



NETWORK RELIABILITY STEERING COMMITTEE 2008-2009 BIENNIAL REPORT

April 2010



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ATIS-0100029, *NRSC 2008-2009 Biennial Report*

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TO: Stakeholders of the Nation's Public Communications Networks



Network reliability is a discernible issue at both the Federal and State levels and its visibility has increased with the current Administrations. It is clear that public communication networks are vital to the nation's social well-being, public safety, economic stability, prosperity, and national security. As well, Federal and State governments continually monitor network outages, network reliability, and the overall availability of critical network infrastructure. Current issues such as emergency communications (e.g., Enhanced 911 or E911), control networks (e.g., Signaling System 7 or SS7), network resiliency, and emergency preparedness are major focus areas that affect

communications service providers and equipment vendors.

Throughout its history, the Network Reliability Steering Committee (NRSC) has focused on various metrics - including outage frequency and outage impact - to ensure that the nation's public networks maintain their vitality. The NRSC also has begun transitioning its initiatives to embrace today's rapidly changing technical and operational environments and the industry shift towards increased broadband and wireless services.

This Biennial Report reviews observed industry network reliability trends and associated recommendations for the years of 2008 and 2009. Within this report, a multitude of studies are presented in which representatives from NRSC member companies partnered to address an observed trend or an identified industry need. The resulting analysis and guidance includes insights as to the major cause(s) of a concern and the specific, actionable countermeasures the industry believes would effectively address the issue.

As with our distinguished predecessors, we recognize the industry's vital role in serving the nation's needs, its commitment to ensuring highly reliable networks, and its willingness to work together for the common good of network reliability despite a very competitive environment. In the coming year, the NRSC will continue in its collaborative mission and activities to be a model for others around the world and seek opportunities to improve this approach. As well, the NRSC will maintain its efforts to efficiently utilize membership resources, to respond to identified industry issues or needs in a timely fashion, to sustain an environment conducive to open communication, and to support NRSC driven initiatives.

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EXECUTIVE SUMMARY

About the NRSC

The Alliance for Telecommunications Industry Solutions' (ATIS) Network Reliability Steering Committee (NRSC) addresses network reliability improvement opportunities of service providers and vendors, in a noncompetitive environment, and allows participants to develop standards, technical requirements, technical reports, bulletins, best practices, and biennial reports on the health of the nation's telecommunications networks. The NRSC also coordinates industry improvements in network reliability through outage analysis. The current mission statement of the NRSC is as follows:

The NRSC strives to improve network reliability by providing timely consensus-based technical and operational expert guidance to all segments of the public communications industry.¹

The NRSC is deeply committed to intra-industry collaboration, which is essential in ensuring that the industry's expertise is available to monitor and address critical trends in the reliability of our nation's public communications networks. This NRSC addresses these critical trends by:

- ◆ Identifying potential network reliability issues through an opportunity evaluation process;
- ◆ Establishing teams to work specific reliability issues;
- ◆ Conducting special studies to develop industry recommendations and/or Best Practices;
- ◆ Providing industry feedback to the Federal Communications Commission (FCC) on network reliability and on the FCC's Network Outage Reporting System (NORS) and Disaster Information Reporting System (DIRS); and
- ◆ Serving as a public educational resource on network outage trends and the industry's ongoing efforts to resolve network reliability concerns.



Figure 1: November 2009 NRSC Full Committee Meeting, Washington, D.C.²

¹ Mission Statement of the NRSC, < <http://www.atis.org/nrsc/index.asp> >.

² From left to right: Percy Kimbrough (AT&T), Norris Smith (Nokia-Siemens Networks, representing Century Link), Mark Adams (Cox Communications), Sharon Cary (Metro PCS), Jim Runyon (Bell Labs-Alcatel Lucent), Stacy Hartman (Qwest), Jay Naillon (T-Mobile), Harold Salters (T-Mobile), Gail Linnell (Telcordia Technologies), Rose Fiala (T-Mobile), Karl Rauscher

As a trusted expert, the NRSC addresses network reliability improvement opportunities in an open, noncompetitive environment. The NRSC advises the communications industry through the development and issuance of standards, technical requirements, technical reports, bulletins, best practices, and biennial reports. This biennial report covers the period of 2008 and 2009. A brief summary of the history of the NRSC is provided in the *Introduction* of this report (pages 6-9).

Changing Regulatory Environment and Changing Industry

In 2009, the communications industry saw a number of new initiatives that may have impacts on network reliability and outages. For instance, the FCC Advisory Committee Communications, Security, Reliability, and Interoperability Council (CSRIC) was re-chartered in 2009 to provide recommendations to the FCC to ensure – among other things – optimal security and reliability of communications systems, including telecommunications, media, and public safety³.

Significant national political attention was focused on broadband deployment. The American Recovery and Reinvestment Act (ARRA) of 2009, which was signed into law on February 17, 2009, provided billions of dollars in funding for initiatives to accelerate broadband deployment in unserved, underserved, and rural areas to create jobs and provide other significant public benefits. The ARRA required the FCC to develop a National Broadband Plan by February 17, 2010. The FCC opened a rulemaking to solicit input on the plan and issued a series of public notices seeking “tailored comments” on issues such as:

- ◆ Broadband-related public safety, homeland security, and cybersecurity issues;
- ◆ The transition from a circuit-switched network to an all-IP network;
- ◆ The potential establishment of a clearinghouse for broadband-related best practices; and
- ◆ How broadband can be used for telework (including its use during pandemics and natural disasters).

Further, on December 16, 2009, the FCC published the National Broadband Plan Policy Framework which identified a data gap with the current framework to improve data collection across the Commission⁴. How this data collection gap is addressed is of great interest to the communications industry

There were also significant changes to the FCC during 2009. The year saw the appointment of a new Chairman and two new Commissioners. The new leadership tasked the FCC with reviews of key internal processes, including a review its data collection processes. A review of the FCC’s preparedness for major public emergencies was also undertaken.

As the aforementioned activities move forward, the NRSC is poised to provide significant contributions and expert industry guidance regarding critical infrastructure network reliability issues.

(Bell Labs-Alcatel Lucent), Robin Howard (Verizon), Rick Griepentrog (AT&T), Lisa Siard (Ericsson representing Sprint), Mark Peay (Cox Communications), Spilios Makris (Telcordia Technologies), Chris Oberg (Verizon Wireless).

³ FCC Public Safety and Homeland Security Bureau CSRIC home page < <http://www.fcc.gov/pshs/advisory/csrc/> >.

⁴ FCC National Broadband Plan Policy Framework
< http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-295259A1.pdf >.

National Shift to Broadband and Wireless

Over the past several years, the lines between wireline, wireless, cable, and satellite services have become increasingly blurred as services continue to converge. Moreover, consumers have become increasingly dependent on the availability and flexibility of communication networks to stay connected to colleagues, friends, and family regardless of their location. Online web services, streaming video, text and instant messaging, and social networking sites have begun to overshadow traditional telephone services and have resulted in the explosive growth of broadband and wireless services across the industry. Yet, despite the emergence of new applications and services and the continued evolution of the network, the underlying legacy network infrastructure continues to be a vital part of communication networks and will remain so well into the future.



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New consumer demands for flexibility and mobility have increased industry and governmental concerns regarding issues such as emergency communications (e.g., E911), control networks (e.g., SS7), network resiliency, and disaster outage preparation. These major focus areas and issues affect not only communications service providers, but also equipment vendors. As the public shifts their expectations, so must the industry as it addresses these concerns. As society and technology move forward, industry must build upon its past success and recognize that reliability remains as vitally important to the legacy network as it is to existing and emerging next generation networks. The lessons learned and the paths taken to resolve reliability issues must be documented, so that they can be applied to avoid or overcome future challenges.

