



# CWM Enablement Showcase

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# Abstract

- ◆ The **CWM Enablement Showcase**, which took place at the OMG Orlando meeting in Decemeber, 2000, was a major breakthrough for warehouse metadata interchange. Six vendors demonstrated the **ease of interchanging metadata using CWM** between ten different warehouse tools and repositories.
- ◆ This talk will give an overview of the Showcase: the sample (retail sales) scenario, the **metadata interchange flows**, and the involvement of the various warehouse tools and repositories. It will give an in-depth discussion of the **CWM metamodel, sample metadata, and XML file** used in one particular metadata interchange flow.



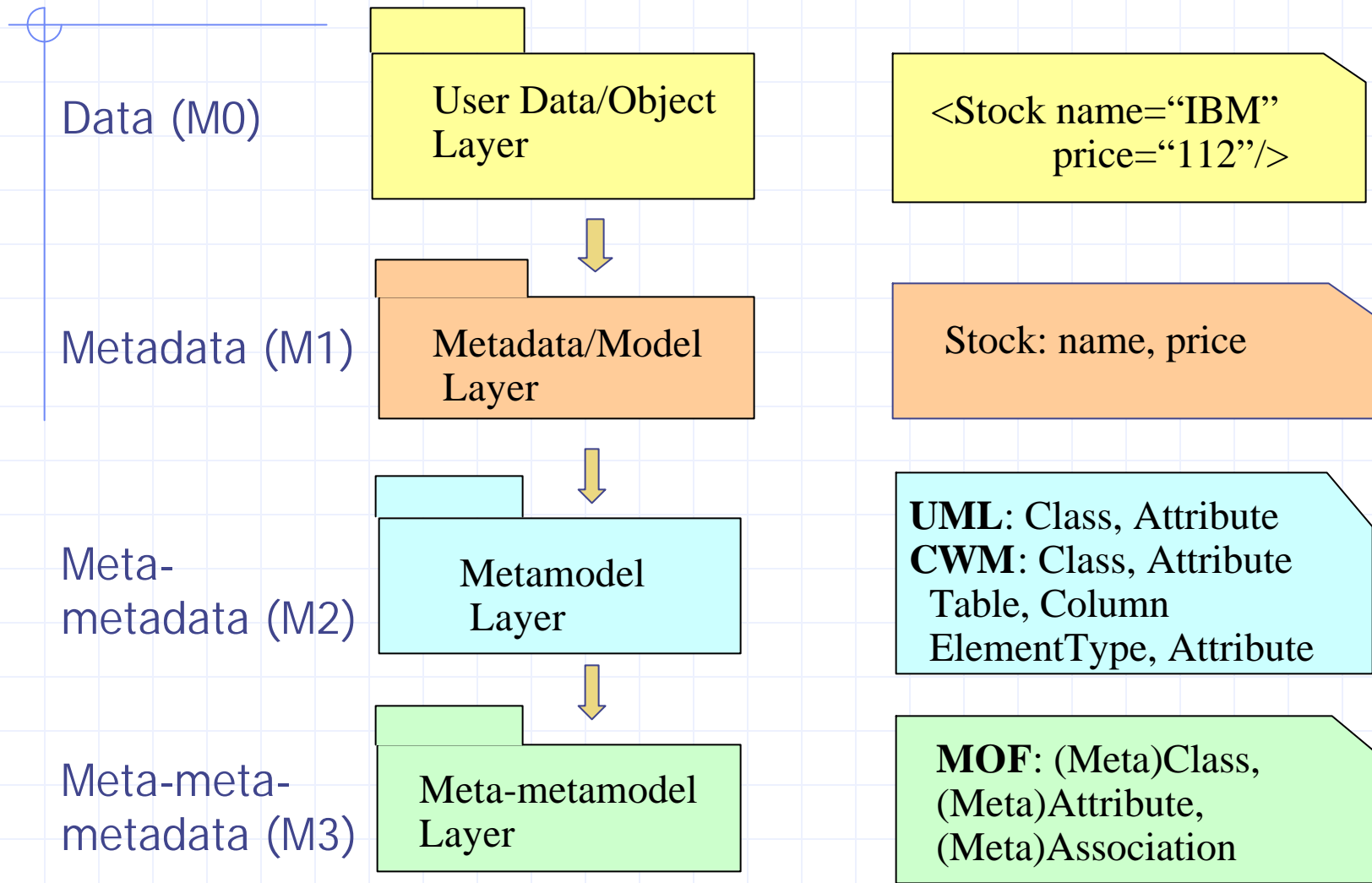
CWM

# CWM 1.0

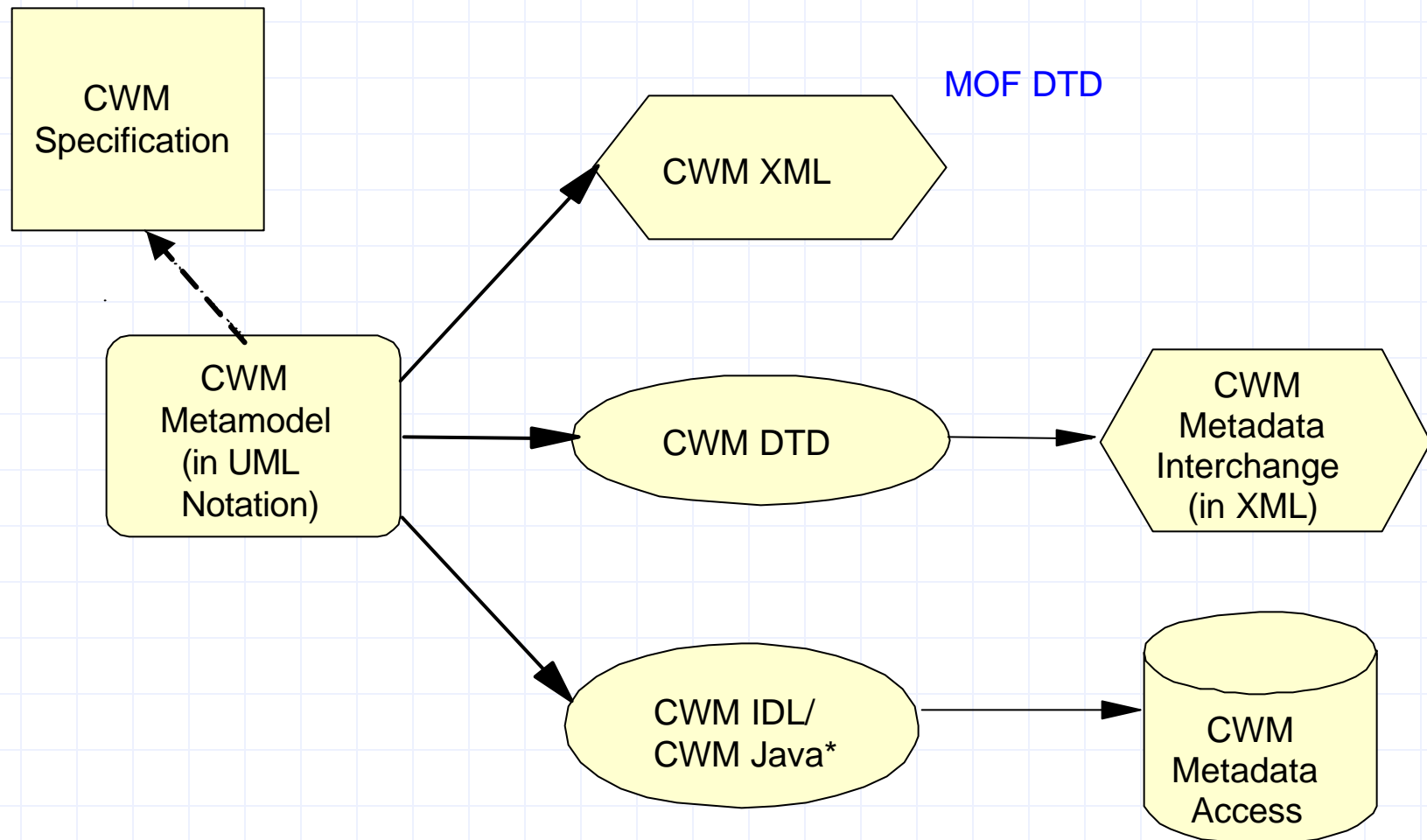
◆ A complete specification of the **syntax and semantics** needed to **export/import** *shared* metadata for **data warehousing (DW) and business intelligence (BI)**, including:

- **The CWM Metamodel (ad/2001-02-01)**
- Formal representation of the CWM Metamodel (**CWM XML, ad/2001-02-03**)
- Interchange format for shared DW/BI metadata (**CWM DTD, ad/2001-02-04**)
- Access API for shared DW/BI metadata (**CWM IDL, ad/2001-02-06**)

