Embedded Mobile
P2P Multimedia System

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Objectives
The objective of this project is to create a mobile device with following features:
- Album-based Peer-to-Peer (P2P) media sharing
- Video synchronization
- Photo Editing in Collaborative Virtual Environment (CVE)

What is Peer to Peer? Why Peer to Peer?
A Server-Client model is a centralized network model with server and clients.
The overall bandwidth is fixed according to the server.
The P2P network is a decentralized network model with only peers.
The overall bandwidth increases as the number of peers increase.
Transfer of large size file to large number of peers at the same time is faster in P2P

How is P2P Done?
1. A Media session is set up to share the medias.
2. Buffers are setup to keep track of downloaded pieces of medias.
3. Procedures in P2P sharing:
   1. A local peer first registers with the tracker and obtains a list of peers that is sharing the media.
   2. The local peer tries to connect some peers in the list.
   3. For connected peers, one of the following is exchanged every few seconds:
      1. The overall buffer information from the peer.
      2. The partial, accurate buffer information from the peer.
      3. A particular piece of a media inside an album.

Video Synchronization
Video synchronization is "what I see is what you see".
1. The master peer controls all other peers in playing video.
2. The procedures in the synchronization session:
   1. The master controls the start, pause, stop and seek of the video playback.
   2. After the playback starts, all peers will keep reporting their playing position to the master.
   3. The master analyzes all peers' playing position.
   4. If a peer is playing too fast or falling behind, the master gives control commands to the peer to adjust their playing positions.
   5. The peers receiving the control command adjusts their playing positions and report their playing position again to the master.
   6. Step 2 to 5 repeats until the video playback is stopped or paused.

Photo Editing in CVE
It is photo editing that allows several peers to edit the same photo at the same time.
1. A server is setup by one of the peers.
2. When changes is made by a peer:
   1. The peer makes the change (draw something).
   2. The peer uploads the change to the server.
   3. The server updates the change (show in screen).
   4. The server sends the change to all peers.
   5. All peers updates the change (show in screen).

The resultant device
1. It consists of a front-end and a back-end system.
2. Back-end is responsible for all background processing including P2P media sharing and the server in CVE.
3. Front-end provides a user interface for viewing medias and provides video synchronization and CVE data.

Conclusion
1. The device gives us the chance to foresee what it will be like to have such a mobile device in the future.
2. The device is more instant, more convenient and more people are allowed to share the same resources.
3. The device can be integrated with the current video, photo sharing sites like YouTube or Facebook.
4. The result of the project is satisfactory.