

**2000**

**XML**

**2000**

**XML**

**論文 碩士學位 論文 提出**

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**梨花女子大學校 科學技術大學院  
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# 碩 士 學 位 論 文

## 認 准

指導教授

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審查委員

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梨 花 女 子 大 學 校   科 學 技 術 大 學  
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가 .

가 ,

가 .

가 .

XML 가

XML

(Scheme)

XQL XML



# I.

## 1.1

가

가

가

[1,2,3,4,25].

가

[2,4,25].

가

[1,2,3,25].

[17,18,19,20].

XML(eXtensible Markup Language)

XML

(DBMS)

[2,12].

가

가

Description

(Catalog) , SQL

CASE

E-R

[29].

XML

(X-MEM)

eXcelon

## 1.2

XML

XML

가 [28].XML

XML

[9,10].

XML

XML

XML

가



## II.

### 2.1

가

가

#### 2.1.1

[2,3].

가

[2,3].

T M				
			가	
		Column		Column
		Index		가?
		Privilidge		
				가?
				?
		,		
				가 가?
B M	Business Intelligence		가?	
		,	,	
		,	,	
			가?	

--	--	--	--

(\* TM : Technical Metadata , BM:Business Metadata )

[ 2.1 ]

· ,  
가 ,  
·

## 2.2

· MDC OIM, OMG MOF 가  
MDC MDIS, OMG XMI, XIF 가 .

### 2.2.1

- MDC OIM(Open Information Model)

OIM

가 ‘ , [20]. OIM

Analysis and Design, Component Description and Specification, Database and Data

Warehousing, Business Engineering, Knowledge Management 5 [20].

5 (Information Model)

SQL Server 7.0

MDC OIM sql

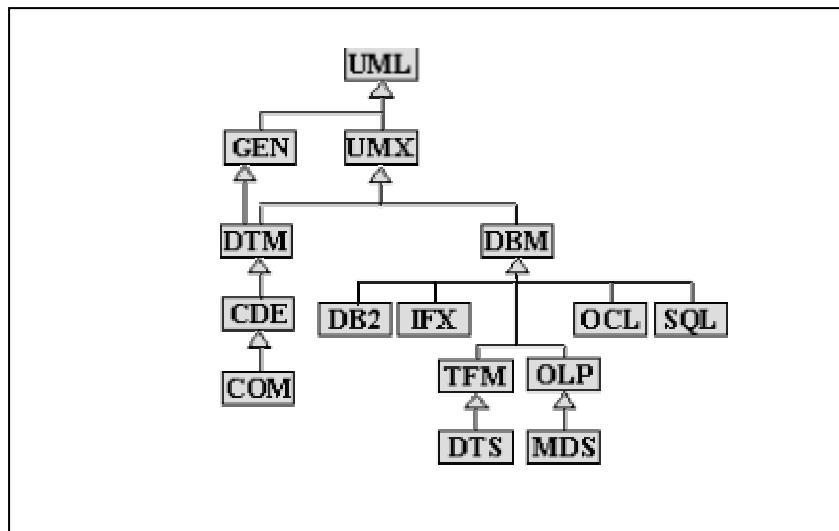
SQL Server7.0 OLE DB

SQL Server DTS(Data

Transformation Service)

SQL Server

[2,22]. MDC OIM



\* UML : UML

\* UMX: Uml Extension Model

\* GEN: Generic Model

\* DTM: Common Data Type

- \* DBM: Database Model
- \* GEN : Generic Model
- \* DB2: DB2 Dbm
- \* OLP: OLAP Dbm
- \* IFX: Informix Dbm
- \* COM : Component Object Model
- \* CDE: Component Description Model
- \* SQL: Dbm
- \* OCL : Dbm
- \* TFM :Transformation
- \*MDS : Microsoft Decision Support

[ 2.1 OIM ]

OIM

UML

2.1

,DB2 OIM Dbm

UML

Dbm

Sql, Db2, Ocl, Tfm, Olp 가

OIM Dbm

, SQL (DDL)

MDIS XML

[2,21,22].

● **OMG MOF**

MOF OMG

API . MOF OMG Repository Architecture Repository

Common Facility

가

ORB(Object Request Broker)



. OMG MOF CORBA  
 , ,  
 ,  
 . MOF MOF Model, MOF IDL mapping, MOF interface

MOF Model	Class, Association, Package abstract language
MOF mapping	MOF CORBA IDL CORBA 가 . IDL .
MOF interface	MOF metamodel CORBA

[ 2.2 MOF ]

2.2.2

가

[4].

,  
 (ANSI), (ISO),  
 (IEC), (ECMA),  
 IBM, DEC Unisys  
 CASE  
 CDIF(CASE Data Interchange Format), CASE  
 PCTE(Portable  
 Common Tool Environment), CALS STEP

SDAI(Standard Data Access Interface)가

IBM Repository Managers

[4].

MDC(Meta Data Coalition)

OMG

XML 가



**XML**

XML

W3

ISO

XML

DTD, XML Schemas



[ 2.2 MDIS ]

2.1 MDC

XML XML DTD

. 2.1 OIM DTD

XML . MDIS

50

[21].

● **OMG XMI**

XMI OMG MOF .

XMI 'XMI' header,content,extensions 32

DTD .

. XMI MDC

MDIS 가 DTD

. MDIS DTD

XML XMI 가

● **XIF**

XIF OIM

XML .

XIF

(Information Model)



3 가

2.4.1

IBM, Metadata Integration

	DB2	Windows Based GUI	OIM
MS Repository	SQL Server	SQL DBMS	XIF
Prisim	ORACLE,Informix,DB 2	Windows Based GUI	CDIF
MetalIntegratio n	MS Access	Windows Based GUI	XIF,XMI

[ 2.3 ]

2.3

MDC OMG

, XML

XML

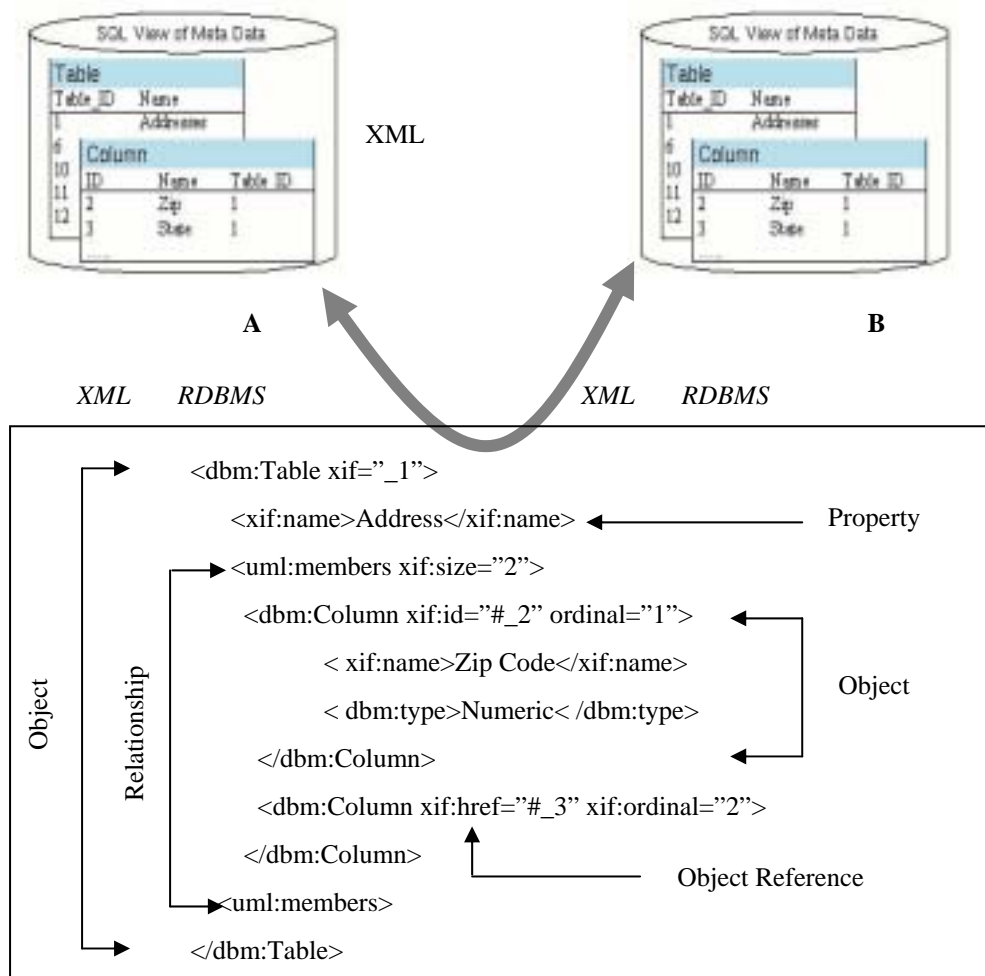
[8].

