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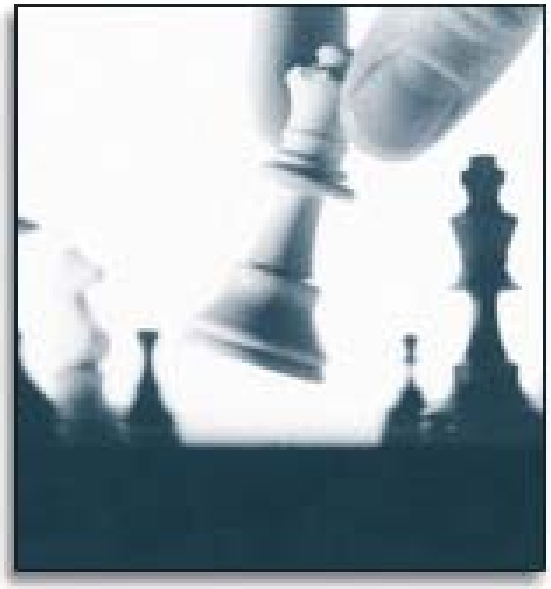

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Live on Oracle Database 11g XML DB

Carlo Tiu (NCPA)
Geeta Arora (Oracle)
Bhushan Khaladkar (Oracle)

The following is intended to outline our general product direction. It is intended for information purposes only, and may not be incorporated into any contract. It is not a commitment to deliver any material, code, or functionality, and should not be relied upon in making purchasing decisions.

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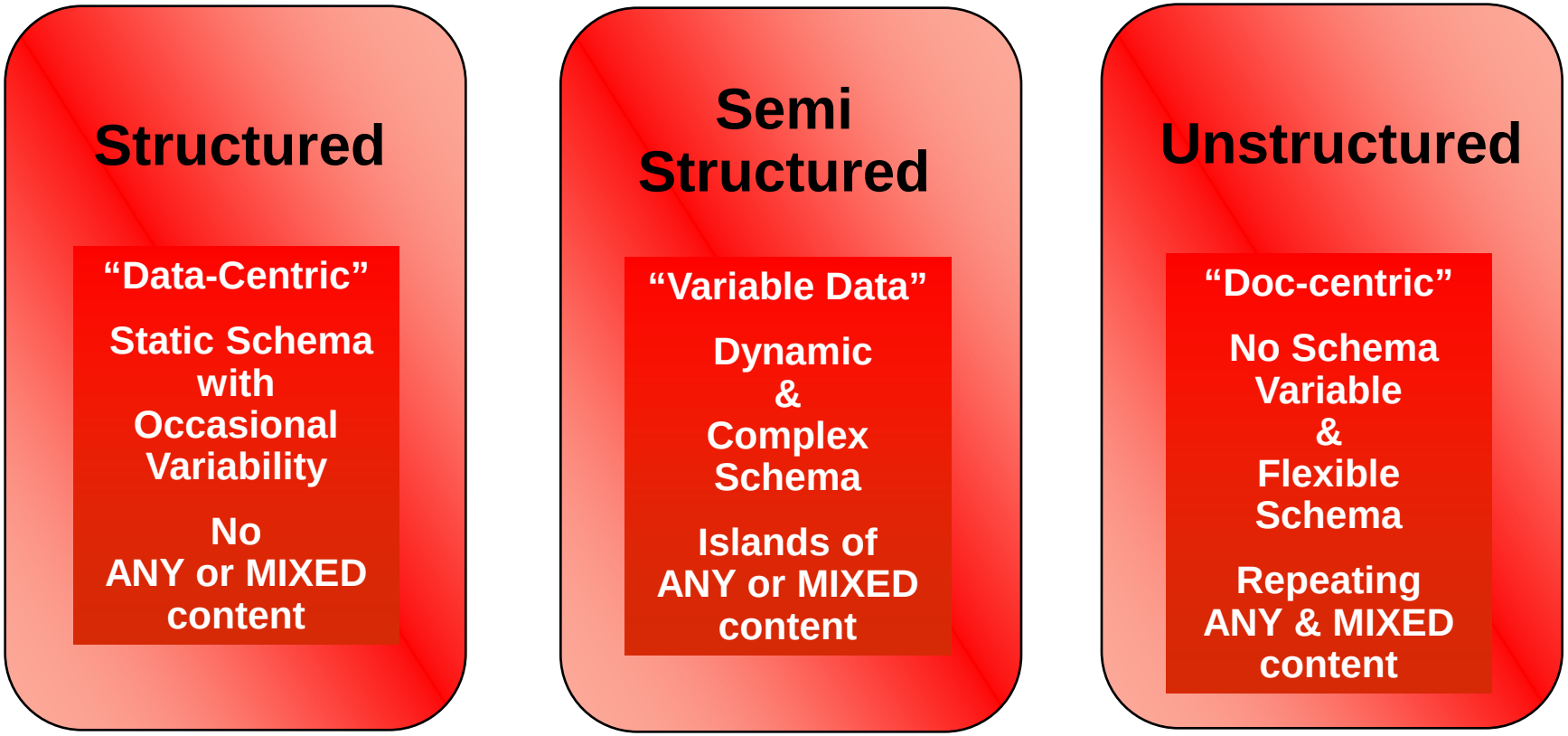
Agenda

