NATIONAL DIVERSITY ASSURANCE INITIATIVE

February 2006

ATIS

Alliance for Telecommunications Industry Solutions
1200 G Street, NW, Suite 500
Washington, DC 20005

TABLE OF CONTENTS

EXECUTIVE SUMMARY 2

BACKGROUND 4

THE INITIATIVE 6
- Initiative Objective 6
- NDAI Team 6
- Initiative Scope 6
- Initiative Goals 6
- Initiative Critical Success Factors 7
- Non-Disclosure Agreement 7
- Initiative Framework – Memorandum of Understanding 7

ASSESSMENT PHASE 8

ASSESSMENT PHASE RESULTS 9

REVIEW AND ANALYSIS 10

CIRCUIT DIVERSIFICATION 10

APPROACHES TO DIVERSITY ASSURANCE 10
- Business Relationships 11
  - *Dedicate Service to One Facilities-Based Carrier* 11
  - *Specific Contractual Agreements with the Carriers* 11
  - *Dedicated Managed Service* 11
  - *Use of an Independent Third Party to Provide Diversity Assessment and Assurance* 12
- Technological Capabilities 12
  - *IP-based Network* 12
  - *Alternate Transport Technologies* 12
  - *Automated Solution* 12

CONCLUSIONS 14

RECOMMENDATIONS 16
- Diversity Guidance 16
- Evaluation of an Automated Solution 16
- Recommendation Exhibit 17

APPENDIX A – NDAI PARTICIPANTS 18

APPENDIX B – SAMPLE COMPOSITE CIRCUIT DIAGRAMS AND MAPS ..... 19 – 21
- HIGH-LEVEL Architectural Perspective 19
- STREET-LEVEL Perspective – City 1 20
- STREET-LEVEL Perspective – City 2 21

APPENDIX C – INITIATIVE PROCESS FLOW 22

APPENDIX D – LESSONS LEARNED 23
- Initiative Learnings 23
- Carrier Learnings 23
- Federal Reserve System Learnings 25

APPENDIX E – GLOSSARY 26

ATIS is a technical planning and standards development organization that is committed to rapidly developing and promoting technical and operations standards for the communications and related information technologies industry worldwide using a pragmatic, flexible and open approach. Over 1,100 participants from more than 350 communications companies are active in ATIS' 22 industry committees, and its Incubator Solutions Program.

EXECUTIVE SUMMARY

The financial services and telecommunications sectors recognize the importance of ensuring continuity of critical operations in the event of a disaster. Both industries have led efforts focused on telecommunications resiliency and reliability of National Security/Emergency Preparedness (NS/EP) facilities since the aftermath of the September 11th terrorist attacks. Telecommunications diversity is a key component of resiliency. It provides multiple communication paths so there is no single point of failure for NS/EP services. Telecommunications diversity can be accomplished in several ways. Establishing multiple physically diverse circuit routes from a critical facility is promoted as a best practice by public and private sector organizations for ensuring resiliency of point-to-point telecommunication links. Financial services, as well as the Government Accountability Office, have raised concerns that telecommunication carriers cannot easily provide periodic information to assure that diversely engineered circuits remain physically separate over time. The National Diversity Assurance Initiative (NDAI), led by the ATIS CIO Council, evaluated the problem inherent in assuring physical diversity of NS/EP financial service circuits in a multi-carrier environment. For the purpose of this report, the context of *"NS/EP diversity, circuit diversity and diversity assurance"* is limited to the practice of ensuring there are multiple diverse physical circuit routes to a critical facility. The scope of the report does not consider other alternatives for achieving or assuring telecommunications diversity.

In April 2004, the President's National Security Telecommunications Advisory Committee (NSTAC) Financial Services Task Force concluded that customers cannot be assured at all times that their telecommunications circuits remain physically diverse. In parallel efforts, individual telecommunications carriers determined in regional initiatives that evaluating circuit diversity from a single carrier perspective, while feasible, was not an accurate reflection of how the telecommunications industry operates today. Based on these regional initiatives, it was apparent that a research effort was needed to evaluate physical circuit diversity assurance from a multi-carrier perspective. Prior to this Initiative, there was no industry analysis conducted to determine the level of effort or to quantify the costs involved in assessing and assuring diversity of telecommunications circuits in that environment. The objectives of the Initiative were to assess the diversity of a set of existing NS/EP circuits, establish diversity for those circuits found not to be diverse, and monitor a selected subset of circuits to assure that diversity is maintained over time. The NDAI team consisted of representatives from the Federal Reserve, AT&T, BellSouth, MCI, Qwest, SBC, Sprint, Verizon and ATIS. Working together, the team was able to create a trustworthy environment where the carriers and the Federal Reserve shared highly sensitive information and industry knowledge.

