Duplication Grouping Semantics in SDP

`draft-begen-mmusic-redundancy-grouping-01`

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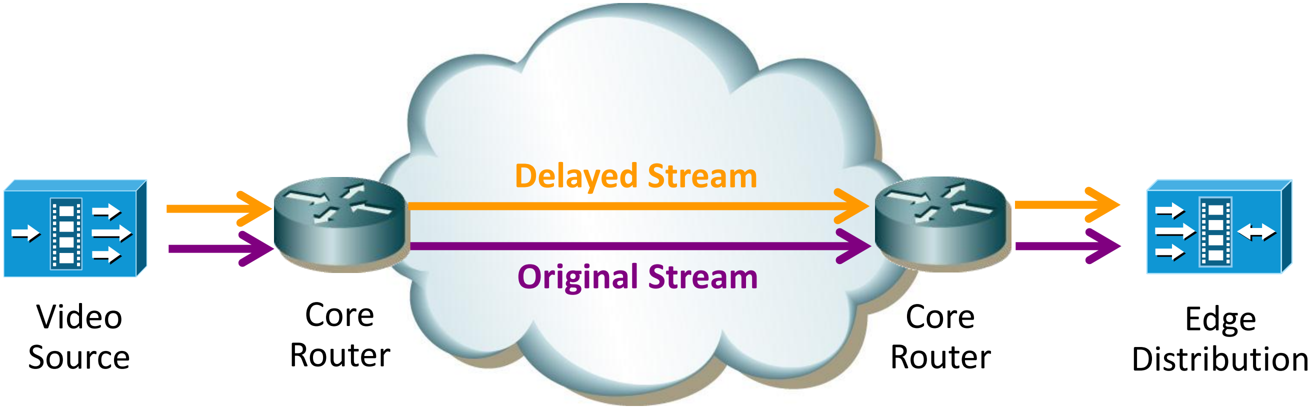
Ali C. Begen, Yiqun Cai and Heidi Ou

{abegen, ycai, hou}@cisco.com

Motivation

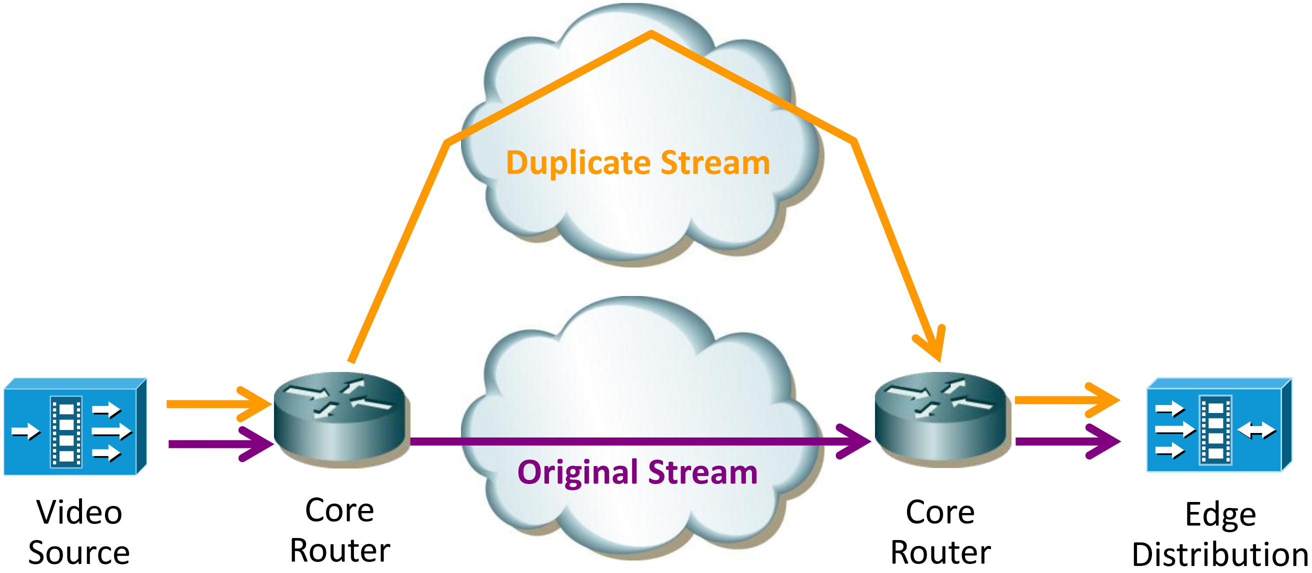
- Packet loss is unavoidable due to congestion or network outages
  - It is especially more problematic in multicasting due to large fanout
  - One basic recovery (within a bounded delay and bandwidth) method is to send redundant stream(s)
- A redundant stream can carry FEC-like data or the duplicates of the original source packets
  - **Here we are interested in methods where duplicates are used**
  - We focus on dual streaming but triple or quadruple streaming is also possible
  - SDP does not have the semantics for describing redundant streams
- This document
  - Defines grouping semantics for redundant RTP streams
  - Defines SSRC-level grouping semantics for SSRC-muxed redundant RTP streams

