e-Learning Content Creation with MPEG-4

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Agenda

- **Overview of the MPEG standards**
- **MPEG-4 Systems**
- **Scene Description**
- **Licensing**
- **Conclusion**

Overview of MPEG standards

- first Meeting in 1988
  ISO/IEC JTC1 SC29 WG11
- MPEG-1: 1992
- MPEG-2: 1994
- MPEG-4: 1998/1999
- MPEG-7: 2002*
- MPEG-21: 2003*

* planned

MPEG-1

- Coding of moving pictures and associated audio for digital storage media at up to 1,5 Mbit/s
- Audio MPEG-1 Layer III (mp3), Video-CD
- ISO/IEC 11172
- 1992

MPEG-2

- **combines** one or more **elementary streams** of video and audio as well as other data into single or multiple streams which are suitable for storage or transmission (**Language**, **Subtitle**)
- Audio MPEG-2 Layer III (mp3), Video for **DVD**, Digital Broadcast Television DVB, Set-Top Box
- ISO/IEC 13818, 1994

MPEG-4

- represents units of aural, visual or audio-visual content - called “media objects” (natural or synthetic origin).
(arbitrary shaped video)
- **describes the composition of these objects to create compound media objects that form audio-visual scenes**
- Audio AAC, MPEG-4 Video
- ISO/IEC 14496, 1998/1999

MPEG-7

- "Multimedia Content Description Interface"
- provides a flexible and extensible framework for describing audio-visual data
- search, filter, index, categorise
- ISO/IEC 15938, 2002

MPEG-21

- The vision for MPEG-21 is to define a multimedia framework to enable transparent and augmented use of multimedia resources across a wide range of networks and devices used by different communities.
- ISO/IEC 21000, 2003 (planned)
- Topics ...

MPEG-21 ...

- Digital Item Declaration
- Digital Item Identification and Description
- Content Handling and Usage
- Intellectual Property Management and Protection
- Terminals and Networks
- Content Representation
- Event Reporting

MPEG-4 AVC - ITU.T H.264

- Joint Video Team: JVT
- Compression efficiency could be 50% better than MPEG-4 Video
- ISO/IEC 14496-10, 2003