O<sub>2</sub> XML 가

Ardent Software

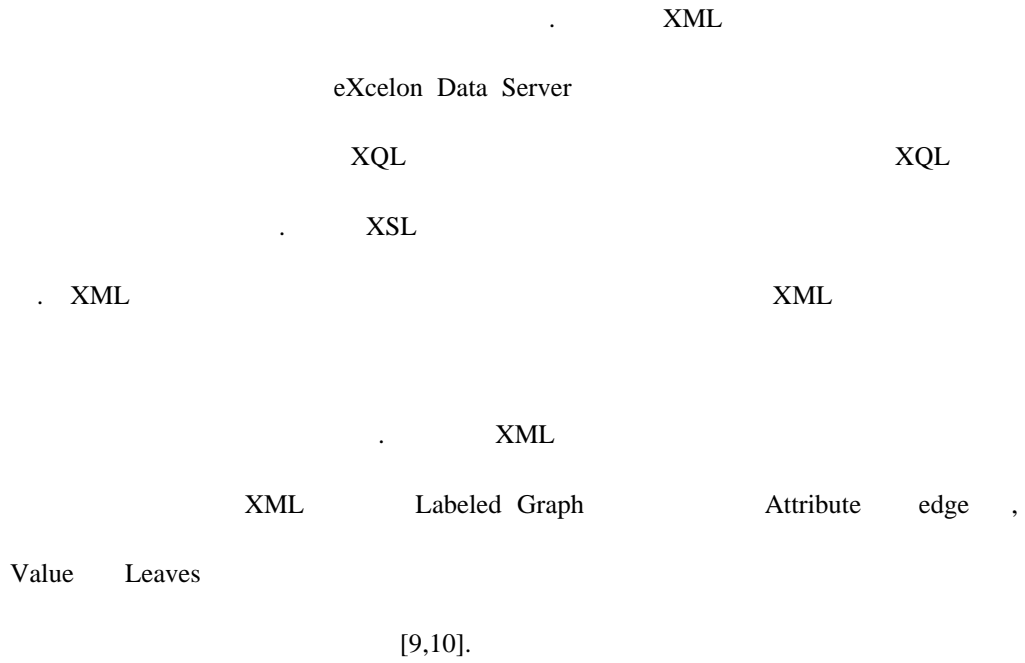
[5].

XML

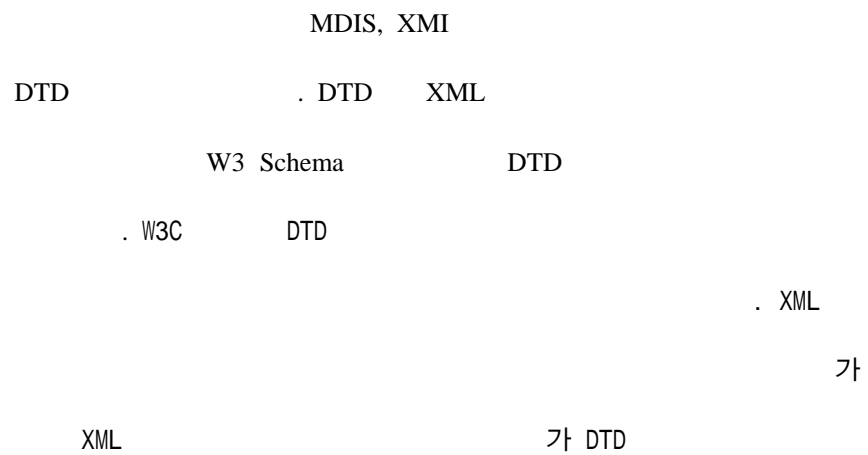


[ 2.3.1

]



2.4.2





. XML  
 XML-Data 가 DTD  
 .DTD ,  
 , Multiple Namespace ,  
 Inheritance .

- Data Typing  
 DTD TEXT . DTD  
 TEXT  
 가 TEXT  
 . DTD XML-Data  
 [15,27].

- Constraint on Allowed Values  
 Minimun, maximun

[15,27].

- Inheritance of Type  
 XML-Data

[15,27].

- Open & Closed Models

DTD          Closed                          XML-Data                          Open Model

Closed Model                          .          , Closed

가                          가          Open

가          [15,27].

XML-Data

### 2.4.3

DBMS

### III. RDBMS

UML(Unified Modeling Language)

X-MEM(XML-Metadate Exchange Model)

XML

#### 3.1 UML

UML

. UML

UML

[31].

UML

XML-Data

#### 3.1.1 UML

[31].

가

UML

### 3.1.2 UML

UML

UML

UML Class, Relationships, Composition, Refinement, Generalization, Dependency

- **Class**

Notation, Semantics, Attributes

- **Relationships**

Relationship

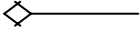
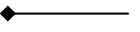
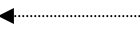
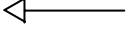

Relationship

Associations, Refinement, Generalization, Dependency

Association

Composition, Aggregation

Notation		Semantic
Association		가

Aggregation		Association 가
Composition		Aggregation 가 가 가
Refinement		
Generalization		
Dependency		

[ 3.1 UML ]

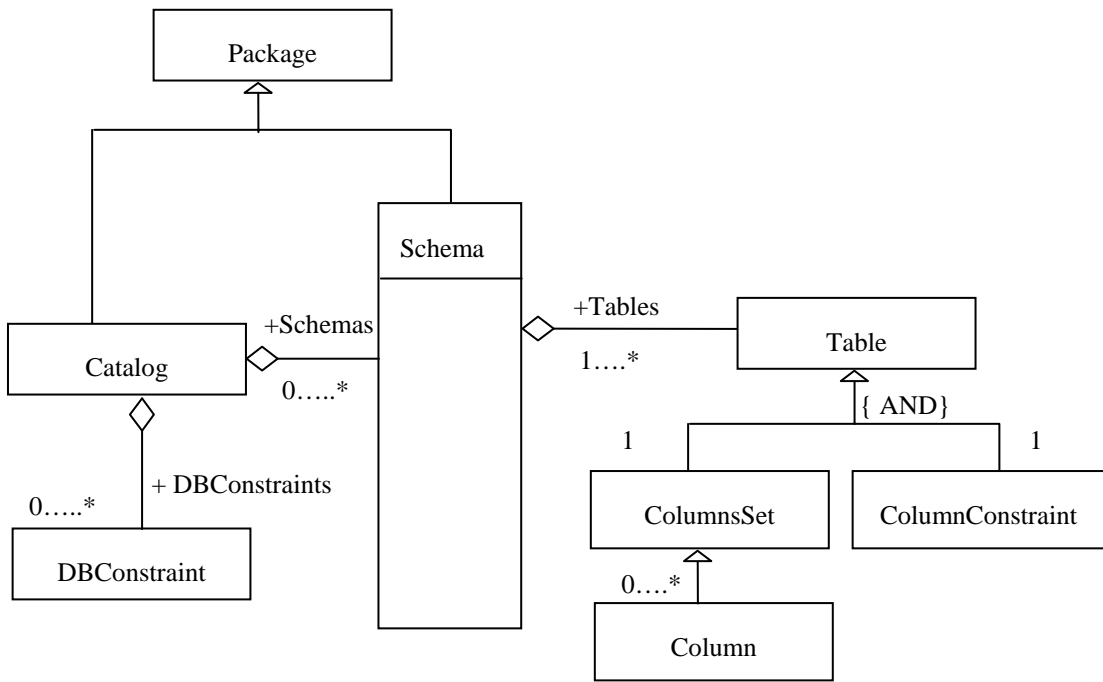
- Notes

- Constraint

Constraint 가 text  
 . Constraint UML  
 rule . Constraint

3.1.3

3.1.2 UML



[ 3.1 ]

3.1

Package,

Catalog, Schema

가

Package 가 가  
UML Package 가 .  
Catalog Top Level Container  
Constraint  
3.1 Table  
Column ColumnsSet Constraint 가  
ColumnConstraint Table  
Schema Aggregation  
Constraint DBConstraint Catalog  
Aggregation .

