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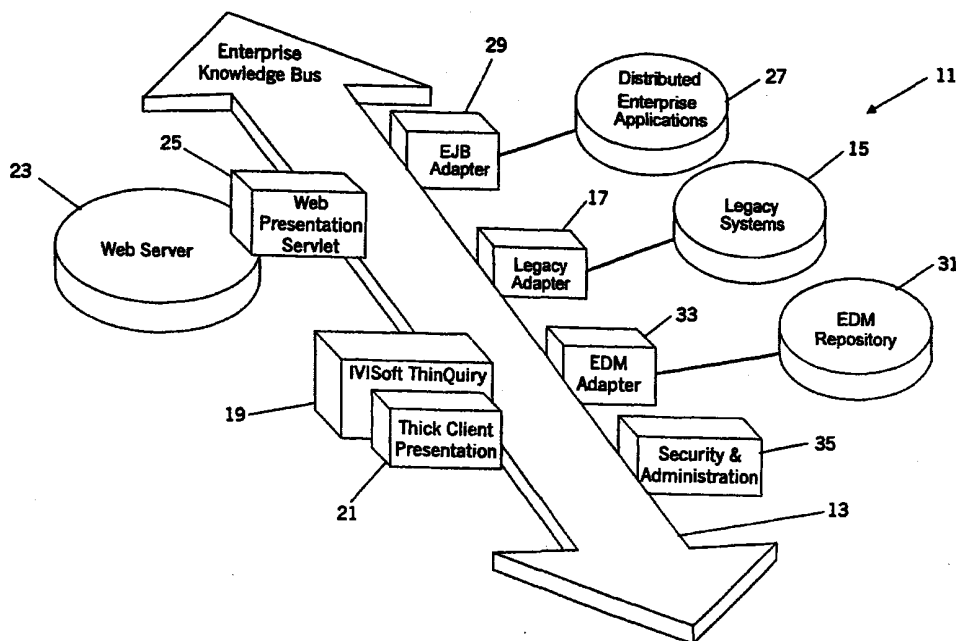
(43) International Publication Date
12 April 2001 (12.04.2001)

PCT

(10) International Publication Number
WO 01/25969 A1

- (51) International Patent Classification⁷: G06F 17/30
- (21) International Application Number: PCT/US00/27120
- (22) International Filing Date: 2 October 2000 (02.10.2000)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
09/411,016 1 October 1999 (01.10.1999) US
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- (81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZW.
- (84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).
- 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: MAPPING BUSINESS CONCEPTS TO STORED DATA IN APPLICATION DATABASES



(57) Abstract: A method and a system that provides for mapping business concepts (13) to data stored (35) in databases (31) for legacy business systems (15) and for accessing the data. The schema for at least one business system (35) is determined. Business concepts (13) within the system are then defined and mapped to elements of the schema. Views are then created for displaying the business concepts (27) to end users and for allowing end users to access and work with the data in the database (31).

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MAPPING BUSINESS CONCEPTS TO STORED DATA IN APPLICATION DATABASES

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Background of the Invention

This invention relates to a method of creating a graphical user interface for accessing existing application databases, and to a system used for accessing and working with the data.

10 In the past, a number of mainframe centric financial systems were developed for use by large companies. The systems developed included systems for accounts payable, general ledgers, fixed assets, project accounting, purchasing and materials management. The systems were built and maintained using traditional mainframe technologies, with the systems employing COBOL, CICS, VSAM, and IMS based technologies. The systems provided high production capabilities and permitted high transaction processing volumes.

15 Subsequent to this early development, client/server computing technologies emerged as computing platforms which offered more flexibility than the traditional mainframe centric applications. Object oriented programming resulted in the development of graphical user interfaces for use in connection with these client/server systems which were intuitive and easy to use. However, these graphical user interfaces were not designed and could not be used to
20 access the previously discussed mainframe systems and databases, among other reasons, because the talent level of those that developed the original mainframe applications no longer existed, and there was little understanding of the mainframe system architecture. Thus, it has become desirable to develop a user interface based application which allows access to existing mainframe databases, for example, which are VSAM applications based, to allow
25 present day users to discontinue the use of the traditional CICS "greenscreens", thereby allowing a more productive user interface for performing inquiry and information exploration activities. Similarly, an interface can be developed for distributed enterprise applications as well as electronic document management (EDM) systems and relational database management systems.

30

Summary of the Invention

In accordance with the invention, it is recognized that data forms the foundation of

information systems in the traditional enterprise mainframe. For purposes of this document, it is understood that the term enterprise mainframe systems include systems which run what are typically known as “legacy” applications, and the terms are used interchangeably herein.

Thus, in accordance with one aspect of the invention, in creating the user interface, a dictionary database of enterprise business concepts in the enterprise mainframe systems is defined and built. By the term “business concepts” is meant “natural business concepts” and semantics as opposed to vendor supplied business concepts, i.e., the vendor will develop the original applications. Thus, in accordance with the invention, a “customer” concept is rendered as a “customer” and not an acronym like “cust” or cryptic code like “CC”. In addition, different concepts may mean different things in two different parts of the enterprise. For example, the term “balance” will have a different meaning in the financial accounting domain as compared to the same term in the manufacturing or engineering domain. Thus, in accordance with a specific aspect of the invention, business concepts are defined and mapped to data in the enterprise system databases. In addition, different business concept definitions are provided and mapped to this specific business concept phase so that the appropriate definition is provided in accessing data in the appropriate business domain.

Thus, in a broad aspect, the user interface is created by defining and building a dictionary database of enterprise business concepts. For example, a minimal business concept definition should include but not be limited to 1) the specification of the name or title of the business concept, e.g., the common names such as “company”; 2) a brief description of the various meanings associated with the business concept; and 3) the specification of the composition of the business concept, i.e., what other concepts if any in the particular concept made up of.

Once the business concepts are defined in the dictionary, they are then mapped to the actual physical data contained in any one or more of the existing enterprise application systems. The mapping of the business concepts to the physical data is conducted through logical/phrase modeling conventional technology, such as through the use of data filters, interpreters, and/or system interrogators which are used to validate the data mappings and will make the data actually visible and available for use. In this regard, conventional parsing “techniques” are used to effectively associate the physical data elements to the business

concepts which are defined as objects in the graphical user interface. The user interface which is an information inquiry tool is developed with the use of Java and XML, for example, and can run on any platform that supports the Java Virtual Machine (JVM). In this manner, the graphical user interface can access, navigate, traverse, and discover enterprise data as well as mapping to more modern platforms and interrelating the data from the enterprise system to similar business concepts in the more modern platforms while providing a consistent user interface to the user. Once a user interface is developed, a runtime connection and communication with the physical database/source is established allowing formulation and execution of the actual queries as requested by the end-user through the user interface.

Thus, in a more specific aspect, the invention relates to a method of mapping business concepts to data stored in databases for legacy business systems, and for accessing the data. For purposes of defining the invention herein, it is noted that while the term "legacy business system" is used to describe traditional legacy applications, for purposes of implementing the invention, it can also relate to distributed enterprise applications as well as electronic data management repositories, and relational database management systems (RDBMS). In all cases, these types of systems have been programmed and operate with traditional methodologies. In accordance with the invention, business concepts for all of these types of systems are defined and mapped to data contained in databases associated therewith.

Generally, the invention involves determining the schema for at least one existing business system. Thereafter, business concepts contained within the business system are defined, and the business concepts in the system are mapped to elements making up the schema. The user then creates views for displaying the business concepts to end users, and for allowing end users to access and work with the data in the database. This is done typically at a desktop connected directly through a bus to the system, or alternatively, through a web server connected to the business system through a bus.

In another aspect, the invention relates to a system for mapping business concepts to data stored in databases for business systems and for accessing the data. The system includes means for determining the schema for at least one existing business system. As will be apparent, such means can be made up of software tools or can be a runtime interface. Means for mapping the business concept in the business system to elements making up the schema is

provided, and can include a desktop system with appropriate software. The desktop system interacting with the software then also includes means for creating views for displaying the business concepts to end users and for allowing the end users to access and work with the data within the business system through views created for the data related to the business
5 concepts.

