Constructing a Movie Preview System Using MPEG-21 and XML

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Abstract

In this paper , the chief purpose is to reserch how the different multimeda elements fit together and apply multimedia framework to MPS (Movie Preview System) . According to the integrated standard , we can reach the multimedia framework and make the various multimedia exist on a browser base interface. This solution is different from traditional method every media must has his own media player.

Currently, multimedia provides the different players from content creators to end-users. However, no complete solutions exist that allow different communities. MPEG-21 will recommend which new standards are required in 2002. Among those standards, DIDL (Digital Item Declaration Language) is established that makes MPEG-21 foreseeable and builds up a developing model for IPMP(Intellectual Property Management and Protection)、REL (Rights Expression Language)、DIA (Digital Item Adaption)……etc. This thesis, We make use of DIDL and XML relational functions to construct a MPS. In this system, the trailer includes different video, audio, image and text media sources there are fit together on a browser frame, and really to prove MPEG-21 is workable and powerful.

Keywords: MPEG-21, DIDL, IPMP, REL, DIA, XML

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1.Introduction

All the time, the multimedia compressed technologies are always the hot topic of discussion. Unusually, today network and multimedia are developing so fast, various multimedia statdards are spring up, and multimedia objects distribute over the world information system. When transmitting those objects via network that needs various media players to browse them. Whether solutions exist that allow different format medias fit together that is Multimedia Framework[1] concept. MPEG org has been established MPEG-1, MPEG-2, MPEG-4 and MPEG-7 video / audio compressed technologies in succession[3]. Recently, MPEG-21 fits for these characters, and becomes very hot topic.

What is MPEG-21 ? The aim for MPEG-21 is to describe how these various elements fit together. 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[3]. The MPEG org recommends which new standards may be developed to resolve where gaps exist.

MPEG-21 consists of the following 7 parts[3,9], and has timetable for standardization.

1. Vision, Technologies and Strategy.
2. Digital Item Declaration.
3. Digital Item Identification and Description.
4. Intellectual Property Management and Protection.
5. Rights Expression Language.
6. Rights Data Dictionary.
7. Digital Item Adaptation part(s).

In Digital Item Declaration Model, we use XML 1.0 Schema and DIDL Syntax to describe abstract elements and interactions among digital Items. The other MPEG-21 domains such as Idenfication&Description, Right Management& IPMP, Data Dictionary., etc. are continually establishing in 2002。

The second chapter,we will describe related researchs of the implement environment, such as XML, MPEG-21 DIDL Abstract Elements Defined[3],and discuss with DIDL and XML Schema. We focus on XML such as XSL、DTD、DOM、XML Data Island.MPEG-21 DIDL and HTML+ Time[7] subjects.In third chapter,we discuss with Movie Preview System architecture,and the last chapter is about applications and future of MPEG-21.

2. Digital Item and XML

2.1 MPEG-21 Digital Item Component

ISO/IEC 21000-1:2001, Digital Items are defined as structured digital objects that include a standard representation, identification,and meta-data. This entity is the fundamental unit of distribution and transaction within the MPEG-21 framework as a whole[9,13].

(1).Naming convention[9]:It is the Digital Item Declaration Model contains the concept names that are used throught the MPEG-21 standard[9,13].

(2).Documentation convention [9]: The semantics of each element in the Digital Item declaration model is specified using the constructs provided by BNF[9,13]. The DID Model is shown in Fig.1.

```
ELEMENT ::= (part1| part2)+ part3*
```

