

1 Technical Approach to Service Delivery

AT&T is positioned to provide the Government with high-quality Federal Acquisition Service (FAS 2001) services through the AT&T Worldwide Intelligent Network (WIN). Our network was designed to meet the advanced and constantly evolving telecommunications needs of the next century. Moreover, AT&T will continue to improve its close partnership with the Government established under FTS 2000. We will create a telecommunications infrastructure, unequalled in its capabilities, to support the secure transfer of Government voice, data, and video over the world's leading, state-of-the-art network. Our network will provide the Government and its telecommunications end users with a seamless transition to the widest array of leading-edge features, enhanced networking services, global reach, technical solutions customer service, and more support than any other network provider in the world today.

AT&T will use its industry-leading WIN to provide the Government's FAS 2001 domestic and international. Service to Alaska is on a product by product basis. Our choice is based on an extensive analysis of all service requirements specified in the FAS 2001 Requirements Document using our comprehensive Service Realization Process. The process is structured to ensure that:

- Customer satisfaction is achieved
- Innovative solutions are encouraged
- Proper focus and resources are applied
- A disciplined management program is followed.

The benefit to the Government is a rigorous review of the Government's requirements.

As shown in **Figure 1-1**, service realization includes the identification of functions and features to support customer needs, analysis of available technology platforms, definition of the technical architecture, specification of technical and operational plans for implementation, and on-going technical and operational process improvement for the delivery of the service. Rigorous testing of new network capabilities and mechanisms for ensuring continuous improvements in AT&T's technical and management approach are all part of our Service Realization Process. This planning process minimizes risk to the Government and maximizes service stability and continuity.

Because FAS 2001 is a request for up-to-date and emerging communications services, each Government requirement was examined in detail against AT&T's current and planned capabilities for commercial services. In addition, our understanding of the Government's needs and intentions was factored into our analysis based on our years of experience in providing over [REDACTED] of FTS2000 services, as well as our experience on numerous other Government telecommunications service contracts. As a result, AT&T is pleased to propose its Worldwide Intelligent Network for FAS 2001 services. AT&T's WIN is an advanced digital switching network operating over [REDACTED] of its traffic on high-speed fiber-optic cable. All signaling systems are [REDACTED] redundant. The network currently handles over 250 million calls on an average business day with peak call days handling over [REDACTED] calls. In today's highly competitive telecommunications sector, AT&T's network services and reliability consistently receive the highest customer confidence.

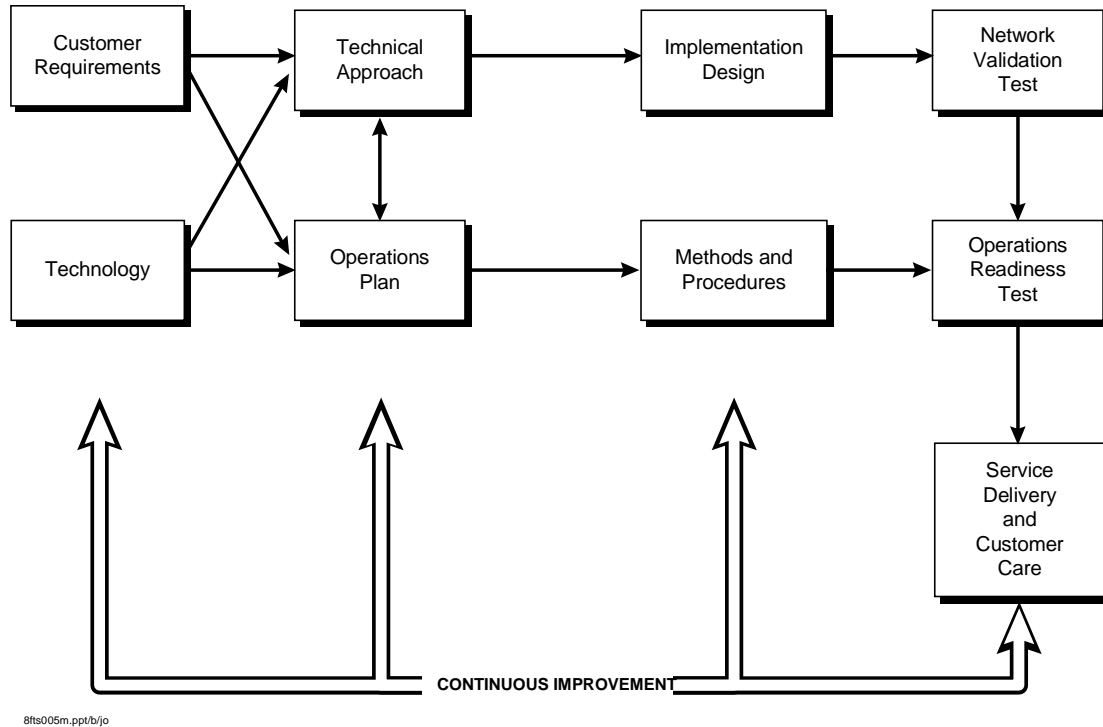


Figure 1-1. The AT&T Service Realization Process — *The Service Realization Process ensures that Government requirements are met in a timely and cost-effective manner.*

In paragraphs 1.1 through 1.14, combined with the service descriptions in Section 2, we provide logical and reasonable approaches to service delivery for FAS 2001 through our WIN. We request that all evaluators read Section 1, paragraphs 1.1 through 1.14, to become thoroughly familiar with AT&T's overall technical approach. Subsections for each requested service provide additional details on AT&T's approach for meeting FAS 2001 requirements.

AT&T's technical experience and our ability to offer a seamless migration for service delivery on FAS 2001, allows us to meet the requirements. Our Service Realization Process, as applied to our commercial network capabilities, means that most FAS 2001 service requirements are already being delivered today to a wide variety of both Government and commercial customers. AT&T's solution is non-disruptive, non-intrusive, and maintains full continuity of service for Switched Data Services and Dedicated Transmission Service users. AT&T's commercial switched network will be used for Circuit Switched Services. Based on this approach, we do not foresee any major problems in the delivery of these services under FAS 2001.

Our primary focus in the implementation of FAS 2001 requirements is the volume of traffic in all services that must be migrated, or implemented. Both shared and dedicated network elements within our WIN comprise the AT&T platform. The shared and dedicated network elements interwork within the WIN to provide end-to-end service. Moreover, our years of experience in the transition and implementation of large-scale communications networks provides a critical value-added advantage to the Government on the FAS 2001 contract modification. AT&T implements networks and services at a scale larger and more robust than any other carrier in the industry. AT&T will apply this experience to the implementation of additional Government traffic on our WIN. In addition to the experience, expertise, and high level of quality service provided by AT&T, our network offers more service functionality and global reach than any

other network operating today and into the foreseeable future. Our network reliability, functionality, FAS 2001 service requirements, and service delivery are described in detail in paragraph 1.1. Network reliability is the first priority in the design, development, and management of AT&T's global network. The presentation on network architecture includes a discussion of our rationale for the architecture design (as requested in L.38.1.1.b), and includes a discussion of the requested congestion and flow control strategy per requirements document Section L.38.1.1.c. By including these discussions, we believe the presentation on network architecture will be more understandable. Our responses to L.38.1.1.b and L.38.1.1.c are a summary of features that are addressed in greater detail in other technical sections. **Table 1-1** is a summary of our features. .

Table 1-1. Topics Addressed in the Subsections of Section 1 of the Technical Proposal —
AT&T's technical approach is compliant with FAS 2001 service requirements.

Paragraph	Subject
1.1	The overall network architecture, including the types and capacity of the transmission and switching media, the transmission facility(ies) configuration, and the type of equipment used in its network.
1.2	The rationale for the network architecture design.
1.3	Congestion and flow control strategy, including redundant switch and transmission facilities, control mechanisms, and the degree of flexibility inherent in the architectural design to handle predicted and unpredicted increased traffic loads and/or switch and transmission failures.
1.4	The amount of the offeror's equipment that would be required at Government locations to deliver the services, including the amount of power and floor space, along with heating, ventilation, and air conditioning loads.
1.5	Reserved.
1.6	An assessment of the impact of various levels of feature usage on service performance.
1.7	A description of network control and diagnostic capabilities and systems, including equipment and procedures for monitoring and testing each of the services and associated features.
1.8	Network transmission and synchronization plans for the various services.
1.9	Approach for incorporating into the offeror's network, at some future time, the emerging services listed in Requirements Document Section C.2.8 that the offeror believes are likely to become commercially available in the timeframe covered by this acquisition, including discussion of potential problems and proposed solutions.
1.10	Approach for adapting the offeror's network and services to meet the Government's evolving service requirements.
1.11	Discussion of the offeror's ability to meet the domestic and international service coverage requirements including limitations in current coverage and the offeror's plans for increasing this coverage after contract award and during the term of the contract, including explicit lists of where and when services and features will be offered.
1.12	Discussion of the performance standards associated with the international carriers and service providers the offeror proposes to use.

Paragraph	Subject
1.13	Discussion of the offeror's ability to meet the domestic excluding Alaska, service coverage requirements including limitations in current coverage and the offeror's plans for increasing this coverage after contract modification award and during the term of the contract modification, including explicit lists of where and when services and features will be offered.
1.14	Reserved
1.15	Network evolution approach to optimizing the Government's switched data cost-effectiveness (e.g., by extending network concentration and switching points).

1.1 Network Architecture

AT&T's corporate commitment to provide quality telecommunications functionality and service for Government is based on our Mission Statement for FAS 2001: "To be the best at bringing Federal employees together, providing them with easy access to one another and to the information they need to conduct Government business anywhere, and in any form (voice, data, image, and video)." The WIN is our platform of choice for reliable, easy-to-use, cost-effective FAS 2001 services.

AT&T is pleased to propose its industry-leading WIN, as the network architecture for the Government's FAS 2001 domestic and international communications needs. . Service to Alaska is on a product by product basis The AT&T WIN is the largest, most sophisticated and reliable communications network in the world. It includes more than [REDACTED] circuit miles of transmission facilities, it is [REDACTED] digital for switched traffic, and the network carries more than [REDACTED] of its traffic on high-speed fiber-optic cable. With the exception of a few network transport segments, AT&T's network is wholly owned and managed by AT&T — the next largest carrier leases [REDACTED] of its network facilities. The AT&T network also provides long-distance service to over [REDACTED] and territories worldwide. This represents service to virtually every country in the world. AT&T currently offers direct-dial service to more than [REDACTED] of these countries and territories. **Table 1.1-1** provides key statistics on the size of the AT&T network. AT&T's goal has been to set the standard for network reliability, and today that position remains unchallenged on the world's largest network.



Table 1.1-1. The AT&T Worldwide Intelligent Network — *Providing global reach with unequalled reliability, advanced technology, functionality, and customer service and support.*

The AT&T Worldwide Intelligent Network	
Handled nearly [REDACTED]	increase over the 1996 total of 68 billion calls.
Carries more than [REDACTED]	voice, data, and video calls on an average business day. Handles over [REDACTED] calls on peak business days.
Completes more than [REDACTED]	of all domestic calls on the first attempt. Of every one million calls dialed during 1996, only 124 did not complete on the first attempt due to a hardware, software, or procedural failure on the network.
Uses over 240 high-capacity digital switches to route long-distance calls within the United States.	
Has more than [REDACTED]	of fiber-optic cable routes in the continental United States.
Is [REDACTED]	digital for all domestic transport services, with more than [REDACTED] of services implemented on fiber optic technology.
Uses dynamic network routing schemes to automatically complete calls using, [REDACTED]	
Ensures network reliability by using the FASTAR system to automatically reroute circuits should a fiber-optic cable cut occur on the core network. This system reroutes [REDACTED]	of the interrupted circuits within seconds of a cable cut.
Provides telecommunication service to virtually every nation in the world.	
Provides direct-dial access to more than [REDACTED]	countries and territories.
Offers customers extremely fast call setup time. (Call setup time is the period between the last digit dialed and the distant telephone ringing.) On a typical point-to-point domestic call, that is [REDACTED]	
Includes more than [REDACTED]	circuit miles of domestic transmission facilities.

AT&T is the recognized industry leader in the development and implementation of advanced communications services. AT&T excels in designing and deploying networks and services to a larger scale (in overall network size, traffic capacity, coverage, and feature functionality) than any other carrier. We operate on a scale best suited to a large customer like the U.S. Government. Choosing AT&T as its FAS 2001 provider will significantly reduce the Government's risk and provides assurance of successful contract modification outcomes on this critical twenty-first century telecommunications procurement. As an FTS2000 contractor, AT&T worked closely with General Services Administration (GSA) and the agencies to provide [REDACTED] contract modifications to enhance network services.

AT&T provides the best quality service in the industry and has been rated as the industry leader in this area by The Yankee Group (Top International Service Provider), Communications Week International (World's Best Carrier), and the International Telecommunications Union (First in International Service Satisfaction), among others. AT&T customers receive the best transmission in regard to quality, reliability, and customer service. This important factor is demonstrated in **Table 1.1-2.**

Table 1.1-2. Recognition of AT&T's Industry Leadership — AT&T provides the industry leadership to ensure successful execution of the FAS 2001 contract modification.

