Inter-Device and Inter-Media Synchronization in HBB-NEXT

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FP7-287848 HBB-NEXT
Agenda

1) Synchronization in HBBNEXT
2) Inter-Media Sync
3) Inter-Device Sync
4) Combined prototype
1) Synchronization in HBBNEXT

- **HBBNEXT** is a EU FP7 research project
- **Runtime:**
  10/2011 – 04/2014
- **WP4:**
  A/V Synchronization

**Partners:**
THM, TNO, IRT, rbb
1) Synchronization in HBBNEXT

● **Goals:**
  - Share media experience in heterogeneous groups
  - Enhance Accessibility features
  - Incorporate second screens
2) Inter-Media Synchronization

1. **Goals:**
   - Heterogeneous sources (DVB, on-demand IP, IPTV)
   - Synchronize play-out on a single end-device (PiP)

1. **Solution:**
   - Solution: Enrich DVB signal with timeline (absolut values) – specified in DVB but never used
2) Inter-Media Synchronization

Broadcast Timeline Generation

- VIDEO ES
  - PES Header
    - I-Frame
  - PES Header
    - B-Frame
  - PES Header
    - P-Frame
  - PES Header
    - I-Frame
  - PES Header
    - B-Frame
  - PES Header
    - P-Frame
  - PES Header
    - I-Frame

- Timeline ES
  - PES Header
    - auxiliary_data
      - TVA_descriptor + broadcast_timeline_descriptor
    - TimeCode
  - PES Header
    - auxiliary_data
      - TVA_descriptor + broadcast_timeline_descriptor
    - TimeCode
  - PES Header
    - auxiliary_data
      - TVA_descriptor + broadcast_timeline_descriptor
    - TimeCode
  - PES Header
    - auxiliary_data
      - TVA_descriptor + broadcast_timeline_descriptor
    - TimeCode
2) Showcases

- Newscast (DVB)
- Sign Language Interpreter (IP)

- Left Eye DVB
- Right Eye IP
3) Inter-Device Synchronization

Basic Aspects

- Exchange of timing information between devices
- Common Time base
- Synchronization Scheme (Distributed, Master-Slave, Star Topology)
- Protocol
3) Inter-Device Synchronization

Solution:

- Exchange absolute timecode values, based on the inter-media timeline
- Packet with snapshot:
  - Absolute wallclock time
  - Playposition
- Network Time Protocol

PLAYPOSITION: 9132
TIMESTAMP: 01/01/1970;17:33:05:280
3) Inter-Device Synchronization
3) Inter-Device Synchronization

Protocol:

- Simple UDP protocol
- Clients subscribe a session
- Remain in Soft-state (dropped after timeout)
- Regular sync messages (resync)
4) Combined Prototype

HBBNEXT STB
- Middleware
- Decoder
- Timeline Extractor
- HbbTV video/broadcast Object
- Sync Module

HBBNEXT Android Tablet
- Android Middleware
- Decoder
- Media Framework
- Sync Module

DVB
4) Combined Prototype

Features:

- Synchronized extra on demand content on tablet:
  - Video (e.g. Sign Language Interpreter)
  - Audio (Audio Description, additional languages)
  - Metadata (Subtitles)
4) Combined Prototype

Challenges:

- Achieve Frame accurate seeking on Android devices (limited access, inaccurate timing queries)
- Extract precise timeline values on set top box (decoder buffering)
- Consider output screen postprocessing
4) Combined Prototype

Screenshot:

- Will be presented at demo Session!
4) Combined Prototype

Outlook

- Timeline and Synchronization features will make its way into HbbTV 2.0
- Next step: Inter-Destination Synchronization – fill the gap
- ICCE 2014 Las Vegas – Presentation of a multi topology synchronization model
4) Combined Prototype

References

- "A DVB/IP streaming testbed for hybrid digital media content synchronization“, Consumer Electronics - Berlin (ICCE-Berlin), 2012 IEEE International Conference on

- HBBNEXT Deliverables
  - D4.2 DESIGN AND PROTOCOL: Middleware Components Content Synchronisation/Cloud Service Offloading
  - D4.3.2 EVALUATION: Intermediate Middleware Software Components for Content Synchronisation
  - D4.5.1 EVALUATION: Final Middleware Software Components for Content Synchronisation
  - D6.3.2 Intermediate Report Applications and Prototype Releases