Brief Description of the Drawings

Figure 1 is a schematic diagram of one embodiment illustrating how the system of the invention is implemented;

10 Figure 2 is a flow diagram illustrating how modeling is conducted according to the invention to access data in an existing system;

Figure 3 is a block diagram illustrating how data in an existing system is adapted into a generic format readable by an end user;

Figure 4 illustrates a process overview of the invention;

15 Figure 5 illustrates how the schema for an existing system is captured;

Figure 6 illustrates how concepts are defined and mapped to data in an existing system;

Figure 7 illustrates how mapping between concepts and elements of a schema are achieved;

20 Figure 8 illustrates how the presentation of consumer or end user concepts for a consumer's or end user's use is accomplished;

Figure 9 illustrates how localized properties for each concept is created;

Figure 10 illustrates how views for each concept are created;

25 Figures 11 and 12 consisting of Figures 11A, 11B, 12A, 12B and 12C illustrate in code form how the conceptual modeling process of Figure 6 is achieved;

Figure 13 illustrates in code form how the views for implementing of the process of Figure 10 is achieved;

Figure 14 consisting of Figures 14A and 14B illustrates in code form how the localized properties are created in the process of Figure 9; and

Figure 15 consisting of Figures 15A and 15B illustrates in code form how the mappings are created between concepts and elements of a schema in the process of Figure 7.

Detailed Discussion of the Invention

5 In a specific implementation of the system, a multi-tiered client-server view is presented. In one aspect, a user interface with the business concepts defined and set forth in a dictionary is developed where the business concepts are data objects in a generic format and have logical semantics. The user interface connects to a business system adapter which transforms data which is structured in a legacy systems native database into a generic data
10 format which is readable by the user interface and serves to transform query requests into a format acceptable to the native databases query interface. This is done by generation of data objects which are in the native data base interface format and include database semantics. Through the business system, e.g., enterprise system having legacy applications and a data store, the data is accessed through the data access interface through the use of the data
15 objects.

 In developing the interface, initially, the presentation for the interface is created by defining and visually creating the business concepts which can include such concepts as "company," "purchase order," "original order," etc. and mapping the various business concepts to each other. Thereafter, in the context of the applications to be accessed,
20 correlations between the elements in the logical object model and elements in the data store physical mode are defined and stored in a schema. The structure of an enterprise or legacy application is defined by characterizing its model, entities, dependents, attributes (including data type, and length), including those which are primary and searchable, as well as associations between data.

25 Having thus generally described some of the aspects of the invention, the following is a more detailed description thereof making reference to the appended drawings.

 Figure 1 illustrates in schematic form the general system of the invention. As may be appreciated, at its most basic level, the system includes a bus 13. Connected to the bus 13 is a desktop system 19 and 21, which includes a customer or end user presentation module 21,
30 and an interface 19, and makes up part of the system of the invention for defining business

concepts and connecting business concepts to a legacy system 15. The legacy system 15 is also connected to the bus 13 and includes a database containing data relating to the business concepts as further defined herein. The legacy system 15 is connected through a legacy adapter 17 to the bus to allow the two systems to communicate as will become clearly more evident from the following discussion.

While the system 11 will be described with specific reference to legacy system 15, and directly connected desktop 19 and 21, it will be readily apparent that the system can be implemented with a remote web server 23 which connects through a web presentation application 25 through the Internet to the bus 13. Similarly, other types of systems such as distributed enterprise applications 27 can be connected to the bus through an enterprise Java Bean adapter 29, or an electronic data management repository 31 can be connected through an electronic data management adapter 33 to the bus 13 for providing access thereto through the use of common business concepts. A security and administration system 35 can also be connected to the bus 13 in a conventional manner. Thus, in accordance with the system of the invention, corporate information can be accessed throughout an entire system, making knowledge shareable with various consumers and end users of the system throughout a corporate enterprise.

As maybe further appreciated, in accordance with the system of the invention, at its most basic level, the data structure of the database is mapped to a common structure usable by the desktop, which is then mapped to a presentation format, for example, through the use of HTML, conventional graphical user interface technologies, etc., as will be readily apparent to those of ordinary skill in the art. For each system connected to the bus, business concepts are defined and mapped to the schema for each system. This is done using conventional object programming techniques. In all cases, a detailed understanding about the data stored is required, as well as what data is stored. Thereafter, the common concepts can be defined and mapped through data modeling to the data in the database.

Thus, as shown in Figure 2, at the configuration stage below the dotted line, definitions are created and viewed at step 41 and related to business concepts at step 43. The business concepts are then mapped to the schema at step 45. How the concepts are presented at the end user or localized level, are defined at step 47. This is all done during runtime

interfacing and then the elements which have been configured are used in a runtime environment as indicated by the solid arrow. Thus, in a runtime environment, the existing legacy system 15 is connected through a legacy adapter to link data to concepts at step 51. The content is then generated at step 49 and related to the data obtained from the system 15
5 for use by an end user.

This operation is better shown in Figure 3 which shows how runtime system components are used for conceptual adaptation. In this case, a client indirect generic integration adapter 61 is provided which receives data objects 63 from a business system adapter module 65. The business system adapter module includes a generic business system
10 data access interface 67 for providing the data objects to the client generic integration adapter 61. On the back end, a native container adapter 69 is provided for receiving data objects 71 which are in the native database interface format and contains database semantics as received from or passed to the business system 75 through a native container data access interface 73, which interfaces to the data store 79 associated with the legacy application 77.

15 Figure 4 more conceptually illustrates the modeling process overview by illustrating the schema capture and the definition of the concepts to then map the concepts to the schema as illustrated by the arrows therein.

Figure 5 illustrates the modeling process for schema capture. This task provides for the capture of data store schemas for an existing business system. If the system being adapted
20 provides a runtime interface to its database schema, such as through ODBC or a native database driver, the runtime interface may be utilized to access the business system schema elements. Otherwise, the schema of the system must be captured by other means, for example, through a set of tools, all of which, upon knowledge of the invention as described herein, are readily apparent to those of ordinary skill in the art.

25 Figure 6 further illustrates the conceptual modeling process in which concepts are defined and mapped to the schema. More specifically, this figure illustrates the defining of the concepts and relationships between concepts that are contained within a business system, the details of which are more clearly illustrated in example form through the code shown in Figures 11A, 11B, 12A, 12B and 12C where specifically, as further discussed herein, Figures
30 11A through 12C show various examples of configuration resources required by runtime

components of the integration/adaptation system in order to provide concepts, mapping of concepts to schemas of back-end systems, and dynamically generated views of concepts to a variety of client devices in a language-independent manner. Thus, Exhibit 1 shown in Figures 11A and 11B is an example of a concept definition (XMI) file. This file specifies the structure of a concept and its relationship to other concepts. In this Exhibit 1, the concept defined is an automated clearing house vendor.

Figures 12A, 12B and 12C consisting of Exhibit 2 are an example of a “concept model” (XMI) index file. This file specifies a set of concepts and their relationships to other concepts. Many concept definitions and relationships are stored within a conceptual model. The conceptual model acts as an index of concepts and has references to concept definition files contained within it. Three concepts are contained in Exhibit 2, i.e., automated clearing house vendor, bank, and calendar entry.

Figure 7 further illustrates the conceptual modeling process to maintain concepts to schema mappings and is self-explanatory from a viewing thereof. Specifically, when concepts have been defined, and schemas have been captured, mappings are created between concepts and elements. This is further illustrated in greater detail by Figures 15A and 15B showing Exhibit 5 as an example of a mapping file for concept elements to schema elements. Specifically, this file provides for attributes of concepts to be mapped to elements of a schema. There may be multiple mapping files for concepts of a system, if the concepts are mapped onto multiple data store types for partitions of data. The examples shown in Exhibit 5 illustrate a one-to-one mapping of an automated clearing house vendor concept to a corresponding record of a VSAM-based schema.

Figure 8 further illustrates the presentation development process overview in which localized resources are defined for modeling and the layouts are then defined for presentation to an end user.

Figure 9 further illustrates the presentation development process for maintaining localized resources. Specifically, as illustrated therein, localized properties for each concept in the conceptual model of a system are created. Localized resources are properties such as text or graphics that are associated with concepts in a specific locale. They are used to provide internationalizable properties used within views of concepts that are presented to end

users or customers.

