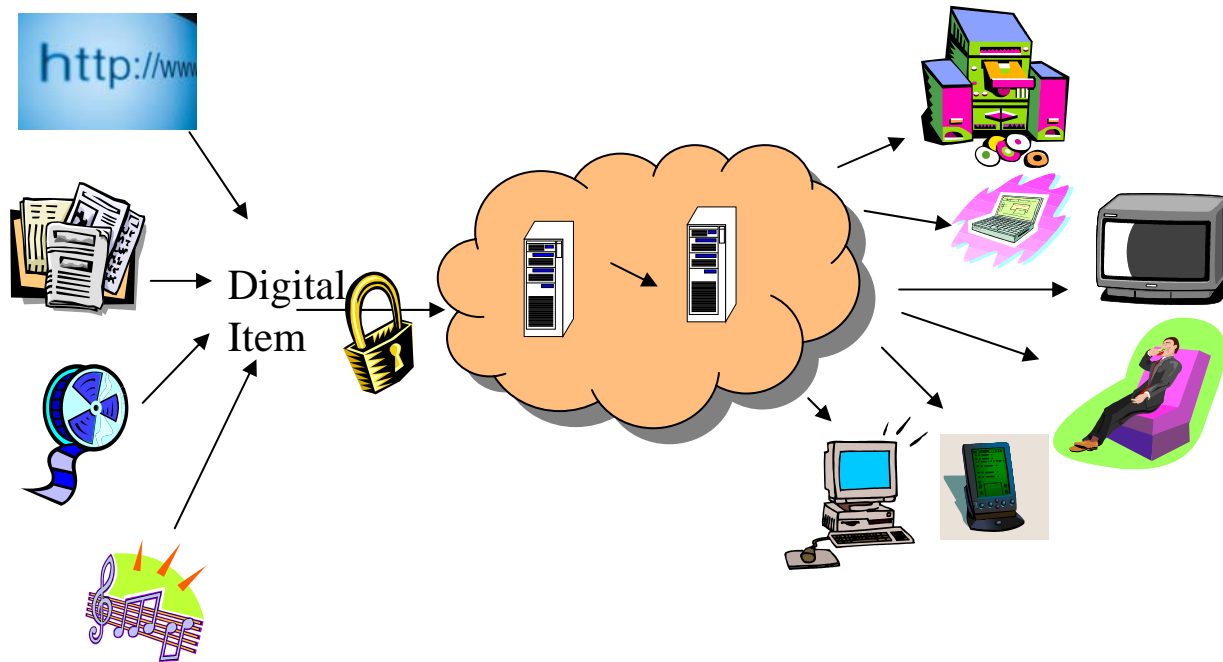


**MPEG-21**  
**Digital Items – the core concept and its  
Declaration**

**A brief intro to ISO/IEC 21000-2**

# MPEG-21 Vision

*A multimedia framework “to enable transparent and augmented use of multimedia resources...”*