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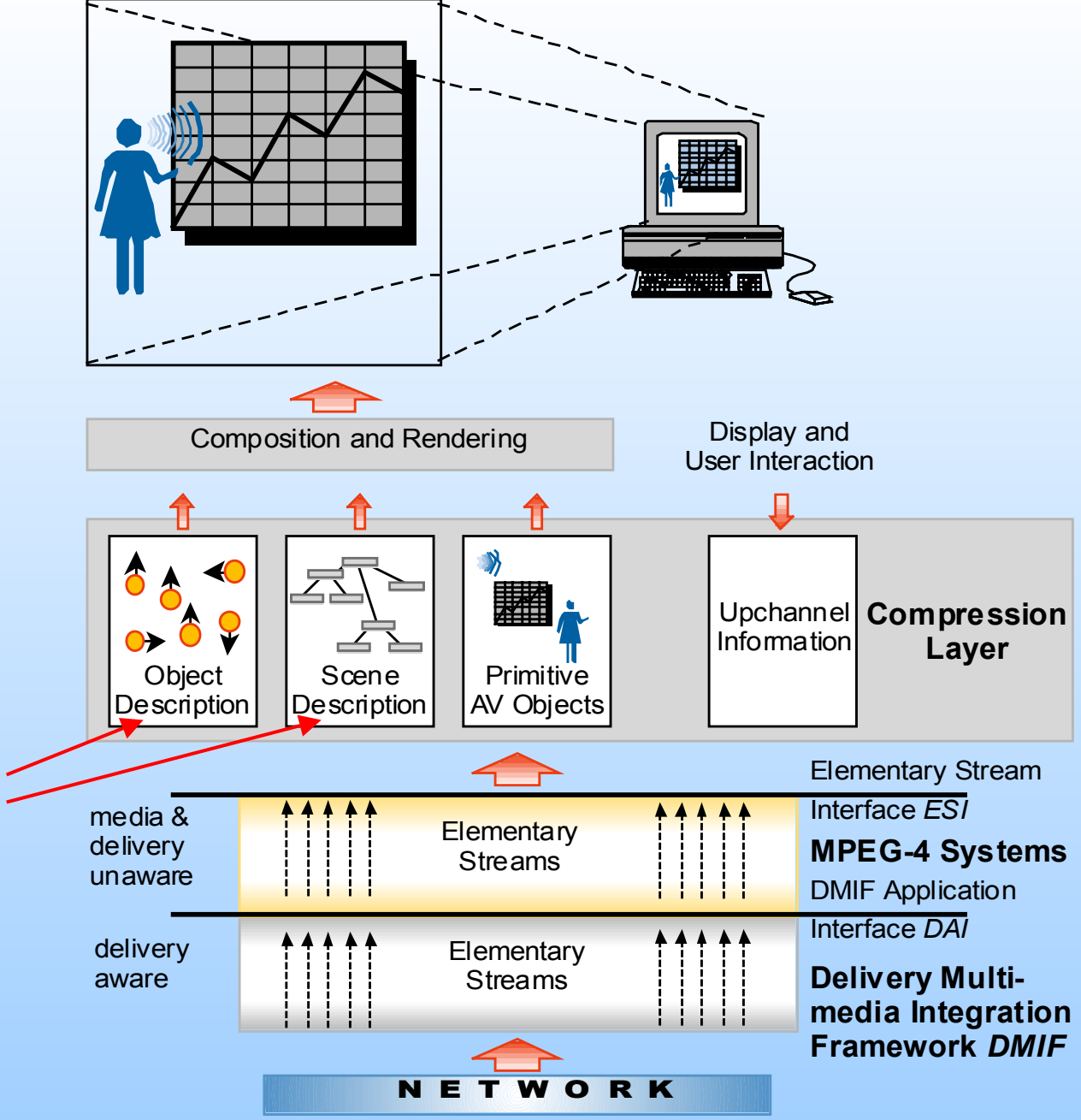
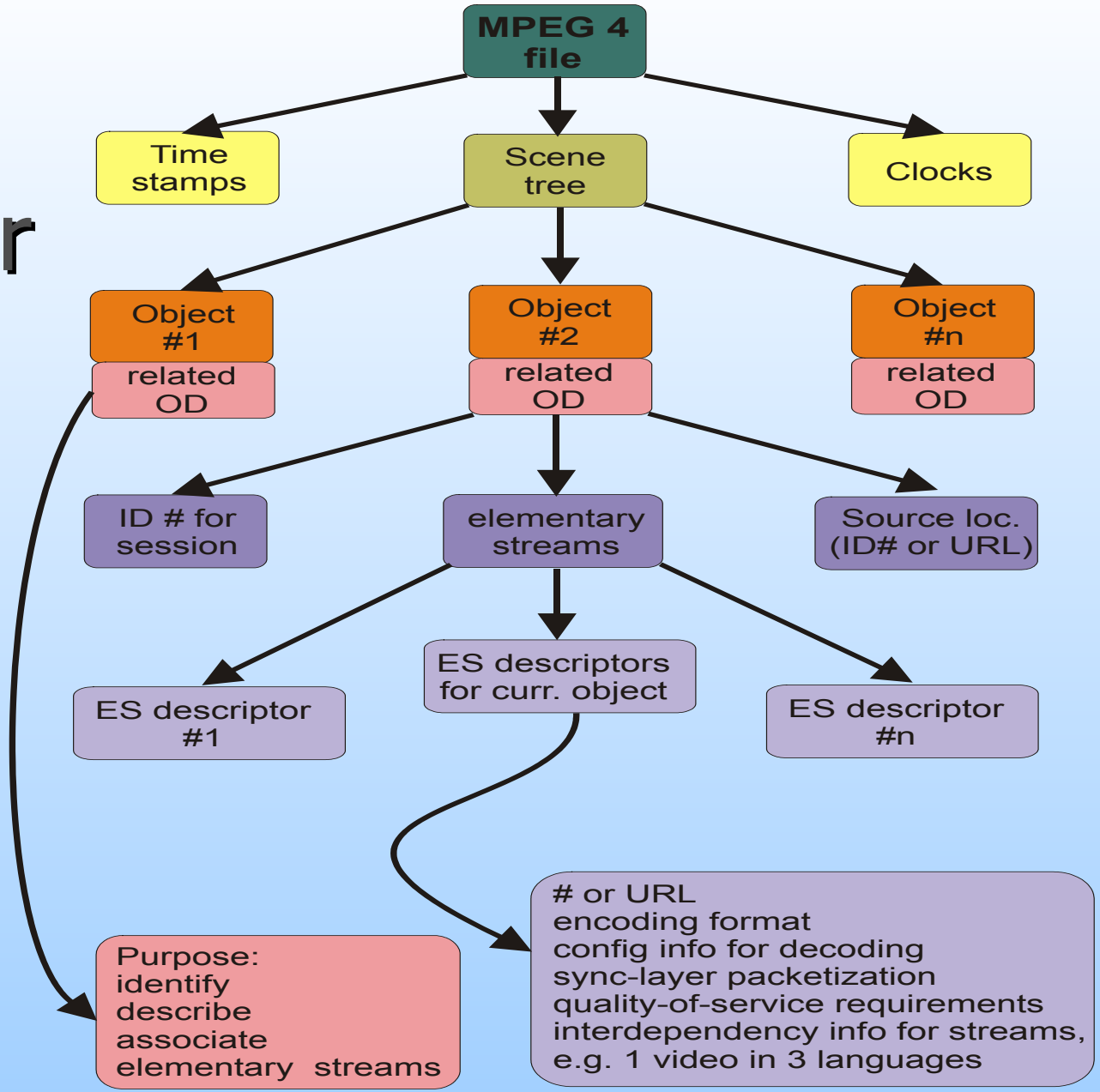
MPEG-4 parts