The NRSC plays a critical role as industry mentors and acts as an archive of the past, as well as the future of reliability of communication networks, regardless of the evolving technologies or regulatory environment.

Highlights

During the 2008 to 2009 timeframe, the NRSC was involved in various stages of eleven special studies and NRSC initiatives, studies, and filings. Along with the special study teams, the NRSC also formed two standing Subcommittees. These groups provided informative status reports during the NRSC's quarterly public meetings. The covered topics included:

- ◆ Special Studies:
 - DS3 Outage Study Subteam
 - E911 Outages Subteam
 - Wireless Outages Subteam
 - Wireline Outages Subteam

- ◆ NRSC Initiatives, Studies, and Filings:
 - NRSC Restructuring
 - NRSC comments on Data Collection, Processing, Analysis and Dissemination to the Office of Strategic Planning and Policy Analysis
 - NRSC comments on NBP Public Notice #3 for GN Dockets 09-47, 09-51, and 09-137 for Telework
- ◆ Subcommittees:
 - Best Practice Subcommittee
 - Pandemic Special Study
 - Outage Reporting Advisory Subcommittee (NORS⁵ and DIRS⁶)
 - DIRS User Manual Review
 - DIRS Industry Test Case
 - NORS User Manual Review
 - Recommendations on NORS Descriptions of Root Cause, Direct Cause, and Contributing Factors

As a result of these studies:

- ◆ A Pandemic Preparation Checklist was developed and made available to the industry free of charge.
- ◆ A White Paper on State Outage Reporting was developed.
- ◆ 6 NRSC Bulletins were posted.
- ◆ 19 new Best Practices were developed and posted.
- ◆ Over 50 existing Best Practices were highlighted for industry attention.
- ◆ Six study teams gave over 45 analysis reports to the industry during quarterly public meetings.

This report provides a statement on the health of the nation's public networks that represents the expert industry collaborative analysis, specific actionable guidance for improving network reliability, and context for understanding issues that affect the NRSC's ability to continue to be an effective force in promoting high reliability.

⁵ Network Outage Reporting System.

⁶ Disaster Information Reporting System.

Network Reliability Steering Committee

2008-2009 Biennial Report

INTRODUCTION

History of the NRSC

Several Catastrophic Outage Events

From 1988 through the early 1990s, the United States communications industry experienced several network outages that impacted a large number of subscribers. Beginning with the “Great Hinsdale Fire” of 1988 through several Signaling Transfer Point (STP) outages in 1991, the nation increased its focus on the reliability of its public networks.

The Network Reliability Council is Established

In November 1991, the Network Reliability Council (NRC) was established by the FCC to bring together telecommunications industry leaders and telecommunications experts from academic and consumer organizations to explore and recommend measures to enhance network reliability.⁷

The FCC Mandates Outage Reporting

In April 1992, the FCC required the reporting of outages by exchange and interexchange service providers. In order for an event to be reportable, it had to last 30 minutes or more and potentially affect at least 50,000 customers.⁸ The industry-led NRC afterward recommended that the reporting criteria be lowered to 30,000 customers. Another NRC recommendation was to report all outages affecting 911 emergency call centers, major airports, nuclear power plants, major military installations and key government facilities. Carriers began reporting outage events using the lowered threshold criteria in June 1992. Because of the sensitive nature of some of the outage events (e.g., military installations), in May 1993, the National Communications System (NCS) accepted the task of reporting such outages to the FCC. In August 1994, FCC outage reporting regulations were revised.⁹ Most of the changes had already been accommodated for by the industry in their voluntary reporting of events that began in June 1992. Other major changes included the reporting of fire-related incidents potentially affecting 1,000 or more lines, and the requirement that final reports include root-cause analysis and a review of how Best Practices (BPs) could have prevented or mitigated the impact of such events.

⁷ Daugherty, H.T., Klein, W. J., *U.S. Network Reliability Issues and Major Outage Performance*, IEEE Computers and Communications, 1995. Proceedings., IEEE Symposium on Volume , Issue , 27-29 Jun 1995, Pages: 114 -119.

⁸ *FCC Report and Order, CC Docket No. 91-273*, Federal Communications Commission, Washington, D.C., adopted February 13, 1992, released February 27, 1992.

⁹ *FCC Second Report and Order, CC Docket No. 91-273*, Federal Communications Commission, Washington, D.C., adopted July 14, 1994, released August 1, 1994.

The NRC Recommends the Industry Formation of the NRSC

In its 1993 *Report to the Nation*, the NRC¹⁰ recommended formation of the Network Reliability Steering Committee (NRSC), under the auspices of the Alliance for Telecommunications Industry Solutions (ATIS), for the purpose of monitoring network reliability on an ongoing basis. As defined at that time, the NRSC's mission was to "analyze the industry's reporting of network outages to identify trends, distribute the results of its findings to industry, and where applicable, refer matters to appropriate industry forums for further resolution, in order to help ensure a continued high level of network reliability."¹¹

The FCC Makes Changes in Outage Reporting

In 2005, new FCC regulations regarding outage reporting were put in force.¹² These new mandates can be summarized as having three major aspects: (a) expansion regarding who was required to report; (b) new reporting thresholds, timeframes, and concepts; and (c) limited access to the outage data due to confidential protection under the Freedom of Information Act (FOIA). Regarding the reporting expansion, in addition to wireline providers, the new requirements included wireless, satellite, paging, and cable telephony service providers. Changes in the thresholds and concepts include events that affect 900,000 user-minutes and events impacting DS3 facilities. Because of the new criteria, the overall number of reportable events substantially increased. Limited access to the total outage data reported to the FCC under the new regulations has seen the NRSC adapting analysis strategies using a reduced, albeit statistically significant, data set voluntarily contributed by NRSC member companies.

Factors Affecting Network Reliability

The NRSC has historically recognized that identifying and understanding the underlying causes of outage trends are an important part of learning from past experiences and preparing for future challenges as networks evolve. When evaluating negative or positive trends that affect network reliability, having standard analytical methodologies and trending schemas has proven to be a solid link to the past, while providing a bridge into the future. The NRSC membership works to identify the direct and root cause(s) associated with particular trends, evaluates these against existing Best Practices, or appropriately develops new or modifies existing Best Practices. Additionally, members appropriately develop new or modify existing cause code categories, review other completed studies, review internal company outage data, determine contributing factors, and review associated federal and state regulations.

Figure 2 illustrates the basic building blocks of communications infrastructure and is utilized by the NRSC as a standard methodology. While each of the ingredients is essential for the operation of communication networks, each ingredient includes intrinsic vulnerabilities that must be proactively prepared for and addressed.

¹⁰ Since the subsequent re-charters under the name "Network Reliability and Interoperability Council (NRIC)", this first Council is sometimes referred to as "NRC-1".

¹¹ *Network Reliability: A Report to the Nation*, Network Reliability Council, June 1993. Section I, p. 6.

¹² *Report and Order and Further Notice of Proposed Rulemaking*, ET Docket No. 04-35, adopted August 4, 2004, released August 19, 2004; *Errata*, ET Docket No. 04-35, released September 3, 2004.

