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U.S. House of Representatives

Committee on Energy and Commerce

SUBCOMMITTEE ON TELECOMMUNICATIONS AND FINANCE

Washington, DC 20515

ROOM H2-316
FORD HOUSE OFFICE BUILDING
PHONE (202) 226-2424

HERBERT H. BROWN
CHIEF COUNSEL AND STAFF DIRECTOR

February 3, 1992

MEMORANDUM

To: Edward J. Markey, Chairman
John Bryant, Member
Other Members of the Subcommittee

From: Staff

Subject: Subcommittee Staff report entitled "Review of Telephone Network Reliability and Service Quality Standards."

This report summarizes Bell operating company and long distance carrier responses to a series of questions posed by Chairman Markey and Congressman Bryant regarding each company's internal service quality standards. The report proves two points. First, this report shows that it is possible to obtain and analyze data on network service quality standards. Second, and contrary to assertions of some industry representatives and Federal Communications Commission officials, it demonstrates that there is value in such an effort.

Service quality standards are but one of the many variables to consider in evaluating network reliability. There are a host of network design, management, human resource and quality control variables as well. But the experience of business users points to quality standards as a key indicator of network reliability. In short, these standards are a composite picture of how companies operate in the current legal, economic, and regulatory climate.

The staff report documents that the companies comprising our local and long distance networks do not share a common view of service quality standards or performance measures. Although one could argue that each company should be free to establish standards corresponding to their respective networks, the existence of substantial differences among company standards is cause for concern because the various networks are far more alike than they are dissimilar.

The fact that one company's standards in a certain category are higher or lower than that of another company does not resolve the question of whether that company's network is more or less reliable, nor is it reflective of higher or lower service quality. However, extensive differences in standards across the industry give rise to concerns over whether the industry as a whole devotes sufficient attention to service quality matters.

One response to the variation in standards documented in this report is for the FCC to mandate industry-wide standards and performance measures. This will be the subject of a future Subcommittee staff investigation. This report should be of value to this investigation and to the Subcommittee's deliberations over the Commission's role in ensuring network reliability and service quality.

INTRODUCTION

During 1991, several major telephone failures plagued the nation's local and long distance telephone networks, capturing the attention of Congress, regulators, businesses, and residential customers. In January 1991, an AT&T cable was accidentally cut by the company's own workmen in Newark, NJ, blocking over 12 million calls. In June and again in early July, similar switch failures disrupted Pacific Bell and Bell Atlantic local telephone service for over 9 million customers in Los Angeles, San Francisco, Pittsburgh, and Washington, D.C. In September, a power supply failure knocked-out AT&T's central office switch in Manhattan, blocking 5 million calls and severely disrupting nationwide air traffic. And in November, Boston lost AT&T long distance service when the company's Blackstone facility was disabled during a seemingly routine maintenance procedure.

As the year progressed, telephone network failures were no longer viewed as isolated events. By the end of 1991, common carriers had reported hundreds of service disrupting switch failures. Starting at mid-year, the Commission developed an "ad hoc" outage investigation capability, convened meetings of industry experts to brainstorm solutions, and proposed service disruption reporting requirements.

The Commission's investigations and leadership in bringing the industry together to share lessons learned from prior, untold failures may lead eventually to improvements in network reliability and service quality. For its part, the industry has made progress in testing and implementing new signalling system software. The Commission's establishment of a Network Reliability Council also has the potential to provide the Commission with expert technical advice. At issue, however, is whether the Council will be effective in the absence of a formal regulatory effort focused exclusively on network reliability and service quality.

Throughout the formulation of these changes, and repeatedly in testimony before the Subcommittee, the FCC maintained that network reliability and service quality were common carrier responsibilities. Although the Chairman of the Commission has pointed to the initiatives that industry and government will pursue as the key to providing America with the highest quality phone service, the Commission has yet to propose or implement a substantive regulatory mechanism recognizing its role of ensuring the integrity of the nation's telecommunications network.