Source	Recognition
Data Communications	<ul style="list-style-type: none"> ■ Oct 2008 Leader in Enterprise Telecommunications Service ■ Oct 2008 – Leader in Domestic North American Managed MPLS Services ■ Aug 2008 – Leader in Quadrant in Magic Quadrant for Manage Professional Network
J D Power and Associates	<ul style="list-style-type: none"> ■ April 2007 – Highest in Customer Satisfaction Among Large Data .
Frost & Sullivan	<ol style="list-style-type: none"> 1. July 2007 – Market Leadership Award in Providing Telecom Services, Videoconferencing, Virtual Field Trips and Disaster Recovery.

In the following paragraphs, we introduce the facility network architecture of AT&T's WIN. It is the transmission network on which AT&T services are provided. Subsections provide additional detail on AT&T's network architecture and critical control features that will support required FAS 2001 services.

AT&T is recognized by its customers and trade publications as the network technology and reliability leader in the telecommunications industry. AT&T has developed and deployed network architectures and services to maintain their leadership position by meeting customer communications requirements through new technologies that have become industry standards.

The following paragraphs describe the AT&T advanced SONET ring deployment, which utilizes a four-fiber technology for maximum reliability. Span Protection Switch

The span protection switching capability protects against failures that affect only the service fiber pair. Other protection facilities around the ring remain available for another similar failure. A span switch to the protection fiber pair automatically occurs if one service fiber pair fails.

Loopback Protection Switch

The loopback protection switching capability protects against failures that affect both the service and protection fiber pairs in the same span, which might occur with a fiber cut on networks being deployed by other carriers. AT&T's loopback switching automatically occurs on a fiber cut.

These protection switches initiate within milliseconds of a cut, and service traffic is reestablished on the protection pair. Service automatically returns to the primary circuit path when it is restored.

Dual Ring Internetworking Protection

End-to-end traffic may traverse several interconnected rings, being dropped from a terminal on one ring and added to a terminal in another ring in the same node. Dual Ring Internetworking (DRI) is the interconnection of the two rings in two nodes used to protect against a failure in one of the interconnecting nodes.

Figure 1.1-3 illustrates the Dual Ring Internetworking Protection switching. A circuit from Ring 1 is dropped in the primary node (Node A) and also continues on Ring 1 to the secondary node (Node B) where it is also dropped. The circuit is added to Ring 2 at both the primary and

secondary nodes, with the primary node selecting the signal on Ring 2. AT&T's SONET network uses smaller, more highly interconnected rings, and makes full use of the DRI protection system. Another carrier with larger, more sparse networks would have a single point of ring interconnection and would not be able to match the inherent reliability of AT&T's facility network architecture.

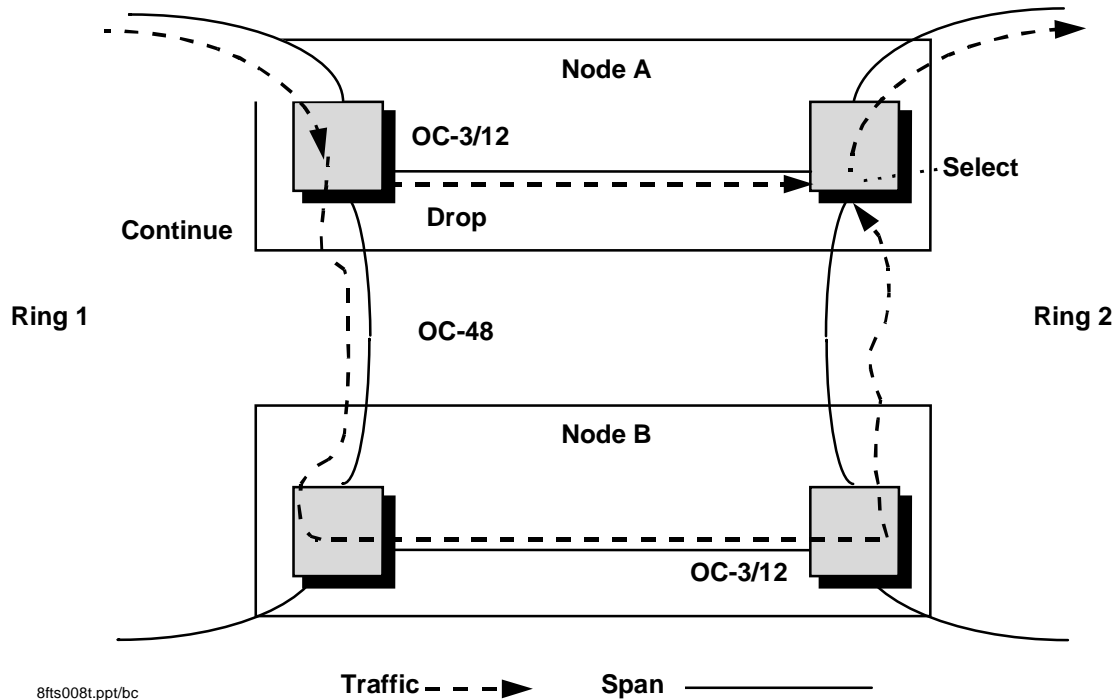


Figure 1.1-3. Dual Ring Internetworking Protection — AT&T's DRI provides the best failure protection of any operating network in the world today.

AT&T deployed a switch restoration scheme for transport services using ATM. ATM switches provide cross-connect capabilities and an additional layer of backbone restoration. These switches allow for routing changes without disrupting traffic flows, thus the network can be optimized frequently. Remote, non-intrusive testing, which minimizes customer impact, will also be facilitated by the ATM switches. ATM switch restoration is a capability aimed at network failures not restorable by the self-healing functions of the BLSRs or the Dual Ring Internetworking. These protected failure types include:

A double ring failure where two failures simultaneously occur in one SONET ring. The failure can be a combination of a cable cut and a span equipment failure, or both Dual Ring Internetworking node failures. (Multiple span failures are restorable by the self-healing ring).

An ATM node failure caused by a malfunction of the ATM switch or its interface to the ring terminal. In this case, traffic normally transiting a failed ATM node can be rerouted on alternate paths through other ATM switches.

FASTAR Network Management Technology

Figure 1.1-4 depicts Fastar technology used with the ATM infrastructure and shows the ATM logical network integrated into the physical SONET ring network. The physical connections (a physical trunk) between the ATM switches is a SONET circuit that can be on the same ring or

traversing multiple SONET rings. A trunk group consists of multiple physical connections between ATM switches that may be on diverse routes over different SONET rings. Fastar features are presented in paragraph 1.3, Congestion and Flow Control Strategy.

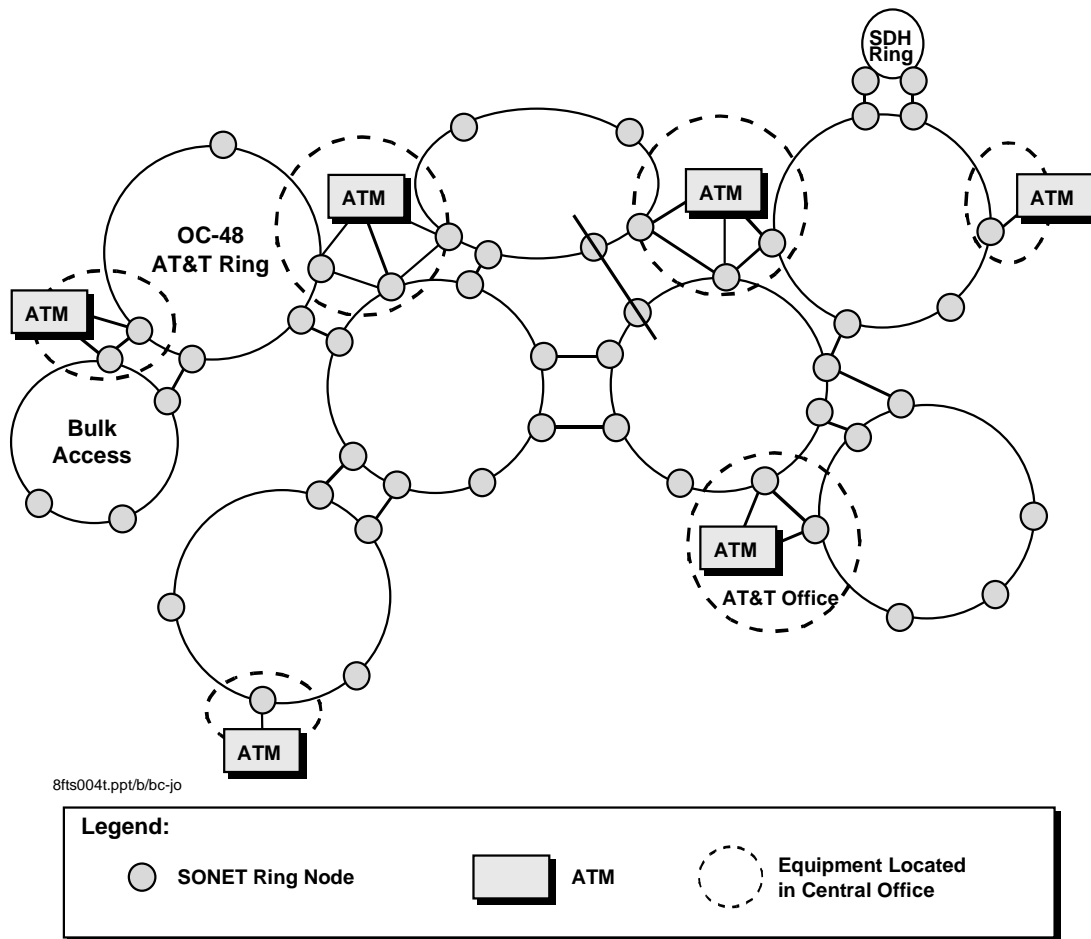


Figure 1.1-4. AT&T's FASTAR — As with AT&T's existing WIN, the introduction of Fastar brings AT&T's unsurpassed network management to Government entities dependent on highly reliable communications services.

International Service Coverage - AT&T's Global Reach

AT&T uses the Inmarsat to provide remote, global, and oceanic communications services. Satellite circuits are currently used for global communications, but not generally for Continental U.S. traffic.

Access

AT&T relies on the capabilities of alternative access providers for access from the SDP to the POP for FAS 2001 access services. We will continue to use our current business relationships with these carriers and will establish connection, when cost effective, with new competitive carriers in this emerging market. As a FTS2000 contractor, we are experienced in dealing with access providers, and will apply our capability to the delivery of FAS 2001 services. We used both incumbent and competitive access providers for the provision of FTS2000 service. We

provided access management to ensure appropriate quality for the Government. AT&T continues to evaluate alternative access providers to meet customer needs.

AT&T deployed the use of ATM technology, called Integrated Network Connection Service (INCS) that combines voice and data over access facilities. INCS utilizes a robust statistical multiplexer capable of achieving [REDACTED] concentration on T1.5 circuits and enabling dynamic use of the access bandwidth. Utilizing various forms of compression, coupled with dynamic routing algorithms, the technology provides bandwidth to permit flexible peak hour voice and data traffic loads as well as data connectivity far above typical fixed rates. The traffic is packetized and interleaved to form streams of data that use all available bandwidth. The technology will multiplex the traffic on the customer premises, adapt the traffic to the appropriate ATM class of service, and then dynamically allocate and route the traffic over the T1.5 facility. It can carry voice, data, and packet services and provide a fan out of these services within the network. The technology includes both in-band and out-of-band management capabilities to enhance the dynamic deployment and maintenance of the service. It includes an evaluation of the technical approach, as well as a characterization of the performance of the services using the technology. Rapid market introduction of this new capability is underway. AT&T is an experienced vendor in this area, having recommended and provided many installations of Switched Digital Integrated Services under FTS2000 and similar commercial offerings. This leading-edge technology can be included in FAS 2001 with contract modification.

Network Summary

Along with AT&T's existing WIN, the introduction of Fastar brings further enhancement to AT&T's unsurpassed network management capabilities. AT&T's management of the world's most reliable and largest network has made AT&T's services and communications facilities the industry standard by which other networks are measured. With AT&T, customers have greater network capacity by using second generation SONET technology with a robust restoration hierarchy that is second to none. Use of these features on FAS 2001 provides the Government with the best managed and most advanced network and telecommunications services in the world.

1.1.1 Circuit Switched Services

AT&T's Worldwide Intelligent Network is the premier service platform for delivering Government required circuit switched services on FAS 2001.

Circuit Switched Services (Switched Voice Service [SVS], Circuit Switched Data Service [CSDS] and Toll-Free Service) are served by a common set of network elements with transport between these elements provided on the AT&T network. No other switched voice and data network incorporates as many sophisticated design features and back-up systems – all to ensure that the Government's data and voice calls get through faster, clearer, and with the highest reliability. As shown in **Figure 1.1.1-1**, five key network functions are involved in transporting information and processing calls through the AT&T high-capacity digital switching network:

- **Switching** – Over [REDACTED] digital switches in the AT&T architecture
- **Signaling** – A diverse and redundant Common Channel Signaling System 7 network
- **Network Access** – Provided as dedicated or switched
- **Network Egress** – Includes additional reliability features

- **Transport** – [REDACTED] domestic digital facilities and expanding international digital connectivity, as discussed in paragraph 1.1.