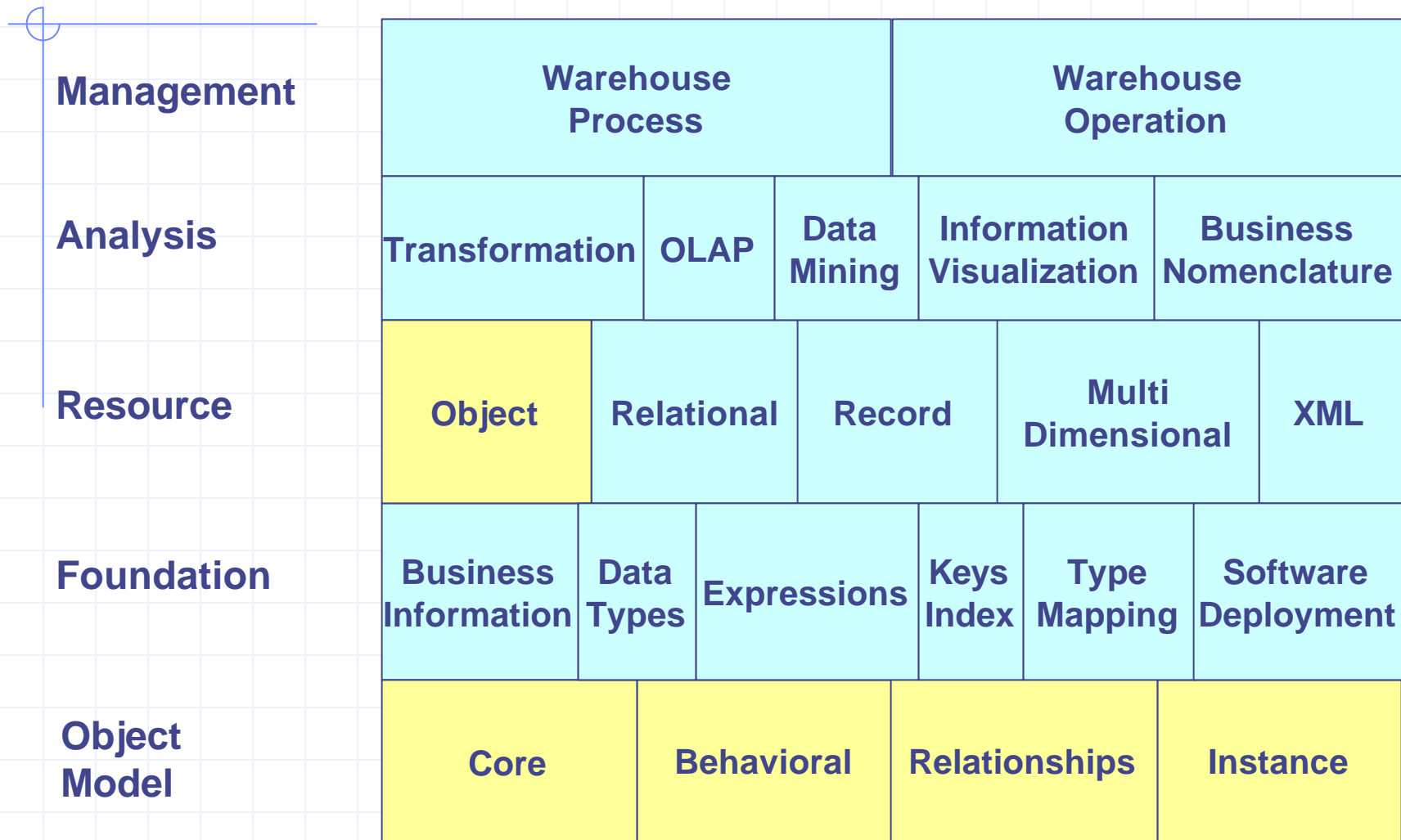
# OMG Metamodeling Architecture



# CWM Model Driven Architecture



# The CWM Metamodel

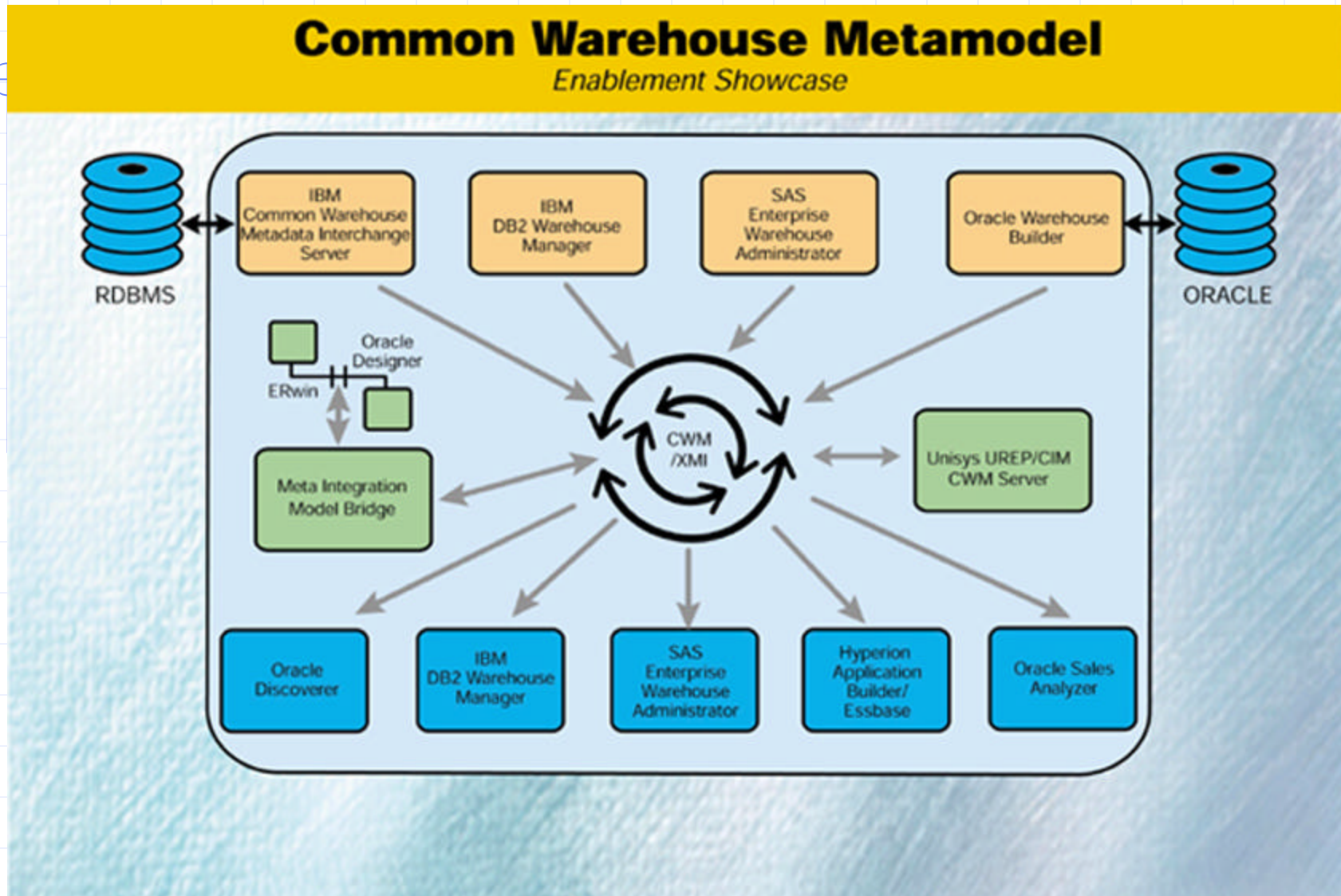




# CWM Enablement Showcase



# CWM Enablement Showcase



# Metadata Interchange Flows

## ◆ Horizontal

- Top: producer
  - ◆ IBM CWM Interchange Server
  - ◆ IBM DB2 Warehouse Manager, SAS Enterprise Warehouse Administrator
  - ◆ Oracle Warehouse Builder
- Bottom: consumer
  - ◆ Oracle Discoverer
  - ◆ IBM DB2 Warehouse Manager, SAS Enterprise Warehouse Administrator
  - ◆ Hyperion Application Builder/Essbase, Oracle Sales Analyzer
- Middle: bridge/repository (consumer/producer)
  - ◆ Meta Integration Model Bridge
  - ◆ Unisys UREP/CIM CWM Server

