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Mobile TV Technologies

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Abstract— Mobile TV is a generalized term used for the technologies through which all the TV channels can be seen on our mobile phone. Using their mobile TV phone, people could enjoy real-time news, sports, weather forecasts and live entertainments in a fast-moving car, outdoors, and anywhere. Technologies are classified in Cellular and Broadcast. Cellular Network includes 3G, MBMS and TDtv. Broadcast services includes 1Seg, DMB, DVB-H and MediaFLO. Few platforms which provide this technology are Alcatel's Unlimited Mobile TV, Bharti Telesoft's VDP, CyberLink Mobile TV Solution etc.

Keywords— 3G, MBMS, TDtv, 1Seg, DMB, DVB-H, MediaFLO

I. INTRODUCTION

No doubt the biggest media in history is TV and the biggest communication industry nowadays is mobile phone. Mobile TV will be a killer application in the next generation of mobile phones, creating a new convergence paradigm of broadcast and mobile services. Mobile TV involves bringing TV services to the mobile phones. Today's mobile digital broadcasting technologies enable the combination of that two in one device, the mobile TV phone. Using their mobile TV phone, people could enjoy real-time news, sports, weather forecasts, and live entertainments in a fast-moving car, outdoors, and anywhere. In addition to mobility, mobile TV delivers a variety of services including video-on-demand, and live TV programs

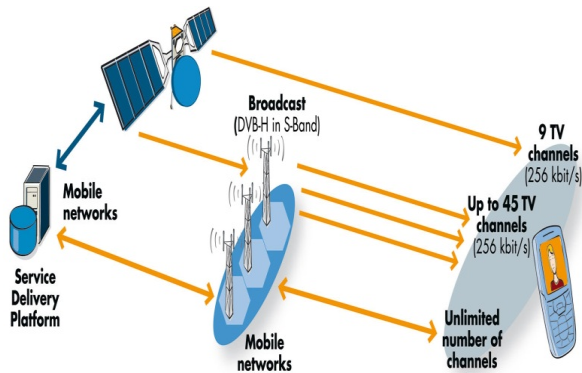


Fig. 1 Mobile TV Concept (Generalized Figure)

Another exciting opportunity for users is Mobile TV pod casts, where content is delivered to a user's mobile on demand or by subscriptions. Stored locally on the handset, this content can then be viewed even when there's no network connection. And a service provider can schedule the delivery to "off-peak" hours, for example during the night.

II. TRANSMISSION MODES

Technically, there are currently two main ways of delivering mobile TV. The first is via a two-way cellular network and the second is through a one-way dedicated broadcast network.

1 Two Way Cellular Network

Out of the 120 plus commercially launched mobile TV services worldwide, more than 90% of these are based on existing two-way cellular networks, using unicast. With unicast, content is transmitted separately from a single source to a single destination, like from a server to a mobile handset. Land-based broadcasting methods send out analog or digital TV signals over the air from terrestrial base stations. A phone with a TV antenna and an analog or digital TV tuner (receiver) can pick up the signals.