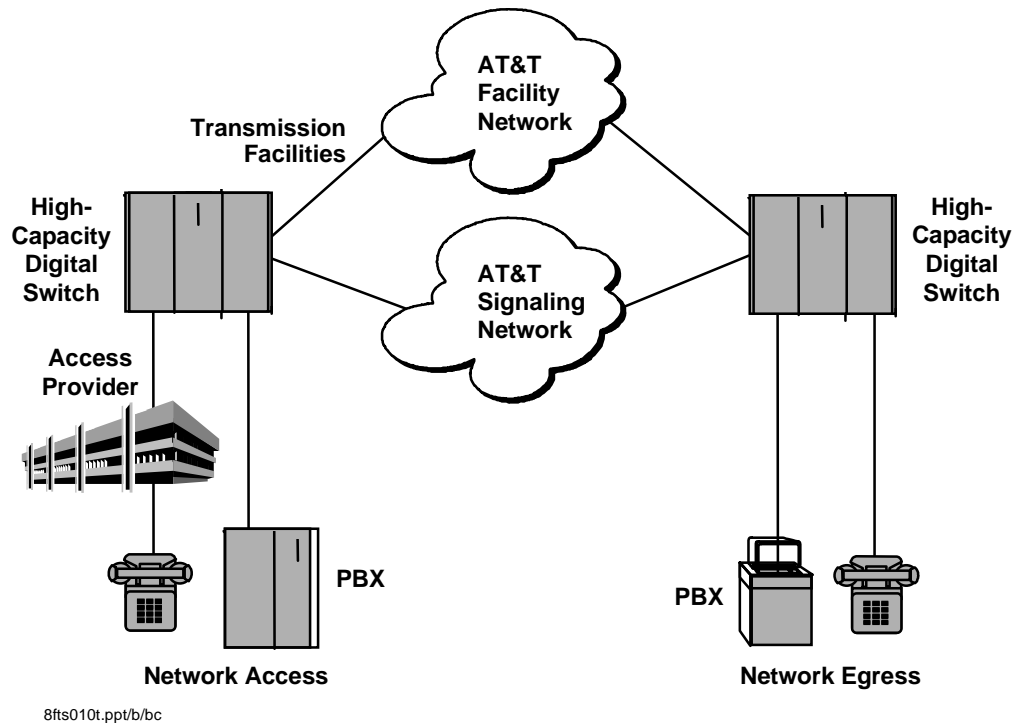


Figure 1.1.1-1. AT&T's Key Network Components — AT&T's circuit switched network architecture provides a common platform for the FAS 2001 circuit switched services.

1.1.1.1 Switching

AT&T is implementing future enhancements to the WIN circuit switched architecture. Digital switching system platforms perform switching and call management functions across the suite of AT&T switched network services. AT&T's network currently has over 240 digital switches.

AT&T's network strives through technological enhancement to implement network improvements that continually improve reliability. Unprecedented growth in traffic is managed with customer expectations for reliability, availability, and throughput as the major drivers. AT&T utilizes proactive reliability management to understand the impacts of new technology before it is deployed. This balances the business focus, with doing things right the first time, and reduces the cost of quality by a factor of ten. The network service reliability objective is: A Network Where Failures are Detected and Corrected before They Impact any Customer.

Reliability is based on prevention and restoration. AT&T's WIN has incorporated the Dynamic Network Routing (DNR) systems, such as Real-Time Network Routing (RTNR), with Fastar, with the four-fiber SONET ring architecture to achieve the best reliability in the industry. [REDACTED]

[REDACTED] Recent upgrades to the high-capacity switches have doubled their call handling capacity. Likewise, upgrades to the Signal Transfer Points have doubled their capacity. By carefully managing upgrades to the WIN backbone infrastructure, the percent real-time usage, an indication of real-time capacity, has dropped from [REDACTED] for the high-capacity switches. AT&T has deployed a signaling architecture that is redundant in facility deployment, processor

deployment, and additionally, loads no single processor over [REDACTED] This strategy ensures the network can have no single point of failure.

AT&T deployed the Segmentation Directory capability in the WIN. This technology enables the new dial number-based features, the unique treatment for individual customer routing plans, and greatly reduce intervals for switched services provisioning. The segmentation directory deployment incorporates intelligent control points, which contain every originating and terminating number and the associated feature information to properly route and complete the calls with maximum efficiency.

AT&T is adding more switches in both the backbone and the edge applications because of strong traffic growth in the network. The network currently handles [REDACTED] calls on an average business day and has handled a peak business day load of [REDACTED] calls. This peak exceeds the previous peak by almost [REDACTED] calls, indicative of our ability to manage growth in the network. The switches connect various network components and manage the routing of calls on different pathways to ensure that calls get through on the first attempt. The call completion rate for calls completed on the first attempt is [REDACTED]

First introduced in 1976, the digital switches in our network have been regularly upgraded and enhanced and are considered state-of-the-art for high-capacity call handling. For example, in April 1995, AT&T completed a 13-month project that seamlessly upgraded the 1A processor in our 4ESS switches with the new 1B processor. This upgrade more than doubled the switching capacity of each machine, increasing it from approximately [REDACTED] calls per hour to well over one million calls per hour. Each of the digital switches is capable of handling over [REDACTED] calls simultaneously.

In addition, AT&T continues to expand its digital architecture by deploying flexible and more feature-rich digital switches closer to the customer. This enables us to be more responsive to market demand for new feature functionality. Because this architecture is responsive to changing customer requirements, AT&T deploys multiple vendors' switches to ensure the best technology mix. Adjunct processors work in conjunction with the high-capacity digital switches to handle announcements, prompts, digit/response collection, intercepts, and other call processing functions.

In addition, the Network Control Point (NCP) works in concert with the digital switches to store the Government's routing information, dialing plans, and call processing information. Each NCP is powered by a redundant, dual processor and a dual database. These NCPs are paired and split across different signaling regions for enhanced network reliability. All other network competitors combined have fewer NCPs than AT&T, and none are deployed in mated pairs. The mated pair architecture deployed by AT&T eliminates a potential single point-of-failure in the network. AT&T is using higher capacity, more reliable, Lucent Technologies' No. 2 NCPs to handle increased traffic in the network. An order of magnitude increase in processor power, main memory, and disk storage (from the previous NCP) ensures sufficient transaction capacity for advanced FAS 2001 circuit switched service features.

1.1.1.2 Signaling

AT&T pioneered the industry's most advanced signaling capability, the Common Channel Signaling System Seven (CCS7). AT&T's deployment of CCS7 results in decreased call setup time compared to other carriers' signaling systems and ensures one of the fastest call setup times

The diagram illustrates a Fully Duplicated Signaling Network (FDSN) architecture. It features a central cloud labeled "AT&T Signaling network (CCS7)". Within this cloud are two boxes: "STP" (Signal Transfer Point) and "Paired STP". Outside the cloud, there are two cylinders: "NCP" (Network Control Point) and "Paired NCP". The connections are as follows: the "Access Provider" (represented by a telephone icon) connects to a "High-Capacity Digital Switch", which in turn connects to the "STP" box. The "Paired STP" box connects to another "High-Capacity Digital Switch", which connects to a "PBX" (represented by a telephone icon). The "NCP" cylinder connects to the "STP" box, and the "Paired NCP" cylinder connects to the "Paired STP" box. The text "Fully Duplicated Signal Transfer Points (STPs) and Network Control Points (NCPs) Deployed as Physically Diverse Mated Pairs" is written below the cloud.

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The AT&T WIN contains the most STPs and NCPs in the industry to ensure maximum service reliability for our customers. In addition, AT&T maintains a second entirely separate signaling network to back up the primary signaling network.

Access/egress can be provisioned in a variety of ways including switched and dedicated lines. AT&T will use its own facilities or those of an access provider from the POP to the Government SDP. Access to the network (the connection between the access provider and the AT&T WIN) is continuously managed and monitored by AT&T Network Management Centers (NMCs), including the Government Markets NMC in Oakton, Virginia, and two NMCs located in Denver, Colorado, and Atlanta, Georgia. These centers work in conjunction with the Global Network Operations Center (GNOC) in Bedminster, New Jersey. The NMCs control the movement of traffic as it enters and leaves the AT&T WIN. Sophisticated systems and highly trained technicians monitor and manage the network [REDACTED], to maintain peak network performance. These operations centers work closely with access providers to ensure the highest level of services. These centers receive real-time information regarding the operations and status of the network and serve as AT&T points of contact with access carriers.

Egress can be provided in a variety of bandwidths from DS-0 to DS-3. AT&T can offer a variety of reliability enhancements to maximize call completion from the AT&T network to the final destination. These include a number of advanced call routing and call rerouting features, such as protection for switched AT&T Toll-Free Service calls through either Split Access Flexible Egress Routing (SAFER) or Alternate Destination Routing (ADR). Using these features, calls may be rerouted to other locations if trunks to the primary terminating switch are busy.

1.1.1.4 Evolution of FTS Circuit Switched Services

The FTS2000 circuit switched services were primarily served on Lucent Technologies' 5ESS switches that interconnect with AT&T's commercial network for off-net connectivity. Over the course of the FTS2000 contract, the interconnection with and use of both the 5ESS and the commercial network and its intelligent network elements became more and more important in providing for the ever-growing volumes of traffic and the greater complexity of services that the Government requires. The following are examples of this continuing network evolution.

- The FTS routing database was moved, first from the 5ESS to a dedicated 1NCP (Network Control Point), then to a 2NCP shared with commercial applications. This allowed for growth in traffic and Service Delivery Points, and higher processing speed for faster call set-up.
- Call routing plans in Toll Free Service were also migrated from the 1NCP to the 2NCP. This also allowed for higher processing speed for faster call set-up, and in the case of large customers like the Social Security Administration, reduced routing plan update times.
- The two large Toll Free customers, the Internal Revenue Service and the Social Security Administration, were provisioned directly on the commercial network. This allowed seasonal traffic variations of these large customers to be more easily handled in AT&T's large commercial network, and allowed for traffic growth on the FTS 5ESS network.
- Growing volumes of traffic destined to off-net locations were accommodated by periodically increasing the trunk group sizes between the 5ESS and the 4ESS.
- Video transmission moved from a reservation-driven private line network to a more ubiquitous CSDS. This provided on-demand video and other CSDS calls, without the need for advance reservations. Also made available was connectivity of CSDS calls (including video) to off-net locations.
- 900 service was introduced using the resources of the commercial network. This allowed the service to be introduced as rapid as possible to FTS2000.

The 5ESS Integrated Custom Network was implemented for the FTS2000 circuit switched services to provide a leading edge platform for the advanced capabilities required by large customers such as the Government. The commercial network is now evolving to a core/edge architecture, in which additional, high-capacity, feature-rich digital switches are deployed closer to customers to provide additional feature/functionality and capacity.

1.1.2 Switched Data Services

AT&T is offering the most advanced network functionality for Switched Data Services available today. AT&T's integrated solution for the Frame Relay and ATM network architecture is cost effective for the Government and addresses the need for customers to operate legacy systems side-by-side with advanced network applications.

AT&T provides the best service quality in the industry, and this specifically includes data services. AT&T customers receive the best transmission quality, reliability, and customer service. This fact is aptly demonstrated in **Table 1.1.2-1**.

Table 1.1.2-1. Recognition of AT&T's Industry Leadership — *AT&T provides the industry leadership to ensure successful execution of the FAS 2001 contract Update table.*

Source	Service Recognition
ComputerWorld Magazine	February 3, 1997: <ul style="list-style-type: none">■ AT&T top-rated provider of WAN transmission services■ AT&T No. 1 in overall client satisfaction■ Top scores in [REDACTED] product and services criteria
Data Communications	1996 – Best Overall Score: <ul style="list-style-type: none">■ Internet Access■ TCP/IP■ Frame Relay■ Switched Digital Services■ Customer Service
Internet At Work	1996 – Best Frame Relay Network
CIT Research	1995 – AT&T is No. 1 <ul style="list-style-type: none">■ Reliability■ International Customer Service■ Global Data Quality■ Innovation■ Repair/Maintenance■ Transmission Quality
Network World	1994 – Best Private Line, Frame Relay, Switched, Video, and Virtual Networks

In the following subsections we discuss the network architecture for the Switched Data Services on the FAS 2001 contract

1.1.2.1 Reserved

1.1.2.2 Frame Relay and Asynchronous Transfer Mode (ATM) Service

AT&T premiered its AT&T Frame Relay capability in 1991. Since then, AT&T has become the leading provider of Frame Relay service in the United States. When AT&T initially brought Frame Relay service to the market, ATM was on the horizon. To provide for an easy migration path to ATM, AT&T designed a cell relay backbone transport mechanism required for ATM while maintaining Frame Relay connectivity at the customer interface. The cell relay technology used on AT&T's Frame Relay service from its inception provides lower latency and lower cell-to-cell delay variations than conventional frame switching methods used on other networks. This allows AT&T to provide the consistent performance needed by many applications, especially legacy applications. Throughput is also enhanced by a technique known as pipelining, where frames entering the network are broken into cells and transmitted as soon as each cell is filled, without waiting for the whole relay frame to arrive at the network interface.

AT&T is continuing to upgrade its Frame Relay backbone to the standards-based ATM cell relay specification. As shown in **Figure 1.1.2.2-1**, AT&T is implementing a two-tiered architecture. This architecture uses ATM cell relay technology for backbone transport with ATM and Frame Relay customer interfaces. This design allows AT&T to provide additional protocols and value-added services as customer's needs evolve. Using high-speed ATM cell relay nodes, the network facilities are engineered by AT&T Laboratories for low congestion, consistent performance, and high reliability. The network will evolve to SONET interconnection in the future and will be transparent to the Government on FAS 2001.