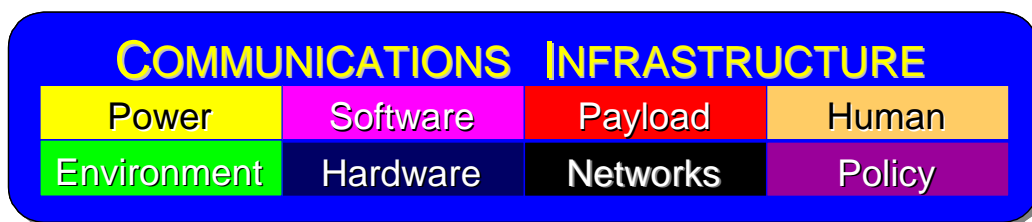


Figure 2: Ingredient Framework for Communications Infrastructure¹³

This framework is helpful in systematically reviewing the network elements and identifying possible influences (either negative or positive) on national network outage trends. Table 1, Systematic Review of Network Reliability Influencers – Examples, summarizes examples of these factors for each ingredient:

¹³ Rauscher, Karl. F., *Protecting Communications Infrastructure*, Bell Labs Technical Journal Homeland Security Special Issue, Volume 9, Number 2, 2004; Proceedings of 2001 IEEE Communications Society Technical Committee Communications Quality & Reliability (CQR) International Workshop < <http://www.comsoc.org/~cqr> >; ATIS-0100523.2007, *ATIS Telecom Glossary* 2007, < <http://www.atis.org/glossary/definition.aspx?id=8347> >.

Table 1: Systematic Review of Network Reliability Influencers - Examples¹⁴

Ingredient	Possible Influencers (positive or negative)
Power	<i>increasing dependence on power capabilities for distributed remotes</i> <i>increased reliance on AC, which has more components</i> <i>decreasing number of subject matter experts</i> <i>increased back-up power need for cooling during commercial power failures</i>
Environment	<i>increased concentration of hardware packaging increases cooling challenges</i> <i>increased physical security affects access</i> <i>increased distributed mesh network topology potentially reduces significance of any single site</i>
Hardware	<i>increasing use of common hardware across equipment suppliers</i> <i>increased outsourcing by equipment suppliers</i> <i>increased capacity of single elements</i> <i>increased rate of technology turnover</i>
Software	<i>increased outsourcing by equipment suppliers and network operators</i> <i>increased use of artificial intelligence</i> <i>increased deployment of service-oriented architectures</i> <i>increased presence of worms and viruses</i>
Networks	<i>decreasing dependence on silicon for control (shift to software)</i> <i>decreasing prevalence of deterministic availability and path control</i> <i>increased complexity of interconnections with other entities</i> <i>increasing exposure to wireless interfaces</i>
Payload	<i>increasing diversity of services running on networks (video, gaming ,etc.)</i> <i>increasing variation in traffic levels due to service types</i> <i>decreased segregation of traffic with control messages</i> <i>increased use of "always on" sessions</i>
Policy	<i>increased number of connected network entities and elements</i> <i>increased number of relevant standards</i> <i>increased global divergence on the expected role of regulation</i> <i>decreasing preparation for turn up of new capabilities</i>
Human	<i>decreased time allotted for learning curve advances for new technologies</i> <i>increasingly competitive environment increases overall workloads</i> <i>increasing electronic authentication dependence to support virtual worksites</i> <i>decreased social cohesion with proliferation virtual work teams</i>

HEALTH OF THE NATION'S PUBLIC NETWORKS

The members of the NRSC have a historic and unique perspective on network reliability. Nowhere else in the world have subject matter experts from competing companies gathered regularly for the purpose of analyzing network outage data, developing consensus determinations about the data analyzed, and offering expert guidance on actionable countermeasures to improve network reliability. Through this collaboration, high reliability for the nation's public networks is promoted, expert guidance is offered, and an ongoing accurate view of the health of networks is provided at a national level. The NRSC continues to believe that the reliability of the nation's public network is the best in the world.

¹⁴ *Systematic Assessment of NGN Vulnerabilities*, Appendix G, NSTAC NGN Task Force Report, March 2006.

Introduction to Special Studies

The NRSC had eleven special study teams and initiatives during 2008-2009. The purpose of these special studies and initiatives was to bring industry experts' attention to network reliability issues or concerns, to determine the underlying cause/s behind national trends, to determine the most effective best practices or other means for preventing and ameliorating the impact of such events, and to provide industry level guidance regarding the issue or concern. The keys to the success of these teams are open dialogue, meaningful information sharing, and collaboration among the industry participants on potentially sensitive issues. To protect the interests of participating companies and protect their sensitive and critical infrastructure data, a Non-Disclosure Agreement (NDA) between the NRSC member companies is in place.

The special studies presented in the following pages address the areas of DS3 outages, E911 outages, wireless outages, wireline outages, NRSC restructuring, state outage reporting, notice of proposed rulemaking initiative, a checklist of guidelines for pandemic preparation, NRSC FCC comment filings, and Outage Reporting Advisory Subcommittee (ORAS) updates. The highlighted studies also represent the thousands of hours that NRSC members have contributed to the painstaking scrutiny, documenting, and publishing of publically available findings and results. These efforts are instrumental in providing expert industry guidance and ensuring high network reliability in the United States.

DS3 Outage Subteam

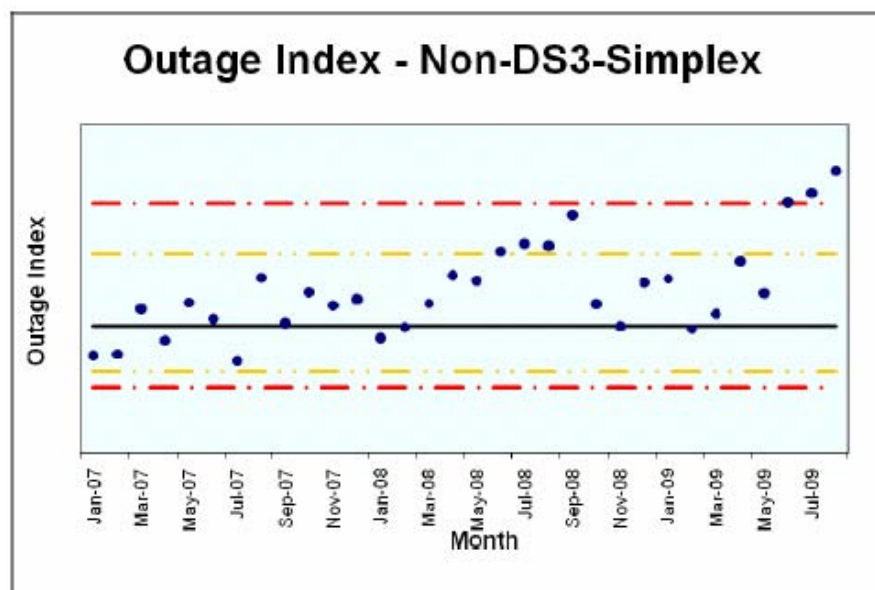


Figure 3: Frequency of Outage for Non-DS3-Simplex Cause Category

Background

In order to address FCC concern over the increasing trend in the number of DS3 outage reports, the NRSC created the DS3 Outage Study Subteam in December of 2007.

Methodology of the Special Study

Eight service providers and one vendor participated in this special study. As part of their efforts, the study participants examined the root and subcategory causes for DS3 outages, the outage duration, the magnitude of the outage, and the growth of DS3s in the network for the period of January 2005 to October 2007. Refinement of the outage data was accomplished by studying outage data by the identification and use of new cause subcategories. The DS3 Outage team findings were established and industry recommendations were identified as described below.

