draft-singh-avtcore-mprtp-04

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Updates since -02

- Updates based on comments from MMUSIC
- MPRTP interface advertisements in SDP
  - Without ICE
  - With ICE
- Clarified in-band vs out-of-band interface advertisements (Sec 7.1.3.)
- RTSP using MPRTP

Re-cap

- Advertise Candidates
- RTP header extension for Subflow ID and Subflow sequence numbers
- Subflow RTCP for reporting path characteristics

Interface Advertisement

- Out-of-band: in SDP
- In-band: RTCP or suitable STUN extension

- Out-of-band signaling for session setup and initial interface negotiation
- In-band signaling to deal with frequent changes in interface state.

- The endpoint SHOULD always respond using the same mechanism
- If a mismatch in type of advertisements occurs then SDP MUST be used.

Interface advertisement in SDP

```
mprtp-interface = "interface" ":" counter SP unicast-address
                                ":" rtp_port
                                *(SP interface-description-extension)
```

Example

```
v=0
o=alice 2890844526 2890844527 IN IP4 192.0.2.1
s=
c=IN IP4 192.0.2.1
t=0 0
m=video 49170 RTP/AVP 98
a=rtpmap:98 H264/90000
a=fmtp:98 profile-level-id=42A01E;
a=extmap:1 urn:ietf:params:rtp-hdrext:mprtp
a=mprtp interface:1 195.148.127.42:49170
a=mprtp interface:2 130.233.154.105:51372
```

MPRTP using ICE

1. Advertise ICE candidates (initial offer): the endpoints run connectivity checks.

2. Advertise MPRTP interfaces: When enough connectivity checks succeed.

- When adding an interface in mid-session, should the endpoints also send the ICE candidates for the connections in use?

- What happens when an updated offer does not contain ICE candidates but MPRTP interfaces

ICE SDP Example

INITIAL OFFER:

```
m=video 49170 RTP/AVP 98
a=rtpmap:98 H264/90000
a=fmtp:98 profile-level-id=42A01E;
a=candidate:1 1 UDP 2130706431 195.148.127.42 49170 typ host
a=candidate:2 1 UDP 1694498815 130.233.154.105 51372 typ host
```

ANSWER:

```
m=video 4000 RTP/AVP 98
a=rtpmap:98 H264/90000
a=fmtp:98 profile-level-id=42A01E;
a=candidate:1 1 UDP 2130706431 195.148.127.36 4000 typ host
```

(after enough connectivity checks succeed)

UPDATED OFFER (with MPRTP interfaces):

```
a=mprtp interface:1 195.148.127.42:49170
a=mprtp interface:2 130.233.154.105:51372
```

ANSWER:

```
a=mprtp interface:1 195.148.127.36:4000
```

Open Issues

- In-band vs Out-of-band
  - Both or do only one?

- Keep the basic SDP but move the complex cases to another document?

Some results

TABLE I: Single Path vs Multiple Paths

Path Characteristic		Avg. PSNR	σ_{PSNR}	PLR
No Losses on any path	1-Path	48.427	0.00	0.00
	2-Path	48.427	0.00	0.00
	3-Path	48.427	0.00	0.00
0.5% Loss on every paths	1-Path	40.887	0.506	0.49
	2-Path	40.314	0.576	0.505
	3-Path	40.406	0.849	0.494
1% Loss on every paths	1-Path	36.172	0.705	1.01
	2-Path	36.564	1.006	0.94
	3-Path	36.212	0.572	0.99
Dissimilar RTTs	2-Path	48.303	0.278	0.004

libgstreamer, libx264, Dummynet

TABLE II: Varying Link Properties

	Avg. PSNR	σ_{PSNR}	PLR
Variable losses per path			
2-Path (0-0.5%)	43.4	1.9	0.24
3-Path (0-1.0%)	40.5	0.49	0.48
Variable RTT per path			
Multi-Path	48.164	0.32	0.0121
Variable channel capacity per path			
Multi-Path	42.93	2.23	0.772

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Next Steps

- Turn this into WG item

- Add security considerations
- Double-check with MMUSIC.