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**Recommended Practice for Transport Stream Verification
in an IP Transport Network**

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1.0 SCOPE

This document is identical to SCTE 168-7 2010 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.

This Recommended Practice is to give guidance about detecting errors in the IP Transport network used for the delivery of media services including Video and Audio streams of data with the associated control information to provide MPEG transport through an IP network. The IP Transport Layer operates in conjunction with other Application and Physical component layers that could also generate network impairments, this document will focus on the effect these impairments have on the detection of the cause of problems in the delivery of media services. Common IP network events and failures are characterized with their impact on the MPEG transport stream in a functioning system. Every network layout is different and presents unique configuration challenges; this document does not provide guidance on configuration of the network but does provide background information on the individual components of the IP network as well how the IP transport network operates in a multimedia network.

This document describes the protocols within the IP network and the possible IP layer causes of media impairments but does not provide metrics that correlate specific IP failures to media impairments. Industry accepted metrics have been provided for IP packet loss, delay and jitter.

This background on the IP network layer provides guidance to operators who are planning to deploy or are currently deploying MMM systems and, where appropriate, refers to other SCTE documents that provide supplemental information about other network components outside of the IP Transport Network.

2.0 INFORMATIVE REFERENCES

The following documents may provide valuable information to the reader but are not required when complying with this standard.

2.1 SCTE References

[1] SCTE 142, Recommended Practice for Transport Stream Verification

[2] SCTE 168-6, Recommended Practice for Monitoring Multimedia Distribution Quality

2.2 Standards from other Organizations

[3] IEEE 802.3, Ethernet protocol family

[4] IETF RFC 791, Internet Protocol

- [5] IETF RFC 2460, Internet Protocol Version 6 (IPv6) Specification
- [6] IETF RFC 3031, Multiprotocol Label Switching Architecture
- [7] IETF RFC 2236, Internet Group Management Protocol version 2 (IGMPv2)
- [8] IETF RFC 3376, Internet Group Management Protocol version 3 (IGMPv3)
- [9] IETF RFC 2710, Multicast Listener Discovery (MLD) for IPv6
- [10] IETF RFC 3810, Multicast Listener Discovery Version 2 (MLDv2) for IPv6
- [11] IETF RFC 4445, A Proposed Media Delivery Index (MDI)
- [12] IETF RFC 2328, OSPF Version 2
- [13] IETF RFC 1195, Use of OSI IS-IS for Routing in TCP/IP and Dual Environments
- [14] IETF RFC 1771, A Border Gateway Protocol 4
- [15] IEEE 802.1d, Spanning Tree Protocol
- [16] IETF RFC 3209, RSVP-TE: Extensions to RSVP for LSP Tunnels
- [17] IETF RFC 3036, LDP Specification
- [18] IETF RFC 2679, A One-way Delay Metric for IPPM
- [19] IETF RFC 2362, Protocol Independent Multicast-Sparse Mode
- [20] IETF RFC 3973, Protocol Independent Multicast - Dense Mode (PIM-DM)
- [21] IETF RFC 2463, Internet Control Message Protocol (ICMPv6) for the Internet Protocol Version 6 (IPv6)

3.0 DEFINITIONS AND ACRONYMS

ASM – Any Source Multicast

DSCP – Differentiated Service Code Points

EGRESS – Network traffic that is sent out of a router port for a destination outside of the router.

IGMP - Internet Group Management Protocol

INGRESS – Network traffic that originates from outside of a router which is processed by the router.

MLD - Multicast Listener Discovery

Policer – Policing, or rate limiting, enables you to limit the amount of traffic that passes into or out of an interface.

RTP – Real Time Protocol

SSM – Source Specific Multicast

4.0 INTRODUCTION

One of the challenges to detecting errors in the transport of MPEG streams is that these packets are carried in UDP, which is essentially connectionless. In order to determine that there is a failure there has to be a known metric by which to measure the traffic. In an IP Network there are specific network events that could lead to impairments or service degradation that would cause a perceived problem for the end user of a specific service such as watching a Video On Demand television program.

Work has been documented in SCTE 142 [1] to detail media impairment severity levels specific to the connection between the emission remultiplexer and the QAM modulator.

Recommended Practice SCTE 142 specifically refers to the MPEG Transport Stream and is independent of the underlying distribution system. Rather than using traditional ASI transport technologies, MPEG2 Transport Streams can be carried between the Head End System and a downstream Modulator over an IP-based network infrastructure such as that shown in Figure 1 with a simplified network view shown in Figure 2. When a packet network is used as the distribution system it could be non-deterministic and may cause errors that are reported at the transport stream layer when the SCTE 142 Recommended Practice has been implemented.



Figure 2 – Simplified View of IP Transport Network

Because the type of media data in any given IP packet varies widely the effects of a single lost IP packet will vary. Most deployed networks do not prioritize specific packets based on content or handle packets with different content differently, and since any IP packet is