The FCC's proposed rule to gather data on network failures illustrates the point: though the information may assist the Commission in staffing investigation teams and responding to inquiries, as of now it remains unclear what the FCC plans to do

the needs of their customers. Recent severe network failures affecting interexchange carriers undercut this assumption. The devastating consequences to public safety and the economy experienced in the major network outages over the past 2 years leads to the conclusion that vigilant oversight is necessary.

Conclusion

The nation's local and long distance telephone companies have taken steps to develop and deploy "self-healing" networks. Their efforts are not complete and additional capital investment is needed to increase network redundancy and diversity. Completely self-healing network architectures are only part of the solution, however, and are still several years away. Better management is needed to design, build and operate the networks of the future. In addition, highly skilled and experienced maintenance personnel must be on hand to keep quality on the line. And finally, many observers point to the price cap regulatory regime, which creates incentives for companies to cut costs that may include skimping on maintenance and cutting back their skilled work force, as incompatible with the goal of high quality telecommunications networks.

This report raises the question whether another step to achieving high quality telephone service is industry-wide service quality standards and performance measures. The architectural, physical, and operational aspects the networks have in common would argue in favor of more widespread agreement on service quality matters. Moreover, a set of common, industry-wide standards and performance measures could bring more focused attention to service quality issues and help ensure a more consistent interpretation of service quality among the nation's local telephone networks.

SUMMARY

The modern telephone network is not "fail-safe." Service disruptions can and do occur. For the period beginning April 1, 1991 and ending September 30, 1991, a total of 1,057 service disrupting switch failures were reported to the FCC by the Bell Operating companies, GTE and United Telecom. Both local and long distance telephone companies seek "self-healing" network architectures to help ensure that the effects of network failures are transparent to their customers. In many respects their efforts have been successful. Nonetheless, residential and business customers alike are concerned over the increasing number and severity of recent telephone outages and have complained about declining network reliability and service quality.

The Federal Communications Commission (FCC) has maintained that telephone network quality has not diminished but actually increased, pointing to the fact that the nation's telephone companies have deployed fiber optic technology and sophisticated digital switching equipment into their networks. Unfortunately, this assertion fails to recognize that advanced technology introduced to our nation's telephone networks, while yielding an increase in quality, does not necessarily bring with it a concomitant increase in network reliability. As recent history has shown, more advanced technology may in some instances contribute to increased vulnerability of the network to massive failure.

To address these concerns, the Chairman of the Subcommittee on Telecommunications and Finance, together with Congressman John Bryant, asked local and long distance companies to provide detailed information on their internal service quality standards. The companies use these standards as guides or measures of performance in the provision of a wide variety of business and residential telephone services. Consequently, these standards reflect what each company considers to be the minimally acceptable level for service installation, performance or repair.

Local Exchange Carriers

Each of the seven Regional Bell Operating Companies, GTE and United Telecom responded to initial and follow-up questions posed in August and October of 1991, respectively. As shown in the detailed analysis section of this report, wide and unexplained variances sometimes exist between the companies' highest or lowest standards. For example:

-- In the category of trouble reports per 100 lines, a common measure of service quality, Wisconsin Bell's standard is 1.6, while GTE has a standard of 7 in some states and 10 in Indiana.

-- Pacific Bell seeks to meet 99 percent of customers' requests for one-day installation of residential service, while New York Telephone Company's standard is to meet 70 percent of requests within 5 days.

-- For business users, BellSouth and Ameritech install PBX trunks within two days in most cases, while Pacific Bell's standard interval is 12 days.

-- To repair outages in switched access service, Ohio Bell commits to a standard two and one-half hour interval, while GTE's interval is 24 hours.

-- For DS1 Service, Pacific Bell's standard is 99.85 percent error-free seconds over a continuous 24 hour period, while BellSouth offers 95 percent and NYNEX reports 95 percent error free seconds as listed in its state tariffs. In parts of New York where service is provided completely over fiber optic facilities, NYNEX reports a separate standard of 98.75 percent.