Figures 14A and 14B provide an example of a localized resource file for a concept. Specifically, Figures 14A and 14B illustrate a file in which language-specific presentation properties are related to a concept. Exhibit 4 thereof provides an example of how English-
5 language properties are specified for a concept (automated clearinghouse vendor). As will be readily apparent from a viewing thereof, multiple localized resource files may exist for a single concept such as shown in Figures 11A and 11B, and one file per locale (language) for which the concept may be viewed.

Finally, Figure 10 illustrates the presentation development process in which views are
10 defined for presentation to an end user or customer. Specifically, as shown therein, when concepts have been defined, views can be created for each concept such as, for example, in a graphical user interface. A view specifies how features of a concept will be laid out when presented to an end user through a terminal. View layouts define the structure of the view, and view style sheets define styles of the view such as colors, additional graphics, font sizes,
15 etc. By using the view layouts, presentation resources, and style sheets, a presentation rendering system can dynamically create views of concepts at runtime on a variety of client devices. A further example of this is illustrated in Figure 13 which shows Exhibit 3 as a file which specifies layout information for review of a concept. Field definition tags within the file make reference to attribute tags in a concept definition file, i.e., Figures 11A and 11B.
20 Defined in the example of Exhibit 3 as shown in Figure 13 is a tabular view of an automated clearing house vendor.

Having thus briefly described the invention, the same will become better understood from the appended claims in which it is set forth in a non-limiting manner.

Claims

What is claimed is:

1. A method of mapping business concepts to data stored in databases for business systems, and for accessing said data, comprising:
 - 5 determining the schemas for at least one existing business system;
defining business concepts contained within the business system;
mapping the business concepts in the business system to elements making up the schema; and
creating views for displaying the business concepts to end users, and for
10 allowing end users to access and work with the data in the database.
 2. The method of claim 1, further comprising connecting said existing business system to a bus, and accessing said database of the business system and the business system through a desktop system connected to the bus for mapping said business concepts to said data, and for accessing said data by interfacing through said business concepts.
 - 15 3. The method of claim 1, wherein said business system, further comprising:
determining the schema for each one of a plurality of business systems;
defining common business concepts contained within the plurality of business systems;
mapping the business concepts in each one of the plurality of the business
20 systems; and
creating views for displaying the business concepts to end users.
 4. The method of claim 1, further comprising creating a dictionary of business concepts contained in the business system.
 5. The method of claim 1, wherein said determining or creating the schema for an
25 existing business system is conducted by reviewing indexes of the database for the business system.
 6. The method of claim 1, further comprising connecting said existing business system to a bus, mapping the business concepts to the data stored in the database thereof, and accessing the data in the database through use of web browser on a system connected to the
30 bus through the Internet.

7. The method of claim 1, further comprising presenting the business concepts to end users in a runtime environment, and having the end users access data corresponding to the business concepts by interfacing with the business systems through representations of said business concepts.

5 8. The method of claim 1, further comprising determining the schema for an existing business system through the use of a runtime interface to its schema.

9. The method of claim 1, further comprising determining the schema for an existing business system through the use of a set of software tools.

10 10. The method of claim 1, further comprising creating localized properties for each business concept for presenting properties used within the concepts to end users.

11. A system for mapping business concepts to data stored in databases for business systems, and for accessing said data, comprising:

means for determining the schema for at least one existing business system;

means for defining business concepts contained within the business system;

15 means for mapping the business concepts in the business system to elements making up the schema;

means for creating views for displaying the business concepts to end users, and for allowing the end users to access and work with the data.

12. The system of claim 11, further comprising a bus to which the business system and its database is connected, and a desktop system connected to the bus for mapping said business concepts to said data, and for accessing said data by interfacing through said business concepts.

13. The system of claim 11, further comprising means for determining the schema for each one of a plurality of business systems, means for defining common business concepts contained within the plurality of business systems; means for defining common business concepts contained within the plurality of business systems; means for mapping the business concepts in each one of the plurality of the business systems; and means for creating views for displaying the business concepts to end users.

14. The system of claim 1, further comprising a dictionary of business concepts contained in the business system.

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15. The system of claim 1, further comprising means for reviewing indexes of the database for the business system.

16. The system of claim 1, further comprising a bus to which said existing business system and its database are connected; and a remote terminal having a web browser
5 for connection to said bus from the Internet for mapping the business concepts at the web browser to the data stored in the database, and for accessing the database through the web browser.

17. The system of claim 1, further comprising means for presenting the business concepts to end users in a runtime environment and for having said users access data
10 corresponding to the business concepts by interfacing with the business system through representations of said business concepts.

18. The system of claim 1, further comprising a runtime interface for determining the schema of an existing business system.

19. The system of claim 11, further comprising software tools for determining the
15 schema for an existing business system.

20. The system of claim 11, further comprising means for creating localized properties for each business concept for presenting properties used within the concepts to end users.

21. A method of creating an interface for use in accessing existing enterprise
20 mainframe system databases, comprising:

defining and building a dictionary database of enterprise business concepts in the enterprise mainframe system;

mapping each defined enterprise business concept in the dictionary database to other business concepts in the enterprise mainframe system;

25 mapping each defined business concept in the dictionary database to corresponding data in the existing enterprise mainframe system databases; and

generating a representation of each defined business concept in the dictionary database, whereby the data in the existing enterprise mainframe system databases corresponding to the business concepts defined can be accessed by linking through
30 said representation of each defined business concept.

22. A system for accessing and processing data in enterprise mainframe system databases, comprising;

5 means for displaying data objects representative of business concepts in enterprise mainframe systems databases, and for displaying said data objects in a graphical user interface to users of the system;

means for transforming data in enterprise mainframe system databases into generic data formats;

means for linking said data objects to said data in said generic data formats; and

10 means for transforming query requests through linking of said objects into a format acceptable to an enterprise mainframe system database's query interface.

