

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
29 January 2004 (29.01.2004)

PCT

(10) International Publication Number
WO 2004/010333 A1

- (51) International Patent Classification⁷: **G06F 17/30**
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- (21) International Application Number:
PCT/KR2003/001262
- (81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.
- (22) International Filing Date: 27 June 2003 (27.06.2003)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
10-2002-0043097 23 July 2002 (23.07.2002) KR
10-2002-0068890 7 November 2002 (07.11.2002) KR
- (84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).
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- Published:
— with international search report
- For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

(54) Title: ENCODED MULTI-KEY INDEX DATA STREAM STRUCTURE

(57) Abstract: Disclosed is an index data stream structure for digital contents metadata containing an encoded multi-key for digital contents metadata defined in the TV-Anytime forum (that is, TVA metadata), thereby allowing a receiver receiving the digital contents metadata to locate the metadata meeting a plurality of conditions, that is, composite conditions, in a prompt and efficient manner, by providing an encoded multi-key of the digital contents metadata. The present invention provides a method of accessing an encoded multi-key indexing in order to provide functions for an efficient location and an access relative to the TVA metadata fragment, thereby allowing the receiver receiving the TVA metadata to search for composite conditions for the TVA metadata in an efficient manner.

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ENCODED MULTI-KEY INDEX DATA STREAM STRUCTURETechnical Field

The present invention relates, in general, to an encoded multi-key index data stream structure for locating composite index keys of digital contents metadata and, more particularly, to an index data stream structure containing a
5 fragment of multi-key indices encoded for XML metadata for digital contents defined in the TV-Anytime Forum (hereinafter referred to as "TVA metadata") so as to allow composite index keys for metadata to be efficiently located when TVA metadata is transported in an independent unit so called a fragment.

10 Background Art

As well known to those skilled in the art, the TV-Anytime Forum is a civil organization for standardization, established in September 1999. with an aim of developing standards for providing audio and visual related services in a user environment such as a PDR (personal digital recorder) having a high volume
15 storage for personal purpose. To specify, the TV-Anytime Forum is designed to enable all the users to listen and view TV programs in various forms (e.g., existing broadcasting services and on-line interactive services, etc.) in any desired manner and at any desired time on the basis of the personal storage.

The TV-Anytime Forum is carrying the project for standardization by
20 operating several working groups for business models, system, transport interfaces and content referencing, metadata, rights management and protection, etc. With respect to the metadata involved in the present invention, "SP003v1.3 Part B Version 1.3" had been published up to August 2, 2002. In "WD647-Draft SP003v13 Part B" currently in discussion, an encoded multi-key index data stream
25 structure for metadata fragment indexing has been proposed.

The structure comprises:

1. Index list (index_list) section

The index list (index_list) section provides a list of all the multi-keys being transported. Within each index list (index_list) structure is included num_fields so as to enable multi-key indexing as suggested in Table 1.

Table 1

5

Syntax	No. of Bits	Mnemonic
index_list() {		
for (j=0; j<num_indexes, j++) { ...		
index_descriptor_length	8	uimsbf
fragment_type	16	uimsbf
if(fragment_type == 0xffff) {		
fragment_xpath_ptr	16	uimsbf
}		
num_fields	8	uimsbf
for(k=0; k<num_fields; k++) { ...		
field_identifier	16	uimsbf
if(field_identifier == 0xffff) {		
field_xpath_ptr	16	uimsbf
}		
field_encoding	16	uimsbf
}		
index_identifier	8	uimsbf
}		
}		

2. Index section

Table 2

Syntax	No. of Bits	Mnemonic
index() {		
overlapping_subindexes	1	bslbf
single_layer_sub_index	1	bslbf
reserved	6	bslbf
fragment_locator_format	8	uimsbf
for (j=0; j<sub_index_count, j++) { ...		
for(k=0; k<num_fields; k++) { ...		
if (overlapping_subindices == '1') {		
low_field_value	16	uimsbf
}		
high_field_value	16	uimsbf
}		
sub_index_container	16	uimsbf
sub_index_identifier	8	uimsbf
}		
}		

