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Simms et al.

(54) GLOBAL LISTINGS FORMAT (GLF) FOR MULTIMEDIA PROGRAMMING CONTENT AND ELECTRONIC PROGRAM GUIDE (EPG) INFORMATION

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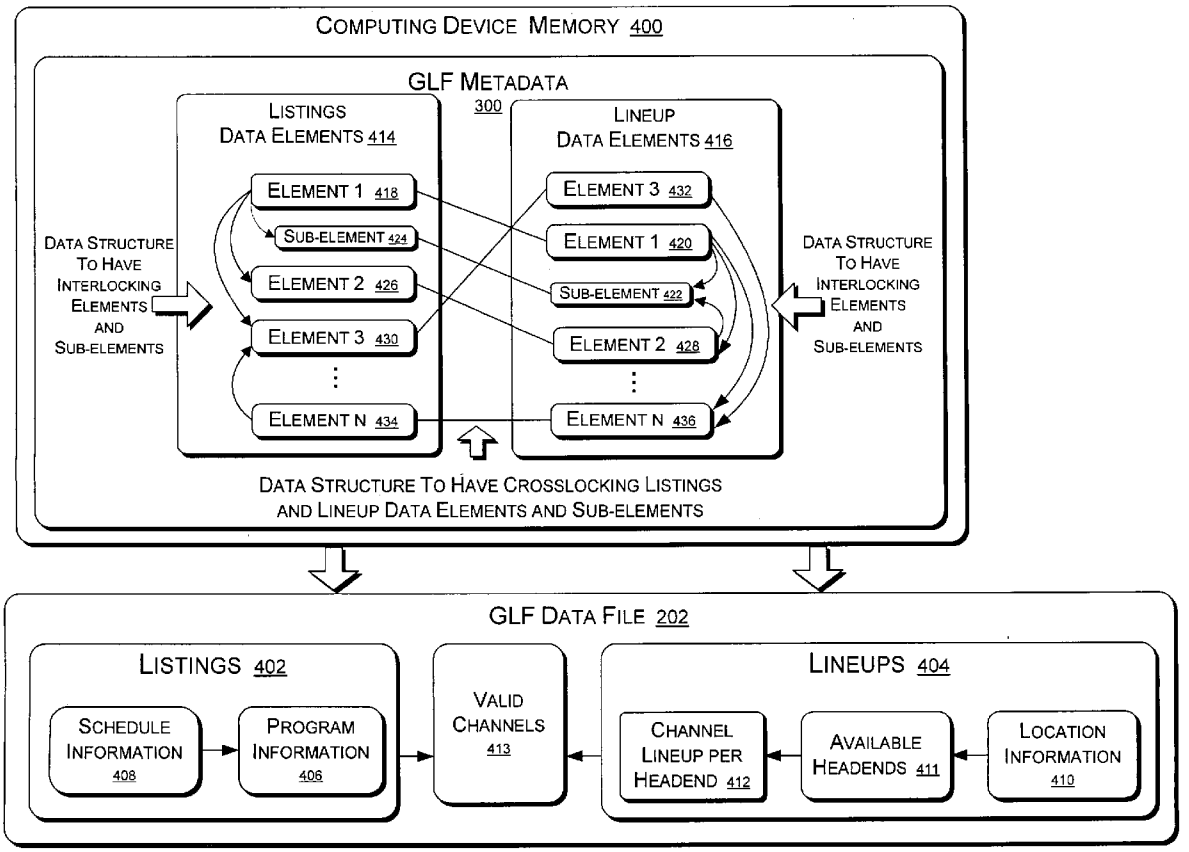
(57) **ABSTRACT**

An exemplary global listings format (GLF) is metadata for electronically transferring multimedia programming content and electronic program guide information. The GLF metadata specifies a self-referential data structure having a self-consistency mechanism comprising interlocking and cross-locking data elements. The self-consistency mechanism ensures completeness and validity of transferred programming data. In one implementation, the exemplary GLF is expressed in an extensible markup language (XML) schema definition (XSD) specification.



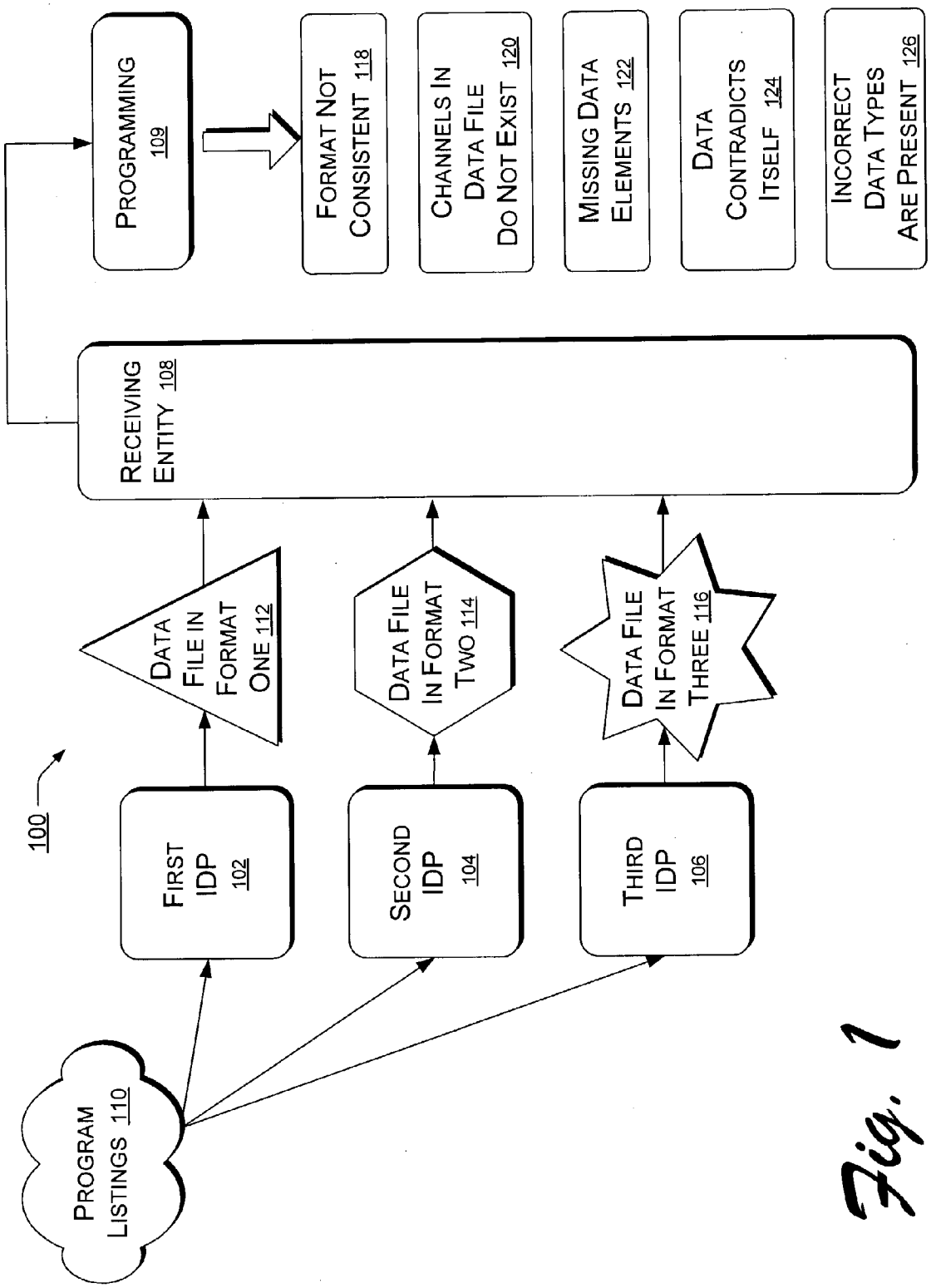


Fig. 1
(PRIOR ART)

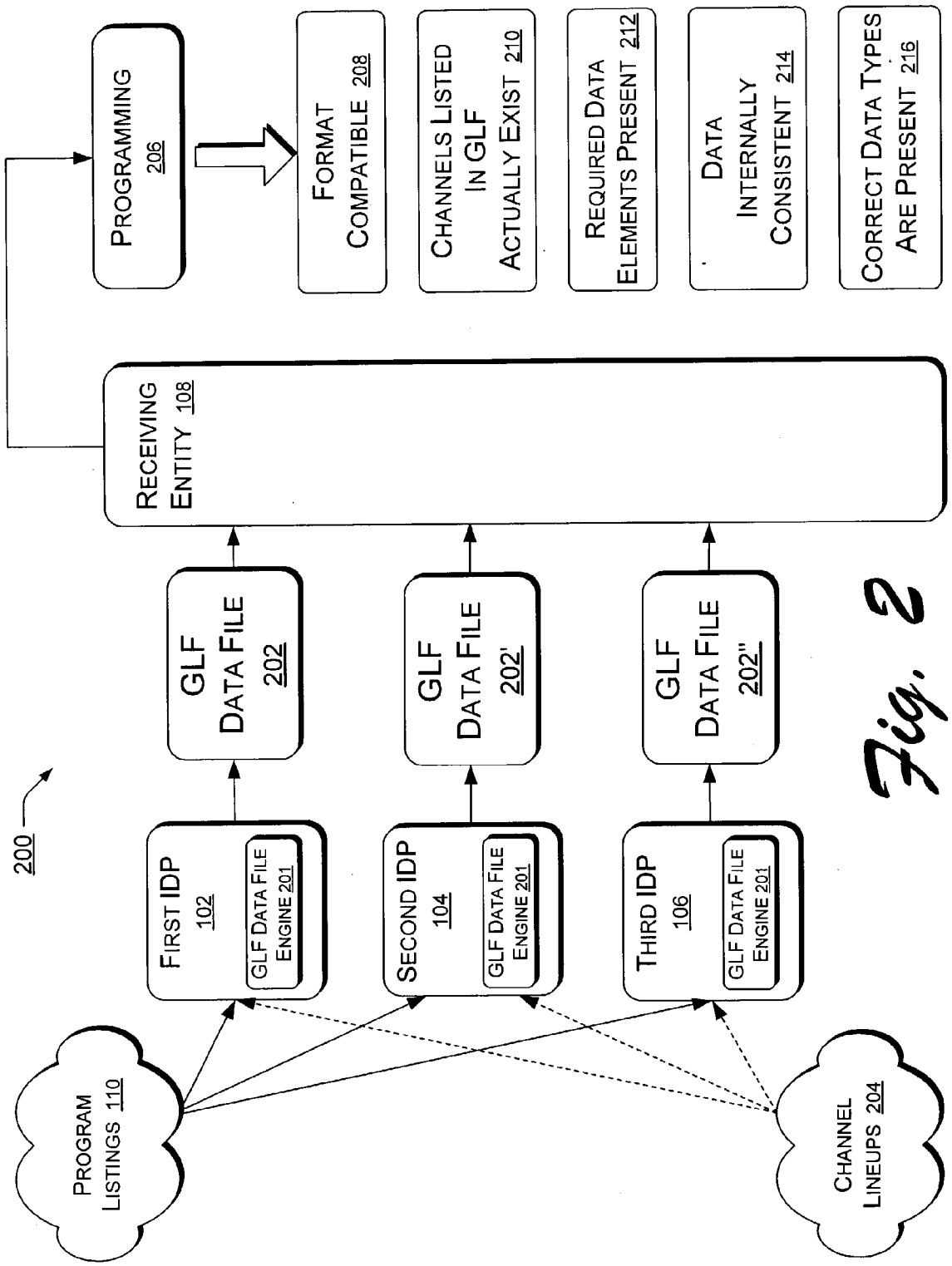

200
PROGRAM LISTINGS 110
FIRST IDP 102
GLF DATA FILE ENGINE 201
SECOND IDP 104
GLF DATA FILE ENGINE 201
THIRD IDP 106
GLF DATA FILE ENGINE 201
CHANNEL LINEUPS 204
GLF DATA FILE 202
GLF DATA FILE 202'
GLF DATA FILE 202''
RECEIVING ENTITY 108
PROGRAMMING 206
FORMAT COMPATIBLE 208
CHANNELS LISTED IN GLF ACTUALLY EXIST 210
REQUIRED DATA ELEMENTS PRESENT 212
DATA INTERNALLY CONSISTENT 214
CORRECT DATA TYPES ARE PRESENT 216