### 3.2 XML-Data X-MEM

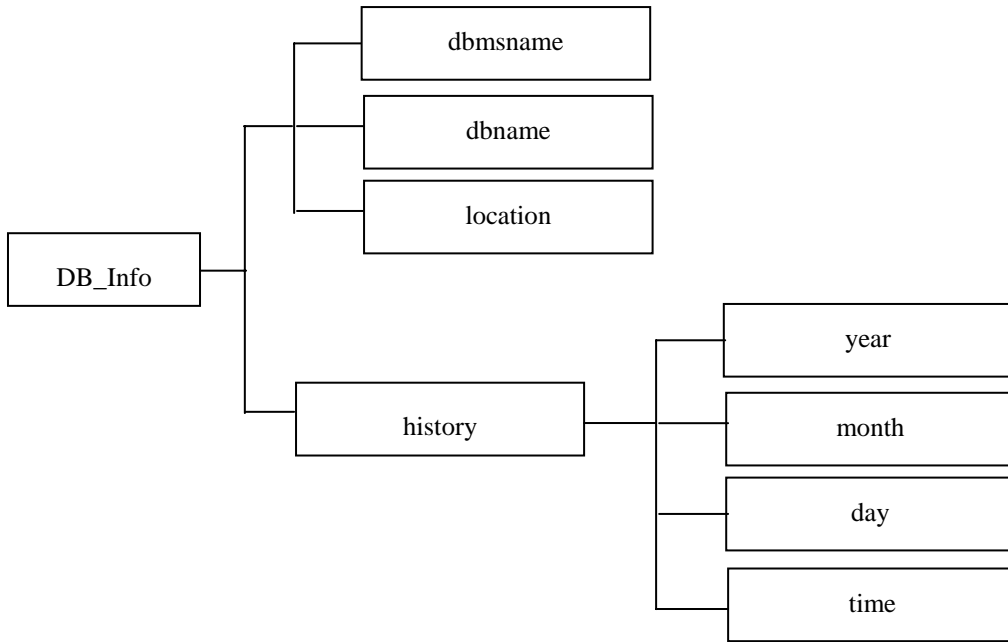
XML  
. XML  
가 XML  
DTD(Document Type Definition)  
XML DTD XML-  
Data DTD XML-Data .

UML

### 3. 2.1

XML XML  
, XQL  
DBMS .

- DBMS



[ 3.2 DBMS ]

### 3.2 DBMS

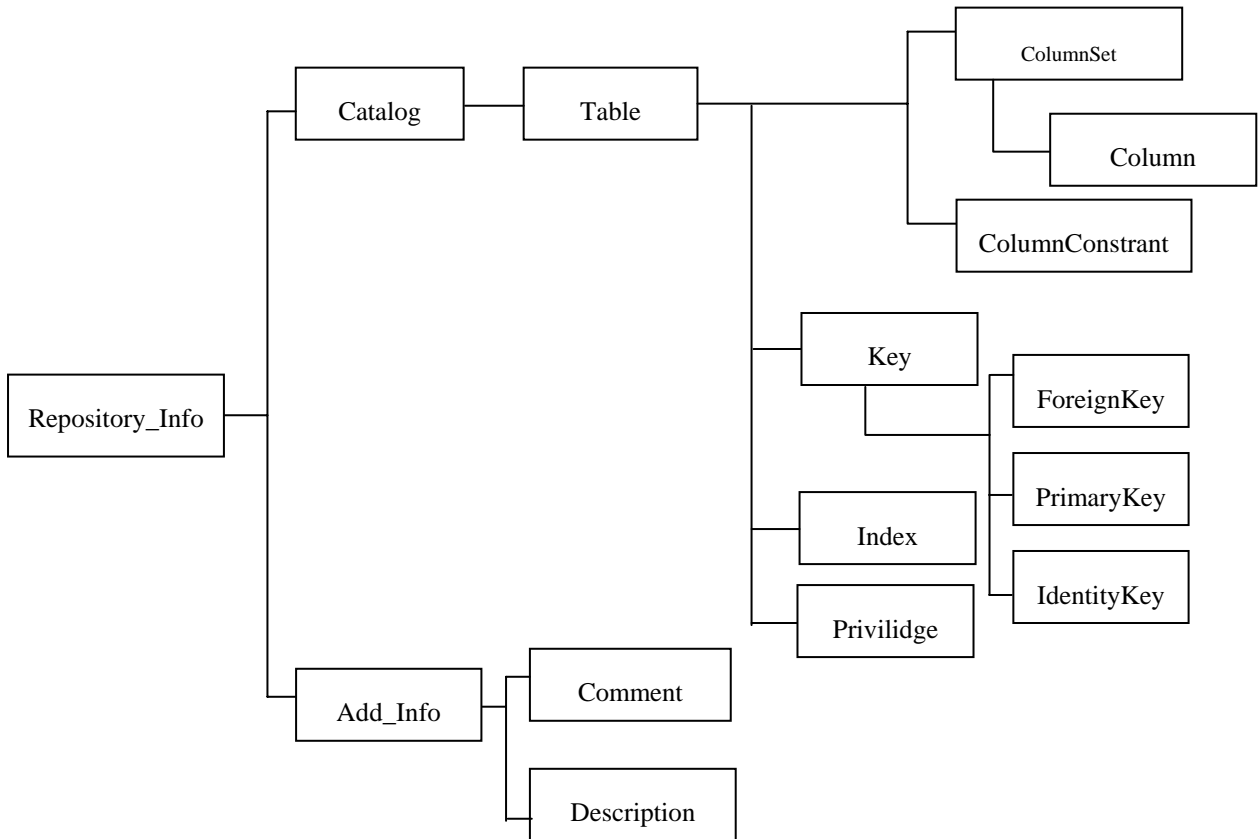


(Machine)

DBMS

Version

XML



[ 3.3 ]

3.3

. Repository\_Info

Catalog

Add\_Info

가

### 3.2.2

XML-Data

3.2

3.3

XML-Data

- XML-Data

```
<?xml version="1.0"?>  
<Schema xmlns="schemaname" xmlns:dt="urn:schemas-microsoft-com:datatypes">  
  <ElementType name="elementname" content="contenttype"/>  
</Schema>
```

XML-Data

XML

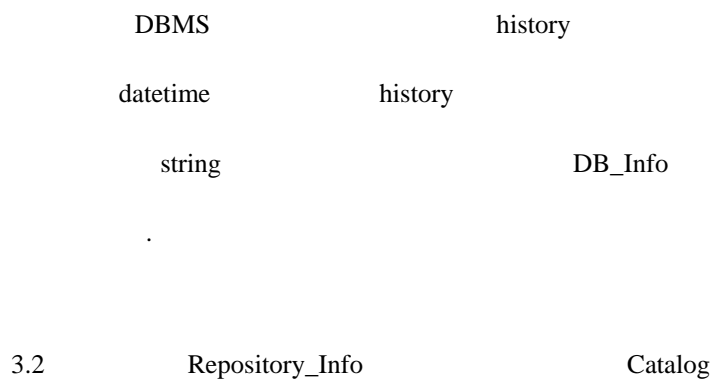
1.0

3.1

DBMS

```
<?xml version="1.0"?>  
<Schema xmlns="urn:schemas-microsoft-com:xml-data" xmlns:dt="urn:schemas-  
microsoft-com:datatypes">  
  <AttributeType name="id" dt:type="string"/>  
  <ElementType name="dbmsname" dt:type="string">  
  <ElementType name="dbname" dt:type="string">
```

```
<ElementType name="location" dt:type="string">
<ElementType name="year" dt:type="datetime"/>
<ElementType name="month" dt:type="datetime"/>
<ElementType name="day" dt:type="datetime"/>
<ElementType name="time" dt:type="datetime"/>
<ElementType name="history" content="eltOnly" order="one">
<group order="seq">
  <element type="year"/>
  <element type="month"/>
  <element type="day"/>
  <element type="time"/>
</group>
</ElementType>
<ElementType name="DB_Info" content="eltOnly">
  <attribute type="id" required="yes"/>
  <element type="dbmsname"/>
  <element type="dbname"/>
  <element type="location"/>
  <element type="history"/>
</ElementType>
</Schema>
```



Constraint

. Add\_Info

Comment Description

가

가 . XML-Data

Global Attribute

```

<AttributeType name="id" dt:type="id"/>
<AttributeType name="href" dt:type="idref"/>
<AttributeType name="seqno" dt:type="int"/>
<AttributeType name="Author" dt:type="string"/>
<AttributeType name="description" dt:type="string"/>
<AttributeType name="name" dt:type="string"/>

```

Global Attribute

Attribute	.	id	
		seqno	(int)
		Author,	description,
		name	(string)
	href	idref	. Global
Attribute		가	.