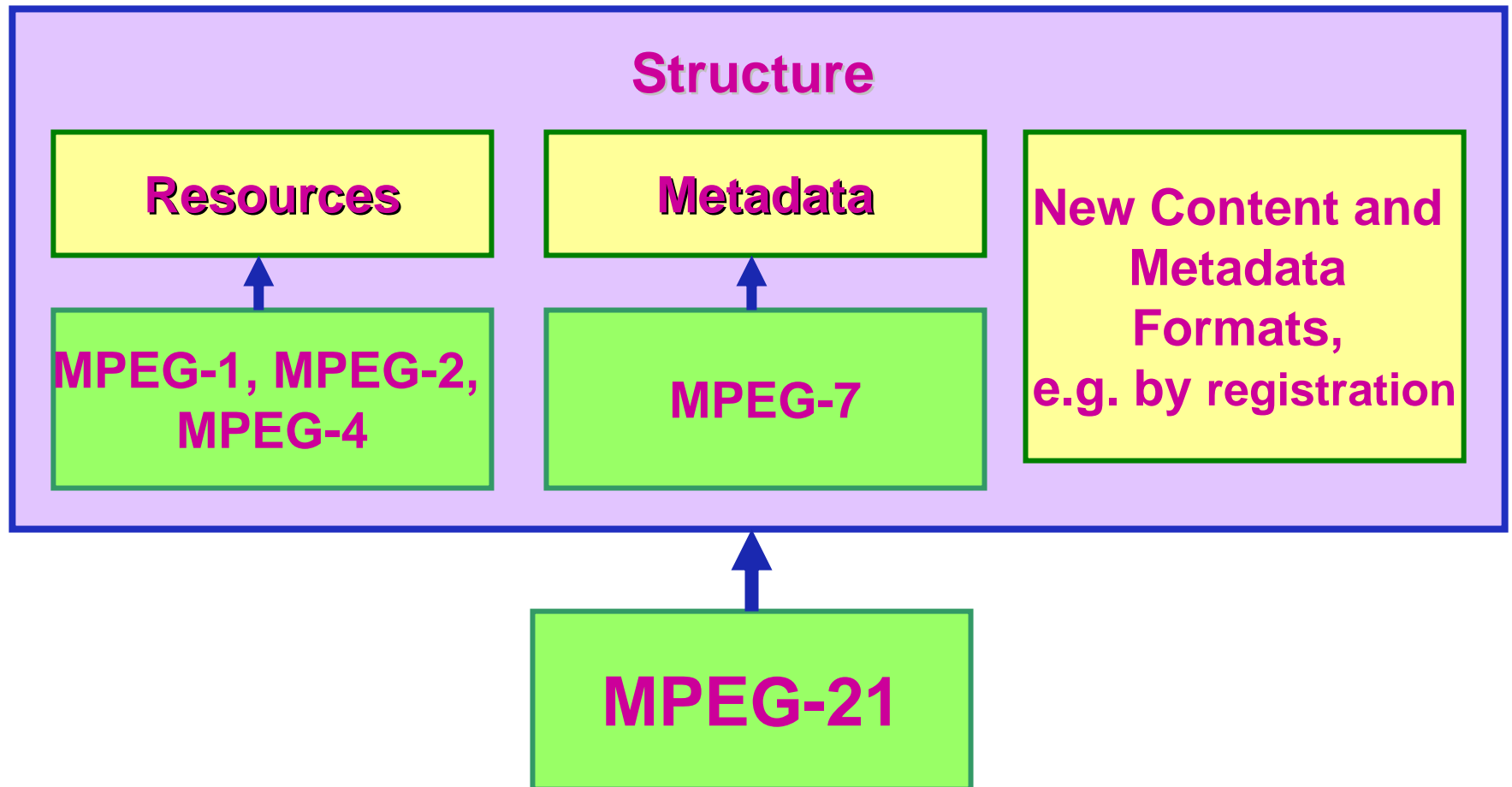
# Declaring “Digital Items” – why ?

- Currently, multimedia applications are based on transfer, processing, presentation ... of
  - different media types, with different representations
    - still images (JPEG2000, GIF, PNG, ...)
    - video (MPEG-4, QuickTime, ASF, ...)
    - audio (WAV, MP3, ...)
    - text (txt, doc, ...)
    - ...
  - Essentially it's a file based world!
  - metadata
    - descriptive information about actual data
    - Rights information, expressions etc
    - configuration information
    - Adaptation information
- Need to connect together files, media resources and metadata

# What is a Digital Item?

- A structured digital object with a standard representation, identification and metadata
- The fundamental unit of distribution & transaction in the MPEG-21 framework
- Digital Items can be expressed using Digital Item Declaration Language (XML schema)
- Digital Item = resources + metadata + structure
  - *Resource*: individual asset(s)
  - *Metadata*: information about or pertaining to the Item
  - *Structure*: relationships between the parts of the Item

# A MPEG-centric Digital Item



# Example – a music album

- Example: a digital music album
  - without the concept of “digital item declaration”
    - a “flat directory” containing a loose set of
      - audio files
      - lyrics files
      - a readme.txt file
      - a config.ini file
        - (“to be used by advanced users only”)
      - playTrack.exe
        - (a player only executable on a single platform/OS)
      - ...
    - no “structure”

# Declaring “Digital Items” – structure

**aria title: Nessun Dorma**

**track number: 04**

...

nessunDorma.txt

type: lyrics

composer: Giacomo Puccini

opera: Turandot

copyright: Ricordi & co

...

nessunDorma.mp3

type: audio

format: mp3

duration: 200 s

bitrate: 192 kbps

copyright: EMI

...