Fig. 2

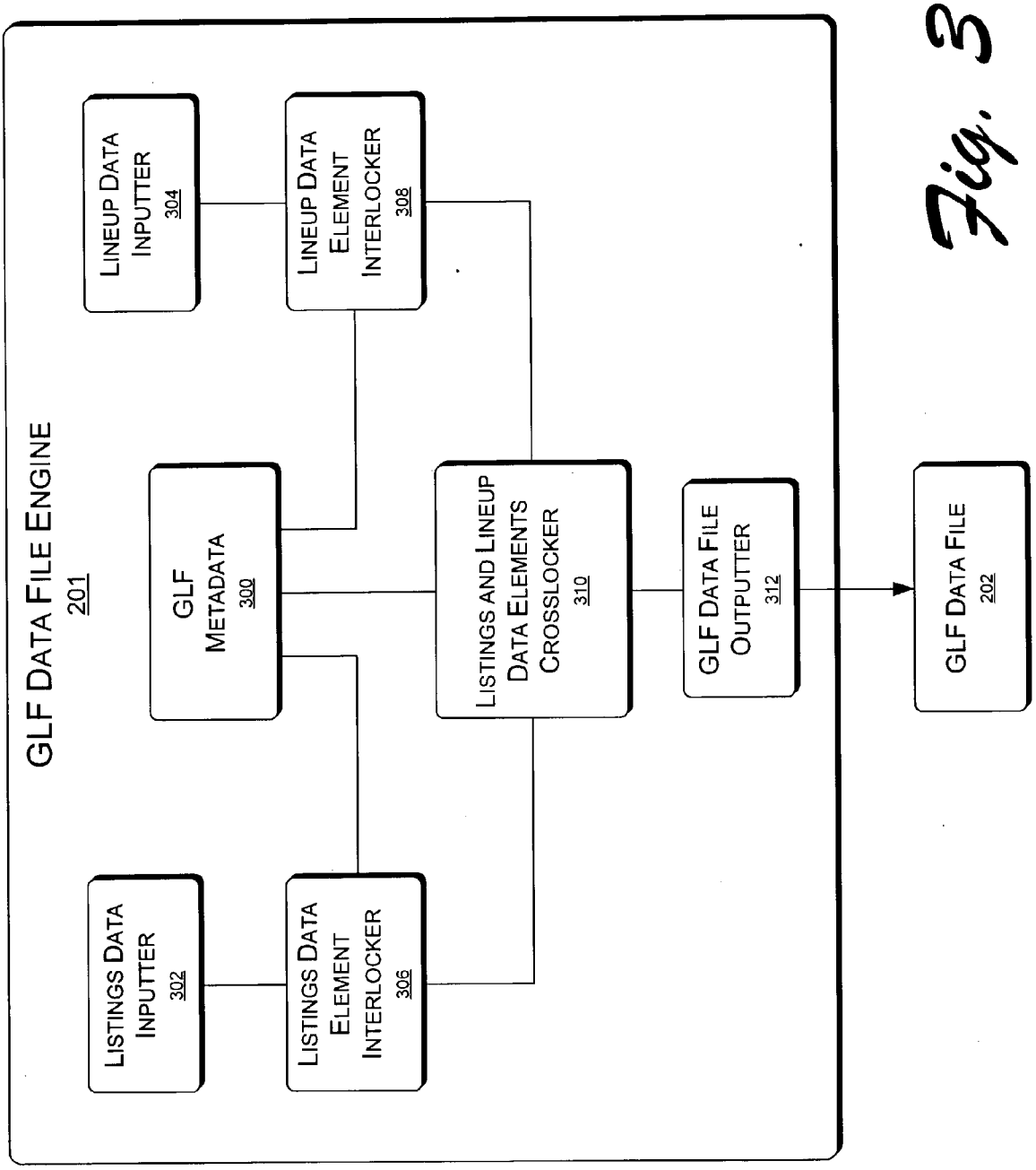
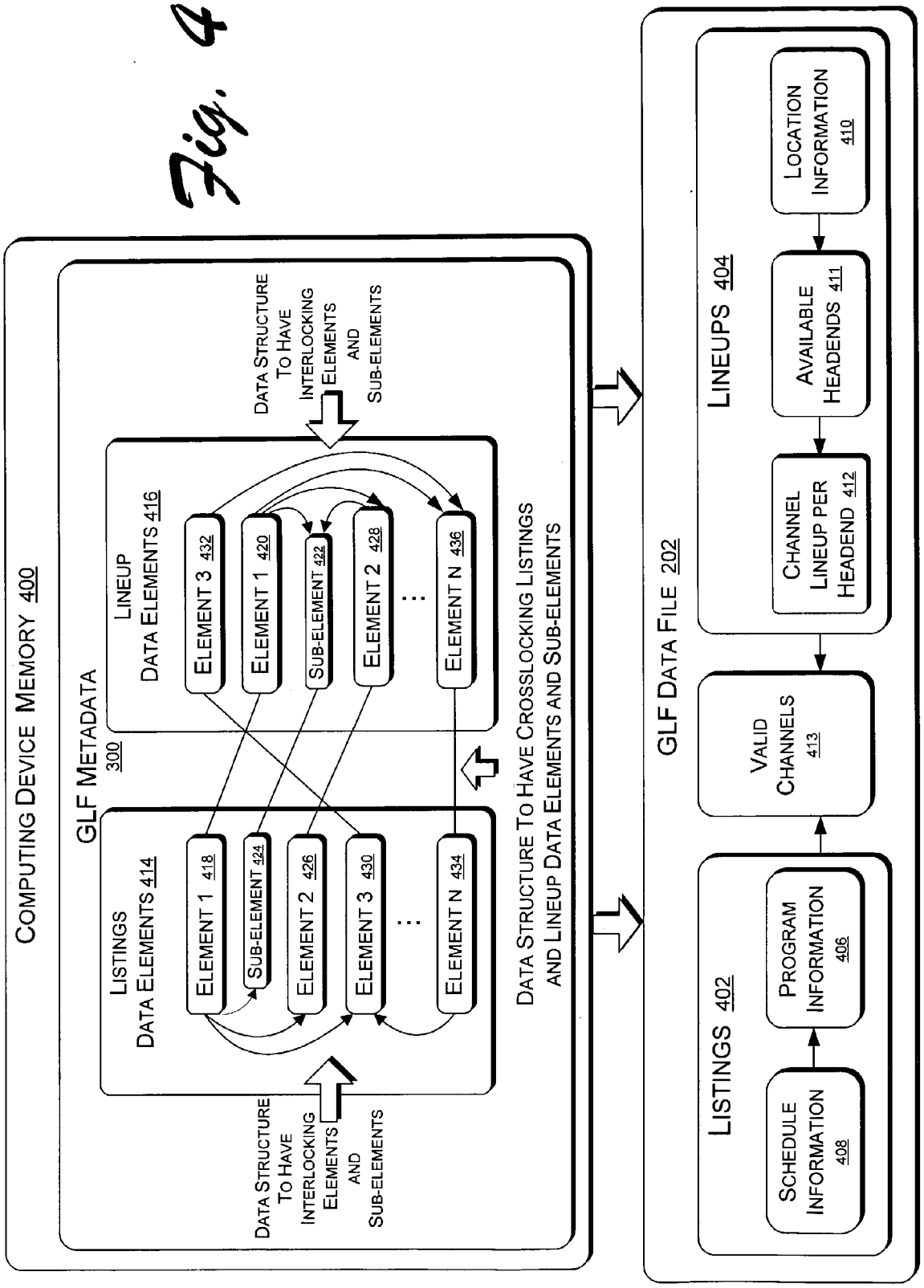

GLF DATA FILE ENGINE
201
LISTINGS DATA INPUTTER
302
LINEUP DATA INPUTTER
304
GLF METADATA
300
LISTINGS DATA ELEMENT INTERLOCKER
306
LINEUP DATA ELEMENT INTERLOCKER
308
LISTINGS AND LINEUP DATA ELEMENTS CROSSLOCKER
310
GLF DATA FILE OUTPUTTER
312
GLF DATA FILE
202

Fig. 3

Fig. 4


COMPUTING DEVICE MEMORY 400
GLF METADATA 300
LISTINGS DATA ELEMENTS 414
ELEMENT 1 418
SUB-ELEMENT 424
ELEMENT 2 426
ELEMENT 3 430
ELEMENT N 434
LINEUP DATA ELEMENTS 416
ELEMENT 3 432
ELEMENT 1 420
SUB-ELEMENT 422
ELEMENT 2 428
ELEMENT N 436
DATA STRUCTURE TO HAVE INTERLOCKING ELEMENTS AND SUB-ELEMENTS
DATA STRUCTURE TO HAVE INTERLOCKING ELEMENTS AND SUB-ELEMENTS
DATA STRUCTURE TO HAVE CROSSLOCKING LISTINGS AND LINEUP DATA ELEMENTS AND SUB-ELEMENTS
GLF DATA FILE 202
LISTINGS 402
SCHEDULE INFORMATION 408
PROGRAM INFORMATION 406
VALID CHANNELS 413
LINEUPS 404
CHANNEL LINEUP PER HEADEND 412
AVAILABLE HEADENDS 411
LOCATION INFORMATION 410

