ATIS-0300202.2015**(R2020)**

Interwork Operations – Guidelines for Network Management of the Public Telecommunications Network under Disaster Conditions

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ATIS-0300202.2015, *Interwork Operations – Guidelines for Network Management of the Public Telecommunications Networks under Disaster Conditions*

Is an American National Standard developed by the **ATIS Telecom Management and Operations Committee (TMOC)**.

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American National Standard for Telecommunications

Internetwork Operations – Guidelines for Network Management of the Public Telecommunications Networks under Disaster Conditions

Alliance for Telecommunications Industry Solutions

Approved June 17, 2015

American National Standards Institute, Inc.

Abstract

The purpose of this standard is to delineate network traffic management actions that should be performed prior to and during disaster conditions. This standard is applicable to all telecommunications network operators that are interconnected to the public telecommunications networks. A coordinated network traffic management response by all affected network operators should ensure the integrity of the public telecommunications networks.

Foreword

The information contained in this Foreword is not part of this American National Standard (ANS) and has not been processed in accordance with ANSI's requirements for an ANS. As such, this Foreword may contain material that has not been subjected to public review or a consensus process. In addition, it does not contain requirements necessary for conformance to the Standard.

The Alliance for Telecommunication Industry Solutions (ATIS) serves the public through improved understanding between providers, customers, and manufacturers. The Telecom Management and Operations Committee (TMOC) develops operations, administration, maintenance and provisioning standards, and other documentation related to Operations Support System (OSS) and Network Element (NE) functions and interfaces for communications networks - with an emphasis on standards development related to U.S.A. communication networks in coordination with the development of international standards.

ANSI guidelines specify two categories of requirements: mandatory and recommendation. The mandatory requirements are designated by the word *SHALL* and recommendations by the word *SHOULD*. Where both a mandatory requirement and a recommendation are specified for the same criterion, the recommendation represents a goal currently identifiable as having distinct compatibility or performance advantages.

This document contains two informative annexes. These annexes are for information only and are not considered part of this standard.

Suggestions for improvement of this document are welcome. They should be sent to the Alliance for Telecommunications Industry Solutions, TMOC, 1200 G Street NW, Suite 500, Washington, DC 20005.

At the time it approved this document, TMOC, which was responsible for its development, had the following leadership:

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1 Scope & Purpose

1.1 Scope

These guidelines encompass the cooperative network management[1] actions (that may be) required of interconnected network operators during emergency conditions associated with disasters that threaten life or property and cause congestion in the public telecommunications networks. Network management actions should optimize the integrity of the public telecommunications networks while obtaining the maximum use of network capability during a disaster condition. These guidelines address the network actions required to relieve congestion in the public telecommunications networks caused by traffic overload and/or failures resulting from disaster conditions. Examples of disaster conditions that would benefit from these guidelines are:

- Natural disasters (such as hurricanes, earthquakes, floods, and the like);

- Major accidents (such as transportation, industrial, or environmental); or

- Civil disturbances (such as terrorist acts or other similar events).

It is recognized that public telecommunications networks consist of multiple non-homogeneous interconnected networks that are based on different technologies (e.g., circuit-switched, wireless, IP, and ATM) and architectures supporting a variety of services. In some cases, the specific types of network management actions needed may be dependent upon the underlying technology, architecture, or service being provided. Guidelines for technology specific network management actions are beyond the scope of this standard, but may be provided in future standards. See Annex B for additional information on what types of future standards may be needed.

1.2 Purpose

The purpose of this standard is to delineate network traffic management actions that should be performed prior to and during disaster conditions. This standard is applicable to all telecommunications network operators that are interconnected to the public telecommunications networks. A coordinated network traffic management response by all affected network operators should ensure the integrity of the public telecommunications networks.

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[1] The term *network management* may have a broad connotation as defined in ITU-T TMN Recommendations (e.g., M.3010, M.3320, and M.3400) or a narrow connotation as defined in the ITU-T E.410 Recommendation series and this standard, both of which are focused on congestion control, or what may be termed *network traffic management.*

2 Normative References

The following standards contain provisions which, through reference in this text, constitute provisions of this American National Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this American National Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below.

