

## SELF-DESCRIBING BUSINESS OBJECTS

### CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of the filing date of U.S. Provisional Application No. 60/489,573 for ENTERPRISE SERVICES FRAMEWORK TECHNOLOGIES, filed Jul. 22, 2003, the disclosure of which is incorporated by reference in its entirety.

### BACKGROUND

[0002] The present invention relates to data processing by digital computer, and more particularly to self describing business objects.

[0003] Large scale business software applications are sometimes categorized in terms of a “front end component” that includes a graphical user interface (GUI) to present data to users and accept data entry from users. Such front end components are customized for specific customers. Another component of such software applications is sometimes referred to as a “back end component” that stores business data and processes the business data according to business logic. The back end component retrieves, generates, and maintains the business data. The back end component is usually responsible for the consistency and correctness of the data. The back end component also can store relationships between the various data. In a typical business software application, the front end component includes application code to display and aggregate data of the back end and provides help to generate requests to the back end for update operations.

[0004] The data of the back end can be represented using relational database terminology. In relational database terminology, an entity is a record and an entity type is a set of entities with common attributes to which a unique name and a unique description are assigned. Typically, a database has multiple two dimensional tables where each table represents an entity type and each row in each table represents an entity. An attribute is a description of a characteristic of an entity or entity type. Typically, an attribute is specified in a field or a column in a database table. Entity types can also have relationships that enable linking one or more entities of an entity type to other entities of another entity type. This linking can be done using foreign keys by having one or more fields in one table pointing to a primary key of a second table. This enables traversing from a set of entities in one table to related entities in another table.

### SUMMARY OF THE INVENTION

[0005] In one aspect, the invention features a method that includes representing, in a repository, services from a server, the services including interacting with one or more collections of data elements using a set of operations on the data elements in the collections, the repository comprising descriptions of the collections and common attributes for each collection, the repository organized according to a meta model. The method also includes enabling a software entity to request a service represented in the repository, the service representing a first operation on one or more data elements in a first collection from the collections, and executing the first operation on the one or more data elements in the first collection.

[0006] Embodiments may include one or more of the following. The repository further comprises descriptions of specialized actions on a collection of data elements from the collections. A description of a specialized action includes a name of the specialized action, a name of a data structure for input data for the specialized action, and a name of the collection of data elements. The set of operations correspond to methods of a service provider class, in some cases, the set of operations include select, delete, select by relation, and update operations. The repository further includes descriptions of relations between pairs of collections of data elements. The first collection has a relation with a second collection of data elements, a description of the relation is stored in the repository, and the relation enables the software entity to request the retrieval of data elements of the second collection by specifying data elements of the first collection. The repository is a database.

[0007] Executing the first operation includes reading the one or more of the attributes of the first collection of data elements from memory storage and sending the attributes to the software entity. In some cases, executing the first operation further includes calculating the one or more of the attributes of the collection of data elements and sending the attributes to the software entity. A description of a collection and common attributes for the collection includes a name of the collection and a description of a data structure defining the attributes.

[0008] The first operation is a query and executing the first operation further comprises searching for individual data elements within the first collection and returning keys representing the individual data elements. In some cases, the repository includes a definition of the query including a search parameter structure of the query and an input name defining a key that is used for filtering one or more data from the collection of data.

[0009] Embodiments may also include enabling a software entity to request a service represented in the repository, the service representing the first operation on one or more data elements in a second collection from the collections, and executing the first operation on the one or more data elements in the second collection.

[0010] In another aspect, the invention features a system that includes a first computer configured to execute a client program, a second computer configured to execute a server program, and a network linking the first and second computers such that the server program is configured to execute the following. Represent, in a repository, services from the server program, the services including interacting with one or more collections of data elements using a set of operations on the data elements in the collections, the repository including descriptions of the collections and common attributes for each collection, the repository organized according to a meta model. Enable the client program to request a service represented in the repository, the service representing a first operation on one or more data elements in a first collection from the collections. Execute the first operation on the one or more data elements in the first collection.

[0011] Embodiments may include one or more of the following. The repository further includes descriptions of specialized actions on a collection of data elements from the collections. In some cases, a description of a specialized