

UNLOCKING XBRL CONTENT

**An effective database solution for storing
and accessing XBRL documents**

**An Oracle & UBmatrix Whitepaper
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Introduction

In today's economic and political climate, everyone is talking about transparency.

- Governments and market regulators are under great pressure to ensure that they effectively and accurately collect the data needed to monitor key business sectors and make that data available for public review in a simple and transparent way.
- Enterprises of all sizes want to implement a simple process that ensures that the data they provide is accurate and in compliance with the governing rules and regulations. Therefore they need transparency over what they are currently being asked to provide.
- Financial markets, individual investors, credit issuers and other users of business information want to reduce the cost to acquire and improve the accuracy and usefulness of the data they analyze and on which they base critical business decisions.

All three groups – regulators, enterprises and financial markets - can be direct beneficiaries of eXtensible Business Reporting Language (XBRL). XBRL is a standard for the electronic communication of business and financial data increasingly being adopted as the format for business reporting around the world. XBRL provides significant benefits in the preparation, analysis and communication of business information.

- Regulators using XBRL can provide a consistent and complete set of rules on the data that reporting enterprises need to provide, while also reducing the reporting burden by simplifying and reducing duplication in the reporting process.
- Enterprises using XBRL can cut the costs associated with complying with the various regulatory reporting requirements by further automating the regulatory reporting process and also extend this framework to improve their own internal controls and risk management systems.
- Investors, insurers and other users of financial data are finding that as XBRL is adopted, a wealth of information is becoming available in a format which enables them to consume it directly into financial models without the inefficiencies, costs and manual errors inherent when rekeying or converting traditional formats.

By separating facts from the structure, XBRL promotes reuse of the content of an instance document, but also introduces new challenges in validating and querying the content. With the growing adoption of XBRL, there is an increasing volume of XBRL content that needs to be stored, managed and made available for analysis. This whitepaper describes how this can be done in a scalable fashion.

Oracle and UBmatrix have been working together to combine the power of the XBRL standard with the benefits of a scalable and reliable database technology to address the challenges of storing, managing and querying XBRL content. The joint solution outlined below provides a significant improvement on existing approaches to XBRL document storage by creating a 'native' XBRL data repository for the storage of validated XBRL documents; easy integration with Business Intelligence tools; simplified access via web portals; and integration into enterprise architectures.

The Power of XBRL

The standardization and transparency that XBRL brings to the exchange of financial and other business information can be deployed in a wide array of application areas. Below are listed a number of areas where XBRL has already proven itself to be of value.

- **Regulatory Reporting Frameworks** – Government and market regulators whose mission require them collect large amounts of reported data from a wide range of enterprises can reap huge benefits from adopting XBRL. Organizations such as the U.S. Federal Deposit Insurance

Corporation, Banque de France, the Dutch Tax Office, and the U.S. Securities and Exchange Commission have found that XBRL significantly improves the quality of data collected and enables exception based workflow to improve the efficiency of regulatory oversight. The ability for XBRL systems to automatically validate submissions results in less errors and a more efficient reporting process. The adoption of XBRL features such as XBRL Formulas enables regulators to fine tune their processes and focus on which areas they want to investigate in more detail.

- **Enterprise External Reporting and Compliance** – Enterprises have multiple external reporting requirements, from creating quarterly and annual company reports to filing tax returns. This often involves consolidating data from numerous systems. XBRL provides enterprises with the information on what needs to be reported and enables them to check and validate the data that they are sending – improving compliance and accuracy.
- **Internal Reporting** – Much of the internal reporting process is about exchanging information between different computer systems. XBRL helps improve data quality and enables information to be shared readily. In particular it reduces what is often referred to as spreadsheet hell – mass proliferation of spreadsheets containing conflicting information, errors and macros that no one understands that propagate themselves as the spreadsheets are edited and forwarded.
- **Information Exchange Hubs** – Many industries rely on high levels of data and financial information being passed between multiple independent players. Electronic Data Interchange (EDI) standards were developed to help facilitate this communication, but have proven costly and inflexible. XBRL allows the potential benefits of EDI to be realized at a much lower cost, as demonstrated by the Microfinance Information Exchange (MiX). The MiX acts as an information hub between over 1200 microfinance institutions and their approximately 90 sources of capital. The XBRL solution has reduced manual data entry and eliminated inconsistent data definitions, resulting in significant improvements in data accuracy and provides a powerful data dashboard for benchmarking and analyzing performance, which in turn will attract more players into the market.
- **Financial Information Consumers** – Investment companies, banks, credit insurance companies, etc are large consumers of financial data. Having a wealth of financial information available on companies in a consistent and machine-consumable form provides a massive opportunity to reduce costs, improve data quality and processes. It also facilitates the use of business intelligence tools for information discovery. A number of Dutch banks recently announced that they will be accepting XBRL documents for loan applicants' credit reports, while Japanese banks already accept XBRL documents.

