisitions as well.

Rural environments dictate different, sometimes nonstandard approaches. For example, both the Fish and Wildlife Service (FWS) and the National Park Service, agencies of the Interior Department, must accommodate difficult physical and climate issues. Many sites do not have local telephone service, further complicating the problem. Technically, FWS is expected to adhere to the same rules and standards as everyone else. However, such standard capabilities as ISDN may not be available. Thus, FWS planners must improvise.

The Air Force is activating two ISDN switches at Mathers Air Force Base in Sacramento. The Air Force views this activation as a model for later ISDN deployment at more than 50 bases worldwide. It is expected that ISDN will result in cost savings through greater data capability. If ISDN interfaces can be developed for different host computers, the Air Force should realize substantial savings over other architectures.

In a more flexible approach, the U.S. Geological Survey has established an Ethernet-based LAN that supports five networking protocols:

- The Military Standard TCP/IP
- Xerox's XNS
- Digital's DECNet
- IBM's and Microsoft's NetBIOS
- IBM's SNA

A sixth network, Primenet, supports Prime equipment and uses gateways to connect to the other LANs.

The Department of the Interior policy specifies departmentwide use of the USGS GEONET X.25 network service for dial-up data communica-

tions requirement. The USDA has used a similar directive for departmentwide data communications through the DEPNET X.25 network.

Also, DoD has operated for several years under a directive to use the DDN and the associated TCP/IP protocol for all data communications. Although DoD has indicated a willingness to adopt OSI standards, the transition will be slow. Presently, the institution of new standards for DoD fits most logically with implementation of ISDN, as there is already a larger equipment lease and more products available.

E

Agency Perspectives

INPUT asked agency officials their views on major nontechnical impacts on federal telecommunications. Agency officials also provided suggestions for improvements that vendors could make in telecommunications systems and services to increase their value to the government.

1. Nontechnical Impacts

Most agency officials felt that legislative and regulatory policies will continue to influence their plans and acquisitions for the foreseeable future. Agencies cannot predict the timing or effects of additional FCC and OMB actions and consequently encounter difficulty in forecasting telecommunications costs and acquisition schedules. Governmentwide or agencywide telecommunications programs need to reflect agency telecommunication needs and be supportive of these needs.

Every agency expressed concern over congressional budget actions to counteract the rising federal deficit. In general, agencies with security or emergency-preparedness missions felt less threatened by budget cuts. In periods of budget reduction, use of telecommunications facilities, such as teleconferencing, gains favor as a cost-effective alternative to travel. FIRMR Bulletin 16, Travel by Federal Telecommunications System, substantiates this view.

Reductions in the DoD budget would force some reprogramming of telecommunications funds. In most cases, strategic and tactical systems receive priority. However, base communications modernization programs lose funding or are deferred to later years.

2. Agency Recommendations to Vendors

Most agencies want vendors to work toward and support common telecommunications standards, even though the OSI reference model has not yet become effective. Vendors could address the government's protracted problems with system interconnection and interoperability by supplying compatible hardware architecture and communications protocols. In most cases, however, this is incompatible with the vendors' marketing thrusts.

Agencies also would prefer that vendors package telecommunications systems and services as integrated solutions. Most agencies do not want to perform in-house system integration. Agency officials frequently commented on the vendor-buyer business relationships. Vendors are too "opportunity" oriented and only concerned with making the next sale.

In conjunction with the previous comment, agencies contacted believe that vendors could improve their image with federal officials through better pre- and post-award support.

They believe that vendors should respond to the confusion over divestiture and the shortage of federal telecommunications expertise by providing more planning guidance. Vendors need to increase the responsiveness and quality of service after a system goes into operation.

Agency officials noted a growing need for secure telecommunications, including end-to-end encryption. Vendors should develop additional and more-secure systems and services. Current PBX equipment and facilities were mentioned as being particularly difficult to secure.

V

Competitive Trends

A

The Marketplace

As explained earlier in Section III, INPUT has broken the federal telecommunications market into three separate segments:

- Leased Telecommunications Services
- Telecommunications Equipment (Hardware)
- Telecommunications Professional Services (made up of Telecommunications Maintenance Services and Telecommunications Technical Support)

Further, in its competitive analysis, INPUT has divided the federal telecommunications market segments above into "single" and "bundled" subsets. The vendors and values that appear in a single market segment analysis represent contract actions that contain only the Federal Supply Codes (FSCs) for products and services that define the market segment. The bundled market segments contain contract actions that involve at least one of the selected Federal Supply Codes as well as any other Federal Supply Code or Codes. For example, a single contract for leased telecommunications services should contain ONLY the FSC for leased telecommunications services, and nothing else. A bundled contract in the same segment would include the FSC for leased telecommunications as well as other FSCs for anything from computer security equipment or other ADP supplies to X-ray equipment or garbage collection services.

As one might expect from the above discussion, each of the segments that make up the federal telecommunications market contains a percentage of single and a percentage of bundled contract actions. The following exhibits show this single versus bundled breakout for each market segment or subsegment. Analyzing each market segment's composition of single and bundled contract activity helps to contrast the concentration of

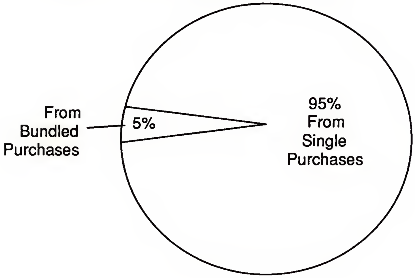
funding spent on specialized product or service contracts (single), with funding spent on contracts involving the purchase of multiple products and services (bundled). Armed with knowledge of these contrasts, vendors may better select only the particular telecommunications market segments that match their capabilities.

1. Leased Telecommunications Services

Exhibit V-1 shows the percentage of total federal leased telecommunications services obligations that originated through single and bundled contracts. The 100% sum represents all obligations for federal leased telecommunications from fiscal years 1984 to 1987.

EXHIBIT V-1

PERCENTAGE OF TOTAL SERVICE MODE PURCHASES SINGLE VERSUS BUNDLED MARKETS FISCAL YEARS 1984-1987 LEASED TELECOMMUNICATIONS



Single purchases of these services accounted for 95% of all obligations for the period. The leased telecommunications services portion of bundled contracts for the same period accounted for only 5% of the total. In this market, specialized contracts involving the purchase of only leased telecommunications services account for nearly all of the federal

obligations for those services. Such a lack of obligations from bundled contracts may indicate that there are relatively few products and services that may readily be purchased in conjunction with leased telecommunications services.

Exhibit V-2 shows the top three "other" products and services purchased by the federal government through the same contract as leased telecommunications. The percentages indicate the proportion of total bundled contract obligations spent on each "other" product or service.

EXHIBIT V-2

TOP THREE "OTHER" PRODUCTS AND/OR SERVICES PURCHASED IN BUNDLED MARKET SEGMENTS FISCAL YEARS 1984-1987 LEASED TELECOMMUNICATIONS

RANK	PRODUCT/SERVICE MODE	PERCENT OF TOTAL BUNDLED SEGMENTS
Selected Service(s)	Leased Telecommunications	47
1	Lease-Rent of Communications Equipment	15
2	Communications Security Equipment and Computers	9
3	Telephone and Telegraph Equipment	6

In the bundled market, the selected service, leased telecommunications, accounted for the highest percentage of bundled dollars spent. The next three most popular products and services purchased through leased telecommunications contracts were lease and rent of communications equipment at 15%, communications security equipment at 9%, and finally, telephone and telegraph equipment at 6%. In this bundled market, each of the "other" categories are closely related to leased telecommunications services, and relatively few items outside of the primary scope of the contract are purchased.

2. Telecommunications Equipment

The split between single and bundled obligations for telecommunications equipment is shown in Exhibit V-3. In this market, the proportion of obligations that originate in single contracts does not so heavily outweigh the obligations through bundled actions. Single contract actions accounted for 68% of the total funding spent on telecommunications equipment for the four years analyzed. Bundled contract totals for this equipment represent 32% of the funding for the same period. The telecommunications equipment market may be successfully approached through either contracting strategy; however, the most cost effective method for market penetration appears to be through single contract actions.

EXHIBIT V-3

PERCENTAGE OF TOTAL SERVICE MODE PURCHASES SINGLE VERSUS BUNDLED MARKETS FISCAL YEARS 1984-1987 TELECOMMUNICATIONS EQUIPMENT

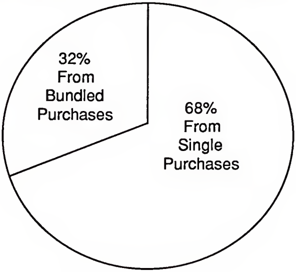


Exhibit V-4 shows that, as a proportion of all funding spent in bundled contracts, telecommunications equipment drew 19% of the obligations. The next three items most likely to be included in a bundled telecommunications equipment purchase show the defense-related nature of this marketplace. Electronic Countermeasures and Quick Reaction Equipment accounted for 14% of the bundled funding spent in this market during the 1984-1987. In the same period, Fixed-Wing Aircraft and Airframe Structural Components were next highest in percentage spending bundled with telecommunications equipment. The nature of these "other" items indicates that much of the telecommunications equipment

acquired by the federal government is not only purchased through single contracts, but also through contracts heavily involved with aircraft avionics suites and aircraft assembly items.

EXHIBIT V-4

TOP THREE "OTHER" PRODUCTS AND/OR SERVICES PURCHASED IN BUNDLED MARKET SEGMENTS FISCAL YEARS 1984-1987 TELECOMMUNICATIONS EQUIPMENT

RANK	PRODUCT/SERVICE MODE	PERCENT OF TOTAL BUNDLED SEGMENTS
Selected Service(s)	Telecommunications Equipment	19
1	Electronic Countermeasures and Quick Reaction Equipment	14
2	Aircraft, Fixed Wing	10
3	Airframe Structural Components	4

3. Telecommunications Technical Support Services

Exhibit V-5 indicates that single contract actions represent 88% of the total telecommunications technical support services market obligations, whereas bundled contract actions account for only 12% of the funding spent on those services. This market is another where single contract actions outweigh bundled in their contribution to total federal contract obligations. In many instances, telecommunications technical support services are purchased through a specific contract for technical support, completely separate from contracts for other equipment and services.

The top "other" category purchased as part of a bundled contract involving telecommunications technical support was ADPE system configuration services, as shown in Exhibit V-6. As a percentage of total bundled dollars spent in this market, technical support only ranked second, accounting for 19% of the spending. The third most likely item to be

EXHIBIT V-5

PERCENTAGE OF TOTAL SERVICE MODE PURCHASES SINGLE VERSUS BUNDLED MARKETS FISCAL YEARS 1984-1987 TELECOMMUNICATIONS TECHNICAL SUPPORT SERVICES

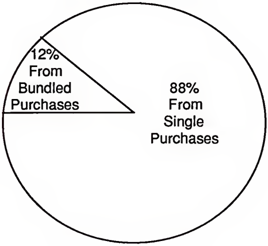


EXHIBIT V-6

TOP THREE "OTHER" PRODUCTS AND/OR SERVICES PURCHASED IN BUNDLED MARKET SEGMENTS FISCAL YEARS 1984-1987 TELECOMMUNICATIONS TECHNICAL SUPPORT

RANK	PRODUCT/SERVICE MODE	PERCENT OF TOTAL BUNDLED SEGMENTS
1	ADPE System Configuration	27
Selected Service(s)	Telecommunications Technical Support	19
2	Operation of Government Missile Systems Facilities	5
3	Operations of Government Maintenance Buildings	4

purchased on a bundled contract for technical services is the operation of government missile systems facilities, consuming 5% of the bundled market's expenditures. Operations of government maintenance buildings assumed 4% of the obligations.

The high ranking of ADPE system configuration is not an oddity, since it is so closely related to telecommunications technical support services. However, heavy purchases of operations of government missile facilities services show the bundled market for telecommunications technical services skewed toward contracts aimed at areas outside the scope of the market.

4. Telecommunications Maintenance Services

Exhibit V-7 shows the proportion of obligations for federal telecommunications maintenance services through single and bundled contract actions. Single purchases of maintenance services accounted for 72% of all obligations, while bundled contract actions represented 28% of the total. Although single contracts do not dominate quite so heavily in this market, they still represent the most cost-effective method of providing telecommunications maintenance services to the federal government. Such a low proportion of funding for single contracts may be related to the wide variety of telecommunications equipment that is purchased, with maintenance services included. Nonetheless, the high percentage of single contract obligations also allows vendors to enter this market not through an equipment sale, but through a maintenance sale, either for their own equipment, or as a third party.

EXHIBIT V-7

PERCENTAGE OF TOTAL SERVICE MODE PURCHASES SINGLE VERSUS BUNDLED MARKETS FISCAL YEARS 1984-1987 TELECOMMUNICATIONS MAINTENANCE

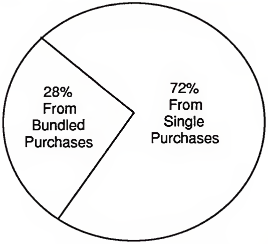


Exhibit V-8 shows the percentage of federal obligations that were spent on the top three "other" products and services in bundled contracts. The top category in bundled contracts was the selected service telecommunications maintenance, which absorbed 16% of all the funding spent in bundled contracts in this market. The next top categories were miscellaneous communications equipment at 9%, electronic countermeasures and quick reaction equipment at 7%, and guided-missile remote control systems at 3% of the total bundled spending in the telecommunications maintenance market. This collection of "other" service categories indicates that, through bundled contracts in this market, the government purchases primarily telecommunications maintenance services. But on the same contracts, the federal agencies also purchase large quantities of equipment that is unrelated to telecommunications maintenance.

EXHIBIT V-8

TOP THREE "OTHER" PRODUCTS AND/OR SERVICES PURCHASED IN BUNDLED MARKET SEGMENTS FISCAL YEARS 1984-1987 TELECOMMUNICATIONS MAINTENANCE

RANK	PRODUCT/SERVICE MODE	PERCENT OF TOTAL BUNDLED SEGMENTS
Selected Service(s)	Telecommunications Maintenance	16
1	Miscellaneous Communications Equipment	9
2	Electronic Countermeasures and Quick-Reaction Equipment	7
3	Guided-Missile Remote Control Systems	3

B

Federal Telecommunications Vendors

Each of the three market segments (combining maintenance and technical support into professional services) contains its own unique set of competing vendors and top performers. The following sections of this report discuss the performance of the top five telecommunications vendors in each federal government market segment over the past four fiscal

years, 1984-1987. Each section addresses a particular market segment and, in the case of telecommunications professional services, two subsegments.

Also as discussed above, each market segment and subsegment has been analyzed from both a "single" and a "bundled" point of view. The single market analyses cover contract actions that involve only the selected FSCs for that segment, while the bundled market analyses cover actions that include at least one selected FSC, and any number of other FSCs represented on the same contract.

Single and bundled market analysis of otherwise identical segments allows for emphasis of the wide variety of distinctions between doing business in single versus bundled environments. Because of the variety of procurement methods used by the federal government, an apparently straightforward market on the surface may be better understood when broken into single and bundled components.

1. Leased Telecommunications Market

The leased telecommunications market segment includes vendors that provide leased telecommunications services to the federal government. The Federal Supply Code for these services is S113, specifically for "utilities, telephone and/or communications." The vendors in the single analysis have contracted to sell only S113 services, whereas the vendors in the bundled analysis have sold some S113 as well as any number of other products or services on the same contract.

As shown in Exhibit V-9, for the single federal leased telecommunications market, the top vendor slot has been convincingly controlled by AT&T for the past four years, with an average market share of 44%. This standing should come as no surprise to even casual followers of the federal leased telecommunications market. However, rankings 2 through 5 constantly fluctuate in the single market over the four-year span. Bell Atlantic was the only other vendor to even rank in the top five each year, although its position varied from second in 1984 to fourth or fifth from 1985 through 1987. Western Union made reasonable showings for the four-year period, but was not ranked in the top five in 1987. On the more volatile side of the market, a few vendors showed in the rankings for only one of the four years covered. These one-year showings come from U.S. West and Independent Domestic Communications Corp.

The single leased telecommunications market will continue to be controlled by AT&T for the time being. However, the impending FTS-2000 procurement has the potential for a significant reallocation of market shares. The lower positions (2-5) are the only places for significant vendor competition. Based on past performance and corporate capabilities, Bell Atlantic should continue to be successful in this area. Contel,

EXHIBIT V-9

TOP FIVE VENDORS AND MARKET SHARES, LEASED TELECOMMUNICATIONS FISCAL YEARS 1984-1987 SINGLE CATEGORY

FY 1984			FY 1985		
RANK	VENDOR	PERCENT SHARE	RANK	VENDOR	PERCENT SHARE
1	AT&T	42	1	AT&T	46
2	Bell Atlantic	9	2	Western Union	8
3	Western Union	6	3	Independent Domestic Communications	5
4	Contel Corp.	5	4	Bell Atlantic	4
5	U.S. West	4	5	GTE	4

FY 1986			FY 1987		
RANK	VENDOR	PERCENT SHARE	RANK	VENDOR	PERCENT SHARE
1	AT&T	46	1	AT&T	42
2	Western Union	6	2	The Boeing Company	7
3	Bell Atlantic	5	3	Contel Corp	7
4	General Electric	4	4	Bell Atlantic	6
5	GTE	3	5	General Electric	3

U.S. West, and even Boeing have the potential to be strong competitors in the years to come.

The top five vendors in the bundled leased telecommunications market are listed in Exhibit V-10.

EXHIBIT V-10

TOP FIVE VENDORS AND MARKET SHARES, LEASED TELECOMMUNICATIONS FISCAL YEARS 1984-1987 BUNDLED CATEGORY

FY 1984			FY 1985		
RANK	VENDOR	PERCENT SHARE	RANK	VENDOR	PERCENT SHARE
1	AT&T	37	1	AT&T	53
2	City of Colorado Springs	13	2	City of Colorado Springs	8
3	South Central Bell	10	3	South Central Bell	8
4	GTE	6	4	GTE	5
5	MCI Telecomm.	3	5	Southwestern Bell	3

FY 1986			FY 1987		
RANK	VENDOR	PERCENT SHARE	RANK	VENDOR	PERCENT SHARE
1	AT&T	51	1	AT&T	35
2	Electrospace Systems Inc.	17	2	Electrospace Systems Inc.	27
3	Astronautics Corp. of America	8	3	Astronautics Corp. of America	7
4	U.S. West	6	4	City of Colorado Springs	5
5	City of Colorado Springs	4	5	U.S. West	5

The vendors listed in this segment of the analysis have sold a variety of "other" products and services through contracts that happen to include FSC S113—leased telecommunications services. Since even those contracts with minor revenues from leased services are included here, some new vendors now rank in the top five.

