

Solutions to the selected problems in chapter 28

P. 28.8. RTP bandwidth = $0.05 \times 1 \text{ Mbps} = 50 \times 10^3 \text{ bps}$

RTP bandwidth for sender = $10 \times 10^3 \text{ bps}$

RTP bandwidth for receiver = $40 \times 10^3 \text{ bps}$

RTP packets sent by sender per second:

$$\frac{10000 \frac{\text{bits}}{\text{sec}}}{1000 \frac{\text{bits}}{\text{packet}}} = 10 \frac{\text{packets}}{\text{sec}}$$

RTP packets sent by receivers per second:

$$\frac{40000 \frac{\text{bits}}{\text{sec}}}{10 \times 1000 \frac{\text{bits}}{\text{packet}}} = 4 \frac{\text{packets}}{\text{sec}}$$

number
of receivers

P. 28.9.

1000 0110 0000 0011 0010 0001 0011 0010

- version 2
- no padding
- no extension header
- 6 contributors
- GSM audio
- 36 bytes

$12 + 6 \times 4$
 First part of header CSRCs

Problem 28.16.

$$\frac{4 \times 10^6 \times 8 \text{ bits}}{56 \times 10^3 \frac{\text{bits}}{\text{sec}}} = 571 \text{ Sec}$$

Problem 28.18.

a) player start at t_8 :

Packets	1	2	3	4	5	6	7	8	9	10
Arr. Time	t_4	t_7	t_9	t_{10}	t_{12}	t_{14}	t_{14}	t_{14}	t_{14}	t_{16}
Play time	t_8	t_9	t_{10}	t_{11}	t_{12}	t_{13}	t_{14}	t_{15}	t_{16}	t_{17}

only packet 6 cannot be played

b) player starts at t_9 :

Packets	1	2	3	4	5	6	7	8	9	10
Arr time	t_4	t_7	t_9	t_{10}	t_{12}	t_{14}	t_{14}	t_{14}	t_{14}	t_{16}
Play time	t_9	t_{10}	t_{11}	t_{12}	t_{13}	t_{14}	t_{15}	t_{16}	t_{17}	t_{18}

all can be played.

Problem 28.23.

note: solve by figure 28.30 and 28.31

- a) at time 00:00:17
 first packet 10 units arrived, 9 units played, 1 unit in buffer
 second packet 2 units arrived, none of them played, 2 unit in buffer
- b) at time 00:00:20
 first packet finished
 second packet 5 units arrived, 2 units played, 3 units in buffer

Problem 28.23 continued.

c) at time 00:00:25

first packet finished

second packet 10 units arrived, 7 units played, 3 units in buffer

d) at time 00:00:30

first packet finished

second packet finished

third packet 3 units arrived, 2 units played, 1 unit in buffer.