- 1: Systems
- 2: Visual
- 3: Audio
- 4: Conformance
- 5: Reference Software
- 6: Delivery Multimedia Integration framework
- 7: Optimised Software on Encoders
- 8: 4 on IP - framework
- 9: Reference Hardware Description (n/a)
- 10: Advanced Video Coding

MPEG-4 System



Object Descriptor OD



OD

```
#Object Descriptor
{
   objectDescriptorID            3
   esdescr [
    ES_Descriptor {
            es_id       3
            muxInfo muxInfo {
              fileName "Beispiel.jpg"
              streamFormat       JPEG
            }
            decConfigDescr DecoderConfigDescriptor {
                        objectTypeIndication 0x6C
            }
            slConfigDescr SlConfigDescriptor {
                        predefined              0
            }
```

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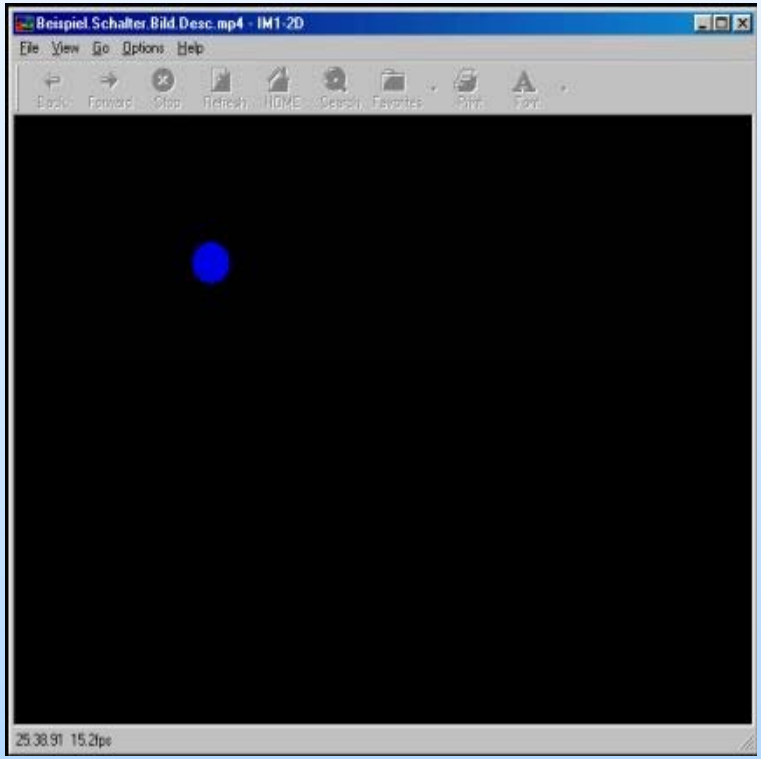
Scene Description

