

# MPEG Standards Enabling Universal Multimedia Access

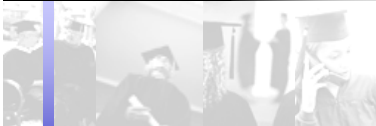
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**1<sup>st</sup> Int'l. Conf. on**  
**Automated Production of Cross Media Content for Multi-channel Distribution**  
**~AXMEDIS 2005~**  
**December 1, 2005**

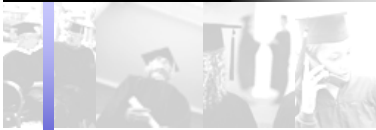
**Acknowledgements:**

**John R. Smith, Anthony Vetro**  
**Ian Burnett, Fernando Pereira, Rik Van de Walle**



## Outline

- **Introduction: Universal Multimedia Access (UMA)**
- **Existing W3C Activities and Standards  
(Partially) Addressing the UMA Challenge  
Relationship W3C and MPEG Activities**
- **MPEG-7 Multimedia Content Description**
- **MPEG-21 Multimedia Framework – Overview**
- **MPEG-21 Digital Item Adaptation (DIA)**
- **Demos**



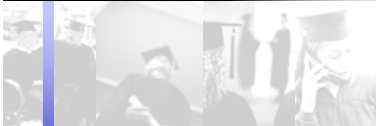
# MPEG Standards Enabling Universal Multimedia Access

## Introduction: Universal Multimedia Access (UMA)

**Hermann Hellwagner**

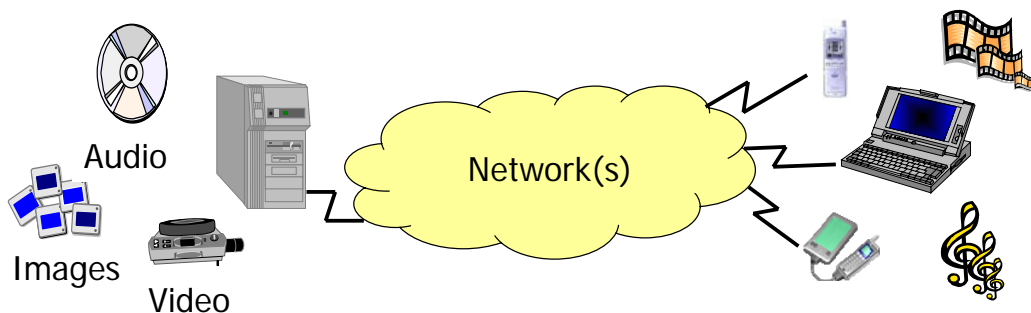
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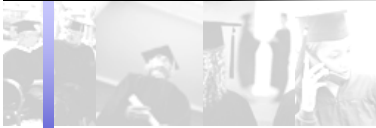
## Universal Multimedia Access :=

Any content should be available anytime, anywhere



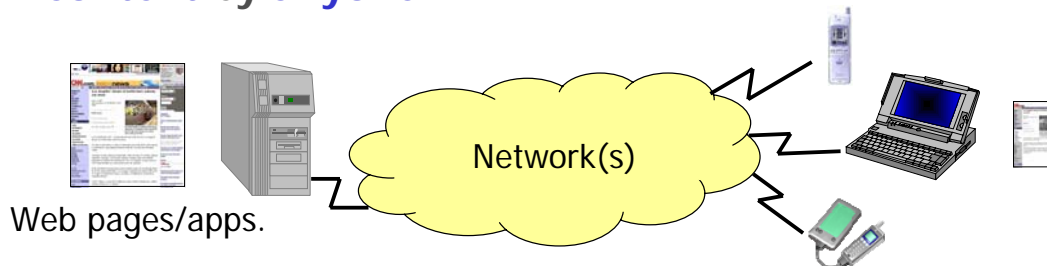
## [ Universal Multimedia Experiences :=

User should have worthwhile, informative experience anytime,  
anywhere ]



