Mobile TV Technologies

Zahid Ghadialy

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What is Mobile TV

Mobile TV Broadcasting allows the user to watch their favourite TV programs such as dramas, news, music, sports and documentaries on their mobile device. The service works by receiving a specialised digital TV broadcast signal from the air in much the same way as televisions at home will do in future. Channel guides will also be broadcast allowing users to keep abreast of the latest programs on air. It is not the same as a streaming video service over 3G or GPRS, but one which is optimised for longer period TV viewing by large numbers of simultaneous users with high picture quality and low battery power consumption.

Mobile TV Technologies

- BCMCS: BroadCast MultiCast Services (3GPP2)
- DVB-H: Digital Video Braodcasting-Handheld (ETSI)
- ISDB-T: Integrated Service Digital Broadcasting – Terrestrial (ARIB)
- T-DMB: Terrestrial Digital Multimedia Broadcasting (Korean Standard)
- MediaFLO: Media Forward Link Only (Qualcomm proprietary)

MBMS is not Mobile TV

- MBMS uses existing 3G Spectrum whereas Mobile TV needs new frequency spectrum

- Channel switching is faster using Mobile TV technologies compared to MBMS

- Very little number of channels using MBMS are possible as compared to Mobile TV technologies

- Battery life is much less if MBMS is used as compared to Mobile TV technologies

- Higher coverage possible with Mobile TV technologies

Mobile TV Technologies In Depth Analysis

Qualcomm has pulled together The FLO Forum, (*Forward Link Only*) which is pushing to standardize this Qualcomm's technology for transmitting multimedia content to mobile devices.
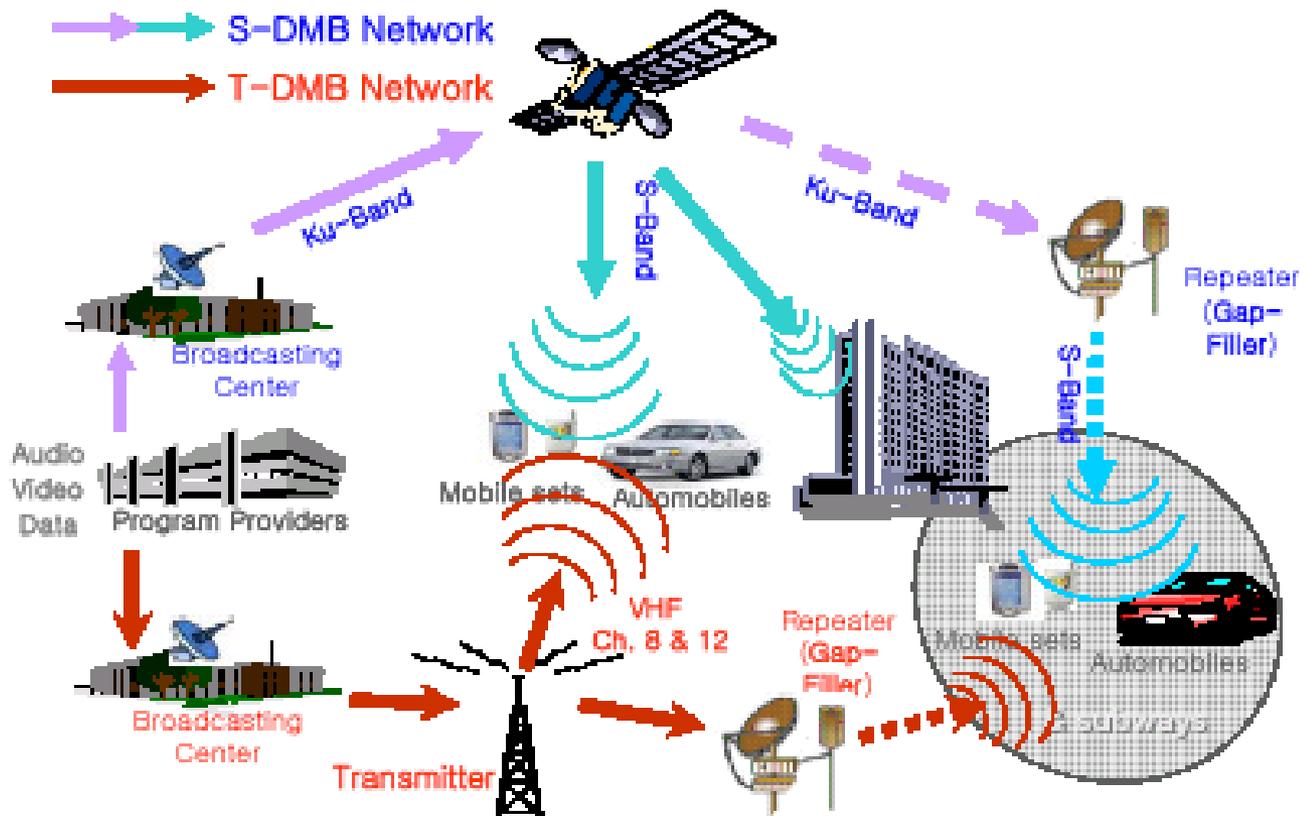
MediaFLO