- **XMLDB 11.2 enhancements**
  - **Schema and XQuery**
  - **Structured usecases**
  - **Semistructured and Unstructured usecases**
  - **Repository**
- **NCPA demo**

XML Use Cases



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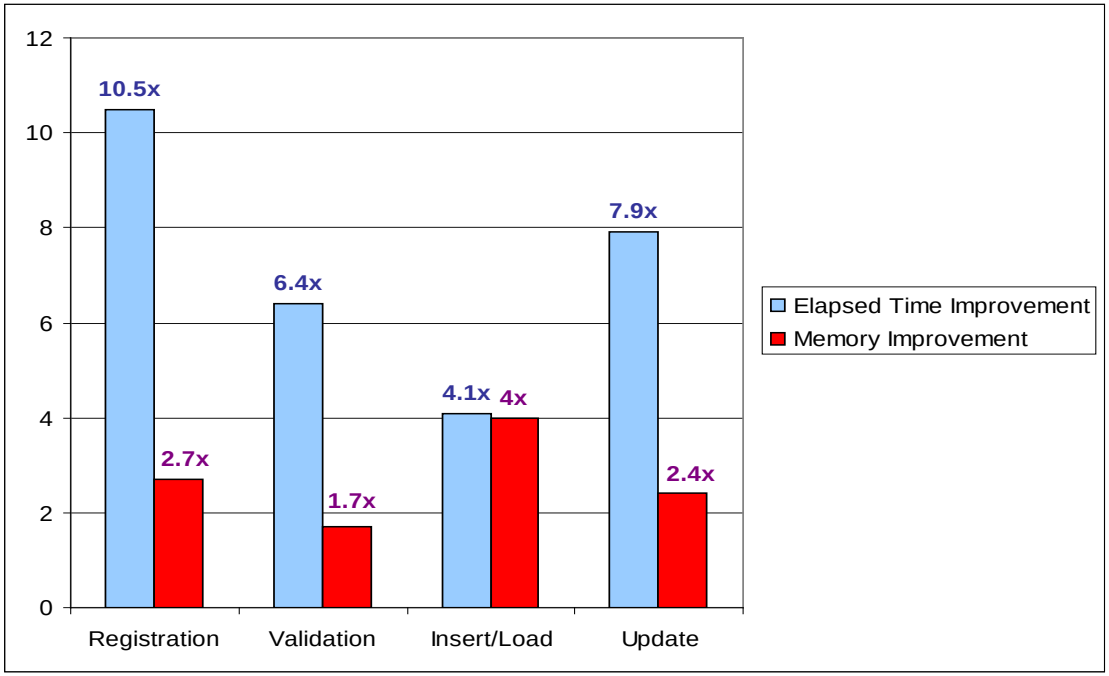
XML Schema Enhancements