### Catalog

```
<AttributeType name="OwnerInformation" dt:type="string"/>
<ElementType name="Catalog" content="mixed">
  <attribute type="id" required="yes"/>
  <attribute type="Author"/>
  <attribute type="description"/>
  <attribute type="name"/>
  <attribute type="OwnerInformation"/>
</ElementType>
```

	Catalog	Global Attribute id, Author,
description,name	Catalog	
OwnerInformation	String	.

### Repository\_Info

```
<ElementType name="Repository_Info" content="eltOnly">
  <element type="Catalog"/>
  <element type="Column"/>
  <element type="ColumnConstraint"/>
</ElementType>
```

Repository_Info	Content Type	subelement
-----------------	--------------	------------

Column

```

<AttributeType name="initialValue" dt:type="int"/>
<AttributeType name="IdentityIncrement" dt:type="int"/>
<AttributeType name="isNullable" dt:type="boolean"/>
<AttributeType name="isAllowable" dt:type="nmtokens"/>
<AttributeType name="ColumnType" dt:type="string"/>
<AttributeType name="ColumnSize" dt:type="int"/>
<ElementType name="Column" content="mixed">
  <attribute type="id"/>
  <attribute type="description"/>
  <attribute type="name"/>
</ElementType>

```

Column

Column

id, (name), (description)

(initialValue) , 가 (IdentityIncrement), Null (isNullable)가 .

/ / / 'isAllowable'

nmtokens (space) .

ColumnSize (int), ColumnType(string) .

ColumnConstraint

```

<ElementType name="ColumnConstraint" content="eltOnly">
  <element type="Key"/>
  <element type="Privilege"/>
  <element type="Index"/>
</ElementType>

```



### PrimaryKey

```
<ElementType name=" PrimaryKey " content="mixed">  
  <attribute type="name" required="yes"/>  
  <attribute type="seqno"/>  
  <attribute type="href"/>  
  <attribute type="description"/>  
</ElementType>
```

Key	PrimaryKey	name,
PrimaryKey	seqno, ColumnSet	Column
	href,	description

### ForeignKey

```
<ElementType name="ForeignKey" content=" mixed ">  
  <attribute type=" name " required="yes"/>  
  <attribute type="seqno"/>  
  <attribute type="href"/>  
  <attribute type="description"/>  
</ElementType>
```

ForeignKey	FeirgnKey
name	, ForeignKey 가
seqno	, ColumnSet Column href ,



description .

### IdentityKey

```
<ElementType name="IdentityKey" content="mixed">  
  <attribute type="name" required="yes"/>  
  <attribute type="value"/>  
  <attribute type="description"/>  
</ElementType>
```

Key

IdentityKey

가

name

가

value,

description .

### Index

```
<AttributeType name=" IsClustered " dt:type="boolean"/>  
<AttributeType name="isSorted" dt:type="boolean"/>  
<AttributeType name="IsUnique" dt:type="boolean"/>  
<ElementType name="Index" content="textOnly">  
  <attribute type="name" required="yes"/>  
  <attribute type="description"/>  
  <attribute type="IsClustered"/>  
  <attribute type="isSorted"/>  
  <attribute type="IsUnique"/>  
</ElementType>
```

Index

Global Attribute name, description 가 (IsUnique),  
 (IsSorted) , Clusted NonClusted (IsClusted) Index  
 textOnly Content .

### Privilege

```

<AttributeType name="Grantor" dt:type="string"/>
<AttributeType name="Grantee" dt:type="string"/>
<AttributeType name="setPrivilege" dt:type="string"/>
<ElementType name="Privilege" content="empty">
  <attribute type="seqno"/>
  <attribute type="Grantor"/>
  <attribute type="Grantee"/>
  <attribute type="setPrivilege"/>
</ElementType>

```

Privilege empty  
 Privilege seqno, ,  
 (.Grantee) (setPrivilege) .

### Table

```

<ElementType name="Table content="mixed">
  <attribute type="id" required="yes"/>
  <element type="ColumnSet"/>
  <element type="ColumnConstraint"/>
</ElementType>

```

Table

id                      Content  
mixed                      .

Table

ColumnSet , ColumnConstraint

ColumnSet,

ColumnConstraint

가 .

# IV.

XML

eXcelon

## 4.1

4.1

	Windows NT Server 4.0
Data Server	Object Store eXcelon 2.1
	Internet Information Server 4(IIS4)
	Microsoft Internet Explorer 5.0
	MS SQL Server 7.0 , MySQL JDBC Driver , JAVA1.1.6 SDK Extensible Style Sheet Language (XSL) XQL(XML Query Language) Active Server Pages

[ 4.1]

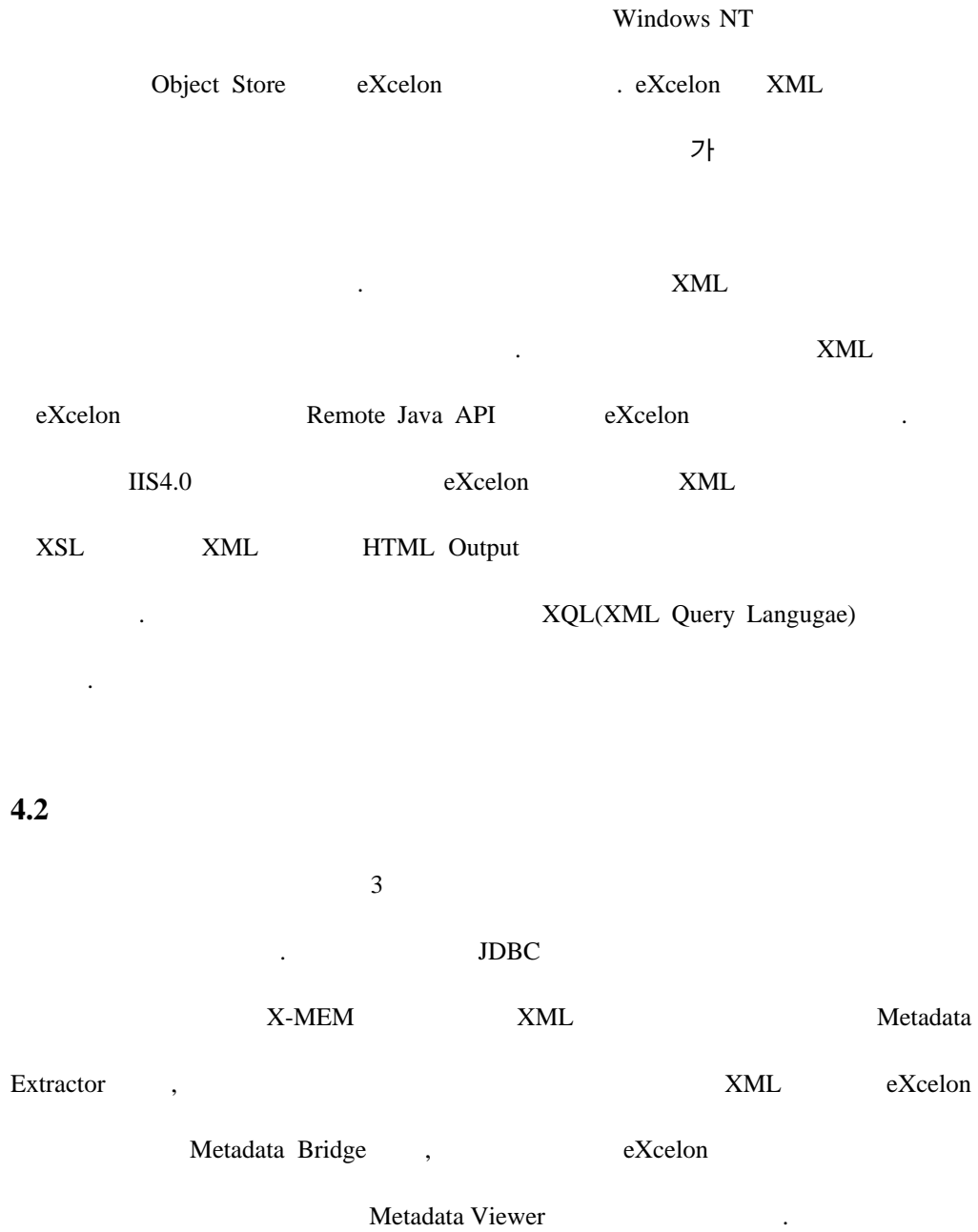
JDBC

JDK(Java Developer'