# Metadata Interchange Flows

## ◆ Vertical

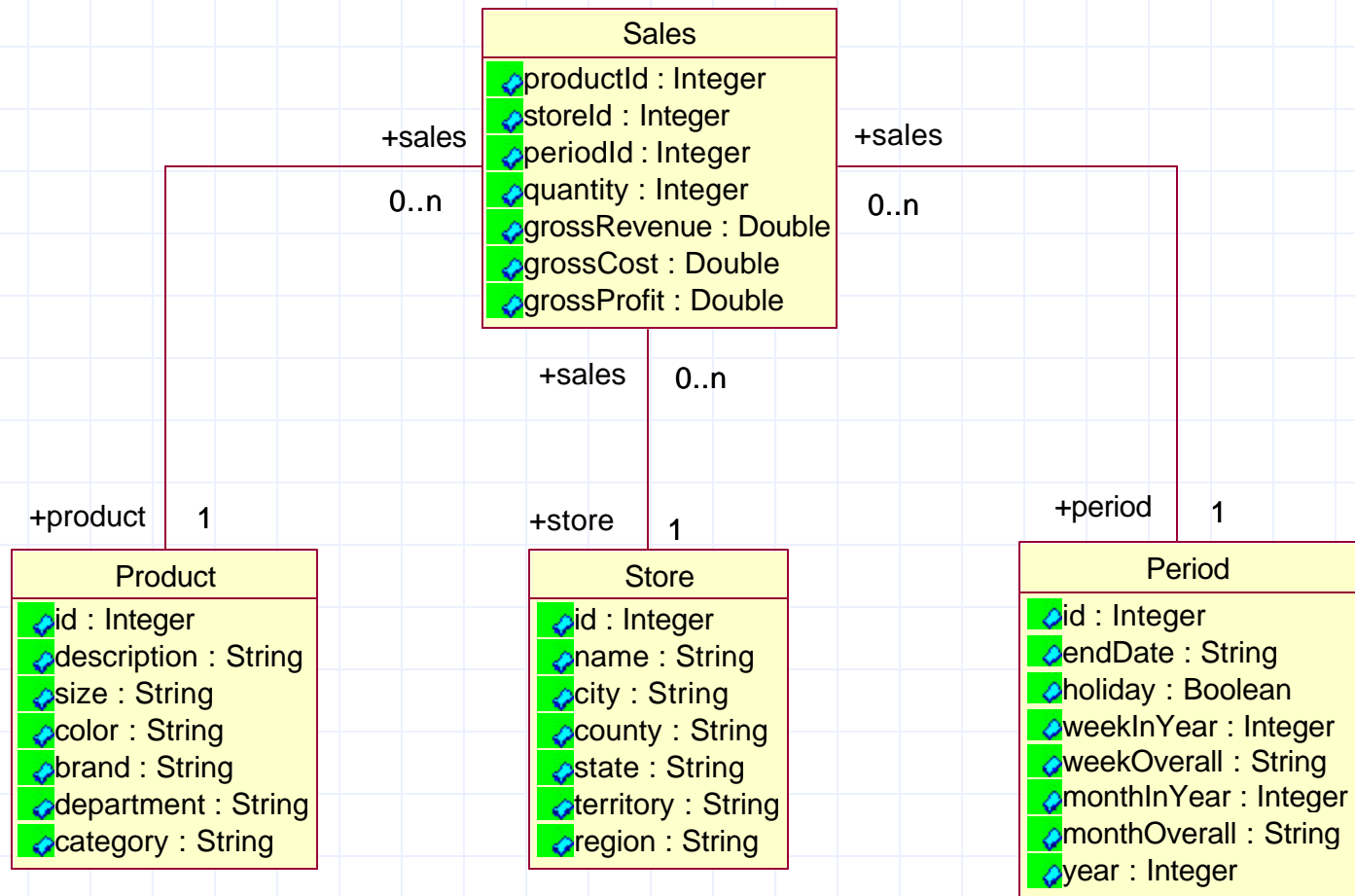
- Left: relational
  - ◆ IBM CWM Interchange Server →
  - ◆ Meta Integration Model Bridge →
  - ◆ Oracle Discoverer, IBM DB2 Warehouse Manager
- Right: OLAP
  - ◆ Oracle Warehouse Builder →
  - ◆ Hyperion Application Builder/Essbase, Oracle Sales Analyzer
- Middle: warehouse process
  - ◆ IBM DB2 Warehouse Manager ↔
  - ◆ SAS Enterprise Warehouse Administrator
- Metadata repository
  - ◆ Unisys UREP/CIM CWM Server

# Scenario: CwmStore (OLAP)

CwmStore Star Schema (M1)

