

Babis Theodoulidis, Aziz Ait-Braham, George Andrianopoulos, Jayant Chaudhary, George Karvelis and Simon Sou

UMIST, Department of Computation, P.O. Box 88, Manchester M60 1QD, United Kingdom  
Tel: +44 61 200 3309, Fax: +44 61 2003324, email: babis@sna.co.umist.ac.uk

## 1. Project Overview

The ORES is an ESPRIT III project (no. P7224) that develops a demonstrator Temporal Database Management System (TDBMS). The ORES TDBMS will support the efficient and user friendly representation and manipulation of temporal knowledge and it will be developed as an extension of the relational database management system INGRES. The ORES project will result in a general purpose TDBMS [1], the development of which is based on a practical and yet theoretically sound approach.

More specifically, the overall objectives of the ORES project are: i) to develop a formal foundation for temporal representation and reasoning, ii) to develop a temporal query language that will be upwards consistent with SQL2, iii) to develop models, techniques and tools for user friendly and effective definition, manipulation and validation of temporal database applications, and iv) to evaluate the ORES environment using a hospital case study [2].

## 2. ORES Architecture

The ORES TDBMS architecture is shown in figure 1. As shown in this figure, ORES consists of two components namely, the valid-time component and the conceptual component.

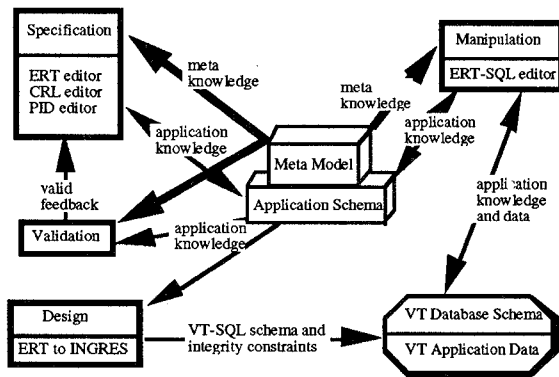


Figure 1: The ORES Architecture

Within the ORES relational component, two categories of languages for reasoning and querying have been developed: a procedural language, *Valid-Time Relational Algebra (VT-RA)* [3], and a non-procedural language, *Valid-Time SQL (VT-SQL)* [4]. VT-SQL is a temporally-oriented minimal extension of standard SQL. The design and implementation of VT-SQL is done through VT-RA. VT-RA is itself an extension of the relational algebra.

The ORES conceptual component consists of a *data definition tool* for specifying graphically and textually the application domain, a *data manipulation tool* for manipulating application knowledge, a *data validation tool* for validating the application specification and a *database design tool* for

transforming conceptual specifications to valid-time specifications.

Data definition and manipulation is based on the ORES Conceptual Design Formalisms [5] which consist of the Entity-Relationship Time (ERT) model, the Conceptual Rule Language (CRL), the Process Interaction Diagram (PID) and the ERT-SQL query language [6]. The ERT model provides constructs for describing the structural parts of an application, e.g. the classification of the objects and their associations. The CRL language provides constructs for describing rules of the application, e.g. derivation and constraints rules as well as the dynamics of the application. The PID model provides constructs for describing the processes of the application. The information about the application is held in a metamodel, an information repository [7]. Finally, ERT-SQL is a temporal query language operating on an ERT database.

Before the conceptual schema is handed out to the system analysts to serve as the basis for the implementation, the schema should be correct in some sense. The activity of ensuring the correctness of the schema is called *validation*. The implemented system should follow the specification, the schema. The activity of ensuring that the specification has been correctly implemented is called *verification*.

## 3. ORES Consortium

The partners of the ORES consortium are: 01-Pliroforiki (Greece), Clinica Puerta de Hierro (Spain), Information Dynamics (Greece), Royal Institute of Technology (Sweden), UMIST (United Kingdom), Agricultural University of Athens (Greece) and University of Athens (Greece).

The conceptual component is developed jointly by UMIST and RIT whereas the valid-time component is developed jointly by 01-Pliroforiki, University of Athens, Agricultural University of Athens and Information Dynamics.

## 4. Selected References

- [1] 01-Pliroforiki: "Specification of System Requirements", ORES Deliverable C2, Athens, 1993.
- [2] CPH: "User Requirements", ORES Deliverable B2, Madrid, 1993.
- [3] 01-Pliroforiki: "Implementation of Valid Time Relational Algebra", ORES Deliverable C4, Athens, 1993.
- [4] 01-Pliroforiki: "Specification of Valid Time SQL", ORES Deliverable D2, Athens, 1993.
- [5] RIT: "Conceptual Design Formalisms of ORES", Technical Report no. P7224/ORES/RIT/WPE/T5/R2, Stockholm, 1993.
- [6] UMIST: "An SQL-Like Language for the Entity-Relationship Time Model", Technical Report no. P7224/ORES/UMIST/WPE/2, Manchester, 1993.
- [7] UMIST: "The ORES Metamodel", Technical Report no. P7224/ORES/UMIST/WPE/3, Manchester, 1993.