- Qualcomm proprietary
- It uses unidirectional COFDM (Coded Orthogonal Frequency Division Multiplexing)
- Its under the process of standardisation
- Interested parties include LG, Sanyo, Sharp, Huawei
- In US, MediaFLO will deliver 29 channels on TV channel 55.
- Not many people interested because of patented technology.

ISDB

- **Integrated Services Digital Broadcasting (ISDB) is the digital television (DTV) and digital audio broadcasting (DAB) format that Japan has created to allow radio and television stations there to convert to digital.**
- **ISDB is maintained by ARIB.**
- **The core standards of ISDB are ISDB-S (satellite television), ISDB-T(terrestrial), ISDB-C (cable) and 2.6GHz band mobile broadcasting.**
- **ISDB-T and ISDB-Tsb are for mobile reception in TV bands.**
- **Not popular outside Japan**

Digital Multimedia Broadcasting (DMB)

- Developed in South Korea

- China has started using this as their Mobile TV technology

- Also being adopted in some European countries

- Based on Digital Audio Broadcasting (DAB) standard

- Two types of DMB technology available. S-DMB (Satellite) and T-DMB (Terrestrial)

S-DMB Network
T-DMB Network

Ku-Band
S-Band
Ku-Band
S-Band

Audio
Video
Data

Program Providers

Broadcasting
Center

Broadcasting
Center

Transmitter

Mobile sets   Automobiles

VHF
Ch. 8 & 12

Repeater
(Gap-
Filler)

Repeater
(Gap-
Filler)

Mobile sets
Automobiles

Subways

S-DMB and T-DMB

- S-DMB provides nationwide mobility and more channels compared to T-DMB
- S-DMB video quality (15 frames/s) not as good as T-DMB (30 frames/s)
- S-DMB always pay channel as satellites are used. T-DMB can be paid or free.
- For T-DMB III-band or L-band has been proposed
- III-band spectrum is full and this frequency requires special antennas (unsuitable for phones)
- L-band spectrum is crowded and in many countries only 1 channel (3-4 TV channels) is available

LG V9000 first DMB-T phone

Samsung SGH-P900 GSM/GPRS/EDGE with DMB-T Mobile TV

DMB-T Trials in Europe

- **Samsung SGH-P900 and LG V9000 are being trailed by Debitel in Germany**
- **According to the review, "**To this viewer, a movie, airing on ZDF, had amazingly high quality. The pictures were formatted for easy viewing on the small display. The resolution was good. The audio was equally good. For anyone addicted to TV, this could be a real drug."

DVB-H

GLOBAL MOBILE TV DVB H

- Digital Video Broadcasting for Handheld
- Designed especially for Mobiles in Europe
- Based on DVB-T (Terrestrial) that has been around for some time now. Many features have been improved on DVB-T
- Adopted in Nov 04 by ETSI as a standard for Mobile TV

What is DVB-H

- DVB-T: OFDM in 2K and 8K mode (carrier spacing)

New in DVB-H
- Time slicing / IP encapsulaton in MPEG-2 transport stream
- reserved TPS bits now used to indicate DVB-H specific modes
- 4K mode with In Depth Inner Interleaving
- Reed-Solomon FEC on IP (MPE-FEC)
- 5 MHz channel (USA: 1.6 GHz Band)
- Lower power consumption for mobile terminals
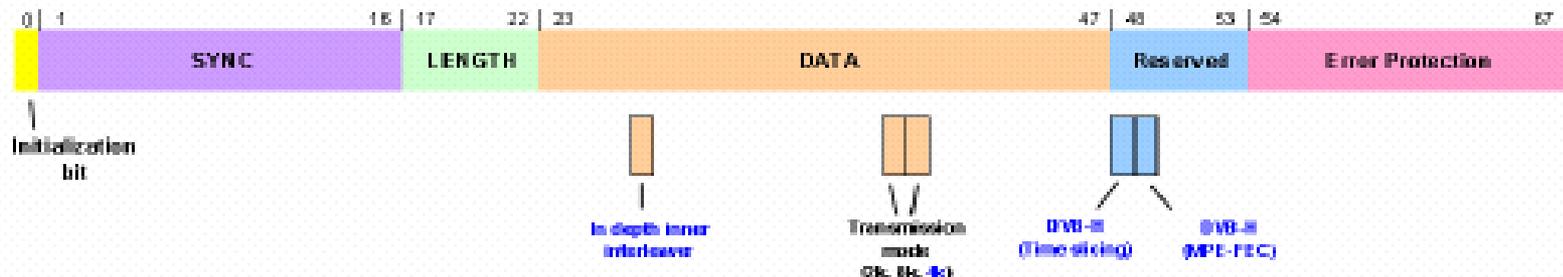- Secured reception in mobile environment