Sales: "instance" of Cube

Product, Store, Period: "instances" of Dimension





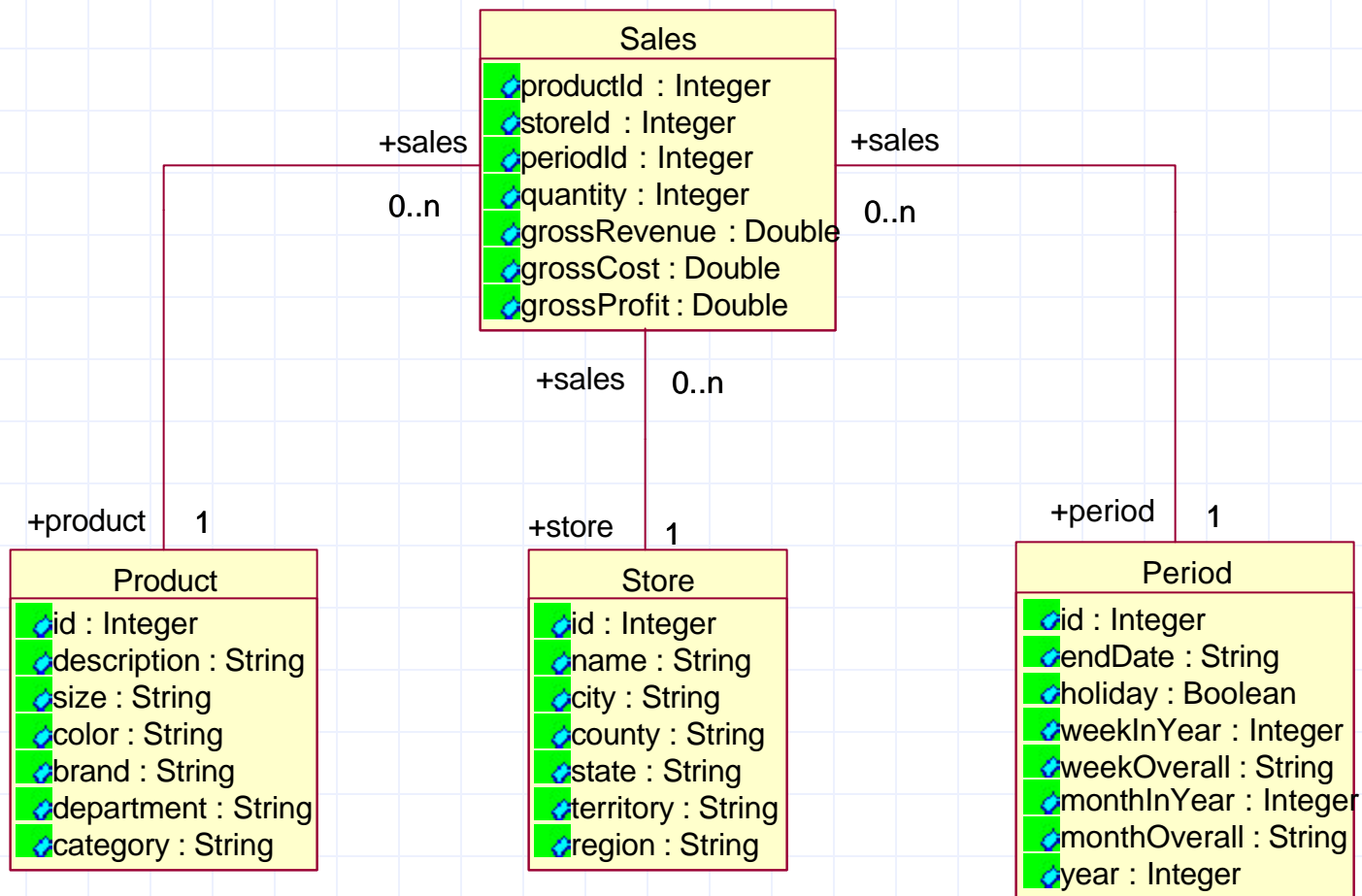
# Relational Metadata Interchange

# Scenario: CwmStore (Relational)

CwmStore Star Schema (M1)