The team created a framework and processes to better understand what was required to develop a diversity assessment and assurance model. Circuit diversity was assessed manually for a subset of the Federal Reserve Bank's NS/EP circuit pairs. High-level conceptual and street-level maps for these circuits were created to explicitly show the physical routes of the circuit pairs. The Federal Reserve was able to use these maps to identify circuits as diverse or not diverse. The team discovered that conducting an end-to-end multi-carrier assessment of telecommunications circuits is a very labor and cost intensive process and can currently only be conducted in a manual fashion. Several factors contributed to this high level of effort and cost: complexity of the circuits and the systems (topology and architecture) used to access the circuit information, company structure (internal processes), disparate mapping processes in use by the carriers, and the lack of a common cross-industry circuit identifier to identify all of the circuit segments that comprise a diverse circuit pair. The team validated the assessment framework, fulfilled the Initiative goals, and developed valuable learnings that can be applied to any future efforts to address diversity assessment and assurance.

At the completion of the Assessment Phase, the team concluded that end-to-end multi-carrier circuit diversity assurance currently cannot be conducted in a scalable manner. The cost and level of manual effort required were comparable to the assessment step and demonstrated that an ongoing program for end-to-end multi-carrier circuit diversity assurance, as it exists today, cannot be offered as a widey available commercially viable product. Circuit route diversity, as defined by the scope of this Initiative, is widely promoted as a public and private sector best practice. The team concluded,

however, that it is not possible to guarantee that circuits are diverse and remain diverse over time unless manual assessment and periodic manual assurance are performed. Due to the high level of effort and cost involved in performing manual end-to-end circuit diversity assurance in today's multi-carrier environment, circuit route diversity assurance, may be justified for organizations with life safety missions and critical business needs. The team concluded that an automated system providing the capability to track circuits across multiple carriers would streamline the process for determining end-to-end diversity assessment and assurance. While the financial services sector considers the lack of diversity assurance for telecommunications services supporting its NS/EP functions a serious risk, practices using physical circuit route diversity in combination with other alternatives, such as geographic dispersion of operation centers, could mitigate the risk of a single event disrupting critical telecommunication functions. The telecommunications carriers believe that the marketplace to support the specialized requirements of NS/EP functions on a wide-scale basis is insufficient to recover costs from only the users of the service. The findings of this report support the need to develop and implement automated solutions that address diversity assessment and assurance if physical route diversity assurance is a requested carrier provided service. External funding for development and implementation must be made available before such development can proceed.

The team highly recommends that other industries with critical missions and circuits evaluate their current risks in regards to telecommunications continuity and take the necessary steps to mitigate those risks. In addition, the team developed recommendations that could be pursued as follow-on activities to this Initiative (detailed in the Recommendations section of this report).

First, the lessons learned from the Initiative provide information and terminology that could be used by organizations supporting critical NS/EP services to better understand the telecommunications infrastructure supporting their business needs in a multi-carrier environment. Second, the team recommends a follow-up effort to determine more accurately the requirements for providing an automated end-to-end diversity assurance solution in a multi-carrier environment. As a first step, a small-scale effort could be undertaken to leverage the findings of the Initiative to scope the objectives and requirements for providing an end-to-end diversity assurance solution in a multi-carrier environment. This scoping effort should include at least the creation of high-level requirements, cost estimates and the level of effort to develop and implement an automated circuit assurance solution. The telecommunications carriers believe that the scoping effort will need to be sponsored, by the Federal government. Without an automated circuit assurance solution, a real-time capability to identify, aggregate, and analyze circuit information for diversity concerns in a multi-carrier environment cannot be achieved. The results of the scoping effort could assist in quantifying the project scale and costs required to consider implementation of a diversity solution that could be used across different sectors. It is unclear whether circuit route diversity assurance in a multi-carrier environment is important in other critical sectors. An agency of the Federal government, perhaps the Department of Homeland Security (DHS), could provide insights regarding the level of urgency within other critical sectors for diversity assurance. The telecommunications carriers believe that external funding must be secured prior to the implementation of an automated solution.

BACKGROUND

The September 11, 2001, terrorist attacks highlighted the susceptibility of the telecommunications infrastructure to disruption. These attacks damaged telecommunications facilities, lines, and equipment and resulted in the loss of voice and data communication throughout lower Manhattan. As a result, critical U.S. financial institutions faced challenges as they restored business operations after the attacks. Through unparalleled efforts, the financial services industry and the telecommunications industry worked together to restore operations of the financial markets within five days after the attacks.