XBRL is not the answer for all types of information exchange; however its general adoption as 'the' standard for business reporting provides increasing benefits. A common technology standard, like XBRL, enables organizations to develop generic solutions to satisfy multiple needs – further simplifying processes and reducing the costs of managing information. In the longer-term, the harmonization of data collection requirements, accounting standards and regulatory rules based upon this common technology standard will enable business and financial information to be shared readily without the need to continually redevelop applications. Key industry analysts are therefore making strong predictions that XBRL will have a significant impact, not only in the areas above, but also in many other areas of information exchange.

XBRL Explained

XBRL grew from a very simple idea, that to share financial information, each party has to have a common understanding of what each piece of information means. In essence, XBRL builds upon the XML standard, using data tags to describe information, an approach which has been accepted in the IT industry for many years. This tagging of data elements, allows reports to be converted into a document,

which is machine-readable and understandable by a receiving application that has the relevant 'dictionary' by which to read it. In XBRL this dictionary is known as an XBRL taxonomy.

However, XBRL adds much more than simple data tagging to financial information. It allows for the relationships between data elements to be defined and business rules to be established. This enables the data being sent and received to be 100% validated against a transparent set of formulae or rules. The improvement in the quality of reported data is a significant factor in the growing adoption of XBRL. XBRL also provides a very flexible model for extending or reorganizing the information exchanged without breaking the application.

The XBRL standard is managed by XBRL International, a non-profit organization which counts over 500 global organizations as its members. It promises enterprises and government agencies a cost-effective method to deliver a 100% compliant communication process for both external and internal reporting. For more information, visit www.xbrl.org.

Storing XBRL Documents

The XBRL standard has a number of characteristics that make it different from standard XML. These need to be taken into consideration when developing solutions for storing, managing and accessing XBRL content.

One key consideration is that XBRL content consists of two types of documents:

- XBRL Instance Document – a flat XML document that simply contains a set of facts related to a context (e.g. one or more reporting periods). These facts are not stored in any hierarchy or in any particular order.
- XBRL Taxonomy – contains information about how the facts are organized. An XBRL taxonomy defines one or more complex information hierarchies that allow the facts contained in an instance document to be put into context. It also defines rules about how to validate and present the content of the instance document. A typical XBRL taxonomy also consists of multiple XBRL linkbases, i.e. the taxonomy itself is spread across multiple computer files.

By separating facts from the structure, XBRL promotes reuse of the content of an instance document. It also makes it easy for organizations to extend a taxonomy, making it possible to report additional or more detailed facts where appropriate. The separation of fact from structure however makes it extremely difficult for traditional query and analysis tools to understand and interpret the content of an XBRL document correctly.

A second consideration is that in order to process the content of an XBRL document correctly, an XBRL 'processing engine' is required, which is fully compliant with the latest XBRL specifications and can perform the following tasks:

- Determine which taxonomy is required to process the content of the XBRL instance document.
- Locate the set of files required to construct the XBRL taxonomy (known as the Discoverable Taxonomy Set or DTS).
- Validate that the facts contained in the instance document are compliant with the rules defined by the taxonomy, including XBRL formulas.
- Organize and present the facts in the instance document as described by the taxonomy.
- Transform the instance document or generate new derived facts as defined by XBRL formulas in the taxonomy

Thirdly, there are already a large number of reference taxonomies in use, with more being published every day. It is therefore likely that an organization may have to manage a significant number of taxonomies in their systems. XBRL taxonomies already exist for IFRS and the general accounting standards for many countries, for example US-GAAP and J-GAAP. In addition XBRL taxonomies have also been published for specific markets, such as COREP for Basel II reporting. Each of these reference taxonomies has been further extended for use by different countries or specific organizations and new versions of these taxonomies are being published to meet new legislative and accounting requirements every year. So there is a strong requirement to manage these taxonomies.

A fourth consideration in designing XBRL systems is that instance documents and the documents that make up the XBRL taxonomy are tightly related. If just one of the documents in the XBRL taxonomy goes missing or gets invalidated, it becomes impossible for the XBRL processor to interpret the instance documents correctly. An instance document is also a statement of record between two organizations and therefore needs to be treated in a secure manner. Consequently any XBRL solution must understand how these relationships are defined, and be able to guarantee the integrity of both the instance documents and the taxonomy.