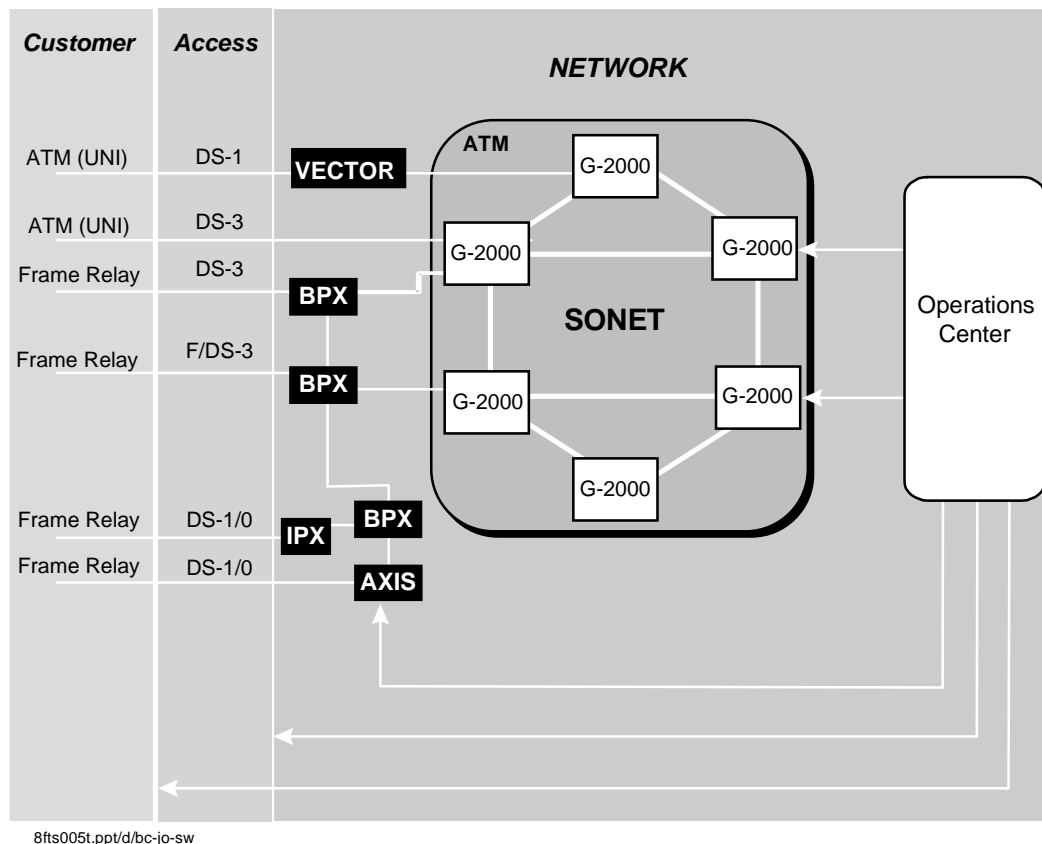


Figure 1.1.2.2-1. Frame Relay and ATM Network Architecture — AT&T has implemented an integrated Frame Relay and ATM network architecture to accommodate rapid growth and emerging customer requirements.

In the first quarter of 1998, the integrated Frame Relay and ATM network was based on Lucent Technologies' GlobeView-2000 (G-2000); Cisco StrataCom Broadband Packet Exchange (BPX), IPX, and AXIS; and Nortel Vector switching platforms. Because technology is rapidly evolving in this area, additional vendors' switches may be substituted or added.

- The GlobeView-2000 (G-2000) is a 20-Gbps cell network switching system that supports memory switching of 2.4-to-2.4 Gbps streams with evolution plans to 80 Gbps and likely Terabit (1,000 Gbps) levels.
- The BPX uses a cross point switching architecture with a current capacity of 9.6 Gbps with evolution plans to 40 Gbps. It supports the IPX/AXIS interface and ATM trunk interfaces

at 45 Mbps. Additionally, it supports interworking (implementing the AAL5 function) between Frame Relay and ATM.

- The Nortel Vector is an edge vehicle in the architecture and is used to support the ATM T1.5 UNI interface. It is also being used for other interfaces such as OC-3.
- The IPX is a cell switch supporting narrowband user services as a feeder node to the BPX.
- The AXIS is an interface shelf supporting narrowband user services as a feeder node to the BPX. The AXIS shelves will provide AT&T with the necessary growth capabilities to support customers as they extend networks and increase bandwidth intensive applications.

Thus, ATM and Frame Relay services have a seamless integrated architecture and can provide seamless Frame Relay/ATM Service interworking. This philosophy is carried throughout the service design by providing for:

- A common global seamless infrastructure
- Common capabilities, including Permanent Virtual Circuits (PVCs), Committed Information Rates (CIRs) and reliable sustained bursting
- Common services and centers, including Customer Network Management Services (CNMS) and operations support
- Common processes, including provisioning, capacity management, and maintenance support.

Interworking

In 1995, Service Interworking was specified by the ATM Forum to allow for network-based conversion between frames and cells, including header and address mapping. This technical specification allows Frame Relay endpoints to communicate seamlessly with ATM endpoints. In most cases, neither the Frame Relay Customer Premises Equipment (CPE) nor the ATM CPE needs to be replaced or modified. All Frame Relay/ATM mappings and translations are done inside the network. These include Frame Relay/ATM header mapping, traffic parameters, upper layer protocol encapsulation translation, ATM Adaptation, and Segment And Reassembly (SAR) of frames to/from cells.

Frame Relay/ATM Service Interworking can be offered between all Frame Relay endpoints and all ATM endpoints, with protocol conversion occurring in the network. Frame Relay/ATM Service Interworking provides a seamless network interface where not all endpoints require full DS-1 or DS-3 ATM, allowing ports to be consolidated at major locations. Further, the capability enables a protocol and speed continuum (Frame Relay and ATM access) and provides a cost-effective solution by reducing network complexity, while preserving the investment made in Frame Relay equipment. These factors allow migration to ATM technology at the end-users pace, where and when appropriate. AT&T has developed the Frame Relay/ATM Interworking solution to meet market demand. The current implementation performs the following:

- Supports Virtual Channel Connections (VCC)
- Supports Variable Bit Rate – Non-Real Time (VBR-NRT) Connection Oriented Data (COD) traffic
- Is engineered to provide performance characteristics of current AT&T Frame Relay and ATM networks
- Supports all data rates currently supported by AT&T Frame Relay service

- Allows customer network management on both the Frame Relay and ATM networks when available
- Offers Transparent and Translation Modes on a Virtual Connection basis
- Offers Translation mode – translation between Network Layer Protocol ID (NLPID) from Frame Relay CPE and Logical Link Control (LLC) from ATM CPE
- Offers Transparent mode – no translations between NLPID and LLC.

Interworking is a key feature which can allow Government agencies to migrate from Frame Relay to ATM while obtaining maximum use of their investment in Frame Relay equipment.

1.1.2.3 Reserved

1.1.3 Dedicated Transmission Service

AT&T's Digital Cross-Connect Systems ensure global network reliability and built-in redundancy for Dedicated Transmission Services.

AT&T's Dedicated Transmission Services are provided over a common standards-based architecture, which provides the highest reliability in the industry. Services are offered using bandwidth in the network at the following rates: single-channel services at 9.6 Kb and 56 Kb; intermediate rate services at N x DS-0, DS-1, fractional DS-3, DS-3, OC-3 and OC-12.

As shown in **Figure 1.1.3-1**, AT&T uses a family of Lucent Technologies' Digital Access Cross-Connect Systems (DACS) as a base platform to its Dedicated Transmission Services.

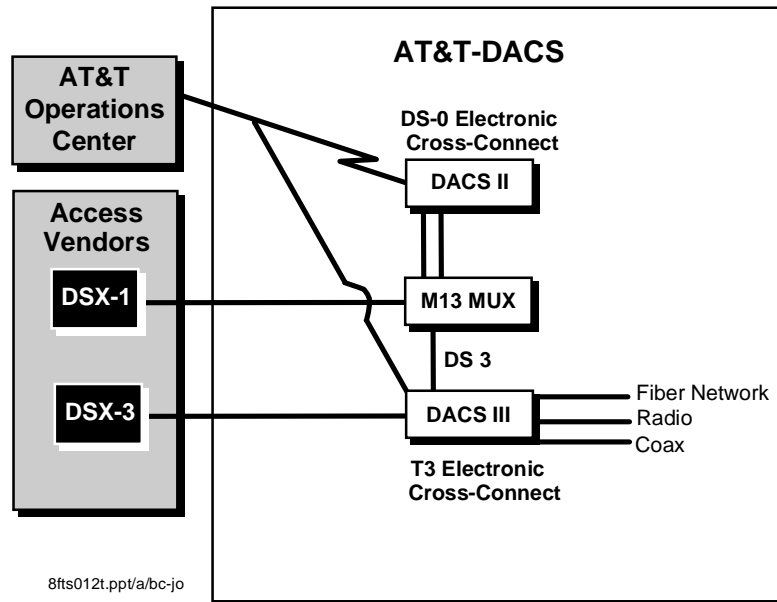


Figure 1.1.3-1. AT&T's Family of Digital Cross-Connect Systems — *Built-in redundancy and test capability ensures high reliability for Dedicated Transmission Services.*

The main function of the DACS microprocessor-based, software-controlled device is to electronically cross-connect customer circuits.

The AT&T platform provides:

- High-speed multiple microprocessors
- Innovative software
- Reliable back-up memories
- Modular growth
- Internal redundancy
- Open-ended design
- Versatility.

The functional capabilities of the DACS in the AT&T Private Line network allows for termination and electronic cross-connect digital transmission lines. T1.5s terminated on the DACS II are cross-connected at the 64-Kbps channel level. T45s (DS-3s) are cross-connected at the DS-3 level using DACS III. Network management and alarm information is transmitted through a variety of advanced systems dependent on the service provided.

1.1.4 Video Teleconferencing Service

Please see Section 10, Enhanced Video Conferencing.

1.2 Network Architecture Design Rationale

Network service and reliability – the only design rationale. The proof of our design choices is a fully operational global network with a call completion rate of 99.987 percent. AT&T provides the Government with the highest performing network in terms of speed of connections, restoration, and network reliability.

The AT&T WIN is the most sophisticated communications network in the world. AT&T has set the standard for network reliability. AT&T's network architecture provides technical feature functionality for communications services, and provides the highest performing network in terms of speed of connections and restoration.

Network reliability is the overriding priority in the design, development, and management of the AT&T network. Network reliability sets AT&T apart from others in this highly competitive industry

Network Service and Reliability – The Only Design Rationale

AT&T uses Defects-Per-Million to gauge network reliability. This measurement is a statistically valid record of how many calls per million did not go through the first time because of a network procedural hardware or software failure. Defects-Per-Million is not an average; it is an accurate accounting of network performance that is tallied by the day, as well as by month-to-date and year-to-date.

The Proof of Our Design Rationale

The Defects-Per-Million score recorded by the AT&T-owned network for 1996 was a remarkable 124. This means that for every one million calls dialed, [REDACTED] through the first time due to a network failure. That equals a call completion rate of [REDACTED] for 1996 on the world's largest communications network.

This high network reliability was not achieved merely in the technical implementation of AT&T's network architecture. High quality network management shares a significant role in our Government, business, and residential customers' view. On an average business day, the AT&T WIN handles more than [REDACTED] calls. [REDACTED] of these calls are monitored for call completion, which means our network managers know exactly how many calls did not go through the first time they were dialed. Proactive Network Management is provided 24x7, monitoring and managing every aspect of the AT&T global network as shown in **Figure 1.2-1**. This comprehensive network management philosophy is in total alignment with the FAS 2001 objectives where service reliability is essential.

Proactive network management represents a significant competitive difference for AT&T customers because our competitors for FAS 2001 monitor only a sample of their customer's calls to gauge their completion rate. Our competitors often depend upon customer complaints to identify network failures. At AT&T's NOC, the objective is to identify a problem and fix it before its impacts the customer. AT&T's network design rationale, coupled with our comprehensive network management commitment, is proven. This will ensure successful delivery of all requested services at a competitive price on FAS 2001.



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Figure 1.2-1. AT&T's Network Operations Center — *Proactive management and monitoring of AT&T's Worldwide Intelligent Network.*

In 1999, AT&T implemented a new Global Network Operations Center (GNOC), the command-and-control facility of AT&T's Worldwide Intelligent Network. Three times the size of its predecessor, the state-of-the-art network management center resides in a separate facility adjacent to the AT&T's existing Bedminster, N.J. building.

GNOC is a significant step in AT&T's strategy to "future proof" the network. Under one roof, network managers have the oversight of all AT&T network services including wireless, data, Internet, and local, as well as domestic and global long distance, some of which were previously managed in separate centers. Being able to handle any traffic, in any quantity, anytime and anywhere in one center is the physical embodiment of AT&T's continuous improvement in its

operations capabilities. Previously, network managers initiated controls directly from computer consoles based on information updated every [REDACTED]. In the new GNOC, network managers receive real time information to manage the flow of long distance, local, global, wireless, data, online, and video communications. This benefits the Government through improved network reliability and customer service.

AT&T reserves the right to upgrade, expand or replace components of technology, network architecture and routing techniques at any time without a formal contract modification, provided performance parameters are met in accordance with the contract modification.

