

COMUNICACIONES MULTIMEDIA

Actividad 2 – Integración de redes



2ºMIT, ICAI
Álvaro Bartolomé Ucero

The attached files show the RTP network traces of a multimedia session between two participants (A and B) with the involvement of a middlebox (M).

Data:

- Participant A is at IP address: 192.168.0.160
- Participant B is at IP address: 192.168.0.160
- Participant M is at IP address: 192.168.0.173

Please analyse the traces and respond to the following questions for each of the traces:

Trace 1:

1. What is the type of middlebox involved? Why?

En esta traza podemos observar que no se modifica ni el paquete ni los SSRC, por lo que estaríamos ante un “Transport Translator”. Este se caracteriza por no modificar el flujo RTP y estar pendiente de los parámetros de transporte. En las imágenes siguientes mostraremos información de dos tramas de la traza.

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000	192.168.0.160	192.168.0.173	RTCP	106	Receiver Report Source description
2	0.000389	192.168.0.160	192.168.0.173	UDP	54	50028 → 30886 Len=12
3	0.000511	192.168.0.160	192.168.0.173	RTCP	106	Receiver Report Source description
4	0.003393	192.168.0.160	192.168.0.173	RTCP	106	Receiver Report Source description
5	0.003727	192.168.0.160	192.168.0.173	UDP	54	50038 → 25406 Len=12
6	0.004072	192.168.0.160	192.168.0.173	RTCP	106	Receiver Report Source description
7	0.014260	192.168.0.160	192.168.0.173	UDP	214	50028 → 30886 Len=172
8	0.024215	192.168.0.160	192.168.0.173	UDP	214	50038 → 25406 Len=172
9	0.033924	192.168.0.160	192.168.0.173	UDP	214	50028 → 30886 Len=172
10	0.043371	192.168.0.160	192.168.0.173	UDP	214	50038 → 25406 Len=172
11	0.053434	192.168.0.160	192.168.0.173	UDP	214	50028 → 30886 Len=172
12	0.057351	192.168.0.173	192.168.0.160	UDP	214	30886 → 50028 Len=172

> Frame 3: 106 bytes on wire (848 bits), 106 bytes captured (848 bits) on interface 0

> Ethernet II, Src: IntelCor_91:4c:68 (e4:b3:18:91:4c:68), Dst: Vmware_49:0b:7f (00:0c:29:49:0b:7f)

> Internet Protocol Version 4, Src: 192.168.0.160, Dst: 192.168.0.173

> User Datagram Protocol, Src Port: 50029, Dst Port: 30887

> Real-time Transport Control Protocol (Receiver Report)

> Real-time Transport Control Protocol (Source description)

0000 00 0c 29 49 0b 7f e4 b3 18 91 4c 68 08 00 45 00 ..)I....Lh..E-

0010 00 5c 1b d2 00 00 80 11 9c 21 c0 a8 00 a0 c0 a8 .\.....!.....

0020 00 ad c3 6d 78 a7 00 48 ed 30 81 c9 00 07 70 65 ..mx..H.0...pe

0030 48 26 00 00 00 00 00 00 00 00 00 00 00 00 00 H&.....

0040 00 00 00 00 00 00 00 00 00 81 ca 00 07 70 65pe

0050 48 26 01 12 64 32 38 35 61 40 70 6a 62 61 38 34 H&..d285 a@pjb84

0060 34 30 2e 6f 72 67 00 00 00 00 40.org..

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000	192.168.0.160	192.168.0.173	RTCP	106	Receiver Report Source description
2	0.000389	192.168.0.160	192.168.0.173	UDP	54	50028 → 30886 Len=12
3	0.000511	192.168.0.160	192.168.0.173	RTCP	106	Receiver Report Source description
4	0.003393	192.168.0.160	192.168.0.173	RTCP	106	Receiver Report Source description
5	0.003727	192.168.0.160	192.168.0.173	UDP	54	50038 → 25406 Len=12
6	0.004072	192.168.0.160	192.168.0.173	RTCP	106	Receiver Report Source description
7	0.014260	192.168.0.160	192.168.0.173	UDP	214	50028 → 30886 Len=172
8	0.024215	192.168.0.160	192.168.0.173	UDP	214	50038 → 25406 Len=172
9	0.033924	192.168.0.160	192.168.0.173	UDP	214	50028 → 30886 Len=172
10	0.043371	192.168.0.160	192.168.0.173	UDP	214	50038 → 25406 Len=172
11	0.053434	192.168.0.160	192.168.0.173	UDP	214	50028 → 30886 Len=172
12	0.057351	192.168.0.173	192.168.0.160	UDP	214	30886 → 50028 Len=172

> Frame 4: 106 bytes on wire (848 bits), 106 bytes captured (848 bits) on interface 0

> Ethernet II, Src: IntelCor_91:4c:68 (e4:b3:18:91:4c:68), Dst: Vmware_49:0b:7f (00:0c:29:49:0b:7f)

> Internet Protocol Version 4, Src: 192.168.0.160, Dst: 192.168.0.173

> User Datagram Protocol, Src Port: 50039, Dst Port: 25407

> Real-time Transport Control Protocol (Receiver Report)

> Real-time Transport Control Protocol (Source description)

0000 00 0c 29 49 0b 7f e4 b3 18 91 4c 68 08 00 45 00 ..)I....Lh..E-

0010 00 5c 1b d3 00 00 80 11 9c 20 c0 a8 00 a0 c0 a8 .\.....

