

# The Valid Web<sup>©</sup>

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## Introduction

The Valid Web is a software prototype implementing temporal extensions of the World Wide Web [1]. The temporal dimension of interest is the *valid time*, which represents the evolution of data with respect of the real-world (or virtual) environment they describe [4]. The prototype consists of a Web site browsable with MS Internet Explorer 5 (Ie5), which allows the selective processing of HTML/XML documents containing historical information or temporal data. The base techniques employed in the prototype design and development, which derive from the temporal database theory [3, 4], are the adoption of data timestamping and temporal selection operators for the creation and management of Web pages, respectively.

The implementation relies on an XML/XSL infrastructure [5, 6] for the support of valid time whose main features are the following:

- the adoption of new XML tags for document timestamping;
- an XML schema to define well-formed temporal documents;
- an XSL stylesheet for selective filtering of temporal documents;
- the introduction of a validity context for temporal browsing (navigation and querying);
- a friendly user-interface for the management of the validity context.

## The XML/XSL Temporal Infrastructure

The adoption of valid time is aimed at allowing the management of historical information (past, present or future). To this purpose, distinct parts of a Web document can be timestamped with their own validity during the document creation. The addition of timestamps to Web documents we adopted is based on XML markup. The functionalities of the new tags (namely `<valid>` and `<validity>` elements) are fully specified by means of suitable XML schemas and stylesheets, without requiring modifications to the Web browsers supporting XML (like Ie5).

The `<valid>` element defines a *validity context*, which assigns a specific time pertinence to the contents it embraces. The timestamp of a validity context is specified by means of `<validity>` tags, which allow the definition of a temporal interval (via the `from` and `to` attributes). In general, multiple intervals can be specified: in this case, the timestamp is defined as the union of the intervals. The timestamping schema can be applied to both legacy HTML pages and XML (semi)structured data in order to make them temporal.

The use of temporal documents is aimed at supporting selective browsing of Web documents, temporal Web navigation and querying of temporal data, according to a *navigation validity context*. The navigation validity context is a time interval which (once set up by the user via

a friendly Java applet) is used by the Web browser for selective processing of documents: only those parts whose timestamp overlaps the navigation validity context are effectively taken into account and displayed. The same is automatically applied when new documents are retrieved by following a link, enabling a full-fledged temporal navigation. When dealing with XML temporal data, the navigation context assumes the meaning of a *query validity context*, which can be used by a Web-based application to select the data on the basis of a temporal comparison operator (not only the overlap one). In our prototype, the valid-time selection relies on the use of an XSL stylesheet [6], which is dynamically changed.

## The Valid Web Site

The demonstration will show two kinds of suited applications:

**Temporal Web Museum** showing the temporal use of “traditional” Web sites (containing HTML-based multimedia documents) with the support of historical information which can selectively be accessed according to its validity;

**Temporal XML Data Management** showing the temporal management of (semi)structured data encoded with XML, which is the upcoming standard for the representation and exchange of data on the Internet, with temporal database functionalities (e.g. TSQL2-like queries [3]).

The Temporal Web Museum we included in the demo is the temporal version of a portion of the popular Web Museum [2]. It is basically a collection of image data representing famous paintings, heterogeneous as to their origin, which can be accessed, for example, via an artist or a theme index. As to the second application, the temporal data we consider consists of facts concerning employees similar to the sample tables presented in [3]. The prototype supports single table TSQL2 queries of the following kind:

```
SELECT < target-list > FROM Employee
WHERE VALID(Employee) < temporal-predicate > Validity_Context
```

where the *< temporal-predicate >* can be: OVERLAPS, EQUALS, PRECEDES, CONTAINS or MEETS.

## References

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