Kit)

3

. XML



## 4.2

3

JDBC

X-MEM

XML

Metadata

Extractor

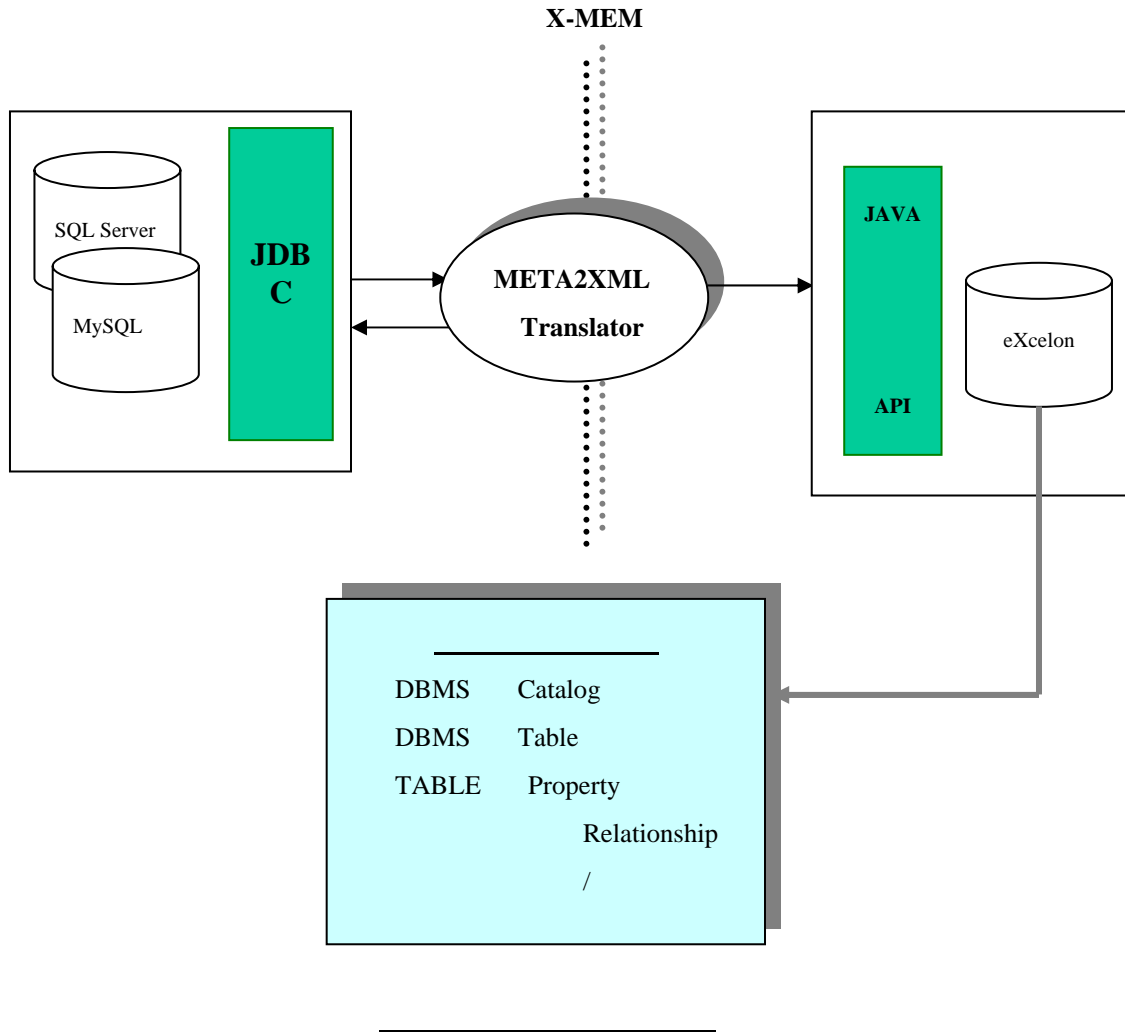
XML

eXcelon

Metadata Bridge

eXcelon

Metadata Viewer



[ 4.1 ]

**4.2.1 (Metadata Extractor Module)**

JDBC

JDK

DatabaseMetaData

(Method)

DBMS SQL Server 7.0

JDBC



java.lang.String SchemaPattern,  
java.lang.String TableName  
java.lang.String ColumnNamePattern)  
throws java.sql.SQLException

---

getColumns	Description
------------	-------------

TABLE_CAT String :	( null )
TABLE_SCHEM String :	( null )
TABLE_NAME String :	
COLUMN_NAME String , COLUMN_SIZE int :	
DATA_TYPE short , TYPE_NAME string : SQL type	Data source
dependent type name	
DECIMAL_DIGITS int :	
NUM_PREC_RADIX int:	
NULLABLE int : Null	
COLUMN_DEF String: Default Value	
CHAR_OCTET_LENGTH int :	
ORDINAL_POSITION int:	('1' )
IS_NULLABLE String : 'NO'	NULL , 'YES'
NULL	

- getPrimaryKeys
-



```
public java.sql.ResultSet getPrimaryKeys (java.lang.String Catalog,  
                                           java.lang.String Schema,  
                                           java.lang.String Table)  
                                           throws java.sql.SQLException
```

---

Primary key	Description	COLUMN_NAME
	.	
TABLE_CAT String :		( null )
TABLE_SCHEM String :		( null )
TABLE_NAME String :		
COLUMN_NAME String :		
KEY_SEQ short: Primary Key		
PK_NAME String : Primary Key		( null )

- `getTablePrivileges`

```
public java.sql.ResultSet getTablePrivileges (java.lang.String Catalog,  
                                              java.lang.String SchemaPattern,  
                                              java.lang.String tableNamePattern)  
                                              throws java.sql.SQLException
```

---

TABLE_NAME, PRIVILEGE	TABLE_SCHEM,
	.
TABLE_CAT String :	( null )

TABLE\_SCHEM String : ( null )

TABLE\_NAME String :

COLUMN\_NAME String :

GRANTOR String: 가

GRANTEE String:

PRIVILEGE String: . INSERT, REFERENCE,  
SELECT, DELETE

IS\_GRANTABLE String:

- getExportedKeys

---

```
public java.sql.ResultSet getTablePrivileges (java.lang.String Catalog,
                                             java.lang.String Schema,
                                             java.lang.String Table)
                                             throws java.sql.SQLException
```

---

Primary Key	Foreign Key	Description
PKTABLE_CAT String : Primary Key	( null )	
PKTABLE_SCHEM String : Primary Key	( null	)
PKTABLE_NAME String : Primary Key		
PKCOLUMN_NAME String : Primary Key		
FKTABLE_NAME String:	Foreign Key	

FKCOLUMN\_NAME String : Foreign Key  
KEY\_SEQ short : Foreign Key  
UPDATE\_RULE short : Primary Key 가 update Foreign Key  
DELETE\_RULE short : Primary Key 가 delete Foreign Key  
FK\_NAME String: Foreign Key identifier  
PK\_NAME String: Primary Key identifier

● getIndexInfo

---

```
public java.sql.ResultSet getIndexInfo (java.lang.String Catalog,  
                                         java.lang.String Schema, java.lang.String Table  
                                         boolean unique, boolean approximate)  
throws java.sql.SQLException
```

---

	NON_UNIQUE, TYPE,
INDEX_NAME,ORDINAL_POSITION	.
TABLE_CAT String :	( null )
TABLE_SCHEM String :	( null )
TABLE_NAME String :	
NON_UNIQUE boolean :	UNIQUE
INDEX_NAME boolean :	
TYPE short :	tableindexStatistic, tableClustered , tableIndexHashed, tableindexOther
ORDINAL_POSITION short :	

