Assignment 3. Voice CODEC Analysis

Weight: 5% (5 marks)

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Submission of report:

Submit on Blackboard by the due date.

Late submission policy: maximum time to submit after due date: ten (10) days. No credit afterwards, but you must still submit as completing all the labs and assignments is a condition for passing the course. 10% will be deducted for each day past the due date.

Learning objectives:

You must deliver a document requiring particular conditions. Students must demonstrate analytical skills, understand technical documentation, adapt technical instructions on specific cases, and generate technical documentation.

You must show your work not just final answers.

Background

Please refer to the lectures about voice CODECs, especially examples in the Wk6 folder. Voice CODECs are used by VoIP devices to convert speech signals to bits and IP packets. To calculate the necessary network resources for successful VoIP operation, one must be able to estimate the operating bandwidth and the overhead of the employed CODECs.

Cheating and Plagiarism:

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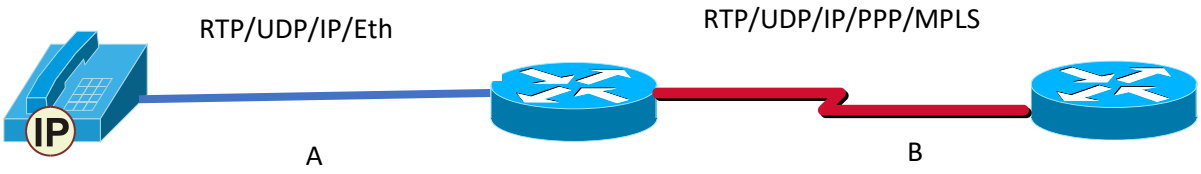
Use Case Scenario

In the topology below, the IP phone uses a CODEC which represents 10ms of voice using 10bytes of data in each frame. How much bandwidth is required for a phone conversation in each of the two segments A and B in each direction, including protocol overhead if there are 4 CODEC frames per packet?

Assume the use of RTCP on both segments and cRTP on the WAN link.



Final Answers

Segment A:

Bandwidth (total) = 2 x Bandwidth in one direction = 2 x 22.68 = 45.36Kbps

A phone call is bi-directional, we need to calculate the BW in one direction first:

BW = PPS x Packet Length x 8bits x 1.05

- 1.05 is the 5% addition to the BW by RTCP

PPS (Packet per second) = 1000ms / Time to transmit a packet = 1000/40 = 25

- Time to transmit a packet = 4 x FS = 4 x 10ms = 40ms
  - 4 CODEC frames per packet
  - CODEC - 10ms of voice, 10Bytes of data
    - FL (Frame Length) = 10B , FS (Frame Size) = 10ms

Packet Length = Payload size + Overhead size = 40B + 68B = 108 Bytes

- Payload size = 4 x FL = 4 x 10B = 40B
- Overhead size = (RTP+UDP+IP)+Ethernet = 12+8+20+28 = 68B

BW = 25 x 108 x 8 x 1.05 = 22.680 bits = 22.68Kbps

Segment B:

Bandwidth (total) = 2 x Bandwidth in one direction = 2 x 11.76 = 23.52Kbps

Calculate the BW in one direction, like in the first segment

Since we are now using cRTP and different L2 protocols, the Packet Length will be different

BW = PPS x Packet Length x 8bits x 1.05

- 1.05 is the 5% addition to the BW by RTCP

PPS = 25 (as previously calculated above)

Packet Length = Payload size + Overhead size = 40B + 16B = 56 Bytes

- Payload size = 40B (previously calculated)
- Overhead size = 4B (cRTP) + PPP + MPLS = 4+8+4 = 16B
  - with cRTP the 40B overhead of (RTP+UDP+IP) is reduced to 4B

BW = 25 x 56 x 8 x 1.05 = 11.760 bits = 11.76Kbps