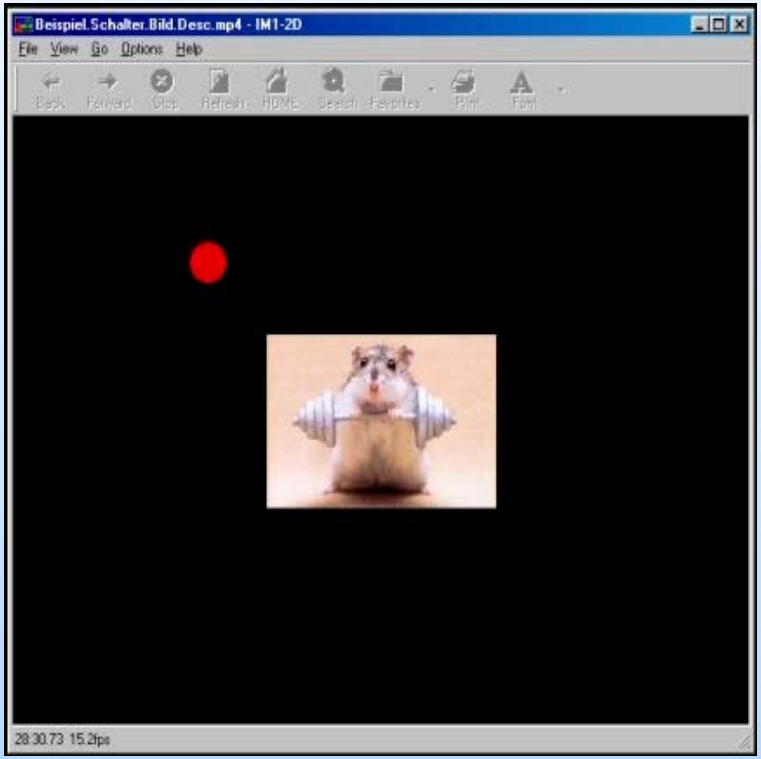
- Scene describes layout and nodes (BIFS)
- Adding and removing nodes on interactivity
- Nodes refer to Objects (ODs)
- Objects refer to Elementary Streams (ES)
- retrieving ES through Delivery

Example: Scene Description

```
01:Group {
02:  children [
03:    DEF S1 Switch {
04:    whichChoice 0
06:        choice [
07:          DEF S1C1 Group {
08:            children [
09:                    DEF Ta1 TouchSensor {}
10:                    Transform2D {
11:                       translation 25.0 -25.0
12:                         children [
13:                              Shape {
14:                                 geometry
15:                                      Circle {
```

Survey: Creating a Switch





- Picture "Blue"
- Picture "Red"

Static scene elements

- red circle
- blue circle
- still image / video
- TouchSensor "Ta1"
- TouchSensor "Ta2"

Creating a Switch

- Required Nodes (BIFS - Nodes)
  - Switch Node
    - Grouping objects
  - TouchSensor
    - Events: Ta1.isOver, Ta1.isActive
  - Route
    - ROUTE Ta1.isActive TO Con1.activate
  - Conditional Node
    - REPLACE S1.whichChoice BY 1

