XBRL Processor "Interstage XWand" and Its Application Programs

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Interstage XWand is a middleware for Extensible Business Reporting Language (XBRL) processes. The XBRL is an XML-based standard for describing financial data. It facilitates the creation, distribution, and reuse of business reports. This specification is organized and maintained by XBRL International. When XBRL is used, financial information can be smoothly shared and circulated among enterprises, financial control authorities, banks, and other users. This paper gives an overview of a Fujitsu middleware called Interstage XWand that reduces application development costs by processing the international standard XBRL documents used for describing financial information. Then, it describes the data models of Interstage XWand and how Interstage XWand is used. Lastly, it describes some of the new XBRL technology being developed to meet future processing needs.

1. Introduction

Extensible Business Reporting Language (XBRL)[1] is an XML[2]–based open standard being developed by a consortium of over 170 companies and agencies. This standard is already delivering benefits to investors, accountants, regulators, executives, business and financial analysts, and information providers.

XBRL is useful to all members of the financial information supply chain, for example, the accounting profession, regulators, analysts, the investment community, and capital markets and lenders. It also provides benefits to key third parties such as software developers, system integrators, consultants, and data aggregators.

XBRL is a standards-based method[3] for preparing, publishing in a variety of formats, exchanging, and analyzing financial statements and the information they contain. XBRL facilitates reporting and makes it easier for companies to identify data that is valued by investors and regulators. XBRL does not set or require changes to existing accounting rules nor require a company to disclose any additional information beyond that which they normally disclose under existing accounting standards. Instead, XBRL improves the processes of preparing, analyzing, and publishing the information in business reports.

2. Overview of Interstage XWand

Interstage XWand[4] (hereafter referred to as "XWand") is a Fujitsu XBRL processor based on XBRL (**Figure 1**). This model provides a rich API by encapsulating all the XML/XBRL-related processes, for example:

- XML parsing (including XML Namespace[5])
- XML Schema validation[6)-8)]
- XML linking[9]
- XBRL calculations (specific link actions).

XWand has the following features:

1) Portability

Our processor supports multiple platforms using the Java and Microsoft .Net Framework environment.

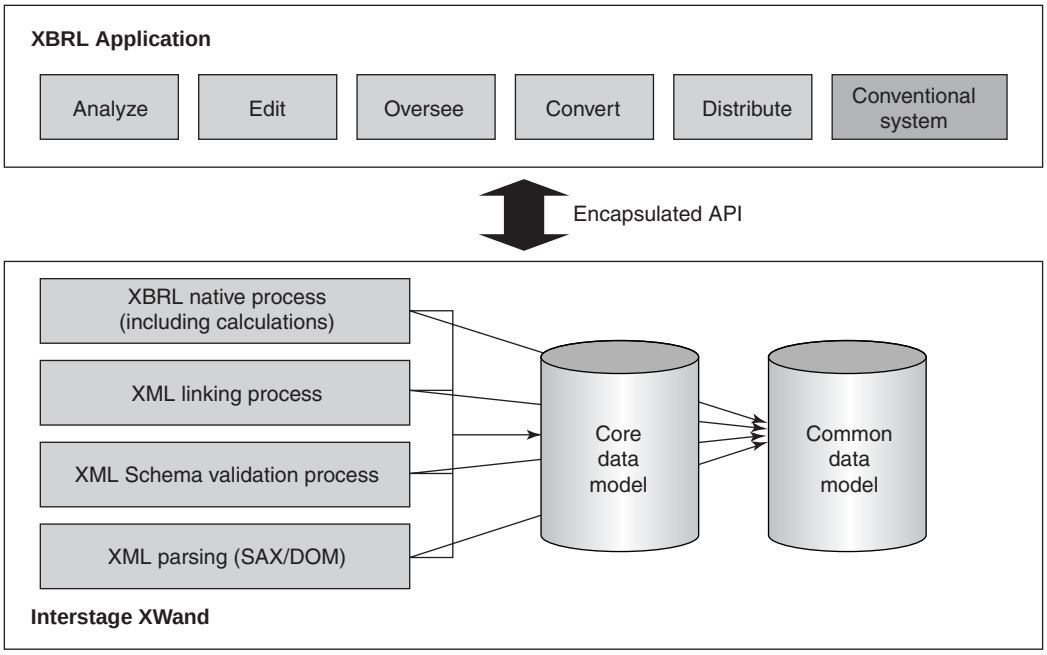

Figure 1
XWand composition.