ACA01039.jpg

type: album cover art

format: image/jpeg

size: 300x400

copyright: EMI

...

**aria title: O mio babbino caro**

**track number: 07**

...

babbinoCaro.doc

type: lyrics

composer: Giacomo Puccini

opera: Gianni Schicci

copyright: DECCA

...

babbinoCaro.wav

type: audio

format: wav

duration: 170 s

bitrate: 128 kbps

copyright: DECCA

...

**title: concert recording**

**date: July 2003**

**location: Covent Garden**

...

concert.mov

type: concert video

type: video/mov

duration: 4500 s

bitrate: 500 kbps

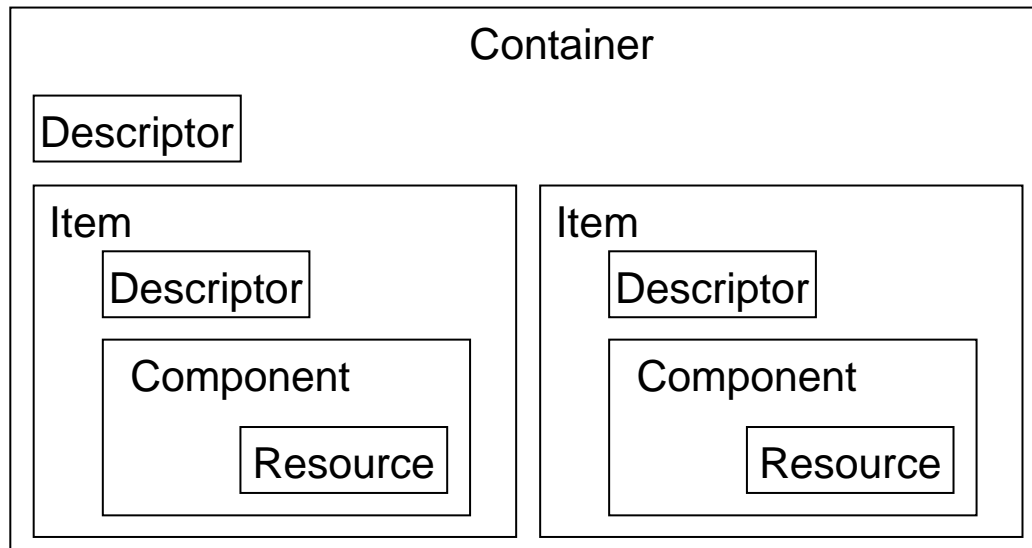
size: 320x240

copyright: DECCA

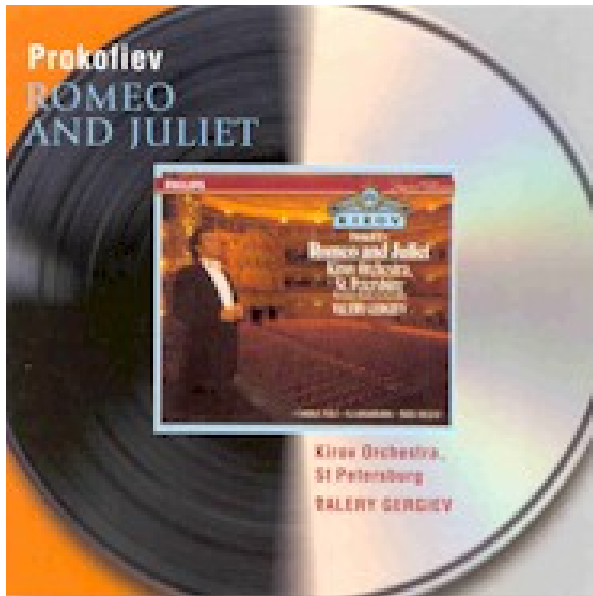
...

