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Priority Classification Levels for Next Generation Networks

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American National Standard for Telecommunications

PRIORITY CLASSIFICATION LEVELS FOR NEXT GENERATION NETWORKS

Alliance for Telecommunications Industry Solutions

Approved December 19, 2008

American National Standards Institute, Inc.

Abstract

This standard formalizes a set of priority classification levels for admission control and service restoration in Next Generation Networks. The highest priority classifications are reserved for *Emergency Telecommunications Service*.

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 carriers, customers, and manufacturers. The Network Performance Reliability and Quality of Service (PRQC) Committee develops and recommends standards, requirements, and technical reports related to the performance, reliability, and associated security aspects of communications networks, as well as the processing of voice, audio, data, image, and video signals, and their multimedia integration. PRQC also develops and recommends positions on, and foster consistency with, standards and related subjects under consideration in other North American and international standards bodies.

- ♦ Performance and Reliability of Networks (e.g., IP, ATM, OTN, and PSTN), and Services (e.g., Frame Relay, Dedicated and Switched Data);
- ♦ Security-related aspects;
- ♦ Emergency communications-related aspects; and
- ♦ Coding (e.g., video and speech), at and between carrier-to-carrier and carrier-to-customer interfaces, with due consideration of end-user applications.

Standards, requirements, technical reports, and contributions will be developed that:

- ♦ Identify and define performance parameters and levels for the speed, accuracy, dependability, availability, and robustness of connection establishment, information transfer, and connection disengagement;
- ♦ Define measurement techniques for these performance parameters;
- ♦ Define methods for characterizing network and signal processing performance for customer applications;
- ♦ Develop transmission planning guidance for the deployment of signal processing devices such as echo cancellers and VoIP elements; and
- ♦ Take into account the characteristics of signal processing and multimedia systems and the needed interworking among network technologies and services such as IP, Frame Relay, ATM, SONET, OTN, TDM, Wireless, etc.

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.

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

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iii

TABLE OF CONTENTS

American National Standard for Telecommunications

Priority Classification Levels for Next Generation Networks

1 SCOPE & PURPOSE

According to ITU-T Recommendation Y.1271 [Y.1271], enhanced priority treatment is an essential requirement for the assured capabilities needed for *Emergency Telecommunications Service (ETS)*. Two critical components of enhanced priority treatment are:

♦ Admission control for telecommunications services seeking entry into a network particularly during emergency conditions when network resources may be depleted.

♦ Network restoration for telecommunications services that are in progress when the network experiences an outage resulting in depleted resources.

These components in a *Next Generation Network (NGN)* can be enabled by:

1. Development of admission control and restoration priority levels based on the criticality of services seeking entry in NGNs and service restoration.
2. Development of necessary extensions in signaling protocols that can indicate the desired service priority levels at NGN interfaces.
3. Development of admission control and restoration mechanisms that can recognize the signaled priority levels and undertake necessary action.

The scope of this document is limited to formalizing priority classification levels for admission control and service restoration (step 1). The purpose is to initiate an examination of existing signaling protocol extensions to determine their adequacy in supporting priority levels and to recommend further action as needed.

2 REFERENCES

2.1 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 Y.1271, *Framework(s) on network requirements and capabilities to support emergency telecommunications over evolving circuit-switched and packet-switched networks*.[1]

ITU-T Y.2171, *Admission control priority levels in Next Generation Networks*.[1]

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[1] This document is available from the International Telecommunications Union. < http://www.itu.int/ITU-T/ >

ITU-T Y.2172, *Service restoration priority levels in Next Generation Networks*.[1]

2.2 Informative References

ATIS-0100003, *User Plane Priority Levels for IP Networks and Services*.[2]

ATIS-0100006, *Service Restoration Priority Levels for IP Networks*.[2]

3 DEFINITIONS

3.1   Admission Control: A set of actions/policies taken by the network at session set-up phase in order to accept or reject a service based on requested performance and priority criteria and the availability of necessary resources.

3.2   Service Restoration: A set of automated or manual methods, invoked after a network failure, to enhance the ability of successful communications reroute and completion around the failed network element(s).

4 ACRONYMS & ABBREVIATIONS

ANS	American National Standard
CAC	Connection Admission Control
ETS	Emergency Telecommunications Service
G-MPLS	Generalized MPLS
IP	Internet Protocol
ISP	Internet Service Provider
ITU-T	International Telecommunications Union - Telecommunication Standardization Sector
MPLS	Multi-Protocol Label Switching
NGN	Next Generation Network
PRQC	Performance Reliability and Quality of Service Committee
QoS	Quality of Service
SLA	Service Level Agreement
VoIP	Voice over IP
VPN	Virtual Private Network

5 OVERVIEW

NGNs are expected to be truly "converged" -- that is, all forms of telecommunications services will be handled by such networks: control plane traffic (e.g., routing messages), emergency telecommunications, real-time voice and video services, data services, *Virtual Private Network (VPN)*

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[2] This document is available from the Alliance for Telecommunications Industry Solutions (ATIS), 1200 G Street N.W., Suite 500, Washington, DC 20005. < https://www.atis.org/docstore/default.aspx >

services, as well as traditional "best effort" traffic. In such an environment, it is important to assign priority levels and establish rules for capacity reservation /admission and service restoration such that:

♦ Critical services are recognized and accepted for call/session setup and admission (or simply carried in the case of non-session oriented traffic) over other services in case of network overloads or failures.