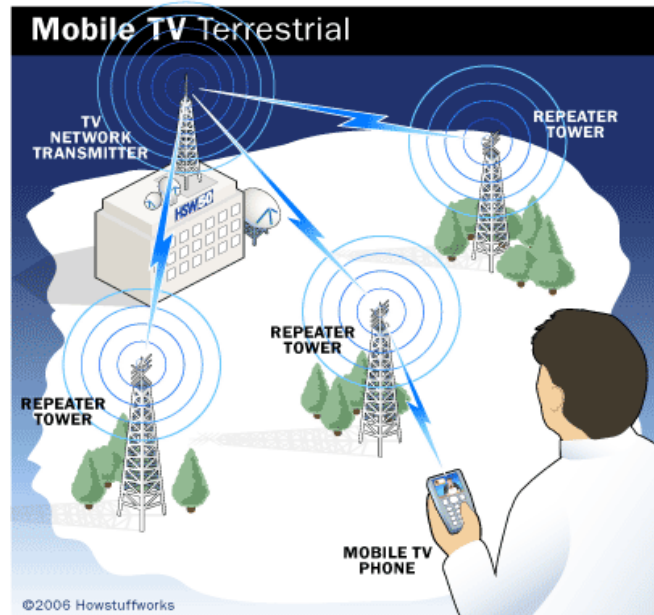


Fig. 2 Mobile TV Terrestrial

There are a bunch of mobile-TV versions like T-DMB (Terrestrial Digital Multimedia Broadcast), MBMS (Multimedia Broadcast and Multicast Services), MediaFLO (a proprietary Qualcomm technology) and DVB-H which use this mode of transmission.

2 Satellite Broadcasting

Some standards rely on satellite broadcasting to deliver live TV to cell phones. They can broadcast from satellite to phone, from satellite to base station to phone or use both methods simultaneously.

Two systems that employ this approach are MBSAT and S-DMB. In the S-DMB (Satellite Digital Multimedia Broadcasting) system, a content server sends the live TV feed through an encoder and transmits the data to an S-DMB satellite. The geostationary satellite rebroadcasts the signals directly to terrestrial repeaters and directly to cell phones on the S-band. The terrestrial repeaters fill in the gaps where satellite signals get disrupted, like in a city surrounded by tall buildings or in the subway. The dual broadcasts are coordinated so that if a subscriber happens to be within range of the satellite and a tower at the same time, he'll receive both broadcasts and end up with a stronger signal.

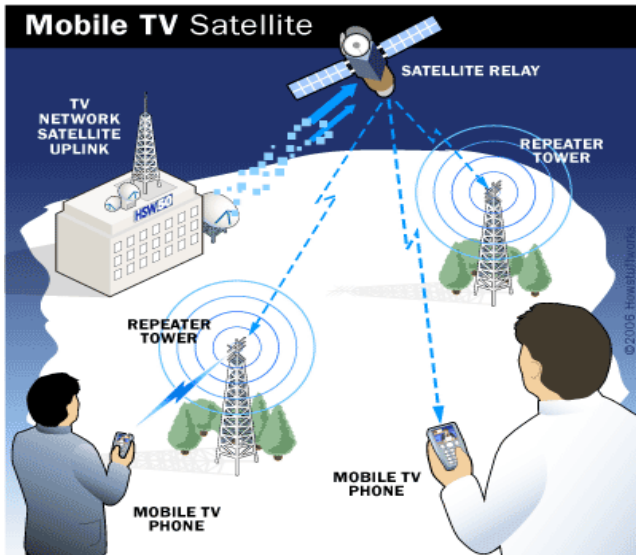
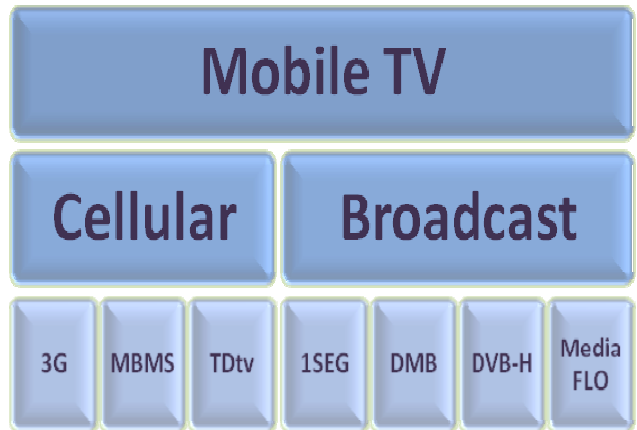


Fig. 3 Mobile TV Satellite Broadcasting

III. DIFFERENT TECHNOLOGY

The below technologies are used. None is ideal as all have drawbacks of one kind or another: spectral frequencies used or needed, signal

strength required, new antennas and towers, network capacity required, or business model.