# MPEG-21 Digital Item Declaration basic concepts

- *Digital Item Declaration Language (DIDL)*
  - a **generic** container structure
  - a set of building blocks
  - expressed in XML
  - allows declaration of **any** Digital Item



# MPEG-21 Digital Item Declaration example



```
<DIDL>
  <Item>
    <Descriptor>
      <Statement mimeType="text/plain">
        Prokofiev: Romeo and Juliet
      </Statement>
    </Descriptor>
    <Item>
      <Descriptor>
        <Statement mimeType="text/plain">
          Valery Gergiev
        </Statement>
      </Descriptor>
      <Component>
        <Resource
          ref="Prokofiev_RnJ.mp3"
          type="audio/mp3"/>
        </Component>
      </Item>
    ...
  </Item>
</DIDL>
```

# MPEG-21 DIDL

## building blocks

- DID technology is described in three normative sections
  - model
    - describes set of abstract terms and concepts
    - a Digital Item is the digital representation of "a work"
    - a DI is the thing that is acted upon within the model
    - DIs are managed, handled, processed, described, exchanged, collected ...
  - representation
    - DID elements are represented in XML
    - normative description of their syntax and semantics
  - schema
    - normative XML schema
    - comprising entire grammar of the DID

# MPEG-21 DIDL building blocks

- ***container***
  - structure allowing *items* and/or *containers* to be grouped
  - groupings of *items* and/or *containers* can be used to form
    - logical *packages* (for transport or exchange)
    - logical *shelves* (for organization)
- ***descriptor***
  - allows for "labeling" of *containers*
  - with information that is appropriate for the grouping (e.g., delivery instructions for a *package*, or category information for a *shelf*).

# MPEG-21 DIDL building blocks

- ***item***
  - grouping of sub-*items* and/or *components* that are bound to relevant *descriptors*
  - *descriptors* contain information about the *item*
  - may contain *choices*
    - allow *items* to be customized or configured
  - may be conditional
  - NOTE
    - *item* that contains no sub-*items* can be considered a logically indivisible work
    - *item* that does contain sub-*items* can be considered a compilation

# MPEG-21 DIDL

## building blocks (example)

```
<DIDL xmlns="urn:mpeg:mpeg21:2002:01-DIDL-NS ">
  <Container>
    <Item>
      <Item>
        .
        .
        .
      </Item>
      <Item>
        .
        .
        .
      </Item>
    </Item>
  </Container>
</DIDL>
```

# MPEG-21 DIDL

## building blocks (example)

```
<DIDL xmlns="urn:mpeg:mpeg21:2002:02-DIDL-NS">
  <Container>
    <Item>
      <Item>
        <Component>
          <Descriptor>
            <Statement mimeType="text/plain">
              Video
            </Statement>
          </Descriptor>
          <Resource ref="myFirstPicture.jpg" mimeType="image/jpeg" />
        </Component>
      </Item>
      <Item>
        <Component>
          <Resource ref="mySecondPic.bmp" mimeType="image/bmp" />
        </Component>
      </Item>
    </Item>
  </Container>
</DIDL>
```

# MPEG-21 DIDL building blocks

- ***component***
  - binding of a *resource* to its *descriptors*
  - *Descriptors* typically contain control/structural information for the *resource*
    - bit rate
    - character set
    - start points
    - encryption information
  - NOTE
    - a *component* itself is not an *item*
    - *components* are building blocks of *items*
- ***resource***
  - individually identifiable asset
    - a video or audio clip
    - image
    - textual asset
  - must be locatable via an unambiguous address

# MPEG-21 DIDL building blocks

- ***anchor***
  - binds *descriptors* to a *fragment*
- ***fragment***
  - corresponds to a specific location or range within a *resource*
  - In DIDL 2<sup>nd</sup> edition fragments are able to be specified using MPEG-7 or the new media pointer scheme defined in part 17 of MPEG-21
- ***statement***
  - literal textual value
  - contains information, but not an asset
  - examples:
    - descriptive info
    - control info
    - revision tracking info

# MPEG-21 DIDL

## building blocks (example)

```
<DIDL xmlns="urn:mpeg:mpeg21:2002:02-DIDL-NS">
<Item>
  <Component>
    <Resource ref="JimsGarageBand.mp3" mimeType="audio/mpeg" />
    <Anchor precedence="200">
      <Descriptor>
        <Statement mimeType="text/plain">The whole session</Statement>
      </Descriptor>
    </Anchor>
    <Anchor precedence="100">
      <Descriptor>
        <Statement mimeType="text/plain">
          Jim's killer drum solo
        </Statement>
      </Descriptor>
      <Fragment fragmentId="mp(/~time('npt','1050'))"/>
    </Anchor>
  </Component>
</Item>
</DIDL>
```