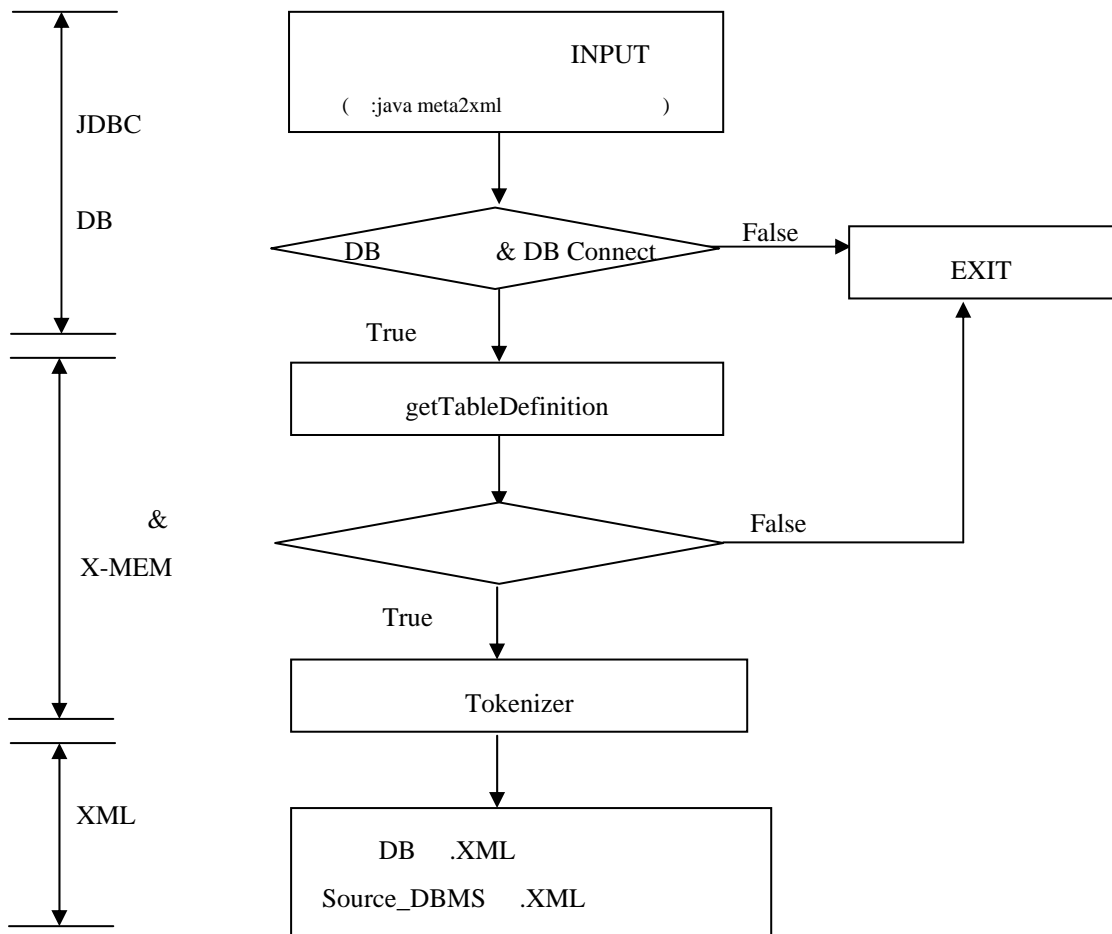
COLUMN\_NAME String : . tableIndexStatistic null

ASC\_OR\_DESC String : ,

CARDINALITY int : TYPE tableIndexStatistic row  
 , index Unique Value

PAGES int : TYPE tableIndexStatistic  
 pages , current index pages

FILTER\_CONDITION String : index column description  
 Filter Condition.



[ 4.2 ]

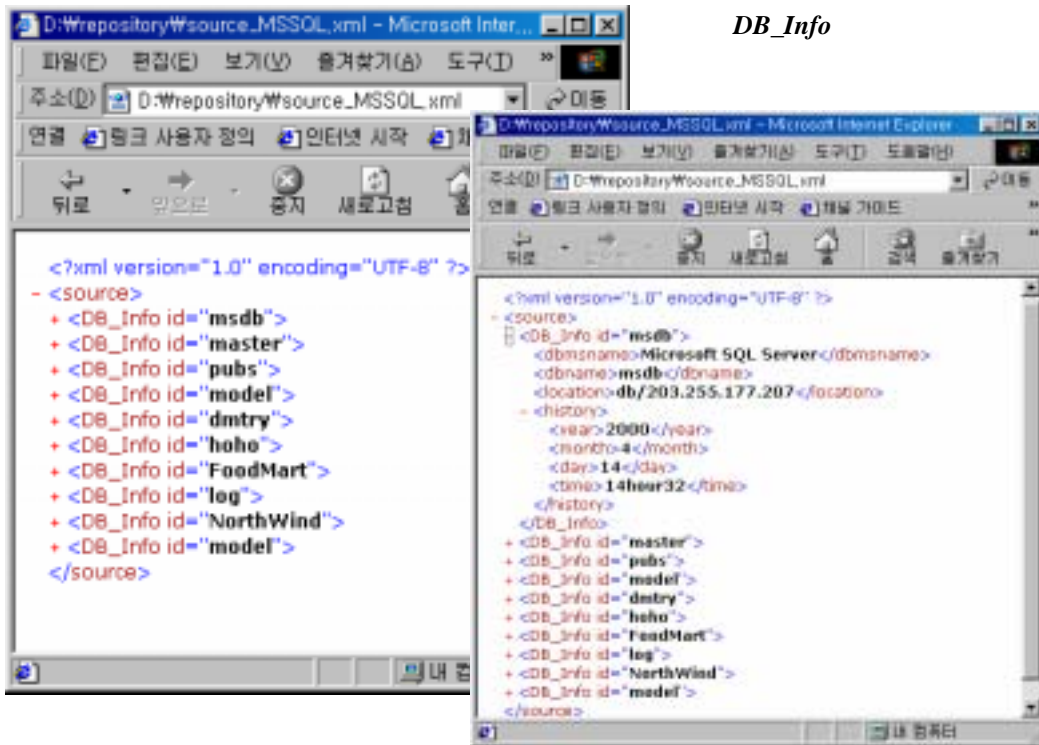
4.2 , X-MEM

, XML 3 가 . XML

XML ‘source\_DBMS .XML’

DB argument ‘DB .XML’

DBMS ‘source\_DBMS .XML’



DB\_Info

[ 4.3 DBMS XML ]





[ 4.5 XML ]

4.3 4.2 XML XML Table

MS SQL

Server 7.0 Table .

eXcelon Metadata Bridge

Module

#### 4.2.2 (Metadata Bridge Module)

XML eXcelon

XML eXcelon .

eXcelon2.1 Data Server 가 Remote JAVA API

eXcelon Data Server XML

```
(1) import eXcelon Version 2.1 Public API ;  
  
(2) meta2bridge( XML ){  
(3)     Connect to the eXcelon Data Server;  
(4)     If(Connection error)  
           exit(1);  
(5)     DatabaseCreate(session s);  
(6) DatabaseCreate(session s)  
       {  
(7)     createDirectory(“repository”); // Create a directory  
(8)     if(CreateDirectory error)  
           exit(1);  
  
(9)     createXMLDocument(“ XML ”); // Put a file in the directory  
  
(10)    Copy a xml file from this directory into the eXcelon file system;  
(11)    Close Session;  
       }  
}
```



	eXcelon 2.1		eXcelon Version 2.1 Public API
		(1)	Class Import
	com.odi.excelon.client, com.odi.excelon.filesystem	import	import
(3)	XlnClientSessionFactory		remote client eXcelon
session (6)		(7)	createXMLStore
		(9)	createDirectory XML
			(10)
	XML		
	(11)		

**4.2.3**

**(Metadata Viewer Module)**

DBMS

(Property) 가

XSL .