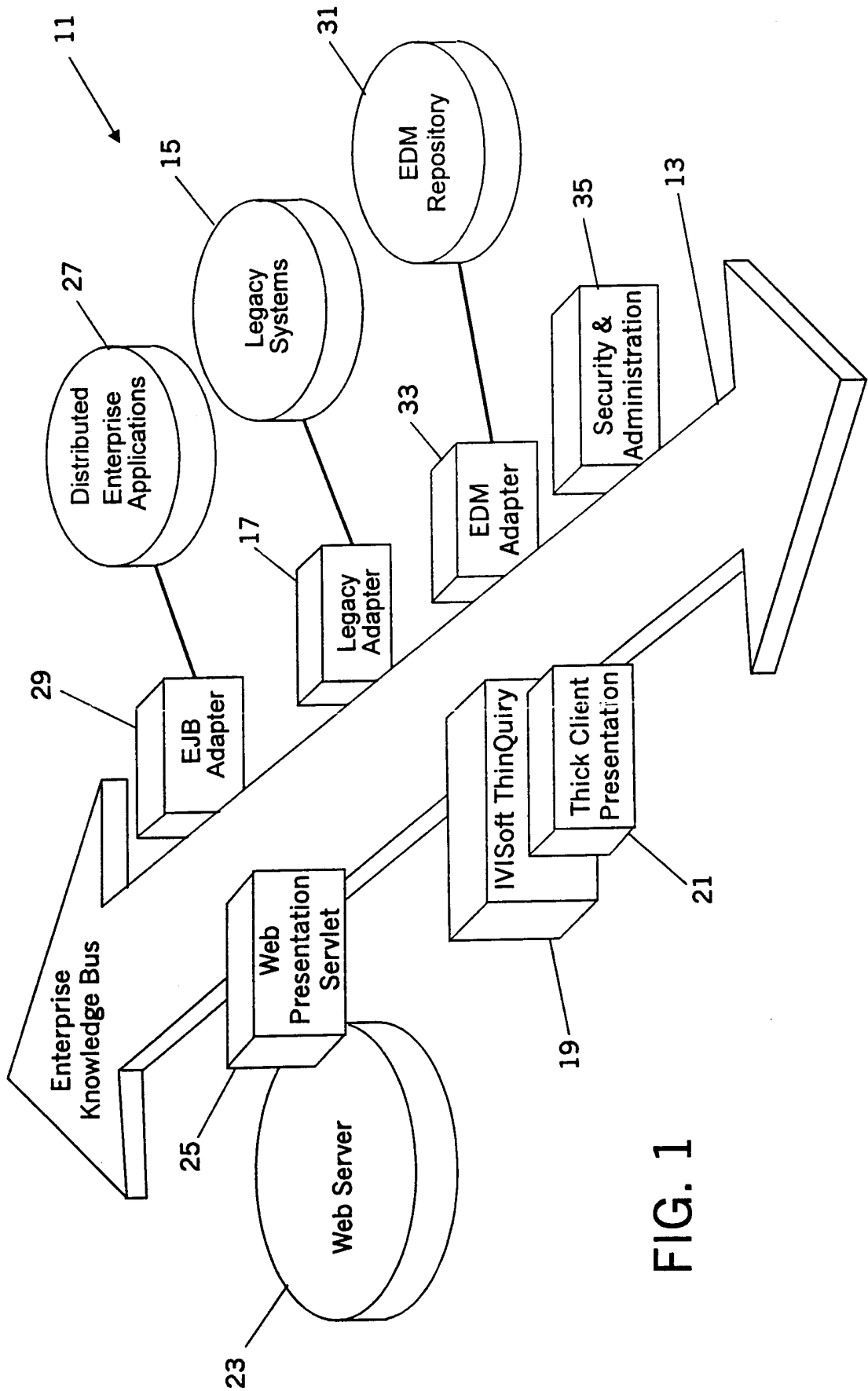


FIG. 1

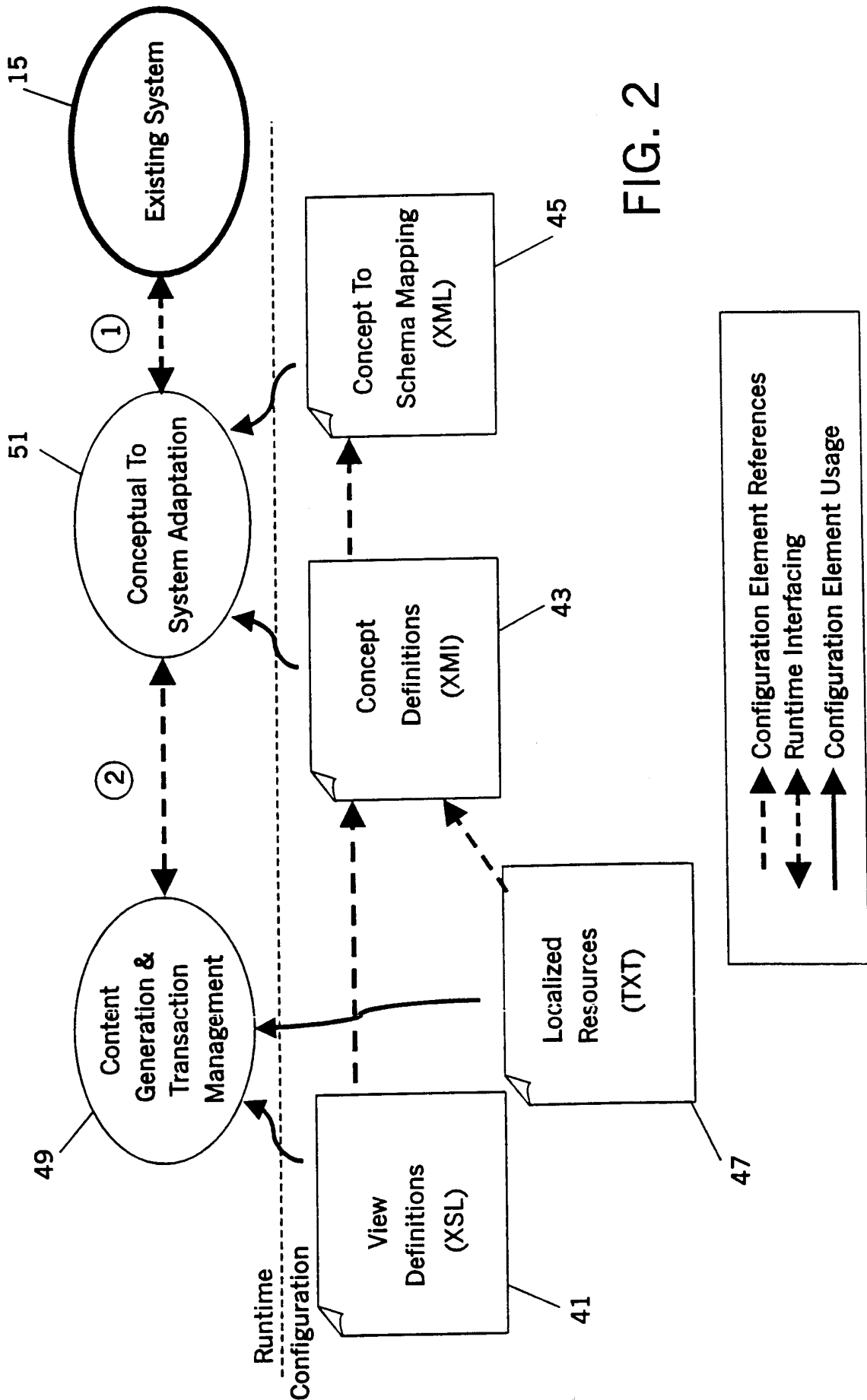


FIG. 2

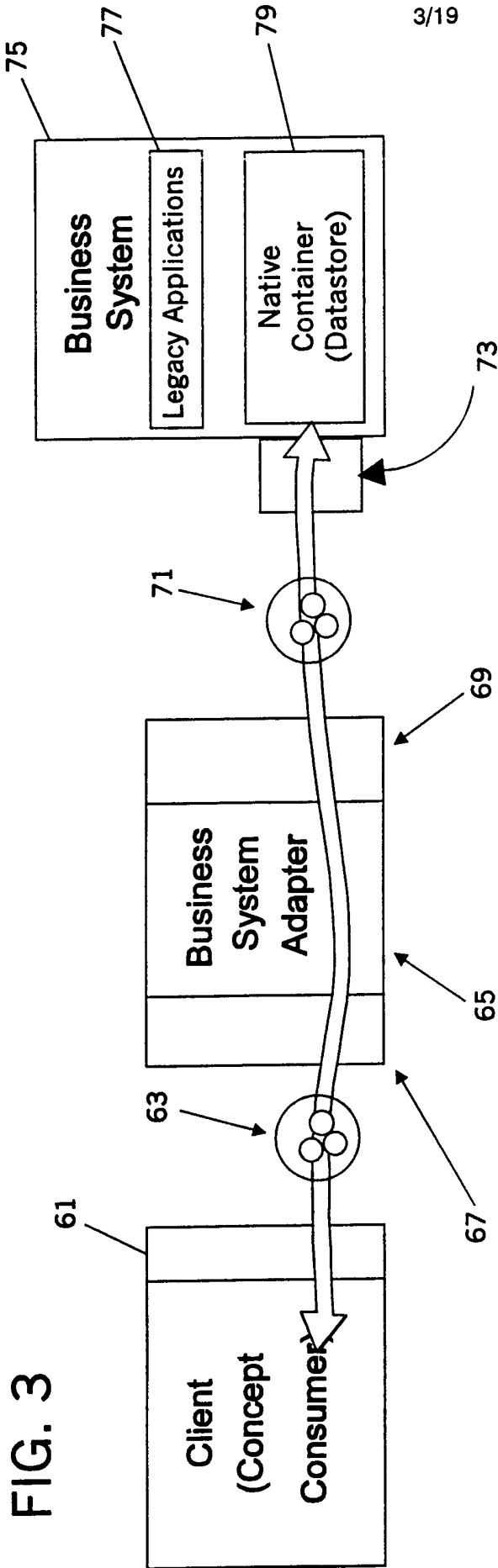


