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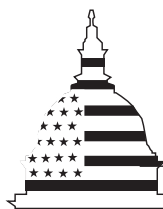
Report to the Special Committee on the  
Year 2000 Technology Problem, U.S.  
Senate

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September 1999

# YEAR 2000 COMPUTING CRISIS

## Readiness of the Telecommunications Industry



**G A O**

Accountability \* Integrity \* Reliability

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**United States General Accounting Office**  
Washington, D.C. 20548

**Accounting and Information  
Management Division**

B-283621

September 30, 1999

The Honorable Robert F. Bennett  
Chairman, Special Committee on the  
Year 2000 Technology Problem  
United States Senate

Dear Mr. Chairman:

The continuity of telecommunication services into the Year 2000 is critical to government, individuals, and major economic sectors both domestically and internationally. On August 3, 1999, we briefed your office on the results of our review of the reported Year 2000 readiness of the telecommunications industry. To identify the reported readiness, we analyzed reports issued by the Federal Communications Commission (FCC), individual carriers, and industry organizations. We did not independently assess whether individual telecommunications organizations are, in fact, Year 2000 ready. We conducted this work from February through July 1999 in accordance with generally accepted government auditing standards. This letter provides a high-level summary of our briefing. Our briefing slides are presented in appendix I.

Basic network services are unlikely to be immediately disrupted by Year 2000-related problems if networks are left unremediated according to experts who have been tracking and studying the telecommunications industry's Year 2000 risks, such as the Network Reliability and Interoperability Council (NRIC) and the International Telecommunication Union (ITU). However, telecommunications carriers could still experience problems with network maintenance, service billing, or operator interfaces, such as incorrect date or day-of-week displays.

Major U.S. public telecommunications carriers have reported making good progress in remediating their networks and supporting systems in order to prevent these types of Year 2000-related problems. However, the status of international carrier renovation efforts is less certain. According to NRIC, large domestic carriers expect to achieve Year 2000 compliance by the end of the third quarter of 1999, while medium and small carriers are projecting that they will achieve compliance through the fourth quarter of 1999. Domestic wireless providers report similar progress, with large providers

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estimating compliance by mid-1999 and medium and small carriers projecting compliance through the third quarter of 1999.

While information is available to NRIC on major carrier readiness, there is less information on the status of medium and small carriers. As a result, efforts are ongoing to collect more data on the readiness of these carriers. The FCC is completing a survey, the U.S. Telephone Association is polling its members, and the National Association of Regulatory Utility Commissioners is developing a state-by-state assessment.

The testing efforts that have been undertaken over the past year by domestic carriers further indicate that remediating networks will not experience major disruptions as a result of the Year 2000. Specifically, tests of local exchange carrier voice and data networking services as well as tests on the interoperability between local exchange carriers and interexchange carrier networks, reported by the Telco Forum and the Alliance for Telecommunications Industry Solutions (ATIS) respectively, resulted in few anomalies. None of the anomalies affected call processing within the network. Further, all Year 2000 anomalies were corrected and successfully retested before tests were concluded.

Internationally, NRIC reported in July 1999 that, while countries around the globe continue to make progress, with some exceptions, their efforts have not matched the pace of efforts in the United States and Canada. NRIC cautioned, however, that the information available for its assessment was limited and varied in its view from source to source. Also, the results of the assessment varied widely within each region. For example, while Asia Pacific is considered to be a region at high risk, some nations within that region, such as Australia, are considered to be at low risk. The interoperability testing of international gateway switches is still under way. However, the ITU reported as of July 1999 that testing was successfully completed on eight international gateway switches.<sup>1</sup>

In addition to renovating and testing telecommunications systems and networks, it is also vital that carriers and the industry plan for unexpected

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<sup>1</sup>It should be noted, however, that international testing is more limited in its minimum defined scope than testing conducted in North America. For example, only voice call processing is included in the minimum testing requirement defined by ITU; the testing of other network services such as data services is optional, as is stress testing. Also, information that is being made available on test results is much less detailed than the documentation on the results of North American test efforts.