♦ Critical service calls/sessions that are in progress when network failures occur receive restoration priority treatment over other services under such conditions (e.g., depleted resources and bandwidth).

As services can be expected to traverse multiple network domains, setting priority classification levels is an important step in the development of the necessary signaling protocol extensions as well as the mechanisms for enabling preferential admission and restoration treatment of critical services.

An NGN must recognize and admit higher priority services into the network, particularly under failure and/or congestion conditions. This can be referred to as a traditional form of *Connection Admission Control (CAC)* priority classification. The need for such priority levels is most critical under emergency conditions when networks may experience loss of resources and capacity coupled with surges of communications traffic as the impacted public seeks help (in the affected areas) or information about family and friends. Priority levels can then be utilized by CAC functions to determine whether incoming calls or sessions can be admitted depending on the criticality of the service and the availability of a potentially reduced set of network resources.

Note that the priority level recommendations proposed in this document strictly relate to the relative importance of telecommunications services seeking admission into networks. They do not reflect implementation specific priority definitions. Further, these recommended levels are independent from the ITU-T Recommendation Y.1541 QoS[3] classes.

Restoration priority classification is based on the following premise: Under reduced bandwidth conditions resulting from network failure, the critical issue for an NGN is the ability to recognize and restore higher priority traffic flows first. The priority level recommendations proposed in this document strictly relate to the relative importance of traffic classes from this perspective. They do not reflect implementation-specific priority definitions. For example, there are mechanisms utilizing *Generalized Multi-Protocol Label Switching (G-MPLS)*-based recovery that define specific recovery capabilities such as 1+1 protection and 1:N protection as described in IETF RFC 4426[4]. Such mechanism-specific priority definitions do not apply to the recommendations in this document.

To summarize, the priority classification levels being recommended in this document are completely independent of the enabling mechanisms that a network operator may utilize.

6 ADMISSION CONTROL PRIORITY CLASSIFICATION LEVELS

Three admission control priority levels are recommended for telecommunications services seeking entry into NGN:

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[3] ITU-T Recommendation Y.1541, *Network performance objectives for IP-based services*.

[4] IETF RFC 4426, *Generalized Multi-Protocol Label Switching (G-MPLS) Recovery Functional Specification*.

♦ *Priority Level 1 (High Priority)*: Traffic with this priority level receives the highest assurance for admission to the network. This level is reserved for emergency telecommunications (e.g., ETS and E911) over NGN.

♦ *Priority Level 2 (Normal Priority)*: Traffic with this priority level will not receive the same assurance for admission as that given to Priority Level 1 traffic, but will receive higher assurance for admission than that given to Priority Level 3 traffic. Examples include real-time services (VoIP, video), VPN, and data services. The selection of this priority level is expected to be determined by appropriate *Service Level Agreements (SLA)* between network operators and customers for the desired service.

♦ *Priority Level 3 (Best Effort Priority)*: Traffic with this priority level receives the least assurance for admission to the network. Examples include "traditional" *Internet Service Provider (ISP)* services (e-mail, web surfing). The selection of this priority level is expected to be determined by appropriate SLA agreements between network operators and customers for the desired service.

Each network operator may adopt additional priority sub-levels within each broad priority classification level. The total number of admission control priority levels may be extended in the future.

The choice of priority implementation mechanisms in the transport stratum is up to the network operator.

7 SERVICE RESTORATION PRIORITY CLASSIFICATION LEVELS

Three restoration priority levels are recommended for traffic in NGN:

♦ *Priority Level 1 (High Priority)*: Traffic with this priority receives the highest assurance of restoration. This class must include control services crucial to the operation of a network and emergency telecommunications. Other services may be included depending on availability of restoration capacity and SLAs between network operators and customers for the desired service.

♦ *Priority Level 2 (Normal Priority)*: Traffic with this priority will receive lower assurance than Priority Level 1 traffic, but will receive higher assurance than Priority Level 3 traffic for restoration. Examples include real-time services (VoIP, video), VPN, and data services. The selection of this priority class is expected to be determined by appropriate SLA agreements between network operators and customers for the desired service.

♦ *Priority Level 3 (Best Effort Priority)*: Traffic with this priority receives the least assurance for restoration. Examples include "traditional" ISP services (e-mail, web surfing). The selection of this priority class is expected to be determined by appropriate SLA agreements between network operators and customers for the desired service.

The choice of the offered priority levels and the priority implementation mechanisms in the transport stratum is up to the network operator.

The total number of restoration priority levels may be extended in the future.