In the bundled market the dominance of AT&T is even more pronounced. In fiscal years 1985 and 1986, the company controlled more than 50% of the market each year. The strong showings each year by the City of Colorado Springs most likely result from major contracts with the Air Force Academy, Air Force Accounting and Finance Center, and possibly the Cheyenne Mountain Complex, all located reasonably near the city. Further, unlike the single category of this market, second and third rankings each represent significant shares of the total pie. Top rank certainly represents an uncontested dominance by the top vendor, but second and even third rankings still allow for an average market share of 16% and 8%, respectively.

The bundled market will most likely continue to be dominated by AT&T, but the second and third rankings could potentially become stronger, wearing away some of the dominance of the top rank. Other strong vendors over the next years will probably include GTE, MCI Telecommunications, South Central Bell, and Southwestern Bell. Also, because of the potential for significant "other" product and service sales, Electrospace Systems, Inc. may make even stronger showings with its comprehensive line of telecommunications control systems, switching equipment, and secure telecommunications products.

2. Telecommunications Equipment Market

The telecommunications equipment market segment includes a wide variety of Federal Supply Codes. A large number of codes is necessary to ensure complete coverage of this complex market segment. Included in the federal telecommunications market are the following Federal Supply Codes:

- 5805 Telephone and Telegraph Equipment
- 5810 Communications Security Equipment and Components
- 5811 Other Cryptologic Equipment and Components
- 5815 Teletype and Facsimile Equipment
- 5820 Radio and TV Equipment, Except Airborne
- 5821 Radio and TV Equipment, Airborne
- 5825 Radio Navigation Equipment, Except Airborne
- 5826 Radio Navigation Equipment, Airborne
- 5830 Intercomm Public Address Systems, Except Airborne
- 5831 Intercomm Public Address Systems, Airborne
- 5850 Visible/Invisible Light Communications Equipment
- 5895 Miscellaneous Communication Equipment

- 5985 Antennas, Waveguides, and Related Equipment
- 5995 Cable Cord Wire Assembly—Communications Equipment
- 60xx Fiber Optic Conductors, Cables, Assemblies, Devices, Interconnectors, and other Accessories
- 6145 Electric Wire and Cable
- 6940 Communication Training Devices

Note: In the interest of completeness, product purchases involving any of these supply codes have been included in this segment study. However, many of these products do not enter into any part of the total federal information technology budget (A-11 43A), on which INPUT bases its telecommunications market forecast.

The data for this market have been separated into single and bundled segments. The single segment includes contracts that involve only the selected FSCs above. The bundled segment includes contracts that cover at least one FSC above and any other product or service in any other FSC.

The leading five vendors in the single telecommunication equipment market are shown in Exhibit V-11. This market is much less "top heavy" than the leased telecommunications market, with the top vendors here claiming an average of only 12%, not 40 to 50% as in leased telecommuncations. However, over the four-year span, there seems to be a developing trend for increased revenue concentration at the top ranks. With fewer but larger contracts coming in the future, this trend will likely continue.

The most consistent performances in this market come from U.S. Philips Trust (which includes Amparex, Magnavox, and various Philips Electronics organizations) and Rockwell, which both appear in the top five in each year of the study. Other strong showings are turned in by General Electric and, in the last two years of the study, GTE, which has gained a significantly larger share of the market in the last two years than the top vendors have in the preceeding two years. Also in this segment, a number of vendors managed to make only sporadic appearances in the top five. Most notable in this category are ITT/Alcatel, Harris Corp., and Raytheon, which, despite having strong lines of telecommunications equipment, have made showings in the top five only once or twice over the four-year span.

EXHIBIT V-11

TOP FIVE VENDORS AND MARKET SHARES, TELECOMMUNICATIONS EQUIPMENT FISCAL YEARS 1984-1987 SINGLE CATEGORY

FY 1984			FY 1985		
RANK	VENDOR	PERCENT SHARE	RANK	VENDOR	PERCENT SHARE
1	U.S. Philips Trust	7	1	ITT/Alcatel	6
2	Raytheon	6	2	Harris Corp.	6
3	General Electric	5	3	U.S. Philips Trust	5
4	Rockwell	4	4	Rockwell	5
5	General Motors	4	5	General Electric	4

FY 1986			FY 1987		
RANK	VENDOR	PERCENT SHARE	RANK	VENDOR	PERCENT SHARE
1	GTE	14	1	GTE	22
2	Rockwell	8	2	U.S. Philips Trust	6
3	U.S. Philips Trust	5	3	Rockwell	5
4	General Electric	4	4	General Motors	4
5	AT&T	4	5	ITT/Alcatel	4

Over the next five years, new growth areas in the single telecommunications equipment market will include at least the three following federal supply groups:

- Any related fiber optics equipment and supplies
- Facsimile Equipment
- Communication Security Equipment

The fiber equipment and supply market will continue to grow as federal agencies begin to realize the increased capabilities of a wideband communications medium. As the GOSIP protocols secure approval by the National Bureau of Standards, and as ISDN capabilities increasingly become one of a number of popular methods for information transmission, the federal government will be pressured to develop fiber optic capabilities to keep pace.

The need for facsimile equipment has already been established in this four-year study. For the fiscal year period 1984-1987, the federal government has already spent fully 2% of its telecommunications equipment obligations on facsimile equipment. With increased reliance on facsimile equipment, this 2% figure will ultimately increase.

Finally, the need for security equipment is even more firmly established, commanding 9% of the federal obligations for communications equipment. As increased numbers of large, sophisticated communications networks become commonplace in the federal government, requirements for more communications security equipment will follow upward as well.

Exhibit V-12 shows the leading five vendors in the bundled telecommunications equipment market for fiscal years 1984-1987. This ranking includes vendors that have sold the government products categorized by at least one of the FSCs above, in conjunction with nearly any other product or service the government may purchase.

Unlike the single telecommunications equipment market, the bundled market allows no one vendor to dominate any of the top positions. In fact, only one vendor (The Boeing Company) in this market ranks among the top five vendors in each of the four years analyzed. Many other vendors in the bundled market perform well in only two or three years, and some, like General Motors, Grumman, or Raytheon, manage to rank in the top five only once. Strong showings in the market indicate vendors with strengths in telecommunications equipment as well as in other computer service arenas. In fact, consistent performers such as Boeing are not necessarily known for their telecommunications equipment products, but are able to rank high because of related business on the same telecommunications equipment contract.

EXHIBIT V-12

TOP FIVE VENDORS AND MARKET SHARES, TELECOMMUNICATIONS EQUIPMENT FISCAL YEARS 1984-1987 BUNDLED CATEGORY

FY 1984			FY 1985		
RANK	VENDOR	PERCENT SHARE	RANK	VENDOR	PERCENT SHARE
1	McDonnell Douglas Corp.	11	1	The Boeing Company	13
2	The Boeing Company	11	2	Lockheed Corp.	7
3	Lockheed Corp.	7	3	ITT/Alcatel	6
4	ITT/Alcatel	6	4	McDonnell Douglas Corp.	6
5	IBM	5	5	General Motors	6

FY 1986			FY 1987		
RANK	VENDOR	PERCENT SHARE	RANK	VENDOR	PERCENT SHARE
1	Grumman Corp.	10	1	Raytheon	18
2	The Boeing Company	7	2	Lockheed Corp.	10
3	McDonnell Douglas Corp.	6	3	The Boeing Company	5
4	Rockwell	6	4	General Electric	5
5	United Technologies	5	5	IBM	5

As in the single telecommunications equipment market, the growth areas in this market will likely be:

- Fiber optics equipment and supplies
- Facsimile equipment
- Communication security equipment

However, since these products are part of bundled contracts, their actual purchase will originate from contracts "related" to telecommunications equipment in some cases. In other cases, the focus of the contract may not be telecommunications equipment at all. These related (and unrelated) contracts allow vendors without strong telecommunications equipment capabilities, especially in the areas listed above, to enter the market through other means. Vendors without strong telecommunication equipment capabilities use a subcontractor or contractors to fulfill product line shortcomings.

3. Telecommunications Professional Services: Telecommunications Maintenance Services and Technical Support

For this analysis, the telecommunications professional services market will include data from two telecommunications services segments: the telecommunications maintenance services market and the telecommunications technical support market. As in other market segment analyses, the professional services segment includes a wide variety of Federal Supply Codes as follow below.

Telecommunications maintenance services include:

- H158 Quality Control of Communications Equipment
- H258 Equipment Test Services
- H358 Inspection Services
- J058 Maintenance and Repair of Communications Equipment
- J060 Maintenance and Repair of Fiber Optics Materials and Equipment
- K058 Modification of Communications Equipment
- L058 Technical Representative Services: Communications
- N058 Installation of Communications Equipment

Telecommunications technical support includes:

- M127 Operation of Government Electronic and Communications System Facility
- R304 ADP Services and Data Transmission
- R426 Professional Services: Communications Services
- R553 Communications Studies

- Y127 Construction of Electronic and Communication Systems and Facilities
- Z127 Maintenance, Replacement, and Alteration of Electronic and Communication System Facilities

Also, like other segment analyses, both of these segments will be further broken into single and bundled markets. Taken as a set, the single and bundled telecommunications maintenance market and the single and bundled telecommunications technical support market will make up the telecommunications professional services segment of this report.

a. Telecommunications Maintenance Services Market

As shown in Exhibit V-13, two vendors, AT&T and IBM, share the top ranks of the single telecommunications maintenance services market. These cover contracts that involve at least one of the FSCs above, but are coupled with no others. Aside from the consistent performance of these top two, and Ford Aerospace's showing in three of the four years, many other vendors listed in this exhibit only show once or twice. In fact, of the ten different vendors who ranked in the top five over the past four years, one half appear only once. These five one-year showings were made by Raytheon in 1984; General Electric in 1985; and Tracor, Allied Signal, and SAIC in 1987.

Such a high rate of vendor appearances in only one year may indicate a highly competitive and volatile market, in which a comparatively few awards can change the top rankings from year to year. AT&T's strong performance in this market probably results from its domination of the leased telecommunications market (both single and bundled), and the likelihood of separate follow-on maintenance contracts from those leased telecommunications contracts. IBM's high revenues from telecommunications maintenance most likely involve subcontracting and OEM activities in areas such as maintenance and repair of communication equipment, technical representative services, or even installation of communications equipment. In the future, the most successful vendors in this market will be those that are able to translate contracting activity in related telecommunications areas into follow-on maintenance contracts for the out years.

The bundled telecommunications maintenance services market includes contracts that contain at least one of the FSCs listed for telecommunications maintenance, along with any other product or service the government may buy. The top five vendors in this market segment are shown in Exhibit V-14. The top position in this market has not been dominated by any one vendor over the four years of the study. In 1984, the top performer was Lockheed; in 1985, number one was General Motors; and in 1986 and 1987 General Electric controlled the top position.

EXHIBIT V-13

TOP FIVE VENDORS AND MARKET SHARES, TELECOMMUNICATIONS MAINTENANCE SERVICES FISCAL YEARS 1984-1987 SINGLE CATEGORY

FY 1984			FY 1985		
RANK	VENDOR	PERCENT SHARE	RANK	VENDOR	PERCENT SHARE
1	AT&T	17	1	IBM	18
2	Ford Aerospace	10	2	Ford Aerospace	12
3	IBM	10	3	AT&T	11
4	Raytheon	9	4	Texas Instruments	7
5	General Motors	6	5	General Motors	5

FY 1986			FY 1987		
RANK	VENDOR	PERCENT SHARE	RANK	VENDOR	PERCENT SHARE
1	AT&T	16	1	IBM	20
2	IBM	7	2	AT&T	13
3	General Motors	5	3	Tracor	4
4	Ford Aerospace	5	4	Allied Signal	4
5	Texas Instruments	5	5	SAIC	3

EXHIBIT V-14

TOP FIVE VENDORS AND MARKET SHARES, TELECOMMUNICATIONS MAINTENANCE SERVICES FISCAL YEARS 1984-1987 BUNDLED CATEGORY

FY 1984			FY 1985		
RANK	VENDOR	PERCENT SHARE	RANK	VENDOR	PERCENT SHARE
1	Lockheed Corp.	13	1	General Motors	12
2	McDonnell Douglas	10	2	General Electric	11
3	GTE	10	3	Lockheed Corp.	7
4	Rockwell International	8	4	Texas Instruments	6
5	Allied Signal	7	5	Allied Signal	5

FY 1986			FY 1987		
RANK	VENDOR	PERCENT SHARE	RANK	VENDOR	PERCENT SHARE
1	General Electric	17	1	General Electric	32
2	United Technologies	10	2	Electrospace Systems	7
3	Ford Aerospace	8	3	Motorola	6
4	Rockwell International	5	4	United Technologies	6
5	Electrospace Systems	5	5	Rockwell International	5

Interestingly, the only appearance in this market by General Motors was in the top position in 1985, and the most consistent performance comes from Rockwell International, ranking no higher than number four, but making that appearance for three of the four years. Although it qualified only three times for the top five ranking, General Electric appears to be the leader in this market for the time being. The company has moved from no standing in 1984, to second status in 1985, to number one in 1986 and 1987; GE had shares of 17% and 32% for those last two-top ranking years.

There are two notable absentees from list. AT&T and IBM do not once qualify for any position in the top five during any of the four years studied. This absence may be explained largely by the variety of "other products and services" bought in the bundled telecommunications maintenance services market.

b. Telecommunications Technical Support Market

The second segment included in the telecommunications professional services market covers single and bundled contracts for telecommunications technical support. The Federal Supply Codes included in this section are listed at the opening of the professional services section.

The top vendors for the single telecommunications technical support segment are listed in Exhibit V-15. Again, these vendors have received revenues only for products listed in the FSCs above for technical support.

The uncontested leader in this market for single telecommunications technical support is Pan Am, the airline. This leadership is at least partly explained by the fact that Pan Am has subsidiaries such as TGS Technology, Inc. and Pan American Electronics, Inc. which are apparently becoming increasingly involved in the federal telecommunications technical support market.

The other vendors in this market do not include such surprises. After Pan Am, the
second-place company in this market is Lockheed, which controlled 21% and 13% shares in fiscal 1985 and 1986, respectively. Many of the remaining vendors in this market qualify for top-five ranking in each of the four years of the study. In fact, unlike other segments, only one vendor appears once, and only two appear twice. Pan Am, General Electric, and Ford Aerospace appear in the top five each year, and Lockheed appears in the rankings for three of the four.

EXHIBIT V-15

TOP FIVE VENDORS AND MARKET SHARES, TELECOMMUNICATIONS TECHNICAL SUPPORT FISCAL YEARS 1984-1987 SINGLE CATEGORY

FY 1984			FY 1985		
RANK	VENDOR	PERCENT SHARE	RANK	VENDOR	PERCENT SHARE
1	Pan Am	24	1	Pan Am	25
2	Allied Signal	17	2	Lockheed Corp.	21
3	General Electric	11	3	Allied Signal	8
4	Lockheed Corp	10	4	General Electric	5
5	Ford Aerospace	6	5	Ford Aerospace	5

FY 1986			FY 1987		
RANK	VENDOR	PERCENT SHARE	RANK	VENDOR	PERCENT SHARE
1	Pan Am	30	1	Pan Am	32
2	Lockheed Corp.	13	2	General Electric	6
3	Ford Aerospace	5	3	Calculon Corp.	4
4	Calculon Corp.	5	4	Ford Aerospace	4
5	General Electric	4	5	E-Systems, Inc.	2

In the bundled telecommunications technical support market segment, the top vendors are shown in Exhibit V-16.

EXHIBIT V-16

TOP FIVE VENDORS AND MARKET SHARES, TELECOMMUNICATIONS TECHNICAL SUPPORT FISCAL YEARS 1984-1987 BUNDLED CATEGORY

FY 1984			FY 1985		
RANK	VENDOR	PERCENT SHARE	RANK	VENDOR	PERCENT SHARE
1	Federal Republic of Germany	16	1	American Management Systems	11
2	Lockheed Corp.	15	2	Caddell Construction	9
3	General Electric	9	3	General Electric	9
4	Motorola	6	4	Dyncorp	8
5	IBM	6	5	Ericsson, Inc.	5

FY 1986			FY 1987		
RANK	VENDOR	PERCENT SHARE	RANK	VENDOR	PERCENT SHARE
1	Zenith Corp.	32	1	Zenith Corp.	48
2	Digital Equipment Corp.	20	2	Digital Equipment Corp.	16
3	Northrop Corp.	10	3	Northrop Corp.	6
4	Dyncorp	7	4	Dyncorp	4
5	TRW, Inc.	4	5	American Management Systems	3

These vendors have sold at least one product from a FSC shown above for telecommunications technical support, along with any other product or service the government may purchase.

The top vendor in this market is Zenith, even though the company did not even show in the rankings until the last two years of the study. This strong performance in the last two years results from the large (and ever growing) Indefinite Delivery contract with the Department of Defense. The contract authorized the purchase of microcomputers and related peripherals. Since some of the other services included in the contract fall under a telecommunications classification, the contract's total value is included here.

Other strong contenders in this market segment include Digital Equipment Corporation, Dyncorp, General Electric, and Northrop Corporation, all appearing at least twice in the top five standings. Top performers in the single market do not show strongly here, where there is no mention of Pan Am or Ford Aerospace; General Electric appears only twice, not four times as in the single market.

C

Vendor Federal Telecommunications Market Plans

The following discussion examines four specific areas of vendor concern in approaching the federal telecommunications market.