- **Schema registration performance**
  - **Eliminate internal and external memory fragmentation**
  - **Optimized schema loading**
  - **Time and memory improved by 50x for US-GAAP, HL7, NIEM**
- **Schema Validator Cache**
  - **Improves XML schema validation by around 5x, more for small docs**
- **Can handle complex industry schemas**
  - **GJ-XML, GML, US GAAP, NIEM, HL7, FixML, MPEG-7, KML**
  - **ACORD, SDMX, FPML, Reed, OAGIS, MPEG7: Binary & O-R**

XML Schema

Performance Improvements over 11gR1



Avg. improvement for NIEM, HL7, US GAAP, FPML

XQuery and SQL/XML
Storage Independent Enhancements

- XQuery 1.0 / SQL/XML standard compliant
- Handling Large XQueries
  - Re-write enabled for large size Xquery (upto 32K)
  - 8x increase in size and complexity of supported XQuery operations
- 20x improvement in functional evaluation of Xquery
- Up to 60x improvement for XML Generation from relational data

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Object-Relational Storage
Enhancements

- **Inheritance constructs like xsi:type and “instance of” now rewrite**
- **Default storage of collections is “table” across the board**
  - **leads to relational query performance**
- **Document ingestion and fragment retrieval faster and more scalable**

Ingestion of Large Documents in Object-Relational Storage

- Files upto 4G can be ingested in an O-R table
  - up from 500M pre-11gR2
- “Direct Insert” : Greedily flushes document fragments directly to destination tables
- Scalable and Performant
  - Minimizes fragments in memory
- Applied when documents are uploaded to XDB using
  - FTP protocol
  - PL/SQL function DBMS_XDB.createResource

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XMLIndex Table-based (New in 11gR2) Example

XML Data

```
<Address>
  <city>Fremont</city>
  <state>CA</state>
</Address>….

<Address>
  <bold> <city>Melbourne</city></bold>
  <font size="21">
    <state><!– state is not in   US --
></state>
 </font>
  <country>Australia</country>
```

XMLTable Index

Key	City	State	Country
10	Fremont	CA	
20	Melbourne		Australia

XMLIndex Table-based

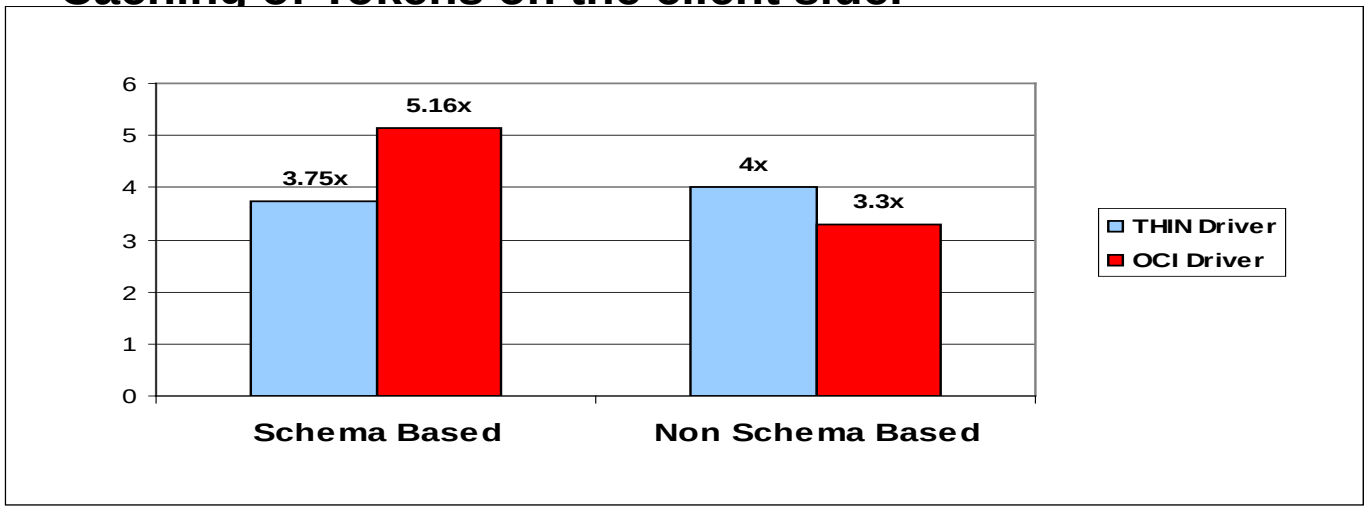
- Complements Path based XML Index
- Project commonly searched structured data into a table
- Secondary relational indexes can be created on top of index content tables
- Text Index can be created on projected text column
  - Speed up text search in XML content
- Rewrites queries for relational performance