0020 00 ad c3 77 63 3f 00 48 a1 42 81 c9 00 07 34 b2 ..wc?.H.B....4.

0030 1d b4 00 00 00 00 00 00 00 00 00 00 00 00 004.

0040 00 00 00 00 00 00 00 00 00 81 ca 00 07 34 b24.

0050 1d b4 01 12 63 62 62 64 35 40 70 6a 66 65 66 37cbbd 5@pjfef7

0060 32 61 2e 6f 72 67 00 00 00 00 2a.org..

2. How many RTP streams are these? Please indicate their SSRC values.

Hay 2 SSRC, y los podemos observar en el reporte recibido de las tramas mencionadas anteriormente.

- Sender SSRC: 0x70654826 (1885685798)
- Sender SSRC: 0x34b21db4 (884088244)

3. Indicate what are the CNAMEs of the RTP endpoints at A and B

Al igual que en la pregunta anterior, esto también se puede observar en la información mostrada de cada una de las dos tramas. En este caso, en la sección “SDS items”. Los CNAMEs son:

- Text: d285a@piba8440.org
- Text: cbbd5@pjfef72a.org

4. How many sessions are there? Please indicate what are the transport parameters that identify the sessions.

Hay dos sesiones, y podemos observar los puertos de fuente y destino que utilizan. Estas son:

- Source: 50039, destination: 25407
- Source: 50029, destination: 30887

2140	10.625709	192.168.0.160	192.168.0.173	RTCP	134	50039	25407	Sender Report	Source description	Goodbye
2141	10.632075	192.168.0.160	192.168.0.173	UDP	214	50028	30886	50028 → 30886	Len=172	
2142	10.652460	192.168.0.160	192.168.0.173	UDP	214	50028	30886	50028 → 30886	Len=172	
2143	10.672438	192.168.0.160	192.168.0.173	UDP	214	50028	30886	50028 → 30886	Len=172	
2144	10.686346	192.168.0.160	192.168.0.173	RTCP	134	50029	30887	Sender Report	Source description	Goodbye

5. What types of RTCP messages are exchanged? How often are RTCP messages sent?

Se intercambian cuatro tipos de mensajes cada 5 segundos. Estos son:

- Receiver Report
- Source Report
- Source Description
- Goodbye

1	0.000000	192.168.0.160	192.168.0.173	RTCP	106	50029	30887	Receiver Report	Source description	
3	0.000511	192.168.0.160	192.168.0.173	RTCP	106	50029	30887	Receiver Report	Source description	
4	0.003393	192.168.0.160	192.168.0.173	RTCP	106	50039	25407	Receiver Report	Source description	
6	0.004072	192.168.0.160	192.168.0.173	RTCP	106	50039	25407	Receiver Report	Source description	
45	0.193936	192.168.0.160	192.168.0.173	RTCP	126	50039	25407	Sender Report	Source description	
48	0.203947	192.168.0.160	192.168.0.173	RTCP	126	50029	30887	Sender Report	Source description	
987	4.902988	192.168.0.160	192.168.0.173	RTCP	126	50039	25407	Sender Report	Source description	
1016	5.042572	192.168.0.173	192.168.0.160	RTCP	106	25407	50039	Sender Report	Source description	
1022	5.063257	192.168.0.173	192.168.0.160	RTCP	106	30887	50029	Sender Report	Source description	
1028	5.092650	192.168.0.160	192.168.0.173	RTCP	126	50029	30887	Sender Report	Source description	
1967	9.782572	192.168.0.160	192.168.0.173	RTCP	126	50039	25407	Sender Report	Source description	
2021	10.042642	192.168.0.173	192.168.0.160	RTCP	106	25407	50039	Sender Report	Source description	
2026	10.062666	192.168.0.173	192.168.0.160	RTCP	106	30887	50029	Sender Report	Source description	
2048	10.172548	192.168.0.160	192.168.0.173	RTCP	126	50029	30887	Sender Report	Source description	
2140	10.625709	192.168.0.160	192.168.0.173	RTCP	134	50039	25407	Sender Report	Source description	Goodbye
2144	10.686346	192.168.0.160	192.168.0.173	RTCP	134	50029	30887	Sender Report	Source description	Goodbye

6. Using wireshark please determine, for each stream: the average jitter, the maximum jitter, the packet loss rate.

En la siguiente imagen podemos ver los parámetros requeridos.