Equally disturbing, some local exchange carriers did not have internal standards for certain service quality factors identified in the Subcommittee's questions. For example, Bell Atlantic and New England Telephone do not have internal standards for installation of residential service, preferring to rely instead on customer satisfaction surveys.

Except in response to customer trouble reports, none of the local exchange carriers currently measures actual network performance against its standards for bit error rate, availability, or error-free seconds -- all key indicators of data transmission service quality. Without appropriate measures, the companies cannot demonstrate that they actually provide services of the quality they claim. Only Pacific Bell revealed firm plans for deploying technology that will enable passive monitoring of data transmission service quality.

Long Distance Carriers

AT&T, MCI and Sprint responded to similar service quality questions posed in October 1991. Some carriers requested that the information they submitted be considered proprietary, due to the competitive nature of the long-distance market. As a group these responses, however, were less informative than those of local exchange carriers because some carriers did not respond fully to the information request. Because of this, the staff will seek additional information to comprehend the operational standards followed by the major long distance carriers.

Some contend that standards for the interexchange carriers are less relevant than for local exchange carriers because competition exists in the long distance market. Such competition theoretically forces the carriers to adopt standards responsive to

RECAP OF 1991 FAILURES, INVESTIGATIONS AND ACTIONS TAKEN BY THE FCC

During 1991, the reliability of the nation's telephone networks and the varying service quality standards among telephone companies emerged as issues capturing the attention of policymakers, regulators, business and residential customers, and the industry itself. In 12 months, the public view of network failures has shifted from one that regarded telephone outages as isolated events to one that sees them as becoming increasingly frequent.

Regulators Play "Catch-Up"

In January 1991, the FCC was not prepared to investigate major telephone network failures or address the network reliability and service quality concerns they embody. The January 4, 1991, AT&T cable cut in Newark, NJ was the first such failure this year investigated by the Commission. Staff from the field operations division were given the task because the FCC does not have a separate organization specifically dedicated to network reliability and service quality issues. The staff investigation, which focused on AT&T's procedures for removing fiber optic cable that had been retired from service, faulted AT&T's methods for ensuring that the cable to be cut was not in use.

The Bell Atlantic - Pacific Telesis failures that occurred between June 10 and July 2, 1991, all involved the software used in the companies' signalling networks, which route calls to their recipients. The Commission assembled another ad hoc staff to investigate the outage and address outage-related issues in a broader context. The staff investigation found that a seemingly minor software upgrade contained an error that may have contributed to each of the outages. The FCC also was troubled that lessons learned from similar previous signalling system failures were not shared within the industry and that insufficient testing may have been done.

Many industry experts and members of the regulatory community remain unconvinced that software errors and a lack of coordination provide a satisfactory explanation the root cause of these June-July outages. These episodes raised serious concerns throughout the industry about the management controls governing the release of new software, and the practice of installing new software without substantial testing how it would operate under realistic workloads in the integrated network environment.

Getting Industry to Work the Problem

The Commission holds the view that network reliability and service quality are common carrier, not FCC responsibilities.

with this data. In addition, the Tele-Communications Association (TCA), which represents business users of the nation's telephone networks, has questioned the Commission's proposed reporting thresholds of 30 minutes and 50,000 lines. The Association's recent study found that only 4 of the 1,057 service disrupting switch failures occurring from April through September 1991 met the Commission's threshold. The TCA study shows that lower thresholds would provide data for more clearly determining industry trends and focusing industry attention to problems they may have in common.

During appearances before the Subcommittee and in correspondence, Commission officials defended the FCC reporting requirements and discounted the feasibility and value of structuring an FCC network reliability role predicated on the development, monitoring, evaluation and analysis of network service quality standards or performance measures and controls. The Commission even appears reluctant to collect information about telephone company internal standards. Against this backdrop, and as a first step in defining the appropriate role for the FCC in this area, Chairman Markey and Congressman Bryant set out to gather relevant information on the telephone industry's standards. An analysis of that data is set forth below.

In advancing this view, it has taken several steps which have the potential to substantially enhance industry's attention to network reliability and service quality issues.