FIG. 3

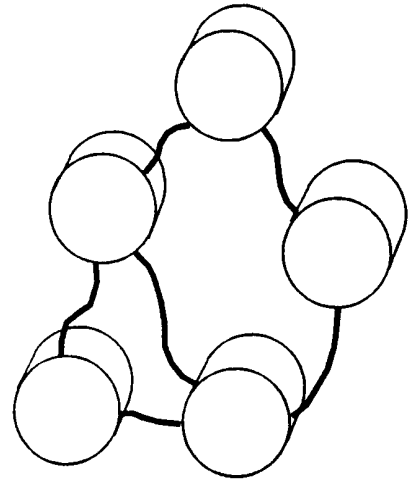


FIG. 5

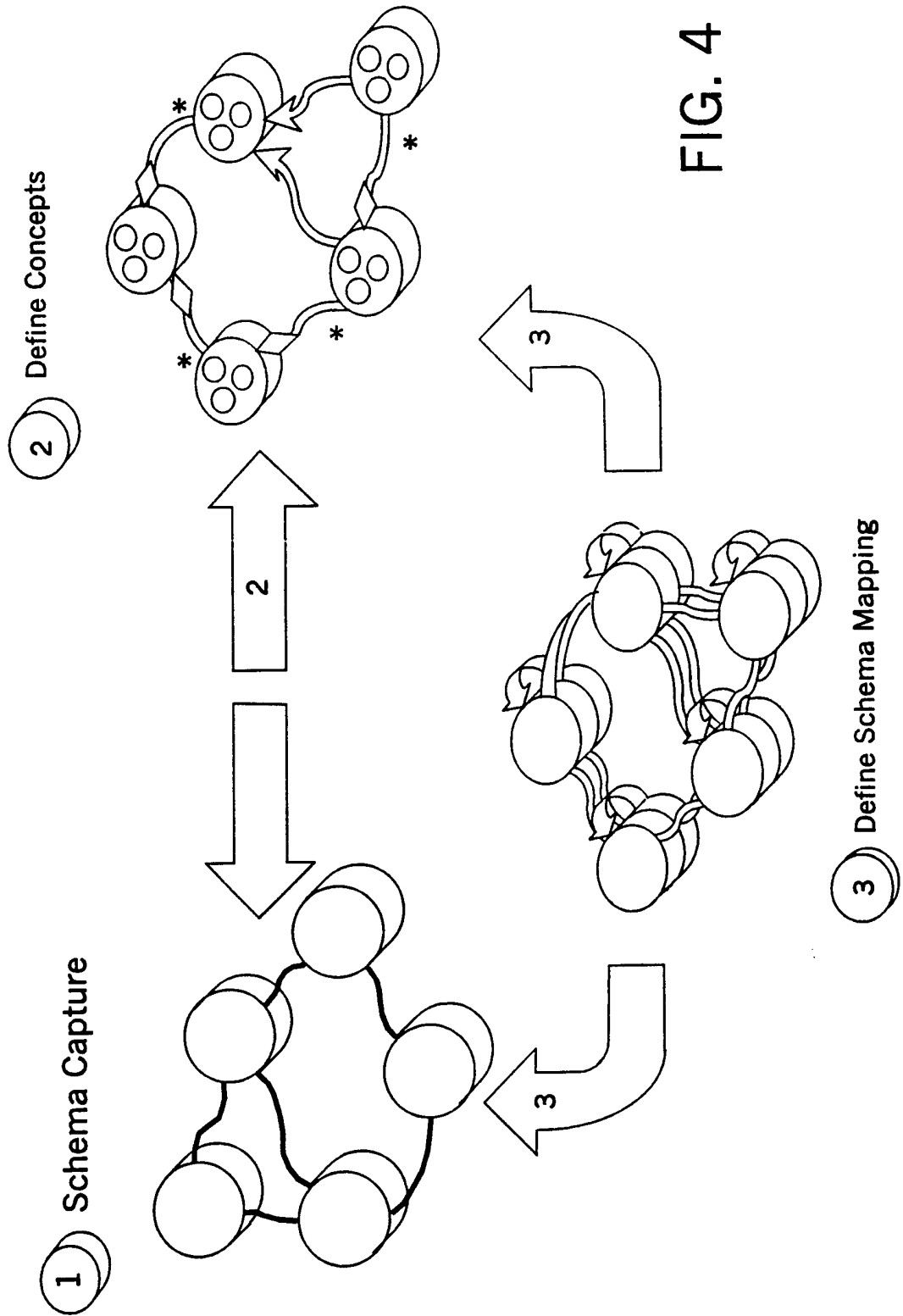
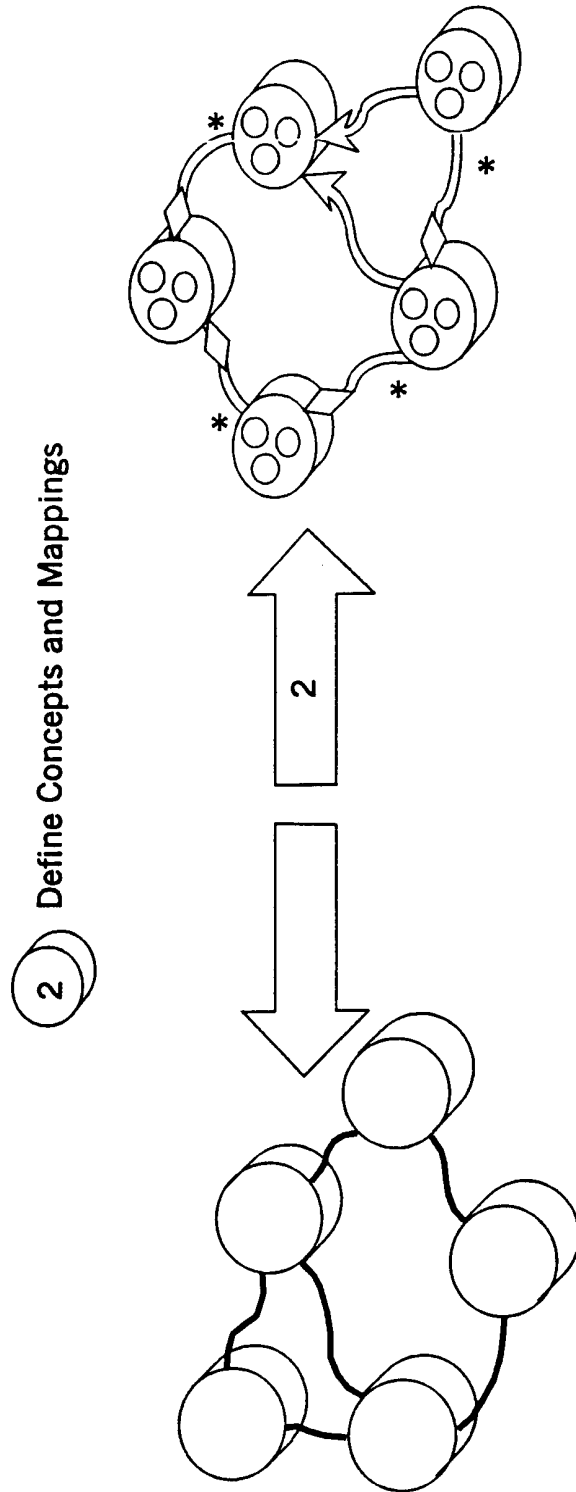