Source Address	Source Port	Destination Address	Destination Port	SSRC	Payload	Packets	Lost	Max Delta (ms)	Max Jitter	Mean Jitter	Status
192.168.0.160	50038	192.168.0.173	25406	0x34b21db4	g711U	532	0 (0.0%)	24.449	0.818	0.302	
192.168.0.160	50028	192.168.0.173	30886	0x70654826	g711U	535	0 (0.0%)	22.929	0.740	0.297	
192.168.0.173	25406	192.168.0.160	50038	0x70654826	g711U	531	0 (0.0%)	30.110	2.913	0.580	
192.168.0.173	30886	192.168.0.160	50028	0x34b21db4	g711U	530	0 (0.0%)	30.180	2.304	0.583	

Trace 2:

1. What is the type of middlebox involved? Why?

En esta segunda traza estamos ante un Mixer, en lugar del Traductor de la traza anterior. A diferencia de la anterior, ahora el middlebox sí que genera su propio SSRC. Podemos ver los distintos SSRCs en la imagen siguiente.

No.	Time	Source	Destination	Protocol	Length	Source Port	Destination Port	Sender SSRC	Info
1684	8.356329	192.168.0.173	192.168.0.160	RTP	214	13252	50026		PT=ITU-T G.711 PCMU, SSRC=0x15D7AC3, Seq=30064, Time=66880
1685	8.365162	192.168.0.160	192.168.0.173	RTP	214	50026	13252		PT=ITU-T G.711 PCMU, SSRC=0x3CD01146, Seq=5574, Time=67040
1686	8.365578	192.168.0.173	192.168.0.160	RTP	214	27266	50036		PT=ITU-T G.711 PCMU, SSRC=0x96D1BE8, Seq=14785, Time=67040
1687	8.375377	192.168.0.160	192.168.0.173	RTP	214	50036	27266		PT=ITU-T G.711 PCMU, SSRC=0x72256F36, Seq=3965, Time=67040
1688	8.375719	192.168.0.173	192.168.0.160	RTP	214	13252	50026		PT=ITU-T G.711 PCMU, SSRC=0x15D7AC3, Seq=30065, Time=67040
1689	8.385077	192.168.0.160	192.168.0.173	RTP	214	50026	13252		PT=ITU-T G.711 PCMU, SSRC=0x3CD01146, Seq=5575, Time=67200
1690	8.385507	192.168.0.173	192.168.0.160	RTP	214	27266	50036		PT=ITU-T G.711 PCMU, SSRC=0x96D1BE8, Seq=14786, Time=67200
1691	8.395619	192.168.0.160	192.168.0.173	RTP	214	50036	27266		PT=ITU-T G.711 PCMU, SSRC=0x72256F36, Seq=3966, Time=67200
1692	8.396046	192.168.0.173	192.168.0.160	RTP	214	13252	50026		PT=ITU-T G.711 PCMU, SSRC=0x15D7AC3, Seq=30066, Time=67200
1693	8.405358	192.168.0.160	192.168.0.173	RTP	214	50026	13252		PT=ITU-T G.711 PCMU, SSRC=0x3CD01146, Seq=5576, Time=67360
1694	8.405684	192.168.0.173	192.168.0.160	RTP	214	27266	50036		PT=ITU-T G.711 PCMU, SSRC=0x96D1BE8, Seq=14787, Time=67360
1010	5.000753	192.168.0.173	192.168.0.160	RTCP	106	13253	50027	0x015d7ac3 (22903491)	Sender Report Source description
1009	5.000604	192.168.0.173	192.168.0.160	RTCP	106	27267	50037	0x096d1be8 (158145512)	Sender Report Source description
1	0.000000	192.168.0.160	192.168.0.173	RTCP	106	50027	13253	0x3cd01146 (1020268870)	Receiver Report Source description
3	0.000103	192.168.0.160	192.168.0.173	RTCP	106	50027	13253	0x3cd01146 (1020268870)	Receiver Report Source description
96	0.441368	192.168.0.160	192.168.0.173	RTCP	126	50027	13253	0x3cd01146 (1020268870)	Sender Report Source description
1084	5.365630	192.168.0.160	192.168.0.173	RTCP	126	50027	13253	0x3cd01146 (1020268870)	Sender Report Source description
1696	8.415747	192.168.0.160	192.168.0.173	RTCP	134	50027	13253	0x3cd01146 (1020268870)	Sender Report Source description Goodbye
4	0.000372	192.168.0.160	192.168.0.173	RTCP	106	50037	27267	0x72256f36 (1915055926)	Receiver Report Source description
6	0.000482	192.168.0.160	192.168.0.173	RTCP	106	50037	27267	0x72256f36 (1915055926)	Receiver Report Source description
45	0.186429	192.168.0.160	192.168.0.173	RTCP	126	50037	27267	0x72256f36 (1915055926)	Sender Report Source description
1049	5.196217	192.168.0.160	192.168.0.173	RTCP	126	50037	27267	0x72256f36 (1915055926)	Sender Report Source description
1695	8.413850	192.168.0.160	192.168.0.173	RTCP	134	50037	27267	0x72256f36 (1915055926)	Sender Report Source description Goodbye