# MPEG-21 DIDL building blocks

- **choice**
  - describes set of related *selections*
  - *selections* can affect the configuration of an *item*
- **selection**
  - describes specific decision that will affect one or more *conditions* somewhere within an item
  - if chosen, its *predicate* becomes true
  - if not chosen, its *predicate* becomes false
  - if it is left unresolved, its *predicate* is undecided
- **condition**
  - describes the enclosing element as being optional
  - links it to the *selection(s)* that affect its inclusion
- **predicate**
  - can have 3 obvious possible “values”
    - True, false, undecided

# MPEG-21 DIDL building blocks

- ***assertion***
  - defines a full or partially configured state of a *choice*
  - by asserting true, false or undecided values
  - for *predicates* associated with the *selections* for that *choice*

# MPEG-21 DIDL

## building blocks (example)

```
<DIDL xmlns="urn:mpeg:mpeg21:2002:02-DIDL-NS">
  <Item>
    <Choice minSelections="1" maxSelections="1">
      <Descriptor>
        <Statement mimeType="text/plain"> Would you like to include the supplemental video?
      </Statement>
    </Descriptor>
    <Selection select_id="SHOW_VIDEO">
      <Descriptor> <Statement mimeType="text/plain">Yes please!</Statement> </Descriptor>
    </Selection>
    <Selection select_id="NO_VIDEO">
      <Descriptor> <Statement mimeType="text/plain">No thanks.</Statement> </Descriptor>
    </Selection>
  </Choice>
  <Choice minSelections="1" maxSelections="1">
    <Descriptor>
      <Statement mimeType="text/plain"> What video format do you prefer? </Statement> </Descriptor>
    <Selection select_id="VIDEO_MPEG">
      <Descriptor> <Statement mimeType="text/plain">I want MPEG-1/2</Statement> </Descriptor>
    </Selection>
    <Selection select_id="VIDEO_QUICKTIME">
      <Descriptor> <Statement mimeType="text/plain">I want Quicktime</Statement> </Descriptor>
    </Selection>
  </Choice>

```

.....

# MPEG-21 DIDL Example cont'd

.....

```
<Component>
  <Resource ref="audio.mp3" mimeType="audio/mpeg"/>
</Component>
<Component>
  <Condition require="SHOW_VIDEO VIDEO_MPEG"/>
  <Resource ref="video.mpg" mimeType="video/mpeg"/>
</Component>
<Component>
  <Condition require="SHOW_VIDEO VIDEO_QUICKTIME"/>
  <Resource ref="video.mov" mimeType="video/quicktime"/>
</Component>
</Item>
</DIDL>
```

# MPEG-21 DIDL building blocks

- ***annotation***
  - describes set of information about another identified element
  - without altering or adding to that element
  - information can take the form of
    - *assertions*
    - *descriptors*
    - *anchors*

# MPEG-21 DIDL

## building blocks (example)

```
<DIDL xmlns="urn:mpeg:mpeg21:2002:01-DIDL-NS">
  <Item>
    <Item id="PHOTO_1">
      <Component>
        <Resource ref="myFirstPicture.jpg" mimeType="image/jpg" />
      </Component>
    </Item>
    <Item>
      <Component>
        <Resource ref="mySecondPic.bmp" mimeType="image/bmp" />
      </Component>
    </Item>
    <Annotation target="PHOTO_1">
      <Descriptor>
        <Statement mimeType="text/plain">This photo is really cool!</Statement>
      </Descriptor>
    </Annotation>
  </Item>
</DIDL>
```

# Vision - progress

- We have a method of declaring and exchanging Digital Items – our STANDARD multimedia containers
- Remaining parts:
  - Digital Item Identification
  - IPMP Components
  - Rights Expression Language
  - Rights Data Dictionary
  - Digital Item Adaptation
  - Digital Item Processing
  - MPEG-21 Systems
- Cover the exchange, transport, adaptation and delivery of Multimedia objects expressed and declared as Digital Items