After the June-July outages, the Commission brought together representatives from all facets of the industry to discuss

- -- possible risks faced by contemporary and future networks;
- -- network interconnection issues;
- -- current communication and coordination measures; and
- -- available processes and systems to improve network coordination and service integrity.

On September 12, 1991, the Commission, together with the National Association of Regulatory Utility Commissioners, State and other Federal agency officials, met with 30 industry representatives for four hours to discuss national telephone reliability issues. Noting the telephone industry's public responsibility to provide dependable, quality service, FCC Chairman Sikes stated, "The integrity of this nation's telecommunications infrastructure must be assured by industry and government working together." What the Federal role might be in this partnership remains undefined.

Requiring Common Carrier Outage Reports

On September 16, 1991, the FCC adopted a Notice of Proposed Rulemaking that would require common carriers to report incidents during which service to 50,000 or more customers is disrupted for 30 minutes or more. In explaining the underlying rationale for the proposed rule, the notice documented the undeniably woeful regulatory conditions in-place at the FCC. Specifically, it stated that the Commission (1) has no systematic way by which to become informed quickly of significant service disruptions, (2) is unable to determine whether particular kinds of technology or equipment are threatening service reliability, and (3) does not receive sufficiently timely or specific information regarding service disruptions from the semiannual and quarterly service reporting requirements established under the local exchange carrier incentive regulation. The Notice also explained that the current regulation does not require common carriers to evaluate and report the apparent or known causes of service disruptions or the steps taken to restore service and to prevent further outages.

The Worst Outage in Recent History

On September 17, 1991, management failure, power equipment failure, and human error combined to completely disable AT&T's central office switch at 33 Thomas Street in Manhattan. The number of circuits affected (over 5 million calls blocked), the inability to reroute traffic out of or away from the damaged facility, and the impairment of air traffic control activities into and out of 398 airports throughout much of the Northeast combined to create an unprecedented disruption of telephone

services.

The Thomas Street outage was complicated by several factors including a power shedding agreement with Consolidated Edison; construction at various locations within the facility; replacement of outmoded power equipment; deliberately muted, inadvertently disabled, and defective alarms; lack of remote power monitoring capability; training of power technicians on new technology; and procedural confusion over responsibility for routine inspections while the power technicians were being trained.

On the day of the outage, AT&T attempted to switch from commercial to diesel generator power, but a transformer failure caused the facility to go on emergency battery power. Because a technician did not -- at any time during the six hour period following the power change -- conduct a simple walk-through inspection, as required, the few alarms that were in working order went unnoticed until scheduled shift change. By that time there was too little battery power remaining to recover the switching system.

The FCC's November 8, 1991 report on the results of its investigation of the outage was not only critical of AT&T management, but also concluded that two massive AT&T outages within 10 months warranted certain special steps to track more closely AT&T's reliability auditing processes. These special steps took the form of four separate reporting requirements pertaining to: (1) the risk-benefit of continued participation in power shedding arrangements with electric power utilities; (2) status of efforts to upgrade facilities having the same power plant configurations as 33 Thomas street; (3) status and plans for upgrades to the power systems, alarms, and emergency power systems at all other switching offices; and (4) a study of the vulnerability of the entire AT&T network to unintentional disabling events and description of steps AT&T has taken or will take to reduce vulnerability.

Realistic Software Tests Proposed

On October 4, 1991, Bellcore released for comment by industry its Common Channel Signaling Internetwork Testing proposal. The proposal, which was developed in response to a September 12, 1991 request from the FCC Chairman, advocated more extensive pre-deployment testing of new and revised software and hardware in an integrated multi-supplier network environment. The testing will focus on network stress testing, survivability, and recoverability. The proposal has the following objectives:

- -- Facilitate the identification of signalling network vulnerabilities and stimulate corrective responses.
- -- Provide confidence in new software before deployment.
- -- Develop a library of possible problems and solutions.
- -- Provide a framework for postmortem analysis.
- -- Enable suppliers to demonstrate reliability and

interoperability in a unique, multi-supplier environment.