XMLIndex Path-based Enhancements

- **Partitioning, parallel index creation and parallel query supported**
- **Physical rewrite for path subsets**
- **Many queries improve 5-20x**
- **Asynchronous DML performance improves 2.5x**

Binary XML Enhancements

- Improved query performance without indexes
  - New Search based decoder
  - Document level Summary
  - Improved XPath Caching
- Improved End to End Binary XML performance for Thin and OCI drivers
  - Caching of Tokens on the client side.



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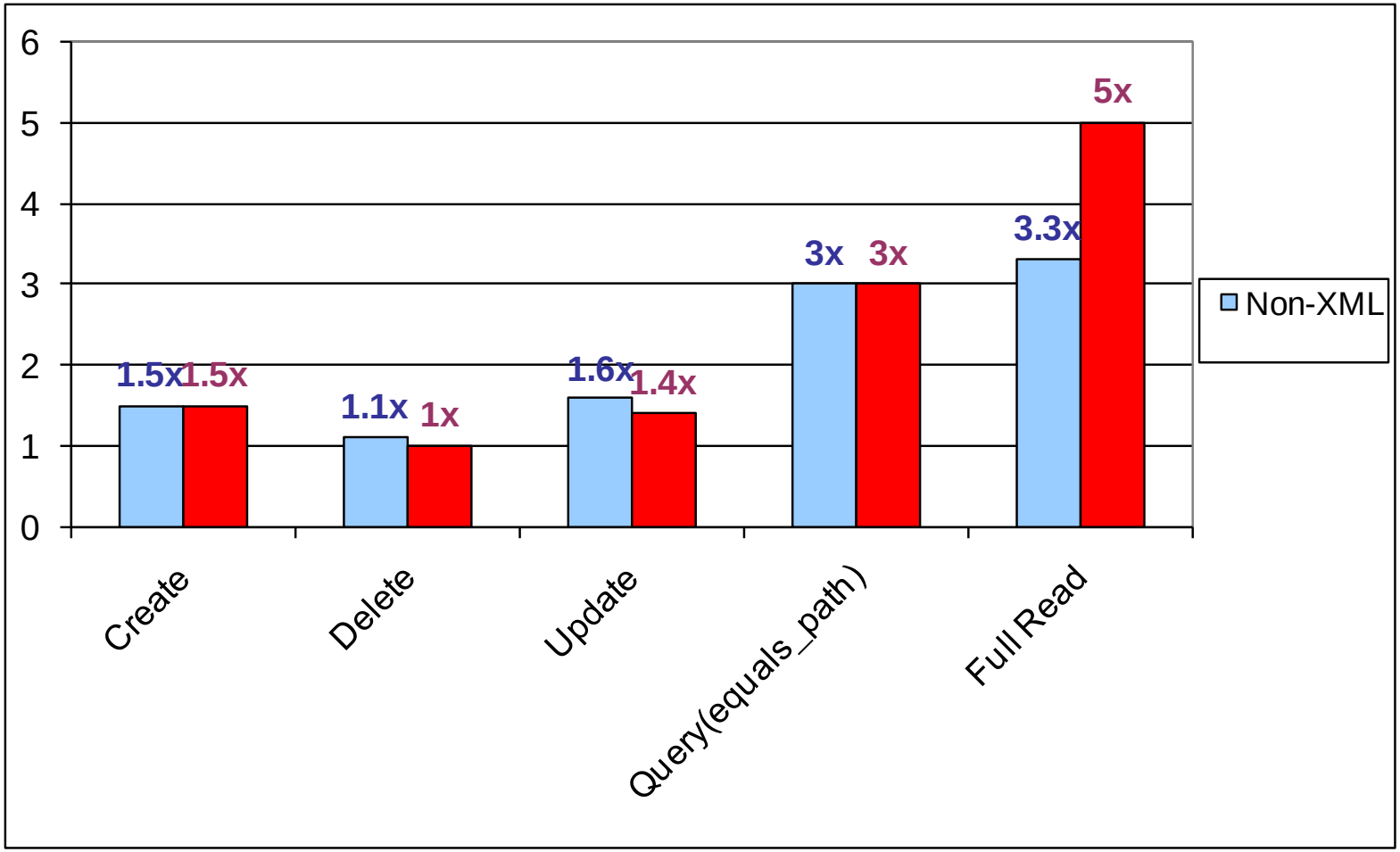
XML DB Repository
Enhancements