Power saving with Time Slicing

- IP encapsulation allows sending the data in bursts
- Time bursts (off time) gives the power saving
- Length of off time depends on used service and burst bit rates
- Even 90% off time (i.e. power saving) can easily be achieved
- **Timesliced and non-timesliced service in common Multiplex (only receiver switched off, transmitter on all the time)**
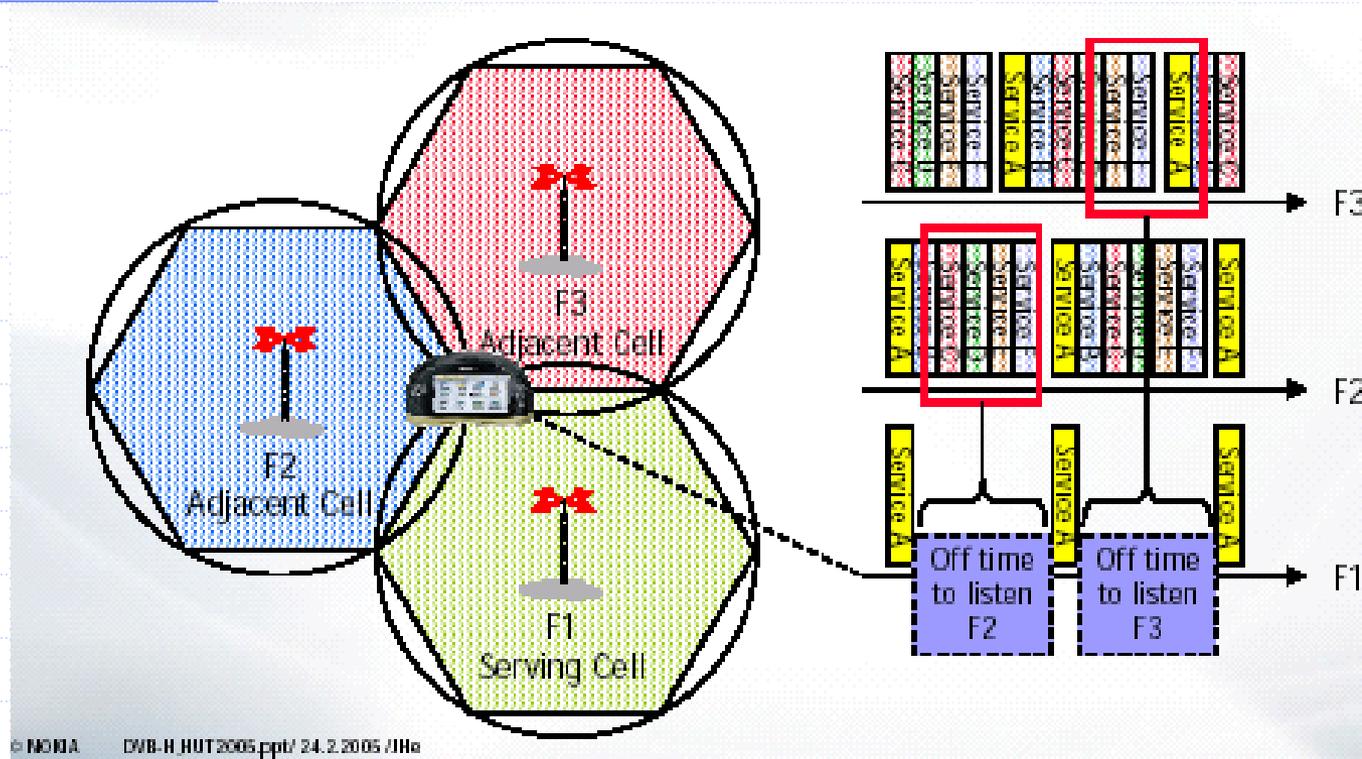

Timesliced:

Service 1, Service 2, Service 3

Non-timesliced:
Service 4
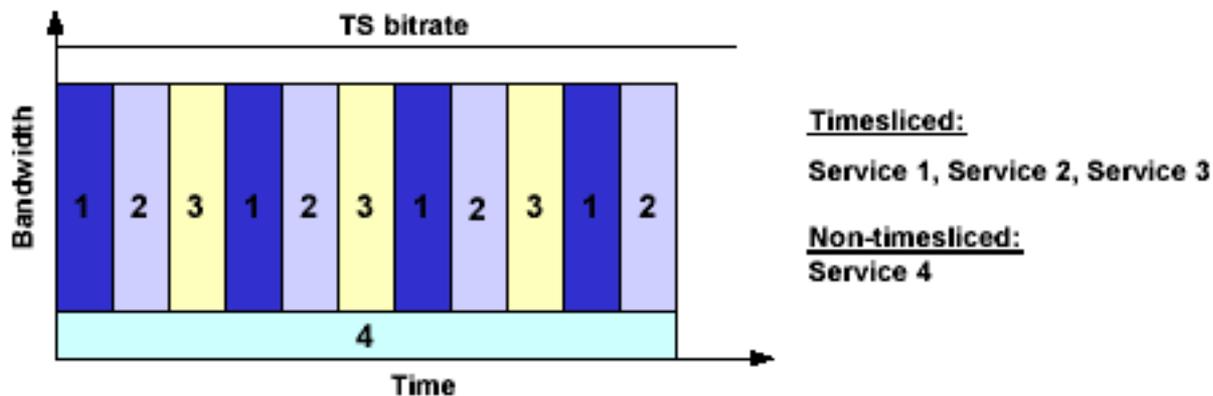
Using extended TPS bits

⊕ **DVB-T standard contains unused TPS bits**

⊕ **DVB-H uses 2 of them + adapt bits of "Data" section**

⊕ **Used for**
  - ◆ **In depth inner interleaver mode**
  - ◆ **4k transmission mode**
  - ◆ **Time slicing**
  - ◆ **MPE-FEC**

0	1	16	17	22	23	47	48	53	54	67
	SYNC		LENGTH		DATA		Reserved		Error Protection	

Initialization bit

In depth inner interleaver

Transmission mode (2k, 8k, 4k)

DVB-H (Time slicing)

DVB-H (MPE-FEC)

Handover support in DVB-H

Time Slicing offers, as an extra benefit, the possibility to use the same receiver to monitor neighboring cells during the off-time

Inter-carrier spacing

- **DVB-T uses 2K and 8K carrier spacing**
- **2K mode**
  - Large inter-carrier spacing: gives tolerance to the echoes affected by Doppler
  - Short symbol duration: limits the maximum delay of accepted echoes
  - Unsuitable for small SFN's (single frequency networks)
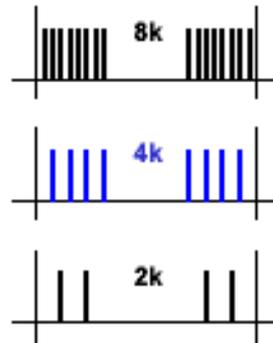 - Suitable for very high speeds
- **8K mode**
  - Small inter-carrier spacing: limits the maximum echoes affected by Doppler
  - Large symbol duration: gives tolerance to delay of accepted echoes
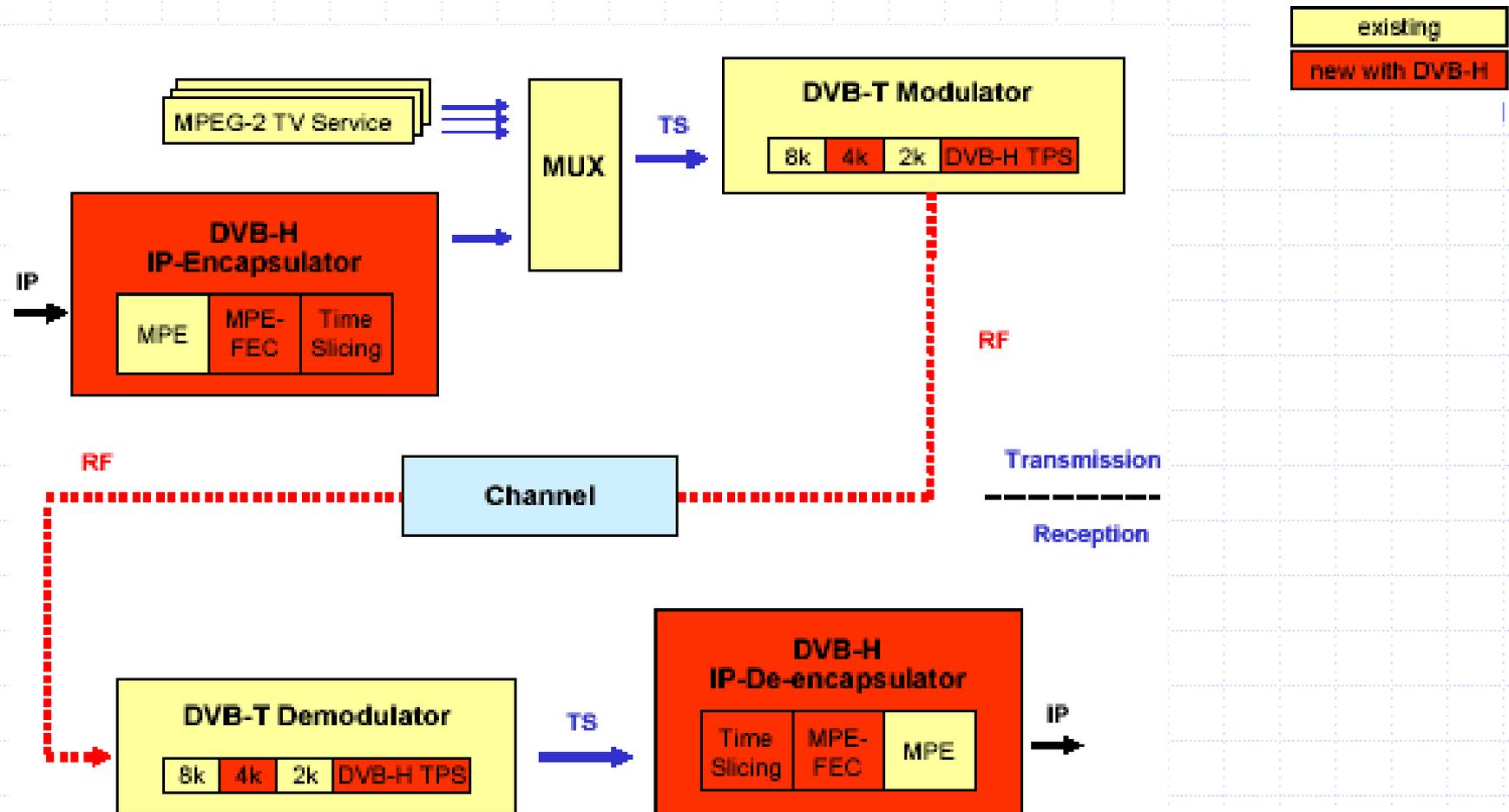 - Suitable for large SFN's
  - Unsuitable for high speeds