Industry comments led to the identification of the Network Operations Forum as the industry body to schedule, coordinate, and report the results of a one year test in which 21 companies agreed to participate.

Mistake in Routine Maintenance Leads to Severe Outage

The third AT&T network outage occurred at the company's Blackstone, MA facility on November 5, 1991. The two and one-half hour outage affected 60 percent of the long distance calls in New England, blocking over 1 million calls. In addition, the Federal Aviation Administration's Nashua, NH Air Route Traffic Control facility lost half of the dedicated long distance lines that connect air traffic controllers with radar and radio sites, transfer data among FAA computers, and enable controllers to coordinate with one another. The FAA described the outage as "massive" and "a near catastrophic failure." Air traffic control operations into and out of Boston's Logan airport were adversely affected for about three hours. The FAA cited its back-up microwave link as a critical factor in averting disaster.

The outage occurred during a relatively simple maintenance procedure which AT&T said had been performed without incident at 145 other locations. The failure occurred when a technician, while working on two components at the same time, mistakenly installed the wrong component into the digital cross connect system. When the system could not be restored to normal operation, the technician overrode the internal controls designed to protect the system. Under AT&T's procedures, the technician should have checked with company experts at the company's network control center before performing the override.

Even though the maintenance procedure was routine in nature, AT&T knew that the network could be disabled if the procedure was not performed correctly. A question remains as to why AT&T did not schedule such service affecting maintenance after midnight when the impact of an inadvertent error would be minimized.

Network Reliability Council Established

On December 13, 1991, the FCC announced formation of the Network Reliability Council and the appointment of Paul Henson, retired Chairman of United Telecommunications, Inc., as its Chair. The Council is composed of 30 communication sector leaders, including the chief executive officers of most of the major U.S. telephone companies, principal equipment suppliers, consumer, corporate and Federal users' representatives, and State regulatory agencies. Canada's Radio and Telecommunications Commission and Telecom Canada (the principal long distance company) will participate in the Council as Associate Members.

As a federal advisory committee, the Council will provide expert technical advice to FCC, as well as act as a mechanism to focus industry attention on network reliability issues that arise from the deployment of new technologies and increasing network interdependence. The first scheduled meeting of the Council will be held at the FCC on February 27, 1992.

IMPACT OF NETWORK OUTAGES

The exact cost of a major telephone failure is hard to calculate, but the cost in lost productivity is staggering. When the phones go dead, businesses large and small suffer immeasurably. The AT&T September failure in New York provides one glimpse of the impact a telephone outage can have on our nation -- even though it occurred late in the day preceding a religious holiday. The full impact of the New York outage remains unknown, but to help illustrate the impact felt by all customers and the public in general, consider the effect on one large and important user of telephones, air traffic controllers.

The FAA relies on AT&T for voice and data communications services that allow pilot-controller voice radio communications, the presentation of radar data, controller-to-controller communications, and computer-to-computer communications.

The New York and Boston telephone network failures had major adverse impacts on air traffic control operations. The New York outage, however, caused the most severe disruption of air traffic control services ever experienced by the FAA. Thousands of passengers were stranded in airports as hundreds of flights were either cancelled or delayed. In response to a request from the Subcommittee, the FAA provided a report documenting the occurrence of 114 major telecommunications outages during the one-year period ending August 1991. According to the report, FAA experienced an average of 8.7 outages per month; the outages lasted an average of 6.1 hours.

There are twenty enroute air traffic control facilities in America. These facilities control the flow of the nation's air traffic outside immediate airport control areas. Each relies on AT&T and other long distance carriers to provide dedicated voice and data communications. Few back-up telecommunications capabilities exist.

For years the FAA has been concerned about the increasing air traffic safety risk associated with the deployment of advanced communications technology. The FAA's primary concern involves the greater vulnerability to single point of failure outages stemming from the concentration of communications circuits brought about by the deployment of fiber optic technology.