Scene Description in Detail I

```
01:Group { # start of scene, independent of groups described above
02: children [
03:         DEF S1 Switch { #Defines Switch S1 (blue, red button and sensors)
04:         whichChoice 0   # default choice selected to 0 -> S1C1
06:             choice [ # Group blue Button
07:                     DEF S1C1 Group { # defines first choice as S1C1
08:                     children [
09:                         DEF Ta1 TouchSensor {} # def. Touchsensor Ta1 blue
10:                         Transform2D {
11:                             translation 25.0 -25.0 # Position
12:                             children [
13:                                 Shape {
14:                                     geometry
15:                                         Circle {
16:                                         radius 16.0
17:                                         } ... appearance .... Material ...
```

Scene Description in Detail II

```
60: DEF S2 Switch {    # defines Switch S2 (JPEG/Video) on or off
61:    whichChoice 0    # default choice 0 -> Switch2Choice1
63:       choice [
64:          DEF S2C1 Group { children [] } # empty S2C1, default
69:          DEF S2C2 Group { # second choice S2C2
70:          children [
72:################# add object to switch ################
74:                   DEF Picture Transform2D {   # picture if button activated
77:                            translation 184.0 -136.0
78:                            children [
79:                               Shape {
80:                                     geometry Bitmap {}
81:                                     appearance Appearance {
82:                                           texture ImageTexture {
83:                                           url 3   # objectDescriptorID 3
```

Scene Description Detail III

125: ROUTE Ta1.isActive TO Con1.activate

 # wait, until Touchsensor Ta1 is activated and proceed Con1

(change Button)

129:ROUTE Ta2.isActive TO Con2.activate

 # wait, until Touchsensor Ta2 is activated and proceed Con2

133:ROUTE Ta1.isActive TO Con3.activate

 # wait, until Touchsensor Ta1 is activated and proceed Con3

(show Picture)