2) Scalability and high performance

Fujitsu supports both an enterprise server application version for handling heavy workloads and a desktop version. The enterprise version has a memory-based architecture with multi-processing to support high performance during peak workloads.

3) Extensibility

Users can add their own linkbase engines to implement their own business rules using API-provided software. Fujitsu will also add linkbase engines to support future revisions of the XBRL specification (**Figure 2**).

4) Optimization

Users can select particular linkbases to be processed, thereby insuring there are no unnecessary linkbases impacting performance.

5) Reliability

The processor provides high reliability by adopting general XML processing engines such as Java API for XML Processing (JAXP).

3. XBRL data models[note 1)]

An XBRL data model is an internal data model created by XWand. It is an integrated model of an instance document and one or more taxonomies. Compared with DOMs (Document Object Models), XBRL data models simplify operations with their use of instance documents and taxonomies based on the XBRL 2.0/2.1 specification. XBRL data models are classified into the following three categories:

1) Models common to instance information[note 2)] and taxonomies
2) Models specific to instance information
3) Models specific to taxonomy information[note 3)]

3.1 Models common to instance information and taxonomies

The following two types of model (core data model and common data model) are common to

note 1) Unique data models provided by XBRL Processor. An XBRL data model is configured so that instance documents and taxonomies as defined in the XBRL 2.0/2.1 specification are integrated to enable handling of data.
note 2) XBRL data model elements corresponding to an instance document, whose syntax is defined in the XBRL 2.0/2.1 specification.

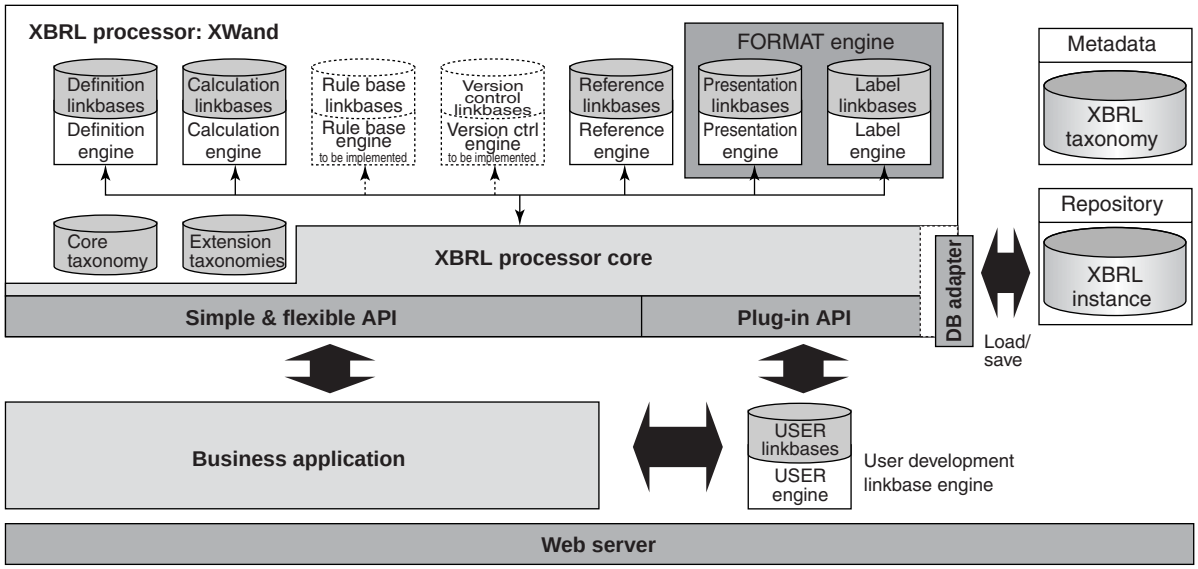

Figure 2
XWand extension architecture.

instance documents and taxonomies.

1) Core data model

In a core data model, root elements represent a variety of facts, which are business entities. The two major aspects of this type of model are explained below.

• XBRL data model

An XBRL data model is configured so that instance documents and taxonomies are integrated to enable data handling. It also contains information (e.g., different types of links) that is common to both an instance document and a taxonomy.

• XBRL elements[note 4)]

In XBRL elements, two types of items are integrated into the model. The first type are elements written in an instance document. Item elements and tuple elements are modeled as the first type. The second type are definitions written in a taxonomy. Element elements are modeled as the second type.