In the fiber environment, back-up circuits are readily available at the central office facility providing communications. But FAA's concern over single point of failure vulnerability comes into play when nearly all dedicated circuits run through a single central office. If the central office were to be disabled, the air traffic control facilities it served would also be disabled. This condition presently exists at each of FAA's 20 enroute air

traffic control centers. However, some centers, like Boston's, have limited microwave back-up capabilities.

Under General Services Administration rules, the FAA was prohibited from seeking alternative carriers to provide the circuit diversity needed to reduce the vulnerability to single point of failure outages. However, in the aftermath of the New York outage at AT&T's 33 Thomas Street central office, FAA now has a mandate to develop, at a estimated cost of $1.6 Billion, private telecommunications network with the redundancy and diversity required to eliminate single point of failure outages.

The consequences suffered by the FAA during an outage, and the steps they have taken to ameliorate such consequences, dramatize the point that network failures have substantial impact on customers and the public in general. The failures experienced by local exchange carriers are accompanied by analogous, if not quite as dramatic, evidence of the impact of network failures. Whenever millions of people lose the ability to communicate, either locally or over long distances, the economy marks time until service is resumed. From the business community, we know that resumption of telephone service does not immediately result in the resumption of business as usual. There is a lag period as businesses in every sector take the necessary steps to ensure their former ability to communicate has been restored in full.

Clearly, when the telephone network suffers a disabling outage, whether in Newark, Washington, D.C., Pittsburgh, Los Angeles, San Francisco, or Boston the economy suffers. Among the most significant lessons embedded in each of the 1991 telephone network outages is that reliable, quality telephone service is not the automatic product of advanced technology. What all of this shows is that our telephone network is too critical a part of our economy and our society to leave to good intentions.

SCOPE AND METHODOLOGY OF THIS REPORT

Each respondent was asked a number of questions about their internal service quality standards. In response, companies often provided information from a variety of source documents, including industry standards, individual company standards, and published tariffs. Consequently, the analysis of companies' minimum installation, service, or repair standards sometimes required that comparative data be extracted from different sources. Because there is little, if any, disagreement within the industry on the definition of the specific service elements discussed in this report, the potential for data incomparability is small; however, the possibility cannot be categorically dismissed.

If companies have, in fact, cited different standards or performance measures in the various documents supporting their responses, this condition would logically lead to a question about the need for more universally accepted, industry-wide service quality standards. In fact, part of the rationale underlying this report is to demonstrate the extent to which companies may differ in their internal views of what constitutes acceptable service quality standards.

SECTION 2

DETAILED ANALYSIS OF LOCAL EXCHANGE CARRIER INTERNAL SERVICE QUALITY STANDARDS

Summary

This section contains general remarks about the industry's response to questions in each internal service quality category. Its purpose is to illustrate differences among the standards used by the various local exchange carriers (LECs) that comprise the industry. Companies with the highest and lowest standards have been identified for the purpose of illustrating the degree to which the industry differs on individual standards.

Section I: Questions Regarding Internal Standards

1. Trouble reports per 100 lines

With the exception of U S West, the LECs do not differentiate between residential and business service in establishing internal standards for maximum acceptable level of trouble reports. Two LECs, Nevada Bell and United, appear to calculate this measure using a different basis than the other companies, so a direct comparison seems impossible.

Highest: Wisconsin Bell (internal standard of 1.6)
U S West (internal standard of 1.8 for business)

Lowest: GTE (varies by state, generally 5-7 with a high of 10 in Indiana)
BellSouth (internal standard of 5.3)
New York Tel. (internal standard of 5.2)
Bell Atlantic (internal standard of 5.0)

2. Residential service intervals

a. Installation

Highest: Pacific Bell (meets 99% of 1-day requests)
Ameritech (meets requests of 1-3 days)

Lowest: New York Tel. (meets 70% of requests within 5 days)
United (meets requests within 3 to 5 days)

No standard: Bell Atlantic and New England Telephone rely on customer satisfaction surveys rather than internal standards.

b. Repair

Highest: U S West (80% of reports received before 1 p.m. are cleared the same business day) Southwestern Bell (meets requirements imposed by some PUCs to clear 95% of reports within 24 hours)

Lowest: New England Tel. (meets state standards of 63% within 24 hours in Rhode Island, 70% within 24 hours in Massachusetts)

No standard: Bell Atlantic
Pacific Bell
(New England Tel. and Southwestern Bell use state standards)

3. Installation and Repair of Other Services

The intervals discussed below are in working days for installation and in hours for repair, unless otherwise noted. Some carriers distinguish between initial installation and additional service, or between designed and non-designed services. For purposes of this summary, intervals relate to installation of initial, non-designed services.

