XTOPO: An XML-Based Topology for Information Highway on the Internet

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ABSTRACT

The need for interoperation and data exchange through the Internet makes XML a dominant standard language. Much work has been done on translating relational data into XML documents and vice versa. However, there is not an integrated method to combine them together as one technology for mass information transmission on the Internet. Furthermore, most XML-enabled database management systems can only translate a few relations into an XML document without data semantics constraints consideration, which is not sufficient for information highway on the Web. This paper presents a methodology, XTOPO, to transmit a relational database on the Internet using XML document as medium. XTOPO facilitates the translation from relational database to XML document and vice versa. XTOPO divides an XML document hierarchical structure into four different topologies—single sub-element (element, sub-element), multiple sub-elements (element, multiple sub-elements), group (element, group of sub-elements), and referral element (element, element—and captures their semantics into classification tables as a knowledge-based repository. The view of a sender company’s information in a relational database is mapped into four topological XML documents according to their data semantics constraints. The intermediate XML documents are integrated into an XML document using DOM (Document Object Model). The XML document instances are loaded into a relational database with generated Object Identity as key. The receiver company translates the XML document back to relational database for processing. The result is a mechanism of mass information transmission on the Internet for an information highway.

Keywords: data conversion; data dependencies; information highway; knowledge-based repository; relational database; schema translation; topology; XML document.

INTRODUCTION

To conduct business, companies exchange a huge amount of paperwork through the Internet, which includes many relations and their data semantics. The XML document is an attractive candidate for its supportive tools and vendors. It improves compatibility between disparate systems, and creates new market opportunities. We need a mechanism for translating a view of a relational database into an XML document for companies’ communication. XTOPO automates the translation of relational schema and data into four kinds of topological XML documents based on their
data semantics. They are integrated into an XML document. The translated XML document is mapped and stored into the receiver’s relational database for computing. The contribution of XTOPO is to automate the translation of schema and data through four topological data structures of an XML document.

Using XML document and XTOPO, we can enrich data portability and application access on the Internet more efficiently than ever before. XTOPO and XML documents allow a company to realize long-term benefits via improved feasibility in the market. We also bring information into any Web browser anywhere in the world. By providing an information highway on the Internet, the XML document is made to suit a company’s intercompany and self-defined requirement for data exchange. The tasks involved are:

1. Select and map a view of sender’s relational database into four different topological XML documents: single sub-element, multiple sub-elements, group, and referral.
2. Integrate the translated topological XML documents into one.
3. Translate the XML document to receiver’s relational database for storage.

To make relational tables compatible with the XML document, we join the former into a single relation, and transfer the joined relational schema into XML schema. We load tuples of the joined relation into object instances of elements or attributes in the XML document according to the XML schema, and preserve their data dependencies.

To receive an XML document from the Internet, we need an XML-to-Relational Connectivity Machine. The machine maps an XML schema into a relational schema. By traversing the XML document from Root to all element instances, it loads XML instances into tuples in relations with OID (object identity). The Data Map schemas consist of relational schemas and their corresponding XML schemas. The company relational database consists of seller and buyer databases.

To convert a relational database into an XML document and vice versa, we apply a Relational XML Connectivity Machine

Figure 1: Architecture of XTOPO

![Architecture of XTOPO](image-url)
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