2) Common data model

The following are modeled using a common data model:

• Common characteristics for each document that handles linkbases:

An instance document, taxonomy, and linkbase document are included in the model.

• Basic information about links

Information representing individual links associated with extended-link-type elements and their sub-elements is integrated into the model. Also integrated are characteristics common to extended-link-type elements and their sub-elements.

note 3) XBRL data model elements corresponding to a taxonomy, whose syntax is defined in the XBRL 2.0/2.1 specification. An XBRL taxonomy is a description and classification system for the contents of financial statements and other business reporting documents. XBRL taxonomies can be regarded as extensions of XML Schema, augmented with written documentation and a number of additional XML Linking (XLink) files.

note 4) XBRL data model elements corresponding to items, tuples, and other elements described with the instance document syntax of the XBRL 2.0/2.1 specification.

3.2 Model specific to instance information

The model specific to instance information integrates the individual elements defined for the instance document and their attributes.

3.3 Model specific to taxonomy information

The model specific to taxonomy information integrates information associated with links that can be defined in taxonomies and the import function defined in XML Schema.

4. XBRL Processor processing

XWand provides functions that enable XBRL documents[note 5)] to be processed with the XBRL data models described above. By using the data models, the programmer can easily program any application that processes XBRL without needing to consider the XBRL specifications related to XML. XWand is used to do the following:

1) Create an XBRL data model

An XBRL document is created as an XBRL data model. XBRL data models are created in one of two ways:

- By generating an XBRL data model
- By converting an existing XBRL document into an XBRL data model

2) Save an XBRL data model

XBRL data models can be saved as:

- An XBRL document or
- an XBRL data model object (serialized)

3) Reference data in an XBRL document

Data in an XBRL document can be referenced as components of an XBRL data model.

4) Modify data in an XBRL document

Data in an XBRL document can be modified by manipulating the components of the corresponding XBRL data model.

note 5) XBRL data model elements corresponding to items, tuples, and other elements described with the instance document syntax of the XBRL 2.0/2.1 specification.

5. Examples

Using XWand, programmers can easily create a variety of XBRL applications. We will now describe some example applications of XWand.

1) Example 1: Taxonomy editor (**Figure 3**)

XWand enables simple programming for generating taxonomy documents, linkbase references, and instance documents. The taxonomy editor is used to generate, read, and edit taxonomy documents written in XBRL and display them in a tree structure (in the order of presentation link layers and definition link layers). The character strings displayed in the tree are automatically selected according to the national language based on the label link. The taxonomy editor enables programmers to do the following:

- Display and edit a tree view of roll-up linkbases
- Display and edit a table view of labels and references
- Display the representation sequence in XBRL
- Handle extension taxonomies

2) Example 2: XBRL instance document editor (**Figure 4**)

This program is an instance document editor for displaying and editing instance documents in spreadsheet format. It enables programmers to do the following:

- Handle instances

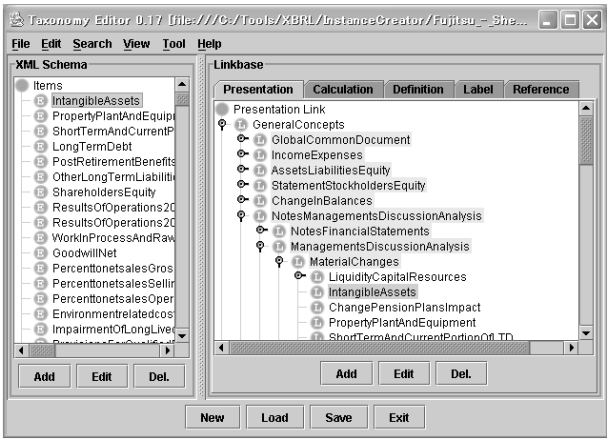

Figure 3
Taxonomy editor.

- Display a tree view of instance labels
- Display a table view of instance data
- Represent a "clean XBRL presentation"
- Import and export CSV data
- Display instance documents using a Web browser
- Display and edit footnotes
- Check calculations

Please feel free to try out the evaluation versions of these Fujitsu XBRL tools.[10)]

6. Latest technologies

XBRL International will establish a new protocol for enhancing the effects of XBRL. In this section, we describe the new technologies that can be achieved without rewriting applications.

6.1 Versioning linkbase

The versioning linkbase is a mechanism that manages interchangeability (convertibility) between versions of description rules of the financial information that can easily be subjected to annual law revisions. It is used as a method that realizes comparisons between financial statements before and after law revisions or periods of several years. Also, its specifications are used to define mappings between different taxonomies.

