9 Multimedia Content Production and Management

9.1 Media Asset Management
9.2 Media Production Chains

Literature:

- Gregory C. Demetriades: Streaming Media, Wiley 2003
- Rosenblatt et al., Chapter 10
Information Progression and Content

• A holistic view according to Demetriades (p. 189) and Virage Inc.:
Content Monetization

- There are several traditional models for gaining a return on investment on content
  - Network-based media enable the integration of all models
Digital Asset Management

• Very similar acronyms:
  – Digital Asset Management DAM
  – Media Asset Management MAM
   » Rich Media Asset Management RMAM
  – Digital Media Management DMM

• Basic idea:
  – To make the right media material \textit{(media assets)} available for each specific use, in the right version and the right format

• Integration technology:
  – Workflow integration
  – Integration with various media processing tools
  – Integration with content management and syndication solutions

• Broad range of product offerings
  – From large IT companies (IBM, EMC) to niche vendors
Example: OpenText Media Management

- Digital Asset Management product, see www.opentext.com
- Media ingestion:
  - Various import tools, e.g. hot folders, email
- Media file storage, access and delivery
- Complete workflow coverage:
  - Individual activities of team members
  - Group projects
- Individual view:
  - “Inbox” – What are the tasks I am assigned to, which dates, which assets
- Project view:
  - Participants, status, associated assets, events (milestones, new versions)
- Asset management view:
  - Asset-centric, navigation to various projects
  - History: “where used”, “who used”, “how used”
9 Multimedia Content Production and Management

9.1 Media Asset Management

9.2 Media Production Chains

Literature:

Gregory C. Demetriades: Streaming Media, Wiley 2003

Jürgen Mayer (Hrsg.): streaming media - Internet bewegter, bunter, lauter. Markt&Technik 2001

High-Level View of A/V Media Production

• Premeditate
• Capture
• Archive
• Annotate
• Query
• Message Construction
• Organize
• Publish
• Distribute

Lynda Hardman: Canonical Processes of Media Production, CWI Amsterdam, REPORT INS-E0512 SEPTEMBER 2005

Production process of books is significantly different – but not for (online) magazines
Hardware in the Streaming Delivery Chain

A/V Capture

Encoding

Encoding station(s)
Workstations or automatic servers

Storage

Serving

Web serving

Possibly many servers with load balancing

Streaming

Distribution

Content delivery network – possibly many servers

Viewing

Decisions to be taken based on (e.g.)
– expected scale of business
– required reliability
Organisations in the Streaming Delivery Chain

A/V Capture → Content Distribution Service Provider → Encoding Service Provider

Encoding

Hosting Service Provider

Storage

Serving

Streaming

Distribution

Content Distribution Service Provider

Internet Service Provider

Viewing

Content Distribution Service Provider
Encoding and Transcoding

• Audio and video needs to be converted for streaming delivery
  – Compression, proprietary formats
• Transcoding: Conversion of media files from one format to another
• Repurposing: Using existing content for new purposes
  – e.g. using TV ads as streaming content
Factors Determining Video Bandwidth

- Physical resolution (number of pixels)
  - Determines picture size in standard rendering resolution (e.g. 72 dpi)
  - Dependent on playback device
    » “Set Top Box” for TV set requires full-screen TV signal
    » Video window on PC can be adjusted in size

- Frame rate
  - Desirable: 25 fps
  - Over low-bandwidth links often only smaller rates possible (e.g. 10 fps)

- Color (sub)sampling

- Audio quality
  - Sampling rate, resolution (e.g. speech vs. CD quality)
  - Mono, stereo, multi-channel

- Degree of compression
  - Determines appearance of compression artefacts
Network Limitations

• Bandwidth towards receiver is limited:

• Effective bandwidths for various access network technologies:
  – 28.8 modem: 20 – 23 Kbps
  – 56.6 modem: 32 – 35 Kbps
  – ISDN: 45 – 55 Kbps
  – Dual-ISDN: 80 – 100 Kbps
  – DSL: 1000 Kbps and more
  – VDSL: 25 Mbps and more
  – Cable modem: 4 – 36 Mbps
  – LAN: 10 – 100 Mbps

• Compromise between bandwidth limitations and quality:
  – Picture format
    » E.g. for 28.8 modem picture format 176 x 144 pixel (QCIF)
    » E.g. for DSL picture format 360 x 288 pixel (CIF)
  – Plus other factors
Multiple Bit Rate Encoding

- In general, the same content has to be encoded in several qualities/bit rates
- File allocation:
  - One file multiplexing several qualities, or
  - Several files
- Selection of appropriate quality/bit rate:
  - Dependent on network access technology and dynamic network load
  - Manual selection: Through different alternatives on Web page, or
  - Automatic selection:
    » Using streaming server software and adequate client
    » Often access network type stored in user preferences for client software
  - Adaptive modification (see next chapter)
**Example: Multiple Bit Rate Encodings**

<table>
<thead>
<tr>
<th></th>
<th>Video source</th>
<th>Broadcast (DVB)</th>
<th>DSL/cable</th>
<th>Modem</th>
</tr>
</thead>
<tbody>
<tr>
<td>Target data rate</td>
<td>(270 Mbit/s)</td>
<td>4 Mbit/s</td>
<td>500 kbit/s</td>
<td>35 kbit/s</td>
</tr>
<tr>
<td>Required data reduction</td>
<td></td>
<td>40:1</td>
<td>330:1</td>
<td>4700:1</td>
</tr>
<tr>
<td>Frame size</td>
<td>720 x 480 (CCIR 601)</td>
<td>720 x 480</td>
<td>192 x 144</td>
<td>160 x 120</td>
</tr>
<tr>
<td>Frame rate</td>
<td>30</td>
<td>30</td>
<td>15</td>
<td>5</td>
</tr>
<tr>
<td>Colour sampling</td>
<td>4:2:2</td>
<td>4:2:0</td>
<td>YUV12</td>
<td>YUV12</td>
</tr>
<tr>
<td>Uncompressed data rate (Mbit/s)</td>
<td>166</td>
<td>124</td>
<td>5</td>
<td>1.15</td>
</tr>
<tr>
<td>Fraction of original data rate</td>
<td></td>
<td>1:1.33</td>
<td>1:33</td>
<td>1:144</td>
</tr>
<tr>
<td>Required compression</td>
<td>30:1</td>
<td>10:1</td>
<td>30:1</td>
<td></td>
</tr>
</tbody>
</table>

From: D. Austerberry
Combining Media Elements to Compound Media

• Combining video streams, audio streams, text captions, graphics, links to Web locations
  – In space on the screen (e.g. video with banner advertisement)
  – Temporally (e.g. “pre-roll advertisement” with video streams)

• Enhancing interactivity and flexibility
  – E.g. free navigation
  – E.g. language options

• Technological basis:
  – Spatio-temporally structured compound multimedia documents
  – with high degree of interactivity
  – Example technologies:
    » SMIL in RealPlayer
    » MPEG-4
    » Proprietary players e.g. in Flash
Automated Transcoding

- Example 1: Multiple Formats
  - TV Broadcaster
  - Repurposing into streaming media for Web-based Video-on-Demand
  - Live capturing, encoding (e.g. MPEG)
  - After program end: transcoding to different bit rates, delivery to streaming server

- Example 2: Flipping on Demand
  - Media archive for a cable channel to be made available through Web
  - Media kept in single, high-quality format
  - On demand (request), files are transcoded, watermarked, streamed

- Example 3: Collaboration Distribution
  - Large company working on marketing materials
  - One rough cut of a new commercial to be distributed to 100 clients with varying quality expectations and platforms
    - Content distribution service transcodes according to client requirements

- Example product: Telestream FlipFactory (www.telestream.net)