Findings and Guidance of the Special Study

The intense analysis resulted in the following significant findings and recommendations:

- ◆ DS3 outages increased at a rate of 3.2% per month (January 2005 - October 2007).
- ◆ NORS "Sympathy" reports (i.e., outages in an adjacent network) accounted for 17% of the outages.
- ◆ The median DS3 outages lasted 8 hours and impacted 11 DS3s (50th percentile).
- ◆ Outages with 1, 2, or 3 DS3s grew at a higher rate than the overall rate.
- ◆ DS3 outages (~80%) were caused by: cable damage, hardware failure, power failure, external environment, or were from unknown causes.
- ◆ Within each of these areas, the actual cause was largely unknown (i.e., 70% of the cause subcategory was "other").
- ◆ 10 new subcategories of direct cause were defined, studied, and recommended for further review by the NRSC Outage Reporting Advisory Team. The recommended Subcategories are (Note: the format below is Direct Cause: New Subcategory):
 - Cable Damage: **Fiber Failure**
 - Hardware Failure: **Card/Circuit Pack Failure**
 - Power: **Customer Premise**
 - Power : **Unidentified Power Surge**
 - Power: **Breaker Tripped/Blown Fuses**
 - Environmental External: **Animal Damage**
 - Unknown: **Outside Owned Network**
 - Unknown: **Third Party**
 - Unknown: **Cleared While Testing, Restored Before Cause Determined**
 - Unknown : **Other**
- ◆ "Fiber Failure" accounted for almost half of the outside Cable Damages (45%, increasing 6.2%/month).
- ◆ "Card/Circuit Pack Failures" was the biggest "inside" contributor to Hardware Failure (69%, increasing 4.3%/month).

Recommendation:

- ◆ That the FCC adds a “Sympathy Report” checkbox to NORS to allow the reporting party to indicate the failure occurred in another company’s network, thereby allowing identification of redundant outage reports.
- ◆ Service Providers should review their “Cable Management” program.
- ◆ Service Providers should review and implement the following new and modified “Cable Management” Best Practices, as applicable.

NEW BEST PRACTICES – Cable Management

Number ¹⁵	Description
7-P-0783	Cable Management: Network Operators and Service Providers should consider including spare fiber connectors and their locations in asset inventory systems.
7-P-0784	Cable Management: Network Operators and Service Providers should utilize appropriate fiber/cable management equipment or racking systems to provide cable strain relief and ensure that bend radius is maintained to avoid micro bends (e.g., pinched fibers).

MODIFIED BEST PRACTICES – Cable Management

Number	Description
7-7-0472	Cable Management: Network Operators and Equipment Suppliers should consider connector choices and color coding to prevent inappropriate combinations of cables.
7-7-0423	Cable Management: Equipment Suppliers should provide cable management features and installation instructions for network elements that maintain cable bend radius, provide strain relief to prevent cable damage, ensure adequate cable connector spacing for maintenance activities, and provide clear access for cable rearrangement (i.e., moves/add/deletes) and FRU (Field Replaceable Unit) swaps.

- ◆ Service Providers should review and implement Best Practices focused on the outage data collection process, including the proper cause subcategory classification of the outage.
- ◆ Service Providers should conduct a review of their Vendor Management Program with a focus on card/circuit pack management.
- ◆ Service Providers should conduct a review of their sparing program with a focus on Best Practices (below).

¹⁵ “P” indicates a proposed new or modified Best Practice

- ◆ For equipment carrying DS3 traffic, Service Providers should review and implement Best Practices related to redundancy/diversity and failover test (below).

FAILURE DATA COLLECTION & ANALYSIS BEST PRACTICES

Number	Description
7-7-0422	Failure Data Collection and Review: Network Operators should collect failure related data and perform cause analysis, impact and criticality analysis, and failure trending. Network Operators and Equipment Suppliers should work together to jointly perform this analysis, and meet periodically with the specific agenda of sharing the failure and outage information to develop corrective measures.

SPARING BEST PRACTICES

Number	Description
7-7-0406	Spares and Inventory: Network Operators and Service Providers should, where appropriate, establish a process to ensure that spares inventory is kept current to at least a minimum acceptable release (e.g., hardware, firmware or software version).
7-7-0504	Spares and Inventory: Network Operators and Service Providers, in order to facilitate asset management and increase the likelihood of having usable spares in emergency restorations, should consider maintaining "hot spares" (circuit packs electronically plugged in and interfacing with any element management system, as opposed to being stored in a cabinet) for mission critical elements.
7-7-5080	Spares and Inventory: Network Operators should identify and track critical network equipment, location of spares, and sources of spares to ensure the long term continuity and availability of communication service.

REDUNDANCY/DIVERSITY BEST PRACTICES

Number	Description
7-7-5075	Network Diversity: Network Operators and Service Providers should ensure that networks built with redundancy are also built with geographic separation where feasible (e.g., avoid placing mated pairs in the same location and redundant logical facilities in the same physical path).

FAILOVER TESTING BEST PRACTICES

Number	Description
7-7-0421	Fast Failover of Redundancies: Equipment Suppliers should design network elements intended for critical hardware and software recovery mechanisms to minimize restoration times.
7-7-0461	Fast Failover of Redundancies: Equipment Suppliers should provide the capability to test failover routines of redundant network elements.

The most up-to-date Network Reliability and Interoperability Council (NRIC) Best Practices can be found at:

- ♦ <http://www.bell-labs.com/USA/NRICbestpractices>
- ♦ <https://www.fcc.gov/nors/outage/bestpractice/BestPractice.cfm>

Conclusion

As a result of the NRSC DS3 Outage Study Subteam's findings and recommendations, the FCC has implemented the "Sympathy Report" checkbox in NORS. The NRSC determined that the two major contributors to DS3 Outages are fiber failures "outside the building" and hardware card/circuit pack failures "inside the building". As a result, the industry has recommended that Best Practice reviews be conducted for each of these areas. Further, to reduce hardware failures, Service Providers are encouraged to enhanced their vendor management program (e.g., directly, TL 9000 SOTS, etc.). The industry believes these efforts will reduce the number of DS3 outages over time.

Wireless Outage Subteam

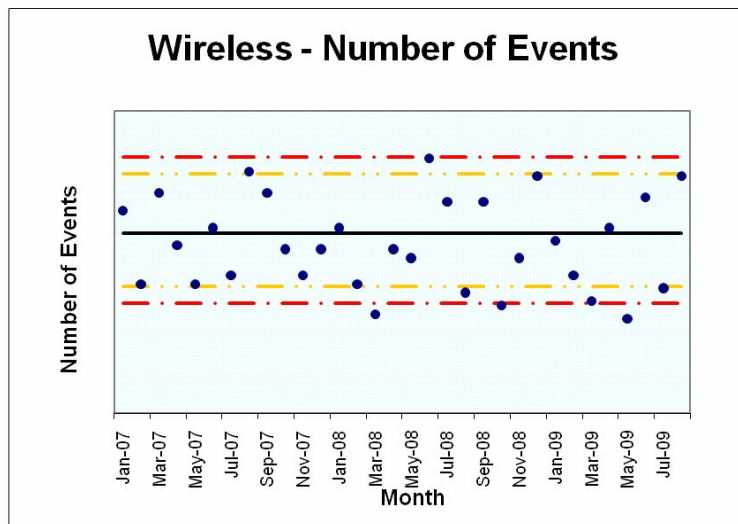


Figure 4: Frequency of Outage for Wireless Cause Category

Background

The NRSC responded to the FCC Public Safety and Homeland Security Bureau's (PSHSB) interest in a perceived increase in wireless outage reporting.