- Federal telecommunications standards
- FTS 2000 strategies and reactions
- Industry reaction to VANs on the TSP
- Development of LAN Services

1. Standards

Vendors and federal agencies generally agree that the federal government should migrate toward the OSI standards for its telecommunications protocols. In fact, over 40% of the vendors interviewed currently support some subset of the OSI standards, almost always including X.25. Nearly one-third of the vendors also support IBM's SNA and TCP/IP, the latter being a DDN protocol.

During the final weeks of August 1988, the National Bureau of Standards (NBS) adopted a set of internationally recognized communications protocols as the Government Open Systems Interconnection Profile (GOSIP) standard. The NBS spent nearly two years developing this profile as a federal information processing standard (FIPS). According to the bureau, the new GOSIP profile will include the message-handling systems, as well as file transfer, access, and management applications of the International Standard Organization's Open Systems Interconnection (OSI) standards. This set of protocols will operate in four network

environments: X.25, Carrier Sense Multiple Access with Collision Detection (CSMA/CD; IEEE 802.3), Token Bus (IEEE 802.4), and Token Ring (IEEE 802.5).

Because of the recent GOSIP activity and other commercial application momentum, the full OSI reference model and associated standards is expected to gain additional vendor support during the next five years. Nearly 65% of the vendors interviewed will either add OSI product support, maintain the coverage they offer, or expand their product support of OSI protocols.

Even vendors with a strong commitment to proprietary protocols are responding to the federal trend toward OSI. For example, IBM and Digital Equipment Corporation have both made public statements supportive of OSI, and are active participants in NBS-sponsored OSI activities.

In another telecommunication protocol development, the major standards organizations have been gradually moving toward agreement on architectures for network and LAN management. Groups within the IEEE 802 committee are developing protocols for LAN management, which will fit into the layered OSI model. These protocols do not entirely agree with the same work done by the ISO, but industry representatives are working on convergence of these network protocols.

In further work to get the OSI word out, the National Bureau of Standards is sponsoring demonstrations of OSI-based MAP/TOP systems. The Bureau is also coordinating vendor activities on a project called OSINET, which provides vendors with a testbed X.25 network for developing, testing, and demonstrating OSI protocols and products. This network was provided by AT&T and Wang. Other workshop participants in OSINET are shown in Exhibit V-16a. As a result of this workshop, NBS issued a March 1987 revision of the "Implementation Agreements for Open Systems Interconnection Protocols" (NBSIR-86-3385-4).

More recently, users and vendors gathered this past June 1988 at the Enterprise Networking Event to show their commitment to the closely related OSI and MAP/TOP protocols. The event, jointly sponsored by the Corporation for Open Systems (COS) and MAP/TOP users' groups, included numerous demonstrations of MAP and TOP-based systems "in action." Concurrent sessions included discussions of the CCITT X.25 and X.400 protocols for packet-switched networks and electronic mail transmission.

Communications protocol conformance has become an important marketing tool in developing products and services that reflect users' demand for products that implement common standards. Both industry and government see the need to continue to coordinate their efforts in protocol and standards development.

EXHIBIT V-16a

OSINET AND OSI WORKSHOP PARTICIPANTS

- Computer Manufacturers
- Semiconductor Manufacturers
- Word Processing Vendors
- Process Control Vendors
- Communication Carriers
- Network Services Vendors
- Federal Government Users
- Canadian and European Government Representatives

Note: Over 200 vendors and federal agencies have participated in the OSI workshop series.

2. FTS 2000 Strategies and Reactions

FTS 2000 is the largest single telecommunications network acquisition proposed by the federal government to date. Surrounded by dispute, this program had been through at least 10 substantive revisions and amendments prior to reaching the formal RFP stage. The contract award and implementation, now scheduled for December 1988, will alter all federal telecommunication vendors' and federal agencies' approaches to selling or acquiring nearly any type of telecommunication product or service. INPUT asked both vendors and federal agencies to comment on the procurement.

As shown in Exhibit V-17, most vendors believe that centralization of federal telecommunications is in the best interest of the government. The percentage of positive responses is slightly lower when the best interests of individual agencies are considered. This lower positive response rate reflects agency concerns that the GSA may not fully understand the scope of agencies' particular telecommunications requirements.

EXHIBIT V-17

VENDOR OPINION OF CENTRALIZED FEDERAL TELECOMMUNICATIONS*

	BEST INTEREST	
	GOVERNMENT OVERALL (Percent)	INDIVIDUAL AGENCIES (Percent)
Yes	85	70
No	15	30

*Updated 1987

Most vendors also agree that the successful FTS 2000 prime bidder and subcontractor teams would gain a substantial competitive edge in the federal telecommunications over the term of the contract. Current FTS common carrier and federal VAN suppliers stand the greatest risk of losing future business due to FTS 2000.

Some vendors also voiced the opinion that the FTS 2000 procurement, as described in the original RFP, unfairly restricted competition. Inclusion of such a diversity of services through FTS 2000 could narrow the range of commodities that a telecommunications vendor could realistically sell to the federal government.

Several of the major telecommunications companies had joined forces in submitting bids for the FTS 2000 contract. Three teams were originally established:

- AT&T, Boeing Computer Services, and Computer Sciences Corporation
- Martin Marietta, MCI Communications Corp., and Northern Telecom (and RCA American Communications, Inc.)
- U.S. Sprint Communications Co. and Electronic Data Systems

EDS withdrew from the bidding process in July 1987, leaving U.S. Sprint to actively seek another partner and reevaluate its bidding options. U.S.

Sprint announced several weeks later that it was dropping out of the procurement too, due to lack of time and resources to bid the project by itself as a prime bidder.

With GSA's decision to redraft the FTS 2000 RFP, mandating a multivendor contract award, U.S. Sprint re-entered the bidding process. Bidders to the amended RFP submitted bids for both a 60% and 40% share of the proposed services in order to be considered.

Although the $25 billion FTS 2000 project has been fraught with delays almost since its inception, General Services Administration officials and congressional staff believe the delays are not unusual for a project of this size. The most recent delay involved GSA's cancellation of the September 30, 1988 award date, which has now been rescheduled for December of 1988, at the earliest. According to the GSA, the target date has been extended to gain additional time for evaluating the huge amount of technical and financial data. The bids from the three teams vying for the FTS 2000 job have created a great deal of work for GSA evaluators; for example, the AT&T team alone submitted 10 copies of its 12,000-page, 20-volume proposal. The other two teams' bids are expected to be of similar size.

The General Services Administration has published an interim regulation that requires all agencies of the federal government to use the FTS 2000 system, disallowing all exemptions made previously to those agencies. GSA procurement analysts pointed out, however, that this ruling will affect only those telecommunications procurements begun after October 1, 1988, and will not preempt procurements in progress now.

Directly affected by this newly worded FTS 2000 mandate are the Departments of Defense, as well as seven civilian agencies, including: NASA, the Tennessee Valley Authority, the Nuclear Regulatory Commission, the Department of Energy, the Federal Aviation Administration, the Veterans Administration, and the Bureau of Prisons. Department of Defense officials still claim that their telecommunications needs include unique security requirements and huge traffic volumes over large areas, which would make use of the FTS 2000 system impractical. At this writing, Congress is considering legislation to force DoD onto FTS 2000.

Since the procurement began long before the October 1988 deadline, the $600 million Department of Defense Telecommunications Modernization Project (TEMPO) is not subject to the FTS 2000 nonexemption ruling, and is still progressing roughly on schedule. The program calls for the upgrade of the DoD Washington area administrative telecommunications network only. Provided the program comes to fruition, TEMPO could be at least one federal telecommunication system existing outside of the FTS 2000 realm.

However, the specifications for this program have recently come under dispute as officials of several telecommunications firms have charged that current specifications for TEMPO are skewed in favor of the incumbents, C&P Telephone and AT&T. Under the current contract, C&P provides 95,000 leased Centrex lines, and AT&T supplies 195,000 telephone handsets to 300 defense department buildings in the Washington, D.C. area. Current wording of the specifications in TEMPO documents allows AT&T and C&P to use their current supplier status to their own extreme advantage.

3. Industry Reaction to VANs on the GSA TSP

The majority of vendors INPUT contacted either supply or plan to supply VAN services to the federal government. These value-added network services vendors provided mixed opinions when asked for their reaction to GSA's plans to supply VAN services through the TSP. There was no clear preference for or against the GSA plan.

However, vendors do believe that inclusion of VANs on the TSP will offer federal agencies several benefits. Agencies could benefit from economies of scale, by buying large amounts of VAN services at one time. The government could realize the benefits of new technology sooner, and would ultimately benefit from the simplified procurement processes involved in MASC arrangements like the TSP.

Any expressions of disadvantages to offering VAN services on the TSP centered on potential difficulties in evaluating vendor technical offerings and costs within the current TSP framework. There were also further concerns regarding computer security.

When evaluating their own positions, vendors foresee advantages and disadvantages. Perceived advantages include the ability to offer multiple services through a single contract, the bolstering of Remote Computer Services (RCS) revenues, and overall increases in federal business. Disadvantages include concerns about the reduction of profit margins for RCS and an increase in competition.

4. Development of LAN Services

Nearly all of the vendors queried either supply or plan to supply local-area network services to the federal government. All respondents agreed that the agencies appear to be planning to use ever-increasing amounts of LAN services, especially DoD and NASA. Vendor respondents also noted that federal agency implementation of local-area networks for interconnectivity of diverse sites has increased, with no restriction imposed by the agency's mission.

Popular agency LAN applications include general data exchange, as well as administrative, scientific, and technical applications. Agencies are incorporating LANs into their office automation and command and control programs in ever-increasing numbers.

For example, the Naval Fleet Analysis Center in Corona, California has recently taken delivery of a relatively new network product called LocalNet. This new technology includes a 8200 Ethernet/Token-Bus Backbone bridge as its central innovation. The network, which conforms to the IEEE 802.4 Token-Bus protocols, offers connection capability to multiple protocol subnetworks. As a Naval Fleet Analysis Center spokesman envisions it, placing a LocalNet in each of its 24 buildings would allow him to transparently emulate one large network that could support Ethernet, Token Bus, and even Defense Data Network (DDN) communications protocols.

In future plans for local-area networks, the Navy hopes to issue a formal request for vendor comments on a proposed PC LAN hardware and software contract to supply sites Navy-wide with PC local-area network capabilities. Naval Regional Data Automation Center officials in Norfolk, VA hope to issue the request for comments by November, 1988 and to make an award for this program in October 1989.

Industry standards will represent a major consideration for this contract, as specifications drafters are considering either Ethernet (IEEE 802.3) or Token-Ring (IEEE 802.5) architecture definitions. Some of the more certain requirements for the contract include network servers based on the Intel 80386 microprocessor running at no less than 25MHz, at least 150 MB of hard disk space (expandable to 600 MB), and an industry-standard operating system. The specifications will most likely also include several types of communications gateways providing access to a variety of mainframe systems and other networks, as well as uninterruptable power supplies and a tape backup system. This package will be available to any and all navy sites as well as other interested DoD agencies. Through this contract, the Navy hopes to reduce the occurrence of proprietary or one-of-a-kind networks within the services.

Increased availability of LAN products that provide advanced protocol capabilities continues to encourage dramatic growth in federal LAN implementation. New developments, such as baseband and broadband chips and high-speed optimized switches all work to resolve the voice/data integration problems. Now there is a new high-speed network product available to solve both the interconnection problems and inequal data transmission rates of today's LANs. Scientific Computer Systems, a supercomputer manufacturer, now offers an "ultra-high-speed" token ring network with a data transfer rate of 1.4 gigabits/second, carried over

fiber optic or copper media. This speed renders the product, VectorNet, 140 times faster than Ethernet, and 14 times faster than the emerging Fiber Distributed Data Interface (FDDI) networks. The product is directed at large research labs and other large organizations that use a mix of high-end equipment and require transporting large amounts of data over a variety of networks. In fact, supercomputers installed with the DoD or at numerous Department of Energy sites would be the ideal candidates for making the most of such high-speed, high-volume capabilities. New products and technologies such as these add flexibility and diverse capabilities to federal communications networks.

Vendors support many current LAN standards such as Ethernet and token ring, but also maintain consistent use of their own proprietary network protocols and standards. Many vendors also mentioned the IEEE 802.3 LAN Network Bridge as prevalent in recent agency RFPs for local-area networks. These bridges and other gateways linking dissimilar networks are growing in sophistication and popularity, thus providing public and private wideband network interconnection options for federal users.

Local-area network standards that vendors believe will prevail in the future include Ethernet, IEEE 802.5 for token ring topologies, and ISDN interface capabilities. Respondents also believed the impact of Fiber Distributed Data Interface (FDDI) will affect additional alterations in the LAN marketplace.

D
Vendor Concerns

In discussing the federal telecommunications market, vendors voiced several concerns about federal organization, staffing, and procurement practices.

1. Federal Organization and Staffing

Vendors expressed some frustration with government progress toward integrated voice and data communications management. Although each agency's Office of Information Resources Management (OIRM) is chartered to manage both data and voice communications, necessary organizational changes have been made only recently or are still in progress. Because of this confusion, vendors have had difficulty determining exactly which office or offices are responsible for telecommunications requirements and initiatives. In some cases, where agency voice and data communications are acquired and managed separately, vendors continually receive contradictory information about long-range agency telecommunications plans.

Vendors recognize that most agencies are still lagging industry in telecommunications expertise. Vendors also perceive that, as a result of this

lag, many federal RFPs, live test demonstrations, and benchmarks contain terms, conditions, and specifications that are inappropriate for modern telecommunications systems. On the other hand, agencies with strong in-house telecommunications expertise tend to overspecify solutions and standards, rather than state requirements and allow vendors to bid appropriate technical solutions.

2. Federal Procurement Practices

Vendors believe that federal agencies should place less emphasis on selection of the lowest bidder in telecommunications procurement. Such specialized services may not be directly comparable from vendor to vendor, due to a lack of standard offerings.

Further, some vendors feel that the government agencies have not taken FCC regulations and the AT&T divestiture into account when stating RFP requirements. As a result, these vendors feel that some recent telecommunications services acquisitions have been less than fully competitive. Other vendor concerns about full and open competition were directed specifically at DoD telecommunications acquisitions. Except for companies with existing DoD telecommunications contracts, vendors regard the majority of DoD directives as unnecessarily restrictive, especially those directives relating to the DDN.

3. Suggested Improvements to Products and Services

Industry respondents were asked what practices and services they believe vendors should change or improve over the next five years to make their products and services more valuable to the federal government. Replies varied, correlating to the different types and degrees of experience the vendors have encountered with federal agencies.

In descending order of frequency of mention, Exhibit V-18 lists the primary suggestions for product and service improvements made by industry respondents. Provision of network management services and system integration services was cited most frequently as a suggested means of making vendor offerings more valuable to the federal government. Since increased availability of these services was a major concern voiced by the agencies, vendors and the federal government seem to be making positive steps in increasing satisfaction levels. For areas of future product and service improvements, vendors mentioned the provision of increased telecommunication security measures and compatibility with FTS 2000 standards.

EXHIBIT V-18

SUGGESTED IMPROVEMENTS TO PRODUCTS/SERVICES

FACTOR	RANK*
• Provide Network Management and System Integration Services	1
• Provide Increased Security Measures	2
• Provide Services Compatible with FTS 2000	3
• Provide Application-Oriented Solution to End-User Requirements	4

*Rank based on frequency of mention by respondents.

4. Vendor Perceptions of Agency Opportunities

Opinions of vendors in the federal telecommunications market differ on which agencies provide the most-attractive opportunities. Most large vendors market to both the DoD agencies and to a selection of civil agencies; however, a majority of the respondents indicated that the DoD presented the most opportunities for sales of their products and services. The Department of the Treasury and the IRS in particular were cited by the vendors as the civil agencies with the largest number of telecommunications opportunities. A significant share of the vendor respondents have also decided to concentrate their federal marketing efforts on the Departments of Justice, HUD, and HHS, as well as the VA and GSA.

Most civilian agencies are still upgrading or developing programs for telecommunications that will satisfy additional data requirements into the 1990s. Future opportunities will also arise as agencies begin to implement increasingly stringent computer security measures.

If FTS 2000 is delayed again, additional agency opportunities may appear. This is particularly true among civilian agencies, which have deferred some programs for several years in anticipation of FTS 2000. Only recently, and as a result of pending legislation, has the Department of Defense begun participating in FTS 2000 activities.

5. Factors Affecting Government Spending

Vendors surveyed by INPUT suggested several factors that could increase or decrease federal government spending on telecommunications products and services over the next two to five years. As shown in Exhibit V-19, INPUT has grouped these factors into nontechnical and technical categories.

EXHIBIT V-19

FACTORS AFFECTING GOVERNMENT SPENDING ON TELECOMMUNICATIONS PRODUCTS AND SERVICES

- Nontechnical
  - Impact of Budget Changes
  - Government Directives and Policies

- Technical
  - High-Speed Packet-Switching Technologies
  - Open System Industry Standards Implementation
  - Computer Security

In the nontechnical category, the factor that gained the most consensus among vendors was the impact of budget changes. The most frequently mentioned suggestions centered on the emphasis on budget cuts and changes in authorization and appropriations procedures. Government directive and policy issues were combined as the second most important factor that could affect government spending.

Technical factors affecting government spending most frequently cited included high-speed packet switching, implementation of open system industry standards, and computer security measures. Other factors mentioned by vendors involved potential technical advancements in computer operating systems and the maturing of telecommunications software.

E INPUT Recommendations

Telecommunications vendors need to invest more time and effort in understanding agency missions and related communications requirements. Vendors need to be aware that in the federal contracting environment, there are many acquisitions that support multiple missions. Further, there are other acquisitions supporting several parts of an agency with diverse functions. These sorts of acquisitions cover numerous requirements under one contracting vehicle, which ultimately limit the number of telecommunications opportunities in that agency. An understanding of unstated constraints and future federal directions is essential to a successful bidding strategy. Recommendations are summarized in Exhibit V-20.

EXHIBIT V-20

RECOMMENDATIONS TO VENDORS IN THE FEDERAL TELECOMMUNICATIONS MARKET

- Understand Agency Missions
- Increase Awareness of Unique Federal Telecommunications Contract Constraints
- Anticipate Future Federal Telecommunications Directions
- Offer Comprehensive Telecommunications Solutions in Response to Federal Requirements

In the near future, vendors can assist agencies in preparation of better solicitations while improving their own strategic positions. To assist the federal government, vendors could offer briefings or seminars on key technical issues and regularly respond to agency Requests for Information (RFIs) and Statements of Work. Vendors might also send technical bulletins to agency management, technical, and contracting officials.