1.3 Congestion and Flow Control Strategy

In an environment where all major carriers have SONET rings, the differentiation in dependability will be driven by how well the SONET technology is incorporated in a facility network architecture, and by how well the SONET technology is managed. While several SONET ring architectures are available, AT&T uses OC-48, four fiber, Bi-Directional, Line-Switched Rings. This inherently more reliable, robust ring architecture, coupled with our Fastar recovery capability, clearly sets AT&T apart from all other carriers in our ability to deliver highly reliable service to FAS 2001 network users.

Congestion and flow control capabilities are implemented in the WIN in multiple layers of our network architecture. The facility network will first be discussed, and detailed subsections will provide discussion of the congestion and flow control strategy for each service.

SONET technology has been highly touted as having superior restoration capabilities, (i.e., milliseconds) for single failures, but SONET rings alone are not enough. It is the way technologies are integrated into complex software, management, and human systems that are a part of Fastar that determines the dependability of AT&T's network. Customers demand higher levels of reliability and capacity, while reducing cost and providing greater network control. SONET and ATM technologies will help. However, technology itself cannot create more reliable, flexible networks; the full promise of this new technology can only be realized through proper implementation and management. These are the areas where AT&T has the most experience and expertise in the industry. As our customer's communications requirements have evolved and as new technologies have become available and standardized, AT&T has developed and deployed network architectures and services to maintain its telecommunications network service and functionality leadership position. Proof of our abilities is illustrated in Figure 1.3-1. Deployment of leading network technologies, combined with superior network management technology has produced dramatic results for our customers that are recognized throughout the industry.

The incorporation of Fastar ensures even faster recovery from simple cable cuts, as shown in **Figure 1.3-1**. In addition, the percentage of built-in network redundancy will increase from [REDACTED] to nearly [REDACTED], further reducing the effect of cable cuts. In an environment where all major carriers have SONET rings, the differentiation in dependability will be driven by how well the SONET technology is deployed and managed.

While several SONET ring architectures are available, AT&T is using OC-48, four fiber Bi-Directional Line-Switched Rings as the building blocks for the network. These rings offer better distribution of traffic, greater bandwidth and higher availability than other ring designs. SONET

rings provide redundant bandwidth and/or equipment to ensure system integrity in the event of a fiber cut. A detailed description of our SONET ring architecture was provided in paragraph 1.1, Network Architecture. Congestion and Flow Control Strategies are an integral part of our designed architecture. Please refer to paragraph 1.1 and our discussion of Span Protection Switches and Loopback Protection Switches directly relating to this issue.

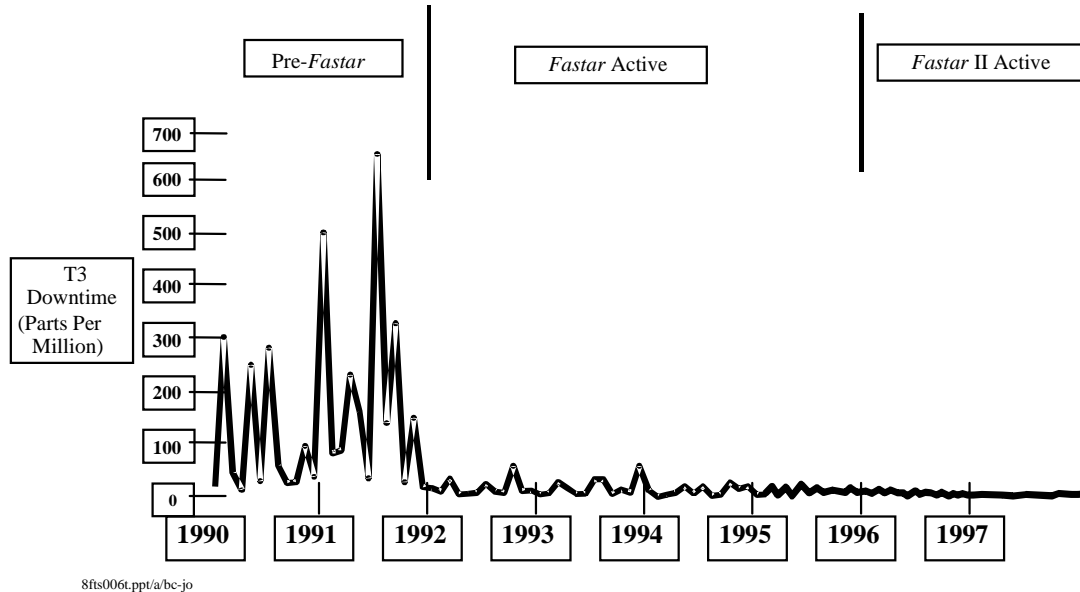


Figure 1.3-1. Fastar Recovery Capability — AT&T pioneered the introduction of network wide facility restoration that has resulted in a dramatic increase in service availability and reliability worldwide.

However, the deployment of superior technology must be effectively managed. In keeping with AT&T's comprehensive network management and control philosophy, we provide the following discussion of Fastar as it applies to network congestion and flow control over our network architecture for FAS 2001.

Figure 1.3-2 depicts AT&T's Fastar with ATM infrastructure showing the ATM logical network integrated into the physical SONET ring network. The physical connections between the ATM switches are over a SONET facility that can ride multiple SONET rings. This end-to-end SONET facility can comprise multiple diverse physical routes between the ATM switches to provide additional redundancy.

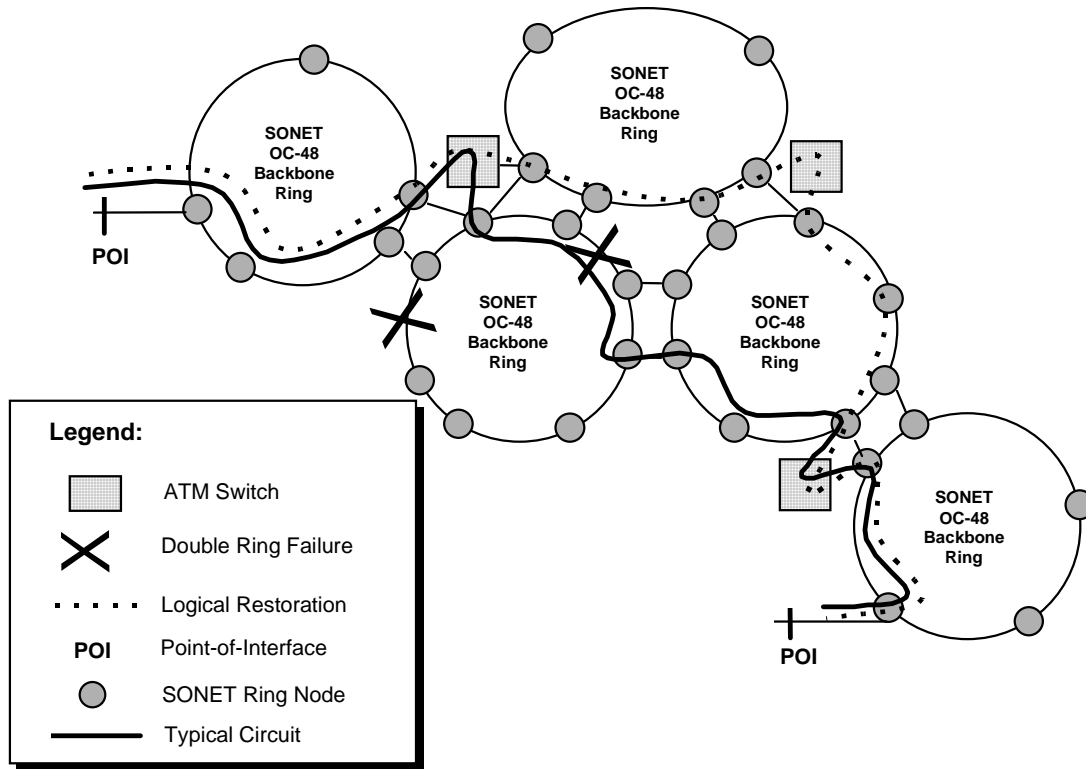


Figure 1.3-2. ATM Network Restoration Scenario — ATM switches are used to reroute the traffic to a totally new SONET ring in the case of multiple failures affecting the same ring. Service is automatically restored without human intervention.

ATM Infrastructure restoration activates when a double ring failure occurs, with the ATM switches rerouting traffic. Fastar is a system that manages the restoration of double ring failures.

The introduction of Fastar brings AT&T's unsurpassed network management to Government customers dependent on highly reliable communications services. With over 100 years of experience designing and managing the world's largest network, AT&T has set the international standard by which all other networks are measured. With AT&T, customers have greater network capacity, using second generation Lightguide technology, with a robust restoration hierarchy that is second to none in the industry today. AT&T was the 1997 Thomas A. Edison Patent Award winner for FASTAR's superior network management capabilities (presented to AT&T by the Research and Development Council of New Jersey).

Disaster Recovery Service

Following a major disaster, the restoration of communications is a top priority. The AT&T Disaster Recovery program, a part of our redundancy strategy, is the only one of its kind available in the industry. A team of highly trained technicians and a fleet of tractor-trailer telecommunications trucks are strategically located across the country, ready to respond when unforeseen disaster strikes.

Team members [REDACTED], and can be enroute to an emergency incident within [REDACTED] of an official call-out. These specially designed tractor-trailers are equipped with highly sophisticated communications equipment and are warehoused and maintained across the United

States. This equipment generally travels by road, but in an extreme emergency, the trailers are also designed to be shipped by rail or air.

The AT&T Disaster Recovery teams and their equipment can restore the service once provided by heavily damaged or destroyed switching offices within a matter of days, rather than months. The team is also equipped to restore long-distance service by erecting temporary microwave towers, installing temporary satellite earth stations, or establishing temporary calling centers that allow customers direct access to the AT&T network.

Since its creation in 1991, the AT&T Disaster Recovery Team has rapidly restored telephone service following Hurricane Andrew (1992), the Midwest floods (1993), the Northridge, California earthquake (1994), a major mudslide and tornado in Kentucky (1994), a tornado in Texas (1995), Hurricane Marilyn (1995), and massive flooding in North Dakota (1997). This highly responsive capability directly assisted Government relief efforts in the affected areas. Because of these sophisticated restoration capabilities, it is AT&T that Government and private relief agencies turn to when disaster strikes.

AT&T Central Offices

All AT&T Central Offices provide common battery backup to the equipment supporting the WIN. The central offices are also equipped with generators to provide backup power. Proper environmental conditions for optimal equipment operation are also maintained. Access to our offices is strictly controlled, limited to the workforce assigned to the building and to visitors with authorization from the building's management. These arrangements increase reliability and ensure privacy of the Government's communications.


1.3.1 Circuit Switched Services

Detailed discussions of AT&T's built-in congestion and flow control management features of our circuit switched network architecture were previously provided with supporting graphics in paragraph 1.1.1. These features are briefly highlighted in the following paragraphs and also supplemented with discussion on network routing and management features.

Circuit Switched Services (Switched Voice Service [SVS], Circuit Switched Data Service [CSDS], and Toll Free Service) are served by a common set of network elements, with transport between these elements provided on the AT&T fiber backbone. No other switched voice and data network incorporates as many sophisticated design features and back-up systems — all to ensure that the Government's data and voice calls get through faster, clearer, and more reliably.

Switching

At the heart of the physical switching architecture resides electronic switching systems. The electronic switching system performs switching and call management for the AT&T switched network services. These digital switches connect various network components and manage the routes of calls on different pathways to ensure that calls get through the first time. Each switch is protected by duplex power plants, redundant processors, and other provisions to ensure maximum reliability and call completion. Key components of the switch and associated processors



Working in concert with the digital switches is the Network Control Point (NCP), which will store the Government's routing information, dialing plans, and call processing information. [REDACTED]

[REDACTED] The mated pair architecture deployed by AT&T eliminates the possibility of call blockages and single points of failure. In addition, each dual processor NCP is never loaded to more than [REDACTED] of capacity to further eliminate the possibility of call blockages.

Numerous network controls are available to network managers when extremely high levels of call traffic threaten to disrupt the network. These controls include the ability to restrict calls originating or terminating in selected portions of the network. Internal flow controls are automatically activated when network switches or network control points approach overload. Controls are judiciously applied to ensure a fair level of service to all customers, with an exclusion allowed for TSP service users.

Signaling

AT&T pioneered the industry's most advanced signaling capability, the Common Channel Signaling System Seven (CCS7). AT&T's deployment of CCS7 results in decreased call setup time compared to other carriers' signaling systems and ensures one of the fastest call setup time in the industry today. As shown in Figure 1.1.1.2-1, AT&T's signaling network (CCS7) works in conjunction with the switching network to provide network services and ensures that administration and operational activities do not interfere with call transmission. The heart of AT&T's signaling networks are [REDACTED] STPs deployed in mated pairs throughout [REDACTED] geographic regions. AT&T designed its network with [REDACTED] regions to create maximum reliability and physical diversity.

AT&T, the company that gave the industry CCS7, gives the Government the most Signaling Transfer Points (STPs) and NCPs in the industry. AT&T has [REDACTED] STPs deployed in mated pairs throughout [REDACTED] geographic regions [REDACTED]. The STPs use both redundancy and physical diversity for protection. Like the digital switches, an STP can run in simplex mode if necessary. The STPs are engineered so that a single STP can handle the entire processing load for a region. By having [REDACTED] domestic regions, AT&T reduces the risk of impairing part of the network due to catastrophic failures.