Fig.1 Digital Item Declaratin Model BNF

The syntax of each element in the Digital Item Declaration Representation is specified using the constructs provided by XML Schema. The Syntax Diagram with Annotation is shown in Fig.2.
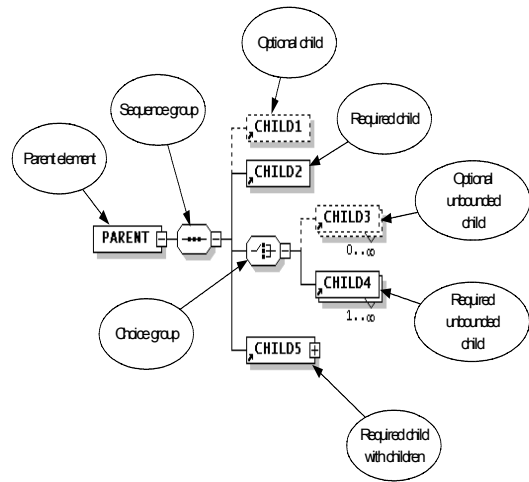

Fig.2 Syntax Diagram with Annotations

(3).MPEG-21 Digital Item Declaration Model: It is to describe a set of abstract terms and concepts to form a useful model for defining Digital Item[13].

Digital Item Declaration Model includes following elements[9,13]:

■ Container:It is a structure that allows items and/or containers to be grouped。

■ Item:It is a grouping of sub-items and /or components that are bound to related descriptors.Items may contain choices which allow them to be customized or configured.

■ Componet:It is the binding of a resource to all of its relevant descriptors.Such descriptors will typically contain control or structural information about resource such as bit rate, character, set ,encryption information.

■ Anchor:An Anchor binds descriptors to a fragment,which corresponds to a specific location or range within a resource.

■ Descriptor:It associates information with the enclosing element.

■ Condition:It describes the enclosing element as being optional and links it to the selection(s) that affect its inclusion.Multiple predicates within

a condition are combined as a conjunction.

■ Choice:It describes a set of related selections that can affect the configuration of an item.

■ Selection:It describes a specific Decision that will affect one or more conditions somewhere within an item.

■ Annotation:It describes a set of Information about another identified element of the model without altering or adding to that element.

■ Assertion:It defines a full or partially configured state of a choice by asserting true, false or undecided values for some number predicates associated with the selections for that choice.

■ Resource:It is an individually identifiable asset such as a video or audio clip,an image,or a textual asset.A resource may also potentially be a physical object.

■ Fragment:unambiguously designates a specific point or range within a resource.

■ Statement:It is a literal textual value that contains information,but not an asset.

■ Predicate:It is an unambiguously identifiable declaration that can be true,false or undecided.
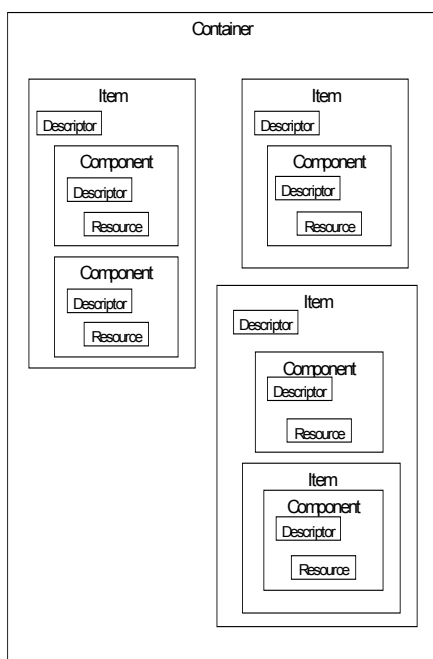

Fig.3 Digital Item Declaration Model hierarchical structure

Due to the XML Schema is flexible, these Abstract Digital Item Elements present their entities via XML Schema.By this way, the other MPEG-21 domains follow this model to develop.

■ DIDL element: In Digital Item Declaration Model,DIDL element is the root element, and includes a namespace declaration[9]. And the XML Schema namespace declaration as Fig4.

```
<DIDL>
```

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

```
<didl:DIDL
xmlns:didl="urn:mpeg:mpeg21:2002/01-DIDL-
NS">
……
</didl:DIDL>
```

Fig.4 DIDL namespace declaration

2.2 XML Structural Markup Language

Ditital Item Model has been transferred to DIDL that make use of XML Schema. As we know, XML is a metadata language,and we can define any tag by myself to describe content such as <resource> movie.mpg type=" video/mpeg " </resource>.Due to XML Schema is Well-Formed XML. At present,XML Schema is the W3C Proposed Recommendation standard [4,7] will replace DTD (Data Type Document).

