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REMOTE DESKTOP SHARING WITH MULTIPLE USERS WITH HIGH QUALITY VIDEO AND AUDIO THROUGHPUTS

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Remote desktop sharing with multiple users with high quality video and audio throughputs

A system that enables multiple remote users to simultaneously connect to a desktop is disclosed. The desktop can be hosted on a remote physical or virtual machine. Audio and video content from the remote desktop is securely transferred over the network to all connected users. The audio and video qualities are adjusted dynamically based on the network performance of all the connections.

Graphic designers, VFX animators and video content editors would like to work in a collaborative environment. The contents of the items they are working on must be stored securely within the company's premises. For example, the designer or animator is editing content and would like to present a video playback to the director for review. Instead of having both parties meet at a desk or a meeting room, the director can just join the remote session of the designer or animator. The designer or animator can show their work on the shared screen, and the director can view the content live. Since the film/animation industry requires high quality and accurate video content to be delivered, having blurry images and video playback that is lagging is not ideal.

Most of the screen sharing and collaboration applications stream the raw content to the connected users. In this case, the quality of the audio and video is not guaranteed. In addition, the content viewed by one user may not be the same as the other user. This could be due to degraded video being delivered on a poor network connection. The system proposed in this paper leverages the benefits of using a protocol which guarantees high quality audio video playback in a remote desktop environment.

The collaboration system encodes the video and audio data once and sends them to all connected endpoints. The video and audio data are decoded identically on all endpoints. This implies that all endpoints have the exact same video and audio contents.

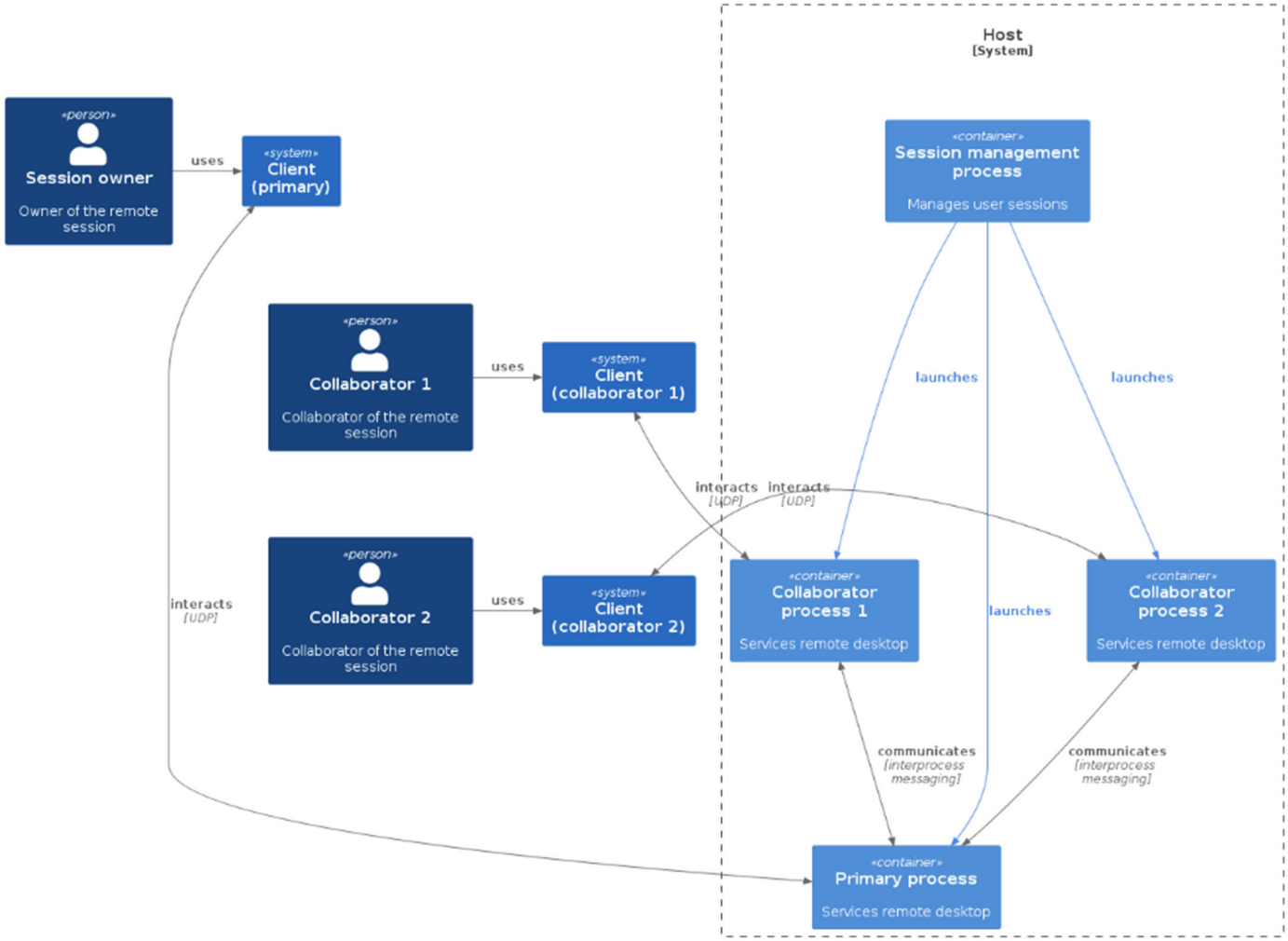

Fig. 1 - Collaboration high level design

As illustrated in Fig 1, when the collaborator session is started, a separate process is launched to handle the connection. The primary process creates a bi-directional inter-process channel to communicate with the collaborator process. Negotiation is in place to make sure all collaborator endpoints are compatible with the host session. All the encoding of audio and video data is performed by the primary process. The collaborator process is responsible for transferring the encoded content to the client end point. The collaborator process also monitors the network connection for the respective client endpoint.