ITU-T Recommendation M.3320, *Management requirements framework for the TMN X-interface.*[2]

3 Abbreviations, Acronyms, & Definitions

3.1 Abbreviations & Acronyms

ATM	Asynchronous Transfer Mode
ETS	Emergency Telecommunications Service
IP	Internet Protocol
ISAC	Information Sharing and Analysis Center
NCC	National Coordinating Center for Communications
NE	Network Element
NNI	Network-to-Network Interface
NS/EP	National Security and Emergency Preparedness
OS	Operations System
PSTN	Public Switched Telephone Network
SS7	Signalling System Number 7
TDM	Time Division Multiplex
TMN	Telecommunications Management Network

3.2 Definitions (from ITU-T M.3320)

3.2.1   network operator: An organization which operates a telecommunications network. A Network Operator may be a Service Provider and vice versa. A Network Operator may or may not provide particular telecommunications services.

3.2.2   service provider: A general reference to an entity that provides telecommunication services to Customers and other users either on a tariff or contract basis. A Service Provider may or may not operate a network. A Service Provider may or may not be a Customer of another Service Provider.

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[2] Available from the International Telecommunications Union < http://www.itu.int/ITU-T/ >.
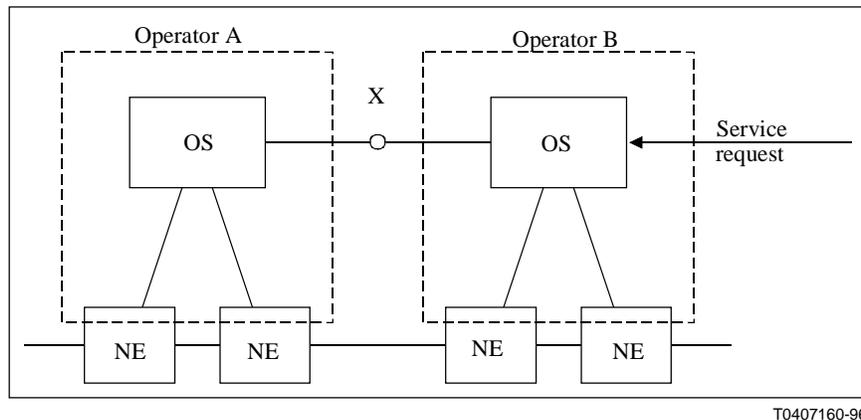
4 Overview of Network Management Actions

The coordinated network management actions consist of preplanning, real-time surveillance, analysis, control of traffic flow, and system restoration in the public telecommunications networks. The objective is to ensure the maximum utilization of the public telecommunications networks under stressful conditions due to traffic overload or network failure. When disaster conditions seriously impact traffic flow through interconnected network elements of interconnected network operators, the need for cooperative network management actions exists.

The specific coordinated network management actions required to manage disaster conditions include:

  a) Planning of coordinated network management actions;

  b) Detection of disaster conditions;

  c) Selection of system recovery and restoration strategies to be employed;

  d) Implementation of network management actions; and

  e) Evaluation and critique of network management actions and responses.

It is highly desirable that the coordination of network management actions between network operators be mechanized to as great an extent as is feasible. For example, cooperative management actions may be performed via the TMN X-interface as shown on Figure 4.1 below. Detailed requirements for interchange of critical network management actions via the X-interface are beyond the scope of this standard, but may be provided in future standards. See Annex B for additional information on what types of future standards may be needed.

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Figure 4.1 – Example for cooperative management via X-interface (also Figure 1/M.3320)

Some cooperative network management actions (e.g., network management controls) may also need to be indicated via the Network-to-Network Interface (NNI) as shown on Figure 4.2 below. The NNI signalling interface consists of the call control protocols and the call control signalling transport protocols. The NNI bearer interface consists of the bearer and bearer transport protocols. In cases where the bearer control is separate from the call control signalling, there would also be a bearer control interface.
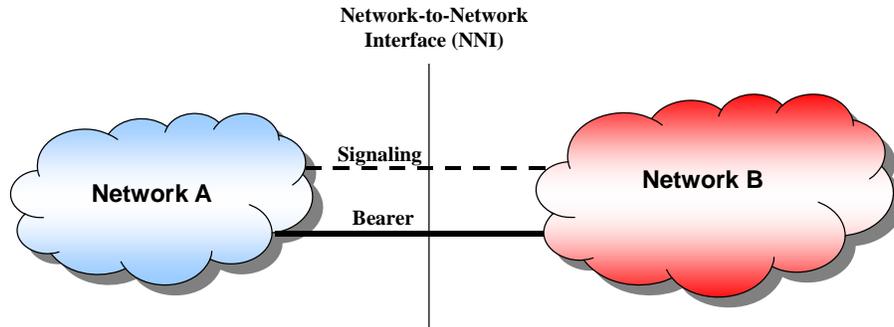
Network-to-Network
Interface (NNI)