When implementing MPS (Movie Preview System) and MPEG-21 framework, we integrate XML with HTML,and embed XML Data Island in HTML.Client will search XML Data Island by script programs, and this operation will be processed in client memory.By this way,the server can decrease CPU load. This is one of the reason to use XML Data Island. Data Island structure as Fig.5.

```
<HTML>

…HTML Tag and content…
```

```
<XML ID=" Island1" >

<?xml version=" 1.0" ?>

<root1>                         First XML Data Island

    ...

</root1>

</XML>

…HTML Tag and content…

<XML ID=" Island2" >

<?xml version=" 1.0" ?>

<root2>

    ...                         Second XML Data Island

</root2>

</XML>

html Tag and content

</HTML>
```

Fig.5 Embed Data Island in HTML

2.3 XML Schema and DTD

XML Schema and DTD (Document Type Definition) both are Validated XML Document.DTD is the first Validated Language to be used by SGML and XML1.0[11], but DTD does not make use of XML Tag language syntax[4],we must learn other syntax for DTD.Therefore,XML Schema follow XML syntax,and it is a Well-Formed XML document.In MPEG-21 DIDL definition and the other domain will be established by XML Schema. The compared table as Fig6.

	DTD	XML Schema
Syntax	(<!ELEMENT …>)(<!ALLIST…>), individual syntax not compatible XML tag syntax.	Well Formed XML Document ,compatible XML tag syntax.
Data type	Support data type less than XML schema. just string type#PCDATA	Support data type as follows: character, boolean, floating, time,date… , etc.
Structure Define	By regular grammar , not flexible	By minOccru and maxOccur to control element occurrence , more flexible than DTD.
Extendable	No name space	Support name space
Architecture	It is closed,Tag	Tag name and

	name and attribute must declare in advance	attribute did not need declare in advance
Verify	DTD is effective for all XML document, not optional for a part.	Can assign XML Schema for special part.
DOM	Not support DOM	Well-Formed XML Document, can be accessed by DOM.

Fig.6 XML Schema and DTD compared table

3. System architecture

For I.E(Internet Explorer)is the conductor of XML development,so we use MSXML3.0 parser and cooperate with XMLSPY[13] to verify XML Well-Formed document.The process of developing MPS Involves DOM(Document Object Model),XSLT,Xpath and XML Schema related function.For the MSXML3.0 is ready,so we adopt this tool.

In application, static XML document is not enough.It must cooperate with server script language.When server finishs his operation and retures HTML+XML document,we run ASP Server Scripts and generate XML document depend on client's request. The data processing as Fig.7.
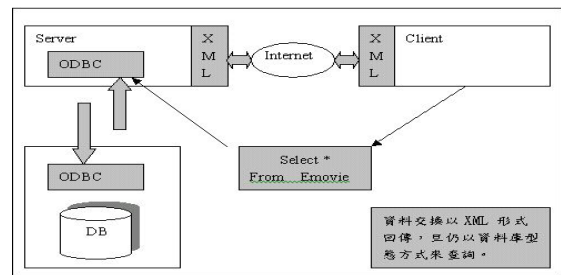

Fig.7 SQL query and return XML format

As soon as, the client .asp programs request,the server process this request and return .html document.When client accepts this result document then executes related VB (or Java)scripts and download all object.Finally, show up the full page.

