DVB AL-FEC Hybrid FEC Protection

draft-ietf-fecframe-dvb-al-fec-00

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Introduction

• DVB AL-FEC protocol uses two layers of protection:
  – Base layer: 1-D Interleaved Parity FEC Code
    → SMPTE 2022-1-2007
  – Enhancement layer: Raptor Code
    → draft-ietf-fecframe-raptor
    → draft-watson-fecframe-rtp-raptor

• Both layers are systematic codes

• The specs are
  – ETSI TS 102 034 v1.3.1
  – Draft ETSI TS 102 034 v1.4.1 (Bluebook A086r7)
DVB AL-FEC Encoder

Source Packet: ++++
           ++++

Base-layer Repair Packet: ++++
           ++++

Enhancement-layer Repair Packet: +~~+
           +~~+
DVB AL-FEC Decoders

Minimum Performance Decoder:

```
+----+ X X +---- --+ Systematic +---- +---- +---- +---- +----
|----+     +----     |FEC Protection| +---- +---- +---- +---- +----
|----+     +----     +----+   Parity  +---- +---- +---- +---- +----
+----+     +----+   Decoder +---- +---- +---- +---- +----
```

Enhanced Decoder:

```
+----+ X X +---- --+ Systematic +---- +---- +---- +---- +----
|----+     +----     |FEC Protection| +---- +---- +---- +---- +----
|----+     +----+   Parity  +---- +---- +---- +---- +----
+----+     +----+   Decoder +---- +---- +---- +---- +----
```

Lost Packet: X
Hybrid Decoding

1. Perform parity decoding
   - Are all missing packets recovered?
     • Yes → Done
     • No → Go to step 2

2. Perform Raptor decoding
   - Are all missing packets recovered?
     • Yes → Done
     • No → Go to step 3

3. Convert the unprocessed parity repair packets to a form in which they can be added to the Raptor decoding process and continue decoding
ETSI TS 102 034 v1.3.1 vs. v1.4.1

- Base-layer FEC
  - v1.3.1: RTP only
  - v1.4.1: RTP only

- Enhancement-layer FEC
  - v1.3.1: UDP only
  - v1.4.1: RTP only
ETSI TS 102 034 v1.3.1

• Base-layer FEC is based on SMPTE 2022-1-2007

• Incompatibilities of SMPTE 2022-1 with RFC 3550
  – SSRC is set to zero in the FEC stream
  – No CSRC fields are allowed in the source packets
  – Timestamp in the FEC stream is ignored by the receivers
    • It is probably set to zero
  – Initial seqnum of the FEC stream is not chosen randomly
  – PT field is set to 96 in the FEC stream
Resolution Attempts

• draft-ietf-fecframe-interleaved-fec-scheme fixed these issues
  – Changes are not backward compatible
  – The draft has not been adopted by DVB (yet)
    • v1.4.1 only allowed to choose the initial seqnum randomly for the FEC stream

• AVT WG sent a liaison to DVB-IPI on Oct 22\textsuperscript{nd}
  – AVT suggested DVB to define a new RTP profile for the AL-FEC protocol
    • This profile prohibits the use of RTP mixers
      \rightarrow Solves the CSRC issue
    • This profile assigns 96 as the payload type
      \rightarrow Solves the PT issue
  – AVT suggested DVB to use explicit SSRC signaling via draft-ietf-mmusic-sdp-source-attributes
    \rightarrow Solves the SSRC issue
  – If the new profile will be defined, only the timestamp issue will remain
IANA Issues

• DVB registered the following for ETSI TS 102 034 v1.3.1
  – vnd.dvb.iptv.alfec-base
    • RTP format parameters are NOT defined for this registration
    • It is not clear how FEC parameters will be defined/set in SDP

• draft-ietf-fecframe-interleaved-fec-scheme registers the following
  – 1d-interleaved-parityfec
    • All RTP format parameters are defined

• DVB has not registered anything for ETSI TS 102 034 v1.4.1
  – Use of vnd.dvb.iptv.alfec-base may cause implementation issues
Next Steps

• draft-ietf-fecframe-interleaved-fec-scheme explains a fully RTP-compliant implementation
• draft-ietf-fecframe-dvb-al-fec explains the exceptions to be compliant with v1.3.1 and v1.4.1
• Unless DVB is willing to resolve the remaining issues in v1.5, we should update the draft based on v1.4.1 and WGLC