

content of one or more aspects. As described previously, an aspect is described by its name (the name is globally unique within a repository), an associated data structure, an associated key (i.e. identifier) structure, a set of implemented actions, a set of outgoing relations, and a set of incoming relations. Aspect service provider **34** has methods EXECUTE, SELECT, INSERT, UPDATE, DELETE, SELECT\_BY\_RELATION, and UPDATE\_FIELDS.

[**0084**] The method EXECUTE is derived from the action service provider **44** and allows executing an action. EXECUTE has as input parameters a name (ASPECT) of the aspect, where the action is to be executed on, keys (INKEYS) of the objects, where the action is executed on, parameters (INPARAM) for the actions, name (ACTION) of the action. Returned parameters include modified or created aspect rows (OUTRECORDS), a Boolean flag (REJECTED) indicating if the request for the method was rejected or not, and return codes (RETURN\_CODES).

[**0085**] The method SELECT reads the aspect data associated with the input keys for a given aspect. SELECT has as input parameters a list of keys (INKEYS) encoded within the associated key structure to describe the aspect rows to read and the name (ASPECT) of the aspect. SELECT has as output parameters the result (OUTRECORDS) encoded in the aspect data structure, a Boolean flag (REJECTED) indicating if the request for the method was rejected or not, and return codes (RETURN\_CODES).

[**0086**] The method INSERT inserts new data into an aspect. INSERT includes as input parameters a table containing the records to be inserted, if aspect is designed for row wise write operations (INRECORDS). The method may allow the inserted record to also define key fields, depending on the aspect description (e.g., a parameter ExternalKeys=true or false). Input parameters also include the name (ASPECT) of the aspect, a set of keys (RELATION\_INKEY) for an action acting on a relation, and a name of the relation (RELATION). Method INSERT returns a set of records (OUTRECORDS) representing the inserted records together with their keys and possible other modifications that aspect service provider **34** wants to do on the inserted records. For example one modification can be filling out calculated fields for the set of records. The order of the OUTRECORDS rows has to correspond to the order of the INRECORDS rows. Other output parameters include a Boolean flag (REJECTED) indicating if the request for the SELECT method was rejected or not and return codes (RETURN\_CODES).

[**0087**] The UPDATE method updates existing instances of an aspect either record wise or field wise. The input parameters for UPDATE method include a table (INRECORDS) containing the instance keys to be updated, if the aspect is designed for row wise write operations. Input parameters also include the name (ASPECT) of the aspect. Parameters returned by the UPDATE method include the updated records (OUTRECORDS) together with their keys and possible other modifications the service provider wants to do. The order of the OUTRECORDS rows can correspond to the order of the INRECORDS rows. Other output parameters include a Boolean flag (REJECTED) indicating if the request for the SELECT method was rejected or not and return codes (RETURN\_CODES).

[**0088**] The DELETE method deletes rows or instances of an aspect in the backend (e.g., backend database **24**). Input

parameters for DELETE method are a list of keys (INKEYS) encoded within the associated key structure to describe the aspect rows to be deleted and the name (ASPECT) of the aspect. Parameters returned by the DELETE method include a Boolean flag (REJECTED) indicating if the request for the DELETE method was rejected or not and return codes (RETURN\_CODES).

[**0089**] The SELECT\_BY\_RELATION method returns, depending on the relation parameter description, either attributes to follow a relation or another aspect, where the source aspect has a relation pointing to that other aspect. Input parameters for SELECT\_BY\_RELATION are name (RELATION) of the relation to follow, records (INRECORDS) of the source aspect, name of the source aspect (ASPECT), and a structure (OPTIONS) describing various options of the queries for paging, etc. Output parameters returned by SELECT\_BY\_RELATION include the result encoded in the target aspect data structure (OUTRECORDS), an index table showing which row of the OUTRECORDS parameters belongs to which INRECORDS row (INDEX), a description of the result (DESCRIPTION), a Boolean flag (REJECTED) indicating if the request for the SELECT\_BY\_RELATION method was rejected or not and return codes (RETURN\_CODES).

[**0090**] The UPDATE\_FIELDS method updates fields of instances of an aspect. Input parameters include a list of keys (INRECORDS) encoded within the associated key structure to describe the instances of the aspect to be updated. Input parameters also include a table (INFIELDS) containing pairs of names of fields and corresponding values to be updated within a set of records, if the aspect is designed for field wise write operations. If more than one instance of an aspect is to be updated, the additional field index INKEY points to the associated key record. Input parameters also include the name (ASPECT) of the aspect. Parameters returned by UPDATE\_FIELDS include the created or changed instances of the aspect (OUTRECORDS) together with their keys and possible other modifications performed by the aspect service provider **34**. The index of the various OUTRECORDS rows have to be associated to the row indexes in the INFIELDS table. Other parameters returned include a Boolean flag (REJECTED) indicating if the request for the UPDATE\_FIELDS method was rejected or not and return codes (RETURN\_CODES).

[**0091**] Query service provider **32** performs queries. A query in the repository **18** is described in table SCOL\_QUERY by the query name in field QUERY\_NAME, the associated parameter structure in field PARAM\_STRUCTURE, the associated result aspect in field RESULT\_ASPECT, and optionally, the associated aspect key, with its unique data structure in field INPUT\_KEY\_ASPECT. Query service provider **32** has one EXECUTE method that performs a query on one or more aspects. Input parameters include the name of the query (QUERY), a data structure (INPARAM) containing the parameters for the query, and an optional table-type parameter (INKEYS), containing the keys of the aspect rows to which the query shall be restricted. INKEYS can but does not have to consist of the keys of OUTRECORDS returned by EXECUTE method. INKEYS can be of any key aspect structure. Which key structure is associated to the query is specified in the repository **18** in table SCOL\_QUERY in field INPUT\_KEY\_ASPECT. Optionally, other input parameters can be