Telecommunications route diversity involves establishing different physical routes to ensure that facilities and circuits are diverse so that no single point in the communications path can cause all services to fail. Telecommunications route diversity has been a long standing best practice for business continuity from both private and public sectors. Assuring that circuits engineered to be diverse remain so, however, has been a major concern. In December 1997, NSTAC reported, "despite assurances about diverse networks from the carriers, a consistent concern among the financial services industry was the trustworthiness of their telecommunications diversity arrangements."[1] According to the U.S. Government Accountability Office, "This concern was validated following the September 11 attacks when firms that thought they had achieved redundancy in their communications systems learned that their network services were still disrupted. Other firms that had mapped out their communications lines to ensure that their lines flowed through physically diverse paths at the time those services were first acquired found that their service providers had rerouted some of those lines over time without their knowledge, eliminating that assurance of diversity in the process."[2]

Recognizing how highly dependent the financial services industry is on telecommunications, the Federal Reserve promoted several efforts to improve financial services resiliency. In November 2002, the Federal Reserve asked NSTAC to consider whether structural vulnerabilities or business practices within the telecommunications infrastructure posed a threat to the operation of the U.S. financial system or other elements of the critical infrastructure (such as power, transportation, etc.). Federal Reserve staff advised the NSTAC that unlike other key elements of the critical infrastructure, there are no alternatives or backup arrangements that public and private sector entities can implement to maintain critical communications services. It further advised the NSTAC that the financial system is so dependent on telecommunications that a widespread disruption of the telecommunications infrastructure that was not quickly recovered would bring the nation's wholesale financial system –- which processes trillions of dollars and securities transactions daily -- to a halt. Recognizing the national importance of the concerns raised by the Federal Reserve, NSTAC established a Financial Services Task Force to report on the ability of the telecommunications infrastructure to provide an appropriate level of service for national security level circuits in the financial system and other elements of the critical infrastructure.

In April 2003, the Federal Reserve Board developed, in conjunction with the Office of the Comptroller of the Currency and the Securities and Exchange Commission, an "Interagency Paper on Sound Practices to Strengthen the Resilience of the U.S. Financial System."[3] This interagency white paper identified business continuity objectives and sound practices aimed at strengthening the resilience of the U.S. financial system. The focus was to minimize the immediate systemic effects of a wide scale disruption of critical financial markets by ensuring that backup capabilities are resilient and robust. The paper promoted geographic separation of primary and backup operations centers to ensure that these are supported by separate utility infrastructures.

In response to the Federal Reserve's request, the NSTAC Financial Services Task Force published a report in April

[1] The President's National Security Telecommunications Advisory Committee (NSTAC), *Financial Services Risk Assessment Report,* December 1997.

[2] U.S. Government Accountability Office, *Potential Terrorist Attacks, Additional Actions Needed to Better Prepare Critical Financial Market Participants:* GAO-03-251, February 2003.

[3] Board of Governors of the Federal Reserve System, Office of the Comptroller of the Currency, and the Securites and Exchange Commission, *Interagecny Paper on Sound Practices to Strengthen the Resilience of the U.S. Financial System,* April 2003.

2004 that analyzed the dependencies of the financial services sector on the telecommunications industry and assessed the risks involved from a diversity perspective. As a result of its analysis, the Financial Services Task Force concluded: "Without a real-time process to guarantee that a circuit's path or route is static and stable, an [National Security and Emergency Preparedness] NS/EP[4] customer cannot be assured at all times that the diversity component of the resiliency plan retains its designed characteristics."[5] The report identifies additional measures that would improve the resiliency and reliability of critical NS/EP circuits. The report notes that development of a "diversity assurance" process (i.e., protocols for maintaining physical diversity of circuits within and across telecommunications carriers) is important, because differing definitions and interpretations of "diversity" among telecommunications providers and customers has led to uncertainty regarding maintenance of physical diversity for paired critical circuits.

In September 2004, the Payments Risk Committee, Assuring Telecommunications Continuity Task Force, published *Best Practices to Assure Telecommunications Continuity for Financial Institutions and the Payment and Settlements Utilities.*[6] These best practices and recommendations focus on what financial institutions and payment and settlement utilities should do in order to avoid telecommunication outages and to facilitate rapid recovery when outages occur.

In parallel with the activities conducted by the financial industry, the telecommunications industry began its own efforts to address the issue of circuit diversity assurance. In mid-2003, a working council of communications CIOs was established at the Alliance for Telecommunications Industry Solutions (ATIS) to formulate proactive positions as an industry interface with government and cross-industry interests on identified security matters. Building on the aforementioned studies that address critical financial services network issues, the CIO Council recognized the need to examine telecommunications circuit diversity. The CIO Council includes participation from AT&T, BellSouth, MCI, Qwest, SBC, Sprint, and Verizon.

Initially, individual carriers conducted their own regional initiatives to evaluate circuit diversity for their customers. The pilots only involved the respective carrier performing the pilot and were confined to one geographic area. During these initiatives, it became evident that evaluating circuit diversity from a single carrier perspective was not an accurate reflection of how the telecommunications industry operates today. Evaluation of the situation from a multi-carrier perspective was needed. Therefore, the CIO Council formed a working team consisting of participants from the member companies to develop a framework for a National Diversity Assurance Initiative.