The XML and HTML website look very much alike.When .asp connect DB by SQL command after get record set and return XML that we must set ContentType="text/xml".In <movielist> tag we use a loop to get all records. To

distinguish every recordset from all records we add a <Movie> tag. The MPS related query, architecture and result page as Fig.8,9,10.

```
<%@ Language=VBScript %>
<%
'connect database
Dim conn
Set conn = CreateObject("ADODB.Connection")
conn.Open "Provider=SQLOLEDB;" & _
   "Data Source=(10.1.2.253);" & _
  "Initial Catalog=movie;" & _
      "User Id=sa;" & _
      "Password=;"
 'put SQL query reslut into rsMovielist Recordset
   Dim rsMovielist
   Set rsMovieist = conn.Execute( "SELECT * FROM
   Movie WHERE Title LIKE '%"  )
<% Response.ContentType = "text/xml" %>
   <?xml version="1.0" encoding="Big5" ?>
   <Movielist>
          <% DO UNTIL rsMovielist.EOF %>
     <Movie>
     <影名><%=rsMovielist("Title") %></影名>
     <編號><%=rsMovieist("MovieNo") %></編號>
     <片長><%=rsMovielist("Time") %></片長>
     </Movie>
  <% rsmlist.MoveNext %>
<% LOOP %>
    </Movielist>
    rsMovielist.Closeconn.Close %>
```

Fig.8 SQL Query and return XML data
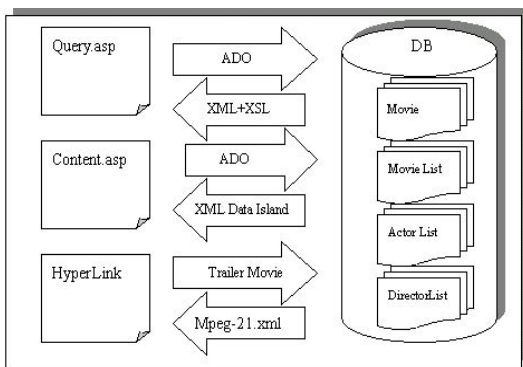

Fig.9 MPS System architecture

Fig.10 MPS query result page

When dynamic returning XML document must be checked whether they are Validate Formed XML. Due to the document may be not correct data type,destoryed or not perfect design…etc[1]. So we make use of DOM to solve these peoblems. By this way to make sure return XML document is correct. The verify code as Fig.11.

```
Set ReceivedDoc=CreateObject( "Microsoft.XMLDOM)
ReceivedDoc.validateOnParse=True
ReceivedDoc.async=False
ReceivedDoc.load Request
```

Fig.11 By DOM to verify XML document

In the system we take WIN2K,MSSQL2K and IIS5.0 to be the database server.Clients use web browser and ADO access MSSQL database. The MPS consists of Query.asp ,Content.asp and MPEG-21.xml hyperlink. Query.asp is responsible for searching movie by director or actor name.Content.asp is responsible for detailed scenario introducing.MPEG-21 is responsible for movie trailer introducing.In Query.asp we design content type attribute value is text/xml for XML Data Island,and we set up a XSL template for processing the output form. In MPEG-21 frame that includes different video,audio,image,text resources and introduces the movie trailer.

4. Movie Preview System

Finally,we make use of MPEG-21 to implement Movie Preview System.The system is different from other website.MPS's trailer include different resource medias such as video,text,image…etc., and we can modify any resources as we wish. Even could not need any film editing tools.Every media is one of the resources,and it could be replaced any time.So,it is very different

from other trailers that need film editing tools and compose multimedia resources to a video clip.

MPS support searching function by director's or actor's name.When click the stage photo that links MPEG-21.XML will play the trailer by browser.The trailer includes video, synopsis and stage photo are playing by time sequence.We don't need any media player.MPEG-21 has very good advantage of acrossing different media platform.