A final consideration is that XBRL content needs multiple representations for different uses. The original XML representation needs to be preserved for transport, exchange. But the facts, values, concepts also need to be made available for relational access to integrate with BI tools and legacy applications.

These considerations highlight the special challenges faced when developing an XBRL storage model. The model must be taxonomy independent, able to deal with multiple taxonomies, versions and extensions. Additionally it must be able to leverage the taxonomy to effectively query facts or the set of facts contained in the instance documents. Consequently when adopting an XBRL solution, organizations should be careful not to select a solution that has been hard-wired to one particular XBRL taxonomy.

Existing Approaches to Storing XBRL Documents

Early XBRL applications and systems stored XBRL documents (taxonomies and instance documents) in a file system. However, stored in this way, the information is not readily accessible for querying and analysis in a secure, scalable manner. So organizations often extract the data from the XBRL document and 'shred' the information into a relational database, thus creating two copies of the same data with the associated challenges of synchronization between the two copies. This approach has both strengths and weaknesses.

- While the data in the relational database is easily accessible and analyzed using standard query tools, it cannot be used to recreate the original XBRL document and cannot be used as a statement of record.
- The data in the relational database cannot easily leverage the valuable 'context' and 'reference' information in the taxonomy such as associated labels and presentation order (e.g. "show me the balance sheet for company A's SEC filing under the US GAAP taxonomy).

Also a simple file system cannot guarantee the integrity of the taxonomy and associated instance documents. The complexity of managing these relationships; ensuring nothing is lost or overwritten; maintaining version histories and other data management issues becomes the responsibility of the application. Thus, the complexity of the application becomes an issue as compared to managing this natively within a database.

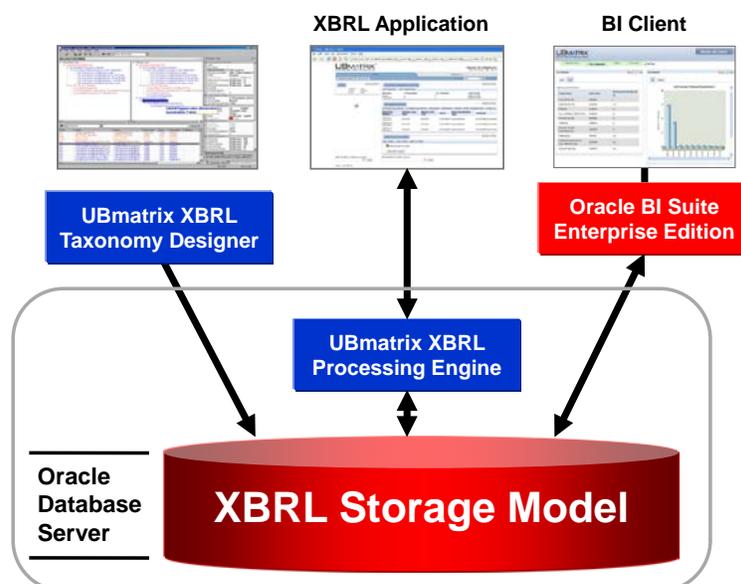
It is clear that a better solution would be for databases to effectively store XBRL documents in their 'native' format, so that the storage and querying can be done with the efficiencies that accrue from an understanding of the inherent structure of XBRL while leveraging the capabilities of a strong database management system.

The Oracle & UBmatrix Solution

Oracle & UBmatrix are working together to provide a comprehensive solution for developers building XBRL applications. The solution integrates an XBRL storage model in the Oracle Database tightly integrated with the UBmatrix XBRL Processing Engine. The Oracle and UBmatrix XBRL solution is comprised of:

- An *XBRL Storage Model* based on Oracle XML DB which provides XBRL storage and easy access for query and reporting via a set of XBRL specific services
- An *XBRL Processing and Validation Engine* – UBmatrix XBRL Processing Engine
- An *XBRL Taxonomy Development Tool* – UBmatrix Taxonomy Designer.

Together they provide a complete XBRL solution. The solution also provides easy integration with *Oracle Business Intelligence Suite Enterprise Edition* and other business intelligence products to help users interact with the data.



XBRL Storage Model

The XBRL Storage Model provides storage for XBRL content in the Oracle Database preserving its XML and document representations so that the content can be stored as is with minimum transformations. XBRL content is recognized at the time of intake and used to populate metadata structures that the database uses to enforce the integrity of the XBRL content and to provide alternative representational views over it.