Vendors should emphasize comprehensive, lasting solutions to agency telecommunications requirements. Single vendor proposals for federal telecommunications programs must also address numerous agency concerns. Among these agency concerns, vendors should include mention of long-term compatibility and expandability of the proposed system, and the potential for integration of voice/data communication. Additionally, vendors should emphasize corporate stability and a commitment to the telecommunications market. Finally, vendors should be aware of potential for additional revenues from continuation of services after award and implementation, particularly for communications hardware.

Vendors wishing to enter or expand their share of the federal telecommunications market face a number of significant barriers. Competition in this market is capital intensive and usually requires considerable presolicitation investment. Also, many new federal telecommunications systems have been acquired within the last few years, with projected system life cycles of five to ten years. Further, development of attractive new telecommunications products and services is costly in terms of capital investment and qualified personnel.

To overcome these barriers, and ultimately save valuable time and money, vendors should investigate a number of alternative strategies for new-product development. Newer or smaller companies should develop teaming or subcontracting relationships with larger, more experienced federal telecommunications vendors, especially concentrating on vendors active in systems integration. Vendors should also target new products and services for specific growth areas of interest to the federal government. These areas include interconnection and interoperability of existing hardware and teleconferencing facilities. Other growth areas include various professional services, such as training and telecommunications system design, management, and maintenance.

Vendors could also develop products and services around the OSI and GOSIP models to meet future federal requirements. Participation in NBS-sponsored OSI activities also presents a cost-effective approach to research and development.

Telecommunications hardware vendors must be watchful of current federal buying trends. They must also be prepared to supplement their revenues beyond FY 89 by providing additional enhancements and services for systems acquired in the mid 1980s. For those left out of the FTS 2000 awards, innovative products and services will be needed to realize a measurable federal market share.

VI

Telecommunications Opportunities

This section describes specific opportunities in the federal information technology market. Lists of programs are provided for future telecommunications and related services. The opportunities list consists of major programs that are typical of the federal market and serves as a representative sample.

A Present and Future Programs

Funding for telecommunications is provided in several budget categories of federal government agencies. New information technology programs, including telecommunications acquisitions that are larger than $1- $2 million, are listed in at least one of the following federal government documents:

- OMB/GSA Five-Year Plan, which is developed from agency budget requests submitted in compliance with OMB Circular A-11
- Agency long-range information resource plans developed to meet the reporting requirements of the Paperwork Reduction Act of 1980
- Agency annual operating budget requests submitted to both congressional oversight and appropriations committees based on the OMB A-11 information
- *Commerce Business Daily* notice of specific opportunities—for qualification as a bidder and for requesting a copy of an RFP or RFC
- Five-Year Defense Plan, which is not publicly available, and the supporting documentation of the separate military departments and agencies

Telecommunications opportunities may or may not be specifically identified as such in the following documents:

- Information technology planning documents usually identify mission requirements to be met by specific programs, rather than methods for meeting these requirements

To add to the difficulty of identifying planned telecommunications buys, most medium and smaller buys (valued at less than $1 million) are rarely identified in agency budget documents.

All funding proposals are based on cost data of the year submitted, with inflation factors dictated by the Administration as part of its fiscal policy, and are subject to revision, reduction, or spread to future years in response to Congressional direction. Some additional reductions will be likely in Fiscal 1989 and beyond due to the deficit reduction constraints of the Gramm-Rudman-Hollings Act.

B

Recent Telecommunications Awards

While the following programs may require other products or services, they all include telecommunications support.

Agency/Program (PAR Reference)		Contractors	Value ($ Millions)
Defense - Air Force			
HQUSAF	Air Staff Local Area Network (ASLAN) (V-1-69)		
HQUSAF	Operations System Network (OPSNET) V-1-79	Booz Allen Hamilton Allied Cable CBM	6.0
AFCAS	Unified Local Area Network Architecture (ULANA), Phase I (V-1-102)	EDS and TRW	200.0
AFWAL	Materials Research Automation; (V-1-16)	Various	2.6
Defense - Army			
ANG	Army National Guard Management Information System (ANG-MIS) (V-2-6)	Burroughs	100.0 (Est.)
ARI	Comprehensive Army Research Institute Systems (Partial Award for LAN) (V-2-23)	Pan Systems, Inc. (PSI)	4.0 (Est.)

Agency/Program (PAR Reference)		Contractors	Value ($ Millions)
Defense - Navy			
ASN	Department of the Navy Office Automation and Communications System; (DONOACS) (V-3-3)	Zenith DEC	11.4
NMPC	Public Data Network	ATT MCI	14.6
NAVSUP	Headquarters Project (Integrated Information System) (V-3-76)	Zenith 3Com	18.0
DNL	Naval Laboratory Technical Office Automation and Communications System (NALTOACS) (V-3-1)	IMS CSC CCI Zenith	142.7
Department of Defense			
DLA	Defense Automatic Addressing System (DAAS) ADPE Replacement Program (DARP) (Partial Award for Local Area Network) (V-4A-4)	Network Systems Corp.	1.6
DLA	Automatic Digital Network Replacement (AUTODIN) (V-4A-8)	C3, Inc.	14.2
Civil - Health and Human Services			
IHS	Integrated IHS Hospital Information Systems (VII-8-22)	Severn Companies, Inc.	7.3
Housing and Urban Development			
	HUD Mortgage Accounting Project (HUDMAP) (VII-9B-2)	Various Contracts to EDS	27.9
Department of the Treasury			
IRS	IRS Service Center Cost Accounting/ Integrated Management System (VII-12-35)	Award Pending	9.5 (Est.)
NASA	Technical Management Information System (TMIS) (VII-15-64)	Boeing Computer Services	335.0

Agency/Program (PAR Reference)		Contractors	Value ($ Millions)
Environmental Protection Agency			
EPA	Telecommunications Network (VII-17-1)	Tymnet	21.5

C

Telecommunications Opportunities by Agency

Agency	Program	PAR Reference	RFP Schedule	FY88-93 Funding ($ Millions)
Defense - Air Force				
AFCC	Project 6000	V-1-2	-	-
ESD	Air Force WWMCCS Information System (AFWIS)	V-1-27	1QFY90	180.2
ESD	Joint WIS (JWIS)	V-1-32	1QFY90	317.0
AFLC	Air Force Technical Order Management Systems (AFTOMS)	V-1-53	3QFY90	29.1
AFSC	Computer-Aided Acquisition and Logistics Support (CALS)	V-1-108	Various	Various
AFLC	Air Force Equipment Management System (AFEMS)	V-1-109	12/88	7.4
AFMPC	Air Force Automated Personnel Data System II (APDS II)	-	Various	8.0
Defense - Army				
ISEC	Army WWMCCS Information System (AWIS)	V-2-8	1QFY90	254.9
COE	Corps of Engineers Automation Plan, Objective 1 (CEAP-1)	V-2-9	FY89-91	100.0 (est.)
ORDA	Acquisition Information Management (AIM) Program	V-2-39	10/89	-

Agency	Program	PAR Reference	RFP Schedule	FY88-93 Funding ($ Millions)
Defense - Navy				
NAVSUP	Computer-Aided Acquisition and Logistics Support (CALS)	V-3-80	Various	150.5
NAVSUP	Uniform Automated Data Processing Systems for Stock Points (UADPS-SP)	V-3-82	-	37.7
	Navy WWMCCS Information System (NWIS)	V-3-83	1QFY90	60.5
NAVTEL	NAVTELCOM ADP Software Services Contract	-	3QFY89	31.0
Defense Logistics Agency				
DLA	Defense Automatic Addressing System (DAAS) ADPE Replacement Program (DARP)	V-4A-4	Various	22.5
DLA	Logistics System Modernization Program (LSMP)	V-4A-9	1QFY89	204.2
DLA	Computer-Aided Acquisition and Logistics Support (CALS)	V-4A-14	Various	Various
DLA	Open Network Architecture/ Uniform Local-Area Network Acquisition	V-4A-15	-	107.0
DoD-Dependent Schools				
	DoDDS Management Information Systems	V-4F-1	2QFY89	8.98
Department of Agriculture				
AMS	Departmental Data Communications Network (DEPNET)	VI-5-28	7/90	2.2
USFS	Local-Area Network	VI-5-33	-	-

Agency	Program	PAR Reference	RFP Schedule	FY88-93 Funding ($ Millions)
Department of Commerce				
NTIS	Electronic Demand Printing	VI-6-20	-	-
NOAA	Upgrade/Enhance the Office of Systems Operations (OSO) Gateway Computer Systems	VI-6-30	-	93.6
	General Administration Office; Distributed Communications Processors	-	2QFY91	1.9
Department of Energy				
Oak Ridge	Power Control System	VI-7-57	FY92	-
Oak Ridge	National Waste Information Network (NWIN)	VI-7-85	-	-
Department of Health and Human Services				
SSA	Computer-Based Training	VII-8-28	-	11.4
HFCA	Medicare Catastrophic Protection Network	VII-8-38	4QFY89	100.0
SSA	Social Security Data Exchange System	-	2QFY99	5.5
Department of the Interior				
BLM	Automated Land and Mineral Record System (ALMRS)	VII-9-11	6/89	147.0
Department of Labor				
PWBA	ERISA Electronic Data Base	VII-9A-2	2Q89	8.3
Department of Justice				
FBI	Computer Applications Communications Network (CACN)	VII-10-9	-	152.6

Agency	Program	PAR Reference	RFP Schedule	FY88-93 Funding ($ Millions)
Antitrust	Antitrust Office Automation	VII-10-17	-	9.02
FPI	Standard Industries System	VII-10-19	3QFY89	-
Department of Transportation				
FAA	Tower Communications System (TCS)	VII-11-29	3QFY89	-
Department of the Treasury				
IRS	Treasury Multi-User Acquisition Contract (TMAC)	VII-12-12	-	-
IRS	Integrated Telecommunications Network (ITN)	VII-12-32	2QFY89	300 (est.)
FMS	System 90	VII-12-46	-	37.5
General Services Administration				
IRMS	Information Processing and Data Communications for the 1990s	VIII-14-5	2QFY89	66.4
National Aeronautics and Space Administration				
GSFC	Customer Data and Operations System (CDOS)	VIII-15-62	Various	200.0
HQ	NASA Net	VIII-15-69	Various	-
MSFC	Program Support Communications Network (PSCN)	VIII-15-73	FY94	-
LaRC	LaRC Local Network	-	2QFY90	1.9
The Veterans Administration				
DMS	Medical Center Telephone System Replacement	VIII-16-9	FY89	119.0
DVB	Department of Veterans Benefits Modernization	VIII-16-11	FY91	145.0

Agency	Program	PAR Reference	RFP Schedule	FY88-93 Funding ($ Millions)
Environmental Protection Agency				
RTP	Recompetition of Telecommunications Network	VIII-17-1	1QFY91	-

A

Appendix: Interview Profiles

A Federal Agency Respondent Profile

1. Contact Summary

For this update of the report, INPUT interviewed 27 agency personnel by telephone:

- Policy makers - 12
- Buyers - 8
- Users - 7

2. List of Agencies Interviewed

Department of Agriculture.

Department of Commerce.

- National Bureau of Standards.
- National Telecommunications and Information Administration.

Department of Defense.

- Air Force.
- Army.
- Navy.
- Defense Communications Agency.
- National Security Agency.
- Office of the Joint Chiefs of Staff.

Department of Energy.

Federal Aviation Administration.

Federal Communications Commission.

General Services Administration.

- WITS Program Office.
- ASP Program Office.
- Office of Technology Assessment.

Department of Housing and Urban Development.

Department of Interior.

- Office of Information Resources Management.
- Bureau of Land Management.
- United States Geological Survey.

National Aeronautics and Space Administration.

Nuclear Regulatory Commission.

Office of Management and Budget.

- Office of Information and Regulatory Affairs.

Department of Transportation.

- United States Coast Guard.
- Federal Aviation Administration.

Department of the Treasury.

- Internal Revenue Service.
- United States Customs Service.

United States Information Agency.

B

Vendor Respondent Profile

For the updated study, INPUT contacted a representative sample of vendors who provide telecommunications systems or services to the federal government. Job classifications among individual vendor respondents included marketing as well as administrative executives. All contacts with vendor personnel were made by telephone.

B

Appendix: Definitions

The definitions in this appendix include hardware, software, services, and telecommunications categories to accommodate the range of information systems and services programs described in this report.

Alternate service mode terminology employed by the federal government in its procurement process is defined along with INPUT's regular terms of reference, as shown in Exhibit B-1.

The federal government's unique nontechnical terminology that is associated with applications, documentation, budgets, authorization, and the procurement/acquisition process is included in Appendix C, Glossary of Federal Acronyms.

EXHIBIT B-1

FEDERAL INFORMATION SYSTEMS AND SERVICES PROGRAM SYSTEMS AND SERVICES

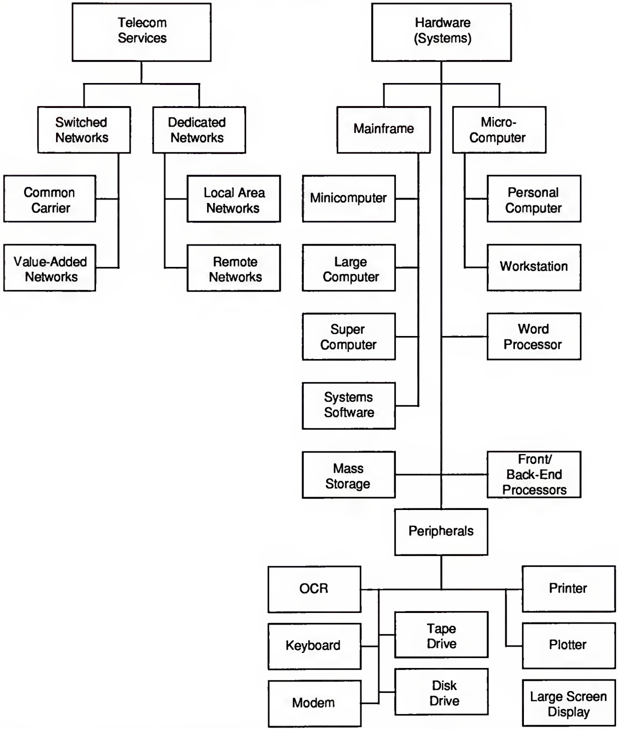


EXHIBIT B-1 (Cont.)

FEDERAL INFORMATION SYSTEMS AND SERVICES PROGRAM SYSTEMS AND SERVICES (Cont.)

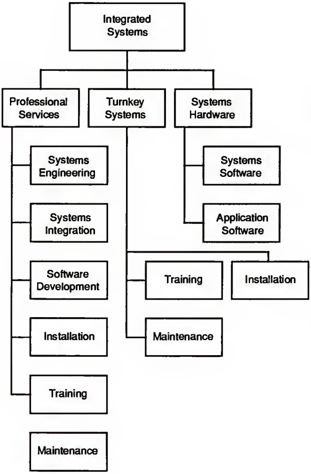
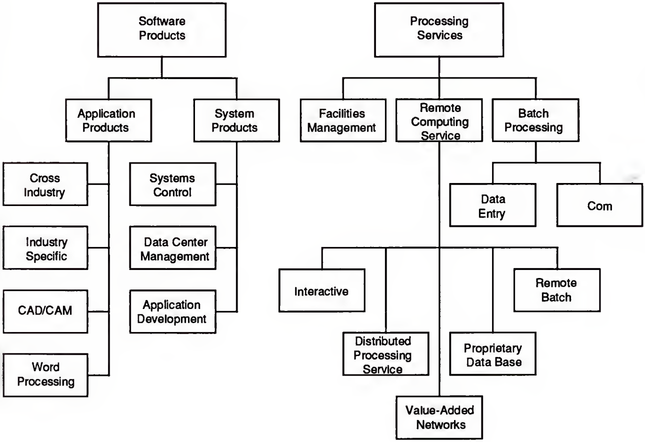


EXHIBIT B-1 (Cont.)

FEDERAL INFORMATION SYSTEMS AND SERVICES PROGRAM SYSTEMS AND SERVICES (Cont.)



A

Service Modes

1. Processing Services

Processing services include remote computing services, batch services, and processing facilities management.

Remote Computing Services (RCS) - Provision of data processing to a user by means of terminals at the user's site(s). Terminals are connected by a data communications network to the vendor's central computer. The most frequent contract vehicle for RCS in the federal government is GSA's Teleprocessing Services Program (TSP). RCS includes the following submodes.

- *Interactive (timesharing)* - Characterized by the interaction of the user with the system, primarily for problem-solving timesharing but also for data entry and transaction processing; the user is on-line to the program/ files.

- *Remote Batch* - Where the user hands over control of a job to the vendor's computer which schedules job execution according to priorities and resource requirements.

- *Proprietary Data Base* - Characterized by the retrieval and processing of information from a vendor-maintained data base. The data base may be owned by the vendor or by a third party or be licensed by a federal agency.

- *Value-Added Network Services* - Special purpose and/or high-quality network specifically designed to carry digital information, with features not usually provided by the voice-grade, switched public network.

- *Distributed Processing Services* - Alternately called "Distributed Data Processing" (DDP) that can provide:

  - Access through the network to the RCS vendor's larger computers.

  - Local management and storage of a data base subset that will service local terminal users via the connection of a data base processor to the network.

  - Availability of significant software that may be "down loaded" as part of the service.

Batch Processing - These include data processing performed at vendors' sites for user programs and/or data that are physically transported (as opposed to transported electronically by telecommunications media) to and/or from those sites. Data entry and data output services, such as

keypunching and computer output microfilm processing, are also included. Batch services include expenditures by users who take their data to a vendor site that has a terminal connected to a remote computer for the actual processing.

Processing Facilities Management (PFM) - Also referred to as "Resource Management," "Systems Management," or "COCO" (Contractor-Owned, Contractor-Operated). The management of all or part of a user's data processing functions under a long-term contract of not less than one year. This would include remote computing and batch services. To qualify as PFM, the contractor must directly plan, control, operate, and own or lease the facility provided to the user, either on-site, through communications lines, or in a mixed mode.

