Feasibility of DVB-H Deployment on Existing Wireless Infrastructure

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Digital
Video
Broadcast
Handhelds

Feasibility of DVB-H Deployment on Existing Wireless Infrastructure
MOTIVATION

• “… mass market demand for mobile multimedia entertainment is conditioned to the low cost provision of these services.”

• DVB-H allows IP broadcasting to mobile phones based on DVB-T (Digital Video Broadcast – Terrestrial)

• DVB-H is a good candidate for the provision of mobile multimedia services at low cost BUT
  – Much more severe propagation conditions than DVB-T
  – Requirement of similar coverage levels than 2G/3G

THUS
  – Higher powers or/and more transmitters will be required
  – Need for efficient network deployment of DVB-H!

➢ Investigate the feasibility of deploying DVB-H on existing wireless infrastructure to provide indoor coverage
DVB-H Network Deployment

- **DVB-H Network Configurations:**
  - **Shared Network**
    * Shared multiplex with DVB-T
    * DVB-T and DVB-H share the capacity of the RF channel
    * One transport stream
  - **Hierarchical Network**
    * Shared multiplex with DVB-T
    * Hierarchical modulation
    * DVB-T in the High Priority stream
    * DVB-H in the Low Priority stream
  - **Dedicated Network**
    * Exclusive use for DVB-H
DVB-H Network Deployment

**Main Problem:**
- Existing broadcasting infrastructure might **NOT** be able to transmit the required powers due to electromagnetic exposure limits
  - Very high operational costs for power levels ~50-60 dBWs
- **Additional transmitters are a must**
  - Possible solution to reduce costs: *re-use cellular infrastructure*

**Shared and Hierarchical configurations:**
- **DVB-H** indoor coverage  **DVB-T** indoor portable coverage
- **DVB-T** networks planned for rooftop reception

**Dedicated configuration:**
- **Most suitable**
  - Optimized for the desired capacity and coverage
System Model

Existing Wireless Infrastructure:
- **Broadcasting**: TV towers
- **Cellular**: 2G/3G sites

DVB-H System Parameters:
- Shared: “French mode” 22.1 Mbps
  - 8K, GI 1/8, 64QAM 2/3
- Dedicated: 10 Mbps, no MPE-FEC
  - 4K, GI 1/4, 16QAM 1/2

Link Budget Parameters:
- Indoor coverage @ 700 MHz

receiver synchronized to closest transmitter

TV Tower 150 m
Cellular Site 35 m
Cellular Site not used

R = 25 km
R_{cl} = 3.5 km
Results (I)

- Only Broadcasting Infrastructure (Shared and Dedicated):
  - Coverage targets: **DVB-T** 99%, **DVB-H** 95%.

  “Coverage Area Radius vs. Power from the TV Tower”

- Huge differences in link budget between
  - **DVB-T** rooftop
  - **DVB-H** indoor

- Shared: ~40 dB
- Dedicated: ~30 dB

- **DVB-H** outdoor +7 dB
Results (II)

- Only Broadcasting Infrastructure (Shared and Dedicated):
  - Service area radius 25 km. **DVB-H** indoor coverage 95%.
  - "Coverage vs. Power from the TV Tower"

- Power Levels:
  - Shared **DVB-T rooftop**: 30 dBW
  - Dedicated **DVB-H indoor**: 60 dBW

- Coverage levels > 80% more difficult to achieve
Results (III)

- Broadcasting and Cellular Infrastructure (Dedicated):
  - Service area radius 25 km. **DVB-H** indoor coverage 95%.

  "**Required power per DVB-H cellular site as a function of the cell radius of the cellular network**"

- Coverage from TV tower:
  - 40 dBW: 37%
  - 50 dBW: 73%

- Number of Sites:
  - Radius 2.5 km: 109
  - Radius 5 km: 31

  ➤ For 5 km cell radius power levels > 30 dBW
  ➤ Lower cell radii!
Results (IV)

• Broadcasting and Cellular Infrastructure (Dedicated):
  – Service area radius 25 km. DVB-H indoor coverage 95%.
  – Radius cellular network 2.5 km.

“Required power per DVB-H cellular site as a function of the number of cellular sites employed”
Conclusions

- Very high power levels are required at the broadcasting sites for achieving **DVB-H indoor coverage**
- **Re-using cellular sites** is a valid solution to avoid excessive powers at the broadcasting sites
- The required **powers** at the **cellular sites** might not be acceptable for health concerns (e.g. more than 30 dBW) for typical sub-urban cell radii (e.g. 5 km)
- For **smaller cell radii** (e.g. 2.5 km) the power levels are feasible, but the required **number of sites** is large

- **Power Limits + Cost Model**
  - **Minimum Cost Deployment**
Thanks for your attention!
Questions?

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