3. Multi field sub index(multi_field_sub_index) section

Table 3

Syntax	No. of Bits	Identifier
multi_field_sub_index() {		
multi_field_header {		
leaf_field	1	bslbf
multiple_locators	1	bslbf
reserved	6	bslbf
}		
multi_field_index_entries {		
for (j=0; j<num_entries; j++) { ...		
if(single_layer_sub_index == '0') {		
multi_layer_sub_index_structure()		
} else {		
single_layer_sub_index_structure()		
}		
}		
}		
}		

5

10

In the conventional multi-key index data stream structure, since a fragment or a key have respectively been provided with an encoded value, an Xpath or a method of encoding the same have to be assigned to each index key and any field not belonging to a fragment subject to being indexed cannot be specified with a key. In addition, indexing by means of a synthesized key field not existing

as an actual field in the TVA metadata XML document is not possible.

Disclosure of the Invention

Accordingly, the present invention has been made keeping in mind the
5 above problems occurring in the prior art, and an object of the present invention is
to provide an encoded multi-key index data stream structure useful for locating
composite index keys of digital contents metadata.

In order to accomplish the above object, the present invention provides an
encoded multi-key index data stream structure of digital contents metadata,
10 wherein a mandatory index list required for the TV-Anytime is specified and a key
of the index belonging to the mandatory index list is assigned an encoded value
without using an XPath. Therefore, the present invention features that only an
encoded value is assigned even when the index key is comprised of several multi
fields.

Best Mode for Carrying Out the Invention

Hereinbelow, the present invention will be described in details with
reference to the tables below.

A mandatory index list, for illustrative purpose, required for the TV-
20 Anytime will be observed.

An encoding value is assigned to each index according to an index key, in
which the encoding value can contain information about a fragment thereof. A
multi-key is treated as a composite index key, but a specified multi-key is assigned
an encoding value as same as in a single key. 0x0000 may be assigned to an
25 unspecified field so as to index an arbitrary fragment.

Table 1

Fragment Type	Index Key	Value
Unspecified fragment type	Any field of Schema type TVAIDType	0x0000

Program Information	@programId	0x0001
	BasicDescription/Title	0x0002
	BasicDescription/Keyword	0x0003
	BasicDescription/Genre	0x0004
	PersonName -> (FamilyName, GivenName)	0x0005
Group Information	GroupType	0x0006
	@groupId	0x0007
OnDemandProgramLocation		
BroadcastEvent	@serviceIDRef	0x0008
	(@serviceIDRef, PublishedTime, EndTime)	0x0009
Schedule	(@serviceIDRef, start, end)	0x000A
Service Information	@serviceId	0x000B
	ServiceGenre	0x000C
PersonName	@personNameId	0x000D
	(FamilyName, GivenName)	0x000E
OrganisationName	@organisationNameId	0x000F
ProgramReviews	Program/@crid	0x0010
CSAlias	@alias	0x0011
ClassificationScheme	Term	0x0012
Segment Information	ProgramRef/@crid	0x0013
	@segmentId	0x0014
	Description/Title	0x0015
	Description/Keyword	0x0016
Segment Group Information	ProgramRef/@crid	0x0017
	GroupType	0x0018
	@groupId	0x0019
	Description/Title	0x001A
	Description/Keyword	0x001B

TVA Reserved	N/A	0x000E – 0x00EF
User Private	N/A	0x00F0 – 0xFE00
W3C XPath Expression	N/A	0xFFFF

Based on the above table, two types of special index keys may be introduced.

