

# Design of a Canadian Hydrographic Service Database Using CASE Technology

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## Abstract

The Canadian Hydrographic Service (CHS) is in the process of developing a National Database using ORACLE tools and methodology. The object of this project is to map the business functions of the CHS using computer assisted tools (CASE). The basic components of the CASE Designer is the Functional Hierarchy and Entity Relationship (E-R) diagram. The functional hierarchy is developed by interviewing the clients and mapping their work in terms of business functions. These functions are then mapped to entities mapped on E-R diagram reflecting the CHS data model.

## Introduction

Hydrographic data is being collected in the order of 4 gigabytes/hour. The CHS has found it necessary to design and implement an appropriate data model to manage these massive amounts of data. This data model must also be able to handle the legacy information that has been collected in previous years and resides in a digital form. In June 1994, a decision was nationally made to use ORACLE "Multi-Dimension", designed by CHS (Varma 89), as the database engine and ORACLE CASE methodology to create and build the hydrographic database. The database project, at this point in time, will focus only on point and line data.

## Oracle CASE Methodology

Oracle CASE methodology is supported by and integrated with Oracle CASE Tools. These tools provide the user with a full development suite including CASE Dictionary as the repository, CASE Diagrammer for entity relationship modeling, function hierarchy modeling, data flow diagrams and matrix diagramming. CASE Generator provides a 4GL approach to generating the applications. The tools provide project documentation, graphical presentation of models, definition and description of entities and attributes, application constraints and auto code generation for integrated product quality assurance. (Barker 90)

CASE methodology approaches database creation using the Business System Life Cycle, which groups specific tasks into major stages and has specific deliverables attached to each stage. The Business System Life Cycle is shown in Figure 1. The stages are Strategy, Analysis, Design, Build, User Documentation, Transition and Production. The Strategy and Analysis stages define the scope of the project and within that scope what function the organization carries out to complete its mandate. These are the current phases being addressed by the CHS Source Database Team. The remaining stages address the building, testing and implementation of applications to

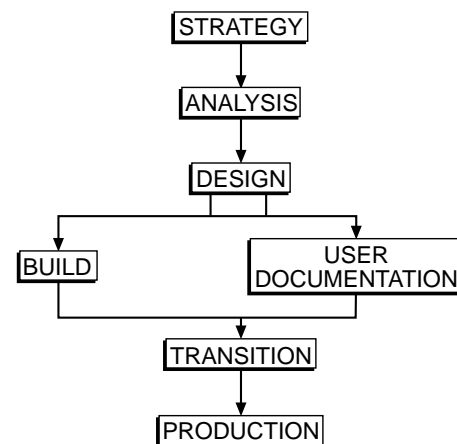


Figure 1. Business System Life Cycle (BARKER 90)

meet production requirements. (Evangelatos *et al.* 1994) This paper will concentrate on the processes and events encountered in each of the Strategy and Analysis stages.

## Strategy Stage

The expected deliverable of the strategy stage is a plan of the organization which will take into account organizational, financial and technical constraints. An analysis of the organization is performed and a business model is built from this analysis. The key deliverables from the strategy stage are a statement of business direction, an entity relationship diagram, a function hierarchy that states what the business does now, organizational and technological issues and a phased development plan.

The CHS Source Database Team began the Strategy stage of the project in October 1994. At that time a draft E-R diagram was created to identify the scope of the project and identify some of the entities that would effect the points and lines database. An early version of the E-R diagram is shown in Figure 2.

Interviews of all management and supervisory staff in the Atlantic Region began in November 1994. From these inter-