2. Professional Services

Professional services provide labor-intensive consulting, design, education and training, programming and analysis, management, and systems integrations as defined within these general categories.

- *Contract Services* - Provision of professional and technical services of various skill levels to accomplish specific tasks not specifically or necessarily associated with a delivered product, other than paper or ADP media records. Contracts generally require vendor management of staff and/or resources.

- *Consulting* - Information systems and/or services management consulting, program assistance (technical and/or management), feasibility analyses, and cost-effectiveness trade-off studies.

- *Education and Training* - Products and/or services related to information systems and services for the user, including computer-aided instruction (CAI), computer-based education (CBE), and vendor instruction of user personnel in management operations, programming, and maintenance of systems.

- *Systems Design* - Preparation of systems/sub-systems architecture, specifications, and performance criteria from functional information processing statements or performance of an operations requirements study. May include ADP, telecommunications, site layout, training, and maintenance facilities.

- *Software Development* - Also known as programming and analysis services, this includes applications and systems software design, contract or custom programming, code conversion, independent verification and validation (IV&V), and benchmarking. These services may also include follow-on software development and maintenance.

- *Documentation Services* - Vendor preparation, modification, or replacement of system operating manuals, software coding records, training manuals, software library records, and equipment modification records.

Professional Services Facilities Management (PSFM) - Also referred to as GOCO (Government-Owned, Contractor-Operated) services. The computing equipment is owned or leased by the client (government), not by the vendor. The vendor provides the staff to operate, maintain, repair, schedule, and manage the client's facility over a term of three to five years. Submodes include:

- *Facilities Control* - Vendor management, including scheduling of resources and personnel, to meet specified operations objectives or produce specified information products, with no direct client supervision.

- *Operation and Maintenance (O&M)* - Vendor operation and maintenance of government-owned ADP/telecommunications equipment in a government-owned/leased facility (on-site) without vendor management of the facility.

- *Programming and Analysis (Support)* - Vendor-furnished professional and technical staff support, which may be provided on or off the client's site, to analyze information processing requirements, plan resource applications, and/or develop/modify/maintain custom software, over a period of time not less than one year. Contracts tend to be task-oriented to control the work flow.

- *Hardware and/or Software Maintenance* - Vendor-furnished services provided after installation and acceptance by the government, where the vendor may not be the original supplier (third-party maintenance or TPM) and may use either on-site or on-call personnel to perform services.

- *Repair and Replacement* - Vendor-furnished services and acquires information system components to repair or replace worn or defective equipment and to add equipment needed to meet new or unusual requirements.

Systems Integration - Services associated with design and integration, software development, and installation and government acceptance of ADP/telecommunications systems. Services may also include related engineering activities such as Systems Engineering and Integration (SE&I) or Systems Engineering and Technical Assistance (SETA).

- *Engineering and Integration* - Vendor-furnished technical services provided separately from acquisition of hardware and software to expand the initial design into specifications, interface descriptions, installation, and operating instructions of the complete system.

- *Applications Software* - Custom software development to satisfy non-commercially available information processing requirements of an integrated system.

- *Education and Training* - Vendor development of training aids, manuals, and curricula for indoctrinating client management, operation and maintenance, and information product user personnel on the newly integrated information system.

3. Turnkey Systems

Turnkey systems, also known as integrated systems, include systems and applications software packaged with hardware as a single entity. Most CAD/CAM systems and many small business systems are integrated systems. This mode does not include specialized hardware systems such as word processors, cash registers, and process control systems.

4. Software Products

Software products include user purchases of applications and systems packages for in-house computer systems. Included are lease and purchase expenditures, as well as expenditures for work performed by the vendor to implement and maintain the package at the user's sites. Expenditures for work performed by organizations other than the package vendor are counted in the category of professional services. There are several subcategories of software products, as indicated below and shown in detail in Exhibit B-2.

Application Products - Software that performs processing which services user functions. The products can be:

- *Cross-Industry Products* - Used in multiple industry applications as well as in federal government sectors. Examples are payroll, inventory control, and financial planning.

- *Industry-Specialized Products* - Used in a specific federal government sector, such as planning, resource utilization, aircraft flight planning, military personnel training, and others. May also include some products designed to work in an industry other than the federal government but applicable to specific government-performed commercial/industrial services, such as hospital information, vehicular fleet scheduling, electrical power generation and distribution, CAD/CAM, and others.

Systems Products - Software that enables the computer/communications systems to perform basic functions. These products include:

- *System Control Products* - Function during applications program execution to manage the computer system resources. Examples include operating systems, communication monitors, emulators, and spoolers.

- *Data Center Management Products* - Used by operations personnel to manage the computer systems resources and personnel more effectively. Examples include performance measurement, job accounting, computer operations scheduling, and utilities.

- *Applications Development Products* - Used to prepare applications for execution by assisting in designing, programming, testing, and related functions. Examples include languages, sorts, productivity aids, compilers, data dictionaries, data base management systems, report writers, project control systems, and retrieval systems.

5. Hardware and Hardware Systems

Hardware included all ADP and telecommunications equipment that can be separately acquired by the government with or without installation by the vendor and not acquired as part of an integrated system. For the purpose of this report, hardware is grouped in three major categories: peripherals, terminals, and hardware systems (processors).

Peripherals - Include all input, output, communications, and storage devices other than main memory that can be connected locally to the main processor and generally cannot be included in other categories such as terminals.

- *Input Devices* - Includes keyboards, numeric pads, card readers, light pens and track balls, tape readers, position and motion sensors, and analog-to-digital converters.

- *Output Devices* - Includes printers, CRTs, projection television screens, micrographics processors, digital graphics, and plotters.

- *Communication Devices* - Modems, encryption equipment, special interfaces, and error control.

- *Storage Devices* - Includes magnetic tape (reel, cartridge, and cassette), floppy and hard disks, drums, solid state (integrated circuits), and bubble and optical memories.

Terminals - Federal government systems use three types of terminals as described below.

- *User-Programmable* - Also called intelligent terminals, including:

  - Single-station or standalone.
  - Multi-station shared processor.
  - Teleprinter.
  - Remote batch.

- *Non-Programmable* - Also called "dumb" terminals, including:

EXHIBIT B-2

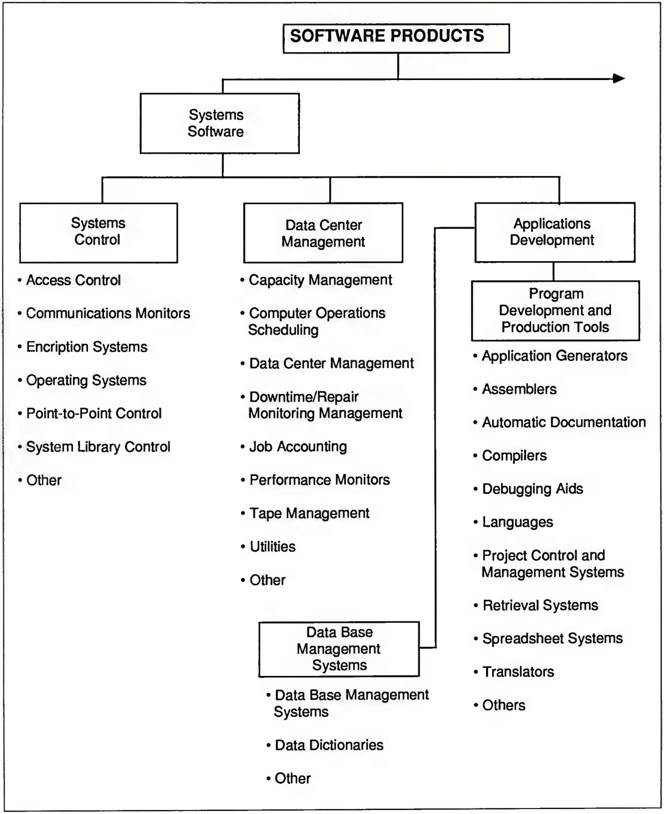
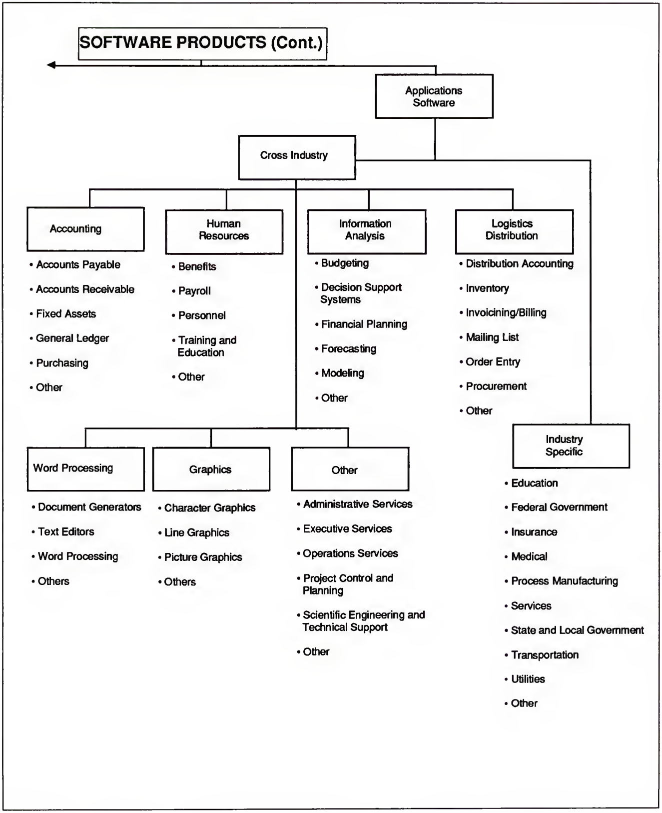

SOFTWARE PRODUCTS
Systems Software
Systems Control
• Access Control
• Communications Monitors
• Encription Systems
• Operating Systems
• Point-to-Point Control
• System Library Control
• Other
Data Center Management
• Capacity Management
• Computer Operations Scheduling
• Data Center Management
• Downtime/Repair Monitoring Management
• Job Accounting
• Performance Monitors
• Tape Management
• Utilities
• Other
Applications Development
Program Development and Production Tools
• Application Generators
• Assemblers
• Automatic Documentation
• Compilers
• Debugging Aids
• Languages
• Project Control and Management Systems
• Retrieval Systems
• Spreadsheet Systems
• Translators
• Others
Data Base Management Systems
• Data Base Management Systems
• Data Dictionaries
• Other

EXHIBIT B-2 (Cont.)



- Single-station.
- Multistation shared processor.
- Teleprinter.

• *Limited Function* - Originally developed for specific needs, such as point-of-sale (POS), inventory data collections, controlled access, and other applications.

Hardware Systems - Includes all processors from microcomputers to supercomputers. Hardware systems may require type- or model-unique operating software to be functional, but this category excludes applications software and peripheral devices, other than main memory and processors or CPUs not provided as part of an integrated (turnkey) system.

• *Microcomputer* - Combines all of the CPU, memory, and peripheral functions of an 8-, 16-, or 32-bit computer on a chip in the form of:

  - Integrated circuit package.

  - Plug-in boards with more memory and peripheral circuits.

  - Console including keyboard and interfacing connectors.

  - Personal computer with at least one external storage device directly addressable by the CPU.

  - An embedded computer which may take a number of shapes or configurations.

• *Minicomputer* - Usually a 12-, 16-, or 32-bit computer which may be provided with limited applications software and support and may represent a portion of a complete large system.

  - Personal business computer.
  - Small laboratory computer.
  - Nodal computer in a distributed data network, remote data collection network, or connected to remote microcomputers.

• *Midicomputer* - Typically a 32- or 64-bit computer with extensive applications software and a number of peripherals in standalone or multiple-CPU configurations for business (administrative, personnel, and logistics) applications; also called a general purpose computer.

• *Large Computer* - Presently centered around storage controllers but likely to become bus-oriented and to consist of multiple processors or parallel processors. Intended for structured mathematical and signal processing and typically used with general purpose, VonNeumann-type processors for system control.

- *Supercomputer* - High-powered processors with numerical processing throughput that is significantly greater than the fastest general purpose computers, with capacities in the 10-50 million floating point operations per second (MFLOPS) range. Newer supercompu-ters, with burst modes approaching 300 MFLOPS, main storage size up to 10 million words, and on-line storage in the one-to-three gigabyte class, are labeled Class IV to Class VII in agency long-range plans. Supercomputers fit in one of two categories:
  - *Real Time* - Generally used for signal processing in military applications.
  - *Non-Real Time* - For scientific use in one of three configurations:
    - Parallel processors.
    - Pipeline processor.
    - Vector processor.
  - *Super( )computer* - Term applied to micro, mini, and large mainframe computers with performance substantially higher than attainable by VonNeuman architectures.
- *Embedded Computer* - Dedicated computer system designed and implemented as an integral part of a weapon, weapon system, or platform; critical to a military or intelligence mission such as command and control, cryptological activities, or intelligence activities. Characterized by military specifications (MIL SPEC) appearance and operation, limited but reprogrammable applications software, and permanent or semi-permanent interfaces. May vary in capacity from microcomputers to parallel processors computer systems.

6. Telecommunications

Networks - Electronic interconnections between sites or locations which may incorporate links between central computer sites and remote locations and switching and/or regional data processing nodes. Network services typically are provided on a leased basis by a vendor to move data, voice, video, or textual information between locations. Networks can be categorized in several different ways.

- *Common Carrier Network* - A public access network, such as provided by AT&T, consisting of conventional voice-grade circuits and regular switching facilities accessed through dial-up calling with leased or user-owned modems for transfer rates between 150 and 1,200 baud.
- *Value-Added Network (VAN)* - Provided by vendors through common carrier or special-purpose transmission facilities with special features not available in the voice-grade switched public network. These include:

- *Dedicated Network* - Also known as a private network, established and operated for one user or user organization using dedicated circuits to establish permanent connections between two or more stations.

- *Packet Switching* - Real time network routing, transmitting, and receiving data in the form of addressed packets, each of which may be part of a message or include several messages without exclusive use of a network circuit by the transmitting and receiving stations.

- *Message Switching* - Non-real time process for routing messages through network where a user message is received, stored, and forwarded from switch to switch through the network without an end-to-end circuit between sending and receiving stations; used primarily for data.

• *Local Area Network (LAN)* - Limited-access network between computing resources in a relatively small (but not necessarily contiguous) area, such as a building, complex of buildings, or buildings distributed within a metropolitan area. Uses one of two signalling methods.

- *Baseband* - Signaling using digital waveforms on a single frequency band, usually at voice frequencies, and bandwidth, limited to a single sender at any given moment. When used for local area networks, typically implemented with TDM to permit multiple access.

- *Broadband* - Transmission facilities that use frequencies greater than normal voice-grade, supported in local area networks with RF modems and AC signaling. Also known as wideband. Employs multiplexing techniques that increase carrier frequency between terminals to provide:

  ° Multiple channels through FDM or TDM.
  ° High-speed data transfer via parallel mode at rates of up to 96,000 baud.

Transmission Facilities - Includes wire, carrier, coaxial cable, microwave, optical fiber, satellites, cellular radio, and marine cable operating in one of two modes depending on the vendor and the distribution of the network.

• *Mode* - may be either:

- *Analog* - Transmission or signal with continuous waveform representation, typified by AT&T's predominantly voice-grade DDD network and most telephone operating company distribution systems.

- *Digital* - Transmission or signal using discontinuous, discrete quantities to represent data, which may be voice, data, record, video, or text, in binary form.

• *Media* - May be any of the following:

- *Wire* - Varies from earlier single-line teletype networks, to two-wire standard telephone (twisted pair), to four-wire full-duplex balanced lines.

- *Carrier* - A wave, pulse train, or other signal suitable for modulation by an information-bearing signal to be transmitted over a communications system, used in multiplexing applications to increase network capacity.

- *Coaxial Cable* - A cable consisting of an insulated central conductor surrounded by a cylindrical conductor with additional insulation on the outside and covered with an outer sheath used in HF (high frequency) and VHF (very high frequency), single frequency, or carrier-based systems; requires frequent reamplification (repeaters) to carry the signal any distance.

- *Microwave* - UHF (ultra-high frequency) multi-channel, point-to-point, repeated radio transmission, also capable of wide frequency channels.

- *Optical Fiber* - Local signal distribution systems employed in limited areas, using light-transmitting glass fibers and TDM for multi-channel applications.

- *Communications Satellites* - Synchronous earth-orbiting systems that provide point-to-point, two-way service over significant distances without intermediate amplification (repeaters), but requiring suitable groundstation facilities for up- and down-link operation.

- *Cellular Radio* - Network of fixed, low-powered two-way radios that are linked by a computer system to track mobile phone-data set units. Each radio serves a small area called a cell. The computer switches service connection to the mobile unit from cell to cell.

B

General Definitions

103/113 - Bell standard modem for low-speed transmission up to 300 bps, asynchronous, half or full duplex.

212 - Bell standard for medium-speed transmission at 1200 bps, asynchronous or synchronous, half or full duplex.

ASCII - American National Standard Code for Information Interchang—eight-bit code with seven data bits and one parity bit.

Asynchronous - Communications operation (such as transmission) without continuous timing signals. Synchronization is accomplished by appending signal elements to the data.

Bandwidth - Range of transmission frequencies that can be carried on a communications path; used as a measure of capacity.

Baud - Number of signal events (discrete conditions) per second. Typically used to measure modem or terminal transmission speed.

Benchmark - Method of testing proposed ADP system solutions for a specified set of functions (applications) employing simulated or real data inputs under simulated operating conditions.

BPS - Bits per second - also mbps and kbps, million bits per second and thousand bits per second, respectively.

BSC - IBM's binary synchronous communications data link protocol. First introduced in 1968 for use on point-to-point and multipoint communications channels. Frequently referenced as "bisync."

Byte - Usually equivalent to the storage required for one alphanumeric character (i.e., one letter or number).

CBX - Computerized Branch Exchange - a PABX based on a computer system, implying programmability and usually voice and data capabilities.

Central Processing Unit (CPU) - The arithmetic and control portion of a computer; i.e., the circuits controlling the interpretation and execution of computer instructions.