Cellular-I : 3G

HSDPA is an evolution of 3G technology for the carriage of higher data rates in a quest to support video services. HSDPA can extend the bit rates to 10 Mbps or even greater (downlink) on 5-MHz 3G networks. This is achieved using new physical layer techniques such as adaptive modulation and coding, fast packet scheduling, and fast cell selection. On average a user can expect 550–1000 kbps download speeds even in a loaded environment. This makes possible the delivery of DVD-quality video for the small screens of mobile TV.

Cellular-II : MBMS

Multimedia Broadcast Multicast Service is a broadcasting service that can be offered via existing GSM and UMTS cellular networks. MBMS will start to be rolled out in cellular networks during 2008 and gives the opportunity to broadcast TV, film, information and other media in these networks. MBMS has the major benefits that the network infrastructure is already there for mobile network operators and the deployment can be cost effective compared with building a new network for the services. The infrastructure offers an option to use an uplink channel for interaction between the service and the user. MBMS uses multicast distribution in the core network instead of point-to-point links for each end device. The broadcast capability enables to reach unlimited number of users with constant network load. Further it also enables the possibility to broadcast information simultaneously to many cellular subscribers for example emergency alerts.

Cellular-III : TDtv

TDtv combines IP Wireless commercial UMTS TD-CDMA solution and 3GPP Release 6 Multimedia Broadcast Multicast Service (MBMS) to deliver Mobile TV. TDtv operates in the universal unpaired 3G spectrum bands that are available worldwide at 1900MHz and 2010MHz. It allows UMTS operators to fully utilize their existing spectrum and base stations to offer mobile TV and multimedia packages without impacting other voice and data 3G services.

Drawback: It still needs separate RF transmitters installed on each base station. Integrating the network into a 3G network means that each operator has to build its own TDtv network rather than having a 3rd party build a network that all operators can access.

Broadcast-I : ISEG

ISEG is a mobile terrestrial digital audio/video and data broadcasting service in Japan. Terrestrial digital broadcast in Japan (ISDB-T) is designed so that each channel is divided into 13 segments (plus one segment for separating channels). HDTV broadcast occupies 12 segments, and the remaining (13th) one segment is used for mobile receivers. Thus the name, 'Iseg'

Drawback: Almost a year after the Iseg trial Mobile reception is difficult, especially in a moving vehicle/train, as the signal quality deteriorates quickly even at speeds around 20 km/h (12 mph). This leaves the majority of the target audience for this service unable to receive it.

Broadcast-II : DMB

Digital Multimedia Broadcasting is made for transmissions on radio frequency bands band III (VHF) and L (UHF), for terrestrial.

The audio and video is encapsulated in MPEG-2 TS. In order to diminish the channel effects such as fading and shadowing, DMB modem uses OFDM-DQPSK modulation. A single-chip T-DMB receiver is also provided by an MPEG-2 transport stream demultiplexer. DMB has several applicable devices such as mobile phone, portable TV, PDA and telematics devices for automobile.

Drawback: DMB is less efficient than DVB-H, but DMB can still carry almost 4 times as many radio stations as DAB, and is therefore almost 4 times cheaper to implement in terms of cost per service.

Broadcast-III : DVB-H

Digital Video Broadcasting technology is a superset of the very successful DVB-T (Digital

Video Broadcasting - Terrestrial) system for digital terrestrial television, with additional features to meet the specific requirements of handheld, battery-powered receivers.

All data is transmitted in MPEG-2 transport streams with some additional constraints (DVB-MPEG). DVB-H can offer a downstream channel at high data rates which can be used as standalone or as an enhancement of mobile telecommunication networks which many typical handheld terminals are able to access anyway. Time slicing technology is employed to reduce power consumption for small handheld terminals