Dynamic Network Routing (State-of-the-Art Congestion and Flow Control)

Dynamic Network Routing (DNR) allows the network to exhaust all available network routing pairs to complete every incoming call. An example of DNR is the Real-Time Network Routing used in the AT&T backbone. In 1991, AT&T deployed this exclusive new routing technology called Real-Time Network Routing (RTNR). The capability of the AT&T network to complete an unmatched [REDACTED] of all calls on the first attempt is due largely to AT&T's patented RTNR function. The switches are interconnected by two fully redundant, independent signaling networks. Each switch signals its status to every other switch in the network and finds the most efficient path for any given call in real time. When a call is being dialed, the network begins a "look ahead" function to determine the most efficient route, even before the call dialing is complete.

Network Access

Access/egress can be provisioned in a variety of ways — a switched or dedicated T1 or T3 lines. Access to the network (the connection between the Access Provider and the AT&T network) is

continuously managed and monitored by the AT&T NOC and two NMCs. Sophisticated systems and highly trained technicians monitor and manage the network 24x7, to maintain peak network performance. The two NMCs continuously control traffic entering and leaving the AT&T network and work closely with Access Providers to quickly resolve any problems that arise.

1.3.2 Switched Data Services

The following subsections briefly discuss congestion and flow control for the Switched Data Services. Frame Relay and ATM services are discussed together in paragraph 1.3.2.2, as they share a common architecture. Detailed discussion of congestion and flow control for these services are provided in paragraphs 1.1.2 (Switched Data Services) and 1.1.3 (Dedicated Transmission Services).

1.3.2.1 Reserved

1.3.2.2 Frame Relay and ATM Services

AT&T's Frame Relay/ATM network architecture provides multiple layers of reliability and restoration. The first line of defense is the highly reliable AT&T Frame Relay/ATM network and its inherent rerouting capabilities. In the event of a network incident such as a facility cut, PVCs reroute around the cut to another path within the network in seconds. When the primary route is restored, PVCs return to that route. Rerouting around a cut allows continued service while the problem is repaired.

Because Frame Relay/ATM technology provides service to many customers over a common backbone, it is critically important to ensure one customer's traffic does not interfere with another customer's traffic. To ensure this, AT&T provides two key features. First, at the entrance to the network, AT&T provides a separate buffer for each PVC so customers with large data transmission needs (i.e., high Committed Information Rate (CIR)) do not impact the performance of smaller CIR customers. Second, within the AT&T Frame Relay/ATM network, AT&T uses ReliaBurst, a unique "closed loop" congestion management algorithm which ensures customers receive their CIR all the time data is presented, not just over some average time period. Further, excess backbone bandwidth used for bursting is fairly allocated in proportion to each customer's subscribed CIR so that no customer's traffic can unfairly impact the burst capabilities of other customers.

- **PVC Buffers** – A distinct feature of AT&T's Frame Relay implementation is the notion of individual buffer space for each PVC derived from each port. PVCs have access to dedicated buffer space on ingress connections, independent of other PVCs within and between ports on any single switch. If traffic sources provide large offered loads that have the potential to fill the buffer, then Forward Explicit Congestion Notification (FECN)/Backward Explicit Congestion Notification (BECN) bits will be set. As the buffer drains, the FECN/BECN bits will no longer be set on subsequent frames. Individual PVC buffers inherently provide for partitioning between all logical connections thereby ensuring that resources cannot be manipulated by a single user at the expense of others, or by specific applications at the expense of others. If a customer has a port with two PVCs — one for IP traffic and the other for SNA — they will get consistent performance on both PVCs. This mechanism allows for fair allocation of resources among all users, a critical

element of any “public” Frame Relay network. Also, the drain rate of these PVC buffers onto the backbone trunk/BPX is clocked in direct proportion to the subscribed CIR of the PVC. These implementation details are not described in the Frame Relay standard, but are critically important to a service provider in establishing a fair, reliable, and consistent level of quality in a service offering.

- **ReliaBurst** – Drain rates of PVCs are controlled and adjusted on a real-time basis through a closed-loop scheme, called ReliaBurst, whereby each provisioned PVC within the AT&T network is monitored along the path of all facilities and switches that are traversed. Status indicators to measure utilization and buffer allocations of these components are fed back to the ingress port of the PVC. Based upon available spare capacity and congestion that the PVC may experience, the drain rate at ingress will be adjusted incrementally upward or downward. By design and deterministic control, the downward throttling will not be below the subscribed CIR, which further enforces a fair policy and resource efficiency among the user community. Upward adjustments can allow bursting up to the lower of the two port speeds (ingress or egress). Bursting depends on many factors such as the presence of a true offered load at the traffic source that “stresses” the PVC beyond its CIR level. Also, there must obviously be headroom between the port speed and the CIR level of any derived PVC to allow for bursting. The benefit to the Government is not only to burst above the CIR, but also to receive a fair allocation of available spare bandwidth, while guaranteeing that the CIR of all customers, including the Government, is maintained.

The Frame Relay/ATM infrastructure is also designed with a focus on disaster prevention and recovery through redundant equipment and power supplies (including UPS, battery, and generator back-ups) and a WAN topology using multiple diverse terrestrial routes into each node yielding a very robust “looped” architecture allowing easy automatic rerouting of affected circuits and PVCs. Facilities used in the United States embrace “self-healing” characteristics which is provided by Fastar protection of the backbone network in the United States. The wide deployment of meshed POPs in a looped topology yields a robust and recoverable platform. Procedures and training on recovery are also given high priority. AT&T, on a quarterly basis, runs a national “disaster recovery” drill with simulated emergencies and deployed resources that are tested over a week-long period.

1.3.2.3 Internet Protocol Internetworking Service (Redundancy)

Please see Section 6, Crossover Internet Protocol Services.

1.3.3 Dedicated Transmission Service

Dedicated Transmission Services are provided over a common standards-based architecture that affords the highest reliability in the industry. Services are offered at the following rates: single-channel services at 9.6 Kbps and 56 Kbps; intermediate rate services at N x DS-0, DS-1, fractional DS-3, OC-3 and OC-12. Detailed Dedicated Transmission Service Data has been provided in paragraph 1.1.3.

AT&T uses a family of Digital Access Cross-Connect systems as a base platform to its Dedicated Transmission Services. The main function of the DACS microprocessor-based, software-controlled device is to electronically cross-connect client circuits.

The AT&T platform provides:

- High-speed multiple microprocessors
- Innovative software
- Reliable back-up memories
- Modular growth
- Internal redundancy
- Open-ended design
- Versatility.

The functional capabilities of the DACS offered by the AT&T Private Line network, allows for the termination and electronic cross-connect of digital transmission lines. DS-1s terminated on the DACS II are cross-connected at the 64 Kbps channel level. DS-3s are cross-connected at the DS-3 level using DACS III.

As bandwidth services, Dedicated Transmission services rely on the capabilities of Fastar for network restoration. Coupled with redundancy in the DACS platform, this leads to highly reliable services for the Government customer.

AT&T continuously strives to maximize the availability of its core network, providing customer service by employing proactive quality policies and programs, as well as unique restoration technology.

1.3.4 Video Teleconferencing Service

Please see Section 10, Enhanced Video Teleconferencing Services.

1.4 Government Locale Requirements

Based on AT&T's 10 years of experience as the FTS2000 Network A Service provider, AT&T understands there can be a wide range of SDP configurations based on individual needs. Our strategy is to minimize the amount of required equipment at Government locations, making it easier to deliver high quality services to the agency locations.

Based on an analysis of the service and interface requirements in the FAS 2001 Requirements Document, AT&T has determined the need for equipment at Government locations. As an FTS2000 contractor, we gathered the knowledge and experience necessary to work closely with the Local Government Contacts during the installation of our terminating equipment. For example, at major NASA centers such as Goddard and Marshall, AT&T provided rack-mounted versions of terminating equipment such as multiplexers and channel units to handle multiple circuits and services. Each SDP configuration will be determined when orders for service are received by AT&T. **Table 1.4-1** shows the typical types of equipment required at Government locations to deliver FAS 2001 services, including requirements for power, space, and heating, ventilation, and air conditioning.

The government must provide appropriate space, power, and HVAC in order for services to be provided by AT&T at Government locations.

Table 1.4-1. Government Locale Requirements for Equipment to Deliver FAS 2001 Services — *Minimizing the impact at the Service Delivery Point.*

Equipment	Power	Floor Space	HVAC
DSU/CSU stand-alone	0.15 A 115 VAC 60 Hz	7.63" x 12.13"	55 Btu/hr 0-50°C 5-95 % H
DSU/CSU carrier (full)	2.4 A 115 VAC 60 Hz	7.1"H x 14.2"D in Government-furnished 19" rack	1650 Btu/hr 0-50°C 5-95% H
Modem stand-alone	0.2 A 110 VAC 60 Hz	7.6" x 12.1"	27.3 Btu/hr 0-50°C 5-90% H
Modem carrier (full)	2.4 A 115 VAC 60 Hz	7.1"H x 13.4"D in Government furnished 19" rack	325 Btu/hr 0-50°C 5-90% H
Channel Bank	1.1 A 90-135 VAC 47-63 Hz	17" x 15.375" and 9.25"H in Government- furnished 19" rack	200 Btu/hr 0-50°C 5-95% H
Low Capacity DS-3 Multiplexer	2.5 A 90-135 VAC 50-60 Hz	17" x 16.75" and 5.25" in Government- furnished 19" rack	250 Btu/hr 0-45°C 5-95% H
High Capacity DS-3 Multiplexer	5.0 A 90-135 VAC 50-60 Hz	17" x 16.75" and 19.25" in Government- furnished 19" rack	250 Btu/hr 0-45°C 5-95% H

1.5 (Reserved)

1.6 Feature Usage Impact on Service Performance

AT&T has assessed the impacts of a variety of feature usage levels on service performance. The results of our analysis for each service are described below.

- For SVS, CSDS, and Toll-Free Service, [REDACTED] Feature interactions and individual feature usage will be evaluated on an individual case basis, following deployment forecasts and specific requirements from the Government.
- There are no offered transport features for Frame Relay Service or ATM.
- Because Dedicated Transmission Service circuits are dedicated to use [REDACTED] of the time, network congestion is not an issue. Use of Dedicated Transmission Service features will have no impact on overall network congestion.

1.7 Network Control and Diagnostic Capabilities

AT&T's WIN is designed and engineered to be self-regulating. This concept allows the network to monitor itself and to handle routine problems on its own. Network managers step in and apply their skills, knowledge, and experience to keep potential problems invisible to callers.

AT&T maintains and continues to evolve a three-layer systems and work centers capability for network control and diagnostics activities. The structure is illustrated in **Figure 1.7-1**, Layered Approach to Network Control. This capability is consistent with the industry standard Telecommunications Management Network (TMN) approach to management of multiple networks and services.

Service Management

Customer-Oriented Focus



Network and System Management

Worldwide Surveillance and Diagnosis



Element Management

Local Installation and Maintenance



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Figure 1.7-1. Layered Approach to Network Control — *The three-layer approach provides responsive delivery of FAS 2001 requirements by focusing responsibility on the equipment, the network, and needs of the customer.*

AT&T's first control layer consists of Element Management systems and work centers responsible for the configuration, provisioning, and maintenance of individual network elements such as transmission facilities, cross-connects, and switching machines. Personnel staffing these work centers are located at AT&T central offices, at dispatch locations in the case of outside work forces, and at National Work Centers of AT&T's international partners. These personnel act to diagnose and repair network elements. They act autonomously in the event of a local alarm or as directed by a higher level to assist in diagnosis of a problem. At this layer, the individual network elements, which are software-controlled, may themselves contain some element management functionality. Specific diagnostics routines to identify and isolate faults are run automatically or on demand. Test sets, protocol analyzers, and built-in self-test functionality are used to diagnose and isolate faults to the specific frame, shelf, or line card causing the problem. All new elements are completely tested and configured before being turned up to the second layer.

The second control layer is the Network and Systems Management system and work centers. These centers have a broad role of overseeing the interworking of the multiple elements in a given network architecture. AT&T has three network management centers that are staffed 24x7.



Built in 1999, the GNOC in Bedminster, New Jersey, three times the size of its predecessor, is the command-and-control facility of the AT&T WIN, responsible for the bulk movement of voice and data across the AT&T network, as well as the flow of calls to and from 280 countries and territories worldwide. The NMC in Atlanta, Georgia, Denver, Colorado, and, if necessary, Oakton, Virginia manage calls AT&T is handing off to the access provider or calls those companies are delivering to the AT&T network.

The GNOC is a significant step in AT&T's strategy to "future proof" the network. Under one roof, network managers have the oversight of all AT&T network services including wireless, data, Internet, and local, as well as domestic and global long distance. Being able to handle any traffic, in any quantity, anytime and anywhere in one center is the physical embodiment of AT&T's continuous improvement in its operations capabilities. Previously, network managers initiated controls directly from computer consoles based on information updated [REDACTED]. In the GNOC, network managers receive real time information to manage the flow of long distance, local, global, wireless, data, online, and video communications. They can also implement special procedures for dealing with disasters such as earthquakes, floods, or hurricanes. This will benefit the Government through improved network reliability and customer service.

The AT&T network is designed and engineered to be self-regulating. This concept allows the network to monitor itself and to handle routine problems on its own. Network managers step in and apply their skills, knowledge, and experience to handle problems beyond the scope of the network. Two primary management techniques are employed:

- **Proactive Management** – By planning ahead for holidays, technical changes, or special high-volume calling events, such as concert ticket sales or a national radio or television call-in programs, the network managers keep potential problems invisible to callers.
- **Management by Exception** – By setting thresholds within the software support systems used to manage the network, managers are automatically alerted to situations that need special handling.