DVB-H also uses 4K mode

4K mode is a good compromise in terms of:
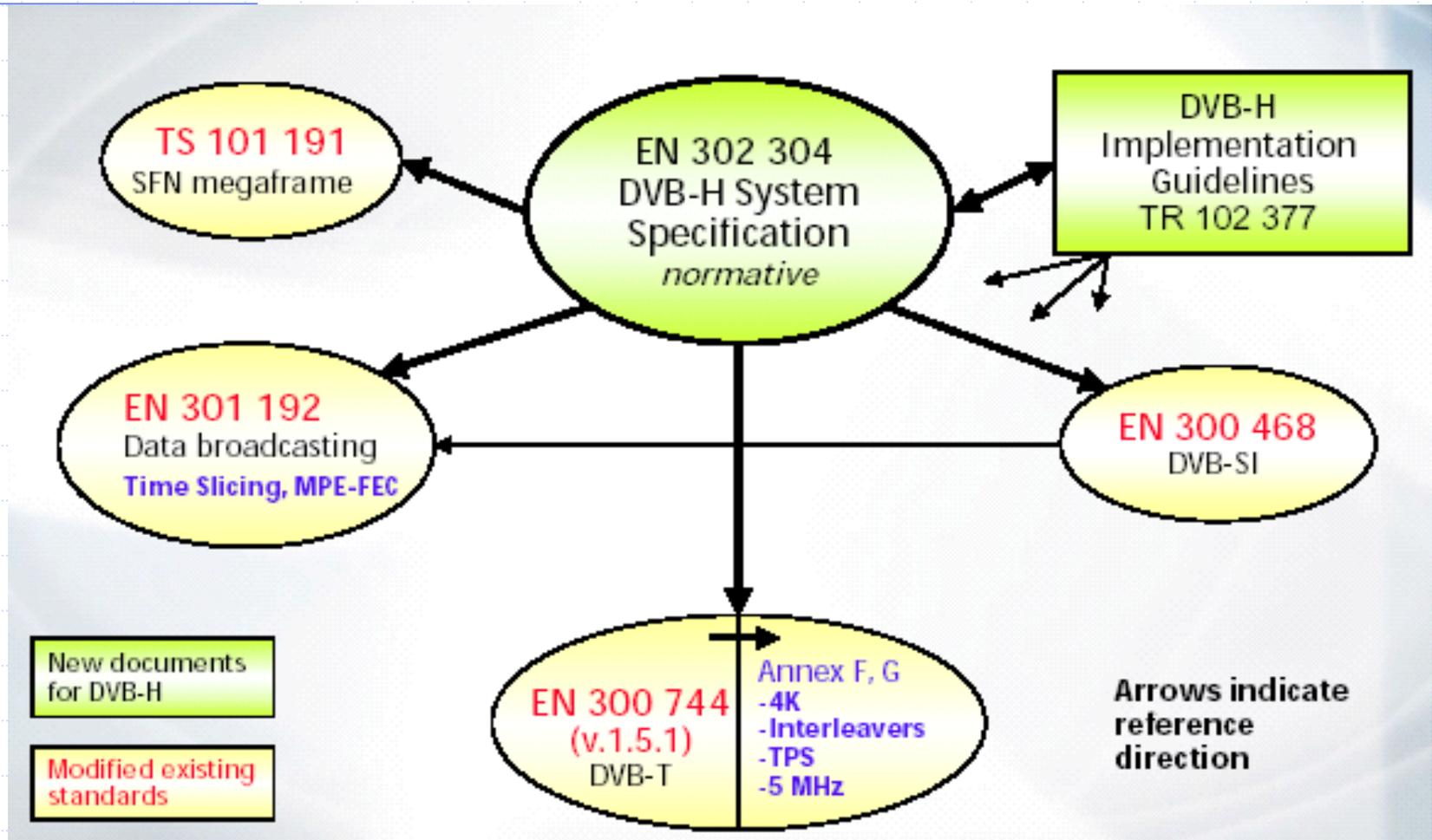- **Mobility**
- **SFN size**