Sales: "fact" table

Product, Store, Period: "dimension" tables



# Relational Metadata Interchange

## ◆ Interchange partners:

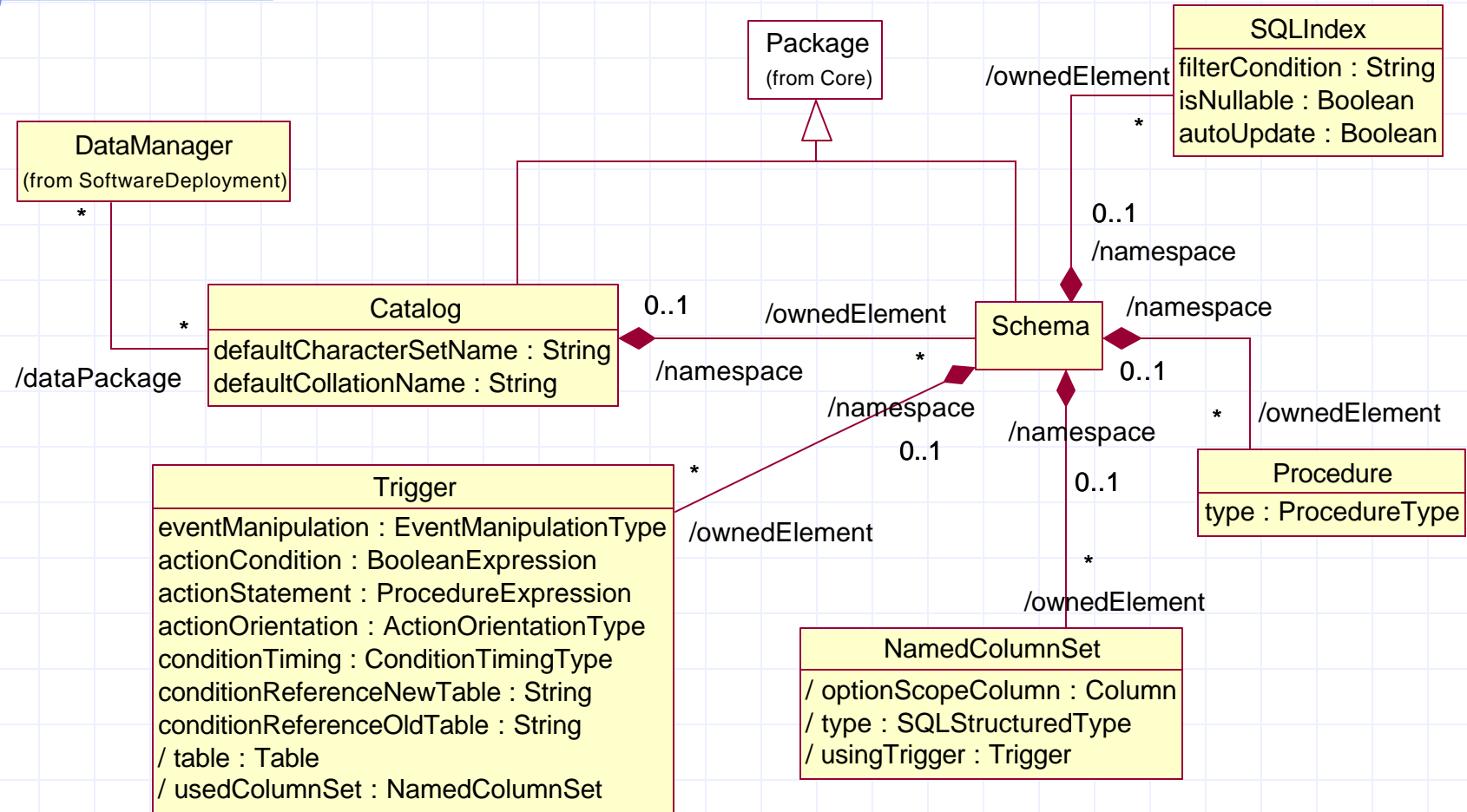
- IBM CWM Interchange Server →
- Meta Integration Model Bridge →
- Oracle Discoverer, IBM DB2 Warehouse Manager