(1) Index key not contained in a fragment

5 Indexing by means of a key field not contained in a concerned fragment is necessary to simplify a query processing of the PDR. In the above table, the ProgramInformation fragment is indexed by use of the person name field contained within the PersonName fragment belonging to CreditsInformation (please note that ProgramInformation may be associated with the PersonName
10 fragment belonging to the CreditsInformation through BasicDescription/CreditsList/PersonNameIDRef). In this case, the ProgramInformation is indexed by (FamilyName, GivenName) located within the PersonName fragment.

(2) Synthesized index key

A synthesized index key not existing within a fragment may be used.
15 The synthesized key is composed by a combination of key fields existing within the fragment. For example, it is desirable to provide an index for a multi-key of <serviceId, PublishedTime, EndTime> for a BroadcastEvent fragment, wherein no key field exists for 'Endtime.' In this case, 'EndTime' may be synthesized by combining 'PublishedTime' and 'PublishedDuration.'

20 To provide the mandatory index list as described above, the following structures are necessary. In the above indices, the key field XPath or key field encoding is not required.

1. index_list section

Table 2

Syntax	No. of Bits	Mnemonic
Index_list() {		
for (j=0; j<num_indexes; j++) { ...		
index_descriptor_length	8	uimsbf
fragment_type	16	uimsbf
if(fragment_type == 0xffff) {		
fragment_xpath_ptr	16	uimsbf
}		
key_identifier	16	uimsbf
If (key_identifier == 0xffff) { ...		
num_fields	8	uimsbf
for(k=0; k<num_fields; k++) { ...		
field_xpath_ptr	16	uimsbf
}		
field_encoding	16	uimsbf
}		
index_container	16	uimsbf
index_identifier	8	uimsbf
}		
}		

5 The fields of the index_list structure described above will be described below.

index_descriptor_length: length of each index_descriptor

fragment_type: encoding value of a fragment type

fragment_XPath_ptr: xpath pointer of a fragment not encoded

10 key_identifier: a value of encoding an index key

num_fields: number of key fields of index keys not encoded

field_xpath_ptr: a xpath pinter of each key field of index keys not encoded

15 field_encoding: an encoding type of each key field of index keys not encoded

index_container: a container id containing an index structure

index_identifier: an ID of the concerned index structure

5 The key_index section and multi_field-sub_index section as described above may be of the same as the conventional sections or a part thereof may be modified according to the above list and the index list section.

Industrial Applicability

10 As described above, the multi-key index data stream structure according to the present invention provides an encoded value, for which it does not need to separately specify an XPath and an encoding method relative to each index key, thereby decreasing the overhead on the receiver side. In addition, since the field not belonging to a fragment subject to being indexed can be specified with a key, thereby capable of generating a user-centered field.

15 Although an embodiment of the present invention have been disclosed for illustrative purposes, those skilled in the art will appreciate that various modifications, additions and substitutions are possible, without departing from the scope and spirit of the invention as disclosed in the accompanying claims.

Claims

1. An encoded multi-key index data stream structure for locating an composite index key of digital contents metadata, comprising a key_index_list(key_index_list) section containing the multi-key data used in the
5 composite index key search, wherein the multi-key data is encoded with a single code value.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR03/01262

A. CLASSIFICATION OF SUBJECT MATTER IPC7 G06F 17/30 According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) IPC 7 G06F Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched KR, JP: IPC as above Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 2001-229060 A (NEC CORP) 24 AUGUST 2001 Abstract, Fig. 1	1
A	US 6263313 B1 (IBM) 17 JULY 2001 See the whole document	1
☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.		
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Date of the actual completion of the international search 25 SEPTEMBER 2003 (25.09.2003)		Date of mailing of the international search report 26 SEPTEMBER 2003 (26.09.2003)
Name and mailing address of the ISA/KR  Korean Intellectual Property Office 920 Dunsan-dong, Seo-gu, Daejeon 302-701, Republic of Korea Facsimile No. 82-42-472-7140		Authorized officer NA, Yong Soo Telephone No. 82-42-481-5680 