The XBRL Storage Model leverages Oracle XML DB (see panel) to provide XML based queryability and protocol access. Content stored in Oracle XML DB can be accessed using file/folder-based protocols like, HTTP, FTP and WebDAV, making XBRL stored in an Oracle database directly available to common desktop tools, The content can also be accessed using traditional programmatic approaches such as Oracle OCI, JDBC, ADO.Net, Web Services, and REST. In addition, Oracle database technology such as Real Application Clusters, Information Lifecycle Management, and Partitioning can be brought to bear on the XBRL content.

Oracle XML Database Features

Oracle XML DB is a high-performance, native XML storage and retrieval technology available with Oracle Database. Oracle XML DB enables XML-centric application development allowing developers to use the Oracle Database to store, manage and manipulate XML Content using XML access paradigms. It supports most of the common XML Standards including XML, XML-Namespaces, XMLSchema, XQuery, XSLT, SQL/XML, XLink and XInclude. It provides organizations with the best of both worlds by allowing SQL centric access to XML content and XML centric access to SQL content. All of the standard tools and APIs used to access relational data in an Oracle database can be used to access XML content stored in Oracle XML DB. Oracle XML DB also includes a unique XML repository which allows XML content stored in Oracle Database to be organized using a familiar File/Folder metaphor and accessed from Desktop tools such as Microsoft Office.

These features make it an ideal platform for managing XBRL documents. The XBRL standard is based on XML Schema, and XLink. Oracle XML DB is optimized for storing and querying XML content that is based on XML Schema, like XBRL. In addition the latest versions of Oracle Database include specific optimizations for processing XML. For more information, visit www.oracle.com/technology/tech/xml/xmlldb/index.html.

The XBRL Storage Model – Access

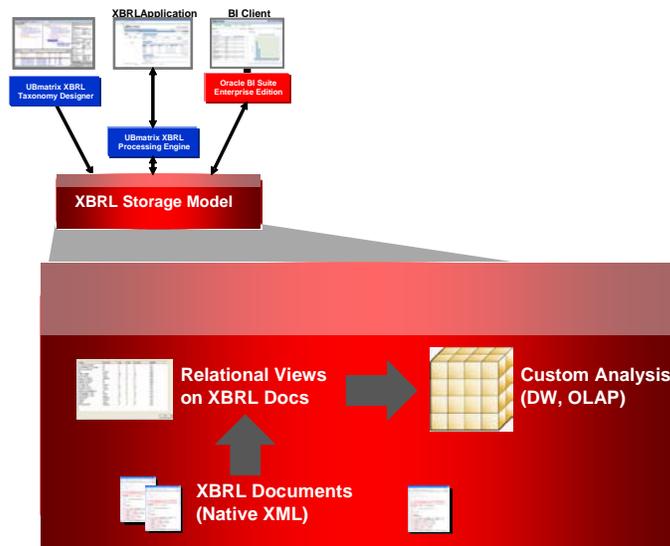
The XBRL Storage Model stores XBRL in its original XML representation as Binary XML in XML DB. This is a native XML representation in Oracle XML DB that enables all of the powerful XML features of Oracle XML DB, such as XQuery and XML indexing to be used to operate on XBRL content.

In addition to XML centric access, the XBRL Storage Model provides a set of relational views. These views define a logical data model that exposes the XBRL instance documents and taxonomy in a manner that enables traditional SQL operations and analytics to be performed directly on the XBRL content. For example, the relational views provided by the XBRL Storage Model can be used to answer queries of the form “find the value for 2009 Q1 Total Revenue in Oracle’s 10-k statement”. Specialized indexing mechanisms included with the XBRL Storage Model ensure that this type of query performs in an optimal manner.

The XBRL Storage Model also provides tooling to reconstruct XBRL networks from the content of the XML Schemas and linkbase documents that comprise an XBRL taxonomy. These networks are generated dynamically and can be used to create live views of the XBRL content. These networks effectively provide the unification of facts and structure which were separated in the XBRL representation. Views generated this way can be used to answer As-Filed queries of the form “list the concepts and labels in the Cash Flow Statement for US-GAAP in an order specified in the XBRL presentation linkbase,” or show the aggregated set of values for this dimension.

The XBRL Storage Model – Services

The XBRL Storage Model also provides a suite of services to facilitate scalable XBRL based operations such as version control including identifying differences between versions of the same document and XSLT transformation. The XML DB architecture ensures this kind of operation is performed without needing to load entire documents into memory thus ensuring these operations scale effectively on large volumes of XBRL content.