The second layer Network and Systems Management work centers can initiate network level testing to diagnose and sectionalize faults. These centers work cooperatively with the first layer Element Management work centers to isolate troubles and effect repairs to maintain a high quality of service.

The third control layer, Service Management, takes a more historical and analytical view of the service and network to ensure timeliness of service delivery, quality improvement, and cost reduction. As both engineering and an operations effort, both near-term (hours, days) and long-term (weeks, months) changes can be affected. The Network and Systems Management work centers can also tap the expertise of the Service Management organizations to assist in diagnosing and clearing unusual network troubles.

The three-layer approach to Network Control and Diagnostics lends itself to a flexible client-server computing environment. In such an environment, data can be exchanged between the layers to facilitate each layer's function. To facilitate the evolution of the Government's services from the FTS2000 systems to FAS 2001 capability, AT&T will use a mediation approach in the best interest of the Government to adapt to the commercial operational systems infrastructure.

1.8 Network Transmission and Synchronization Plans

The WIN proposed for FAS 2001 is an all-digital domestic network with comprehensive international digital connectivity. The network provides superior performance and availability for all FAS 2001 services with a built-in capability for easy evolution to advanced, future digital services. AT&T is the leader in the area of network synchronization by virtue of our central role in international and domestic standards organizations and our existing industry-unique, dedicated timing and synchronization network for distributing Stratum 1 traceable timing.

AT&T's network provides superior performance and availability of all FAS 2001 services. This section describes the transmission and synchronization plan for AT&T's Worldwide Intelligent Network. This plan provides an overall framework for the FAS 2001 services.

Transmission Plan

The WIN architecture includes digital access to AT&T offices containing all-digital systems for switching and transmission, interconnected by high-capacity optical fiber and other digital facilities. The customer network interface has been defined to be the SDP for each service. The network transmission and synchronization plan is structured to ensure quality service from SDP to SDP. The access from customer premises SDPs to the service nodes is provided by access providers, world partners, and AT&T. The interface between the access provider segment and the AT&T-provided portion of the WIN is the Local Access Network (LAN) interface which may also be an SDP.

The network, consisting of access, nodal, and transport components, provides high-quality performance that meets or exceeds all performance objectives specified in the Requirements Document. The key performance objectives for overall service that are universally pertinent to all services are described in the following paragraphs. Special requirements for individual services (e.g., loss and echo control for analog facilities) are also included in the transmission analysis.

Performance Objectives – The service-independent performance objectives of the FAS 2001 network are discussed in this section. The SDP-to-SDP performance objectives that are pertinent to the digital FAS 2001 network are:

The objectives are set by domestic and international standards and AT&T's own performance standards.

Availability and Outage Time – Availability is a measure of network outages. The availability objectives account for the transmission equipment and facility failures and, as such, are included in this transmission plan. Availability is the proportion of a time period for which a customer has contracted service and that the service is usable.

Error-Free Seconds and Errored Seconds – The accuracy with which bits of digital information are conveyed is an important measure of the quality of the transmission channel. The portion of error-free seconds is this measure of transmission quality. This proportion is the ratio of 1-second intervals without any bit error to the total number of seconds in the observation

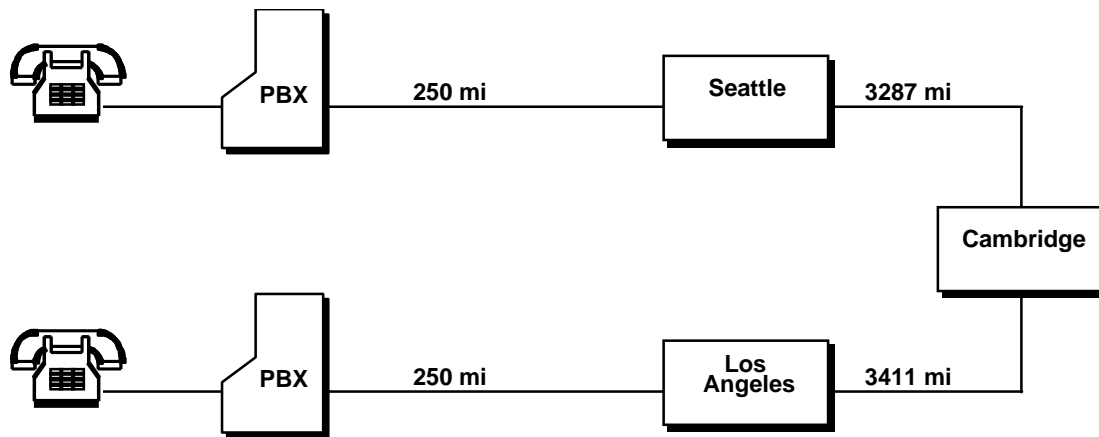
period, excluding periods of outage, and is expressed as Percent Error-Free Seconds (%EFS). A complementary expression is the percent errored seconds (%ES=100-%EFS).

Delay – The end-to-end delay through the digital transmission network consists of two components: (1) the propagation delay and, (2) the equipment delay (due to storage and processing). The propagation delay depends upon the types of transmission facilities and the route mileage.

Hypothetical Reference Connection – **Figure 1.8-1** shows one of our worst-case hypothetical reference connections for the 48-state FAS 2001 network. The Hypothetical Reference Connection (HRC) represents an SDP-to-SDP connection. The HRC is constructed to demonstrate a typical SDP-to-SDP connection for any FAS 2001 service, using the access, nodal, and transport component facilities of the WIN. The worst case is chosen in order to ensure that typical services will be as good as or better than the quality of service represented by this plan.

The performance objectives are established [REDACTED] relevant to the performance parameters and the measured performance of nodal and transport components. The FAS 2001 Transmission Plan then allocates the objectives, based on AT&T models, to the components, as shown in Figure 1.8-1. This figure indicates the allocation on a per-access link basis (two in the HRC), per-service node basis (three in the HRC), and internodal transport (aggregated).

Thus, AT&T's WIN provides high-quality transmission from SDP to SDP by allocating transmission performance to each network component and by monitoring and controlling the performance of each component.



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Figure 1.8-1. An Example of FAS 2001 Hypothetical Reference Connection — *Reference connections ensure that transmission performance requirements are met.*

Synchronization Plan

AT&T is a leader in the area of network synchronization, by virtue of our active role in the international and domestic standards organizations and our existing industry unique dedicated timing and synchronization network for distributing Stratum 1 traceable timing to our own national and international telecommunications networks.

ANSI standard recommends against transferring timing/synchronization signals over SONET payloads. This recommendation allows two basic architectures for the timing/synchronization

network: (1) To have a primary reference clock in every node and not transfer synchronization signals at all, or (2) to have primary reference clocks in a limited number of nodes and at other nodes derive the reference signal from the SONET optical signal (as opposed to getting the synchronization signal from payloads). AT&T has chosen to use the first option that is more reliable under dual and multiple failure conditions. We believe our timing/synchronization network is truly unique in the industry, and we expect its performance to be unparalleled.

The synchronization architecture that AT&T is currently implementing consists of the wide use of GPS receivers. Telecom Solution GPS receivers (model DCD-LPR) are being installed in almost all AT&T nodes. These LPRs feed a Telecom Solution BITS clock (model DCD-523) that is equipped with two rubidium oscillators. The DCD-523 also provides clock distribution functionality to the SONET line terminating equipment as well as to the multiplexing and switching equipment supporting the individual FAS 2001 services in the office.

Figure 1.8-2 shows the AT&T synchronization architecture.

The GPS receivers in the AT&T timing and synchronization network can track up to eight satellites simultaneously. Since receivers need only four satellites to operate in a normal mode, losing one satellite will not affect our synchronization network. As an additional protection, if the GPS signal is lost, AT&T's Stratum 2 BITS clocks (deployed in nearly all offices) with superior holdover performance will provide synchronization during the holdover operation. The foreign Telecommunications Administration will provide Stratum 1 traceable timing in the foreign country. Transmission of synchronous data over satellite facilities requires highly accurate timing as well as adequate buffer capacity to absorb wander effects that are incurred due to satellite movement relative to the Earth. These orbital movements cause Doppler shifts in the received signal, which result in slow frequency movement, referred to as wander, of the received data stream. The amount of wander introduced into the data stream is a function of the magnitude of variation in the path delay. The impairments caused by plesiochronous operation are almost negligible compared to the impairments caused by the satellite wander. Satellite wander can cause slips in the numbers of up to one per hour. The removal of the wander in satellite facilities requires Stratum 1 traceable timing be externally provided to earth station buffers, and that the buffers associated with the received signal be large enough to handle the magnitude of wander. Elastic buffers are used for this purpose. These buffers are designed to operate at the center of their range to compensate for information arriving too quickly or too slowly. Consequently, they must have a storage capacity of as many bits of the data as occur during two times the variation interval. AT&T currently provides the necessary buffers for services that traverse AT&T satellite transmission facilities for all of our customers.

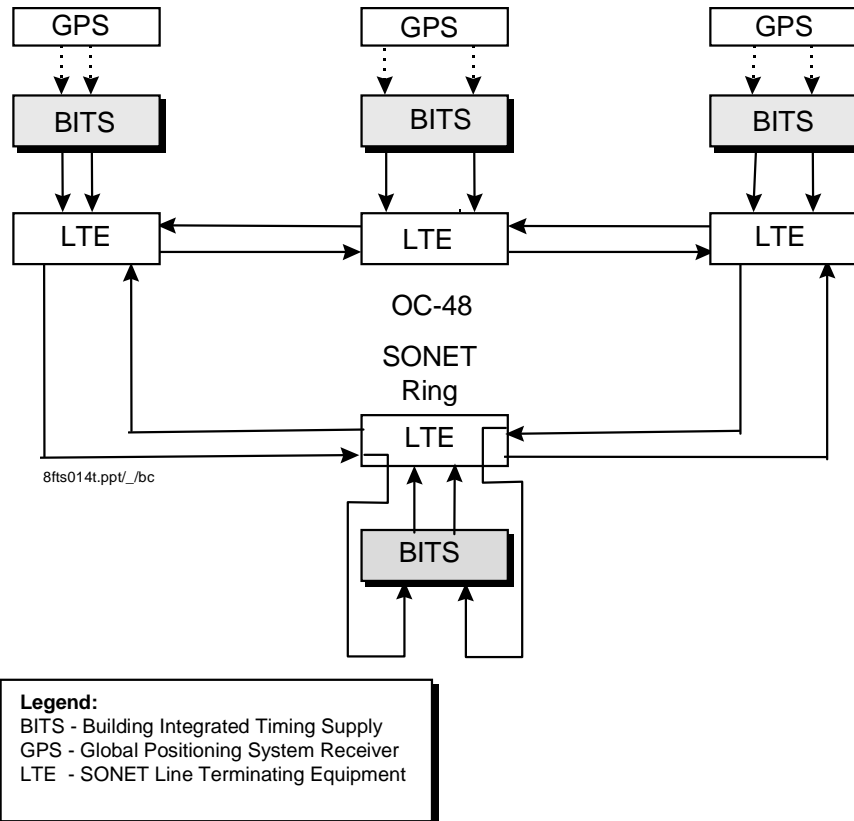


Figure 1.8-2. AT&T's Synchronization Architecture — *The synchronization architecture increases the reliability and performance of the synchronization network.*

1.9 Approach to Emerging Service Incorporation (C.2.8)

AT&T is at the forefront of communications technology innovation and enhancement. Others may be the first to bring new features and technology to the marketplace, but they rarely arrive with the full solution or service offering. This was the case with Frame Relay Services where competitors fielded partial solutions early. Later, when AT&T came to the market, we came with a complete solution, able to serve 60 percent of this new business. AT&T's history of providing complete solutions when introducing new technology was reflected on FTS2000, where AT&T had initiated nearly all of the currently requested services for FAS 2001.

On FTS2000, AT&T introduced 800 Toll-Free and 900 Services—among others—to the Government marketplace. These innovations significantly increased the public's ability to access their Government and Government information. AT&T is proud of its record in improving Government services on FTS2000. Innovation and new technology fielded by AT&T has helped the Government communicate better internally and expanded the public's access to important services and information. We actively expanded Government services on FTS2000 from the five original offerings to nine service offerings, most of which were first introduced on AT&T's FTS2000 Network at the Government's request.

Today, at AT&T Laboratories, scientists, engineers and technical support personnel are continuously assessing our customer's telecommunications needs and developing concepts, systems and equipment that provide effective solutions for meeting those needs. These highly skilled and dedicated people are involved in bringing to fruition new service concepts, improving network functionality, and testing and piloting new technology programs that are expanding the state-of-the-art in global telecommunications systems.

To this end, AT&T will employ its proven Service Realization Process used successfully on FTS2000. We will thoroughly evaluate new technologies that emerge during the life of the contract modification. Their potential for incorporation on FAS 2001, as they become commercially viable, will receive priority attention from the program management and service realization teams. As with FTS2000, AT&T intends to ensure that maximum service functionality is offered to the Government and FAS 2001 agencies when emerging services are brought on-line.