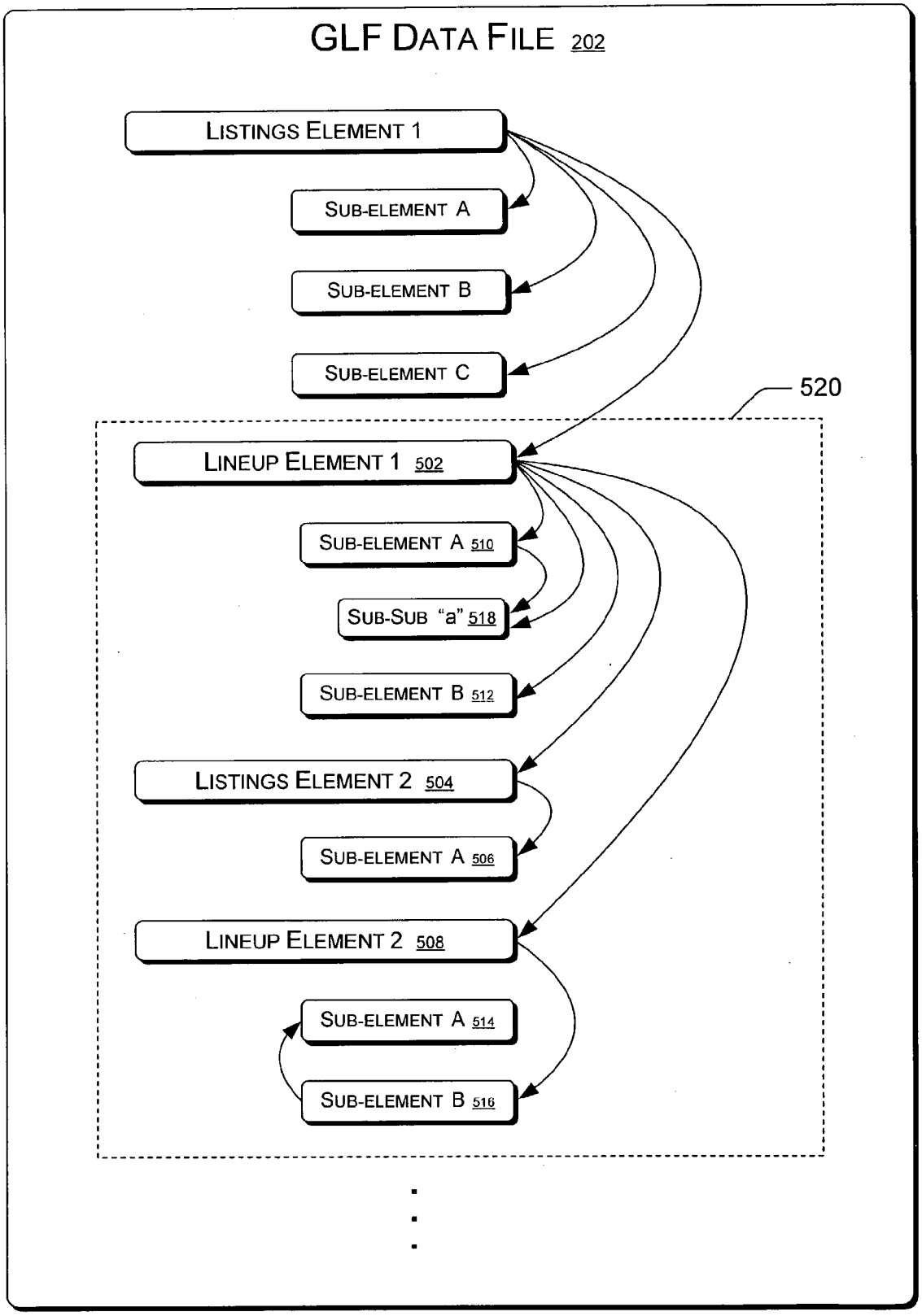

GLF DATA FILE 202
LISTINGS ELEMENT 1
SUB-ELEMENT A
SUB-ELEMENT B
SUB-ELEMENT C
520
LINEUP ELEMENT 1 502
SUB-ELEMENT A 510
SUB-SUB "a" 518
SUB-ELEMENT B 512
LISTINGS ELEMENT 2 504
SUB-ELEMENT A 506
LINEUP ELEMENT 2 508
SUB-ELEMENT A 514
SUB-ELEMENT B 516

Fig. 5

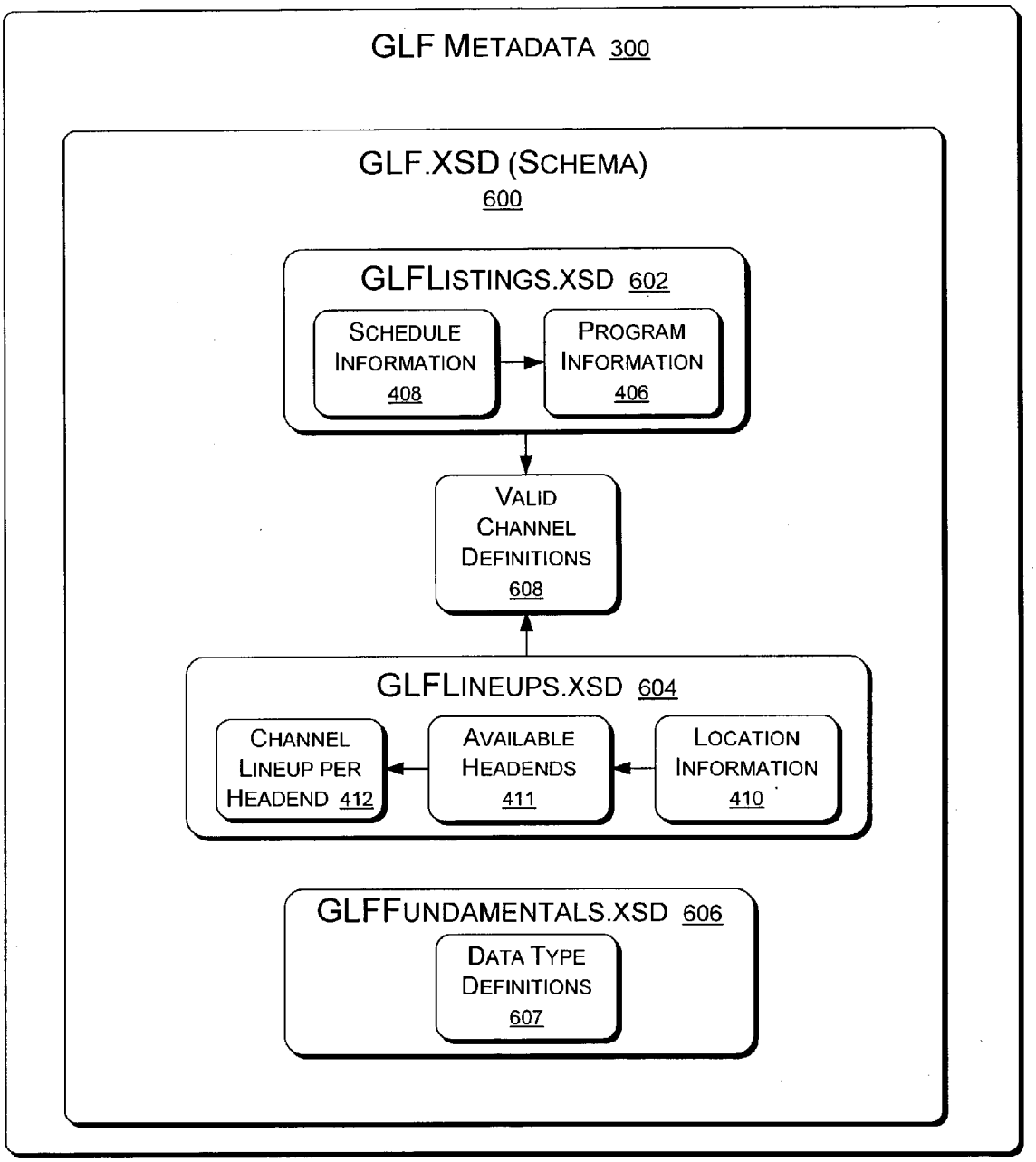

GLF METADATA 300
GLF.XSD (SCHEMA)
600
GLFLISTINGS.XSD 602
SCHEDULE INFORMATION 408
PROGRAM INFORMATION 406
VALID CHANNEL DEFINITIONS 608
GLFLINEUPS.XSD 604
CHANNEL LINEUP PER HEADEND 412
AVAILABLE HEADENDS 411
LOCATION INFORMATION 410
GLFFUNDAMENTALS.XSD 606
DATA TYPE DEFINITIONS 607

Fig. 6

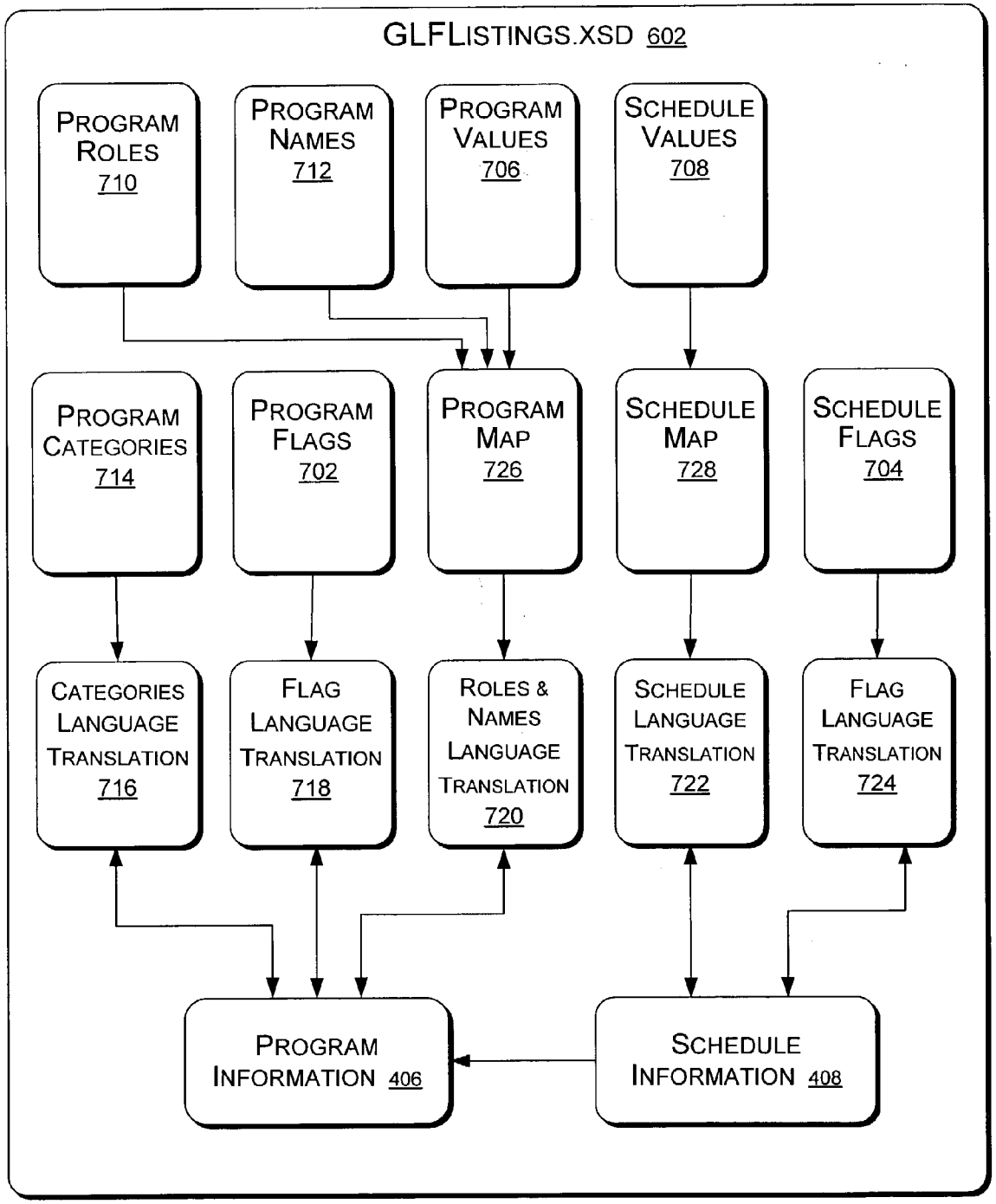

GLFLISTINGS.XSD 602
PROGRAM ROLES 710
PROGRAM NAMES 712
PROGRAM VALUES 706
SCHEDULE VALUES 708
PROGRAM CATEGORIES 714
PROGRAM FLAGS 702
PROGRAM MAP 726
SCHEDULE MAP 728
SCHEDULE FLAGS 704
CATEGORIES LANGUAGE TRANSLATION 716
FLAG LANGUAGE TRANSLATION 718
ROLES & NAMES LANGUAGE TRANSLATION 720
SCHEDULE LANGUAGE TRANSLATION 722
FLAG LANGUAGE TRANSLATION 724
PROGRAM INFORMATION 406
SCHEDULE INFORMATION 408