XBRL Processing and Validation Engine

The Oracle & UBmatrix solution includes the UBmatrix XBRL Processing Engine that can be deployed in the mid-tier or client-tier. The XBRL Processing Engine supports validation and processing based on the latest XBRL 2.1 standard. The XBRL Processing Engine is integrated with The XBRL Storage Model to directly operate on the stored content, to reuse stored taxonomies, or discover taxonomies as needed. The XBRL processing engine supports the Formula 2008 specification so that advanced formulas can be created to provide additional levels of data quality checking and to generate derived facts.

UBmatrix XBRL Processing Engine

UBmatrix has been at the forefront of developing software that takes advantage of the XBRL standard to deliver robust and effective financial reporting systems to government agencies, market regulators and enterprises alike. The UBmatrix XBRL Processing Engine (XPE) is recognized as one of the leading engines for generating, converting, validating, and consuming XBRL documents.

The UBmatrix XPE and other UBmatrix products are in production today on projects such as the Federal Financial Institutions Examination Council (“FFIEC”) Call Reporting system - the first major XBRL based reporting system for 8,000 banks in the United States. The Microfinance Information Exchange (the MIX) an information hub tracking the performance of over 900 microfinance lending institutions is based on UBmatrix products. In Europe, the Banque de France is implementing a Basel II reporting infrastructure for its 620 member banks based on the UBmatrix XPE. UBmatrix products are also at the core of the Dutch Tax Office system, which is part of the Standard Business Reporting project in the Netherlands, which aims to save organizations €350 million a year in administrative costs for business-to-government reporting. For more information on interesting use cases, see www.ubmatrix.com/casestudies.

XBRL Taxonomy Development Tool

The solution includes UBmatrix Taxonomy Designer, a tool for creating or extending taxonomies. This integrated XBRL development tool provides a rich visual environment for the design phase with support for creating/editing taxonomies, validating the new taxonomies against the latest XBRL specification and provides a full suite of debugging aids.

The Oracle & UBmatrix Solution Advantage

The Oracle and UBmatrix solution can be deployed in traditional three-tier architecture with the XBRL Storage Model in the database tier, the XBRL processing engine and potentially the Oracle BI Suite as a separate instance in the mid-tier, and a set of tools on the client desktop.

These functional pieces can be combined using a prepackaged XBRL workflow suite like the Enterprise Application Suite from UBmatrix, or alternatively the components can be integrated into an existing application or combined with portals and BPEL support to meet custom requirements.

Key Benefits

The joint Oracle and UBmatrix solution provides key enhancements over existing solutions by providing a single content model that is used throughout the XBRL document lifecycle, from creation to validation to storage to analysis. Key benefits can be broken down into 3 key areas:

- Processing, validating and storing of instance documents
- Management of taxonomies
- Viewing, analysis and reporting

Processing, validating and storing of instance documents:

- Scalable storage of instance documents – The solution can utilize the advanced data performance features of the Oracle database
- Single copy of document – Instance documents are stored natively, and optimally indexed within the database for easy access.
- Versioning - Instance data is versioned at a document-level.
- Enterprise administration, high level availability and security – The Oracle technology platform ensures that users' experience of the service meets the quality expected even at peak times of demand.

Management of taxonomies:

- Taxonomies are stored, and optimally indexed in the database.
- Taxonomies are linked to the specific instance document.
- Versioning – taxonomies can be versioned at a document level.

Analysis and reporting:

- Scalable viewing of instance documents – allows a large number of users to be connected to the system for viewing and analyzing instance documents.
- Ad hoc reporting – Ability to construct efficient ad hoc queries across reported data using standard Business Intelligence tools.
- Exception reporting – Ability to perform ratios and averages across one or more instance documents.
- Data discovery – Ability to discover a defined set of entities and periods where reported data exists, or where it does not exist. Ability to know which entities still need to submit data.

Oracle & UBmatrix are committed to working together to provide an effective solution which government regulators, market regulators, and enterprises, both large and small, can use to build applications that leverage the growing adoption of XBRL. The objective is to enable our customers to deliver better transparency and accuracy of business and financial information in whatever application or presentation format is required.

Further Information

Oracle XML DB at: <http://www.oracle.com/technology/tech/xml/xmldb/index.html>

UBmatrix Processing Engine and Applications at: <http://www.ubmatrix.com>

XBRL International at: <http://www.xbrl.org>