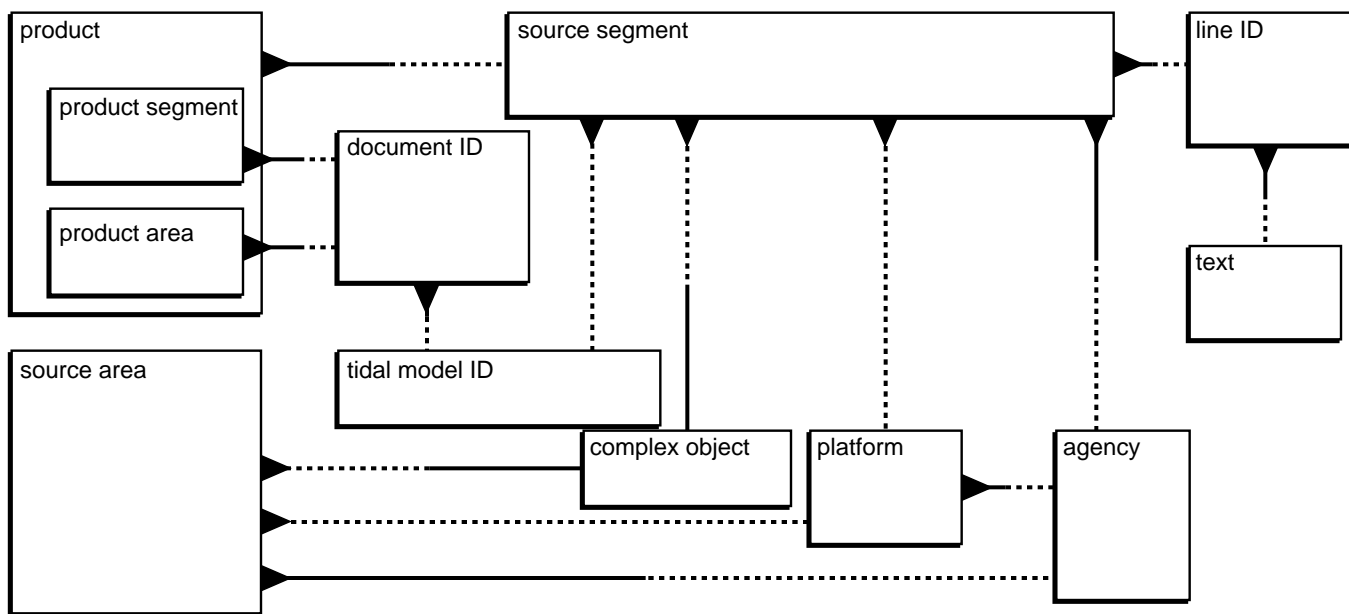
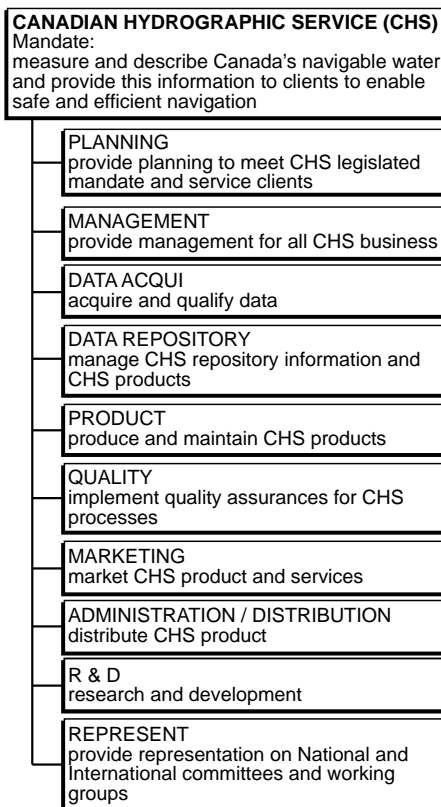


Figure 2. CHS Source Database Project E-R Diagram

views a base functional hierarchy was generated. This hierarchy was used as a model for the interviews that were conducted in the other four CHS Regions: Quebec Region in Mont Joli, Quebec; Central and Arctic Region in Burlington, Ontario; CHS

Headquarters in Ottawa, Ontario; and Pacific Region in Patricia Bay, BC. The information gathered during the regional interviews was used to create a function hierarchy for that region. Once all regional hierarchies had been completed, they were distributed to the regional participants on the interviews for corrections, updates and input. All the input was subject to review and necessary changes were made.

and build stages and a revised system development plan. This is an iterative stage as a function hierarchy being created will consolidate the business of the entire CHS. The high level function hierarchy that was created in the Strategy stage will be expanded to lower, more detailed levels by consolidating the regional hierarchies as well as interviewing a broader section of the CHS staff from all five regions. Both the E-R diagram and the function hierarchy will be reviewed, expanded upon and approved by all regions before the design stage is started. One concern to keep in mind during the Analysis stage is to ensure what is proposed in the final version of the function hierarchy will be within the available budgetary and human resources and will continue to meet the legislative mandate.



The regional function hierarchies were reviewed by the CHS Source Database Team and a high level function hierarchy was created. This function hierarchy shows the overall business functions of the CHS, depicted top level functions. This hierarchy, which is shown in Figure 3, has been approved by the Dominion Hydrographer and is now being presented to all other regions for approval. A strategy report of tasks and deliverables will be produced at the completion of this stage.

### Analysis Stage

The analysis stage consists of breaking down the business into detailed functional parts and building them into a statement of what is needed for the future. The key deliverables from this stage are an approved E-R diagram, an approved functional hierarchy of what we need to do, an outline for manual procedures, constraints of the database, an approved approach to the design

### Conclusion

Upon completion of the Strategy and Analysis stages of the Business System Life Cycle used in ORACLE Methodology, the CHS Source Database Team will continue through each step of the remaining stages until a functional and appropriate database has been built for the national Canadian Hydrographic Service.

Figure 3: Top Level of CHS Function Hierarchy

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**References**

- BARKER, R. 1990. CASE\*Method tasks and deliverables. Addison-Wesley Publishing, Co., New York, N.Y. 186 p.
- EVANGELATOS, T. *et al.* 1994. Developing hydrographic applications using relational technology and multi-dimension codes. Department of Fisheries and Oceans. 4 p.
- VARMA, H.P. *et al.* 1989. Spatio/Temporal database implementation and functionality using HHCodes. Department of Fisheries and Oceans. 4 p.
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