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Multimedia Management (MMM)

**Recommended Practice for Qualifying Network Devices
for High Availability Streaming Video**

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Table of Contents

1. Introduction.....	4
2. Scope.....	5
3. Informative References	5
4. Glossary, Acronyms, and Abbreviations	7
5. Introduction.....	8
5.1 Availability Metrics and Measurements	8
5.2 Availability Reports.....	9
5.3 Pass/Fail Criteria.....	10
6. Test Configurations:.....	10
6.1 Baseline Tests:	12
6.1.1 Test 1: Headend Broadcast Baseline	13
6.1.2 Test 2: Core Network Switch/Router Baseline Operation	15
6.1.3 Test 3: Edge/Hub Network Switch/Router Baseline Operation.....	17
6.1.4 Test 4: Edge/Hub Network Switch/Router Baseline Multicast Operation	20
7. Summary	23

1. Introduction

This document is identical to SCTE 175 2011 except for informative components which may have been updated such as the title page, NOTICE text, headers and footers. No normative changes have been made to this document.

Given the rapidly developing competitive market environment and subscriber sensitivity to program stream impairments, network devices in these applications are required, ideally, to operate without errors of any kind – *ever*. Or, should an error be unavoidable, it ought to be short and, therefore, minimize its impact to subscribers. IP Network devices including data switches and routers are increasingly being deployed in the transport of large numbers of flows of streaming video over IP in MSO transport environments. Program streams have somewhat different characteristics and transport requirements than VoIP and data. MSO Operations Groups now use measurements of per-program *Availability* in evaluating the operation of deployed equipment. Thus, availability Metrics are being deployed by major video service providers to measure and monitor the end-to-end per-program systems performance in their plants. Achieving low numbers of per-program errored seconds to the subscriber through monitoring and management techniques is also the subject of recent SCTE standards such as SCTE 168-6 2010. This RP is intended to specify means to evaluate whether a network device is capable of delivering a desired per-program availability performance level; i.e., 3 nines (99.9%), 4 nines (99.99%), etc. The testing and evaluation specified in this document is intended to be applied during the product evaluation and selection phase before deployment. Comparing test results from different products will help guide the selection of products best suited to delivering high availability streaming media over IP networks typical of MSO deployments.

Because of the differences in video over IP streams' characteristics compared to other payloads such as voice and data, using traditional data application oriented tests exclusively may not reflect the network performance actually experienced when used in streaming media applications. With an emphasis on deriving longer term program availability results, this note proposes and describes the following plan for network device evaluation:

- Identify a set of tests that describe common traffic characteristics and flow paths to be used during a switch and/or network device evaluation intended for streaming media based on common specific configurations found in many MSO streaming media transport networks as described in the ANSI/SCTE 168-7 2010 Recommended Practice.
- Identify realistic, repeatable traffic load test conditions and typical network stress events that will characterize the availability performance of network devices intended for video and streaming media transport.

- Identify test results in terms of program availability to help evaluate expected subscriber results and satisfaction when the DUT is deployed in streaming media networks. These results are also intended to provide a common means of comparing devices that perform similar functions in terms of how subscribers may be affected in the presence of common network operations and stress conditions.

These tests are intended to complement existing data oriented device performance evaluations such as described in RFC 2544, RFC 2889, etc. They include traffic loads with test generated video formatted streams or live streams originating at a service provider.

2. Scope

The ANSI/SCTE 168 series of Recommended Practices [17][18][19] describe IP video networks at MSO Headend, Core, and Hub networks. While all these configurations carry media over IP, the video flow types and distribution, link speeds, and possibly QoS policies are different at various locations. Different mixes of traffic types such as VoIP and data may be present in some locations and not in others. The recommended baseline tests in this document are intended to represent the operation of network devices in these three applications. These baseline tests provide a common set of reference results that can be used to preliminarily screen equipment and configurations during the selection, configuration, and deployment process. They will provide results to determine if the equipment under consideration provides a level of performance that is “in the ballpark” of that intended for an application. The test results indicate a per-program availability for extended “soak” tests of long term delivery of a number of realistic simultaneous video flows. They will also indicate how program availability will be affected by certain types of common realistic network events often experienced in operating complex live networks. Devices that take longer to recover from faults, that cannot accommodate simultaneously arriving persistent packet stream packets, experience crashes, or occasionally lose data for whatever reasons will fare less well in these tests compared to designs and configurations that are optimized for high availability.

Other tests should also be executed to complement these baseline tests before final equipment selection and deployment. Such tests would typically include, but not be limited to, the intended load levels, number-type-and speed of active ports, level and type of non-video converged traffic expected, forwarding protocols, management protocols, etc. that are expected in the operational environment.

3. Informative References

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[8] “Triple-play Services Quality of Experience (QoE) Requirements”, DSL Forum Technical Report TR-126

[9] “Recommended Practices for Monitoring Multimedia Distribution Quality”, ANSI/SCTE 168-6 2010

[10] ITU-T recommendation G.826 (2002), End-to-end error performance parameters and objectives for international, constant bit rate digital paths and connections

[11] ITU-T recommendation I.357 (2000), B-ISDN semi-permanent connection availability

[12] ITU-T recommendation Y.1540 (2007), Internet protocol data communication service – IP packet transfer and availability performance parameters

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[14] ITU-T recommendation Y.1731 (May 2006), OAM functions and mechanisms for Ethernet based networks

[15] ITU-T recommendation G.7710/Y.1701 (June 2007), Common equipment management function requirements

[16] ITU-T SG12 contribution C.116 (October 2007), Comparison of availability definitions for Y.ETHperf

[17] ANSI/SCTE 168-4 2010, Recommended Practice for Transport Stream Verification Metrics

[18] ANSI/SCTE 168-6 2010, Recommended Practice for Monitoring Multimedia Distribution Quality

[19] ANSI/SCTE 168-7 2010, Recommended Practice for Transport Stream Verification in an IP Transport Network

[20] ISO/IEC 13818-1 (2000-12-01), Information technology – Generic coding of moving pictures and associated audio information: Systems

4. Glossary, Acronyms, and Abbreviations

Availability – The number of unimpaired seconds of a multimedia stream divided by the number of tested seconds expressed as a percentage.

CBR – Constant Bit Rate

DUT – Device Under Test

Errored Second – A second during which a measured stream has one or more missing packets.

HD – High Definition; An MPEG 2 encoded HD stream is usually transmitted at greater than 10 Mb/s

IP – Internet Protocol

Link Flap – A network interface that repeatedly becomes enabled and disabled due to a layer 1 fault or other reasons

Multicast -- A method for transmitting a single source stream to many receivers. Multicast uses network devices to replicate packets that are sent to multiple receivers

Packet – an IP Datagram as defined in RFC 791

Program – A program is a collection of program elements. Program elements may be elementary streams. Program elements need not have any defined time base; those that do have a common time base are intended for synchronized presentation. See ISO 13818-1.

Program Element – A generic term for one of the elementary streams or other data streams that may be included in a program. See ISO 13818-1.

Program Stream -- a succession of packets (IP Datagrams) carrying multimedia content and related data for that content.