. DBMS Catalog ,TABLE Property

, Table Relationship, Table , DB ,

Table , Column ,



XML

HTML

XSL Pattern Matching

가

XSL

source\_info.xml

re\_left2.xml

table\_info.xml

update\_metadata.xml

source\_info.xml

'DBMS .XML'

DBMS

, IP Address,

XSL

re\_left2.xml

XML

Catalog

table\_info.xml

. table\_info.xml

, Null

(Constraint)

Primary Key,

Foreign Key, Index

, Privilege

Comment

Description

가

4

XSL

가

Catalog

XML

XSL

4.3



XML DB , Table , Column ,  
XML XQL . XQL  
eXcelon COM API Active Server Page  
eXcelon Application .  
가 DBMS ,  
Active Server Page XQL  
(1)eXcelon session , (2) session  
Query , (3) XQL 가 StyleSheet  
가 .

```
(1) Function getSession
    Set sess = Application("eXcelon")
    If (sess is nothing) then
        Set fact=Server.Object("ODI.eXcelon")
        Set sess = fact.GetSession("",0)
        Set Application("eXcelon")=sess
    End if
    Set getSession=sess
End function

(2) Query
Set sess=getSession()
Set qry=sess.Query("repository:/data/source_MSSQL.XML","/DB_Info/dbname")

(3) XSL StyleSheets
Set qry=sess.GetFileData("repository:/data/source_info.xml", "")
```

### 4.3

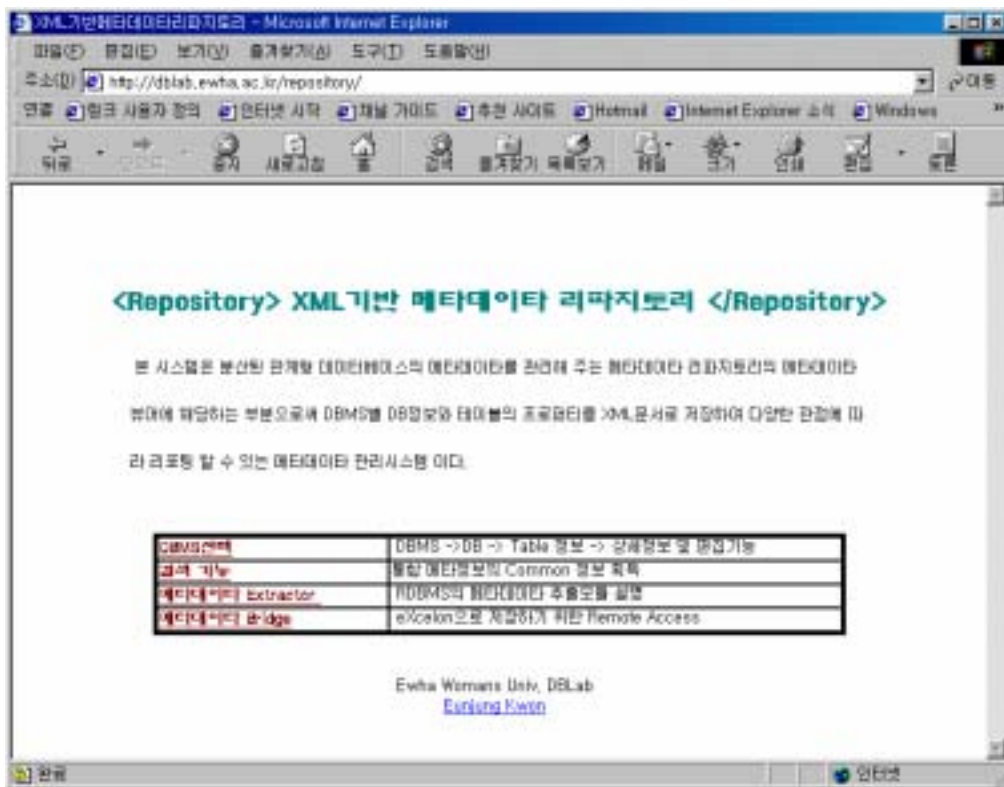
3

X-MEM

. 4.2.3

가

가



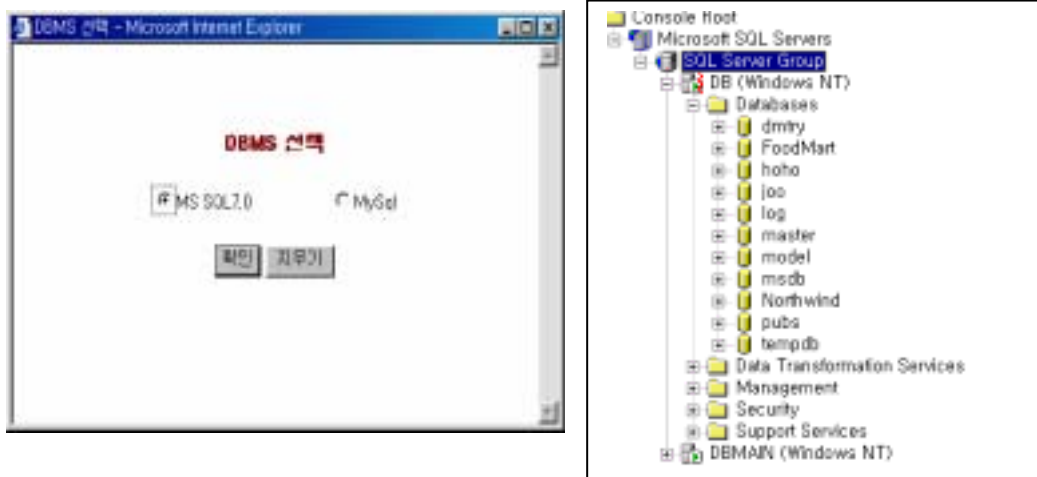
[ 4.6 ]

4.4

DBMS

DB , ,  
가

4.3.1



[ 4.7 DBMS MS SQL Server 7.0 ]