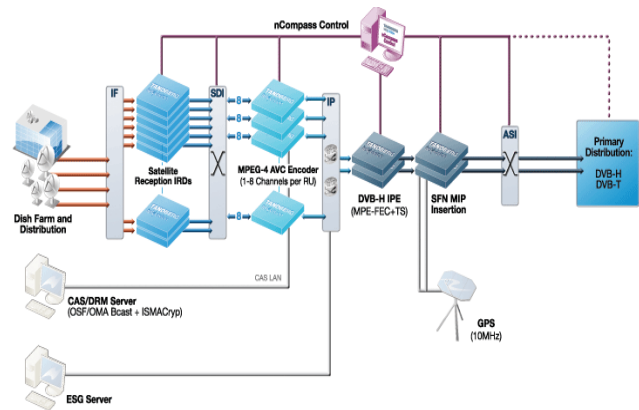


Fig. 4 Digital Multimedia Broadcasting

Now these technologies and knowledge - which include acquisition content processing, CBR and VBR encoding, multiplexing, encapsulation, modulation and network adaptation with overall system management; including automated redundancy - have been applied to the mobile world to produce a highly efficient ecosystem for broadcasting to mobile devices.

European Union has announcement of a single mobile TV standard and as expected DVB-H.

DRAWBACK: DVB-H is a good solution but high license costs and L-band spectrum would damage its business case.

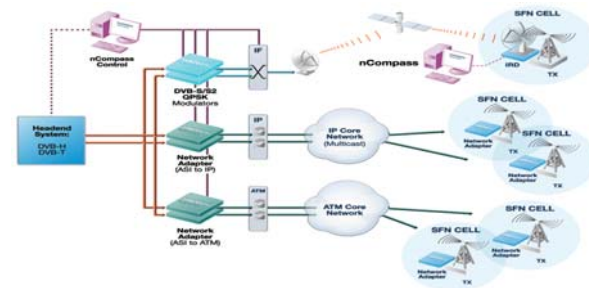


Fig. 5 Digital Video Broadcasting

Broadcast-IV : MediaFLO

MediaFLO is Qualcomm's new technology to broadcast data to portable devices such as cell phones and PDAs. Broadcast data will include multiple real-time audio and video streams, individual, non-real-time video and audio "clips", as well as IP Datacast application data such as stock market quotes, sports scores, and weather reports. The data transmission path is one-way, from the tower to the device. The MediaFLO system transmits data on a frequency separate from the frequencies used by current cellular networks.

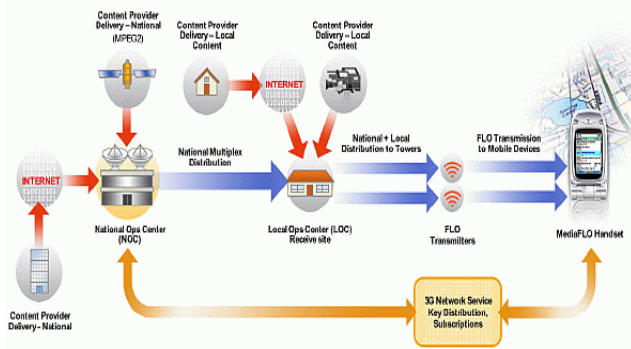


Fig. 6 Media FLO

IV. COMPARISON BETWEEN DIFFERENT BROADCAST TECHNOLOGY

	<i>DVB-H</i>	<i>MediaFLO™</i>	<i>ISDB-T</i>	<i>DMB</i>
Standard	Open	Proprietary	Open	Open
Regions	US, Europe, parts of Asia	US	Japan	Korea, expanding to other countries
Air Interface	OFDM	OFDM	OFDM (sub-banded)	OFDM
Service Availability	Mid 2005, open US spectrum nationwide today	2006 (locally through analog TV channels)	Early 2006	Today
Handset Availability	Today from several OEMs	2006	2006	Today from several OEMs

Fig. 7 Comparison between different technologies

V. CHALLENGES

Device Manufacturer’s challenges:

- 1. High Power Consumption:** Battery technology for mobile portable devices may be stuck in a rat's race. Battery life improved can be eaten up by the upgraded mobile content and enhanced functions.
- 2. Memory:** To support the high buffer requirements of the mobile TV. Current memory

capabilities will not be suited for long hours of mobile TV viewing.