Fig. 7

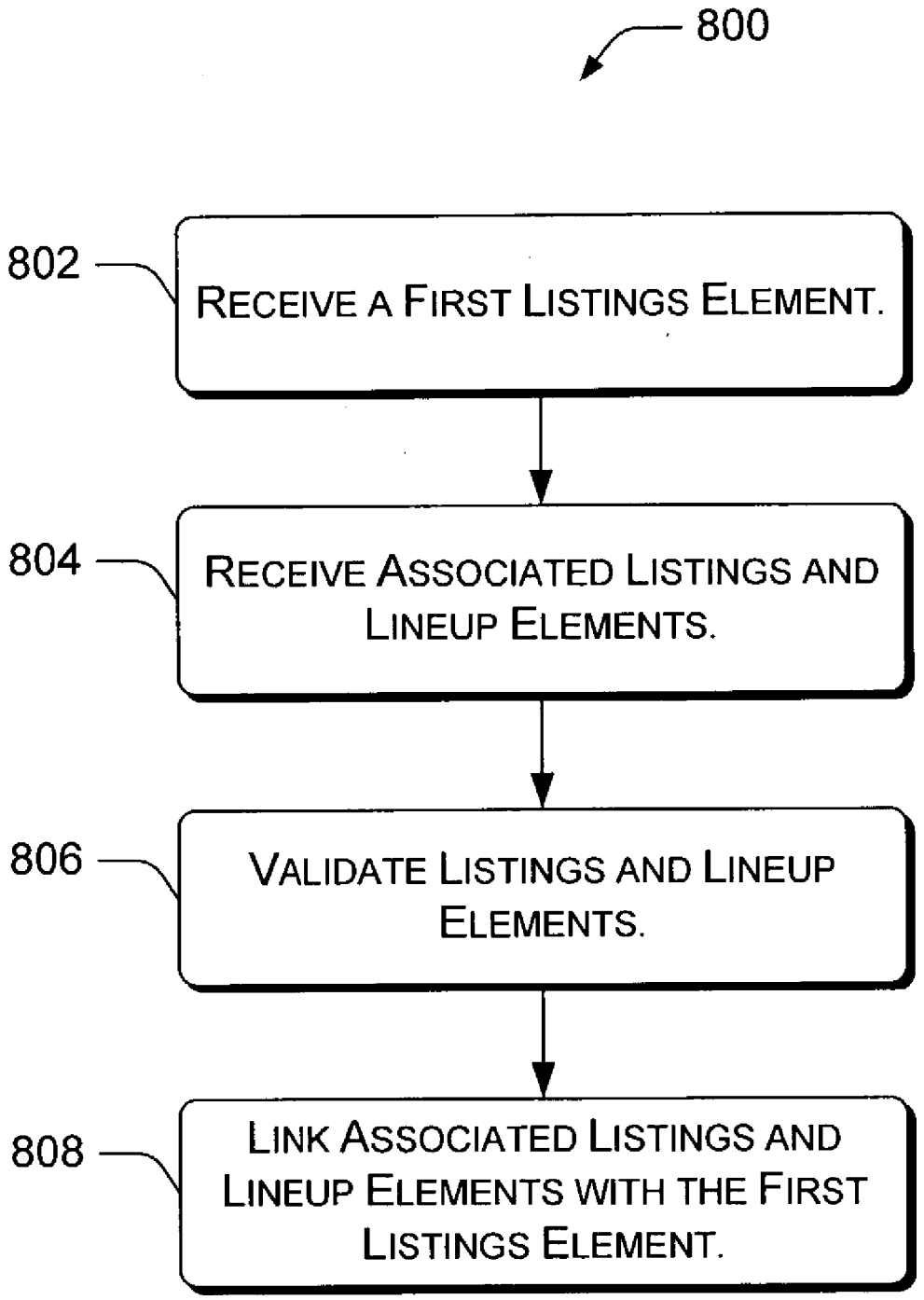

800
802
RECEIVE A FIRST LISTINGS ELEMENT.
804
RECEIVE ASSOCIATED LISTINGS AND LINEUP ELEMENTS.
806
VALIDATE LISTINGS AND LINEUP ELEMENTS.
808
LINK ASSOCIATED LISTINGS AND LINEUP ELEMENTS WITH THE FIRST LISTINGS ELEMENT.

Fig. 8

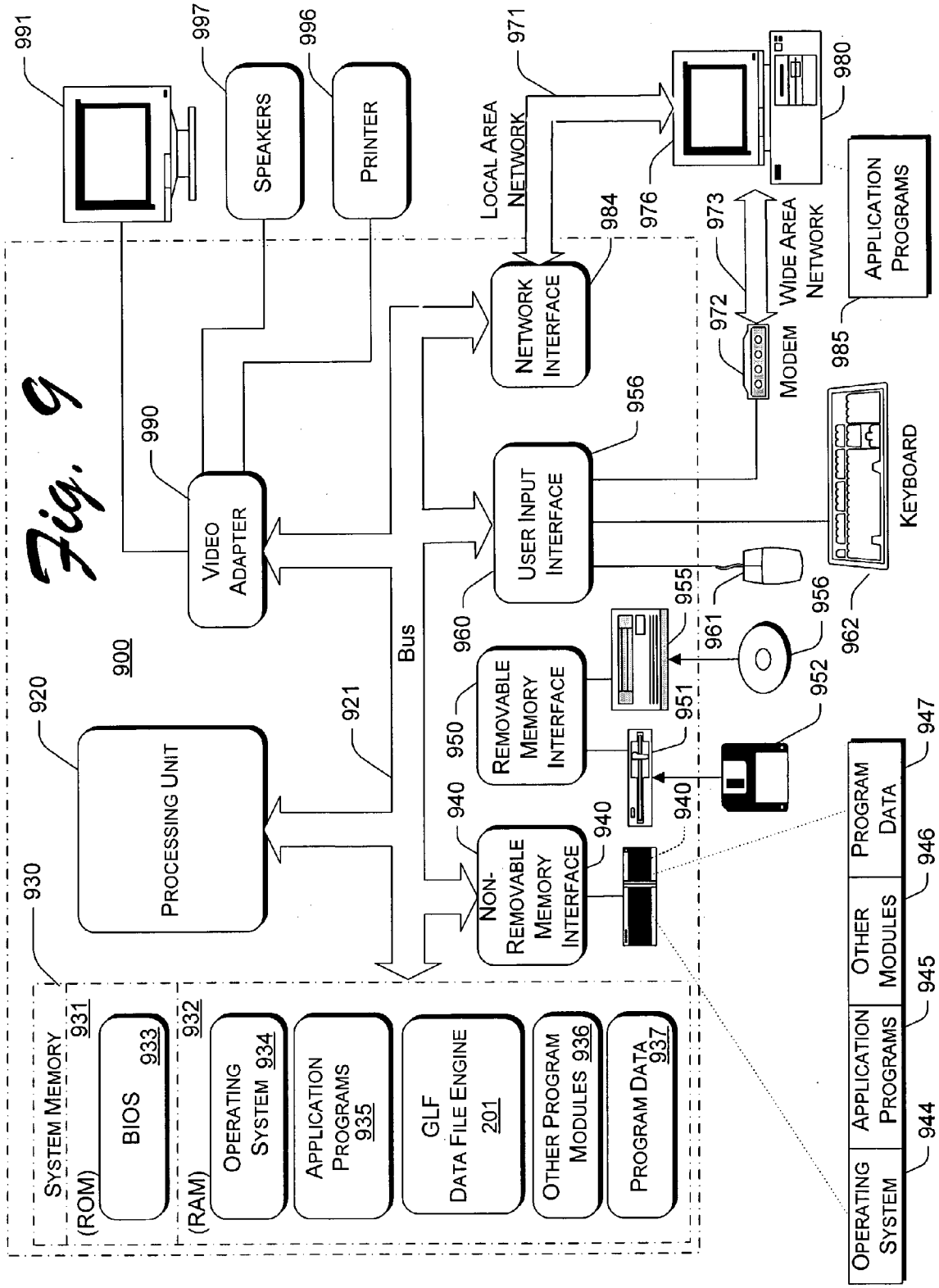

991
997
996
971
980
SPEAKERS
PRINTER
LOCAL AREA NETWORK
976
984
973
WIDE AREA NETWORK
APPLICATION PROGRAMS
985
972
MODEM
NETWORK INTERFACE
990
956
VIDEO ADAPTER
USER INPUT INTERFACE
KEYBOARD
960
955
961
956
962
900
Bus
920
921
950
REMOVABLE MEMORY INTERFACE
951
952
PROCESSING UNIT
940
940
940
NON-REMOVABLE MEMORY INTERFACE
947
PROGRAM DATA
946
OTHER MODULES
945
APPLICATION PROGRAMS
944
OPERATING SYSTEM
930
SYSTEM MEMORY
931
(ROM)
BIOS 933
932
(RAM)
OPERATING SYSTEM 934
APPLICATION PROGRAMS 935
GLF DATA FILE ENGINE 201
OTHER PROGRAM MODULES 936
PROGRAM DATA 937

Fig. 9

GLOBAL LISTINGS FORMAT (GLF) FOR MULTIMEDIA PROGRAMMING CONTENT AND ELECTRONIC PROGRAM GUIDE (EPG) INFORMATION

[0001] One set of XML text file listings used in accordance with the subject matter are provided in an appendix after the abstract on 7 sheets of paper and incorporated by reference into the specification. The XML text file listing is an exemplary sample global listings format data file.

TECHNICAL FIELD

[0002] This invention relates generally to multimedia data communications and specifically to a global listings format (GLF) for multimedia programming content and electronic program guide (EPG) information.

BACKGROUND

[0003] As computerized products for enjoying television and other multimedia forms expand across international markets, originators and distributors of multimedia programming known as Independent Data Providers (IDPs) have multiplied to provide programming content from many countries. Programming content usually consists of the program listings, which are transferred in a "data feed," that is, a "programming data file" that supplies local programming distributors with enough programming content to fill locally available channels for a specified duration, usually measured in days. The amount of programming data to be delivered by an IDP is usually defined in a listings data agreement.

[0004] Each IDP uses a proprietary listings format to create a programming data file that can be received and processed into local programming by a receiving entity. These proprietary listings formats are sometimes similar to each other but more often are different from each other and/or incompatible with each other, and more importantly, are incompatible with the receiving entity's needs. Specifically, the insertion of channel information needed to achieve a channel "lineup" that really works in a given locality for the supplied programming content is haphazard, due to the varying proprietary listings formats. In some instances the proprietary formats vary because collections of listings (i.e., programs and schedules) and lineups (i.e., sets of channels on which the programs and schedules will be implemented) are created by different types of IDPs. IDPs that produce listings usually predominate over the IDPs that produce lineups resulting in proprietary formats that favor listings information but neglect complete and accurate lineup information.

[0005] Additionally, the varying proprietary listings formats do not reliably convey information that has been translated across languages spoken in different countries. It is not always the translation itself that is problematic. A correct translation may be linked incorrectly to the wrong program number, for instance, or a new program number may be unnecessarily adopted because of the new language translation, resulting in a loss of referential consistency and, in this instance, a plethora of program numbers for one program.

[0006] **FIG. 1** shows a conventional programming data file delivery environment **100**, in which delivery proceeds from three example IDPs **102**, **104**, **106** to a receiving entity **108**. IDPs typically select programming from a relatively unlimited universe of program listings **110** to create a programming data file that is marketed to the receiving entity **108**, i.e., a local programming distributor, such as local broadcast station or a television cable company. The programming data files are characteristically large and therefore require, for example, approximately twenty hours of processing time to convert the data file into usable form.

[0007] In creating a programming data file, IDPs typically emphasize program listings **110** information, such as the names of movies and programs, to the exclusion or haphazard inclusion of supporting "lineup" logistical information that would be necessary to present programs at given times on specific channels available in the receiving entity's locale or catchment area. Although most IDPs add schedule information, attempts to include consistent and correct lineup information usually prove insufficient, as discussed above, especially when programming data files are transferred between different countries.

[0008] The blend of information formulated in a proprietary programming data file and the proprietary formats used may vary widely between IDPs. Thus, as shown in **FIG. 1, a** first IDP **102** uses a first proprietary data file format **112**, a second IDP **104** uses a second proprietary data file format **114**, and a third IDP **106** uses a third proprietary data file format **116**. A receiving entity **108**, such as a local programming distributor may even subscribe to several IDPs and must process programming data files from each into programming **109**. Often, after spending, for example, twenty hours of processing time to convert a programming data file into usable programming **109**, the receiving entity **108** discovers that one or more aspects of a proprietary format are not consistent **118**. Perhaps channels listed in the programming data file do not exist **120** or do not exist in the local supplier's geographical and/or geopolitical area. Since the data file formats **112**, **114**, **116** from the various IDPs are arbitrary, data elements may be missing **122**, the data may contradict itself **124**, and/or the data may be present but may be unusable because incorrect and/or unrecognizable data types have been used **126**. Because the data file is partially or completely defective, part or all of the processing time investment may be lost, and troubleshooting may be needed.