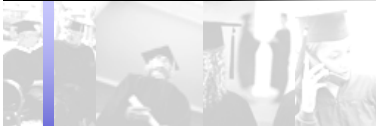
## Device Independence (W3C) :=

Access to a **unified Web** from **any device** in **any context** by **anyone**

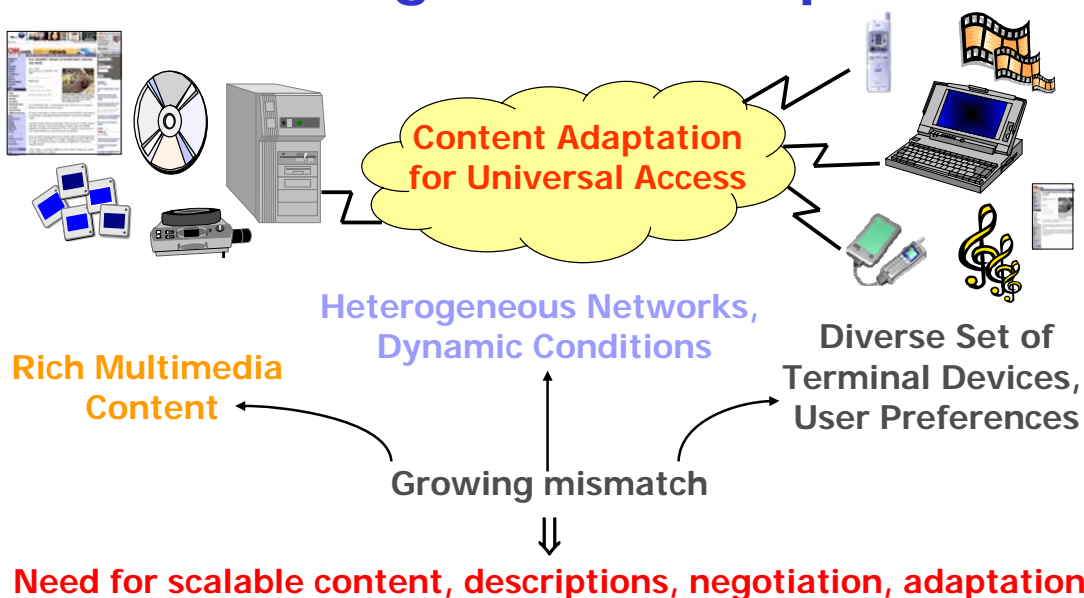


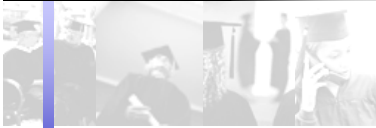
## [ Harmonized User Experience :=

A functional user experience that is sufficiently harmonized with the delivery context to meet the quality criteria of the author ]



## UMA Challenge and Concept



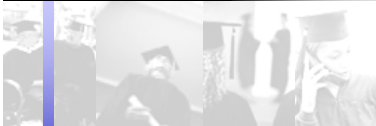


## UMA Challenge: Content

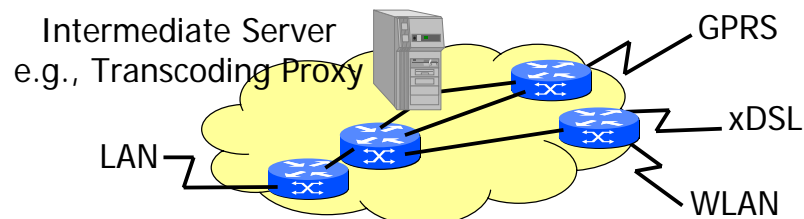


### Rich Multimedia Content

- Different media types and formats
  - Video: MPEG-2, -4, AVC, QuickTime, ...
  - Audio: MP3, AAC, WAV, ...
  - Still images: GIF, PNG, JPEG[2000], ...
  - Graphics, animation, VR/AR, ...
  - Text: .html, .txt, .doc, ...
  - ...
- Scene descriptions: how media streams are related, e.g., BIFS
- Interactive content elements
- Metadata: descriptive information about the actual data, e.g., MPEG-7

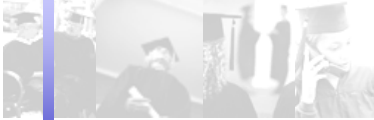


## UMA Challenge: Networks



### Heterogeneous Networks, Dynamic Conditions

- Heterogeneous network infrastructure:
  - Backbones, ISPs, ...
  - Wired access: LAN, xDSL, Cable, ISDN, ...
  - Wireless access: WLAN, GSM, GPRS, UMTS, Bluetooth, ...
- Fluctuating conditions: due to # users, traffic, roaming, ...
- Different intermediate active nodes: proxy, cache, gateway, ...



## UMA Challenge: Devices

- **Different devices:**
  - **Stationary:** workstation, PC, Web TV, ...
  - **Mobile:** notebook, tablet, PDA, smart phone, wearable, appliances in intelligent environment, ...
- **Different capabilities:**
  - A/V support: display, speakers, ...
  - Multimedia decoders/players
  - Modes of interaction
  - OS, processing, memory, bandwidth, energy, ...
  - ...