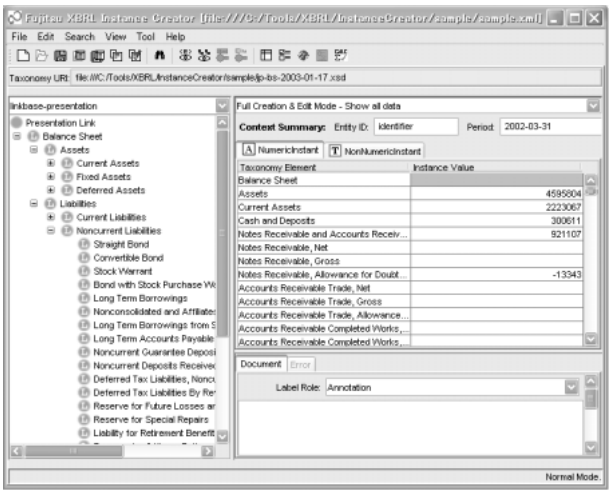

Figure 4
Instance creator.

6.2 Mapping linkbase

When handling financial information, it is often necessary to convert between XBRL instances (XBRL data formats) and other data formats (e.g., legacy data formats such as CSV). This task is done using the mapping linkbase, which uses mapping links to define the mapping rules between each format. The mapping linkbase is used, for example, to create XBRL data from existing financial information. The mapping linkbase is also used when a different type of business imports its financial statements into its own database.

6.3 Formula linkbase

Financial statements are used in various business scenes. The information they contain must be accurate; for example, if a figure in a financial report is incorrect, no matter how well the information format is standardized, the report will be incorrect. However, it takes a lot of time to manually check the figures in financial statements. Formula linkbase helps to solve this problem by enabling the relationships between titles of accounts to be defined in advance. For example, the relationship between a sales amount and profit can be defined as "sales amount > profit", so any profit greater than the corresponding sales amount will be automatically detected.

7. Conclusion

In this paper, we gave an overview of a Fujitsu middleware called Interstage XWand. We then described the data models of Interstage XWand and how Interstage XWand is used. Lastly, we described some of the new XBRL technologies being developed to meet future processing needs.

XWand makes it easy for programmers to write XBRL programs using an original XBRL data model. Because XWand makes it easy to expand a unique linkbase, it will make it easy to add the various linkbase functions that will emerge in the near future. Therefore, by using

XWand, it will be possible to flexibly adapt to future enhancements of linkbase functions and users will be able to add their own function enhancements. We will continue to upgrade XWand so it supports the latest standards, then promptly offer the upgrades to users.

References

1) Extensible Business Reporting Language (XBRL) Specifications.
http://www.xbrl.org/resourcecenter/specifications.asp?sid=22
2) T. Bray, J. Paoli, C. M. Sperberg-McQueen, E. Maler, and F. Yergeau: Extensible Markup Language (XML) 1.0 (Third edition). W3C Recommendation 04 February 2004, W3C (2004).
http://www.w3.org/TR/2004/REC-xml-20040204/
3) XBRL International.
http://www.xbrl.org
4) Interstage XWand.
http://www.fujitsu.com/services/software/interstage-xwand/
5) T. Bray, D. Hollander, and A. Layman: Namespaces in XML. W3C (1999).
http://www.w3.org/TR/REC-xml-names/
6) D. C. Fallside: XML Schema Part 0: Primer. W3C Recommendation 2 May 2001, W3C (2001).
http://www.w3.org/TR/2001/REC-xmlschema-0-20010502/
7) H. S. Thompson, D. Beech, M. Maloney, and N. Mendelsohn: XML Schema Part 1: Structures. W3C Recommendation 2 May 2001, W3C (2001).
http://www.w3.org/TR/2001/REC-xmlschema-1-20010502/
8) P. V. Biron and A. Malhotra: XML Schema Part 2: Datatypes. W3C Recommendation 2 May 2001, W3C (2001).
http://www.w3.org/TR/2001/REC-xmlschema-2-20010502/
9) S. DeRose, E. Malor, and D. Orchard: XML Linking Language (XLink) Version 1.0. W3C Recommendation 27 June 2001, W3C (2001).
http://www.w3.org/TR/xlink/
10) XBRL Tools.
http://www.labs.fujitsu.com/en/freesoft/xbrl-tools

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