DBMS 4.5 MS SQL7.0 MySql

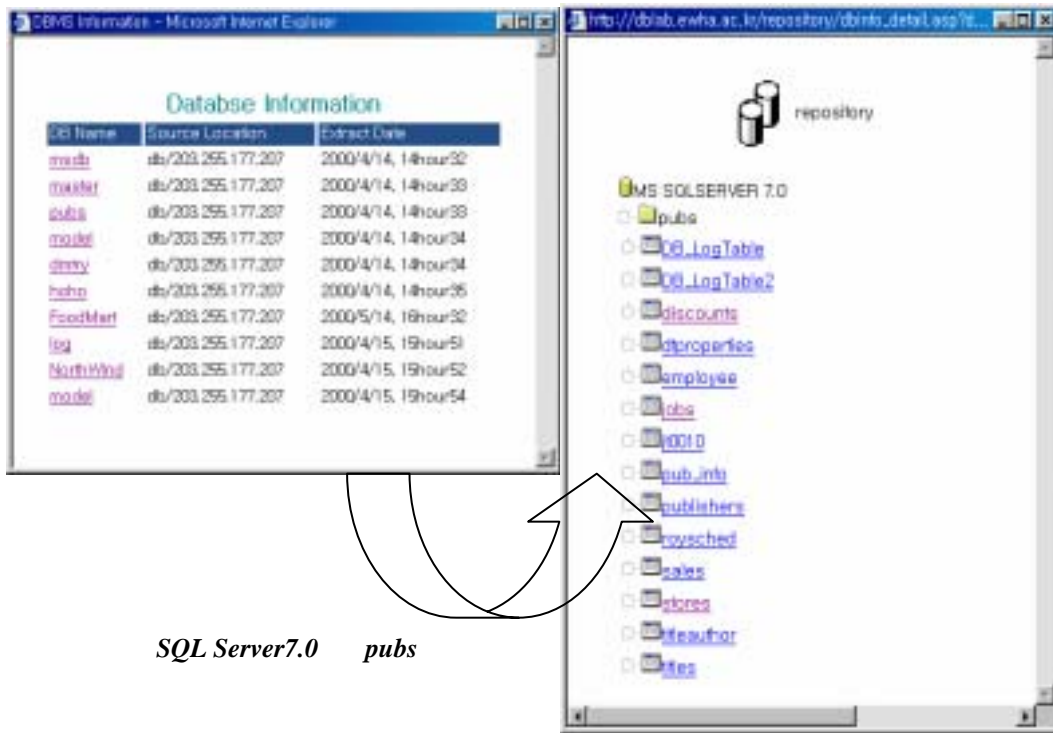
DBMS MS SQL Server 7.0

가 4.5

MS SQL Server 7.0 DBMS

4.5 MS SQL Server 7.0

4.6 DBMS



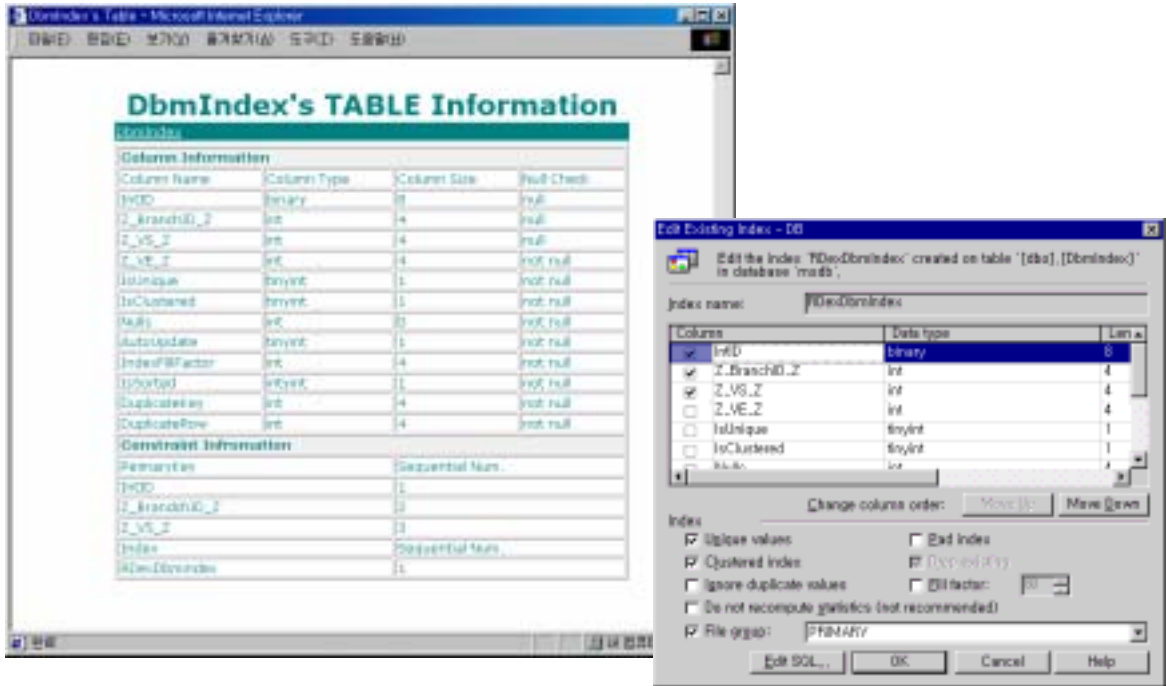
SQL Server7.0 pubs

[ 4.8 ]

4.5 pubs DbmIndex

4.6

4.6 MS SQL SERVER7.0 DbmIndex



[ 4.9 XSL DbmIndex ]

4.5

Description      Comment      가      .

4.6                Update           Update

XML

```

GetSession()      'Session      eXcelon      GetSession
UpdateStr = "<?xml version=""1.0"" standalone=""yes""?><xlupdate version=""1.0"">"
UpdateStr = update_string & "<update select=""/Repository_Info"">"
                 <element location=""lastchild"">"
.....
    
```

```

UpdateStr = update_string & "</element></update>"
UpdateStr = update_string & "</xlnupdate>"
set res = sess.Update(Fname, UpdateStr, "")
' Fname : Update

```

XML Update                      eXcelon                      XML      가 Update      .  
Update                                      Update                                      Update  
eXcelon                      XML                      가                                      .



```

- <Add_Info>
- <Table name="DbIndex">
  <Description>This Table contains Index Information in MS SQL Server7.0!</Description>
  <Comment>No Comment</Comment>
</Table>
</Add_Info>

```

[      4.10                                      XML      ]

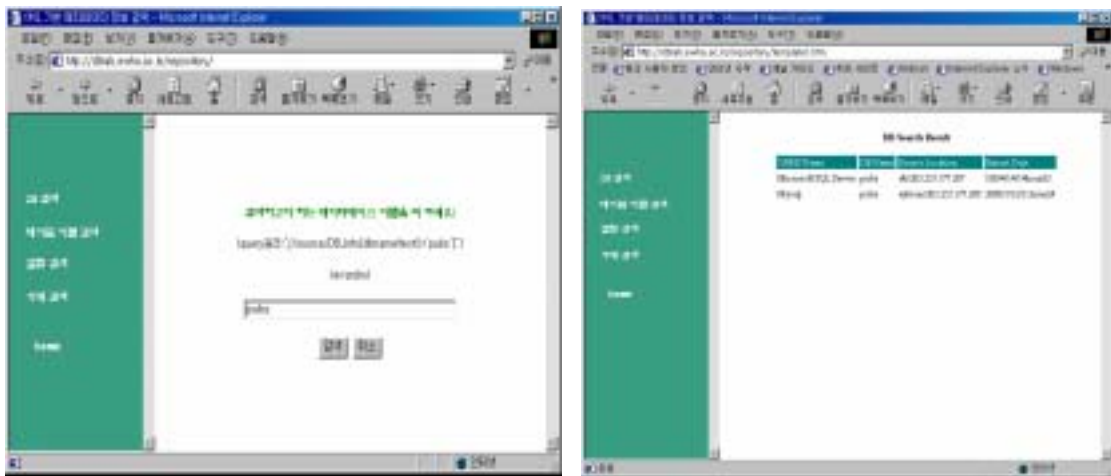
4.3.2

가



XQL

4 가



[ 4.11 ]

XQL

Query : //source/DB\_Info[dbname!text()=' ]

XML

MS SQL Server7.0 DBMS

MySQL DBMS

DBMS , , IP Address



[ 4.13 ]

XQL

*Query :* //Repository\_Info/Catalog/Table/ColumnsSet/Column[@name=' ']



[ 4.14 ]

XQL

*Query :* //source/DB\_Info[dbname!text()='DBMS ']'\$and\$

// Repository\_Info/Catalog[Table[@id=' ']\$and\$

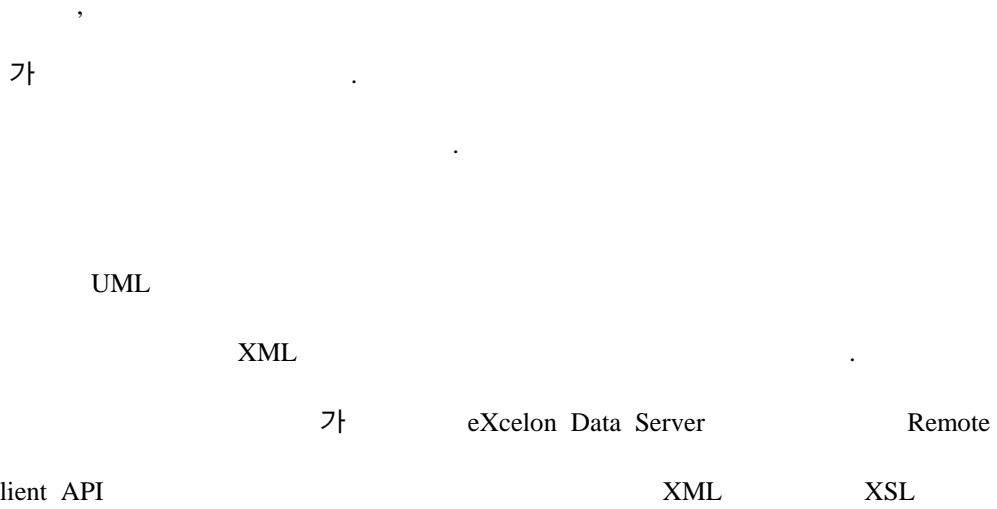
`@chk='mssql']]/ColumnsSet/Column[@ColumnType='` `']`

DBMS , , AND  
, , , NULL OR  
DBMS,  
OR

eXcelon

. 가 5 .

#### IV.



가

•

XML

DBMS

•

XML

XML

XML

•

(join)

XML

data server

가 . . . ,

- 

. XML

가 ,  
(filtering)

- XSL

XML

가 Stored Procedures, Triggers

가

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ABSTRACT

# **Design and Implementation Of XML Based Metadata Repository**

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Kwon Eun Jung*

Metadata is data about data that is used to manage data itself. For example, as card list in library indicates the location and the summary contents of the books, metadata indicates various information about objects and relationship information between them in DBMS.

In this paper, as for the method to manage metadata in RDBMS, we design metadata model using UML(Unified Modeling Language), metadata exchange model about RDBMS and implement metadata repository system. So we show how metadata repository system manage metadata about RDBMS on the web.

To construct metadata repository, metadata extract module should be implemented first, then metadata extract is extracted based on X-MEM(XML Metadata Exchange Model). This model is designed using XML-Data instead of DTD. XML-Data improves the functions in DTD that are restricted to data type and have no inheritance of element attribute of DTD. After metadata extract based on X-MEM is finished, extracted metadata is stored in not RDBMS but eXcelon of XML Data Server using metadata bridge,

Finally metadata information about RDBMS is accessed on the web interface, so everyone can browse and search metadata about various heterogeneous DBMS information through internet. In metadata repository system. The search function is executed by XQL which have multiple document search function and etc. the structure of XML documents resulted from search result is made easy to be presented on web browser by applying a XSL (extensible StyleSheets Language). and these lead to the more efficient metadata management .

1999 .....

1999 가 “ 가  
” 가 가  
6 가 가

가 , ! 가  
가 가

PL  
6  
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(?)

3