Centrex - Central office telephone services that permit local circuit switching without installation of customer premises equipment. Could be described as shared PBX service.

Circuit Switching - A process that, usually on demand, connects two or more network stations and permits exclusive circuit use until the connection is released; typical of the voice telephone network where a circuit is established between the caller and the called party.

CO - Central Office - local telco site for one or more exchanges.

CODEC - Coder/decoder, equivalent to modem for digital devices.

Constant Dollars - Growth forecasts in constant dollars make no allowance for inflation or recession. Dollar value based on the year of the forecast unless otherwise indicated.

Computer System - The combination of computing resources required to perform the designed functions and which may include one or more CPUs, machine room peripherals, storage systems, and/or applications software.

CPE - Customer Premises Equipment - DCE or DTE located at a customer site rather than at a carrier site such as the local telephone company CO. May include switchboards, PBX, data terminals, and telephone answering devices.

CSMA/CD - Carrier Sense Multiple Access/Collision Detect. Contention protocol used in local-area networks, typically with a multi-point configuration.

Current Dollars - Estimates or values expressed in current-year dollars which, for forecasts, would include an allowance for inflation.

Data Encryption Standard (DES) - 56-bit key, one-way encryption algorithm adopted by NBS in 1977, implemented through hardware ("S-boxes") or software. Designed by IBM with NSA guidance.

Datagram - A self-contained packet of information with a finite length that does not depend on the contents of preceding or following packets.

DCA - IBM's Document Content Architecture - protocols for specifying document (text) format which are consistent across a variety of hardware and software systems within IBM's DISOSS.

DCE - Data Circuit-terminating Equipment - interface hardware that couples DTE to a transmission circuit or channel by providing functions to establish, maintain, and terminate a connection, including signal conversion and coding.

DDCMP - Digital Data Communications Message Protocol - data link protocol used in Digital Equipment Company's DECNET.

DECNET - Digital Equipment Company's network architecture.

Dedicated Circuit - A permanently established network connection between two or more stations; contrast with switched circuit.

DEMS - Digital Electronic Message Service - nationwide common carrier digital networks which provide high-speed, end-to-end, two-way transmission of digitally-encoded information using the 10.6 GHz band.

DIA - IBM's Document Interchange Architecture - protocols for transfer of documents (text) between different hardware and software systems within IBM's DISOSS.

DISOSS - IBM's DIStributed Office Support System - office automation environment, based on DCA and DIA, which permits document (text) transfer between different hardware and software systems without requiring subsequent format or content revision.

Distributed Data Processing - The development of programmable intelligence in order to perform a data processing function where it can be accomplished most effectively through computers and terminals arranged in a telecommunications network adapted to the user's characteristics.

DTE - Data Terminal Equipment - hardware which is a data source or sink or both, such as video display terminals that convert user information into data for transmission and reconvert data signals into user information.

EBCDIC - Extended Binary Coded Decimal Interchange Code - eight-bit code typically used in IBM mainframe environments.

EFT - Electronic funds transfer.

Encryption - Electrical, code-based conversion of transmitted data to provide security and/or privacy of data between authorized access points.

End User - One who is using a product or service to accomplish his or her own functions. The end user may buy a system from the hardware supplier(s) and do his or her own programming, interfacing, and installation. Alternately, the end user may buy a turnkey system from a systems house or hardware integrator, or may buy a service from an in-house department or external vendor.

Engineering Change Notice (ECN) - Product changes to improve the product after it has been released to production.

Engineering Change Order (ECO) - The follow-up to ECNs - they include parts and a bill of materials to effect the change in the hardware.

Equipment Operators - Individuals operating computer control consoles and/or peripheral equipment (BLS definition).

Ethernet - Local area network developed by Xerox PARC using baseband signaling, CSMA/CD protocol, and coaxial cable to achieve a 10 mbps data rate.

Facsimile - Transmission and reception of data in graphic form, usually fixed images of documents, through scanning and conversion of a picture signal.

FDM - Frequency Division Multiplexing - a multiplexing method that permits multiple access by assigning different frequencies of the available bandwidth to different channels.

FEP - Front-End Processor - communications concentrator such as the IBM 3725 or COMTEN 3690 used to interface communications lines to host computers.

Field Engineer (FE) - Field engineer, customer engineer, serviceperson, and maintenance person are used interchangeably and refer to the individual who responds to a user's service call to repair a device or system.

Full-Duplex - Bi-directional communications with simultaneous two-way transmission.

General Purpose Computer System - A computer designed to handle a wide variety of problems. Includes machine room peripherals, systems software, and small business systems.

Half-Duplex - Bi-directional communications, but only in one direction at a time.

Hardware Integrator - Develops system interface electronics and controllers for the CPU, sensors, peripherals, and all other ancillary hardware components. The hardware integrator also may develop control system software in addition to installing the entire system at the end-user site.

HDLC - High-level Data Link Control.

Hertz - Number of signal oscillations (cycles) per second - abbreviated Hz.

IBM Token Ring - IBM's local area network using baseband signalling and operating at 4 mbps on twisted-pair copper wire. Actually a combination of star and ring topologies – IEEE 802.5-compatible.

IDN - Integrated Digital Network - digital switching and transmission; part of the evolution to ISDN.

Independent Suppliers - Suppliers of machine room peripherals - usually do not supply general purpose computer systems.

Information Processing - Data processing as a whole, including use of business and scientific computers.

Installed Base - Cumulative number or value (cost when new) of computers in use.

Interconnection - Physical linkage between devices on a network.

Interoperability - The capability to operate with other devices on a network. To be contrasted with interconnection, which merely guarantees a physical network interface.

ISDN - Integrated Services Digital Network - integrated voice and non-voice public network service which is completely digital. Not clearly defined through any existing standards although FCC and other federal agencies are participating in the development of CCITT recommendations.

Keypunch Operators - Individuals operating keypunch machines (similar in operation to electric typewriters) to transcribe data from source materials onto punch cards.

Lease Line - Permanent connection between two network stations. Also known as dedicated or non-switched line.

Machine Repairers - Individuals who install and periodically service computer systems.

Machine Room Peripherals - Peripheral equipment that is generally located close to the central processing unit.

Mainframe - The central processing unit (CPU or units in a parallel processor) of a computer that interprets and executes computer (software) instructions of 32 bits or more.

MAP - Manufacturing Automation Protocol - seven-layer communications standard for factory environments promoted by General Motors/ EDS. Adopts IEEE 802.2 and IEEE 802.4 standards plus OSI protocols for other layers of the architecture.

Mean Time to Repair - The mean of elapsed times from the arrival of the field engineer on the user's site until the device is repaired and returned to user service.

Mean Time to Respond - The mean of elapsed times from the user call for services and the arrival of the field engineer on the user's site.

Message - A communication intended to be read by a person. The quality of the received document need not be high, only readable. Graphic materials are not included.

MMFS - Manufacturing Messaging Format Standard - application-level protocol included within MAP.

Modem - A device that encodes information into electronically transmittable from (MOdulator) and restores it to original analog form (DEModulator).

NCP - Network Control Program - software used in IBM 3705/3725 FEPs for control of SNA networks.

Node - Connection point of three or more independent transmission points which may provide switching or data collection.

Off-Line - Pertaining to equipment or devices that can function without direct control of the central processing unit.

On-Line - Pertaining to equipment or devices under direct control of the central processing unit.

OSI - ISO reference model for Open Systems Interconnection - seven-layer architecture for application, presentation, session, transport, network, data link, and physical services and equipment.

OSI Application Layer - Layer 7, providing end-user applications services for data processing.

OSI Data Link Layer - Layer 2, providing transmission protocols, including frame management, link flow control, and link initiation/release.

OSI Network Layer - Layer 3, providing call establishment and clearing control through the network nodes.

OSI Physical Layer - Layer 1, providing the mechanical, electrical, functional, and procedural characteristics to establish, maintain, and release physical connections to the network.

OSI Presentation Layer - Layer 6, providing data formats and information such as data translation, data encoding/decoding, and command translation.

OSI Session Layer - Layer 5, establishes, maintains, and terminates logical connections for the transfer of data between processes.

OSI Transport Layer - Layer 4, providing end-to-end terminal control signals such as acknowledgements.

Overseas - Not within the geographical limits of the continental United States, Alaska, Hawaii, and U.S. possessions.

PABX - Private Automated Branch Exchange - hardware that provides automatic (electro-mechanical or electronic) local circuit switching on a customer's premises.

PAD - Packet Assembler-Disassembler - a device that enables DTE not equipped for packet switching operation to operate on a packet switched network.

PBX - Private Branch Exchange - hardware which provides local circuit switching on the customer premise.

PCM - Pulse-Code Modulation - modulation involving conversion of a waveform from analog to digital form through coding.

PDN - Public Data Network - a network established and operated by a recognized private operating agency, a telecommunications administration, or other agency for the specific purpose of providing data transmission services to the public.

Peripherals - Any unit of input/output equipment in a computer system, exclusive of the central processing unit.

PPM - Pulse Position Modulation.

Private Network - A network established and operated for one user or user organization.

Programmers - Persons mainly involved in designing, writing, and testing of computer software programs.

Protocols - The rules for communication system operation that must be followed if communication is to be effected. Protocols may govern portions of a network or service. In digital networks, protocols are digitally encoded as instructions to computerized equipment.

Public Network - A network established and operated for more than one user with shared access, usually available on a subscription basis. See related international definition of PDN.

Scientific Computer System - A computer system designed to process structured mathematics, such as Fast Fourier Transforms, and complex, highly redundant information, such as seismic data, sonar data, and radar, with large on-line memories and very high capacity throughput.

SDLC - Synchronous Data Link Control - IBM's data link control for SNA. Supports a subset of HDLC modes.

SDN - Software-Defined Network.

Security - Physical, electrical, and computer (digital) coding procedures to protect the contents of computer files and data transmission from inadvertent or unauthorized disclosure to meet the requirements of the

Privacy Act and national classified information regulations.

Service Delivery Point - The location of the physical interface between a network and customer/user equipment.

Simplex - Undirectional communications.

Smart Box - A device for adapting existing DTE to new network standards such as OSI. Includes PADs and protocol convertors, for example.

SNA - Systems Network Architecture-seven-layer communications architecture designed by IBM. Layers correspond roughly but not exactly to OSI model.

Software - Computer programs.

Supplies - Includes materials associated with the use or operations of computer systems, such as printer paper, keypunch cards, disk packs, and tapes.

Switched Circuit - Temporary connection between two network stations established through dial-up procedures.

Synchronous - Communications operation with separate, continuous clocking at both sending and receiving stations.

Systems Analyst - Individual who analyzes problems to be converted to a programmable form for application to computer systems.

Systems House - Vendor that acquires, assembles, and integrates hardware and software into a total turnkey system to satisfy the data processing requirements of an end user. The vendor also may develop systems software products for license to end users. The systems house vendor does not manufacture mainframes.

Systems Integrator - Systems house vendor that develops systems interface electronics, applications software, and controllers for the CPU, peripherals, and ancillary subsystems that may have been provided by a contractor or the government (GFE). This vendor may either supervise or perform the installation and testing of the completed system.

TI - Bell System designation for 1.544 mbps carrier capable of handling 24 PCM voice channels.

TDM - Time Division Multiplexing - a multiplexing method that interleaves multiple transmissions on a single circuit by assigning a different time slot to each channel.

Token Passing - Local area network protocol which allows a station to transmit only when it has the "token," an empty slot on the carrier.

TOP - Technical Office Protocol - protocol developed by Boeing Computer Services to support administrative and office operations as complementary functions to factory automation implemented under MAP.

Turnkey System - System composed of hardware and software integrated into a total system designed to completely fulfill the processing requirements of a single application.

Twisted-Pair Cable - Communications cabling consisting of pairs of single-strand metallic electrical conductors, such as copper wires, typically used in building telephone wiring and some LANs.

Verification and Validation - Process for examining and testing applications and special systems software to verify that it operates on the target CPU and performs all of the functions specified by the user.

Voice-Grade - Circuit or signal in the 300-3300 Hz bandwidth typical of the public telephone system - nominally a 4 KHz user.

VTAM - Virtual Telecommunications Access Method - host-resident communications software for SNA networks.

C

Other Considerations

When questions arise as to the proper place to count certain user expenditures, INPUT addresses the questions from the user viewpoint. Expenditures then are categorized according to what the users perceive they are buying.

C

Appendix: Glossary of Federal Acronyms

The federal government's procurement language uses a combination of acronyms, phrases, and works that is complicated by different agency definitions and interpretations. The government also uses terms of accounting, business, economics, engineering, and law with new applications and technology.

Acronyms and contract terms that INPUT encountered most often in program documentation and interviews for this report are included here, but this glossary should not be considered all-inclusive. Federal procurement regulations (DAR, FPR, FAR, FIRMR, FPMR) and contract terms listed in RFIs, RFPs, and RFQs provide applicable terms and definitions.

Federal agency acronyms have been included to the extent they are employed in this report.

A

Acronyms

AAS	Automatic Addressing System.
AATMS	Advanced Air Traffic Management System.
ACO	Administrative Contracting Offices (DCAS).
ACS	Advanced Communications Satellite (formerly NASA 30/20 GHz Satellite Program).
ACT-1	Advanced Computer Techniques (Air Force).
Ada	DoD High-Order Language.
ADA	Airborne Data Acquisition.
ADL	Authorized Data List.
ADS	Automatic Digital Switches (DCS).
AFA	Air Force Association.
AFCEA	Armed Forces Communications Electronics Association.
AGE	Aerospace Ground Equipment.
AIP	Array Information Processing.
AMPE	Automated Message Processing Equipment.
AMPS	Automated Message Processing System.

AMSL	Acquisition Management Systems List.
AP(P)	Advance Procurement Plan.
Appropriation	Congressionally approved funding for authorized programs and activities of the Executive Branch.
APR	Agency Procurement Request.
ARPANET	DARPA network of scientific computers.
ATLAS	Abbreviated Test Language for All Systems (for ATE-Automated Test Equipment).
Authorization	In the legislative process programs, staffing, and other routine activities must be approved by Oversight Committees before the Appropriations Committee will approve the money from the budget.
AUSA	Association of the U.S. Army.
AUTODIN	AUTOmatic DIgital Network of the Defense Communications System.
BA	Basic Agreement.
BAFO	Best And Final Offer.
Base level	Procurement, purchasing, and contracting at the military installation level.
BCA	Board of Contract Appeals.
Benchmark	Method of evaluating ability of a candidate computer system to meet user requirements.
Bid protest	Objection (in writing, before or after contract award) to some aspect of a solicitation by a valid bidder.
BML	Bidders Mailing List – qualified vendor information filed annually with federal agencies to automatically receive RFPs and RFQs in areas of claimed competence.
BOA	Basic Ordering Agreement.
B&P	Bid and Proposal – vendor activities in response to government solicitation/specific overhead allowance.
BPA	Blanked Purchase Agreement.
Budget	Federal Budget, proposed by the President and subject to Congressional review.
C2	Command and Control.
C3	Command, Control, and Communications.
C4	Command, Control, Communications, and Computers.
C3I	Command, Control, Communications, and Intelligence.
CAB	Contract Adjustment Board or Contract Appeals Board.

CADE	Computer-Aided Design and Engineering.
CADS	Computer-Assisted Display Systems.
CAIS	Computer-Assisted Instruction System.
CAPS	Command Automation Procurement Systems.
CAS	Contract Administration Services or Cost Accounting Standards.
CASB	Cost Accounting Standards Board.
CASP	Computer-Assisted Search Planning.
CBD	Commerce Business Daily – U.S. Department of Commerce publication listing government contract opportunities and awards.
CBO	Congressional Budget Office.
CCDR	Contractor Cost Data Reporting.
CCN	Contract Change Notice.
CCPDS	Command Center Processing and Display Systems.
CCPO	Central Civilian Personnel Office.
CCTC	Command and Control Technical Center (JCS).
CDR	Critical Design Review.
CDRL	Contractor Data Requirements List.
CFE	Contractor-Furnished Equipment.
CFR	Code of Federal Regulations.
CIG	Computerized Interactive Graphics.
CIR	Cost Information Reports.
CM	Configuration Management.
CMI	Computer-Managed Instruction.
CNI	Communications, Navigation, and Identification.
CO	Contracting Office, Contract Offices, or Change Order.
COC	Certificate of Competency (administered by the Small Business Administration)
COCO	Contractor-Owned, Contractor-Operated.
CODSIA	Council of Defense and Space Industry Associations.
COMSTAT	Communications Satellite Corporation.
CONUS	CONtinental United States.
COP	Capability Objective Package.
COTR	Contracting Officer's Technical Representative.
CP	Communications Processor.
CPAF	Cost-Plus-Award-Fee Contract.
CPFF	Cost-Plus-Fixed-Fee Contract.
CPIF	Cost-Plus-Incentive-Fee Contract.
CPR	Cost Performance Reports.
CPSR	Contractor Procurement Systems Architecture.
CR	Cost Reimbursement (Cost Plus Contract).
CSA	Combat or Computer Systems Architecture.
C/SCSC	Cost/Schedule Control System Criteria (also called "C-Spec").
CWAS	Contractor Weighted Average Share in Cost Risk.

DAL	Data Accession List.
DAR	Defense Acquisition Regulations.
DARPA	Defense Advanced Research Projects Agency.
DAS	Data Acquisition System.
DBHS	Data Base Handling System.
DCA	Defense Communications Agency.
DCAA	Defense Contract Audit Agency.
DCAS	Defense Contract Administration Services.
DCASR	DCAS Region.
DCC	Digital Control Computer.
DCP	Development Concept Paper (DoD).
DCS	Defense Communications System.
DCTN	Defense Commercial Telecommunications Network.
DDA	Dynamic Demand Assessment (Delta Modulation).
DDC	Defense Documentation Center.
DDL	Digital Data Link – A segment of a communications network used for approval of a negotiated procurement.
DDN	Defense Data Network.
DDS	Dynamic Diagnostics System.
D&F	Determination and Findings – Required documentation for approval of a negotiated procurement.
DIA	Defense Intelligence Agency.
DIF	Document Interchange Format, Navy-sponsored word processing standard.
DHHS	Department of Health and Human Services.
DIDS	Defense Integrated Data Systems.
DISC	Defense Industrial Supply Center.
DLA	Defense Logistics Agency.
DMA	Defense Mapping Agency.
DNA	Defense Nuclear Agency.
DO	Delivery Order.
DOA	Department of Agriculture (also USDA).
DOC	Department of Commerce.
DOE	Department of Energy.
DOI	Department of Interior.
DOJ	Department of Justice.
DOS	Department of State.
DOT	Department of Transportation.
DPA	Delegation of Procurement Authority (granted by GSA under FPRs).
DPC	Defense Procurement Circular.
DQ	Definite Quantity Contract.
DQ/PL	Definite Quantity Price List Contract.
DR	Deficiency Report.
DSN	Defense Switched Network.
DSP	Defense Support Program (WWMCCS).