SUMMARY

[0009] Subject matter includes an exemplary global listings format (GLF) for electronically transferring multimedia programming content and electronic program guide (EPG) information. The GLF can be a type of metadata that specifies a data structure having a self-consistency mechanism comprising linked, that is, interlocking and crosslocking, data elements. The self-consistency mechanism ensures consistency, completeness, and validity of a multimedia programming data file to be electronically transferred.

[0010] In one implementation, the exemplary GLF is cast in an extensible markup language (XML) schema definition (XSD) specification and IDPs are supplied with a set of editorial instructions as a guide for producing and delivering programming data. A receiving entity having XML database (XDB) capabilities can import the GLF standardized programming data file for producing substantially complete and error-free programming for a variety of clients, using stan-

dard XML tools and resources. The strong data typing inherent in XML provides one aspect of GLF data validation.

[0011] An exemplary GLF standardizes key relationships in programming data, particularly relationships between listings data and lineup data. Various implementations of the GLF have sufficient richness and versatility to accommodate listings and lineups for programming content and EPG guide information that can be used in many types of multimedia products. Exemplary GLFs are expandable and extensible to accommodate detailed attributes related to the listings and the lineups.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] **FIG. 1** is a block diagram of a conventional environment in which programming data files are transferred.

[0013] **FIG. 2** is a block diagram of an exemplary environment in which global listings format (GLF) programming data files are transferred.

[0014] **FIG. 3** is a block diagram of an exemplary GLF data file engine.

[0015] **FIG. 4** is a graphic representation showing formation of an exemplary GLF data file using exemplary GLF metadata residing as a data structure in the memory of a computing device.

[0016] **FIG. 5** is a graphic representation showing formation of an exemplary GLF data structure in an exemplary GLF data file.

[0017] **FIG. 6** is a block diagram of a GLF.xsd schema and components.

[0018] **FIG. 7** is a block diagram of an exemplary GLFListings.xsd schema component.

[0019] **FIG. 8** is a flow diagram of an exemplary method for producing a GLF programming data file.

[0020] **FIG. 9** is a block diagram of an exemplary computing device environment in which to practice the subject matter.

DETAILED DESCRIPTION

[0021] Overview

[0022] It is rather frustrating to invest perhaps twenty hours of processing time to decode a programming data file **112**, **114**, **116** into usable form, only to find that channels listed in the data do not really exist, that a foreign language translation is attached to the wrong program, or that the same program has multiple unique ID numbers.

[0023] Exemplary subject matter includes a global listings format (GLF) and related methods and data structures for electronically transferring programming content and electronic programming guide (EPG) information, for example, from an IDP to a local distributor client, or between countries in which different languages are spoken. The GLF for multimedia programming content and EPG information also forms a consistent foundation for operating systems that support multimedia processing, such as Windows XP Media Center Edition (Microsoft Corporation, Redmond, Wash.).

[0024] A listings element may be any data or information related to programming content or to the scheduling thereof. A lineup element may be any data or information related to sets of channels on which the programming content and scheduling will be implemented. The exemplary GLF can be thought of as metadata for consistently structuring the listings and lineup information. Insofar as the listings and lineup information is itself metadata about the programming content, the exemplary GLF is arrangement metadata for the listings and lineup metadata. The GLF metadata aims to provide consistently comprehensive and correct programming information, so that a given local distributor receiving a GLF programming data file has all the information at hand that might be needed to provide programming and EPG information in any degree of desired detail. Since the GLF metadata specifies a consistent listings format, whoever uses the GLF metadata can realize the downstream benefits of consistency, completeness, and correctness of the programming data.

[0025] Receiving a GLF programming data file, the local distributor may be freed from the tedious tasks of error correction and gathering of additional information.

[0026] In other words, the exemplary GLF has a self-referential structure and built-in self-consistency mechanism that includes various interlocking mechanisms that establish and enforce completeness and validity of the programming information. Each data element included in a GLF data structure is referred to, so that there are no "left-over," unidentified, or unaccounted for data elements. If completeness is not satisfied, then various specific actions may follow. The various interlocking mechanisms not only detect that a data file is invalid, but can also report on what specifically is incorrect. An error can be logged and a full description of the error sent to the IDP. Since the IDP can also be in possession of the GLF, the IDP can validate their GLF data file before sending it to the local distributor.

[0027] The self-referential structure of an exemplary GLF has interlocking and crosslocking (collectively: "linked") fields and/or data elements that create a data structure wherein important or desirable programming information is not forgotten or inserted incorrectly during programming data file creation. The term "crosslocking" is used for establishing linkages between listings and lineup data. This distinguishes "crosslocking" from "interlocking," which refers to links between two listings data elements or between two lineup data elements.

[0028] In one implementation, the exemplary GLF is cast in an extensible markup language (XML) schema definition (XSD) specification and IDPs are supplied with a set of editorial instructions as a guide for producing and delivering programming data. A receiving entity **108** having XML database (XDB) capabilities can import the GLF standardized programming data file for producing substantially complete and error-free programming for a variety of clients, using standard XML tools and resources.

[0029] An exemplary GLF standardizes key relationships in programming data, particularly relationships between listings data and lineup data. "Listings" is a term used to include program and schedule information, for example, the program title, unique program ID, episode title, episode number, description, year of creation, cast, acting roles, crew, ratings, category, length, start time, frequency, etc.

"Lineup" is a term used for channeling data, such as channels available in a given area, for example on cable, over-the-air, and satellite services. Thus, lineup data is used to partition the set of all available channels into a smaller set that is relevant to a given receiving entity **108** in a particular locale.

[**0030**] Implementations of the GLF have sufficient richness and versatility to accommodate listings and lineups for many types of multimedia products. Exemplary GLFs are expandable and extensible to accommodate detailed attributes about the listings and the lineups.

[**0031**] Programming Data File Transfer Environment

[**0032**] **FIG. 2** shows a programming data file delivery environment **200**, in which delivery proceeds from the three example IDPs **102**, **104**, **106** to the receiving entity **108** using exemplary GLF data files **202**, **202'**, **202"**. Example IDPs **102**, **104**, **106** each having an exemplary GLF data file engine **201**, select programming content from a relatively unlimited universe of program listings **110** to create a data file(s) that can be electronically transferred to a receiving entity **108**, such as a local programming distributor. Each exemplary GLF data file engine **201** contains or has access to GLF metadata for creating a GLF data file **202** in an exemplary GLF format. In each exemplary GLF data file **202**, **202'**, **202"** the programming data is structured so that each selected element from the program listings **110** to be transferred is accompanied, if appropriate, by one or more elements from a universe of channel lineups **204**. The various listings elements and lineup elements are interlocked and crosslocked, where appropriate, to provide an exemplary GLF data structure, including a self-consistency mechanism (i.e., the self-referential interlocks and crosslocks to be discussed more fully below). Thus, an exemplary GLF data file **202** formatted according to exemplary GLF metadata has substantially complete and error-free programming information regardless of which IDP **102**, **104**, **106** creates the programming data file.

[**0033**] The self-consistency mechanism(s) imbued in exemplary GLF data structures ensure substantially complete and error-free programming information, and are especially useful when the programming data is being transferred between international sources. Built-in language translation fields can optionally be used to ensure that language translations are inserted into or interlocked with the proper data elements. The receiving entity **108** processes each received GLF data file **202** to obtain programming **109** that is true to an expected format (**208**), that is, the usable programming **109** conforms to GLF standards of completeness and validity. Further, channels listed in a GLF data file **202** actually exist in the receiving entity's location **210**. The exemplary GLF data structure also assures data completeness and integrity, namely, that required data elements are present **212** (e.g., if a program listing is supplied, then lineup information is also supplied), that the data is internally consistent **214** (i.e., no contradictions are present), and that correct data types have been applied to each data element supplied **216**.

[**0034**] Exemplary GLF System Components

[**0035**] **FIG. 3** shows the exemplary GLF data file engine **201** of **FIG. 2** in greater detail. Of course, other means, such as other engines, routines, rules, etc. can yield an exemplary GLF data structure result. The exemplary GLF data file engine **201** uses GLF metadata **300** to link data elements and attributes into the GLF data structure that comprises at least part of a GLF data file **202**. In one implementation, a listings data inputter **302** and a lineup data inputter **304** are communicatively coupled with a listings data element interlocker **306** and a lineup data element interlocker **308**, respectively. The listings data element interlocker **306** and the lineup data element interlocker **308** are communicatively coupled with a listings and lineup data elements crosslocker **310**. The two interlockers **306**, **308** and the crosslocker **310** are communicatively coupled with and/or have access to the GLF metadata **300**. A GLF data file outputter **312** produces a GLF data file **202** or a combination of GLF data file component files that can be processed by a receiving entity (**108** of **FIG. 2**) into usable programming **109**. The GLF data file outputter **312** may also perform validation of interlocked and crosslocked elements and attributes, including data type validation. The inputters **302**, **304** may also perform the validation of data that is input into the exemplary GLF data file engine **201**.

[**0036**] The purpose of the interlockers **306**, **308** and the crosslocker **310** is to provide completeness and validity to the GLF data file **202** or, in other words, to create a data structure in which expected data elements and attributes for each program are present, complete, and in proper form. The format for providing this completeness and validity is supplied by the GLF metadata **300**. In some implementations of the subject matter, the GLF metadata **300** is a set of rules, a set of tags, one or more templates, and/or one or more markup language schemas for gathering complete information about a program, particularly complete associated lineup information. Specifically, the GLF metadata **300** aims to effect construction of valid channel definitions for a given geographical or geopolitical area where the program will be "broadcast." When the listings data inputter **302** is presented with a program title or unique ID number, therefore, the listings data element interlocker **306** may link other required fields to the prospective program and prompt the listings data inputter **302** and the lineup data inputter **304** to "fill in the blanks" presented by these other required fields before the GLF data file **202** can be considered valid (e.g., pass validity tests, etc.). These consistent and strictly enforced metadata rules with their insistence on completeness enable the GLF data file engine **201** to avoid haphazard insertion of lineup data, which causes incorrect presentation of information, program corruption, and frozen systems.

[**0037**] In some implementations, the GLF metadata **300** takes the form of markup information in a language vehicle, such as extensible markup language (XML). In the case of XML, the elements and attributes of the markup language may be logically linked, for example, by key and keyref constraints that establish and enforce GLF completeness and validity.

[**0038**] It should be noted that if a markup language such as XML is selected as the vehicle for an exemplary GLF, then the GLF data file **202** may validate against one or more GLF.xsd files, as will be discussed more fully below. Also, when the GLF is cast in such a markup language, then all the tools and resources associated with the language may be used to conveniently form and validate GLF data structures and data types.

[**0039**] The listings data element interlocker **306** links listings data elements and attributes with other listings data

elements and attributes. For example, if a listings data element is the program name, e.g., and episode of "Star Trek," then the listings data element interlocker **306** may require a second listings data element, such as the duration of the Star Trek episode, to be supplied to the GLF data file engine **201** and correctly entered as content in a listings data element.

[**0040**] Likewise, the lineup data element interlocker **308** links lineup data elements and attributes with other lineup data elements and attributes. For example, if a lineup data element is a geographical area, e.g., a postal zip code area in San Jose, Calif., then the lineup data element interlocker **308** may require a second lineup data element, such as the name of a headend available in the given zip code area, to be supplied to the GLF data file engine **201** and correctly entered as content into a lineup data element.

[**0041**] The listings and lineup data elements crosslocker **310** links a listings data element or attribute with one or more lineup data elements or attributes. For example, a unit of schedule information (a listings datum) may be relevant only with regard to a certain channel (a lineup datum). The crosslocker **310** requires the channel lineup datum to be supplied and correctly entered once the unit of schedule listings datum is present. Since the crosslocker **310** as well as the interlockers **306**, **308** establish and strictly enforce the GLF described by the GLF metadata **300**, an entire GLF data file **202** (or set of GLF data files) contains consistently applied interlocks and crosslocks providing programming information that is complete and valid for an intended geographical or geopolitical area in which specific language(s) are spoken and in which only some channels but not others are available.