- As emerging commercial infrastructures evolve, and new services become available, AT&T will support the addition of these services to maintain the technical excellence of FAS 2001 communications systems. Inclusion of these emerging services will interoperate seamlessly with FAS 2001 services, as well as other emerging services when incorporated into this contract modification. AT&T will analyze selected services for their commercial availability as standards and commercial deployment takes place during the life of the contract.

AT&T will not introduce partial solutions on FAS 2001. It is not in the best interest of the Government to introduce technology until its most complete functionality can be achieved. Costly, ongoing modifications are reduced by providing a full solution. AT&T's Service Realization Process has proven its value on FTS2000 by introducing new services and feature functionality that have been fully developed and tested. Selecting AT&T as a Government FAS 2001 service provider guarantees continuity of a well planned, tested, and managed network enhancement.

1.10 Adapting to Evolving Requirements

AT&T's Service Realization Process includes all of the critical activities required to ensure successful network migration actions. Our Service Realization Process includes the identification of new functions and features to support emerging customer needs, definition of the technical architecture, specification of technical and operational plans for implementation, and ongoing technical and operational process improvement for the delivery of the requested/required service.

AT&T's Service Realization Process, as shown in **Figure 1.10-1**, includes all of the critical activities and functions necessary to introduce network capabilities to meet the Government's evolving service requirements. Service realization includes the identification of new functions and features to support emerging customer needs, definition of the technical architecture, specification of technical and operations plans for implementation, and on-going technical and operations process improvement for the delivery of the service. AT&T's Service Realization Process specifically addresses interoperability as needed, contingency and restoration procedures, and technology refreshment and service development.

Evolving service requirements are derived from a number of sources. The primary source is AT&T's direct and frequent technical and sales contact with our Government customers. This includes understanding the customers' applications and communications needs, especially the performance and management aspects

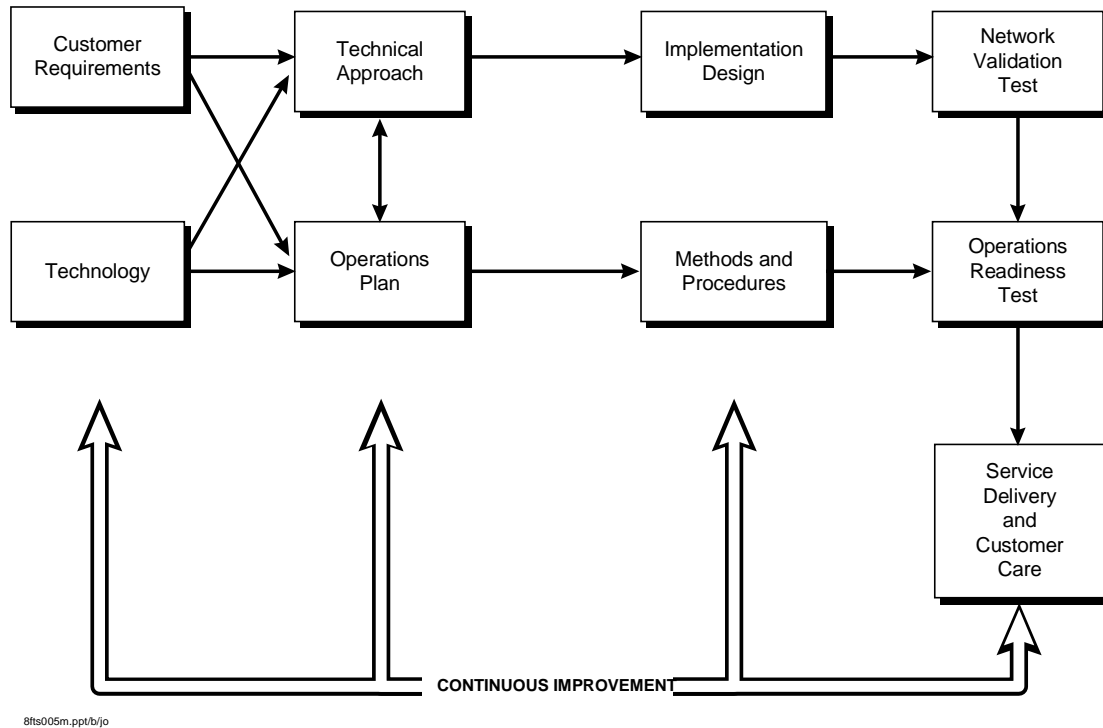


Figure 1.10-1. The AT&T Service Realization Process — *The Service Realization Process ensures that Government evolving service requirements are introduced into the network in a timely and cost-effective manner.*

AT&T Laboratories' technical staff will evaluate alternative technical approaches to deliver the service requirements.

Also, additional adjuncts might be deployed for specialized feature functionality. In Switched Data Services, where standards, technology, and functionality are rapidly evolving, the existing network elements may be upgraded or entirely new equipment and networks may be deployed.

In all cases, attention is given to reliability of the network and services and to operability and network management of the required facilities, equipment, and services. AT&T will use its proven Service Realization Process to adapt the AT&T network and service offerings to meet the Government's evolving service requirements. By using this process, the Government can be assured that its evolving service requirements will be met with commercial services that meet the technical, operational, and performance quality that make AT&T the industry leader in the development and delivery of communications networks and services.

1.11 Domestic and International Service Coverage

AT&T is continually reviewing and updating the principal needs that must be met in delivering global, end-to-end communications solutions. AT&T has the global reach, financial strength, and technical expertise to provide the services Government agencies need, whenever and wherever they want them.

These needs can be summarized into three categories:

- Global Reach
- Reliability
- Responsiveness.

There is a pressing need for a communications provider, such as AT&T, with the global reach, financial strength, and technical expertise to provide the services customers need, whenever and wherever they want them.

Service coverage has been identified by the Government as a top priority. While expanding our global reach, AT&T also aims to extend U.S. standards of quality and reliability worldwide.

AT&T has the technical expertise and legal authorization to offer domestically all services in this proposal. At this time domestic coverage will not include Alaska.

1.11.1 Inside Wire

Inside wire installation and maintenance will be provided within the continental United States, Alaska, Hawaii and Puerto Rico only. For the convenience of the Government, upon the Government's request, AT&T will investigate the practicability of providing inside wire installation and maintenance service to locations that are not within this definition.

1.12 International Performance Standards

AT&T recognizes the need for anytime, anywhere telecommunications. Government agencies need international communications services as a tool, not as an obstacle to be overcome in performing their missions. AT&T's international strategy is to provide performance comparable to domestic standards.

AT&T provides this information to customers regarding their specific networks. This information is not generally available because foreign carriers consider this information proprietary and will not release the detail on their internal networks. **Table 1.12-1** provides the threshold network performance measurements for services provided through AT&T.

Table 1.12-1. Agreed Minimum Performance Levels

<i>Network Performance Measurements</i>	<i>Threshold</i>
Post Dial Delay (PDD): Direct Access to Direct Egress Direct Access to SW Egress Switched Access to SW Egress Switched Access to Direct Egress Call Blocking ((non-continuous)	
Echo	
Signal-to-Noise Ratio	
Signal Loss	

AT&T has also instituted the Operations Performance Measurements shown in **Table 1.12-2**.

Table 1.12-2. Operations Performance Measurements

<i>Trouble Ticket Status</i>	<i>Threshold</i>	<i>Target</i>

The intention is to at least meet threshold requirements and work diligently toward target to improve their performance. To ensure the threshold/target measurements are met, the Project Managers monitor every ticket and intervene if it appears that the trouble is not being resolved quickly and appropriately.

The average response time is either immediate, if the trouble report is assigned directly to an available technician when the trouble is first reported, or within a matter of minutes upon assignment of the report to a technician who makes a callback to the customer contact listed. AT&T maintains a standard and uniform process to handle trouble reports and in general set an objective of MTTR of .

The overall process cycle (Mean Time to Repair) previously discussed has an average . The problem receipt and first diagnosis typically takes about . If the problem restoration requires a Field Engineer on location, the average time is about . These periods are valid for the countries within the West European region.

As with all AT&T processes, the process is managed and improved based on using Process Quality Management and Improvement (PQMI) Methodology. This Kaizen oriented approach, developed in AT&T Laboratories, ensures a continuous improvement based on actual measures.

Grade-of-service and completion rates vary considerably from one country to the next, based upon the sophistication and reliability of the distant-end equipment and the service provider. These ratings can also vary from one month to the next, based upon business, political, or weather conditions at the distant end.

We provide the availability rates for AT&T's global network by geographic region shown in **Table 1.12-3**.

Table 1.12-3. Network Availability Overall through June 30, 1996

Location	Availability
North America	Network availability is [REDACTED].
Western Europe	Network availability is [REDACTED].
Asia Pacific Regions	Network availability is [REDACTED] within the United States; completion rates (i.e., availability) differ from country to country and are a function of its telecommunications infrastructure.
Eastern Europe Middle East	Network availability is [REDACTED] within the United States; completion rates (i.e., availability) differ from country to country and are a function of its telecommunications infrastructure.
South America Central America	Network availability is [REDACTED] within the United States; completion rates (i.e., availability) differ from country to country and are a function of its telecommunications infrastructure.

By way of example of the variation in grade of service and network availability, during past military fighting in Cambodia, local officials closed down their international gateway switch for several days. No calls entered or left that country for an extended period of time. Also, in the past, Iraq has closed down its gateway switch on successive weekends for weeks at a time, cutting itself off from the outside world during these periods. These events notwithstanding, AT&T always makes the best effort to provide the highest levels of service commercially available to the Government.

1.13 Network Evolution Approach

AT&T is the industry leader in the development and implementation of communications services. AT&T, possessing the in-depth knowledge of Federal telecommunications systems and requirements, minimizes the Government's future risk in this area.

AT&T's Service Realization Process (see **Figure 1.13-1**) includes all required activities in evolving the network and optimizing the cost effectiveness of each service provided to the Government. Service realization includes the identification of new commercial functions and features to support emerging customer needs; definition of the technical architecture; specification of technical and operations plans for implementation (including the design of the network with the appropriate network concentration and switching points to meet the traffic and accessibility for Government and commercial customers); and, ongoing technical and operations process improvement (including physical network expansion) for the delivery of the service.

Evolving service requirements are derived from a number of sources. The primary source is AT&T's direct and frequent technical and sales contact with our customers. This includes understanding the customers' applications and communications needs, including traffic requirements and locations to be served. Next, AT&T Laboratories' technical staff evaluates alternative technical approaches to deliver the service requirements. Several key alternatives are available. For example, in circuit switched and dedicated transmission services, hardware and software upgrades could be made in the main network elements (digital switches, digital cross-connects, routers, hubs) to meet evolving commercial service requirements or additional adjuncts might be deployed for specialized feature functionality.

In Switched Data Services, where commercial standards, technology, and functionality is rapidly evolving, the existing network elements may be upgraded, or entirely new equipment and networks may be deployed. In all cases, attention is given to reliability of the network and services and to operability and network management of the facilities, equipment, and services. Evolving service requirements will be met with commercial services that meet the technical, operational, and performance quality that make AT&T the industry leader in the development and delivery of communications networks and services.

AT&T is deploying the use of ATM technology to combine voice and data on a single access facility. This service will show benefits for Switched Data Services as well as the other voice and video services. The deployment includes an evaluation of the technical approach, as well as a characterization of the performance of the services using the technology. Rapid market acceptance of this new capability is anticipated. AT&T is an experienced vendor in this area, having recommended and provided many installations of Switched Digital Integrated Services under FTS2000 and also similar commercial offerings.

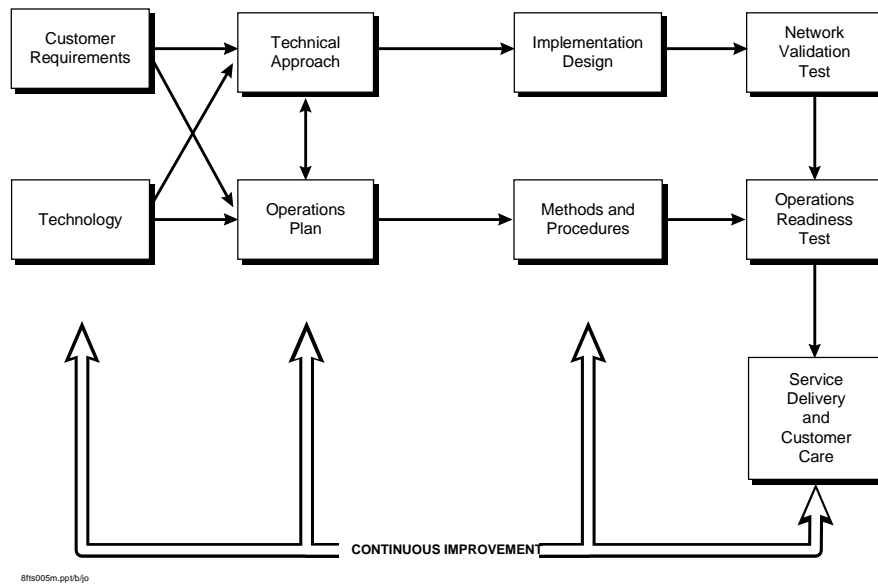


Figure 1.13-1. The AT&T Service Realization Process — *The Service Realization Process includes improvement of network design and operations to optimize each service's cost effectiveness.*

AT&T reserves the right to upgrade, expand or replace components of technology, network architecture and routing techniques at any time without a formal contract modification, provided performance parameters are met in accordance with the contract modification.

1.14 Reserved

1.15 IPS Interoperability Approach

Please see Section 6, Crossover IP Services.