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failures, such as power losses. According to Telco Year 2000 Forum representatives and information posted by carriers on their web sites, telecommunications carriers are updating their existing contingency plans to reflect Year 2000-related contingencies. Details on these plans, such as when they will be completed, are not yet available. For example, out of nine major carriers' SEC filings we reviewed in May 1999, five did not list dates by which their Year 2000 contingency plans would be complete. NRIC is assessing the progress of business continuity and contingency planning efforts.

We are sending copies of this report to the Honorable Christopher Dodd, Vice Chairman, Senate Special Committee on the Year 2000 Technology Problem, and the Honorable Stephen Horn, Chairman, and Representative Jim Turner, Ranking Minority Member, Subcommittee on Government Management, Information and Technology, House Committee on Government Reform. We are also sending copies to the Honorable Jacob J. Lew, Director of the Office of Management and Budget. Copies will be made available to others upon request.

If you have any questions, please contact me or Kevin Conway, Assistant Director, at 202-512-6240 or by e-mail at [brockj.aimd@gao.gov](mailto:brockj.aimd@gao.gov) or [conwayk.aimd@gao.gov](mailto:conwayk.aimd@gao.gov). Other major contributors to this work were Mary Marshall, Sanford Reigle, Philip Rutar, and James Weidner.

Sincerely yours,

A handwritten signature in black ink, appearing to read 'J. Brock, Jr.', with a stylized, flowing script.

Jack L. Brock, Jr.  
Director, Governmentwide and  
Defense Information Systems

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# Briefing to the Senate Special Committee on the Year 2000 Technology Problem

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Accounting and Information  
Management Division

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## **Year 2000 Readiness of the Telecommunications Industry**

Presented to

U.S. Senate Special Committee on the  
Year 2000 Technology Problem

August 3, 1999

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## Agenda

- Objectives, scope, and methodology
- Background
- Reported Year 2000 readiness status
  - Wireline services
  - Wireless services
  - International services
- Industry test activities and results
- Contingency planning activities
- Observations



## Objectives, Scope, and Methodology

Our objectives were to determine the reported Year 2000 readiness status of major carriers; to evaluate results of industry testing; and to identify contingency planning actions and strategies underway.

To meet our objectives, we reviewed

- The Federal Communications Commission's Year 2000 Report on the Communications Sector;
- Reports and working papers of the Network Reliability and Interoperability Council (NRIC);
- Reports on industry Year 2000 testing activities;
- Planning, status and other documentation obtained from carrier web sites; and
- Year 2000 disclosures contained within the quarterly 10-Q and annual 10-K statements of major carriers to the Securities and Exchange Commission (SEC).





## Objectives, Scope, and Methodology (cont'd)

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We also contacted officials at the

- Federal Communications Commission (FCC);
- National Communications System (NCS); and
- Telecommunications associations, including
  - Alliance for Telecommunications Industry Solutions (ATIS),
  - Cellular Telecommunications Industry Association (CTIA), and
  - International Telecommunication Union (ITU).

We conducted our work between February 1999 and July 1999 in accordance with generally accepted government auditing standards.



## Background

Telecommunications services are critically important to

- the economy
- infrastructure operations, including power
- government operations
- safety and well-being of citizens



## Background (cont'd)

Year 2000 poses a range of risks to telecommunications services if left unremediated. While basic call processing may be unaffected, the risks posed include:

- Limited or blocked service due to degraded network operations,
- Problems with service billing,
- Problems with network maintenance capabilities because maintenance activities do not start, or
- Problems with network operator interfaces, such as incorrect date or day-of-week displays.

Also, features available on some customer premises equipment, such as date-related call routing, may fail.



## Background (cont'd)

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There have been significant efforts undertaken to raise Year 2000 awareness.