[**0042**] **FIG. 4** shows formation of an exemplary GLF data file **202** in which listings **402** and lineups **404** are formed from GLF metadata **300** residing as a data structure in a computing device memory **400**. A computing device having memory **400** and suitable as an environment for practicing the subject matter will be described in detail in relation to **FIG. 9** below. In the implementation illustrated in **FIG. 4**, listings **402** may contain subcategories of program information **406** and schedule information **408**. Lineups **404**, in this implementation, may contain subcategories of areas **410** (location information), headends **411**, and channel lineup(s) **412** (per headend). Headends define a set of channels available at one source, such as channels on a particular cable service. Examples of headends are: a DirecTV national feed, over-the-air channels for a specific area, and channel offerings of a cable company. Channel lineups (per headend) form the relation between headends and channels. Areas refer to a geographical or geopolitical region in which certain headends exist.

[**0043**] The presence of both the listings **402** and lineups **404** allow the creation of valid channels **413** for stated locations. Incoming data to be formatted according to the exemplary GLF metadata **300** may be selected or formed from listings **402**, lineups **404**, and/or any of the subcategories **406**, **408**, **410**, **411**, **412**.

[**0044**] Within an exemplary GLF data structure, listings data **414** are crosslocked with lineup data **416**, that is, linkages are comprehensively established between fields for listings data elements and relevant and/or supporting fields for lineup data elements. Furthermore, the fields for the elements and sub-elements within the listings data **414** may be interlocked with each other, in addition to being crosslocked with the fields for the elements and sub-elements of the lineup data **416**. Likewise, within the lineup data **416**, fields for elements and sub-elements may be interlocked with each other, as well as crosslocked with fields for the elements and sub-elements of the listings data **414**.

[**0045**] For example, if the listings data "element **1**"**418** is a television episode, for example "Star Trek," then this episode may only be available via a satellite programming distributor, and so the listings data "element **1**"**418** is crosslocked with lineup data "element **1**"**420**, in this case representing the satellite programming distributor. Lineup data "element **1**," in turn, is interlocked to a lineup data sub-element **422** that represents, for example, the specific channel on which the Star Trek episode will be broadcast via satellite. Likewise, returning to listings data "element **1**"**418**, the Star Trek episode is interlocked with a listings data sub-element **424** that represents the time of day that the Star Trek episode will be broadcast. The particular illustrated implementation of interlocking and crosslocking fields for data elements is only meant to illustrate subject matter, in other exemplary GLFs the interlocking and crosslocking may vary.

[**0046**] As information is added, interlocking and crosslocking linkages between fields for data elements are applied throughout the growth of an exemplary GLF data structure as specified by the exemplary GLF metadata **300**. Thus, for example, listings data "element **2**"**426** is crosslocked with lineup data "element **2**"**428** and interlocked with listings data "element **1**"**418**; listings data "element **3**"**430** is crosslocked with lineup data "element **3**"**432** and interlocked with listings data "element **1**"**418** and listings data "element N"**434**; and listings data "element N"**434** is crosslocked with lineup data "element N"**436** and interlocked with listings data "element **3**"**430**. Likewise, fields for the lineup data elements and sub-elements may be interlocked with each other, in addition to being crosslocked with the listings data elements.

[**0047**] **FIG. 5** shows one implementation of a data structure in an exemplary GLF data file **202** in which the crosslocked and interlocked linkages between fields for data elements include "required field" logical relationships. If a first data element is present, such as the illustrated lineup "element **1**"**502** then data fields linked to lineup "element **1**"**502** must also be included and supplied with correctly entered data in order for data file being created to be valid. "Required fields" linked to lineup "element **1**"**502** may include listings elements, such as listings "element **2**"**504**; listings sub-elements, such as "sub-element A"**506**; other lineup elements, such as lineup "element **2**"**508**; and/or lineup sub-elements, such as sub-elements **510**, **512**, **514**, **516** and sub-sub-element **518**, etc. Thus, because the data structure of the exemplary GLF **202** comprises at least some interlocking fields, various sections of the exemplary GLF **202** data structure will be present or absent in an "all-or-nothing" manner. When lineup "element **1**"**502** is added to the GLF **202** data structure then data structure section **520** must also be present in its entirety, in this implementation. An IDP creating the GLF data file **202** may be prompted to add information to complete the data structure section **520** that accompanies or surrounds a new data element, such as lineup "element **1**"**502**.

[0048] Exemplary XSD Implementation of the GLF

[0049] As mentioned above, in one implementation the exemplary GLF metadata **300** includes an XML schema definition (XSD) specification and a set of editorial instructions. A data file whose structure conforms to the GLF.xsd schema offers many features, which will now be described. In XML, data is hierarchically structured. This hierarchical structure is an excellent vehicle for programming content and EPG information, which is also hierarchically structured. An exemplary data file conforming to the GLF.xsd schema facilitates correct generation of data files that a receiving entity **108** having XML database (XDB) capability can import and process to obtain consistent, standardized, reliably complete, and substantially error-free programming data **109**. For example, the programming data **109** is complete relative to schedule information **408** because the GLF.xsd schema directs that schedule data represent a contiguous block of time, wherein all channels that are included exist in the relevant geographical or geopolitical area and are supplied with programming for the entire time range included in the data file, with no gaps.

[0050] An exemplary GLF data file **202** conforming to the GLF.xsd schema requires no additional import work or query tuning and has a rich enough structure to encode currently known programming attributes as well as new attributes as they arise. Further, the GLF.xsd schema is designed to handle international listing data (i.e., in various languages) via XML's XSD facilities. The GLF.xsd schema is also operating system independent: however, XML and XSD validation may be required in some implementations.

[0051] In an exemplary GLF.xsd schema data structure, basic listings relationships are expressed according to strict form. Strict validation is provided to ensure correct data generation and delivery. Although strict form is used, the GLF.xsd schema is relatively compact and efficient, but not to the point where data generation and data validation suffer. A receiving entity **108** using an exemplary GLF schema parses and validates XML documents against world wide web consortium (W3C) XSD compliant schemas. Use of Microsoft's XML 4 (MSXML4) is recommended in some implementations (Microsoft Corporation, Redmond, Wash.). The exemplary GLF.xsd schema enforces referential integrity constraints and required fields on the underlying data and defines additional structure for features that may not be supported by every IDP but must still be rigorously defined. GLF data files **202** conforming to an exemplary GLF.xsd schema may be stored in more than one programming data file to facilitate electronic transfer.

[0052] **FIG. 6** shows exemplary GLF metadata **300**, which includes and/or comprises an exemplary GLF.xsd schema **600**. The illustrated exemplary GLF.xsd schema **600** is an aggregate that can be broken up into components: a GLFListings.xsd component **602**, a GLFLineups.xsd component **604**, and a GLFFundamentals.xsd component **606**.

[0053] The GLFFundamentals.xsd component **606** contains basic data type definitions **607** used in the aggregate GLF.xsd schema **600**. The GLFListings.xsd component **602** defines the portion of the data related to listings **402**, and the GLFLineups.xsd component **604** defines the portion of the data related to lineups **404**. The GLFListings.xsd component **602** and the GLFLineups.xsd component **604** are joined by a common data entity, channels, i.e., valid channel definitions **608**.

[0054] In one implementation, the GLFListings.xsd component **602**, the GLFLineups.xsd component **604**, and the GLFFundamentals.xsd component **606** can be used as separate modules. Because listings and lineups are often produced by different groups of people, that is, different types of IDPs, the division of the aggregate GLF.xsd schema **600** into a GLFListings.xsd component **602** and a GLFLineups.xsd component **604** may be useful in allowing data files conforming to the components **602**, **604** of an aggregate GLF.xsd schema **600** to be produced in different places, by different entities, and/or at different times, and then combined later by the receiving entity **108** to form the aggregate programming data file conforming to the GLF.xsd schema **600**. This is possible because the GLF data structure is consistent and the component parts intra-compatible regardless of where the component piece originate. An IDP that provides only listings information may use only the GLFListings.xsd component **602** (and the GLFFundamentals.xsd component **606** from which definitions are imported). Likewise, an IDP that provides only lineup information may use only the GLFListings.xsd component **604** (and the GLFFundamentals.xsd component **606**).

[0055] The various .xsd schema definition file components **602**, **604**, **606** are self-contained, i.e., they do not need to refer to outside files for schema definition. Thus, the aggregate GLF.xsd schema **600** can combine listings, lineup, channel definition, and data type definition components into a single file representation suitable for electronic transfer or alternatively, as discussed above, the components **602**, **604**, **606** can be electronically transferred independently as separate files.

[0056] Referential Structure of an Exemplary XSD Implementation of GLF

[0057] In one exemplary XSD implementation, the GLF metadata **300** defines three basic entities with primary keys (also called primary "IDs"). These are "program," i.e., the definition of television programming, including fields such as title and description; "channel," i.e., the definition of television programming source, e.g. a broadcaster; and "headend," i.e., the definition of a group of television programming sources. Program, channel, and headend keys (or IDs) are intended to be persisted indefinitely for each IDP **102**, **104**, **106** and not reused, i.e., each provider is responsible for managing their own ID space. This helps to ensure consistency across language translation, and prevents multiplication of IDs for a single program. Such consistency is important for capabilities such as automatic recording of programs. If a program has already been recorded, it would not be desirable to record it again because an additional program ID number has been unnecessarily generated.

[0058] The three basic entities defined above are further related by three additional entities that tie the data together. These are "schedule," i.e., the definition of the program start time and duration on a channel; "lineup," i.e., the definition of sets of channels associated with a specific headend; and "areas," i.e., the definition of headend mapping according to locale, for example by postal code.

[0059] The structured relationships between the three primary entities and the three additional entities comprise metadata for the GLF self-consistency mechanism. The self-consistency metadata expressed as a referential structure establishes and enforces referential integrity of data

between the three primary entities and the three additional entities by means of key and keyref constraints placed at appropriate levels in the XSD. These constraints ensure that all data elements referenced in a relational element (e.g. a schedule element) must be present in the programming data file or the file will not be considered valid.

[0060] A representation of an exemplary XML programming data file conforming to the GLF.xsd schema **600** appears in Appendix A: "Exemplary GLF Data File Sample Which Conforms to the GLF Specification." This representation contains only an abbreviated selection of elements, attributes, and corresponding values. Accordingly, a typical GLF data file **202** conforming to the GLF.xsd schema **600** can contain more entries than those shown, and/or different elements, attributes and/or corresponding values.

[0061] Expandability of the Exemplary XSD Implementation of the GLF

[0062] The self-referential data structure imparted by an exemplary GLF.xsd schema **600** is expandable with regard to both listings and lineups. In an exemplary GLF.xsd schema **600**, listings **602** may consist of program information **406** and schedule information **408**, as discussed above with reference to **FIG. 4**.

[0063] **FIG. 7** shows another implementation of an exemplary GLFListings.xsd component **602** in which the structure of program information **406** can be enriched by linking optional sub-elements and/or attributes, such as program flags **702**, schedule flags **704**, program values **706**, schedule values **708**, program roles **710**, program names **712**, program categories **714**, and various language translations **716**, **718**, **720**, **722**, **724**.

[0064] A flag **702** is a Boolean mechanism used to express general attributes of a program when the domain of possible values that the attribute can assume is small, e.g., television ratings, such as MPAA and Star ratings in the United States, can be represented by a small set of flags corresponding to each possible value.

[0065] The program values **706** and schedule values **708** are general-purpose key-value mechanisms used to express attributes of a program or schedule when the domain of possible values that the attribute can assume is relatively large, e.g., a program's year of release, or a schedule attribute of "primetime Monday." The extensibility of key-value pairs is applicable for both program and schedule types. Any number of key-value pairs may be assigned to a program information entry (**406**) or a schedule information entry (**408**). The schedule values **708** are similar to the program values **706** except that they are for specific airings of a program, e.g., "sponsored by" and "company name."

