IETF 71 - March 2008 - FECFRAME

DVB AL-FEC overview

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Outline

- Background
- Specification outline
- FEC codes:
  - SMPTE 2022-2
  - “FEC Framework“ and Raptor codes
- Service discovery and selection

Background

- DVB-IPI conducted an extensive evaluation exercise of FEC codes for IPTV application
- Conclusion was to define a “hybrid” code based on:
  - a subset of the Pro-MPEG Code of Practice 3 (now SMPTE 2022-1), plus
  - the Digital Fountain Raptor code
- Approved late 2006, since adopted in ATIS IIF, ITU-T FG IPTV and ETSI TISPAN
- Published early 2007 as ETSI TS 102 034

Specification outline

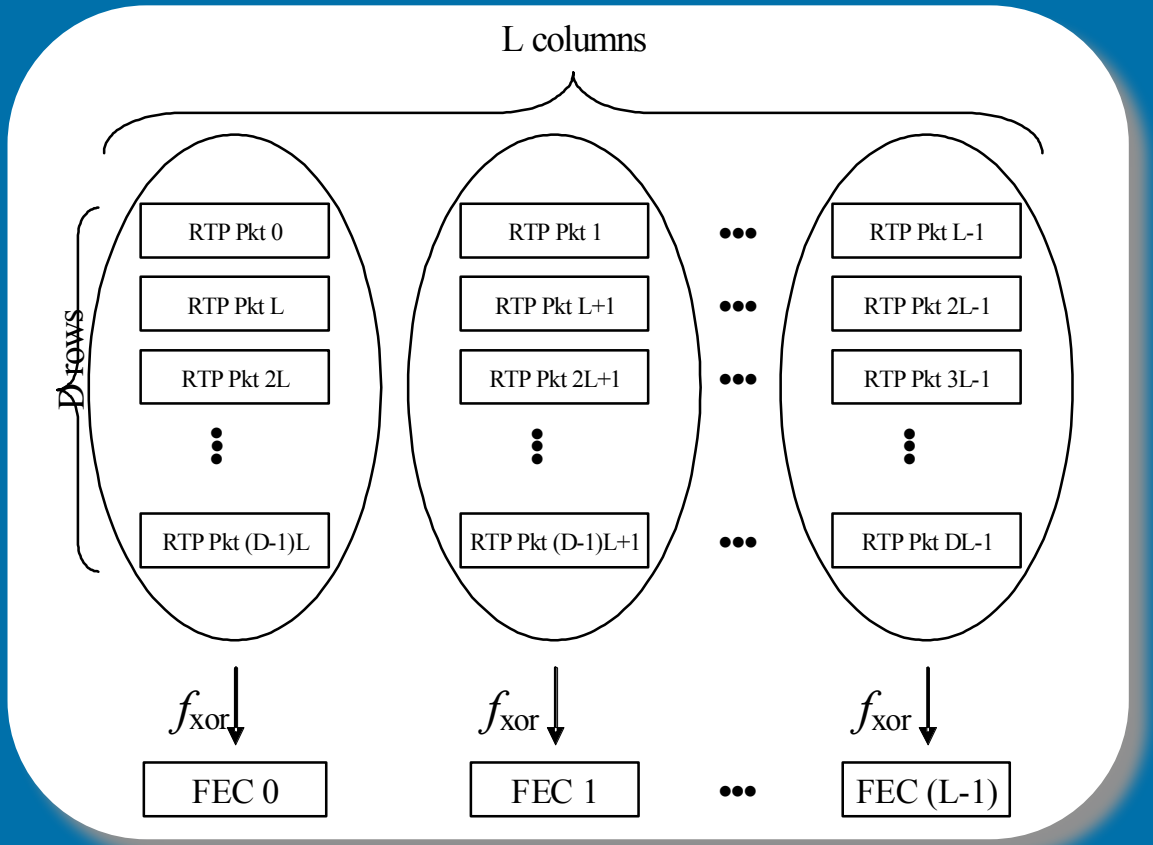
- SMPTE 2022-2 based code
  - This section defines the subset of the Pro-MPEG CoP3 FEC code that must be supported
  - Primarily defined by exceptions/clarifications to the SMPTE 2022-2 specification
- Raptor based code
  - Defines the Raptor code and how it is applied to streaming media
  - Uses concept of “FEC Framework” and “FEC Schemes” taken from IETF RMT, 3GPP MBMS and now IETF FECFRAME

Specification outline ctd.

- FEC Content Delivery Protocols
  - Puts together the components from previous sections, together with the Service Discovery data, to form complete FEC protocols for:
    - Multicast MPEG-2 Transport Stream encapsulated in RTP
    - Unicast MPEG-2 Transport Stream encapsulated in RTP
    - Multicast audio/video directly within RTP (Informative)
    - Unicast audio/video directly within RTP (Informative)

SMPTE 2022-2

- Simple interleaved parity code
- Maximum block size 400 packets (20 x 20)



FEC Framework

- Generic framework for application of FEC to streaming media
- First defined in 3GPP based on IETF RMT work
- Now progressing in IETF FECFRAME
- Supports arbitrary packet flows, not just RTP
- Defines:
  - Mapping of packet data into "source blocks"
  - Partition of "source block" into FEC symbols (source symbols)
  - Labeling of source symbols and repair symbols
  - Packet formats for source and repair data
- DVB-IPI specification adopts and enhances this Framework to support fully backwards compatible operation for the MPEG-2 TS case
  - No modification of source packets
  - Packet labeling based on RTP sequence numbers