- Secure files for all repository content
- Create Operations
  - Improved creation performance of documents conforming to system schemas (ACLs etc).
  - Avoid creating intermediate DOMs while creating resources
  - Optimized in-memory structures
- Retrieval
  - Improved resource_view queries where predicates involve equals_path and under_path – 3x improvement.
  - Avoid copies during full retrieval of documents - 2-3x improvement.
- Delete
  - ACL Deletion performance increase by 5x using ACL OID Index on resources.

XML DB Repository

Performance Improvements over 11gR1



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Northern California Power Agency (Structured)

- NCPA supplies and purchases power from the California grid on behalf of it's members
- Settlement system leverages SOA and XML
- "XML DB Short Circuits the Data Transformation"
  - NCPA is able to process large volumes of XML using commodity hardware
  - System has proven flexible and adjusts quickly to ongoing changes
  - Source code available as 'open-source' – being adopted by other market participants
- In-house solution developed at a fraction of the cost of an off-the-shelf solution
- Currently live on 11gR1 with RAC

Live on Oracle Database 11g XML DB

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Brief Background on NCPA

- NCPA supplies and purchases in the California grid on behalf of it's 16 cities in Northern California
- Our load is about 1000 MW
- We celebrate 41 years of service this year
- Our members' value is derived in large part from:
  - Our ability to be a cost leader
  - Our ability to be agile under different market conditions and regulations

Start of XMLDB Project

- CAISO was formed in 1997 as a result of market restructuring in California
- The meltdown of 2000 formed the basis for the current Market Redesign.
- The aging equipment at the CAISO was the basis for a system refresh of the equipment and technology under MRTU.
- Web Services, B2B Communication and XML Payload Delivery

Project Challenges for NCPA and MRTU

MRTU Challenges

- Evolving Requirements
- Complex Market
- Large Payloads

Business Challenges

- High Reliability
- Agility Built In
- Cost Control

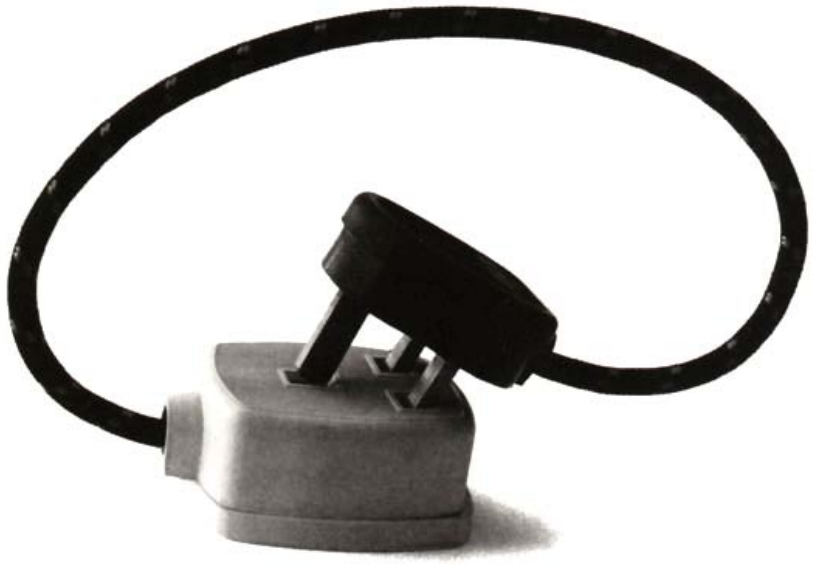
XML DB Short Circuits the Data Transformation

