FEC Grouping Semantics in SDP
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Forward Error Correction (FEC)

Sender Side:

- Source Block N+1
- Source Block N
- (Systematic) FEC Encoder
- Repair Packets for Source Block N-1
- Source Block N-1
- SSM (s1,g2)
- SSM (s1,g1)

Receiver Side:

- Received Repair Packets
- (Systematic) FEC Decoder
- Received Source Block
- Recovered Packets
FEC Framework Flexibility

• Framework Requirements:
  – Source and repair flows are carried in different flows
  – Each FEC scheme requires a different FEC Framework instance

• We’d like to support flexible source/repair flow grouping
  – A source flow **MAY** be protected by multiple instances
  – Within an instance, multiple repair flows **MAY** exist
  – Source flows **MAY** be grouped (combined) prior to FEC protection

• If multiple repair flows are associated with a source flow, we’d like to support
  – Additive repair flows that may be decoded jointly for better recovery chances
  – Prioritization among the repair flows
Source and Repair Flow Association

- RFC 3388: An “m” line identified by its ‘mid’ attribute **MUST NOT** appear in more than one “a=group” line using the same semantics

- RFC 4756 (based on RFC 3388) would require us to write

  \[
  \text{a=group:FEC S1 S2 R1 R2}
  \]

  ⇒ No particular association

- I-D.ietf-mmusic-rfc3388bis removed this requirement
Support for Additivity/Prioritization

<table>
<thead>
<tr>
<th>SOURCE FLOWS</th>
<th>FEC FRAMEWORK INSTANCE #1</th>
</tr>
</thead>
<tbody>
<tr>
<td>S4: Source Flow</td>
<td>R5: Repair Flow</td>
</tr>
<tr>
<td></td>
<td>R6: Repair Flow</td>
</tr>
<tr>
<td></td>
<td>R7: Repair Flow</td>
</tr>
</tbody>
</table>

- **Additivity**
  - Multiple repair flows may be decoded jointly to improve the recovery chances
  - Additive repair flows can be generated by the same or different FEC schemes

- **Prioritization**
  - Prioritization lets receivers know in which order they **MUST** receive/decode the repair flows
  - The repair flows that are assigned a priority may or may not be additive

- **Currently, there is no SDP semantics for additivity/prioritization**
New Semantics (FEC-XR) – Examples

- **Association**
  
  \[a=\text{group:FEC-XR} \ S4 \ R5 \ R6\]
  
  \[a=\text{group:FEC-XR} \ S4 \ R7\]

- **Additivity**
  
  \[a=\text{group:FEC-XR} \ S4 \ R5 \ R6 \Rightarrow R5 \text{ and } R6 \text{ are additive}\]
  
  \[a=\text{group:FEC-XR} \ S4 \ R7 \Rightarrow R7 \text{ is not additive}\]
New Semantics (FEC-XR) – Examples

SOURCE FLOWS | FEC FRAMEWORK INSTANCE #1
S4: Source Flow |----------| R5: Repair Flow
| | R6: Repair Flow
| |----------| FEC FRAMEWORK INSTANCE #2
| | | R7: Repair Flow

• Association
  \[ a=\text{group}:\text{FEC-XR} \ S4 \ R5 \ R6 \]
  \[ a=\text{group}:\text{FEC-XR} \ S4 \ R7 \]

• Prioritization: Priority may be indicated by the order of the ‘mid’ values of the repair flows
  • For the example above \( \rightarrow \ p(R5) > p(R6) > p(R7) \)
  • Open Issue: How do we signal equal priorities?
Comments/Feedback

• Any need for a generic priority signaling in SDP?
• Suggestions for going forward?