Methodology of the Special Study

The Wireless Outages study was initiated in May 2007 to address data presented to the NRSC by the FCC that showed the frequency of Network Outage Reporting System (NORS) outage reports for the wireless category were outside the control limits, and that the frequency trend line was increasing at approximately 4% month over month.

Members of the study team included four national wireless carriers as well as Telcordia. The study included a series of analyses of the wireless outage data covering all final outage reports filed by the participating wireless carriers.

The team's effort culminated in an analysis of 49 months of wireless final outage reports covering the period from May 2005 through May 2009 through analysis of keywords used in NORS reports. These keywords, covering both direct and root causes, resulted in a unified cause trend analysis covering the more relevant period of January 2007 through May 2009.

Findings and Guidance of the Special Study

The Wireless Subteam noted that outages assigned to the Power Failure, Diversity Failure, Cable Damage, and Procedural Service Provider cause groups have been increasing at a significant trend, however, the overall outage frequency during the study period did not increase at a significant rate. In August 2009, the Subteam committed to developing and delivering a bulletin to industry that alerts

wireless service providers to this conclusion and highlights Best Practices concerning these four cause groups:

1. Power Failure
2. Diversity Failure
3. Cable Damage
4. Procedural Service Provider

Power Failure:

Number ¹⁶	Description
7-P-0799	Cell Site Power Backup: Service Providers, Network Operators, and Property Managers should periodically review the need to provide backup power at cell sites, taking into consideration the criticality of the site as well as local zoning laws, statutes, contractual obligations, and feasibility.

Cable Damage:

Refer to NRSC Bulletin No. 2009-006 – Wireline Outages – October 2009 for a comprehensive examination of cable damage issues that are also relevant for wireless network operators.

- ♦ http://www.atis.org/nrsc/Bulletins/NRSC_Wireline_Bulletin_2009-006.pdf

Procedural Service Provider:

Number	Description
7-P-0590	Network Operators, Service Providers, and Equipment Suppliers should review, prepare, and update Methods of Procedure (MOPs) for core infrastructure hardware and software growth and change activities as appropriate.
7-P-0755	Network Operators, Service Providers, and Property Managers should clearly communicate their installation guidelines (e.g., MOP) and the necessity of adherence to the MOP to all involved parties.

The most up-to-date (NRIC) Best Practices can be found at:

- ♦ <http://www.bell-labs.com/USA/NRICbestpractices/>
- ♦ <https://www.fcc.gov/nors/outage/bestpractice/BestPractice.cfm>

The NRSC supports the NRSC Outage Reporting Advisory Subcommittee (ORAS) work on the hardware failure cause codes.

¹⁶ “P” indicates a proposed new or modified Best Practice.

Conclusion

While the overall outage frequency during the study period did not increase at a statistically significant rate, the Wireless Subteam determined that these four opportunity areas: Power Failure, Diversity Failure, Cable Damage, and Procedural Service Provider had the top four average monthly increases for the period January 2007 through May 2009 at statistically significant rates. Accordingly, the Best Practices listed above most closely address these areas. The NRSC believes that a review of these Best Practices and documents will contribute to further reductions in the number of wireless outages over time.

Wireline Outage Subteam

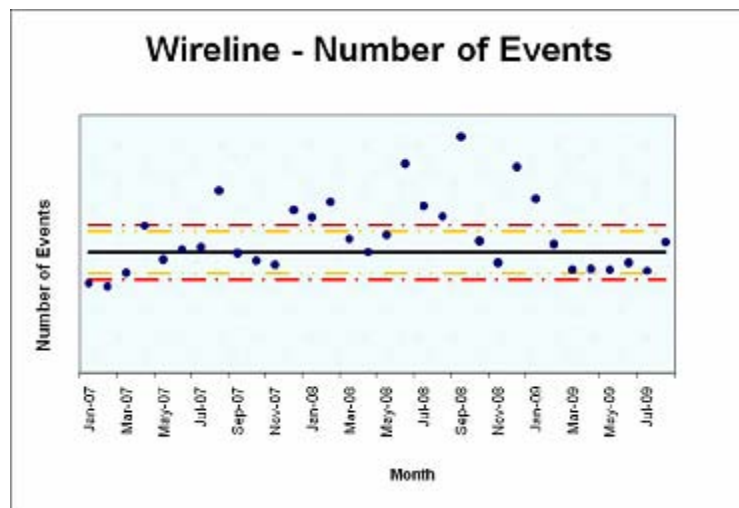


Figure 5: Frequency of Outage for Wireline Cause Category

Background

The NRSC responded to the FCC Public Safety and Homeland Security Bureau's (PSHSB) interest in wireline outage reporting, specifically that the number of FCC wireline outage reports being filed by the industry were increasing at a statistically significant rate (i.e., 3.5%/year) from January 2005 through March 2008.

Methodology of the Special Study

Four service providers and one vendor served on the NRSC Wireline Subteam. As part of their efforts, the participating service providers submitted their outage data from January 2007 through December 2008 to Telcordia for analysis. The subteam examined final Network Outage Reporting System (NORS) Wireline - 900,000 User Minute reports, including the detailed descriptions, the direct causes and roots causes for these outages, as well as whether the events occurred inside or outside a building. While investigating this data, the subteam focused on determining what was driving the increased number of wireline outage reports across the industry.

In addition to the NORS data, participants reviewed their respective internal wireline outage data to determine whether company specific issue(s) contributed to the increase in wireline reports, completed a Network Reliability and Interoperability Council (NRIC) Best Practice (BP) review that focused on

external cable damage, completed a Common Ground Alliance (CGA) BP review that focused on Facility Owner BPs, and completed a state law review that focused on One-Call legislation and laws.

The Wireline Outage Subteam findings were documented and industry recommendations were identified as described below.

Findings and Guidance of the Special Study

This in-depth analysis resulted in the following significant findings:

1. FCC wireline outage reports filed by the participants from January 2007 - December 2008 reflected a 1.3% significant increasing trend.
2. The majority of wireline events occurred outside the building (i.e., 87%).
3. The primary direct cause of the increase in wireline reports was cable damage (i.e., 1.5% significant increasing trend).
4. The primary root cause of the increase in wireline reports was environment external (i.e., 3.1% significant increasing trend).
5. Hardware failure was a relatively small percentage of the direct and root causes identified on the wireline outage reports.
6. Wireline subteam findings align with the DS3 Outage Team analysis and support recommendations for cable damage, environment external, and hardware.
7. The participant's review of their respective internal wireline outage data further supported the Wireline subteam findings, specifically that carriers have experienced an increase in cable damage related issues.
8. The Wireline subteam supports the CGA BPs.

Recommendations:

1. The NRSC recommends that the industry review the following NRIC Best Practices again and consider implementation as appropriate:

Number	Description
7-7-5113	Network Operators, Service Providers and Property Managers, when feasible, should provide multiple cable entry points at critical facilities (e.g., copper or fiber conduit) avoiding single points of failure (SPOF).
7-7-5252	Network Operators should evaluate the priority on re-establishing diversity of facility entry points (e.g., copper or fiber conduit, network interfaces for entrance facilities) during the restoration process.
7-6-1017	Network Operators and Service Providers should have documented plans or processes to assess damage to network elements, outside plant, facility infrastructure, etc., for implementation immediately following a disaster.

