

Broadcast and Multicast Based Mobile Video Distribution

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Multimedia services have become an integral part of mobile networks. Mobile Television is one of these services that have attracted a strong interest worldwide. A new report by Juniper Research predicts that the revenues of Mobile TV services will rise from under \$1.4bn in 2007 to nearly \$12bn in 2012 [1].

This paper provides an overview of Mobile TV and discusses new and future research directions in Mobile TV and upcoming full-fledged Mobile Video-on-Demand (VOD) services.

Mobile TV Systems/Standards

With Mobile TV, users enjoy live and/or on-demand TV using their own mobile devices, such as TV-capable wireless phones and PDAs. The delivery of Mobile TV can be achieved through terrestrial broadcast, satellite broadcast, a combination of terrestrial and satellite broadcasts, and cellular networks. Table 1 lists popular systems/standards for each of one these categories. In contrast with the pure broadcast systems, MBMS and BCMCS are standardized by the 3rd Generation Partnership Project (3GPP) and 3GPP2 for providing resource-efficient, Mobile TV using the GSM/WCDMA and CDMA200 cellular networks, respectively. These two standards allow the coexistence of unicast, multicast, and broadcast services [2]. They can be implemented by introducing only minor changes to existing radio and control network protocols in order to reduce the implementation costs in the mobile terminals and network [3].

Various Mobile TV systems/standards differ in many aspects, including robustness of transmission and quality of service expected in indoor and outdoor environments, power-saving features, channel switching times, handset requirements, spectrum utilization, operating costs, charges, countrywide

availability, roaming, and provided services [4].

Table 1: Systems/Standards for Delivering Mobile TV

Mobile TV Delivery Type	Examples
Terrestrial Broadcast	Digital Video Broadcast to Handhelds (DVB-H), Terrestrial Digital Multimedia Broadcasting (T-DMB), MediaFLO
Satellite Broadcast	China Multimedia Mobile Broadcasting (CMMB), Satellite Digital Multimedia Broadcasting (SDMB)
Terrestrial and Satellite	Digital Video Broadcasting-Satellite Services to Handhelds (DVB-SH)
Cellular Networks	Multimedia Broadcast Multicast Service (MBMS), Broadcast and Multicast Service (BCMCS)

New and Future Research Directions in Mobile TV

A successful implementation of Mobile TV requires accounting for the unique characteristics of the wireless environment (such as noise and multi-path interference), the limited capabilities of mobile devices (such as computing and energy resources), and a distinctive use-case context [2]. In particular, minimizing the energy consumption in Mobile TV systems is a critical problem because of the limited energy supply in the battery-powered mobile devices. Study [5] considered the power optimization problem in broadcast TV systems (DVB-H in particular) through burst scheduling of TV channels, which may be encoded with different bit rates. This scheduling problem was shown to be NP complete.

Interactivity is another major area of research. Mobile phones support user-service

interaction by using a back-channel. These interactions include voting, quiz taking, as well as browsing of side information while watching the program. Social interaction enhances interactivity and provides a more enjoyable TV watching experience by allowing interactions with other peers while watching the TV programs. Study [6] explored peer interaction enablers, including text and audio chat, synchronized zapping and “See-what-I-see” message.

Finally, there has also been a rising interest in providing interoperability among Mobile TV standards. For example, there has been a need for providing a bearer-independent quadruple service (TV, Telephony, Internet, and Wireless) [2]. The objective here is to provide a common system such that the same service-layer functionalities can be used for mobile TV over different broadcast and access networks.

Future Directions in Mobile VOD Services

The main challenge with providing scalable Mobile VOD services is that not all viewers of a video will be at the same playback point. Therefore, the mere use of multicast will not lead to significant reductions in the required load and bandwidth of the server and network. Fortunately, stream merging [7] (and references within) and period broadcasting [8] (and references within) techniques can be used to address this problem. These techniques, however, were not developed for wireless mobile networks, and thus they must be adapted to account for the unique characteristics of these networks. Providing efficient support for VCR-like operations while using stream merging techniques is another major research challenge.

References

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