The carriers generally establish standards relating to the quantity of circuits ordered; larger orders take longer, and each carrier has a cut-off beyond which the installation interval is negotiated with the customer. It should be noted that the characterization of a carrier as having the highest or the lowest standard for a particular service refers only to those companies that have standards. Companies may negotiate intervals that are higher or lower depending on customer needs.

a. Feature Groups B, C, and D

The carriers generally do not distinguish between these three feature groups in developing their internal installation and repair standards.

(i) Installation

Highest: Bell Atlantic (10 days)

Lowest: New England Tel., New York Tel., Pacific Bell (30 days)

(ii) Repair

Highest: U S West (2 hours in high density areas, hours elsewhere)
Ohio Bell (2.5 hours)

Lowest: GTE (24 hours)

No Standard: New England Telephone, New York Telephone

b. Voice grade

(i) Installation

Highest: BellSouth and Southwestern Bell (7 days)

Lowest: New York Telephone (17 days)
United (17 days in some states)

(ii) Repair

Highest: Ameritech (2.8 hours)
U S West (98% within 3 hours)

Lowest: GTE (6.3 hours)
Nevada Bell (same day if request received before noon, 12 p.m. next day if received after noon)

No Standard: Bell Atlantic, New England Telephone, New York Telephone

c. WATS/800

(i) Installation

Highest: Bell Atlantic (4 days); GTE, Nevada Bell, Pacific Bell (5 days if same wire center)

Lowest: New York Telephone (17 days)
New England Telephone (12 days)

(ii) Repair

Highest: Wisconsin Bell (2.4 hours)
Illinois Bell (2.5 hours)

Lowest: U S West (8 hours)
GTE (6 hours)

d. Metallic/Telegraph

(i) Installation

No standard: All other carriers

(ii) Repair

Highest: United (2 hours in some states)
Ameritech (2.8 hours)

Lowest: GTE (6.3 hours)

No standard: Bell Atlantic, New England Telephone, New York Telephone

g. DDS

(i) Installation

Highest: Bell Atlantic (9 days)
GTE (10 days)

Lowest: New York Telephone (31 days for terminations south of 59th St. in N.Y.C., 41 days elsewhere)

No standard: New England Telephone, Southwestern Bell (negotiated)

(ii) Repair

Highest: U S West (98% within 2 hours)
Illinois Bell (2.2 hours)

Lowest: Nevada Bell (same day if request received before noon, otherwise 12 p.m. next day)
GTE (6.3 hours)

No standard: Bell Atlantic, New England Telephone, New York Telephone

h. High Capacity

(i) Installation

Highest: U S West (11 days if equipment in place)
Bell Atlantic (For DS-1 equivalent, days if equipment in place; 7 days in selected areas. For DS3, 10 days)

Lowest: United (22 days in some states)
Nevada Bell (19 days)

No standard: BellSouth, New England Telephone, New York Telephone

(ii) Repair

Highest: United (1 hour in some states)
Indiana Bell (2 hours)
U S West (98% within 2 hours)

Lowest: Nevada Bell (same day if request received before noon, otherwise 12 p.m. next day)
GTE (6.3 hours)

i. DS1

(i) Installation

Highest: BellSouth (6-7 days if equipment available)
Southwestern Bell (8-10 days if equipment available)

Lowest: Pacific Bell (19 days)

No standard: Nevada Bell, New England Telephone, New York Telephone.