As illustrated in Fig 2, the primary process writes the encoded content to a shared memory segment and notifies the collaborator process using inter-process channel. The collaborator process fetches the encoded contents and delivers them to the corresponding client endpoint. Once the encoded data has been processed by the client, an acknowledgement is sent back to the host. When all acknowledgements are received, the primary process frees the content from the shared memory.

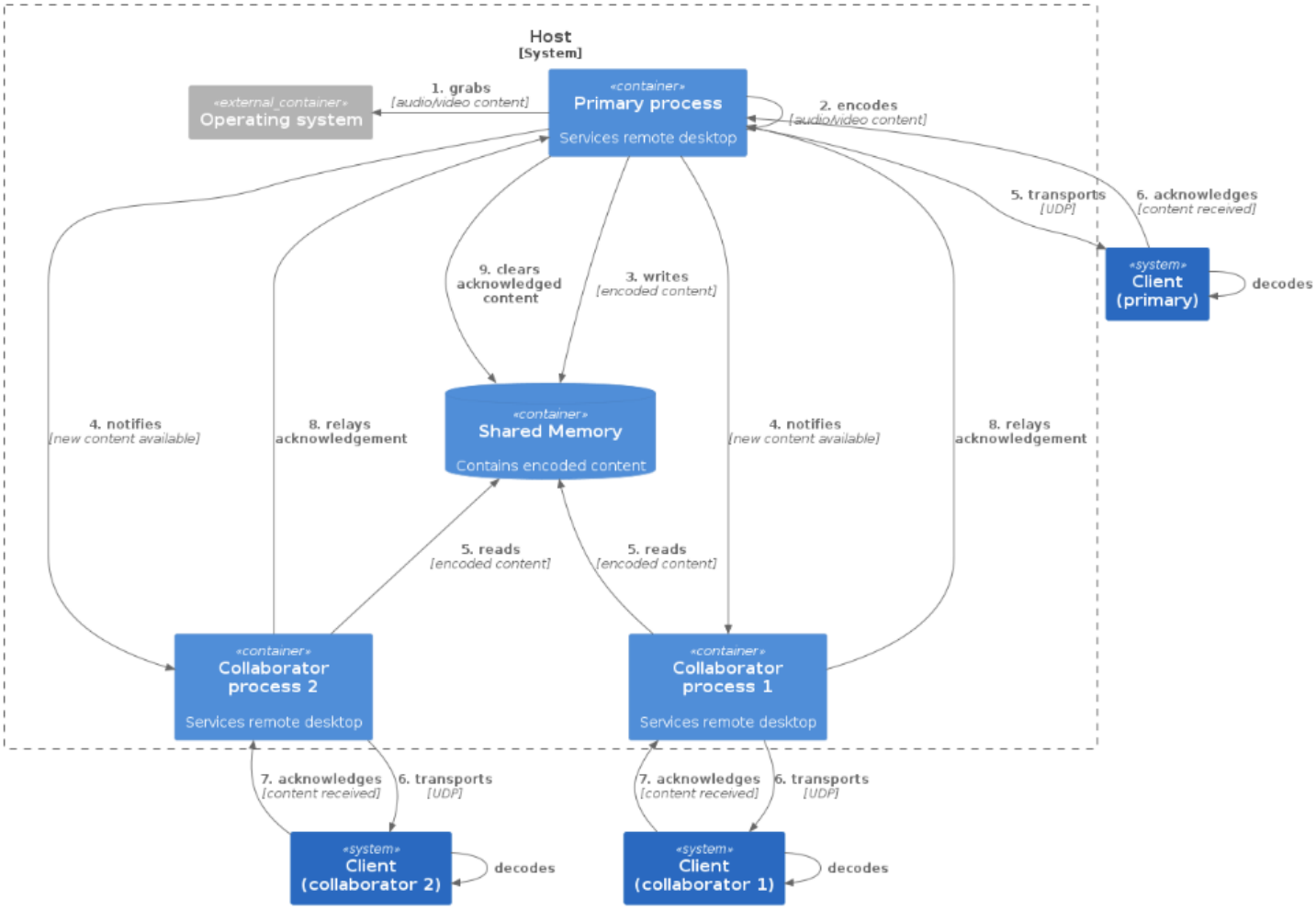

Fig. 2 – Collaboration data management

To ensure the audio and video contents are synchronized on all endpoints, the quality is dictated by the collaborator with the lowest quality connection. All clients send back bandwidth statistics to their host periodically. The information is fed into the imaging and audio pipelines. The imaging and audio pipelines use this information to adapt themselves to the worst performing statistic to guarantee the same quality across all endpoints. Otherwise, the clients on the bad network cannot keep up with the newly generated data.

The system can serve multiple guest collaborators. Adding additional collaborator processes is scalable and consumes minimal system resources since all the resource intensive operations are performed by the primary process.

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