FIG. 6



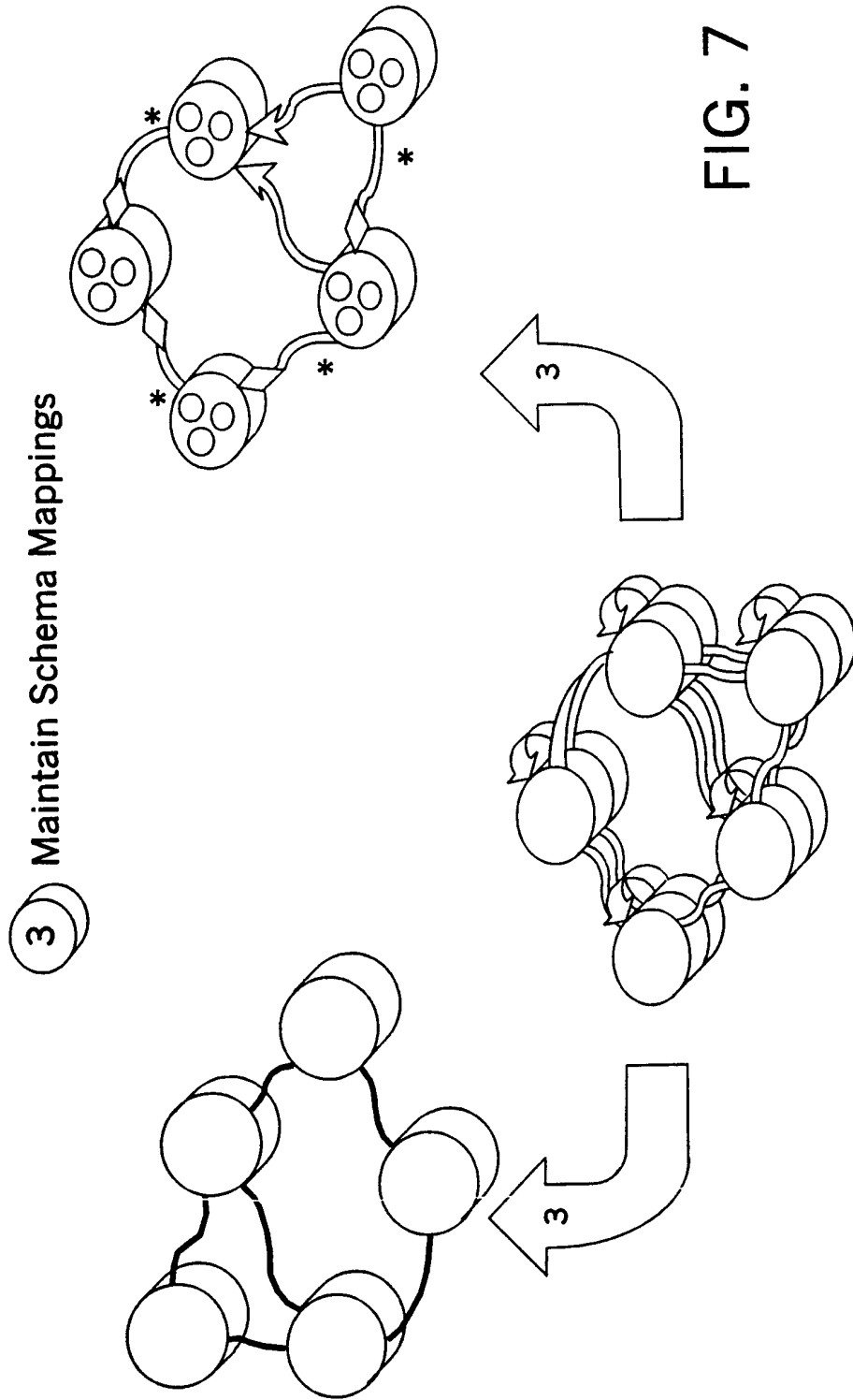


FIG. 7

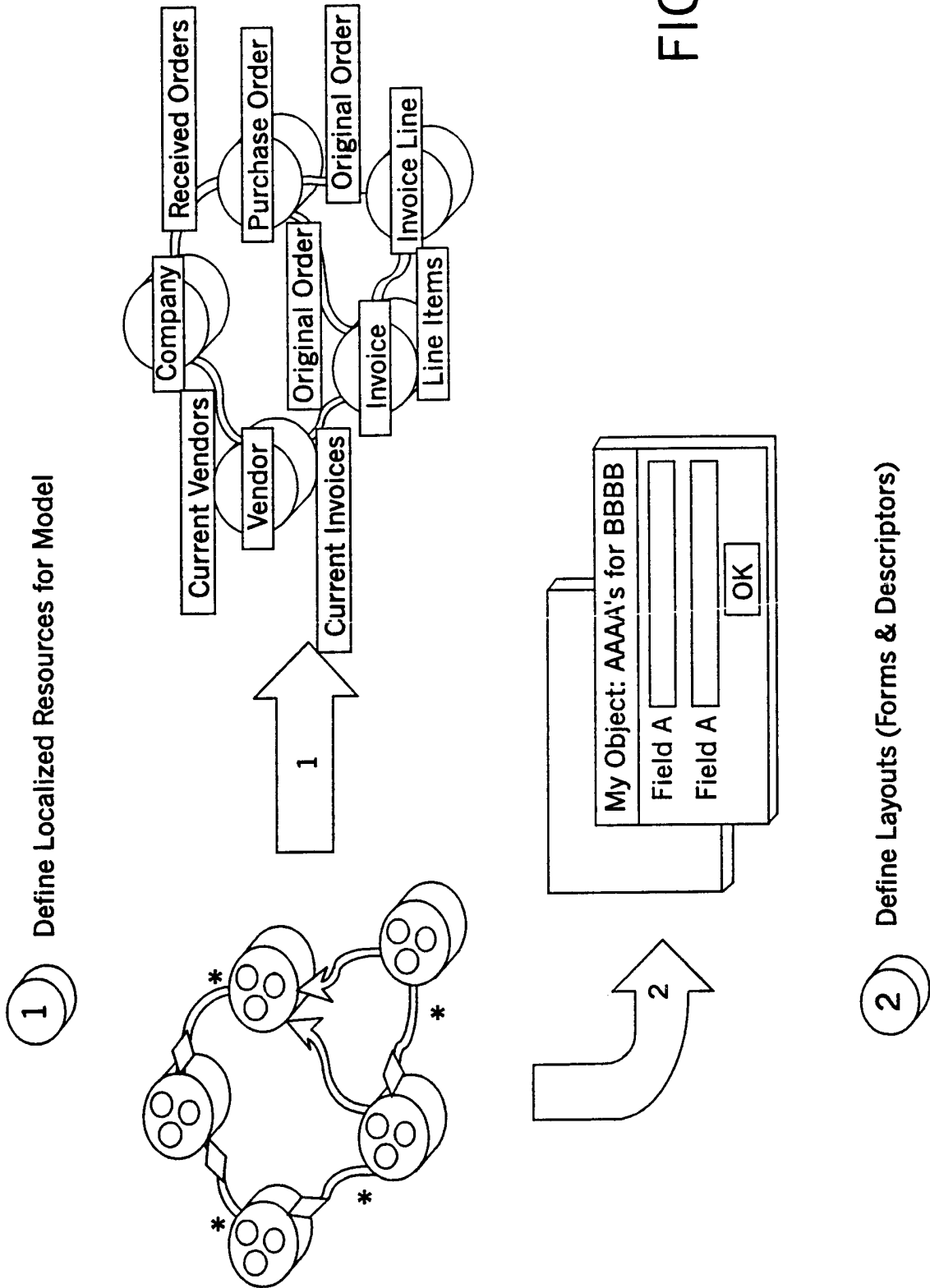


FIG. 8

FIG. 9

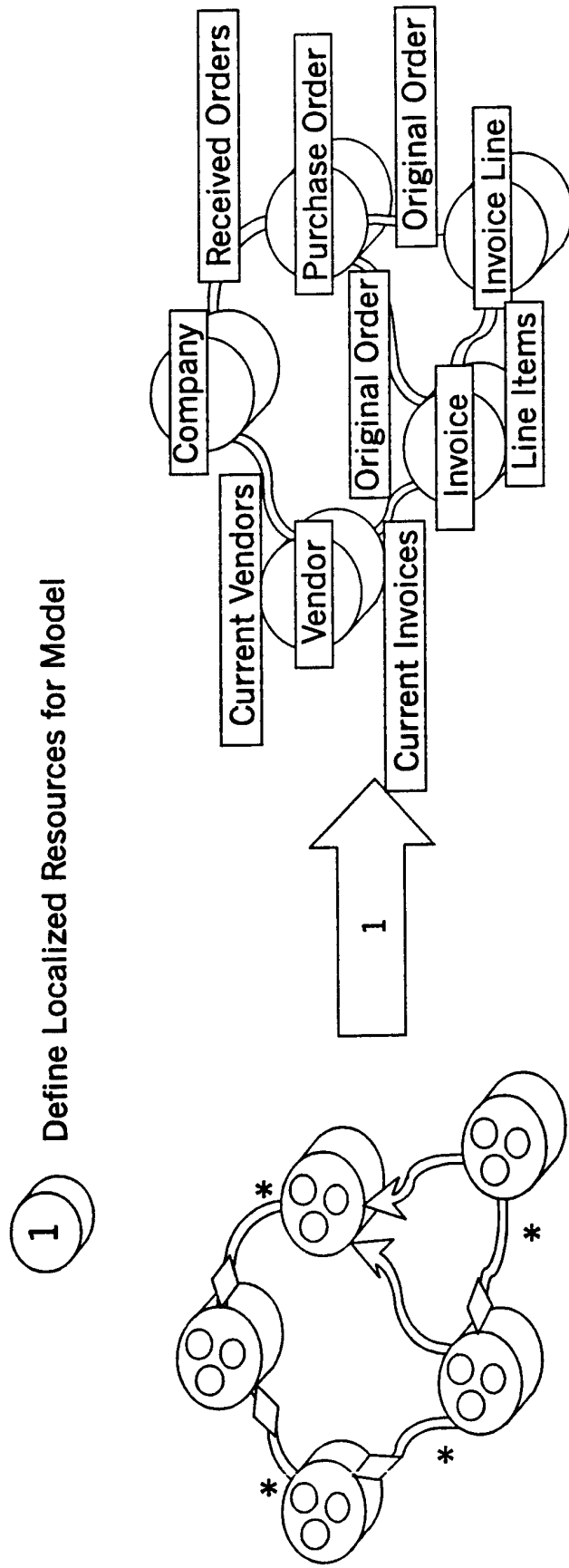


FIG. 10

2 Define Views for Presentation

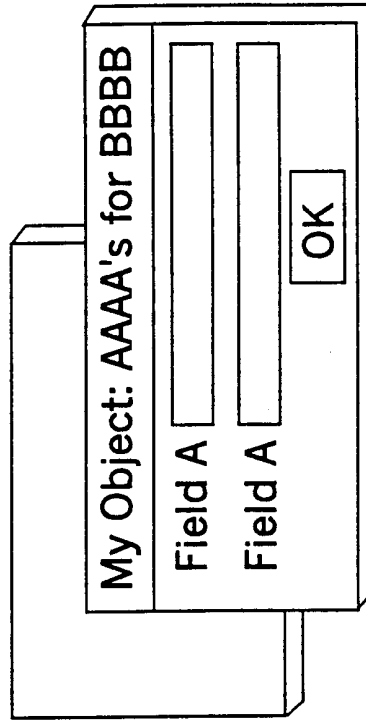
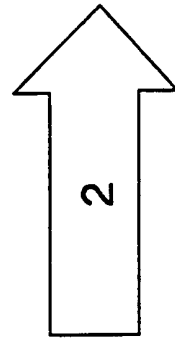
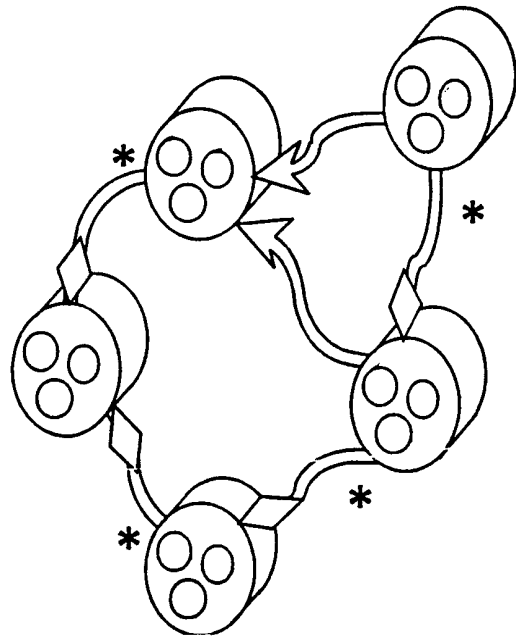


Exhibit 1 – Example of a “Concept Definition” (XMI) File
A file which specifies the structure of a concept and its relationship to other concepts. The concept defined in this example is an Automated Clearinghouse Vendor.

```

<?xml version="1.0" encoding="ISO-8859-1"??>
<!DOCTYPE Entities SYSTEM "metamodel.dtd" >
<Entities id="3677">
  <ContainedByModel id="1"/>
  <Entity id="3675" name="com.ivosoft.legacy.AccountsPayable.ACHVendor">
    <Attributes id="3678">
      <Attribute id="3683" name="accountType">
        <Type id="3682" name="java.lang.String"/>
        <Length id="3684">0</Length>
      </Attribute>
      <Attribute id="3686" name="individualID">
        <Type id="3685" name="java.lang.String"/>
        <Length id="3687">9</Length>
      </Attribute>
      <Attribute id="3689" name="companyCode">
        <Type id="3688" name="java.lang.String"/>
        <Length id="3690">4</Length>
      </Attribute>
      <Attribute id="3692" name="rdfiBankNumber">
        <Type id="3691" name="java.lang.String"/>
        <Length id="3693">0</Length>
    
```

-
-
-

FIG. 11A


```

•
•
•
</Attribute>
<Attribute id="3695" name="dfiAccountNumber">
  <Type id="3694" name="java.lang.String"/>
  <Length id="3696">0</Length>
</Attribute>
<Attribute id="3698" name="deleteFlag">
  <Type id="3697" name="java.lang.String"/>
  <Length id="3699">0</Length>
</Attribute>
</Attributes>
<PrimaryKey id="3679" name="3679">
  <PKAttribute id="3680" name="companyId"/>
  <PKAttribute id="3681" name="individualID"/>
</PrimaryKey>
</Entity>
</Entities>

```

FIG. 11B

FIG. 11A
FIG. 11B

FIG. 11

FIG. 12A

Exhibit 2 – Example of a “Concept Model” (XMI) Index File