Standard not disclosed: United

(ii) Repair

Highest: United (1 hour in some states)
Indiana Bell and Ohio Bell (2 hours)
U S West (98% within 2 hours)

Lowest: Nevada Bell (same day if request received before noon, otherwise 12 p.m. next day)
GTE (6.3 hours)

No standard: Bell Atlantic, New England Telephone, New York Telephone

j. DS3

(i) Installation

Highest: Southwestern Bell (8-10 days if equipment)
Bell Atlantic (10 days if equipment)

Lowest: GTE (42 days)

No standard: Nevada Bell, New England Telephone, New York Telephone

Standard not disclosed: United

(ii) Repair

Highest: United (1 hour in some states)
Indiana Bell and Ohio Bell (2 hours)
U S West (98% within 3 hours)

Lowest: Nevada Bell (same day if request received before noon, otherwise 12 p.m. next day)
GTE (6.3 hours)

k. Switched Feature Group A

(i) Installation

Highest: BellSouth and Southwestern Bell (7 days)

Lowest: New England Telephone and New York Telephone (12 days)

(ii) Repair

Highest: U S West (2 hours in high density areas, hours elsewhere)
United (2 hours in some states)

Lowest: GTE (6.3 hours)
BellSouth (4.5 hours)

No standard: Bell Atlantic, New England Telephone, New York Telephone

l. Basic business service (1MB and equivalent)

(i) Installation

Highest: South Central Bell (2 days)
Other carriers with standards (2 days in some states)

Lowest: GTE, Southwestern Bell, United (5 days in some states)

No standard: Bell Atlantic, New England Telephone, New York Telephone, U S West

(ii) Repair

Highest: United and U S West (2 hours in some states)

Lowest: BellSouth, Nevada Bell (24 hours)

No standard: Bell Atlantic, GTE, New England Telephone, New York Telephone

m. PBX trunks

(i) Installation

Highest: BellSouth (2 days in most cases)
Ameritech (2 days in some states)

Lowest: Pacific Bell (12 days)
Nevada Bell (10 days)
Ameritech (10 days in some states)

No standard: Bell Atlantic, New England Telephone, New York Telephone, U S West

(ii) Repair

Highest: United (2 hours in some states)
Southwestern Bell (3.5 hours)

Lowest: BellSouth, Nevada Bell (24 hours)

No standard: Bell Atlantic, GTE, New England Telephone, New York Telephone

Standard not disclosed: US West

n. Centrex

(i) Installation

Highest: BellSouth (2 days in most cases)

Lowest: Ameritech (12 days)

No standard: Bell Atlantic, New England Telephone, New York Telephone, U S West

(ii) Repair

Highest: United (2 hours in some states)

Lowest: BellSouth and Nevada Bell (24 hours)

No standard: Bell Atlantic, GTE, New England Telephone, New York Telephone

Standard not disclosed: US West

o. 911 service

(i) Installation

Given the extreme variation in intervals, it appears that the carriers interpret this question differently.

Highest: GTE (3-5 days)
Southwestern Bell (9 days)
Pacific Bell (12 days)

Lowest: Ameritech (negotiated: 18-24 months)

No standard: All other carriers

(ii) Repair

All carriers state that they give 911 repairs top priority. Those that assign intervals range from 1 hour (Nevada Bell, United in some states) to less than three hours (United in remaining states, Ameritech).

4. Standards for noise, balance, loss, gain slope
The LECs all agree that these criteria are not applicable to telegraph grade service or digital services (DDS, DS1, DS3).

a. Residential and 1MB business

Highest: Pacific Bell and Nevada Bell (e.g., loss = -8 dB)

Lowest: New England Telephone and New York Telephone
(e.g., loss = -10 dB)

Standards not disclosed: United

b. Analog access services

Each of the regional Bell operating companies uses the same standards for these services, which comply with requirements set forth in Bellcore Technical references. GTE and United appear to use similar standards.

c. PBX trunks

The carriers that disclose their standards utilize similar benchmarks; Bell Atlantic appears to have the highest. GTE, United, and U S West do not disclose their standards.