- Federal efforts
  - President's Council on Year 2000 Conversion
  - Federal Communications Commission (FCC)
  - Network Reliability and Interoperability Council (NRIC)
- Industry efforts
  - Carrier remediation efforts
  - Carrier outreach



## **Wireline, Wireless, and International Carrier Readiness**



## Readiness of Wireline Services

- Significant carrier remediation is underway. Major carriers estimate they will spend more than \$2.8B to upgrade networks and supporting systems.
- According to NRIC, most US carriers report that they expect to complete critical remediation actions soon.
  - Large carriers projecting September 1999 compliance
  - Medium and small carriers projecting completion through the 4th quarter, 1999
- Carriers have completed extensive interoperability testing which disclose no service-affecting problems.
- Limited information is available on small carrier readiness.



## Readiness of Wireless Services

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- Large wireless carriers plan to be compliant by mid-1999; medium and small wireless carriers projecting dates through the 3rd quarter.
- Wireless-wireline interoperability testing completed in February 1999; no service-affecting problems disclosed.



## Readiness of International Services

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International Y2K status is uncertain

- Limited information is available on status of telecommunications carriers outside of the U.S.

In their assessment of International readiness assessment to date, experts caution that disruptions could occur, but the impact will likely be limited in both scope and effect.

- ITU, July 1999
- NRIC, July 1999





## Readiness of International Services (cont'd)

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International Telecommunication Union (ITU), July 1999

- Material disruption to network call connectivity is unlikely; there is little date sensitive information passed across network interfaces in real time.
- There may be difficulties in connecting to some telecommunications providers, and there may be some effects due to re-routing of network traffic.
- Major telecommunications companies and their partners are unlikely to experience significant Y2K-related service disruption.



## Readiness of International Services (cont'd)

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### NRIC Assessment of International Readiness

July 1999

- Risk of call failure between North America and other regions is low.
- Potential impacts include call setup delay due to congestion in some foreign networks, and service quality degradation over time due to non-compliant network components.
- Unpredictable infrastructure failures (e.g., power) could adversely impact networks.



## Readiness of International Services (cont'd)

- NRIC Assessment of International Readiness

July 1999 (219 Countries)

- Used six sources of global risk data that furnished information to NRIC on an anonymous reporting basis
- Defined three levels of risk -- low, medium, and high -- based on perception of risk
- NRIC recognized limitations of data; information is inconsistent from report to report and country to country



## Readiness of International Services (cont'd)

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### NRIC Assessment of International Readiness

#### Result by Region

- High Risk Regions:
  - Central and South America (including Mexico)
  - Indian sub-continent
  - Sub-Sahara Africa
  - Eastern Europe
  - Middle East and North Africa (excluding Israel)
  - Asia Pacific



## **Value, Limitations, and Status of Industry Year 2000 Testing**



## Industry Year 2000 Testing

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### Value

- Interoperability testing provides some confidence in the network's ability to operate properly and accurately exchange information in the Year 2000.
- Inter-carrier testing generates information enabling potentially affected parties to better understand risks posed by the Year 2000 problem.



## Industry Year 2000 Testing (cont'd)

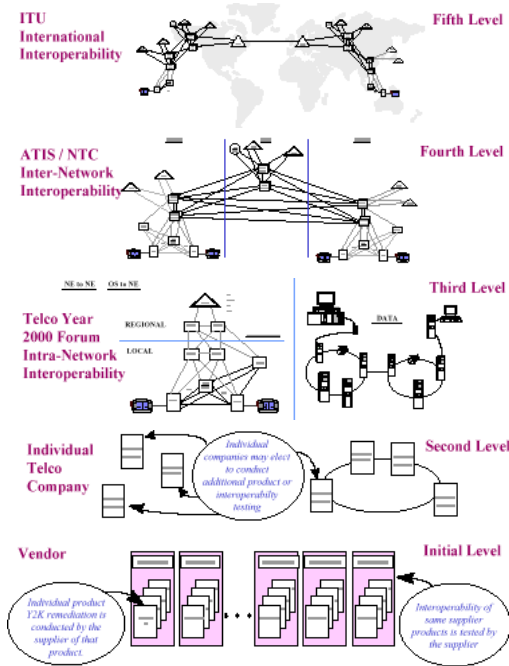
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### Limitations

- Inherent complexities and network interdependencies preclude industry's ability to do 100% testing for Year 2000 readiness.
- Not possible to fully recreate the operational public network in an "off-line" lab environment for testing purposes.
- As a result, Year 2000 interoperability can only be tested in pieces within a lab environment, and can be fully assured compliant only if all pieces interoperate on January 1, 2000.