2. How many RTP streams are these? Please indicate their SSRC values.

En la imagen de la pregunta anterior podemos observar que hay 4 SSRCs distintos, estos son:

- Sender SSRC: 0x015d7ac3 (22903491)
- Sender SSRC: 0x096d1be8 (158145512)
- Sender SSRC: 0x3cd01146 (1020268870)
- Sender SSRC: 0x72256f36 (1915055926)

3. Indicate what are the CNAMEs of the RTP endpoints at A and B

En el apartado "SDS items" de cada trama podemos observar este campo, los CNAMEs serían:

- Text: 924a5@pjdc4d96.org
- Text: 2e7c8@pj36517e.org

4. How many sessions are there? Please indicate what are the transport parameters that identify the sessions.

En esta traza también hay dos sesiones, y podemos observar los puertos de fuente y destino que utilizan. Estas son:

- Source: 50027, destination: 13253
- Source: 50037, destination: 27267

1010 5.000753	192.168.0.173	192.168.0.160	RTCP	106 13253	50027	0x015d7ac3 (22903491)	13253	50027	Sender Report	Source description	
1009 5.000604	192.168.0.173	192.168.0.160	RTCP	106 27267	50037	0x096d1be8 (158145512)	27267	50037	Sender Report	Source description	
1 0.000000	192.168.0.160	192.168.0.173	RTCP	106 50027	13253	0x3cd01146 (1020268870)	50027	13253	Receiver Report	Source description	
3 0.000103	192.168.0.160	192.168.0.173	RTCP	106 50027	13253	0x3cd01146 (1020268870)	50027	13253	Receiver Report	Source description	
96 0.441368	192.168.0.160	192.168.0.173	RTCP	126 50027	13253	0x3cd01146 (1020268870)	50027	13253	Sender Report	Source description	
1084 5.365630	192.168.0.160	192.168.0.173	RTCP	126 50027	13253	0x3cd01146 (1020268870)	50027	13253	Sender Report	Source description	
1696 8.415747	192.168.0.160	192.168.0.173	RTCP	134 50027	13253	0x3cd01146 (1020268870)	50027	13253	Sender Report	Source description	Goodbye
4 0.000372	192.168.0.160	192.168.0.173	RTCP	106 50037	27267	0x72256f36 (1915055926)	50037	27267	Receiver Report	Source description	
6 0.000482	192.168.0.160	192.168.0.173	RTCP	106 50037	27267	0x72256f36 (1915055926)	50037	27267	Receiver Report	Source description	
45 0.186429	192.168.0.160	192.168.0.173	RTCP	126 50037	27267	0x72256f36 (1915055926)	50037	27267	Sender Report	Source description	
1049 5.196217	192.168.0.160	192.168.0.173	RTCP	126 50037	27267	0x72256f36 (1915055926)	50037	27267	Sender Report	Source description	
1695 8.413850	192.168.0.160	192.168.0.173	RTCP	134 50037	27267	0x72256f36 (1915055926)	50037	27267	Sender Report	Source description	Goodbye

5. What types of RTCP messages are exchanged? How often are RTCP messages sent?

En este caso los mensajes intercambiados son los mismos que en la primera traza, y también se envían cada 5 segundos. Estos mensajes son:

- Receiver Report
- Source Report
- Source Description
- Goodbye

6. Using wireshark please determine, for each stream: the average jitter, the maximum jitter, the packet loss rate.

En la siguiente imagen podemos ver los parámetros requeridos.

Source Address	Source Port	Destination Address	Destination Port	SSRC	Payload	Packets	Lost	Max Delta (ms)	Max Jitter	Mean Jitter	Status
192.168.0.160	50036	192.168.0.173	27266	0x72256f36	g711U	421	0 (0.0%)	22.958	0.815	0.442	
192.168.0.160	50026	192.168.0.173	13252	0x3cd01146	g711U	422	0 (0.0%)	22.768	0.798	0.359	
192.168.0.173	27266	192.168.0.160	50036	0x96d1be8	g711U	421	0 (0.0%)	27.547	1.316	0.566	
192.168.0.173	13252	192.168.0.160	50026	0x15d7ac3	g711U	420	0 (0.0%)	28.934	1.577	0.624	