Number	Description
7-7-0709	Network Operators should compare outside plant drawings relative to marking cable route maps when locating buried facilities and resolve any discrepancies.
7-7-0728	Network Operators should use industry standard markings for outside plant cables.
7-7-5199	Network Operators and Service Providers should provide appropriate protection for outside plant equipment (e.g., Controlled Environmental Vault, remote terminals) against tampering and should consider monitoring certain locations against intrusion.
7-7-0710	Network Operators should use 'dig carefully' concepts and utilize guidance from industry sources for the protection of underground facilities when excavation is to take place within the specified tolerance zone. (See Reference/Comment field for additional information.)
7-7-0719	Network Operators should use 'dig carefully' concepts and utilize guidance from industry sources when installing underground facilities.
7-7-0741	Network Operators and Service Providers should review, and adopt as appropriate, best practices aimed at reducing damage to underground facilities that are maintained by the Common Ground Alliance < http://www.commongroundalliance.com >.
7-7-0707	Network Operators should ensure timely response once received from the One Call Center for all locate requests.
7-7-0725	Network Operators and Government should increase stakeholder coordination and cooperation to improve the effectiveness of state one call legislation efforts.
7-7-0740	Network Operators should implement internal processes needed to support the One Call Notification legislation.
7-7-0452	Network Operators, Service Providers, and Property Managers should post emergency contact number(s) and unique site identification in an externally visible location at unmanned communication facilities (e.g., towers, cell sites, Controlled Environment Vault (CEV), satellite earth stations). This signage should not reveal additional information about the facility, except when necessary.

Number	Description
7-7-5046	Network Operators and Property Managers should ensure critical infrastructure utility vaults are secured from unauthorized access.

The most up-to-date (NRIC) Best Practices can be found at:

- ◆ <http://www.bell-labs.com/USA/NRICbestpractices/>
 - ◆ <https://www.fcc.gov/nors/outage/bestpractice/BestPractice.cfm>
2. The NRSC recommends that the industry review the CGA BPs for Facility Owners. (The complete list of CGA BPs can be found at: <<http://www.commongroundalliance.com/>>.
 3. The NRSC recommends that the industry review the DS3 Outage Team Bulletin No. 2009-2 again, with special focus on the recommendations for Cable Damage, Environment External, and Hardware. (The DS3 Outage Team Bulletin No. 2009-2 can be found at: http://www.atis.org/nrsc/Bulletins/NRSC_Bulletin_No_2009-2.pdf)
 4. The NRSC recognizes the importance of effective state one-call legislation, including the Call Before You Dig process, in preventing damage to underground facilities. The NRSC recommends that companies consider becoming more engaged in the one-call and cable damage prevention process(s).
 5. The NRSC supports that the NRSC Outage Reporting Advisory Subcommittee (ORAS) work on the hardware failure cause codes.

Conclusion

The Wireline Subteam determined that the majority of wireline outages occurred outside of the building with the primary direct cause being cable damage and the primary root cause being environment external. There are existing Best Practices, as well as findings from previous NRSC teams, that address this issue. The NRSC believes that a review of these Best Practices and documents will reduce the number of wireline outages over time.

E911 Outage Subteam

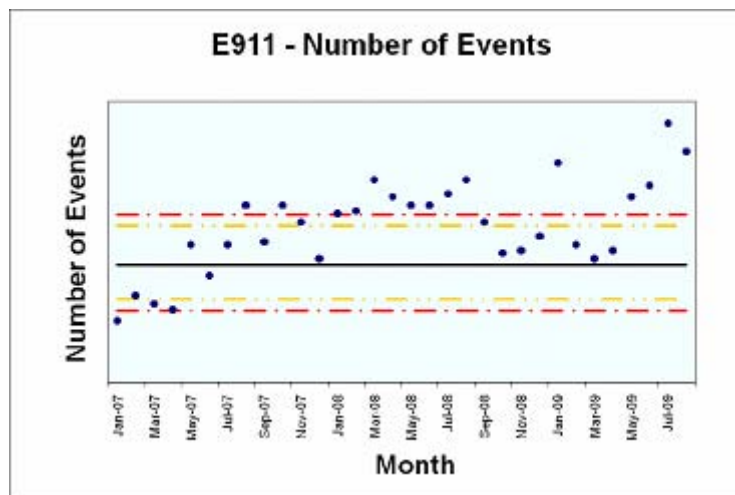


Figure 6: Frequency of Outage for E911 Cause Category

Background

The NRSC created the E911 Subteam in August 2008 in order to investigate the Federal Communications Commission's (FCC's) concern that the number of outage reports that were submitted with E911 as the reason reportable were increasing at a statistically significant rate.

Methodology of the Special Study

Seven service providers participated in this study. As part of their efforts, the service providers categorized events that referenced E911 as the reason reportable and completed a comprehensive data analysis. The analysis included studying the direct and root cause categories referenced in the FCC Network Outage Reporting System (NORS). The Subteam excluded "sympathy"¹⁷ reports in the study because the reporting entity often does not know the cause of the outage and focused on E911 events from January 2008 through March 2009.

Findings and Guidance of the Special Study

The Subteam's analysis of the leading cause categories¹⁸ demonstrated a marked correlation to the division between E911 Phase II and non-Phase II outages. The leading cause categories of non-Phase II outages aligned with the older technology. The leading cause categories associated with Phase II outages indicated failures aligned with the newer, more complex technology and the increased number of players supporting that functionality. The overall number of both Phase II and non-Phase II outages was trending downward. However, the downward trend in Phase II outages was not statistically significant due to the increase in implementations of Phase II functionality.

¹⁷ Failure occurred in another company's network.

¹⁸ Hardware failure (26.6%), Other/Unknown (17.5%), Design Software (14.9%), Procedural Service Provider (11.1%), Cable Damage (10.7%).

The Subteam's analysis showed the total number of outages reported was trending downward; individual major cause categories were also trending downward, with one exception. That exception was a statistically significant increase in the number of "Procedural Service Provider" outages reported.

Further, analysis of the Best Practices (BPs) cited in the NORS data indicated a notable number of outage reports that correlated with "Procedural" errors.

The Subteam examined the BPs cited in the outage reports and analyzed the particular BPs cited in relation to the reported outage causes.

Number	Description
7-7-0588	Network Operators, Service Providers, and Equipment Suppliers should provide awareness training that stresses the services impact of network failure, the risks of various levels of threatening conditions, and the roles components play in the overall architecture. Training should be provided for personnel involved in the direct operation, maintenance, provisioning, security, and support of network elements.

- ◆ This BP was cited in all cause categories and in 24% of all outage reports. It was the most cited BP in Hardware Failure, Other /Unknown, and Cable Damage cause categories. It ranked second in the Procedural Service Provider category and third in the Design Software category.

Number	Description
7-7-0697	Network Operators, Service Providers, and Equipment Suppliers should employ an Ask Yourself program as part of core training and daily operations. This initiative is intended to reinforce the responsibility every employee has to ensure flawless network service.

- ◆ This BP was the most cited in the Procedural-Service Provider category.