Signaling

Network A

Bearer

Network B

Figure 4.2 – Network Interface Diagram

It is expected that network interconnections between the various different network types will be based on standardized interconnection interfaces. For example, it is expected that the different network types will interconnect to each other using PSTN interconnection standards, such as traditional SS7 protocols for call control signalling and TDM trunks for bearer interconnection. In the longer term, the different types of networks may interconnect directly using interconnection standards other than the traditional PSTN interconnection. Therefore, interworking of network management control mechanisms used in the different network types will need to be agreed upon and included within interconnection standards as they are defined. Specific requirements in support of network management actions that need to be indicated across the NNI under disaster conditions are beyond the scope of this document, but should be included within other standards that define NNI interconnections.

5 Phases of Cooperative Network Management Actions

5.1 Planning

Planning actions by a network operator should be initiated to ensure that the most effective detection processes, control strategies, and communications with other network operators will be utilized. When forecasts, warnings, or experiences indicate that a potential disaster condition exists, existing plans shall be reviewed and updated (enhanced) to ensure that they adequately address the specific type of disaster.

5.2 Detection

Serious traffic impairment or overload conditions may indicate that a disaster condition is impacting the network. The condition may be detected by one or more of the following sources:

- Customers;

- Service providers;

- Network operators;

- Network elements;

- Network surveillance systems; and

- Communications Infrastructure Information Sharing & Analysis Center (Communications ISAC) information interchange[3].

The need for cooperative network management actions should be determined by evaluating such reports and data.

5.3 Selection of Strategies

Depending on the network conditions detected, one or more of the following strategies should be employed during disaster conditions. Implementation of the following strategies should help optimize the integrity of the network while obtaining the maximum use of network capability:

a) *Inhibit switching congestion.* Network controls should be employed that will remove ineffective call attempts to a congested switching system. If switching congestion is not controlled, congestion may migrate to other switches in the network and to other interconnected networks.

b) *Optimize facilities.* Network management controls should be employed that will enable the maximum number of call attempts to complete.

c) *Reroute traffic.* Where technically feasible and agreed to by operators of affected networks, network management reroute controls should be employed to redirect overload traffic to trunk groups with available capacity.

d) *Invoke national security emergency preparedness procedures.* To the extent that network capabilities exist to provide National Security and Emergency Preparedness (NS/EP) call services[4], these capabilities should be invoked to enable such services to operate as designed with priority calling capabilities. It is recognized that precedence may also be required for other essential calling traffic and as such these requirements should be met.

e) *Allocate capacity/resources in a disaster area.* Increased network resource capacity should be given to calls originating from a disaster area as compared to terminating calls. People within the disaster area may have a need to originate calls for assistance, to coordinate relief efforts, or to notify family members of their well-being. Thus, network resources available to calls terminating into the disaster area would be relatively less than those available for originating calls[5].

f) *Invoke directionalizing some two-way trunk groups.* For TDM or similar networks, additional trunking resources should be given to calls originating from a disaster area. By switching over some circuits available for incoming calls to allow more circuits for outgoing calls during emergency conditions, service providers can increase the efficiency of depleted network resources and serve the public interest at the same time.

5.4 Implementation of Cooperative Network Management Procedures

Any network operator that determines that congestion stress levels between interconnected networks have been reached should start initiating cooperative network management actions. Any or all strategies described in clause 5.3 may be implemented in disaster and network overload situations. The overall objective is to optimize the

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[3] Additional information about the Communications ISAC may be found at the Department of Homeland Security (DHS) National Coordinating Center for Communications (NCC) website: < http://www.dhs.gov/national-coordinating-center-communications >.

[4] A description of the National Security and Emergency Preparedness (NS/EP) suite of telecommunications services can be found in ATIS-1000005, *Service Description of ETS*. Also see ATIS-1000009, which is listed in Annex A.

[5] This guideline does not change or supersede the recommendation for Call Admission Control (CAC) priority levels for user plane traffic found in ATIS-0100003, *User Plane Priority Levels for IP Networks and Services*.

integrity and capacity of the public telecommunications networks. Other objectives are to treat all customers as equitably as possible within each class of service and to preserve billing integrity.