## Levels of Year 2000 Testing in Telecommunications



SOURCE: Telco Forum

- Industry is using a complementary tiered approach to Year 2000 testing.
  - Telco Year 2000 Forum testing of local exchange carrier (LEC) network services
  - Alliance for Telecommunications Industry Solutions (ATIS) testing of interoperability between LEC and interexchange carrier (IXC) networks
  - Testing of international gateway switches coordinated by the International Telecommunication Union (ITU)

This inter-carrier testing is in addition to vendor product testing, and independent carrier testing.





## Industry Year 2000 Testing (cont'd)

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### Telco Year 2000 Forum Testing Scope

- Local exchange carrier's portion of network
  - Services and features tested
    - Basic, enhanced, and intelligent network services
    - Data transport
    - Management systems
    - Emergency services
  - Interoperability of elements supporting these services and features



## Industry Year 2000 Testing (cont'd)

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### Telco Year 2000 Forum Testing Results

- Testing conducted from July 1998 to December 1998; 1,914 test cases executed
  - Reportedly less than 2% of tests generated findings or anomalies
    - Only six Y2K-related anomalies encountered
    - All six fixed by vendors, successfully re-tested
    - None of the anomalies were service-affecting



## Industry Year 2000 Testing (cont'd)

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### ATIS Network Signaling System Year 2000 Interoperability Testing Scope

- Testing checked inter-network interoperability of different local and long-distance service providers' equipment in a Y2K environment
  - Tests focused on voice call processing events
    - Mass calling events and potential congestion
    - Cross-network services call completion (e.g., calling card validation, toll-free service)
    - Government Emergency Telecommunications Service (GETS)
-



## Industry Year 2000 Testing (cont'd)

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### ATIS Network Signaling System Year 2000 Interoperability Testing Results

- Testing conducted on remediated infrastructure from January 1999 to February 1999
- There were reportedly no Y2K-related anomalies encountered during testing



## Industry Year 2000 Testing (cont'd)

### ATIS Financial Network Service Year 2000 Testing Scope

- Testing to verify functioning of interconnected data communications services (frame relay networks) in a Y2K environment
- Tests focused on network services supporting financial industry transaction processing
  - Credit card authorization
  - Clearing and settlement process



## Industry Year 2000 Testing (cont'd)

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### ATIS Financial Network Service Year 2000 Testing Results

- Testing conducted on remediated infrastructure during April 1999
- There were reportedly no Y2K-related anomalies encountered during testing



## Industry Year 2000 Testing (cont'd)

### Cellular Industry Year 2000 Interoperability Testing Scope

- The Cellular Telecommunications Industry Association (CTIA), major cellular carriers, and equipment suppliers participated with ATIS network testing.
- Testing addressed
  - wireless to wireline testing,
  - wireline to wireless testing,
  - wireless to wireless testing, and
  - emergency 911 calling.



## Industry Year 2000 Testing (cont'd)

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### Cellular Industry Year 2000 Interoperability Testing Results

- Of more than 825 tests executed, there were 75 test anomalies (e.g., facility unavailable, or an improper Enhanced 911 services translation, etc.).
- There were reportedly no Y2K-related anomalies encountered during testing.
- All anomalies encountered were addressed, re-tested, and the test event was subsequently successfully completed.





## Industry Year 2000 Testing (cont'd)

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### International testing scope

- ITU has been coordinating interoperability and testing activities between major international carriers.
- ITU trying to assure all international gateway switch types are tested through bilateral agreements between participating network operators.
- Minimum test requirement covers International Direct Dialed (IDD) voice call set-up, processing, and termination over the course of critical rollover dates.