DVB-H Transmitter/Receiver

DVB-T/DVB-H comparison

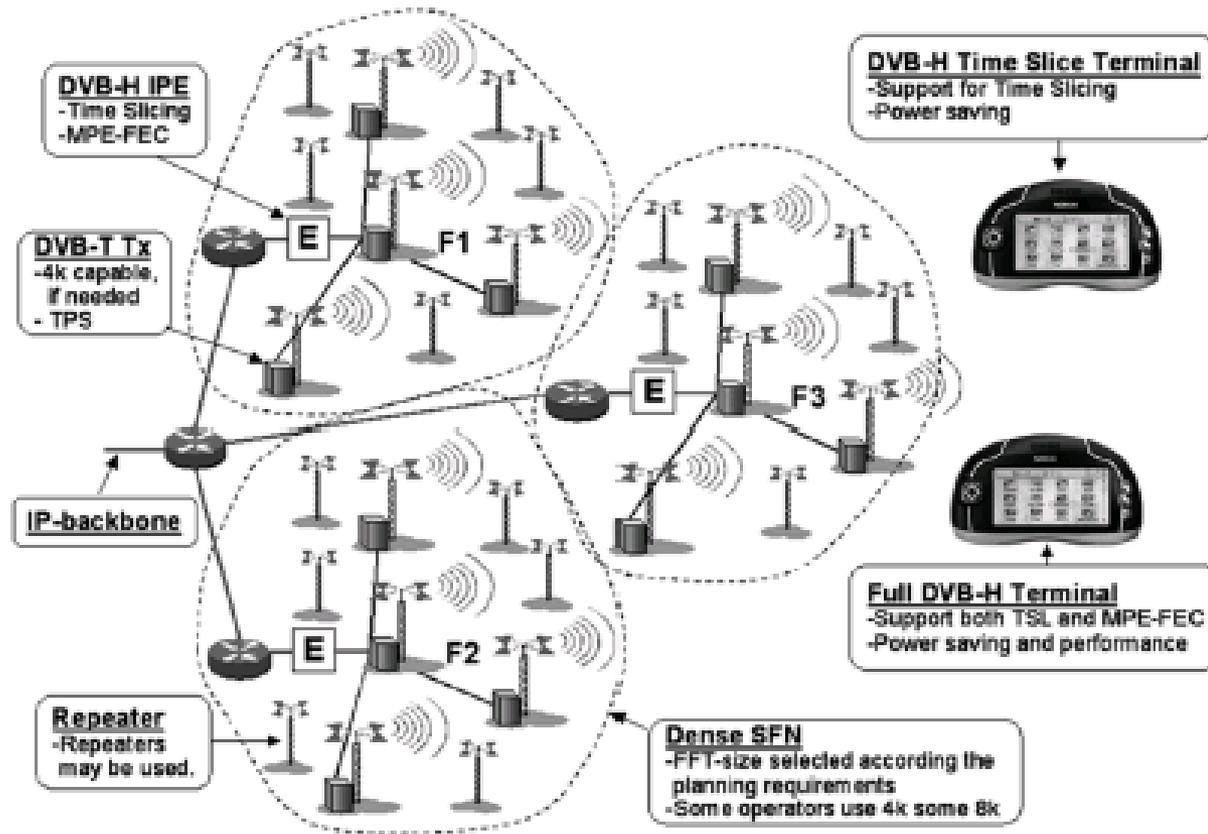|	DVB-T	DVB-H
Data Rate	4-5 Mbps	128-384 kbps
Display	Large and medium TV screen	Small (mobile phone) screen
Antenna	Roof top, Desktop or Car Antenna	Internal
Power Supply	Fixed, Continuous	Battery powered, limited
Reception Mode	Fixed, Indoor portable	Mobile Handheld