All network operators are encouraged to cooperate in the implementations of impact analysis, selection of appropriate strategies to be employed, and agreement on specific network management procedures.

During disaster conditions, network surveillance and the activation of implemented network management controls shall become the joint responsibility of all involved network operators. This responsibility shall include the removal of controls when they are no longer needed.

5.5 Evaluations & Critique of Network Management Actions & Responses

All network operators involved in cooperative network management actions during a disaster condition should participate in a follow-up evaluation and critique after the condition has cleared. A follow-up evaluation and critique will help determine the effectiveness of the procedures and strategies that were employed, so that planning and controls can be improved for dealing with future disasters and traffic overloads.

6   Network Management Disaster Checklist

The following clauses are lists of items that may aid network management organizations in the *planning*, *execution,* and *evaluation* of actions associated with traffic overloads during a disaster.

6.1 Planning

a)   Review and validate network management plans periodically, including when a disaster is forecasted.

b)   Review and validate detection mechanisms for traffic overloads.

c)   Review and validate communication systems and methodologies internally, as well as among interconnected networks.

d)   Negotiate and plan all cooperative agreements.

6.2 Execution

a)   Determine if the developing situation constitutes a disaster condition that will result in network congestion caused by traffic overload and/or failure.

b)   Negotiate and implement network management controls between network operators.

c)   Monitor network surveillance controls during the disaster.

d)   Manage the removal of the network management controls between network operators when no longer needed.

6.3 Evaluation

a)   Jointly evaluate and critique the network management actions and subsequent results of the network management controls implemented.

b)   Identify and implement areas for improvement of the network management control plan for disaster situations.

Annex A: Informative References

(informative)

The publications listed below are for information only and are not essential for the completion of the requirements of this standard.

SR-2275, Issue 4; October 2000, *Telcordia Notes on the Networks, Section 10 – Surveillance and Control.*[6]

ATIS-0300003.2012, *XML Schema Interface for Fault Management (Trouble Administration).*[7]

ATIS-0300026, *Next Generation Interconnection Interoperability, (NGIIF) Reference Document, Part VI, Network Management Guidelines.*[8]

ATIS-0100009, *Overview of Standards in Support of Emergency Telecommunications Service (ETS).*[9]

ITU-T Recommendation E.410, *International network management – General Information.*[2]

ITU-T Recommendation E.411, *International network management – Operational guidance.*[2]

ITU-T Recommendation E.412, *Network management controls.*[2]

ITU-T Recommendation E.413:1988, *International network management – Planning.*[2]

ITU-T Recommendation E.414:1988, *International network management – Organization.*[2]

ITU-T Recommendation E.415:1991, *International network management guidance for common channel Signalling System no. 7.*[2]

ITU-T Recommendation M.3010, *Principles for a Telecommunications management network.*[2]

ITU-T Recommendation M.3350, *TMN service management requirements for information interchange across the TMN X-interface to support provisioning of Emergency Telecommunications Service (ETS).*[2]

ITU-T Recommendation M.3400, *TMN Management Functions.*[2]

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[6] This document is available from Ericsson, at < http://telcom-info.telcordia.com/ >.

[7] This document is available from the Alliance for Telecommunications Industry Solutions (ATIS) at < https://www.atis.org/docstore/product.aspx?id=26776>.

[8] This document is available from the Alliance for Telecommunications Industry Solutions (ATIS) at < https://www.atis.org/docstore/product.aspx?id=26060>.

[9] This document is available from the Alliance for Telecommunications Industry Solutions (ATIS) at < https://www.atis.org/docstore/product.aspx?id=22974 >.

Annex B: Future Study Items

(informative)

The following items have been identified as being important to the implementation of cooperative network management procedures under disaster conditions but are currently beyond the scope of this document. It is expected that standards pertaining to these items will be either provided in a future edition of this document, be incorporated into future editions of other existing standards documents, or be provided via the creation of one or more new standards documents.

