The video transcoding VNF

During the TelMed5G experiment, a separate VNF image was prepared containing the recoding software to be added to the 5GinFIRE portfolio. The VNF is based on GStreamer and provides the functionality of an RTP transcoding service:

- listening for the source RTP stream on the specified local UDP port
- transmitting scaled content over RTP to the specified IP address and port
- serving scaled content using HLS

This functionality enables watching a video stream, encapsulated in MPEG-TS, in a passive manner on any desktop computer or a mobile device. The technology is highly network-resilient and follows well-established standards.

The VNF could be used for cases where streaming is performed using RTP, which is the most common protocol for delivering media in real-time. We hope that this extension will help other experimenters dealing with delivery of real-time video in various qualities.

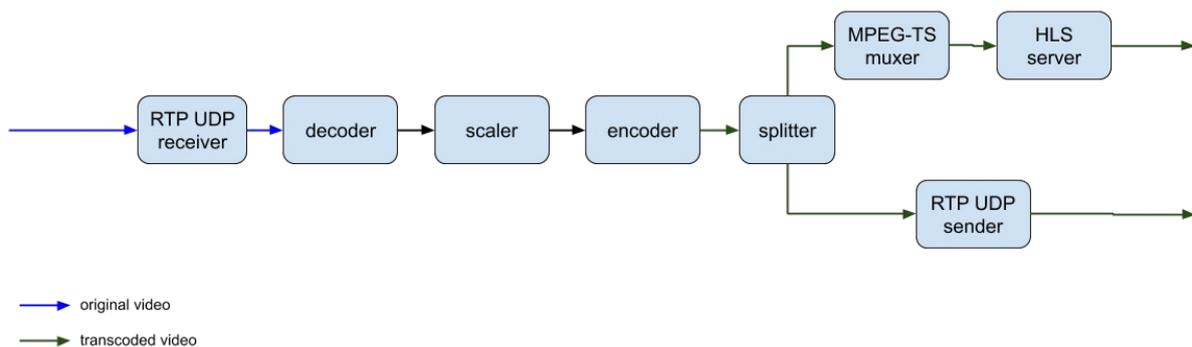The complete, high-level pipeline is depicted on the Figure below.

Figure 1 Flow of a video stream through the transcoding pipeline

Tutorial for using the video transcoding VNF

Connecting to the VNF machine

1. Connect to the VPN where the VNF machine is deployed.
1. Connect to the jump machine over SSH.
2. From the jump machine's shell, connect to the VNF machine over SSH. Current credentials are as follows:
    - user name: ubuntu
    - password: telemedycyna

Starting the transcoder

1. On the VNF machine's shell, move to the running scripts' directory:

cd /home/ubuntu/public-vnf/transcoder-rtp-hls

3. In order to run a transcoder instance, call:

./run-now.sh

The script requires the following parameters:

- *listen-udp-port* - a UDP port to listen to an RTP stream
- *destination-udp-host* - a host to direct the transcoded H.264 RTP to
- *destination-udp-port* - a port to direct the transcoded H.264 RTP to
- *hls-server-port* - an HTTP server port hosting the transcoded HLS (HTTP Live Streaming) MPEG-TS H.264 stream
- *video-width* - width of the transcoded video, in pixels
- *video-height* - height of the transcoded video, in pixels
- *video-bit-rate-kbps* - bit rate of the transcoded video, in kbps

An exemplary call to start a transcoder, listening for an RTP H.264 stream on port 2468, scaling to 960x540, encoding at 1500 kbps, forwarding the transcoded stream to 10.154.86.86:3583 and hosting it on local HLS port 8001 is as follows:

./run-now.sh 2468 10.154.86.86 3583 8001 960 540 1500

Interfacing with the transcoder instance

Locating the instance

The transcoding instance uses a DNS agent to register an own URL. After a successful execution of the agent, the transcoding instance is able to be located under the name *telmed-transcoder.service.ehealth* . This domain name is available (and correct) only within the eHealth5G testbed. Please contact the testbed admins for more details, i.e. an address of the DNS service to use.

Location using a domain name requires an operational DNS agent instance. Should this not be the case, commenting of the relevant line in the *run-now.sh* might be required in order to run the transcoding instance. In such a case, the transcoding instance would still be accessible under its IP address.

Feeding the input stream

In order for the transcoder to work, an RTP H.264 input stream needs to be fed to the specified listening port. Such a stream can be produced using vlc, FFmpeg or GStreamer frameworks.

Gathering the output stream

When the transcoder is operational, there is an RTP H.264 transcoded stream being sent out to the specified IP address and UDP socket. The stream can be processed or played using a multitude of applications, including vlc, SMPlayer, FFmpeg (ffplay) or GStreamer.

Watching the live-streamed content

The same transcoded content, after encapsulation in MPEG-TS, is served on a specified TCP port using HTTP Live Streaming. Currently, a simple single-threaded HTTP server is used, which should handle a few simultaneous streaming clients. This stream is playable in several ways too, including vlc, SMPlayer, FFmpeg (ffplay) or GStreamer. The stream should be accessible at

http://telmed-transcoder.service.ehealth:<hls-server-port>/playlist.m3u8 or

http://<transcoder-instance-IP-address>:<hls-server-port>/playlist.m3u8 .