The Subteam concluded that the BPs cited in the outage reports studied were generally consistent with the outages reported:

- ◆ **Hardware failure cause category:** Five BPs cited in 74% of all reports. Those BPs (7-7-0588, 7-7-5083, 7-7-5107, 7-7-0434, 7-7-0454) cited training, critical spares, and management issues.
- ◆ **Other/unknown cause category:** Two BPs cited in 63% of all reports. Those BPs (7-7-0588, 7-7-0434) cited training.
- ◆ **Design software cause category:** Five BPs cited in 39% of all reports. Those BPs (7-7-0567, 7-7-0404, 7-7-0588, 7-7-8004, 7-7-0421) cited hardware diversity, management issues, training, improved failover mechanisms, and improved default configurations.
- ◆ **Cable damage cause category:** Two BPs cited in 62% of all reports. Those BPs (7-7-0588, 7-7-0736) cited training and management issues.

- ◆ **Procedural service provider cause category:** Six BPs cited in 60% of all reports. Those BPs 7-7-0697, 7-7-0567, 7-7-0588, 7-7-0434, 6-5-0758, 7-7-0418) cited training, hardware diversity, public education, and MOPs.
- ◆ **Other BPs** were cited in reports associated with these cause categories, but were cited in 1% or less of all reports.

Based on the underlying problem descriptions available, the Subteam was unable to correlate the FCC's perceived E911 problems to any pervasive issues or practices. The Subteam found service providers should continue referencing the most up-to-date Network Reliability and Interoperability Council (NRIC) Best Practices found at:

- ◆ <http://www.bell-labs.com/USA/NRICbestpractices/>
- ◆ <https://www.fcc.gov/nors/outage/bestpractice/BestPractice.cfm>

Recommendation

The NRSC recommends that the industry review the NRIC Best Practices cited above and consider implementation as appropriate.

Conclusion

There are existing Best Practices that address the issues identified by the E911 Outage Subteam's study. The NRSC believes that the review of and adherence to these Best Practices should continue to reduce the number of E911 outages over time.

Pandemic Special Study and Pandemic Checklist



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Background

In August 2009, the NRSC released a Pandemic Planning Checklist. This document included a compilation of existing – as well as newly-developed – industry consensus best practices to ensure service provision, and business continuity in the event of a pandemic outbreak. The guidance includes 56 voluntary best practices that continue the U.S. communications industry’s nearly 20-year history of collaboration among experts to promote the health of the nation’s public networks. The Best Practices are available at: < http://www.atis.org/nrsc/Docs/NRSC_Pandemic_Checklist_Final.pdf >.

Methodology of the Special Study

This work – launched in December of 2008 – was accelerated in response to the World Health Organization’s April 29, 2009, declaration of a Phase 5 Alert Level for the H1N1 virus, to ensure its completion prior to a potential outbreak. The NRSC’s approach was unique in that it systematically considered how individual elements of a pandemic can affect the intrinsic vulnerabilities in each of the eight components of the information and communications technology infrastructure (page 8 in this report). The Best Practices Subcommittee included experts from Alcatel-Lucent, AT&T, Cox, CenturyLink, Qwest, Sprint, T-Mobile, Telcordia, and Verizon.

The NRSC also considered a pandemic’s larger, more widespread impact. Beyond the public communications network, a pandemic could affect connecting networks, such as Public Safety Answering Points (PSAPs) and enterprises. For example, the Committee considered protecting 911 call centers from incoming traffic overload, and avoiding the impairment of virtual workforces due to network congestion. In those cases, the NRSC provided the following recommendations:

- ◆ **PSAP Overload Protection:** Local governments should anticipate the possibility of high 911 call volumes, work with local media to inform the public not to call 911 for flu symptoms, and provide directions for where to seek appropriate medical help.
- ◆ **Virtual Workforce Connectivity Protection:** To accommodate the expected enlarged virtual workforces’ capacity demands, enterprises should preemptively prepare by increasing available bandwidth, and implementing policies for shared use of limited resources.

Conclusion

The communications industry's experts have again demonstrated an understanding of the vital role they - and their organizations - play in the safety and stability of society. The Best Practice Subcommittee diligently developed and articulated countermeasures that can ameliorate the impact of a widespread health crisis. This is a perfect example of a timely and effective, industry-led, private-public partnership. This work holistically addresses potential susceptibilities in the national communications critical infrastructure in the event of a pandemic outbreak. This work exemplifies the NRSC's commitment to ensuring the public communications network's continued reliability and vitality.

NRSC Restructuring

Background

In December 2008, the NRSC member companies elected new Co-Chairs for a two year term. Following the election, the new leadership sent a survey to the NRSC member companies in order to better gauge available resources and determine the optimum number of concurrent teams that should be active. Based on the feedback, the Co-Chairs developed the following NRSC goals: to efficiently utilize membership resources, to respond to identified industry issues or needs in a timely fashion, to sustain an environment conducive to open communication, and to support NRSC-driven initiatives. Additionally, the leadership aligned work activities with the ATIS Operating Procedures, including the implementation of an issue proposal review and acceptance process, and developed a timeline and course of action for each accepted issue.

Resulting Actions

The NRSC agreed to adhere to the ATIS Operating Procedures and processes, which has assisted with the organization and completion of NRSC work. Additionally, the NRSC established the following two subcommittees and elected associated leadership for a two year term:

- ◆ **Best Practices Subcommittee**
 - Chair – Karl Rauscher – Bell Labs – Alcatel Lucent
 - Vice Chair – Rick Krock – Bell Labs – Alcatel Lucent
- ◆ **Outage Reporting Advisory Subcommittee (ORAS)**
 - Chair – Rick Canaday AT&T
 - Vice Chair – Rose Fiala – T-Mobile USA

Further, monthly team lead meetings and monthly leadership meetings with the FCC occur and are critical in helping to manage to work flow, effectiveness, and efficiency of the NRSC.

NRSC Comments on Data Collection, Processing, Analysis and Dissemination to the Office of Strategic Planning and Policy Analysis

Background

In September 2009, the NRSC submitted comments regarding an FCC *Commission's Data Collection, Processing, Analysis and Dissemination Review*. In this filing, the NRSC recognized that the Commission has a valid need to collect information about communications outages. The industry has been

providing this information on either a voluntary or mandatory basis for 17 years. The NRSC provided examples of how the outage reporting rules could be modified to alleviate an unnecessary burden on the industry and suggested a model that may be used in the development of any future outage reporting requirements. ATIS and the NRSC members appreciate the opportunity to collaborate with the Commission on reliability issues in the past and indicated that the NRSC looks forward to future collaboration and dialogue, including the discussion of other appropriate changes to the outage reporting rules.

NRSC Comments on NBP Public Notice #3 for GN Dockets 09-47, 09-51, and 09-137 for Telework

Background

In September 2009, the NRSC submitted comments regarding FCC *Network Broadband Plan Public Notice #3 for GN Dockets 09-47, 09-51, and 09-137 for Telework*. ATIS' comments highlighted the work of the NRSC and industry that may be of interest to the Commission in its consideration of telework. The filing addressed how the NRSC provides network reliability improvement opportunities in an open environment and advises the communications industry through the development of standards, technical requirements, technical reports, bulletins, best practices, and annual reports. The NRSC *Hurricane Checklist* and *Pandemic Checklists*¹⁹ were highlighted as examples of recent NRSC work.

Outage Reporting Advisory Subcommittee (ORAS)

Background

Most types of communications service providers – including wireline, wireless, cable telephony, SS7, E911 providers, and facility owners – are required to report telecommunication service disruptions pursuant to Part 4 of the Federal Communications Commission's (FCC's) rules. These reports are filed using an internet-based system, the Network Outage Reporting System (NORS), and analyzed by the FCC Public Safety and Homeland Security Bureau's Communications Systems Analysis Division (CSAD).