**Diverse Set of  
Terminal Devices**

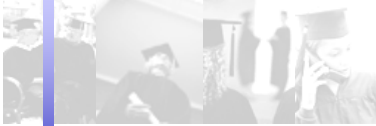


## UMA Challenge: User/Usage Prefs.

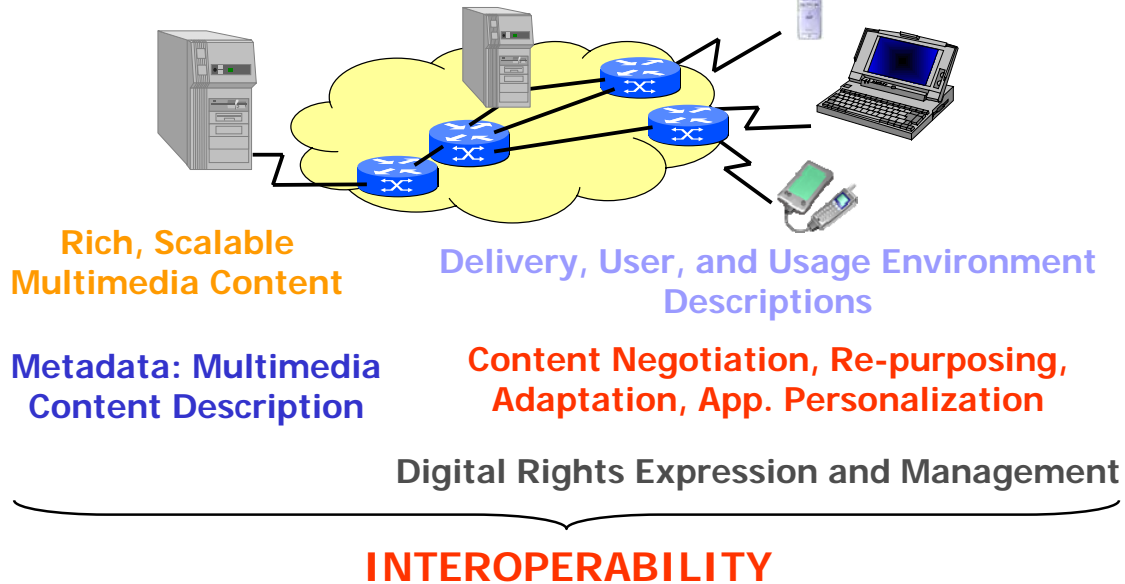
- **User preferences:**
  - **Personal characteristics:** age, impairment, ...
  - **Content prefs.:** genre, interest, ...
  - **Presentation prefs.:** modalities, quality, ...
  - **Interaction prefs.:** voice, stylus, ...
- **Usage environment (context):**
  - **Localization:** time, place, natural environment, ...
  - **Mobility:** stationary, on the move, speed, ...
  - **Current situation:** office, home, public, meeting, ...
  - **Access:** single- or multi-device / -modal
  - ...



**Diverse User and  
Usage Preferences**



## UMA Key Components



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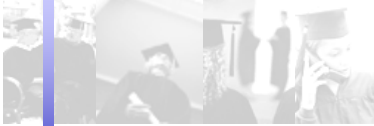
## UMA Components: Content

Supporting technologies/specs.	ISO/IEC	...	W3C
<b>Authoring rich, multimodal, scalable content</b>	JPEG2000 MPEG-2/-4 scal. codecs MPEG-4 XMT, BIFS MPEG-21 SVC .....		XHTML XForms SMIL, SVG VoiceXML ATDI .....
<b>Metadata / semantics</b>	MPEG-7		RDF
<b>Structure and presentation of content and metadata</b>	MPEG-21 Digital Items (DIs)		All markup techniques

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## UMA Components: Descriptions

Supporting initiatives/specs.    ISO/IEC    ...    W3C

Network characteristics  
 Device capabilities  
 User preferences  
 Usage environment

MPEG-21 DI Adapt.  
 Usage Environment  
 Descriptions (UEDs)

Delivery Context  
 CC/PP, UAProf  
 Web Accessibility  
 Internationaliz'n  
 Markup elements  
 ....



## UMA Components: Adaptation

Supporting technologies/specs.    ISO/IEC    ...    W3C

Selecting content

MPEG-21 DI *choice/*  
*selection* mechanism

Markup  
 (e.g., *SMIL switch*;  
 SVG cond. proc.;  
 CSS Media Queries)

Modality conversion

MPEG-21 DIA Amd.

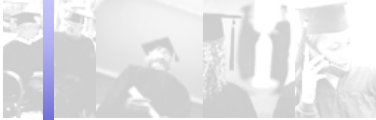
Markup  
 (e.g., EMMA)

Scaling/transcoding  
 content (signal level)

MPEG-21 DIA  
 (e.g., format inde-  
 pendent using gBSD)

Markup (e.g., SVG)  
 XSLT  
 ATDI  
 ....

Transcoding (semant. level)    MPEG-7



## Content Selection Example in MPEG-21: Choice/Selection in a DI

```

<DIDL .....
```

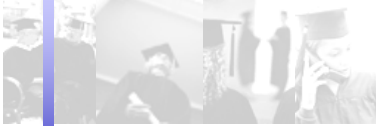


## Content Selection Example in SMIL: switch Markup Element and Test Attributes

```

<par>
  <video src="video.mpg" ... />
  <switch>
    <audio src="audioHQ.aiff" systemBitrate="56000" ... />
    <audio src="audioMQ.aiff" systemBitrate="28800" ... />
    <audio src="audioLQ.aiff" ... />
  </switch>
</par>

```



## References

- **Adopted MPEG standards → ISO/IEC**  
<http://www.iso.org>
- **MPEG standards under development and working documents  
→ MPEG Website**  
<http://www.chiariglione.org/mpeg/index.htm>
- **Fernando Pereira, Ian Burnett: "Universal Multimedia Experiences for Tomorrow", *IEEE Signal Processing Magazine*, March 2003 (Special Issue on UMA).**