From January to June 2004, the working team developed a Non-Disclosure Agreement (NDA), created a project framework, and sought participation from a financial institution. The NDA enabled all of the parties to work together and share and protect information. The framework outlined procedures and processes focused on identifying and rectifying circuit diversity concerns, and served as a work plan for activities that would be completed and identified ownership of deliverables. Lastly, the team worked to find an appropriate national financial institution, supported by multiple telecommunications service providers that would serve as an equal partner working to fulfill the goals of the NDAI. The ATIS CIO Council agreed on June 3, 2004, to form a partnership with the Federal Reserve on an in-depth assessment of circuit diversity assurance. The NDAI working team and the Federal Reserve together formed one team, known as NDAI, to research the feasibility of validating the existence of diversity on critical NS/EP circuits, and to identify methods to assure that the diversity is maintained on those circuits over time.

[4] Circuit(s) that qualify for TSP service under the Federal Reserve's Sponsorship Policy, December 2002.

[5] The President's National Security Telecommunications Advisory Committee (NSTAC), *Financial Services Task Force Report,* April 2004.

[6] The Payments Risk Committee – Assuring Telecommunications Continuity Task Force, *Best Practices to Assure Telecommunications Continuity for Financial Institutions and the Payment & Settlement Utilities,* September 2004.

INITIATIVE OBJECTIVE

The NDAI (Initiative), led by the ATIS CIO Council, was established to evaluate the problem inherent in assuring NS/EP circuit route diversity in a multi-carrier environment. In order to realize the goals of the Initiative, AT&T, BellSouth, MCI, Qwest, SBC, Sprint, and Verizon (carriers), the Federal Reserve, and ATIS worked as partners to scope the Initiative, assess the diversity of a subset of the existing circuits, establish diversity for those circuits that are not diverse, and monitor a selected subset of circuits to assure that diversity is maintained over time. All parties, working in partnership, agreed to evaluate and assess the viability and effectiveness of this process in responding to the Federal Reserve Board, Securities and Exchange Commission, and the Office of the Comptroller of the Currency white paper and the needs of the financial services sector, as expressed in the NSTAC Financial Services Task Force Final Report.

NDAI Team

The NDAI team consisted of representatives from AT&T, BellSouth, MCI, Qwest, SBC, Sprint, Verizon, the Federal Reserve, and ATIS. The Federal Reserve was represented by members from the Board of Governors, Wholesale Product Office at the Federal Reserve Bank of New York, and Federal Reserve Information Technology (FRIT). The ATIS CIO Council designated participants from within their respective companies. A minimum of two representatives from each carrier participated in the Initiative: a *Primary Point of Contact (POC)* and a *Technical Point of Contact (TOC)*. The POC served as the primary representative and acted on behalf of that carrier to assist in setting the direction of the Initiative, attended meetings, and interfaced with other parties throughout the Initiative. The TOC served as the technical representative who was responsible for receiving and delivering circuit information, participating in meetings, and assisting in the development of the deliverable. Due to the competitive and regulated nature of the telecommunications industry, it was necessary for a third party to integrate and manage the Initiative. ATIS served in the third party role and was responsible for providing project management, technical, legal, and administrative support. In this role, ATIS ensured that antitrust concerns were addressed and all parties were protected through a Non-Disclosure Agreement (NDA) and a Memorandum of Understanding (MOU). In order to engage a broader perspective of the financial services industry, a group of financial Subject Matter Experts (SME) from the ClearingHouse, Securities Industry Automation Corporation (SIAC), Payments Risk Committee, Depository Trust Clearing Corporation (DTCC), and SWIFT advised the Initiative activities and deliverables. See *Appendix A* for the list of NDAI team participants.

Initiative Scope

The intent of the Initiative was to explore and research the possibility of circuit route diversity assurance for critical NS/EP circuits across multiple service providers. Discussions of resiliency, reliability, and other elements or industry concerns of business continuity were outside the scope of this Initiative.[7]

Initiative Goals

At the onset of the Initiative, the Team set forth the following goals:

- Understand and define the capabilities of diversity assessment and assurance for the financial services sector.
- Understand the framework and processes that would be required to develop a diversity assessment and assurance model across multiple service providers.
- Identify and develop recommended requirements for providing diversity assessment and assurance.
- Assess framework and lessons learned.

[7] For the purpose of this Initiative, the context of *NS/EP diversity, circuit diversity and diversity assurance* is limited to the practice of ensuring there are multiple diverse physical circuit routes in a multi-carrier environment to an operations facility. The scope of the study did not assess the ability of other alternatives to achieve or assure telecommunications diversity.