Time-Shifted Redundancy (Delayed Duplication)



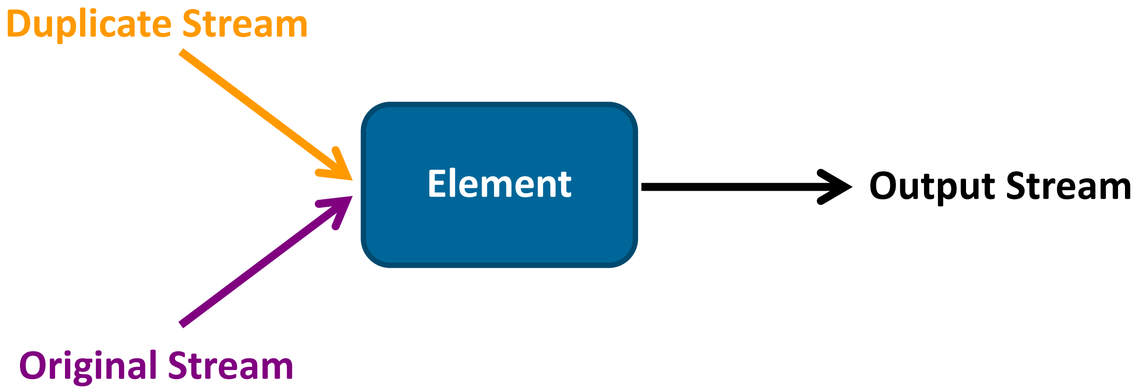
- Let Q denote the max outage duration that is intended to be repaired
- Packets are transmitted twice, each separated by Q time units
- Temporal diversity is hitless if loss/outage can be constrained to Q time units
- This introduces 100% overhead and a delay of Q time units

Spatial Diversity



- Two streams are sent over diverse paths in the core
- Spatial diversity introduces no delay if the paths have equal delays

Duplicate Suppression (Stream Merging)



- RTP packets with the same sequence numbers in each RTP stream carries the same payload
- Streams differ in their SSRCs
- The node suppresses duplicates and outputs a single dup-free (and hopefully gap-free) RTP stream

Separate Source Interfaces

- Two streams are sourced from different addresses and the RTP packets with the same sequence numbers in each RTP stream carries the same payload

```
v=0
o=ali 1122334455 1122334466 IN IP4 dup.example.com
s=DUP Grouping Semantics
t=0 0
m=video 30000 RTP/AVP 100 101
c=IN IP4 232.252.0.1/127
a=source-filter:incl IN IP4 232.252.0.1 198.51.100.1 198.51.100.2
a=rtpmap:100 MP2T/90000
a=rtpmap:101 MP2T/90000
a=ssrc:1000 cname:ch1@example.com
a=ssrc:1010 cname:ch1@example.com
a=ssrc-group:DUP 1000 1010
a=mid:Group1
```

Separate Destination Addresses

- The source duplicates the original stream over two SSM sessions

```
v=0
o=ali 1122334455 1122334466 IN IP4 dup.example.com
s=DUP Grouping Semantics
t=0 0
a=group:DUP S1a S1b
m=video 30000 RTP/AVP 100
c=IN IP4 233.252.0.1/127
a=source-filter:incl IN IP4 233.252.0.1 198.51.100.1
a=rtpmap:100 MP2T/90000
a=ssrc:1000 cname:ch1@example.com
a=mid:S1a
m=video 30000 RTP/AVP 101
c=IN IP4 233.252.0.2/127
a=source-filter:incl IN IP4 233.252.0.2 198.51.100.1
a=rtpmap:101 MP2T/90000
a=ssrc:1010 cname:ch1@example.com
a=mid:S1b
```

Delayed Duplication

- Packets in both streams are routed over the same path but the duplicates are transmitted 50 ms after the original packets

```
v=0
o=ali 1122334455 1122334466 IN IP4 dup.example.com
s=DUP Grouping Semantics
t=0 0
a=group:DUP S1a S1b
a=duplication-delay:50
m=video 30000 RTP/AVP 100
c=IN IP4 233.252.0.1/127
a=source-filter:incl IN IP4 233.252.0.1 198.51.100.1
a=rtpmap:100 MP2T/90000
a=ssrc:1000 cname:ch1@example.com
a=mid:S1a
m=video 40000 RTP/AVP 101
c=IN IP4 233.252.0.1/127
a=source-filter:incl IN IP4 233.252.0.1 198.51.100.1
a=rtpmap:101 MP2T/90000
a=ssrc:1010 cname:ch1@example.com
a=mid:S1b
```

Things to Consider

- Stream merging may take place before or at the ultimate RTP receiver endpoint
- At the network element that does the merging:

  Should we report on the output stream? A new XR report?