B.1 Technology-Specific Network Management Actions

It is recognized that public telecommunications networks consist of multiple non-homogeneous interconnected networks that are based on different technologies (e.g., circuit-switched, wireless, IP, and ATM) and architectures supporting a variety of services. The different network types can be generalized as illustrated in Figure B.1:

1. Circuit-Switched Networks;

2. Satellite Networks;

3. Wireless Network/Mobile Radio Access;

4. IP Cable Networks; and

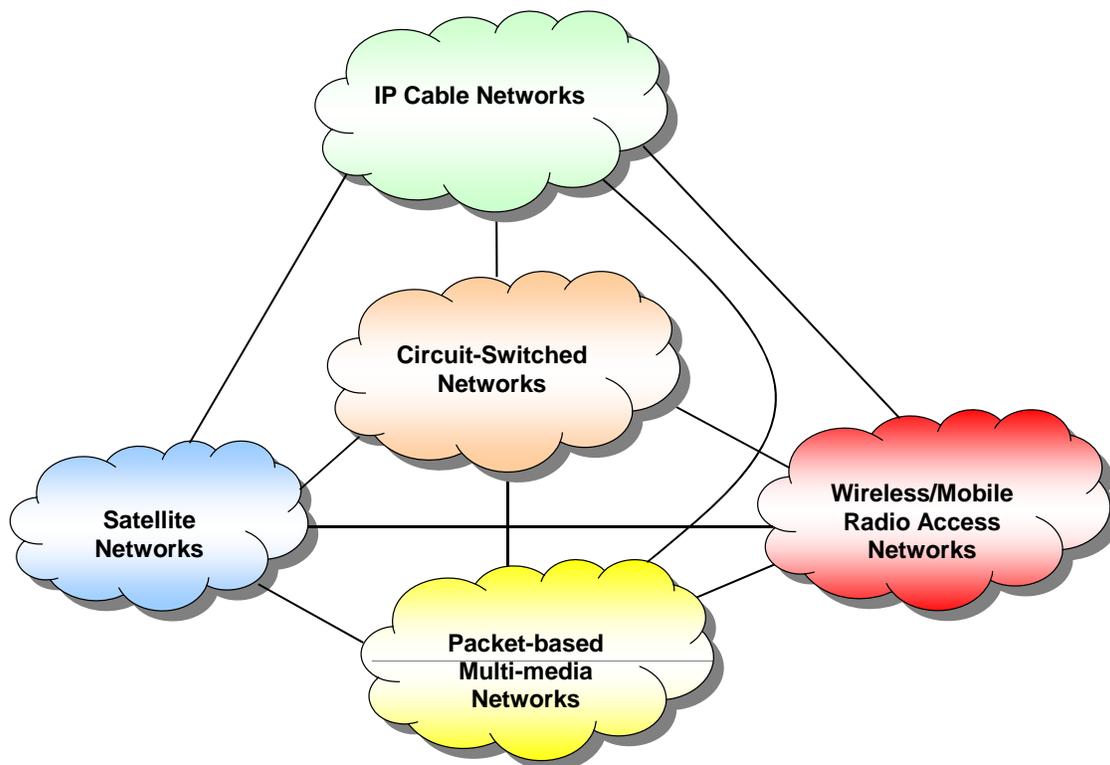5. Packet-based Multi-media Networks.

Figure B.1 – Multiple Interconnected Networks

For circuit-switched networks, network management procedures under disaster conditions have already been developed within the industry. For example, the generic circuit-switched network architecture consists of two distinct networks: the SS7 signalling network and the circuit switched trunk (bearer) network. A catastrophic failure (or disaster) may impact either or both networks. ITU-T Recommendation E.415, *International Network Management Guidance for Common Channel Signalling System No. 7*, provides guidance on responding to catastrophic failure or overload of the common channel signalling network.

For other network types shown on Figure B.1, specifications similar to those developed for circuit-switched networks are needed to define network management procedures under disaster conditions.

In addition, network management procedures under disaster conditions need to be defined at the interworking points between various network types (i.e., the interfaces between different network clouds shown on Figure B.1).

B.2 Network Management Actions via the TMN X-Interface

As described in clause 4, cooperative management actions may be performed via the TMN X-interface. ATIS data interchange standards based on the TMN X-interface have been produced for network management applications such as trouble administration (e.g., see ATIS-0300003). ITU-T Recommendation M.3350 describes requirements for data interchange across the TMN X-interface to support provisioning of ETS. There is a need to extend the suite of X-interface applications standards to more comprehensively address information sharing and control functions needed to perform cooperative (between network operators) network management procedures under disaster conditions.

In addition to X-interface specifications applicable between network operators, a similar approach may be taken for standardization of an X-interface application with respect to Communications ISAC data interchange (see clause 5.2).