A file which specifies a set of concepts and their relationship to other concepts. Many concept definitions and relationships are stored within a conceptual model. The conceptual model acts as an “index” of concepts and has references to concept definition files contained within it. This example shows a conceptual model with three concepts contained within it, Automated Clearinghouse Vendor, Bank, and Calendar Entry, as well as a single relationship between a Company and a Bank. Entity tags make reference to Concept Definition files (see Exhibit 1).

FIG. 12

FIG. 12A
FIG. 12B
FIG. 12C

```

<?xml version="1.0" encoding="ISO-8859-1"?>
<!DOCTYPE Model SYSTEM "metamodel.dtd" >
<Model id="1" name="NGF_Legacy_AP" version="">
  <Entities id="2">
    <Package id="3" name="com">
      <Package id="4" name="ivisoft">
        <Package id="5" name="legacy">
          <Package id="6" name="AccountsPayable">
            <Entity id="3675" name="ACHVendor" remote="true">
              <remoteContent id="3676">
                href="com.ivisoft.legacy.AccountsPayable.ACHVendor.xml"/>
              </Entity>
            <Entity id="3767" name="Bank" remote="true">
              <remoteContent id="3768">
                href="com.ivisoft.legacy.AccountsPayable.Bank.xml"/>
              </Entity>
            <Entity id="3822" name="Approver" remote="true">
              <remoteContent id="3823">
                href="com.ivisoft.legacy.AccountsPayable.Approver.xml"/>
              </Entity>
            •
            •
          </Package>
        </Package>
      </Package>
    </Entities>
  </Model>

```

```

</Entity>
<Entity id="3872" name="CalendarEntry" remote="true">
  <remoteContent id="3873"
href="com.ivoisoft.legacy.AccountsPayable.CalendarEntry.xml"/>
</Entity>
</Package>
</Package>
</Package>
</Entities>
<Associations>
<Association id="3986" name="Company/DefaultBank">
  <Connection id="3987">
    <AssociationEnd id="3988" name="company">
      <multiplicity id="3989">1,1</multiplicity>
      <isNavigable id="3990" Boolean="false"/>
      <aggregation id="3991" AggregationKind="none"/>
    </AssociationEnd>
    <endpointType
id="3992">com.ivoisoft.legacy.AccountsPayable.Company</endpointType>
    <FKattribs id="3993" name="companyCode"/>
    <PKattribs id="3994" name="companyCode"/>
  </AssociationEnd>
<AssociationEnd id="3995" name="defaultBank">
  <multiplicity id="3996">1,1</multiplicity>