DSS	Defense Supply Service.
DTC	Design-To-Cost.
ECP	Engineering Change Proposal.
ED	Department of Education.
EEO	Equal Employment Opportunity.
8(a) Set-Aside	Agency awards direct to Small Business Administration for direct placement with a socially/economically disadvantaged company.
EMC	Electro-Magnetic Compatibility.
EMCS	Energy Monitoring and Control System.
EO	Executive Order – Order issued by the President.
EOQ	Economic Ordering quantity.
EPA	Economic Price Adjustment.
EPA	Environmental Protection Agency.
EPMR	Estimated Peak Monthly Requirement.
EPS	Emergency Procurement Service (GSA) or Emergency Power System.
EUC	End-User Computing, especially in DoD.
FA	Formal Advertising.
FAC	Facility Contract.
FAR	Federal Acquisition Regulations.
FCA	Functional Configuration Audit.
FCC	Federal Communications Commission.
FCDC	Federal Contract Data Center.
FCRC	Federal Contract Research Center.
FDPC	Federal Data Processing Center.
FEDSIM	Federal (Computer) Simulation Center (GSA).
FEMA	Federal Emergency Management Agency.
FFP	Firm Fixed-Price Contract (also Lump Sum Contract).
FIPS	NBS Federal Information Processing Standard.
FIPS PUBS	FIPS Publications.
FIRMR	Federal Information Resource Management Regulations.
FMS	Foreign Military Sales.
FOC	Final Operating Capability.
FOIA	Freedom of Information Act.
FP	Fixed-Price Contract.
FP-L/H	Fixed-Price – Labor/Hour Contract.
FP-LOE	Fixed-Price – Level-of-Effort Contract.
FPMR	Federal Property Management Regulations.
FPR	Federal Procurement Regulations.
FSC	Federal Supply Classification.
FSG	Federal Supply Group.
FSN	Federal Supply Number.
FSS	Federal Supply Schedule or Federal Supply Service (GSA).

FSTS	Federal Secure Telecommunications System.
FT Fund	A revolving fund, designated as the Federal Telecommunications Fund, used by GSA to pay for GSA-provided common user services, specifically including the current FTS and proposed FTS 2000 services.
FTPS	Federal Telecommunications Standards Program administered by NCS; Standards are published by GSA.
FTS	Federal Telecommunications System.
FTS 2000	Proposed replacement for the Federal Telecommunications System.
FY	Fiscal Year.
FYDP	Five-Year Defense Plan.
GAO	General Accounting Office.
GFE	Government-Furnished Equipment.
GFM	Government-Furnished Material.
GFY	Government Fiscal Year (October to September).
GIDEP	Government-Industry Data Exchange Program.
GOCO	Government Owned – Contractor Operated.
GOGO	Government Owned – Government Operated.
GPO	Government Printing Office.
GPS	Global Positioning System.
GS	General Schedule.
GSA	General Services Administration.
HPA	Head of Procuring Activity.
HSDP	High-Speed Data Processors.
HUD	(Department of) Housing and Urban Development.
ICA	Independent Cost Analysis.
ICAM	Integrated Computer-Aided Manufacturing.
ICE	Independent Cost Estimate.
ICP	Inventory Control Point.
ICST	Institute for Computer Sciences and Technology, National Bureau of Standards, Department of Commerce.
IDAMS	Image Display And Manipulation System.
IDEP	Interservice Data Exchange Program.
IDN	Integrated Data Network.
IFB	Invitation For Bids.
IOC	Initial Operating Capability.
IOI	Internal Operating Instructions.
IQ	Indefinite Quantity Contract.
IR&D	Independent Research & Development.
IRM	Information Resource Manager.
IXS	Information Exchange System.

JOCIT	Jovial Compiler Implementation Tool.
JSIPS	Joint Systems Integration Planning Staff.
JSOP	Joint Strategic Objectives Plan.
JSOR	Joint Service Operational Requirement.
JUMPS	Joint Uniform Military Pay System.
LC	Letter Contract.
LCC	Life Cycle Costing.
LCMP	Life Cycle Management Procedures (DD7920.1).
LCMS	Life Cycle Management System.
L-H	Labor-Hour Contract.
LOI	Letters of Interest.
LRPE	Long-Range Procurement Estimate.
MAISRC	Major Automated Information Systems Review Council (DoD).
MANTECH	MANufacturing TECHnology.
MAPS	Multiple Address Processing System.
MASC	Multiple Award Schedule Contract.
MDA	Multiplexed Data Accumulator.
MENS	Mission Element Need Statement or Mission Essential Need Statement (see DD-5000.1 Major Systems Acquisition).
MILSCAP	Military Standard Contract Administration Procedures.
MIL SPEC	Military Specification.
MIL STD	Military Standard.
MIPR	Military Interdepartmental Purchase Request.
MOD	Modification.
MOL	Maximum Ordering Limit (Federal Supply Service).
MPC	Military Procurement Code.
MYP	Multi-Year Procurement.
NARDIC	Navy Research and Development Information Center.
NASA	National Aeronautics and Space Administration.
NBS	National Bureau of Standards.
NCMA	National Contract Management Association.
NCS	National Communications System; responsible for setting U.S. Government standards administered by GSA; also holds primary responsibility for emergency communications planning.
NICRAD	Navy-Industry Cooperative Research and Development.
NIP	Notice of Intent to Purchase.
NMCS	National Military Command System.
NSA	National Security Agency.

NSEP	National Security and Emergency Preparedness.
NSF	National Science Foundation.
NSIA	National Security Industrial Association.
NTIA	National Telecommunications and Information Administration of the Department of Commerce; replaced the Office of Telecommunications Policy in 1970 as planner and coordinator for government communications programs; primarily responsible for radio.
NTIS	National Technical Information Service.
Obligation	"Earmarking" of specific funding for a contract from committed agency funds.
OCS	Office of Contract Settlement.
OFCC	Office of Federal Contract Compliance.
Off-Site	Services to be provided near but not in government facilities.
OFMP	Office of Federal Management Policy (GSA).
OFPP	Office of Federal Procurement Policy.
OIRM	Office of Information Resources Management.
O&M	Operations & Maintenance.
OMB	Office of Management and Budget.
O,M&R	Operations, Maintenance, and Repair.
On-Site	Services to be performed on a government installation or in a specified building.
OPM	Office of Procurement Management (GSA) or Office of Personnel Management.
Options	Sole-source additions to the base contract for services or goods to be exercised at the government's discretion.
OSHA	Occupational Safety and Health Act.
OSP	Offshore Procurement.
OTA	Office of Technology Assessment (Congress).
Out-Year	Proposed funding for fiscal years beyond the Budget Year (next fiscal year).
P-I	FY Defense Production Budget.
P3I	Pre-Planned Product Improvement (program in DoD).
PAR	Procurement Authorization Request or Procurement Action Report.
PAS	Pre-Award Survey.
PASS	Procurement Automated Source System.
PCO	Procurement Contracting Officer.
PDA	Principal Development Agency.
PDM	Program Decision Memorandum.
PDR	Preliminary Design Review.
PIR	Procurement Information Reporting.
PME	Performance Monitoring Equipment.

PMP	Purchase Management Plan.
PO	Purchase Order or Program Office.
POM	Program Objective Memorandum.
PPBS	Planning, Programming, Budgeting System.
PR	Purchase Request or Procurement Requisition.
PS	Performance Specification – Alternative to a Statement of Work, when work to be performed can be clearly specified.
QA	Quality Assurance.
QAO	Quality Assurance Office.
QMCS	Quality Monitoring and Control System (DoD software).
QMR	Qualitative Material Requirement (Army).
QPL	Qualified Products List.
QRC	Quick Reaction Capability.
QRI	Quick Reaction Inquiry.
R-I	FY Defense RDT&E Budget.
RAM	Reliability, Availability, and Maintainability.
RC	Requirements Contract.
R&D	Research and Development.
RDA	Research, Development, and Acquisition.
RDD	Required Delivery Date.
RD&E	Research, Development, and Engineering.
RDF	Rapid Deployment Force.
RDT&E	Research, Development, Test, and Engineering.
RFI	Request for Information.
RFP	Request For Proposal.
RFQ	Request For Quotation.
RFTP	Request For Technical Proposals (Two-Step).
ROC	Required Operational Capability.
ROI	Return On Investment.
RTAS	Real Time Analysis System.
RTDS	Real Time Display System.
SA	Supplemental Agreement.
SBA	Small Business Administration.
SB Set-Aside	Small Business Set-Aside contract opportunities with bidders limited to certified small businesses.
SCA	Service Contract Act (1964 as amended).
SCN	Specification Change Notice.
SDN	Secure Data Network.
SEC	Securities and Exchange Commission.
SE&I	Systems Engineering and Integration.
SETA	Systems Engineering/Technical Assistance.
SETS	Systems Engineering/Technical Support.
SIBAC	Simplified Intragovernmental Billing and Collection System.

SIMP	Systems Integration Master Plan.
SIOP	Single Integrated Operations Plan.
SNAP	Shipboard Nontactical ADP Program.
Sole Source	Contract award without competition.
Solicitation	Invitation to submit a bid.
SOR	Specific Operational Requirement.
SOW	Statement of Work.
SSA	Source Selection Authority (DoD).
SSAC	Source Selection Advisory Council.
SSEB	Source Selection Evaluation Board.
SSO	Source Selection Official (NASA).
STINFO	Scientific and Technical INFOrmation Program-Air Force/NASA.
STU	Secure Telephone Unit.
SWO	Stop-Work Order.
Synopsis	Brief description of contract opportunity in CBD after D&F and before release of solicitation.
TA/AS	Technical Assistance/Analyst Services.
TEMPEST	Studies, inspections, and tests of unintentional electro- magnetic radiation from computer, communication, command, and control equipment that may cause unauthorized disclosure of information; usually applied to DoD and security agency testing programs.
TILO	Qualified Requirements Information Program – Army.
TM	Time and Materials contract.
TOA	Total Obligational Authority (Defense).
TOD	Technical Objective Document.
TR	Temporary Regulation (added to FPR, FAR).
TRACE	Total Risk Assessing Cost Estimate.
TRCO	Technical Representative of the Contracting Offices.
TREAS	Department of the Treasury.
TRP	Technical Resources Plan.
TSP	GSA's Teleprocessing Services Program.
TVA	Tennessee Valley Authority.
UCAS	Uniform Cost Accounting System.
USA	U.S. Army.
USAF	U.S. Air Force.
USCG	U.S. Coast Guard.
USMC	U.S. Marine Corps.
USN	U.S. Navy.
U.S.C.	United States Code.
USPS	United States Postal Service.
USRRB	United States Railroad Retirement Board.

VA	Veterans Administration.
VE	Value Engineering.
VHSIC	Very High Speed Integrated Circuits.
VIABLE	Vertical Installation Automation BaseLine (Army).
VICI	Voice Input Code Identifier.
WBS	Work Breakdown Structure.
WGM	Weighted Guidelines Method.
WIN	WWMCCS Intercomputer Network.
WIS	WWMCCS Information Systems.
WS	Work Statement – Offerer's description of the work to be done (proposal or contract).
WWMCCS	World-Wide Military Command and Control System.

B

General And Industry

ADP	Automatic Data Processing.
ADPE	Automatic Data Processing Equipment.
ANSI	American National Standards Institute.
CAD	Computer-Aided Design.
CAM	Computer-Aided Manufacturing.
CBEMA	Computer and Business Equipment Manufacturers Association.
CCITT	Comite Consultaif Internationale de Telegraphique et Telephonique; Committee of the International Telecommunication Union.
COBOL	COmmon Business-Oriented Language.
CPU	Central Processor Unit.
DBMS	Data Base Management System.
EIA	Electronic Industries Association.
IEEE	Institute of Electrical and Electronics Engineers.
ISO	International Organization for Standardization; voluntary international standards organization and member of CCITT.
ITU	International Telecommunication Union.
LSI	Large-Scale Integration.
PROM	Programmable Read-Only Memory.
UPS	Uninterruptable Power Source.
VLSI	Very Large Scale Integration.

D

Appendix: Policies, Regulations, and Standards

A OMB Circulars

A-11	Preparation and Submission of Budget Estimates.
A-49	Use of Management and Operating Contracts.
A-71	Responsibilities for the Administration and Management of Automatic Data Processing Activities.
A-76	Policies for Acquiring Commercial or Industrial Products and Services Needed by the Government.
A-109	Major Systems Acquisitions.
A-120	Guidelines for the Use of Consulting Services.
A-121	Cost Accounting, Cost Recovery, and Integrated Sharing of Data Processing Facilities.

B GSA Publications

The FIRMR, as published by GSA, is the primary regulation for use by federal agencies in the management, acquisition, and use of both ADP and telecommunications information resources.

Certain parts of the FIRMR are particularly applicable to federal telecommunications systems. These include:

- 201-8 Implementation and Use of Federal Standards.
- 201-21 Telecommunications Management Programs.
- 201-38 Management of Telecommunications Resources.
- 201-39 Major Changes and New Installation of Telecommunications Resources.
- 201-40 Contracting for Telecommunications Resources.
- 201-41 Routine Changes and Use of the Federal Telecommunications System.

The following Bulletins in Appendix B of the FIRMR provide additional guidance.

• 4	Federal Communications Centers.
• 14	GSA Electronic Maintenance, Repair, and Engineering Rates (includes discussion of FSTS).
• 16	Travel by Federal Telecommunications System.
• 17	Acquisition and Installation of Small Telephone Systems.
• 20	GSA Contracts for the Purchase of Telephones and Services (POTS).
• 25	ADP and Telecommunications Standards Index.

Handbook for Life Cycle Management of Telecommunications Systems (February 1987).

C

DoD Directives

DD-5000.1	Major System Acquisitions.
DD-5000.2	Major System Acquisition Process.
DD-5200.1	DoD Information Security Program.
DD-5000.31	Interim List of DoD-Approved High-Order Languages.
DD-5000.35	Defense Acquistion Regulatory Systems.
DD-7920.1	Life Cycle Management of Automated Information (AIS).
DD-7920.2	Major Automated Information Systems Approval Process.

D

Standards

ADCCP	Advanced Data Communications Control Procedures; ANSI standard X3.66 of 1979; also NBS FIPS 71.
CCITT G.711	International PCM standard.
CCITT T.0	International standard for classification of facsimile apparatus for document transmission over telephone-type circuits.
DEA-1	Proposed ISO standard for data encryption based on the NBS DES.
EIA RS-170	Monochrome video standard.
EIA RS-170A	Color video standard.
EIA RS-464	EIA PBX standards.
EIA RS-465	Standard for Group III facsimile.
EIA RS-466	Facsimile standard; procedures for document transmission in the general switched telephone network.
EIA RS232-C	EIA DCE to DTE interface standard using a 25-pin connector; similar to CCITT V.24.

EIA RS449	New EIA standard DTE to DCE interface which replaces RS232-C.
FED-STD 1000	Proposed Federal Standard for adoption of the full OSI reference model.
FED-STD 1026	Federal Data Encryption Standard (DES) adopted in 1983; also FIPS 46.
FED-STD 1041	Equivalent to FIPS 100.
FED-STD 1061	Group II facsimile standard (1981).
FED-STD 1062	Federal standard for Group III facsimile; equivalent to EIA RS-465.
FED-STD 1063	Federal facsimile standard equivalent to EIA RS-466.
FED-STDs 1005, 1005A-1008	Federal standards for DCE coding and modulation.
FIPS 46	NBS Data Encryption Standard (DES).
FIPS 81	DES Modes of Operation.
FIPS 100	NBS standard for packet-switched networks; subset of CCITT X.25.
FIPS 107	NBS standard for local-area networks, similar to IEEE 802.2 and 802.3.
FTP	File Transfer Protocol (MIL-STD-1780).
IEEE 802.2	OSI-compatible IEEE standard for data-link control in local area networks.
IEEE 802.3	Local-area network standard similar to Ethernet.
IEEE 802.4	OSI-compatible standard for token-bus local area networks.
IEEE 802.5	Local-area network standard for token-ring networks.
SMTP	Simple Mail Transfer Protocol (MIL-STD-1781).
TCP/IP	Transmission Control Protocol/Internet Protocol; DoD protocol standards (MIL-STD-1778/1777).
TELNET	Virtual Terminal Protocol (MIL-STD-1782).
X.12	CCITT standard for packet switch networks.
X.21	CCITT standard for interface between DTE and DCE for synchronous operation on public data networks.
X.25	CCITT standard for interface between DTE and DCE for terminals operating in the packet mode on public data networks.
X.75	CCITT standard for links that interface different packet networks.
X.400	ISO application-level standard for the electronic transfer of messages (electronic mail).

E

Appendix: Related INPUT Reports

A Annual Market Analyses

Procurement Analysis Reports, GFY 1987-1992.

U.S. Information Services Vertical Market, 1986-1991.

U.S. Information Services Cross-Industry Markets, 1986-1991.

B Industry Surveys

Directory of Leading U.S. Information Services Vendors.

Eighteenth Annual ADAPSO Survey of the Computer Services Industry – 1984.

C Telecommunications Market Reports

Micro-Mainframe: Telecommunications – 1984.

Network Services Direction – 1986.

Strategies for New Telecommunications Opportunities – 1984.

Telecommunications Support – 1986.

D Telecommunications Planning

Economics of Telecommunications – 1986.

Integrated Voice/Data Communications – 1985.

LAN/CBX: Planning for Change – 1985.

Telecommunications Security – 1985.

LAN/CBX Trends: Decision Processes for Users – 1984.