XML DB

- Register XSD
- Load XML
- Write Queries

Traditional Approach

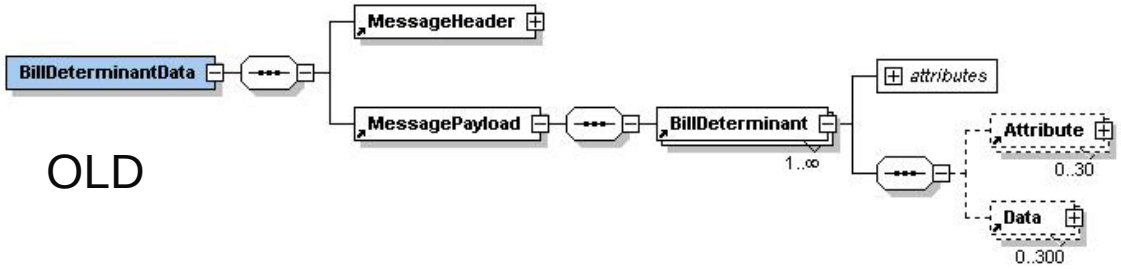
- Design Tables
- Build Tables
- Parse Data
- Write Queries



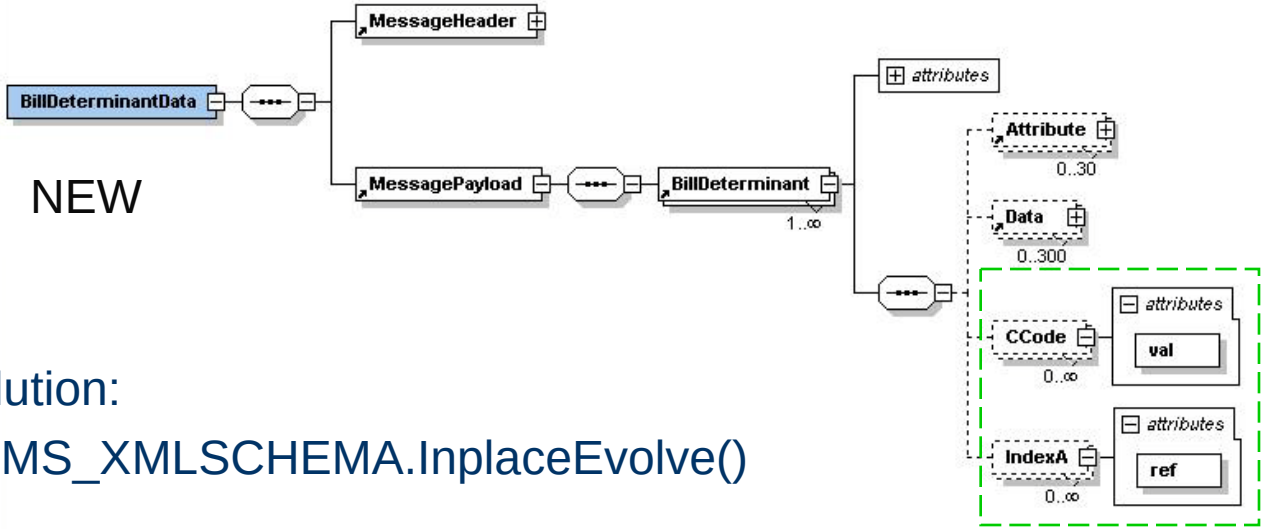
DEMO

- XML Schema Registration
- XMLType tables generated from the registration
- Loading XML Instances
- Xquery Views
- In-Place Schema Evolution
- Copy-Evolve Schema Evolution
- Schema-Based Binary XML