DVB-H standards

DVB-H & DVB-T shared network
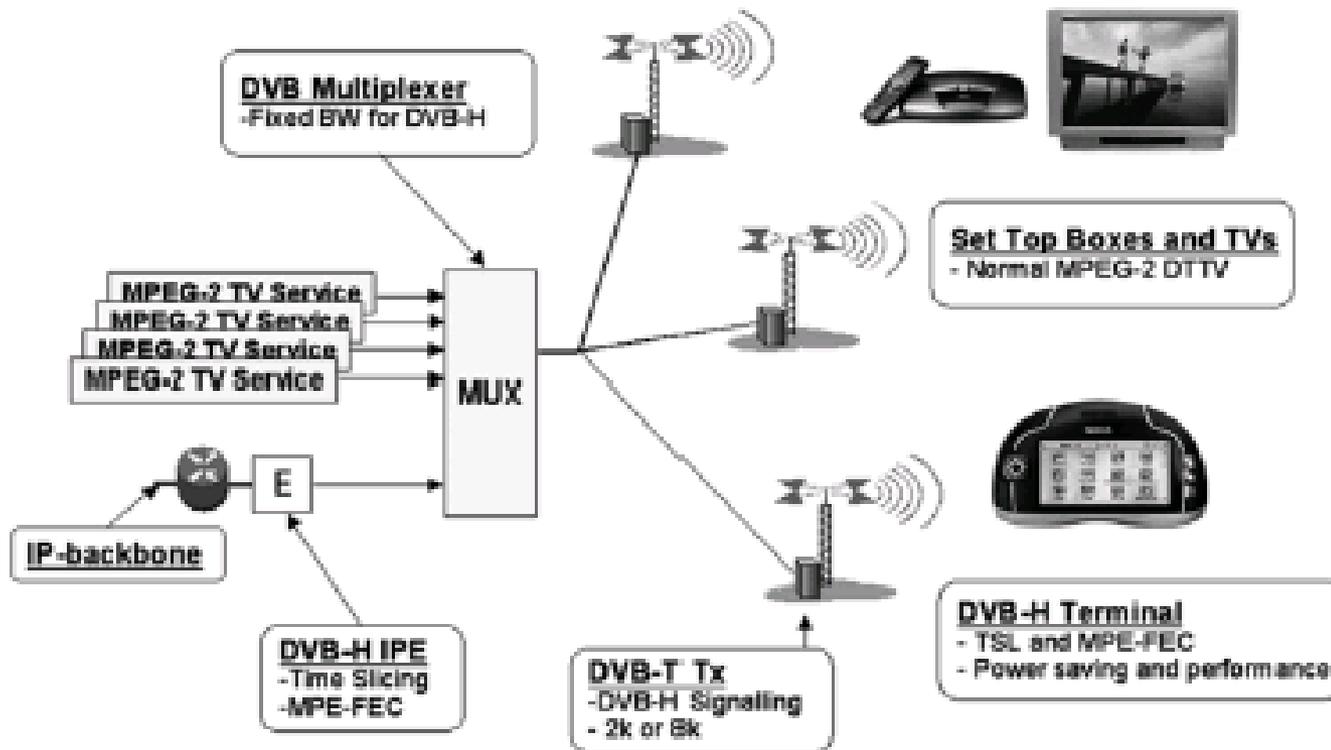
Dedicated DVB-H network

Use of options in DVB-H

- **DVB-H means obligatory use of Time Slicing and *optionally* MPE-FEC over DVB-T physical layer.**
- **MPE-FEC robustness can be selected according to the needs;**
  - **if capacity is available one may build services that on mobile channels are 2-6 dB more robust than the basic mode (sacrificing 25% of the capacity for redundancy)**
  - **the virtual time-interleaving length can be adjusted**
- **All DVB-T options -including the new ones-are available:**
  - **8K, 4Kor 2K**
  - **Modulations QPSK, 16QAM, (even 64 QAM)**
  - **Code rates 1/2-7/8, recommended 1/2 or 2/3**
  - **Native or in-depth interleavers in 2K and 4K**
- **Implementation guidelines will give further guidance in parameter selection**