The CSAD also developed a web-based system, the Disaster Information Reporting System (DIRS), to collect the information needed to determine the status of communications services in areas affected by major disasters (e.g., Hurricane Katrina). DIRS collects information on the status of equipment, such as switches, public safety answering points used for E911, inter-office facilities, cell sites, broadcasting facilities, and cable television systems.

Methodology of the Study

The NRSC established the Outage Reporting Advisory Subcommittee (ORAS) to represent industry and address NORS system improvements. The ORAS is a standing subcommittee that utilizes the experience and expertise of its members to improve the accuracy and consistency of outage reporting data submitted to the FCC via NORS, as well as disaster information submitted via DIRS.

¹⁹ NRSC Hurricane and Pandemic Checklists can be found on the NRSC home page at < <http://www.atis.org/nrsc/docs.asp> >.

Findings and Guidance of the Subcommittee

A review of the NORS User Manual was undertaken to develop recommendations for updates that would provide clarification and enhance consistency of reporting. These recommendations were taken into consideration by the FCC in the release of NORS User Manual - Version 6 (April 9, 2009).

Observations from DIRS activations and exercises by subcommittee members and review of existing documentation were used to develop recommendations for clarification and expansion of information in the DIRS User Manual. These recommendations were taken into consideration by the FCC in the release of DIRS User Manual - Version 2 (March 9, 2009). Additional concerns and recommendations of the subcommittee were addressed with the publication of the Disaster Information Reporting System Standard Operating Procedure (DIRS SOP), prepared by the National Communications System (NCS) and the FCC (June 18, 2009).

Using recommendations from the Hardware Sparing Study Team and the DS3 Outage Study Team, the ORAS performed a review of the NORS and Standard Outage Classification Cause Codes. The purpose of this review was to expand and clarify "NORS Descriptions of Root Cause, Direct Cause, and Contributing Factors" in order to facilitate more accurate classification of outage causes using the formatted NORS fields. The resulting recommendations are under consideration by the FCC.

A review the DIRS User Manual (Version 2, March 9, 2009) was undertaken to evaluate implementation of previous recommendations and develop further recommendations regarding enhancement of the DIRS system interfaces and documentation. The resulting recommendations on the updated DIRS User Manual are under consideration by the FCC. Subsequently, the ORAS initiated an effort to verify features on the DIRS test system to see how the previous ORAS recommendations for downloading DIRS bulk information (previously submitted in a tab delimited file) were implemented. A test case was developed to test features for each report (e.g., Wireline Switch), where appropriate. A number of issues were identified and documented. The results were provided to the FCC for consideration.

Conclusion

The NORS and DIRS processes are complex and require continuous efforts to improve the accuracy and consistency of information provided to the FCC. These efforts involve maintaining a mutual understanding of FCC expectations regarding submitted information, as well as identifying issues and developing recommendations from the users' perspective regarding enhancement of the system interfaces and documentation. Improvements in this area can only be sustained by continued collaboration and commitment.

STANDARDS, TECHNICAL REPORTS, AND WORK IN PROGRESS

The NRSC develops ATIS Standards, which are deliverables developed by ATIS Forums or Committees that define technical or operational solutions for voluntary implementation by the industry. ATIS Standard types include – but are not limited to – an American National Standard, a Technical Requirement, a Technical Specification, a Technical Report, an industry guideline, or a white paper.

ATIS Standards are available online from the ATIS Document Center at: < <http://www.atis.org/docstore/default.aspx> >.

Below are the descriptions of ATIS Standards produced by and the current Works in Progress of the NRSC during the years of 2008 - 2009.

Technical Reports

The NRSC produced one Technical Report entitled ATIS-0100021, *Analysis of FCC-Reportable Service Outage Data*.

ATIS-0100021, Analysis of FCC-Reportable Service Outage Data

This Technical Report provides methods (guidelines and algorithms) for the analysis of service outage data reported to the FCC in response to new outage reporting requirements which became effective in January 2005. These techniques are provided as an aid to the telecommunications industry including the individual reporting service providers and agencies and committees with access to the reports or data captured from the reports.

Work in Progress

The work of NRSC is progressed through the use of ATIS' Issue Process. An Issue may be thought of as similar to a project proposal, where the problem/Issue and proposed resolution are defined, and a suggested timeline for completing the Issue resolution is developed.

Issue: Normalization of Reliability Metrics for FCC-Reportable Service Outage Data

A proposal to develop techniques for adjusting control charts and trend analysis for network growth. The techniques are intended for use in the analysis of FCC-reportable service outage data. The results of this work will be published as a new Technical Report or as an update to ATIS-0100021.

This Issue has the objective of developing normalization methods to analyze outage frequency and outage magnitude relative to network growth. The first step in the process of developing normalization techniques is the identification of network growth metrics that are candidates for correlation with network reliability. Several candidate metrics are based on principles from T1.TR.42-1995, *Enhanced Analysis of FCC-Reportable Service Outage Data*.

Additionally, the Issue proposes gathering data to examine the potential effects of using normalization. Data that is readily available from the FCC was included, and a request for additional data was made.

CONCLUSION

During the period 2008-2009, the NRSC has been very active in both documenting network reliability related information, and investigating and responding to industry and FCC concerns regarding reportable outages. The NRSC documented findings through the creation of new technical reports, the updating of existing reports, and the publication of industry bulletins, white papers, and checklists. In 2009, the NRSC took steps to internally restructure, which has allowed the NRSC to be more efficient and has increased the number of industry-driven initiatives. Since the implementation of the revised FCC outage reporting rules in 2005, the NRSC has overcome several issues related to FCC reporting system data being unavailable to the NRSC. Through increased collaboration between member companies, the NRSC has prevailed over many of these obstacles and has emerged as a stronger, more effective, and determined industry force.

Future Plans

The NRSC has improved the industry's efforts to be proactive rather than purely reactive. To that end, the NRSC has identified initiatives for the future and will continue to provide leadership and guidance for the industry on network reliability issues.

Looking forward to 2010, the NRSC expects to participate on focus groups related to the *Communications Security, Reliability, and Interoperability Council (CSRIC)* and bring its expert guidance to reliability issues outlined in the CSRIC Charter²⁰. The NRSC will also continue to identify issues that are of particular interest to the industry, as well as continue its long relationship with the FCC Public Safety and Homeland Security Bureau to address concerns and issues related to network outages. Finally, as the National Broadband Plan unfolds, the NRSC will review, identify related reliability issues, and provide industry guidance as necessary.

For the Common Good

The NRSC is an example of the spirit of service in the communications industry. Companies that are normally fierce competitors in the marketplace participate in the NRSC, putting competition aside to work together for the benefit of all consumers and the general advancement of network reliability. Working together towards the common good of all communications customers is the finest product of the NRSC.

²⁰ CSRIC Charter can be found at < <http://www.fcc.gov/pshs/advisory/csric/> >.

NRSC Participating Companies

Alcatel-Lucent
AT&T
CenturyTel
Cox Communications
FCC
MetroPCS

National Communications System
Qwest
Sprint
T-Mobile
Telcordia Technologies
Verizon

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Best Practices Subcommittee

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Percy Kimbrough, AT&T
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Rick Krock, Bell Labs, Alcatel-Lucent
Stewart Goldman, Bell Labs, Alcatel-Lucent
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Todd Tobis, Ericsson representing Sprint
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Cynthia Daily, Sprint
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