Telecommunications Annual Planning Report – 1984.

Telecommunications Strategic Planning – 1984.

F

Appendix: Questionnaires

Catalog No. FISS-36
Study Code: G-TE2

I

Federal Agency Interview Questionnaires

Federal Telecommunications Market, 1987-1992 CONFIDENTIAL

1a. Based on our review of your agency's OMB A-11 submissions, the following major programs are proposed for adding to or improving your agency's telecommunications over the next five years (read list from table below). Is this list current and complete?

____ Yes ____ No

(If Yes go to Question 1.c)

1b. (If No)

What programs should be added or removed?

1c. Which of these are ongoing? Expansions? Upgrades? Replacements? New? (Status/Type)

2. What types of telecommunications services are they expected to provide (e.g., private or public network, switched, dedicated, VAN)?

Program (List from OMB A-11 submission)	Status/Type	Type of System/Service
____________	____________	____________
____________	____________	____________

______________	__________	__________________________
______________	__________	__________________________
______________	__________	__________________________
______________	__________	__________________________
______________	__________	__________________________

3.a Have the five year budget forecasts for any of your proposed telecommunications changed over the past year?

3.b (If Yes) In what ways?

Program	Change (Amount $ Increase/Decrease)
__________________________	______________________________
__________________________	______________________________
__________________________	______________________________
__________________________	______________________________

Additional Comments: ____

____

____

4.a Does your agency employ network control centers?

____ Yes ____ No

____ Owned ____ Leased

4.b Are these center centralized or decentralized?

____ Centralized ____ Decentralized

4.c Do these centers control and monitor communications networks?

Center	Control/Monitor	Monitor Only
_____________	_____	_____
_____________	_____	_____

______________ _____ _____

______________ _____ _____

______________ _____ _____

______________ _____ _____

4.d Do you plan to implement new network control centers over the next five years?

_____ Yes _____ No

Upgrades? _____ Yes _____ No

4.e Will these new centers be centralized or decentralized?

_____ Centralized _____ Decentralized

5.a Does your agency currently use Value-Added Networks?

_____ Yes _____ No

5.b Does your agency plan to use VANs over the next five years?

_____ Yes _____ No

5.c How would the availability of VAN service under the TSP/MASC alter your planned usage over the next five years?

_____ Increase _____ Decrease _____ No Change

5.d What would be the advantages and disadvantages for your agency of acquiring VAN service under the TSP/MASC?

Advantages	Disadvantages
______________________	______________________
______________________	______________________
______________________	______________________
______________________	______________________
______________________	______________________
______________________	______________________

6.a Does your agency currently use any Local Area Networks?

_____ Yes _____ No

6.b Do you plan to change any of these LANs over the next five years?

_____ Yes _____ No

6.c Please identify each of these LANs, the type of change (expand, upgrade, replace), the size of the LAN (geographical dispersion and number of workstations), vendor, protocol (e.g., baseband token ring), and applications supported on the LAN. Other examples:

____

Identification	Size Geo.	# Workstations	Vendor	Protocol	Applic.
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____

6.d Do you plan to implement any new LANs over the next five years?

_____ Yes _____ No

7.a What standards are in effect now or might be applied to the following type of communications facilities?

	Current	Future (1992)
Terminals	_____	_____
Switches	_____	_____
Transmission	_____	_____
Interfaces	_____	_____
LANs	_____	_____

7.b Has your agency taken steps to implement OSI standards (Open System Interconnection Protocols)?

____

____

8. What impact will the computer security regulations in Executive Order 145 or as proposed in H.R. 145 have on your agency's exchange of data and security of data, as well as other telecommunications services?

____

____

____

9. Could you estimate the relative proportions of voice and data communications used by your agency?

	Current	Future (1992)
Voice	________	________
Data	________	________

10.a Do you currently have a long range plan or strategy for telecommunications systems and services?

_____ Yes _____ No

(If No go to Question 11)

10.b (If Yes to 10.a)

What are the key elements of the strategy?

____

____

____

11.a What percentage of your agency's communications requirements are met currently by government networks?

FTS _____

Autovon _____

Autodin _____

DDN _____

Other _____

11.b Assuming that GSA's telecommunications modernization plans proceed as scheduled, including FTS 2000 procurements, the WITS and ASP components, what percentage of your agency's communications requirements could be met by these systems when implemented?

Percentage _____

11.c Has your agency ever expressed doubts as to the ability of FTS 2000 to satisfy your agency's communications requirements?

_____ Yes _____ No

What has changed to make your agency more/less confident in these systems?

____

____

____

12.a Does your agency have a preference for leasing or purchasing telecommunications hardware and software?

Lease _____ Purchase _____ No _____

12.b Could you estimate the percentage of telecommunications hardware and software acquisitions in each category, currently and over the next five years?

	Current Lease	Purchase	Future Lease	Purchase
Hardware	_____	_____	_____	_____
Software	_____	_____	_____	_____

13. How does your agency plan to acquire additional, improved, or new telecommunications systems and services? (Check each method)

_____ Use GSA or DCA sponsored facilities

_____ Buy integrated (common carrier) services

_____ Buy VAN services

_____ Buy integrated systems (including hardware, software, circuits/transmission facilities, and service)

_____ Buy components and integrate in-house

_____ Buy components and use a design or integration contractor

14. What special communications requirements does your agency have?

____

____

____

15. What should vendors provide during the next five years to make their telecommunications systems and services more valuable to your agency?

____

____

____

Catalog No. FISS-37
Study Code: G-TE2

II

Vendor Interview Questionnaires

CONFIDENTIAL

Federal Telecommunications Market, 1987-1992

1.a Does your company now provide or plan to provide telecommunications systems or services to the Federal Government?

_____ Yes _____ No

(If No, close the interview)

1.b (If Yes, to 1.a)

What types of systems or services do you now provide or plan to provide?

	Current	Planned
Hardware	____________	____________
Software	____________	____________
Professional Services	____________	____________
Network Services	____________	____________

2. What standards are supported currently or will be supported by your company for the following types of communications?

	Current	Future (1991)
Terminals	____________	____________
Switches	____________	____________
Transmission	____________	____________
Interfaces	____________	____________
LANs	____________	____________

3.a Do you believe that the Federal telecommunications market will increase or decrease over the next 2-5 years?

_____ Decrease _____ Stay the same _____ Increase

3.b If decreasing or increasing, for which particular types of applications, systems or services?

____

____

____

3.c Why?

____

____

____

4.a In your opinion, which agencies provide the most attractive opportunities for telecommunications systems and services?

____

____

____

4.b Why?

____

____

____

5. Government agencies have several alternatives available for changing or adding to their telecommunications resources. Which of the following alternatives do you believe are likely to be most significant over the next five years?

Yes	Alternatives	No
_____	Use of GSA or DCA-sponsored facilities	_____
_____	Buying or leasing integrated (common carrier) services	_____

_____ Buying or leasing VAN services _____

_____ Buying integrated systems (including hardware, software, circuits/transmission facilities, and service) _____

_____ Buying components and integrating in-house _____

_____ Buying components and using a design or integration contractor _____

6.a Does your company supply or plan to supply VAN services to the Federal Government?

_____ Yes _____ No

6.b GSA is considering making VAN services available under the TSP/MASC. Would your company prefer to see VAN services offered to the Government in this way?

_____ Yes _____ No _____ No Preference

6.c What would be the advantages and/or disadvantages for Federal agencies of acquiring VAN services under the TSP/MASC?

Advantages	Disadvantages
____________________	____________________
____________________	____________________
____________________	____________________
____________________	____________________
____________________	____________________
____________________	____________________

7.a Does your company supply or plan to supply local area network services to the Federal Government?

_____ Yes _____ No

7.b In your opinion, do the agencies appear to be utilizing or planning to use more LAN services?

____

____

In what applications?

____

____

8.a GSA has proposed complete replacement of the existing FTS with FTS-2000 by 1990. Are you familiar with this proposed acquisition?

_____ Yes _____ No

8.b Do you believe that centralization of Federal telecommunications is in the best interest of the Government and the individual agencies?

_____ Yes _____ No (Government Overall)

_____ Yes _____ No (Individual Agencies)

8.c In your opinion, what kind of impact will the FTS-2000 acquisition have on telecommunications vendors over the next 5 years?

____

____

____

9. What do you believe vendors need to do over the next 5 years to make their telecommunications systems and services more valuable to the Government?

____

____

____

10. What technological changes might alter the way the Government meets its telecommunications needs?

____

____

____

11. Could you identify those non-technical factors that would have the greatest impact on Government telecommunications acquisitions?

____

____

____

12.a What was your company's total information systems and services revenue from Federal business during your most recent fiscal year?

$ ________________ FY ________________

12.b What percentage of this Federal revenue was for the following telecommunications systems and services?

________________ Overall

________________ Hardware

________________ Software

________________ Professional Services

________________ Network Services

VIII About INPUT

Company Profile

INPUT provides planning information, analysis, and recommendations to managers and executives in the information processing industries. Through market research, technology forecasting, and competitive analysis, INPUT supports client management in making informed decisions.

Continuous-information advisory services, proprietary research/consulting, merger/acquisition assistance, and multiclient studies are provided to users and vendors of information systems and sevices (software, processing services, turnkey systems, systems integration, professional services, communications, and systems/software maintenance and support).

Many of INPUT's professional staff members have more than 20 years' experience in their areas of specialization. Most have held senior management positions in operations, marketing, or planning. This expertise enables INPUT to supply practical solutions to complex business problems.

Staff Credentials

Formed as a privately held corporation in 1974, INPUT has become a leading international research and consulting firm. Clients include more than 100 of the world's largest and most technically advanced companies.

INPUT's professional staff have backgrounds in marketing, planning, information processing, and market research in some of the world's leading organizations. Many of INPUT's professional staff have held executive positions in the following business sectors:

- Computer systems
- Software
- Turnkey systems
- Field service (customer service)
- Processing services
- Professional services
- Data processing
- Network services
- Communications

Educational backgrounds include both technical and business specializations, and many INPUT staff hold advanced degrees.

Domestic and European Advisory Services

INPUT offers ten basic information services: eight covering U.S. information industry markets and two covering European information industry markets.

1. Market Analysis Program—U.S. (MAP)

Provides up-to-date U.S. information services market analyses, five-year forecasts, trend analyses, and sound recommendations for action. MAPS is designed to satisfy the planning and marketing requirements of current and potential information services vendors.

2. Market Analysis Program—Europe (MAPE)

Analyzes and forecasts European software and services markets. Clients receive timely planning information through research-based studies, conferences, client meetings, and continuous client support.

3. Vendor Analysis Program (VAP)

Is a comprehensive reference service covering more than 4,000 U.S. information services vendor organizations. VAP is often used for competitive analysis and prescreening of acquisition and joint venture candidates.

4. Electronic Data Interchange Program (EDIP)

Focusing on what is fast becoming a major computer/communications market opportunity, INPUT's EDIP keeps you informed. Through monthly newsletters, timely news flashes, comprehensive studies, a joint user/vendor conference, and telephone inquiry privileges, you will be informed and stay informed about the events and issues impacting this burgeoning market.

5. Systems Integration Program (SIP)

Focus is on the fast-moving world of systems integration, and the provision of complex information systems requiring multiple products and services. Covers this infant segment in-depth by tracking both the federal and commercial markets via monthly project profiles, market analysis reports, a monthly newsletter, seminars, conferences, a presentation, and hotline inquiry service privileges.

6. Federal Information Systems and Services Program (FISSP)

Presents highly specific information on U.S. federal government procurement practices, identifies information services vendor opportunities, and provides guidance from INPUT's experienced Washington professionals to help clients maximize sales effectiveness in the federal government marketplace.

7. Information Systems Program (ISP)

Is designed for executives of small, medium, and large information systems organizations and provides crucial information for planning, procurement, and management decision making. The program examines new service offerings, technological advances, user requirements for systems and services, IS spending patterns, and more. ISP is widely used by both user and vendor organizations.

8. Integrated Communications Program (ICP)

Provides management insight to ensure effective use of telecommunications. This program provides a comprehensive set of services, including major vendor profiles, market/service trends assessment, service quality assessment, national service profiles for 40 countries, quarterly service news reports, a handbook of international public data networks, issue study reports, conferences, and hotline client inquiry services.

9. Customer Service Program—U.S. (CSP)

Provides customer service organization management with data and analyses needed for marketing, technical, financial, and organizational planning. The program pinpoints user perceptions of service received, presents vendor-by-vendor service comparisons, and analyzes and forecasts service markets for large systems, small systems, telecommunications systems, software maintenance, and third-party maintenance.

10. Customer Service Program—Europe (CSPE)

Parallels the U.S. Customer Service Program, dealing with comparable issues in European markets.

Merger & Acquisition Services

INPUT also offers merger and acquisition services that are tailor-made for your requirements. Our years of experience and data base of company information about information systems and services companies have helped many companies.

Customized Advisory Services Available

In addition to standard continuous-information programs, INPUT will work with you to develop and provide a customized advisory service that meets your unique requirements.

An Effective Combination

INPUT'S Executive Advisory Services are built on an effective combination of research-based studies, client meetings, informative conferences, and continuous client support. Each service is designed to deliver the information you need in the form most useful to you, the client. Executive Advisory Services are composed of *varied combinations of the following* products and services:

Research-Based Studies
Following a proven research methodology, INPUT conducts major research studies throughout each program year. Each year INPUT selects issues of concern to management. Topical reports are prepared and delivered throughout the calendar year.

Information Service Industry Reports
INPUT's Executive Advisory Services address specific issues, competitive environment, and user expenditures relative to:

Software
Processing/Network Services
Systems Integration
Telecommunications Service
Office Systems
Professional Services
Turnkey Systems
Small-Systems Service
Third-Party Maintenance
Large-Systems Service

Industry Market Reports
Detailed analyses of market trends, forces driving the markets, problems, opportunities, and user expenditures are available for the following segments:

Banking/Finance
Discrete Manufacturing
Distribution
Education
Federal/State and Local Government
Insurance
Medical
Process Manufacturing
Service Industry
Telecommunications
Utilities
Accounting
Education/Training
Engineering/Scientific
Human Resources
Other Cross-Industry Markets
Transportation

Hotline: Client Inquiry Services
Daily, weekly, monthly, quarterly, and annual client planning questions are answered quickly and completely through use of INPUT's Client Hotline. Clients may call any INPUT office (California, New Jersey, Washington D.C., or London) during business hours or they may call a unique voicemail service to place questions after-hours. This effective Hotline service is the cornerstone of every INPUT Executive Advisory Service.

The Information Center
One of the largest and most complete collections of information services industry data, the Information Center houses literally thousands of up-to-date files on vendors, industry markets, applications, current/emerging technologies, and more. Clients have complete access to the Information Center. In addition to the information contained in its files, the center maintains an 18-month inventory of over 130 major trade publications, vendor consultant manuals, economic data, government publications, and a variety of important industry documents.

Access to INPUT Professional Staff
Direct access to our staff, many of whom have more than 20 years of experience in the information industry, provides you continuous research and planning support. When you buy INPUT, you buy experience and knowledge.

Annual Client Conference
Each year, you can attend INPUT's Annual Client Conference. This three-day event addresses the status and future of the information services industry, the competitive environment, important industry trends potentially affecting your business, the impact of new technology and new service offerings, and more.

You will attend with top executives from many of the industry's leading, fastest-growing, and most successful vendor companies, and with top Information Systems (IS) managers from some of the world's most sophisticated user organizations.

On-Site Presentation by INPUT Executive
Many of INPUT's Planning Services offer an informative presentation at your site. Covering the year's research, this session is held in the fourth quarter of each calendar year.

Proprietary Research Service

INPUT conducts proprietary research that meets the unique requirements of an individual client. INPUT's custom research is effectively used:

For Business Planning
Planning for new products, planning for business startups, planning expansion of an existing business or product line—each plan requires reliable information and analysis to support major decisions. INPUT's dedicated efforts and custom research expertise in business planning ensure comprehensive identification and analysis of the many factors affecting the final decision.

For Acquisition Planning
Successful acquisition and divestiture of information services companies requires reliable information. Through constant contact with information services vendor organizations, continuous tracking of company size, growth, financials, and management "chemistry," INPUT can provide the valuable insight and analysis you need to select the most suitable candidates.

For the Total Acquisition Process
INPUT has the credentials, the data base of company information, and most importantly, the contacts to assist you with the total acquisition and/or partnering relationship processes:

- √ Due Diligence
- √ Schedules and Introduction
- √ Criteria & Definitions
- √ Retainer and Fee-Based
- √ Active Search

For Competitive Analysis
Knowing marketing and sales tactics, product capabilities, strategic objectives, competitive posture, and strengths and weaknesses of your competition is as critical as knowing your own. The career experience of INPUT's professionals, coupled with its collection and maintenance of current financial, strategic, tactical, and operational information about more than 4,000 active companies, uniquely qualifies INPUT to provide the best competitive information available today.

For Market and Product Analysis
Developing new products and entering new markets involves considerable investment and risk. INPUT regularly conducts research for clients to identify product requirements, market dynamics, and market growth.

More About INPUT...
- More than 5,000 organizations, worldwide, have charted business directions based on INPUT's research and analysis.

- Many clients invest more than $50,000 each year to receive INPUT's recommendations and planning information.

- INPUT regularly conducts proprietary research for some of the largest companies in the world.
- INPUT has developed and maintains one of the most complete information industry libraries in the world (access is granted to all INPUT clients).
- INPUT clients control an estimated 70% of the total information industry market.
- INPUT analyses and forecasts are founded upon years of practical experience, knowledge of historical industry performance, continual tracking of day-to-day industry events, knowledge of user and vendor plans, and business savvy.
- INPUT analysts accurately predicted the growth of the information services market—at a time when most research organizations deemed it a transient market. INPUT predicted the growth of the microcomputer market in 1980 and accurately forecasted its slowdown in 1984.

For More Information . . .

INPUT offers products and services that can improve productivity, and ultimately profit, in your firm. Please give us a call today. Our representatives will be happy to send you further information on our services or to arrange a formal presentation at your offices.

For details on delivery schedules, client service entitlement, or Hotline support, simply call your nearest INPUT office. Our customer support group will be available to answer your questions.

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