LG-U900 first UMTS DVB-H phone

Nokia N92 UMTS DVB-H mobile

HTC's DVB-H phone for Modeo GSM/GPRS/EDGE

Comparisons of Mobile TV technologies

	DVB-H	DMB	MBMS	MediaFLO
Type	Broadcast	Broadcast	Cellular	Cellular
Region	US, Europe, Asia	North America, Europe	US, Europe, Australia, Asia	US
Developer	Open Standard	Open Standard	IP Wireless	Qualcomm
Operator Support	Telstra, O2, 3 Italy, Swisscomm	BT Movio, Virgin Mobile	Orange, BT, TeliaSonera, TIM	Verizon, Sprint Nextel
OEM support	Nokia, Motorola, BenQ, Siemens	LG, Samsung	Ericsson	Samsung, Nokia
Network	DVB Terrestrial	DAB Terrestrial and Satellite	GSM, EDGE, UMTS	CDMA, EVDO
Channels	9-18	8-12	50	15-20
Frequency	UHF non allocated	Existing DAB Frequencies	3G Spectrum	Qualcomm's own (US) 700MHz

LG: Champion of Mobile TV

Who will rule Europe DVB-H or DMB-T?

The DMB-T lobby is trying hard to prove that it is superior to DVB-H and they have made many claims against DVB-H.

- T-DMB network transmission power is lower than DVB-H.
- DVB-H network is ten times more expensive than T-DMB network.
- T-DMB offers unlimited SFN network size.
- DAB investment already done that can be reused for DBM-T unlike in DVB-H.
- T-DMB is best system if the required number of services is low.
- Faster to start with T-DMB due to frequency and existing investments.
- T-DMB commercial terminals are available, DVB-H not.
- T-DMB antenna gain is higher.

DVB-H vs. DMB-T Comparison - 1

Claim: **T-DMB network transmission power is lower than DVB-H.**

Facts:

- **In indoor reception conditions T-DMB C/N requirement is ~10dB and DVB-H 6.4 dB. (both using QPSK modes i.e. same spectral efficiency).**
- **In mobile reception conditions T-DMB C/N requirement is ~14dB and DVB-H 8.5 dB. (both using QPSK modes i.e. same spectral efficiency).**
- **The better sensitivity due to the smaller bandwidth in T-DMB is almost compensated by better C/N performance of DVB-H and DVB-H offers four times more capacity.**

DVB-H vs. DMB-T Comparison - 2

Claim: **T-DMB is the best system if the required number of services is low.**

Facts:

DVB-H network investment is lower than T-DMB network with similar coverage (TDMB in VHF III band and DVB-H in UHF band). DVB-H however provides four times more capacity with lower investment. Even if the originally required number of services is low DVB-H offers future expansion capabilities with smaller investment.

DVB-H *vs.* DMB-T Comparison - 3

Claim: **T-DMB commercial terminals are available, DVB-H not.**

Facts:

- **Most of the TV-terminals sold in Korea as of the start of 2006 are S-DMB terminals, not T-DMB terminals. In practice there are only two major vendors for T-DMB terminals: Samsung & LG.**
- **All Korean terminals are CDMA terminals i.e. not suitable for EU market. The GSM terminals are prototypes.**
- **Nokia has announced a real S60, 3-Band EGSM+WCDMA, WLAN, BT, DVB-H capable N92.**
- **DVB-H terminals will be commercially available from Nokia, Motorola, Siemens, Samsung, Sagem, LG (these have been shown in exhibitions).**

DVB-H vs. DMB-T Comparison - 4

Claim: **T-DMB antenna gain is higher than DVB-H.**

Facts:

- **The antenna gain comparison should be done with same size terminals and integrated antennas.**
- **Antenna does not know which modulation or system is used!**
- **The antenna gain in the same frequency band would be the same.**
- **VHF III antenna gain is -25dBi with integrated antenna.**
- **UHF antenna gain is -7 dBi.**
- **Higher antenna gain benefit in the L-band (-2 dBi) is lost in worse propagation (-8 dB) when compared with UHF.**

DVB-H

OR

T-DMB

LG PM-80 Korean DMB-T

DVB-H *vs.* DMB-T Comparison - 5

Claim: T-DMB specifications are more mature than DVB-H

Facts:

- DVB-H fully specified, T-DMB still with much work to do.
- DVB-H
    - Standard has existed since Oct 2004
    - Full specifications published for ESG, copy protection, service purchase, etc...
- T-DMB
    - Standard has existed since 2005
    - No proper standards for ESG, copy protection, purchase

DVB-H vs. DMB-T Comparison - 6

Conclusion:

There are many many problems using T-DMB compared to DVB-H. All the claims by made T-DMB organisations are baseless. In summary:

⊕ **The price of service for T-DMB in L band is almost 10 times that of DVB-H in UHF**

⊕ **The price of a T-DMB network at any band is about twice (or more) that for a DVB-H UHF network**

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