```

FIG. 12B

```

•
•
•
-----
•
•
•
    <isNavigable id="3997" Boolean="true"/>
    <aggregation id="3998" AggregationKind="none"/>
    <endpointType
id="3999">com.ivisoft.legacy.AccountsPayable.Bank</endpointType>
    <FKattribs id="4000" name="companyCode defaultBankCode"/>
    <PKattribs id="4001" name="companyCode bankCode"/>
    </AssociationEnd>
    </Connection>
    </Association>
</Associations>
</Model>

```

FIG. 12C

FIG. 13

Exhibit 3 – Example of a “Tabular Style” View Layout Stylesheet (XSL) File

A file which specifies layout information for a view of a concept. Field Definition tags within

This file make reference to attribute tags in a Concept Definition file (see Exhibit 1). The view defined in this example is a “tabular” (ie. Collection) view of an Automated Clearing House Vendor. There can be a multitude of different views for a single concept definition.

```

<?xml version="1.0" encoding="ISO-8859-1"?>
<!DOCTYPE ContainerViewLayout SYSTEM "PresentationDev.dtd" >
<ContainerViewLayout title="ACHVendor Container View Layout"
roleName="ACHVendor Container">
  <ViewLayoutKey entityId="3675" viewLayoutID="1"/>
  <FieldDefinition entity_att_id="3689" entity_att_name="companyCode"
preferredWidth="40"/>
  <FieldDefinition entity_att_id="3686" entity_att_name="individualID"
preferredWidth="90"/>
  <FieldDefinition entity_att_id="3683" entity_att_name="accountType"
preferredWidth="10"/>
  <FieldDefinition entity_att_id="3692" entity_att_name="rdfiBankNumber"
preferredWidth="150"/>
  <FieldDefinition entity_att_id="3695" entity_att_name="dfiAccountNumber"
preferredWidth="150"/>
</ContainerViewLayout>

```

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Exhibit 4 -- Example of a Localized Resource File for a Concept
A file which Language-specific presentation properties related to a concept. This is an example of how English-language properties are specified for a concept (Automated Clearing House Vendor). Multiple Localized Resource files may exist for a single concept (see Exhibit 1), one file per Locale (language) for which the concept may be viewed.

FIG. 14

FIG. 14A
FIG. 14B

```

# Resources for ACHVendor_en.properties
# Attribute "accountType" Resources
ID_accountType=Account Type
TOOLTIP_accountType=Account Type is used to distinguish the type of
account that this
                is for ACH processing

# Attribute "individualID" Resources
ID_individualID=Individual ID
TOOLTIP_individualID=Individual ID is the same as the vendor number for
the vendor
                receiving an ACH payment

# Attribute "companyCode" Resources
ID_companyCode=Company Code
TOOLTIP_companyCode=Company identifier

# Attribute "rdfiBankNumber" Resources
ID_rdfiBankNumber=RDFI Bank Number
TOOLTIP_rdfiBankNumber=Receiving DFI Identification is the standard
Routing Number as assigned to
                identify the DFI in which the Receiver maintains his
account

```

FIG. 14A

 ●
 ●
 ●

Attribute "dfiAccountNumber" Resources
 ID_dfiAccountNumber=DFI Account Number
 TOOLTIP_dfiAccountNumber=DFI Account Number is the RDFIs customer
 identification which designates
 the account number to be used for ACH purposes

Attribute "deleteFlag" Resources
 ID_deleteFlag=Delete Flag
 TOOLTIP_deleteFlag=Indicates if a table record has been logically deleted

Role company Resources
 ID_company=Company

FIG. 14B

FIG. 15A

Exhibit 5 – Example of a Mapping File for a Concept elements to Schema elements
A file which attributes of concepts to elements of a schema. There may be multiple mapping files for concepts of a system, if the concepts are mapped onto multiple datastore types for partitions of data. This example shows a one-to-one mapping of an Automated Clearing House Vendor concept to a corresponding record of a VSAM-based schema in a legacy system. Mapping files make reference to attribute definitions contained in a concept definition file (see Exhibit 1).

```

<?xml version="1.0" encoding="ISO-8859-1"?>
<!--DOCTYPE Mapping SYSTEM "mapping.dtd" -->
<Mapping name="AccountsPayable_null_Mapping" version="">
  <UsesModel id="1" name="NGF_Legacy_AP"/>
  <ColumnToAttribute>
    <Column name="ACHVendor.LW-ACCT-TYPE"/>
    <Attribute id="3683"
name="com.iviisoft.legacy.AccountsPayable.ACHVendor.accountType"/>
  </ColumnToAttribute>
  <ColumnToAttribute>
    <Column name="ACHVendor.LW-USR-ENTRY"/>
    <Attribute id="3686"
name="com.iviisoft.legacy.AccountsPayable.ACHVendor.individualID"/>
  </ColumnToAttribute>
  <ColumnToAttribute>
    <Column name="ACHVendor.LW-CO"/>
    <Attribute id="3689"
name="com.iviisoft.legacy.AccountsPayable.ACHVendor.companyCode"/>
  </ColumnToAttribute>

```

•
 •

```

•
•
</ColumnToAttribute>
<ColumnToAttribute>
  <Column name="ACHVendor.LW-RDFI-BANK" />
  <Attribute id="3692"
name="com.iviisoft.legacy.AccountsPayable.ACHVendor.rdfiBankNumber" />
</ColumnToAttribute>
<ColumnToAttribute>
  <Column name="ACHVendor.LW-DFI-ACCT-NO" />
  <Attribute id="3695"
name="com.iviisoft.legacy.AccountsPayable.ACHVendor.dfiAccountNumber" />
</ColumnToAttribute>
<ColumnToAttribute>
  <Column name="ACHVendor.LW-DELETE" />
  <Attribute id="3698"
name="com.iviisoft.legacy.AccountsPayable.ACHVendor.deleteFlag" />
</ColumnToAttribute>
</Mapping>

```

FIG. 15B

FIG. 15

FIG. 15A
FIG. 15B

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US00/27120**A. CLASSIFICATION OF SUBJECT MATTER**

IPC(7) :G06F 17/30

US CL :707/2, 3, 4, 7, 10, 100, 102, 103, 104, 200

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)

U.S. : 707/2, 3, 4, 7, 10, 100, 102, 103, 104, 200; 705/7, 8.

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

Please See Extra Sheet.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5,960,200 A (EAGER et al) 28 September 1999, col. 1, lines 12-67, col. 2, lines 1-6 and lines 9-62, col. 4, lines 31-64, col. 5, lines 4-67, col. 6, lines 1-44, col. 7, lines 7-26, col. 8, lines 32-67, col. 9, lines 1-35 and lines 45-67, col. 10, lines 1-27 and lines 48-67, col. 11, lines 1-17, col. 14, lines 38-58, col. 16, lines 36-51, col. 17, lines 2 ^o 57 and 62-67, col. 18, lines 1-9 and 65-67, col. 19, lines 1-11 and 21-49, col. 20, lines 11-32, col. 24, 58-63, col. 25, lines 29-38, col. 26, 48-50, col. 28, lines 1-9, col. 29, lines 18-29, col. 30, lines 19-30 and col. 31, lines 6-19 and 28-37.	1-22

 Further documents are listed in the continuation of Box C. See patent family annex.

* Special categories of cited documents:	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be of particular relevance	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E" earlier document published on or after the international filing date	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&" document member of the same patent family
"O" document referring to an oral disclosure, use, exhibition or other means	
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search

17 DECEMBER 2000

Date of mailing of the international search report

09 JAN 2001

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US00/27120

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5,819,270 A (MALONE et al) 06 October 1998, col. 1, lines 29-67, col. 2, lines 1-20 and 23-41, col. 3, lines 50-67, col. 4, lines 1-21 and 46-67 and col. 5, lines 1-30, col. 6, lines 43-67, col. 7, lines 1-9 and lines 20-67, col. 8, lines 1-9, col. 9, lines 35-67, col. 10, lines 1-4, col. 11, lines 31-44 and 51-67 and col. 12, lines 18-65 . col. 15, lines 32-48 and col. 16, lines 13-61.	1-22

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US00/27120

B. FIELDS SEARCHED

Electronic data bases consulted (Name of data base and where practicable terms used):

WEST

Search terms: relational database, business concepts, mapping, internet, world wide web, browser, legacy business systems, dictionary database, elements.