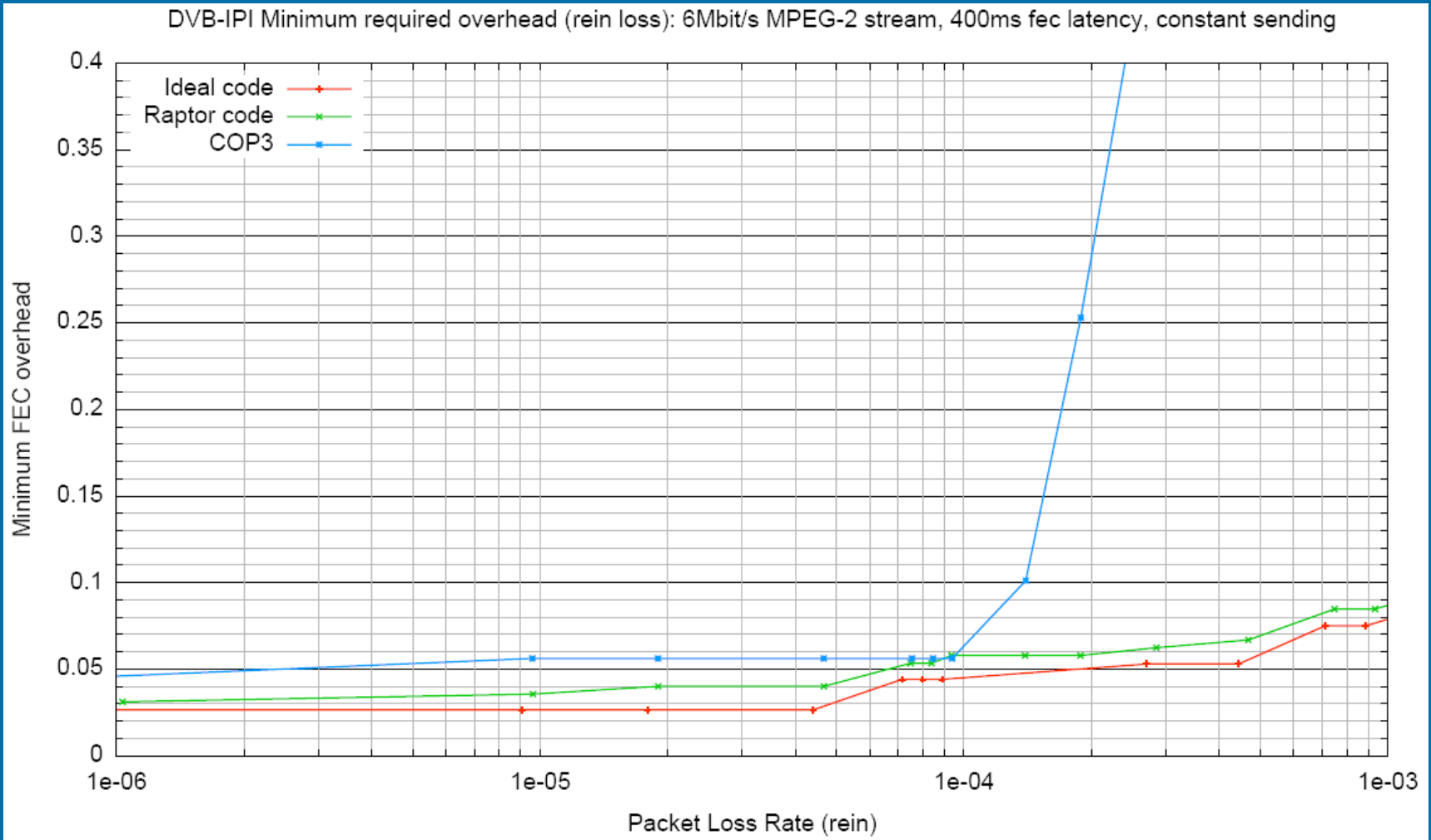
FEC Framework ctd.

- The DVB-IPI specification defines two FEC Schemes for Raptor
  - Raptor FEC Scheme for MPEG-2 Transport Streams encapsulated in RTP
  - Raptor FEC Scheme for arbitrary packet flows (in particular A/V encapsulation directly in RTP)

Raptor code

- Raptor constructs repair data from a complex sequence of XOR operations amongst portions of the original packets
- Defined in terms of explicit encoding sequences: sequence of XOR operations for each supported block size is specified in text files attached to specification
- The Raptor code is identical to RFC5053, except:
  - Only a limited set of block sizes are supported
    - This is fine for streaming were variation in block size is limited
    - Blocks can be padded to one of the supported lengths (no need to actually send the padding)
    - Greatly simplifies encoder implementation and reduces computational complexity

Simulation example



Proposal for FECFRAME

- FECFRAME should standardise the FEC Schemes defined in DVB specification
- Avoid overlap between FEC Schemes:
  - Separate schemes for DVB base layer and Pro-MPEG row code
  - Define DVB base layer, and two DVB Raptor schemes in a single draft

Thank you!