## Industry Year 2000 Testing (cont'd)

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### International testing (cont'd)

- ITU's minimum testing is limited in scope
    - Applies to voice call processing only; other network services or conditions (e.g., data services or network stress testing) may be tested at discretion of parties.
    - As a result, there will be no assurance of uniform testing of a full range of services during all bilateral testing efforts.
  - Test results are not readily available
    - Only limited results are publicly available.
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## Industry Year 2000 Testing (cont'd)

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### International testing (cont'd)

- There are 19 uniquely configured switches sold by seven manufacturers used as international gateway switches.
- The ITU has expressed concern about the ability to test all 19 gateway switch types.
- International testing is continuing.



## Industry Year 2000 Testing (cont'd)

Reported International testing results to date are encouraging

- The ITU is reporting that as of July 1999, testing was successfully completed on eight International Gateway Switches available from six vendors:

VENDOR	SWITCH
Alcatel	E10, S12
Ericsson	AXE10
Lucent	4ESS, 5ESS
NEC	Neax 61E
NORTEL	DMS 300
Siemens	EWSD



## Industry Year 2000 Testing (cont'd)

Although limited test results are available to the public from the ITU, some carriers are making reports available. For example, AT&T posted five reports of successful international testing:

TEST PARTNER	SERVICES TESTED	DATE COMPLETED
Hong Kong Telecom	Voice Services	February 1999
Telkom South Africa	Voice Services	April 1999
Singapore Telecom	Frame Relay Data Services	April 1999
Joint Interoperability Testing		
Cross-Border Team <sup>1</sup>	Voice Services	February 1999
Canadian Telecommunications		
Industry Forum (CTIF) <sup>2</sup>	Voice Services, Wireline, Wireless, Toll Free, and Inbound/Outbound International	February 1999

NOTE: 1. Included AT&T, AT&T Canada, and Stentor.

2. Included AT&T, Sprint, and Canadian telecommunications providers.



## **Contingency Planning**



## Contingency Planning

FCC: “There is no assurance against random Year 2000 disruptions, despite the thorough and deliberate remediation efforts any entity may undertake.”

Contingency planning should be undertaken by:

- Providers of telecommunications services, and
- Users of telecommunications services.



## Contingency Planning (cont'd)

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Limited information available on status of contingency planning.

- FCC reported both wireline and wireless carriers vague about when Y2K contingency plans would be completed.
- FCC concerns echoed in GAO's analysis of SEC 10-Q and 10-K public disclosures; of nine filings reviewed, five did not give completion dates for contingency plans.





## Contingency Planning (cont'd)

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- Carriers are updating existing plans to reflect Year 2000-related contingencies.
  - Telco Year 2000 Forum is addressing contingency planning issue with members through information exchange.
  - NRIC is actively encouraging contingency planning:
    - Co-sponsored April 1999 workshop with US Telephone Association (USTA)
    - Furnished detailed information on how to perform contingency planning at its web site for users and carriers ([www.nric.org](http://www.nric.org))
-



## Contingency Planning (cont'd)

Cross-industry plans are now taking shape, nationally and internationally. For example,

- Cooperative Industry/Government information exchanges are being planned and implemented under NCS auspices (National Coordination Center) in the U.S.
  - Status and trouble reporting on carrier networks and major network elements.
  - Monitoring major date event horizons.
  - Using of both positive reporting and exception reporting.
  - Sharing network status information with President's Council's Information Coordination Center.



## Contingency Planning (cont'd)

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Cross-industry plans are taking shape (cont'd).

- International “follow-the-sun” strategy being pursued under ITU auspices.
  - Y2K anomaly and outage tracking during key date transitions.
  - Beginning with the date change in Asia-Pacific region, which contains over 90% of switching and transmission systems commonly used around the world.
  - Follow a web-based reporting process, with positive reports submitted at prescribed intervals, and exception reports as they arise.



## Observations

- Extensive efforts taken in the U.S. to remediate and test network infrastructure minimize likelihood of widespread service outages
- Test results support conclusion that remediated infrastructure will encounter few, if any, Year 2000-related disruptions
- Contingency planning actions remain important to respond in timely manner to unforeseen circumstances



## Observations (cont'd)

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- Two areas of concern remain
  - Limited information available on status of small and medium domestic carriers, wireline and wireless
  - Limited information available on status of international telecommunications carrier efforts and test results

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