3. User Interface Design: A large number of mobile phones do not support mobile TV; users have to purchase new handsets with improved LCD display and user interface that support mobile TV.

4. Processing Power: Device manufacturers should improve the processing power significantly to support a MIPS intensive application like mobile TV

Content Provider’s challenges

The mobile TV industry opens up a new market for the content specifically tailored for mobile TVs. These could include making new mobisodes –mobile episodes of popular shows which are relatively shorter in length (3 to 5 minutes), modifying the content to suit mobile TV. Providers need to think of innovative ways of editing content, increasing close-up shots for clarity on small screen, etc.

VI. SOLUTION

Alcatel's Unlimited Mobile TV

Alcatel's solution for mass-market mobile TV consists of a mix of nicest and broadcast technologies - a solution that employs hybrid satellite/terrestrial architecture. This 3G-friendly architecture allows mobile operators to protect and leverage their 3G investments, while cooperating with other industry players to take full advantage of the booming mobile TV market. It solution provides mobile users with a high-quality mobile TV service on mobile phones and other devices - any time, any place. With this solution, operators can offer a large number of TV programs, in one or several countries, with superior quality of indoor coverage. The result is a universal solution, which offers an unlimited number of channels, an unlimited audience with unlimited coverage and maximum interactivity, and guaranteed unlimited usage.

Bharti Telesoft’s Video Delivery Platform

Bharti Telesoft’s VDP hosts, manages, and delivers multimedia (video, data and voice) content right to the mobile handset – quickly and efficiently.

As the demands for up-to-the-minute content multiply, VDP scales to handle growing volumes of concurrent video sessions and increasing demands for content download – and upload. With Bharti Telesoft’s Video Delivery Platform (VDP), mobile operators can provide call-based video services to subscribers, and store and manage

video content. VDP enables subscribers to make video calls, access video content via a video portal, send video messages, and engage in video chat.

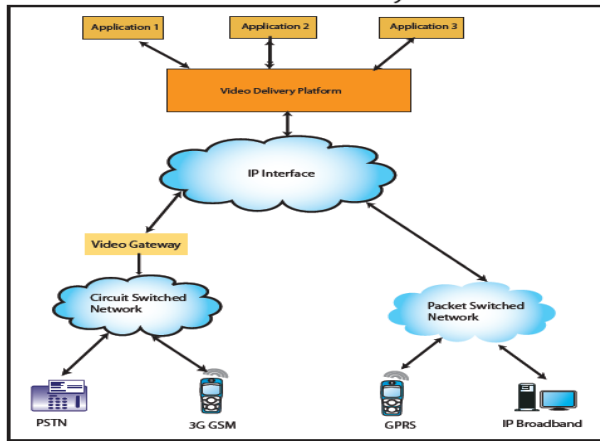


Fig. 8 Bharti Telesoft's Video Delivery Platform

CyberLink Mobile TV Solution

CyberLink Mobile TV Solution provides support for a growing range of popular standards and operating systems. Mobile TV player provides automatic switching between DVB-H, DVB-IP and T-DMB standards, enabling a hassle-free solution for mobile TV users who move between countries. Support for conditional access and digital rights management gives users a wider selection of accessible TV content via pay-TV subscription services.

VII. MOBILE DEVICES THAT WORK ON THIS TECHNOLOGY

Eg: NOKIA N92i, LG U900, NOKIA 7710, SAMSUNG SGH P900 ETC.



Fig. 9 N92i, LG U900, Nokia 7710, Samsung SGH P900

VIII. CONCLUSION

Mobile TV, undoubtedly, is a hot topic today. It is about to become the next big thing in the entertainment mass market. Numerous problems - frequencies, services, different technologies - are also not yet finally solved, nor is it yet fully clear, if and how Mobile TV could become a business, to what extent users will accept the new medium, and how they could be charged for Mobile-TV services. Mobile TV will be a killer application in the next generation of mobile phones, creating a new convergence paradigm of broadcast and mobile services.

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