[0066] Program roles **710** and program names **712** associate cast, crewmembers, and some functions with a program. For example, the names of the writer, producer, and director may be stored in roles as well as casting information, such as "William Shatner as Captain James T. Kirk." Optionally, an explicit attribute for ordering the names and roles is also included. There may also be optional provisions for supporting multiple translations of roles for presentation. Program roles **710** are expressed in this manner to provide strict schema validation and to provide a compact representation without arbitrary restrictions on the number of program roles **710** associated with a program or person. A program map **726** and/or a schedule map **728** may be included in the GLF structure to link program roles **710** and program names **712** to the various program information (**406**) data elements, such as program ID.

[0067] Program categories **714** are a set of references to a hierarchical category structure used to group related programs. For example, it may be useful to categorize all news programs, all sports programs etc. for EPG menuing. Program categories **714** are important attributes for searching. Instead of having to search for a program by title, a user can search a set or tree of hierarchies and find the program without knowing the title.

[0068] The various translations **716**, **718**, **720**, **722**, **724** of text fields (e.g., program title) optional sub-elements, and/or attributes may also be associated with program information **406** and schedule information **408**. If information about a program is available in more than one language, additional program translations can be assigned to a program's unique "program ID" number to accommodate the various languages.

[0069] Schedule information **408** can include the program key (ID) reference, the channel key (ID) reference, a start time, and a duration in seconds, and can map programs to channels by means of the program ID reference, the channel ID reference, and the start time. Like program information **406**, schedule information **408** can be expanded with even more optional sub-elements and/or attributes than illustrated.

[0070] Schedule flags **704** are similar to program flags **702** but exist for specific airings of a program. Thus, a schedule flag **704** is a Boolean mechanism used to express general attributes of an airing when the domain of possible values that the attribute can assume is small, e.g., "closed captioned" which is either true or false. Any number of Boolean schedule flags **704** may be assigned to a schedule entry in the schedule information **408**. Some examples include: U.S. "Vchip" Ratings, U.S. Content Rating, Canadian TV Ratings, Dolby Digital, HDTV, and "Letterbox." A schedule flag **704** may be bound to another schedule flag to indicate, for example, that a given program is in Dolby on Tuesday, but only in regular stereo on Wednesday. Schedule flags **704** may also show the number of parts of a multipart program, or indicate that the program is edited for television. Flag language translation(s) **724** may accompany the schedule flags **704**.

[0071] Like listings **402**, lineups **404** are also expandable via optional sub-elements and attributes, such as lineup type, tuner position, channels per tuner position, and geographical and/or geopolitical areas, which will now be described.

[0072] Lineup types include analog lineup (used for terrestrial broadcast, digital and analog cable), analog satellite (used for large format analog satellite), DVB, ATSC, and "unmapped" (used for any of the above types when the provider cannot provide tuning information). Areas define the availability of lineups (headends, viz sets of channels) in specific geographical and/or geopolitical areas.

[0073] Tuner positions are optional data elements assigned to channels in a lineup. Tuner position data elements represent information used to tune the receiver to the specified channel. This data is generally applicable only in situations where the receiver supports tuning by number (frequency).

In many countries televisions are equipped with radio button style channel selectors that must be configured by the user prior to use (this is similar to old styles of video cassette recorders with "per channel" tuning). An expansion of tuner position is "channels per tuner position" data elements, i.e., more than one channel source occupying a tuner position. These are usually of two types: scheduled and non-scheduled. Scheduled scenarios include programming during primetime followed by a switch to adult programming after a specified time. Non-scheduled means that two or more channels occupy the same tuner position and either could be on at a given time, for example, in the case of PPV channels running free previews on top of paid programming.

[0074] GLF Methods

[0075] **FIG. 8** shows an exemplary method **800** for formatting programming data according to the teachings of the subject matter. This method **800** can be performed by a module, such as the exemplary GLF data file engine **201** shown in FIGS. **2-3**. In the flow diagram, the operations are summarized in individual blocks. The operations may be performed in hardware and/or as machine-readable instructions (software or firmware) that can be executed by a processor.

[0076] At block **802**, a first listings element is received. A listings element may be any data or information related to programming content or the scheduling thereof. For example, a listing element can include the program name, episode number, year of creation, cast, acting roles, crew, ratings, category, length, start time, frequency, etc. The GLF, which may be in the form of GLF metadata **300**, aims to provide comprehensive programming information, so that a given local distributor receiving a GLF data file **202** has all the information at hand that might be needed to provide programming and EPG information in any degree of desired detail.

[0077] At block **804**, listings elements and lineup elements associated with the first listings element are received. The GLF, because of its self-referential structure, ensures completeness of data inclusion. If a data element is required but not entered into a linked field, then the GLF data file **202** is considered invalid. Usually, IDPs have the desired or required information needed to "fill out" the GLF on hand, but proprietary file formatting results in missing parts and/or errors.

[0078] At block **806**, listings and lineup elements are validated. At some point in the process of creating a GLF data file **202**, the various elements and attributes being added to a GLF data structure are verified and/or validated with regard to proper form, including use of proper data types. In some implementations, the validation of block **806** could occur late in the process, but most likely implementation check for valid data types and proper form, including data integrity, checksum matching, etc. upon input. In an exemplary manual input implementation, in which listings and lineup elements are input "by hand" or with human supervision via a user interface or a programming environment, an incorrect data type, for example, can be identified and rejected immediately upon attempted insertion into the GLF data structure. In other implementations, incorrectly formatted data fields or content are identified and/or rectified automatically and/or electronically.

[0079] At block **808**, the associated listings and lineup elements are linked with the first listings element. In other words, a section of a GLF data structure, such as section **520** shown in **FIG. 5**, is thoroughly filled out with elements and attributes, or at least "required field" sections of the data structure section are filled out.

[0080] It should be noted that the interlocks and crosslocks established between various elements of the GLF data structure are logical, not necessarily physical, in nature and so size does not prevent an exemplary large GLF data file **202** from being electronically shipped in parts, for example, in the GLFListings.xsd file **602**, the GLFLineup.xsd file **604**, and the GLFFundamentals.xsd file **606** pieces shown in **FIG. 6**.

[0081] Exemplary Computing Device

[0082] With reference to **FIG. 9**, the components of computer **900** may include, but are not limited to, a processing unit **920**, a system memory **930**, and a system bus **921** that couples various system components including the system memory to the processing unit **920**. The system bus **921** may be any of several types of bus structures including a memory bus or memory controller, a peripheral bus, and a local bus using any of a variety of bus architectures. By way of example, and not limitation, such architectures include Industry Standard Architecture (ISA) bus, Micro Channel Architecture (MCA) bus, Enhanced ISA (EISAA) bus, Video Electronics Standards Association (VESA) local bus, and Peripheral Component Interconnect (PCI) bus also known as the Mezzanine bus.

[0083] Computer **900** typically includes a variety of computer-readable media. Computer-readable media can be any available media that can be accessed by computer **900** and includes both volatile and nonvolatile media, removable and non-removable media. By way of example, and not limitation, computer-readable media may comprise computer storage media and communication media. Computer storage media include volatile and nonvolatile, removable and non-removable media implemented in any method or technology for storage of information such as computer-readable instructions, data structures, program modules, or other data. Computer storage media includes, but is not limited to, RAM, ROM, EEPROM, flash memory or other memory technology, CD-ROM, digital versatile disks (DVD) or other optical disk storage, magnetic cassettes, magnetic tape, magnetic disk storage or -other magnetic storage devices, or any other medium which can be used to store the desired information and which can be accessed by computer **900**. Communication media typically embodies computer-readable instructions, data structures, program modules or other data in a modulated data signal such as a carrier wave or other transport mechanism and includes any information delivery media. The term "modulated data signal" means a signal that has one or more of its characteristics set or changed in such a manner as to encode information in the signal. By way of example, and not limitation, communication media includes wired media such as a wired network or direct-wired connection and wireless media such as acoustic, RF, infrared and other wireless media. Combinations of any of the above should also be included within the scope of computer readable media.

[0084] The system memory **930** includes computer storage media in the form of volatile and/or nonvolatile memory such as read only memory (ROM) **931** and random access memory (RAM) **400**. A basic input/output system **933**

(BIOS), containing the basic routines that help to transfer information between elements within computer **900**, such as during start-up, is typically stored in ROM **931**. RAM **400** typically contains data and/or program modules that are immediately accessible to and/or presently being operated on by processing unit **920**. By way of example, and not limitation, **FIG. 9** illustrates operating system **934**, application programs **935**, an exemplary GLF data file engine **201**, other program modules **936**, and program data **937**. Although the exemplary GLF data file engine **201** is depicted as software in memory **400**, other implementations of an exemplary GLF data file engine **201** can be hardware or combinations of software and hardware.

[**0085**] The computer **900** may also include other removable/non-removable, volatile/nonvolatile computer storage media. By way of example only, **FIG. 9** illustrates a hard disk drive **941** that reads from or writes to non-removable, nonvolatile magnetic media, a magnetic disk drive **951** that reads from or writes to a removable, nonvolatile magnetic disk **952**, and an optical disk drive **955** that reads from or writes to a removable, nonvolatile optical disk **956** such as a CD ROM or other optical media. Other removable/non-removable, volatile/nonvolatile computer storage media that can be used in the exemplary operating environment include, but are not limited to, magnetic tape cassettes, flash memory cards, digital versatile disks, digital video tape, solid state RAM, solid state ROM, and the like. The hard disk drive **941** is typically connected to the system bus **921** through a non-removable memory interface such as interface **940**, and magnetic disk drive **951** and optical disk drive **955** are typically connected to the system bus **921** by a removable memory interface such as interface **950**.

[**0086**] The drives and their associated computer storage media discussed above and illustrated in **FIG. 9** provide storage of computer-readable instructions, data structures, program modules, and other data for computer **900**. In **FIG. 9**, for example, hard disk drive **941** is illustrated as storing operating system **944**, application programs **945**, other program modules **946**, and program data **947**. Note that these components can either be the same as or different from operating system **934**, application programs **935**, other program modules **936**, and program data **937**. Operating system **944**, application programs **945**, other program modules **946**, and program data **947** are given different numbers here to illustrate that, at a minimum, they are different copies. A user may enter commands and information into the computer **900** through input devices such as a keyboard **962** and pointing device **961**, commonly referred to as a mouse, trackball, or touch pad. Other input devices (not shown) may include a microphone, joystick, game pad, satellite dish, scanner, or the like. These and other input devices are often connected to the processing unit **920** through a user input interface **960** that is coupled to the system bus, but may be connected by other interface and bus structures, such as a parallel port, game port, or a universal serial bus (USB). A monitor **991** or other type of display device is also connected to the system bus **921** via an interface, such as a video interface **990**. In addition to the monitor, computers may also include other peripheral output devices such as speakers **997** and printer **996**, which may be connected through an output peripheral interface **995**.

[**0087**] The computer may operate in a networked environment using logical connections to one or more remote computers, such as a remote computer **980**. The remote computer **980** may be a personal computer, a server, a router, a network PC, a peer device or other common network node, and typically includes many or all of the elements described above relative to computer **900**, although only a memory storage device **981** has been illustrated in **FIG. 9**. The logical connections depicted in **FIG. 9** include a local area network (LAN) **971** and a wide area network (WAN) **973**, but may also include other networks. Such networking environments are commonplace in offices, enterprise-wide computer networks, intranets, and the Internet.

[**0088**] When used in a LAN networking environment, the computer **900** is connected to the LAN **971** through a network interface or adapter **970**. When used in a WAN networking environment, the computer **900** typically includes a modem **972** or other means for establishing communications over the WAN **973**, such as the Internet. The modem **972**, which may be internal or external, may be connected to the system bus **921** via the user input interface **960**, or other appropriate mechanism. In a networked environment, program modules depicted relative to the computer **900**, or portions thereof, may be stored in the remote memory storage device. By way of example, and not limitation, **FIG. 9** illustrates remote application programs **985** as residing on memory device **981**. It will be appreciated that the network connections shown are exemplary and other means of establishing a communications link between the computers may be used.