In MPS, we make use of XML,HTML and MPEG-21 related technologies that put video, image ,audio,text into a single frame.We use < Item >, < Descriptor >, < Statement>, <Componet>, <Resource> elements. About time sequence of playing video, image and text. We make use of HTML4.0+Time that support seq,par,begin,dur attributes,and construct a frame that include four regions there are MPEG Video,JPEG Photo ,text resources, and JPEG Photo. In (Region1, Region2) and (Region3,Region4) their timing are parell run each other,but Region1,2,3,4 their timing are sequence. In 78 Seconds. Individually, each region minds his own business,and plays the trailler, director,actors and stage photo. The frame structure as Fig.12 and each region time sequence table as Fig.13.
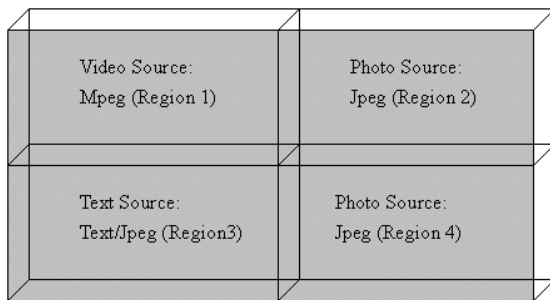
```
<link:LINKtarget="#trailer">
  <htmltime:video src="mpeg21-
  replacement" begin="0" dur="75"
  timeaction="display"/>
  </link:LINK>
</td>
<td width="400" height="300">
<link:LINKtarget="#Actor3.3-pho">
<htmltime:imgsrc="mpeg21-replacement"
  begin="72" dur="5"
  timeaction="display"/>
  </link:LINK>
</td
</tr>…
  …
</table>
</htmltime:par>
```

Fig.13 Region1、Region2 Source Code

In the frame,Region1 plays movie trailer video between 0 and 78 seconds.Region3 plays text introduction at 0,3,11,14,17,25,26,31,36,39,42 and 73 second. Region4 displays a still at 3,14,25,40,43 and 46 second.Region2 displays a still between 73-78 seconds. Between 0-78 seconds,each region displays his own object on the same frame just like a movie.The MPEG-21 frame as Fig.14. In MPS ,client and server interchange data by XML.Internet user just by browser to query and play wanted movie trailer.

Fig.12 MPEG-21 frame structure

```
<htmltime:seq>
  <htmltime:par>
    <table class="time" begin="0"
    dur="indefinite" width="800"
    bgcolor="black">
      .........
    <tr>
      <td width="400" height="300">
```


Fig.14 Frame time sequence table

Fig.15 MPEG-21 Frame

5. Conclusions

In various multimedia environments, there are many media players.MPEG org establishs MPEG-21 definition is a good solution for acrossing different communities. Except defining DIDL to connect with Digital Item by XML Schema.MPEG-21 will support other media object and application that make more media can work together on a multimedia framework,and research worker just develop application no more care about any media platform.In the future,there are more multimedia resources across network and devices used by different communities.It is a great challenge to integrate all kinds of multimedias.MPEG-21 is the trend of future to apply MPEG-21 to following domains[2].

(1)Still Image Media：
photo album,photo kiosk。
(2)Multimedia Project：
digital library,medical research,repository , legal system archives.
(3)Collaborative Publishing Example:
collaboration across public network,version control of individual digital items,control of intellectual property of production, network based musical composition,magazine, Dungeons and Dragons type game.
(4)Audio/Video Usage Cases：
secure streaming of content,user's security model, plug-able payment system
, expanded opportunities for consumer audio,audio kiosk,portable devices for secure digital music.
(5)Broadcast Usage Cases：
broadcasting of protect content,wireless access to multimedia content,access to multimedia content on physical data carriers.
(6)Publishing：
where is this media used, search for unpublish content on a particular subject, focused searches for media, Real-time delivery of contracted digital media, targeted advertising,notification when the anchor for link medias modified,celebrity retrospective issue, aggregation and syndication.
(7)Asset Management：
Companies housing entire image collections from different vendors.
(8)Filtering Content:
Personalized,focused,data mining,gambling savvy investor.
(9)Cataloguing In Publication Scenarios:
Automated metadata generation, targeted data mining, finding the right image, auto -generation of bibliography info from metadata.
(10)Time-Sensitive Automated Generation of Metadata:
Converting news coverage to sales.

Those applications accompany our lives very closely,so the future research is aimed at MPEG-21 to integrate all kinds of the digital media objects into multimedia framework.The multimedia is a vast domain.We finish this application,but there are still many aspects can be improved.we desire more and more research worker to invest a lot of time in MPEG-21 domain.

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