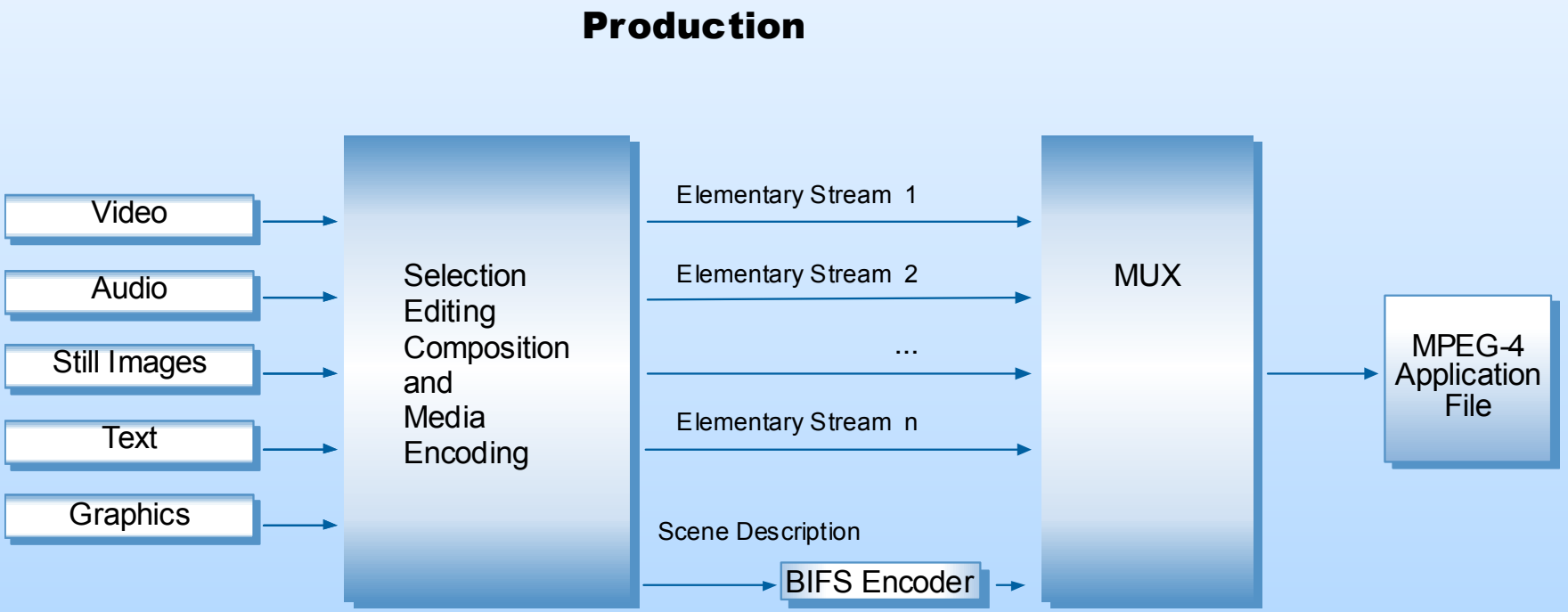
137:ROUTE Ta2.isActive TO Con4.activate

 # wait, until Touchsensor Ta2 is activated and proceed Con4

Scene Description in Detail IV

```
98: DEF Con1 Conditional {
99:         buffer { REPLACE S1.whichChoice BY 1 }
            #  activate choice 2 (1) in Switch S1 -> change Button
102:        }
103: DEF Con2 Conditional {
104:        buffer { REPLACE S1.whichChoice BY 0 }
            # activate choice 1 (0) in Switch S1 -> change Button
107:        }
108: DEF Con3 Conditional {
109:        buffer { REPLACE S2.whichChoice BY 1 }
            #  activate choice 2 (1) in Switch S2 -> show Picture "jpg"
112:        }
113: DEF Con4 Conditional {
114:        buffer { REPLACE S2.whichChoice BY 0 }
            # activate choice 1 (0) in Switch S2 -> hide Picture
117:        }
```

Multiplexing



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Licensing (15 July 2002)

- MPEGLA (License Agreement) (www.mpegla.com)
- captures relevant MPEG-4 patents for Video, System and MPEG-J "MPEG-4 ... Patent Portfolio License"
- builds a patent pool, all patents are covered, one-stop-license
- handles already MPEG-2 patent pool since 1997

Video: Cable, Satellite, Over-the-Air

- if addressing specific subscribers (e.g. Pay-TV)
- US $0.25 per encoder/decoder (HW or SW) for manufacturers
- US $0.25 from content service provider per subscriber per decoder
- Annual cap = $1.000.000 per entity
- 50.000 encoders or decoders per calendar year are royalty free

Video: Internet, Mobile

- US $0.25 per encoder/decoder for manufacturers
- US $0.02/hour for MPEG-4 video content

  or

- US $0.25 per decoder or encoder per subscriber per year
- Annual cap = $1.000.000 per entity
- 50.000 encoders or decoders per calendar year are royalty free

Video: Stored Media

- packaged media, or transmitted and stored
- Content provider will pay US$ 0.01 per 30 minutes

MPEG-4 Systems, MPEG-J

- additional US$ 0.15 per decoder (annual cap = US$ 100.000)
- additional US$ 0.25 per encoder (annual cap = US$ 100.000)
- Stored Video: US $0.001 per 30 minutes or part to a maximum of US $0.004 per movie
- ...

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Conclusion

- Currently, building scenes is not comfortable
- Only VRML experts can start immediately
- No persistent storage
- DivX movies can be easily transformed
- Current license conditions (from July 2002) are acceptable and fee can be estimated

Companies and Institutions

- bSoft:
  - www.bsoft.info/company.html
  - Player, Encoder
- ENST:
  - www.comelec.enst.fr/~dufourd/
  - Encoder, Shockwave transcoder
- FernUni-Hagen:
  - ks.fernuni-hagen.de/~stepping
  - Broadcast delivery

Companies and Institutions ...

- Philips
- Envivio
- TILAB
- France Telecom

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Thanks for your Attention

Any questions?

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