BillDeterminantData.xsd Schema Evolution



OLD



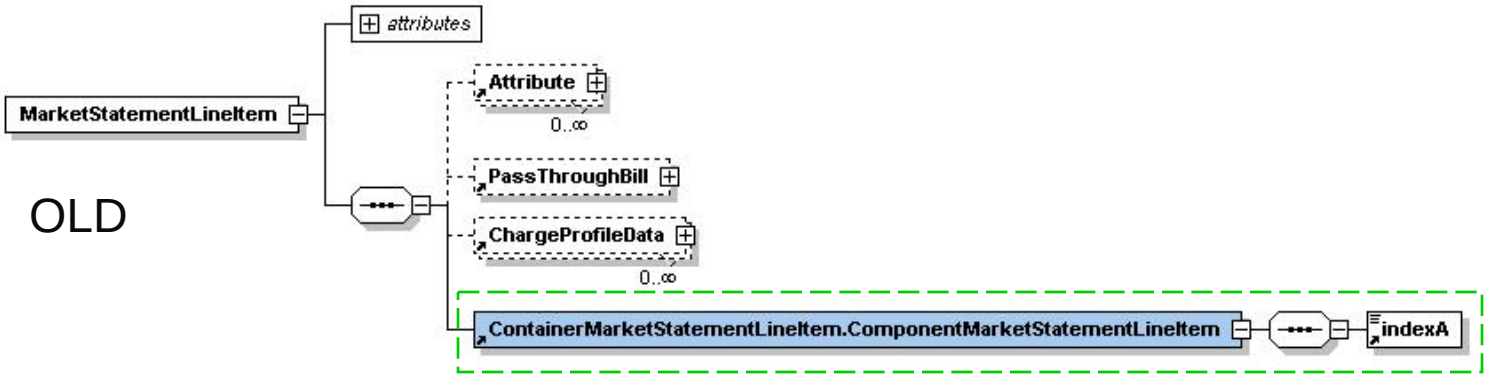
NEW

Solution:

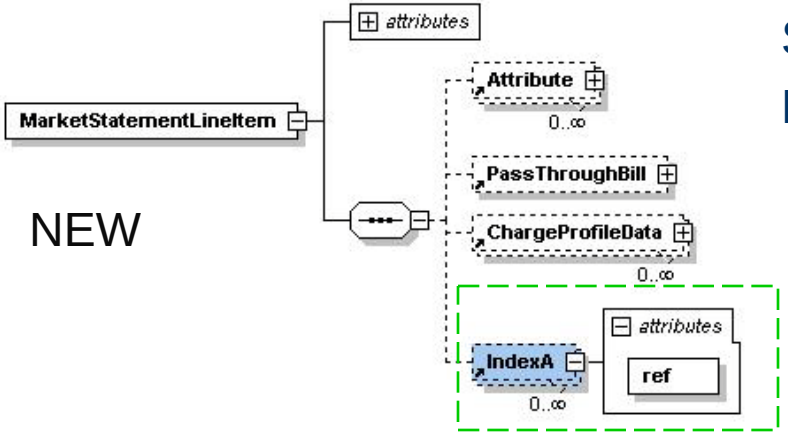
DBMS_XMLSCHEMA.InplaceEvolve()

StatementData.xsd Schema Evolution

OLD



NEW



Solution:

DBMS_XMLSCHEMA.CopyEvolve()

Major Systems Built

- 26 Different Systems Were Impacted
- Major Systems Built For MRTU:
  - Bidding System
  - Settlement System
  - Master File System
  - Dispatch Retrieval System

Costs

- Hardware, Software, and Third Party Components
  - $300 thousand (one time cost)
- Labor (two year effort)
  - $900 thousand (internal)
- $1.2 Million Invested
- $250K Per System…..A Real Bargain

Hardware and Software Configuration

- 64-bit Windows Server 2003 SP 2 on 2 Intel Xeon 5160 dual-core CPUs, with 8 GB of RAM.
- The database is 220 GB (today).
- The Oracle software is Oracle Database 11g Release 11.1.0.7.0 – 64bit Production

End

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