CONCLUSION

[**0089**] It should be noted that the subject matter described above can be implemented in hardware, in software, or in both hardware and software. In certain implementations, the exemplary system and related methods may be described in the general context of computer-executable instructions, such as program modules, being executed by a computer. Generally, program modules include routines, programs, objects, components, data structures, etc. that perform particular tasks or implement particular abstract data types. The subject matter can also be practiced in distributed communications environments where tasks are performed over wireless communication by remote processing devices that are linked through a communications network. In a wireless network, program modules may be located in both local and remote communications device storage media including memory storage devices.

[**0090**] The foregoing discussion describes exemplary systems and methods for a GLF for programming content and EPG information. Although the invention has been described in language specific to structural features and/or methodological acts, it is to be understood that the subject matter defined in the appended claims is not necessarily limited to the specific features or acts described. Rather, the specific features and acts are disclosed as exemplary forms of implementing the claimed invention.

1. A method of formatting multimedia programming data for electronic transfer, wherein the programming data has data elements comprising:

establishing a completeness and validity format for the data;

receiving data elements;

arranging the data elements according to the completeness and validity format.

2. The method as recited in claim 1, wherein the completeness and validity format interlocks data elements to achieve programming data completeness.

3. The method as recited in claim 2, wherein the programming data comprises listings data elements and lineup data elements.

4. The method as recited in claim 3, wherein for each listings data element received the completeness and validity format interlocks associated listings data elements to achieve complete and valid listings data.

5. The method as recited in claim 3, wherein for each lineup data element received the completeness and validity format interlocks associated lineup data elements to achieve complete and valid lineup data.

6. The method as recited in claim 3, wherein the completeness and validity format crosslocks lineup data elements to listings data elements to achieve data completeness and validity.

7. The method as recited in claim 6, wherein for received listings data elements representing a multimedia program entity the completeness and validity format crosslocks enough lineup data elements to achieve a valid channel definition.

8. The method as recited in claim 7, wherein a valid channel definition a description of a valid multimedia channel for airing the multimedia program entity in a given area.

9. The method as recited in claim 3, wherein the completeness and validity format further interlocks a first listings data element with a second listings data element comprising one of a program role data element, a program name data element, a program value data element, a program map data element, a program category data element, a program flag data element, and a language translation data element.

10. The method as recited in claim 3, wherein the completeness and validity format further interlocks a first listings data element with a second listings data element comprising one of a schedule flag data element and a schedule flag translation data element.

11. The method as recited in claim 3, wherein the completeness and validity format further interlocks a first lineup data element with a second lineup data element comprising one of an area data element, a headend data element, and a channel lineup data element.

12. The method as recited in claim 1, wherein the arranging includes checking each received programming data elements for a valid format to achieve programming data validity.

13. A method for linking multimedia information for electronic transfer, comprising:

linking a first multimedia information field with a second multimedia information field, wherein if information is stored in the first information field, then information is required to be stored in the second information field;

receiving multimedia information; and

storing the multimedia information in the first and second information fields.

14. The method as recited in claim 13, wherein the first and second information fields may be any combination of listings information fields and lineup information fields.

15. The method as recited in claim 14, wherein listings information fields can store program and schedule information elements, and lineup information fields can store location, headend, and channel lineup information elements.

16. The method as recited in claim 14, further comprising linking a first listings information field with a first lineup information field, wherein if listings information is stored in the first listings information field, then lineup information is required to be stored in the first lineup information field.

17. The method as recited in claim 16, further comprising linking the first listings information field with a second listings information field, wherein if information is stored in the first listings information field, then information is required to be stored in the second listings information field.

18. The method as recited in claim 16, further comprising linking the first lineup information field with a second lineup information field, wherein if information is stored in the first lineup information field, then information is required to be stored in the second lineup information field.

19. The method as recited in claim 13, wherein the linking uses extensible markup language schema definition (XML XSD) keys and keyref constraints.

20. The method as recited in claim 13, wherein the linking uses a relational representation of a global listings format.

21. The method as recited in claim 20, wherein the multimedia information includes keys and foreign keys and the relational representation uses key and foreign key constraints.

22. A method for formatting multimedia programming information having listings elements and lineup elements according to a global listings format (GLF), wherein the GLF requires each listing element to be validated and linked with associated validated listings elements and linked with associated validated lineup elements to provide complete and valid programming information for an area, comprising:

receiving a listings element;

receiving associated listings elements and associated lineup elements to link to the listings element;

if the associated listings and lineup elements are missing, then prompting for the associated listings and lineup elements;

validating the listings element, the associated listings elements, and the associated lineup elements; and

linking the associated listings elements and the associated lineup elements with the listings element according to the GLF.

23. The method as recited in claim 22, wherein an area is a geographical and/or geopolitical region.

24. The method as recited in claim 22, wherein an area is a region characterized by specific languages spoken in the region.

25. The method as recited in claim 22, wherein an area is a region characterized by specific multimedia programming channels available in the region.

26. A method of creating a self-consistent data structure for transferring multimedia programming data, comprising:

creating listings information elements;

creating lineup information elements; and

linking logically related listings information elements with each other and with logically related lineup information elements to create the self-consistent data structure.

27. The method as recited in claim 26, wherein the linking further comprises linking logically related lineup information elements with each other.

28. The method as recited in claim 26, further comprising linking listings information elements with lineup information elements to consistently describe valid channels in given geographical and geopolitical areas for multimedia program entities.

29. The method as recited in claim 26, further comprising preventing invalid representation of information elements data by checking the form of the information elements.

30. The method as recited in claim 29, further comprising using a pre-established information element format having allowed information element forms and allowed data types.

31. The method as recited in claim 26, wherein the self-consistent data structure uses extensible markup language schema definition (XML XSD) keys and keyref constraints.

32. The method as recited in claim 26, wherein the self-consistent data structure is expressed as a relational representation of a global listings format.

33. The method as recited in claim 32, wherein the relational representation uses key and foreign key constraints.

34. A method for arranging multimedia program content having program information elements, channel information elements, and headend information elements, comprising:

establishing rules for relating the program information elements with both the channel information elements and the headend information elements to create consistently structured data; and

relating the program information elements with the channel information elements and the headend information elements according to the rules to create the consistently structured data.

35. The method of claim 34, further comprising electronically transferring the multimedia program content, comprising:

sending the consistently structured data to a recipient; and

verifying the accuracy and validity of the program information elements, the channel information elements, and the headend information elements using the rules.

36. The method as recited in claim 34, wherein the multimedia program content is arranged according to an extensible markup language schema definition (XML XSD), and the rules include one or more keys and keyref constraints placed in the schema to verify that each of the program information elements, each of the channel information elements, and each of the headend information elements are present and valid.

37. The method as recited in claim 34, wherein the multimedia program content is arranged according to a relational representation of a global listings format.

38. The method as recited in claim 37, wherein the information elements include keys and foreign keys and the relational representation expresses key and foreign key constraints.

39. The method as recited in claim 34, further comprising relating the program information elements, the channel information elements, and the headend information elements with schedule information elements, lineup information elements, and location information elements according to the rules.

40. A computer-readable medium having stored thereon a data structure, comprising:

a first data field containing data representing a listings element of a multimedia program; and

a second data field containing data representing a lineup element of the multimedia program logically related to the listings element, wherein the lineup element is at least part of information required to establish a valid channel definition for airing the multimedia program in a given region.

41. The computer-readable medium having stored thereon a data structure as recited in claim 40, further comprising a third field containing data representing metadata for deciding if the lineup element is sufficient to establish the valid channel definition and for adding additional lineup elements to data fields of the data structure if the lineup element is not sufficient.

42. The computer-readable medium having stored thereon a data structure as recited in claim 40, wherein the data structure is created in sections having required fields and the metadata further comprises data structure completeness and validity information, wherein if a section of the data structure is created then data must be stored in each required field in the created section of the data structure.

43. A global listings format for electronic program guide information, comprising:

listings data fields, wherein at least some of the listings data fields are interlocked with each other; and

lineup data fields crosslocked with the listings data fields, wherein at least some of the lineup data fields are interlocked with each other.

44. The global listings format as recited in claim 43, further comprising a self-consistency mechanism.

45. The global listings format as recited in claim 44, wherein the self-consistency mechanism includes extensible markup language keys and keyref constraints.

46. A data file engine for producing multimedia programming arranged in a completeness-and-validity format, wherein the multimedia programming includes listings data elements and lineup data elements, comprising:

a store of completeness-and-validity metadata;

a listings data element interlocker communicatively coupled with the store of completeness-and-validity metadata;

a lineup data element interlocker communicatively coupled with the store of completeness-and-validity metadata; and

a listings and lineup data elements crosslocker communicatively coupled with the listings data element interlocker, the lineup data element interlocker, and the store of completeness-and-validity metadata.

47. The data file engine as recited in claim 46, further comprising a listings data inputter and a lineup data inputter.

48. The data file engine as recited in claim 47, wherein the listings data inputter and the lineup data inputter perform validity checks on the listings data elements and the lineup data elements.

49. A system for electronically transferring multimedia programming content, comprising:

metadata describing complete and valid multimedia programming; and

a data file engine having access to the metadata to produce a data file having substantially complete and valid multimedia programming information.

50. The system as recited in claim 49, wherein the data file engine further comprises one or more interlockers to link logically related data elements of the multimedia programming content according to the metadata.

51. The system as recited in claim 49, wherein the data file engine further comprises a crosslocker to link listings elements of the multimedia programming with lineup elements of the multimedia programming.

52. A global listings format (GLF) data file for transferring multimedia programming content, comprising:

an expandable multimedia programming listings component; and

an expandable multimedia programming lineup component.

53. The GLF data file as recited in claim 52, further comprising an expandable data type definitions component.

54. The GLF data file as recited in claim 53, wherein each of the GLF data file and the components are XML schema definition (XSD) files.

55. One or more computer readable media containing instructions that are executable by a computer to perform actions comprising:

receiving a first listings element from multimedia programming information having listings elements and lineup elements;

receiving additional listings elements and lineup elements associated with the first listings element;

validating the listings and lineup elements; and

linking the additional listings elements and lineup elements with the first listings element in a data structure.

56. One or more computer readable media as recited in claim 55, the actions further comprising:

using completeness and validity metadata to expand the data structure by receiving subsequent listings elements and linking related listings and lineup elements with the subsequent listings elements.

57. One or more computer readable media as recited in claim 55, wherein the validating further comprises verifying data types of the listings elements and the lineup elements.

58. A computer-readable medium having stored thereon metadata, comprising:

rules for consistently formatting multimedia programming data; and

rules for achieving completeness of the multimedia programming data.

59. The computer-readable medium having stored thereon metadata as recited in claim 58, wherein the rules for consistently formatting multimedia programming data further comprise instructions to interlock a first listings data element with a second related listings data element.

60. The computer-readable medium having stored thereon metadata as recited in claim 58, wherein the rules for consistently formatting multimedia programming data further comprise instructions to interlock a first lineup data element with a second related lineup data element.

61. The computer-readable medium having stored thereon metadata as recited in claim 58, wherein the rules for consistently formatting multimedia programming data further comprise instructions to crosslock a first listings data element with a first related lineup data element.

62. The computer-readable medium having stored thereon metadata as recited in claim 58, further comprising rules for accounting for each element of multimedia programming data.

63. The computer-readable medium having stored thereon metadata as recited in claim 62, further comprising instructions to refer to each element of multimedia programming data.

64. The computer-readable medium having stored thereon metadata as recited in claim 58, further comprising rules for validating each element of multimedia programming data.

65. The computer-readable medium having stored thereon metadata as recited in claim 58, wherein the rules for achieving completeness of the multimedia programming data include rules for creating a data structure of multimedia programming data elements and completing a section of the data structure generated by the rules once a piece of the section has been generated by adding a data element according to the rules.

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