## ◆ Interchanged metadata:

- CWM/Relational

# CWM/Relational - 1

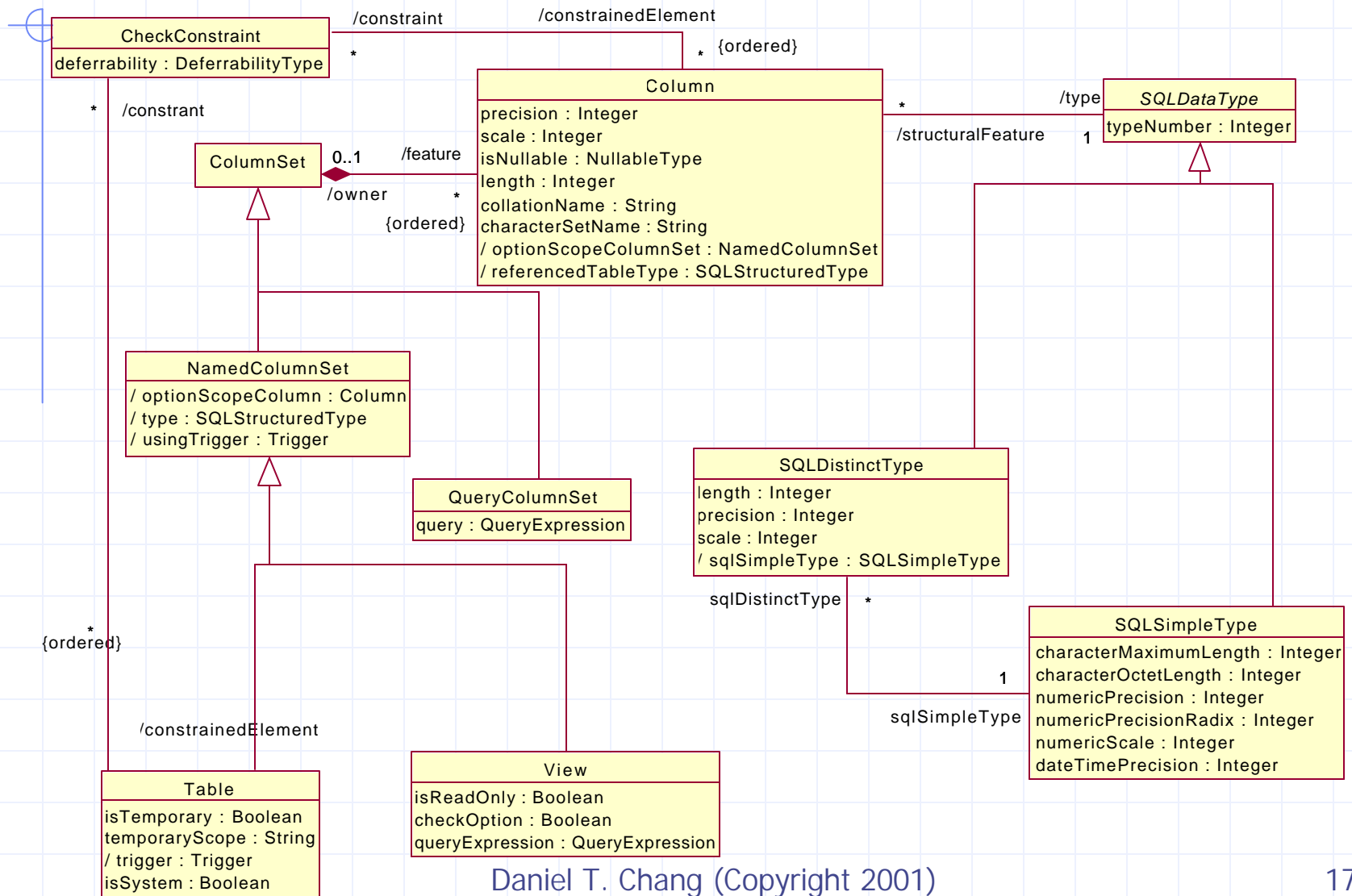
Figure 9-2 Schemas and owned objects





# CWM/Relational - 2

Figure 9-3 Tables, columns and data types



# IBM\_Relational.xml

```
<CWMRDB:Catalog xmi.id="_1" name="CWMSTORE">
  <CWM:Namespace.ownedElement>
    <CWMRDB:Schema xmi.id="_1.1" name="GUEST" namespace="_1">
      <CWM:Namespace.ownedElement>
        <CWMRDB:Table xmi.id="_1.1.1" name="PERIOD"
          namespace="_1.1">
          <CWM:Classifier.feature>
            <CWMRDB:Column xmi.id="_1.1.1.1" name="PERIOD_ID"
              length="10" type="_11" owner="_1.1.1"/>
            ...
          </CWM:Classifier.feature>
          ...
        </CWMRDB:Table>
        ...
      </CWMRDB:Schema>
    </CWM:Namespace.ownedElement>
  </CWMRDB:Catalog>
  <CWMRDB:SQLSimpleType xmi.id="_11" name="INTEger"
    typeName="4"/>
  ...
```



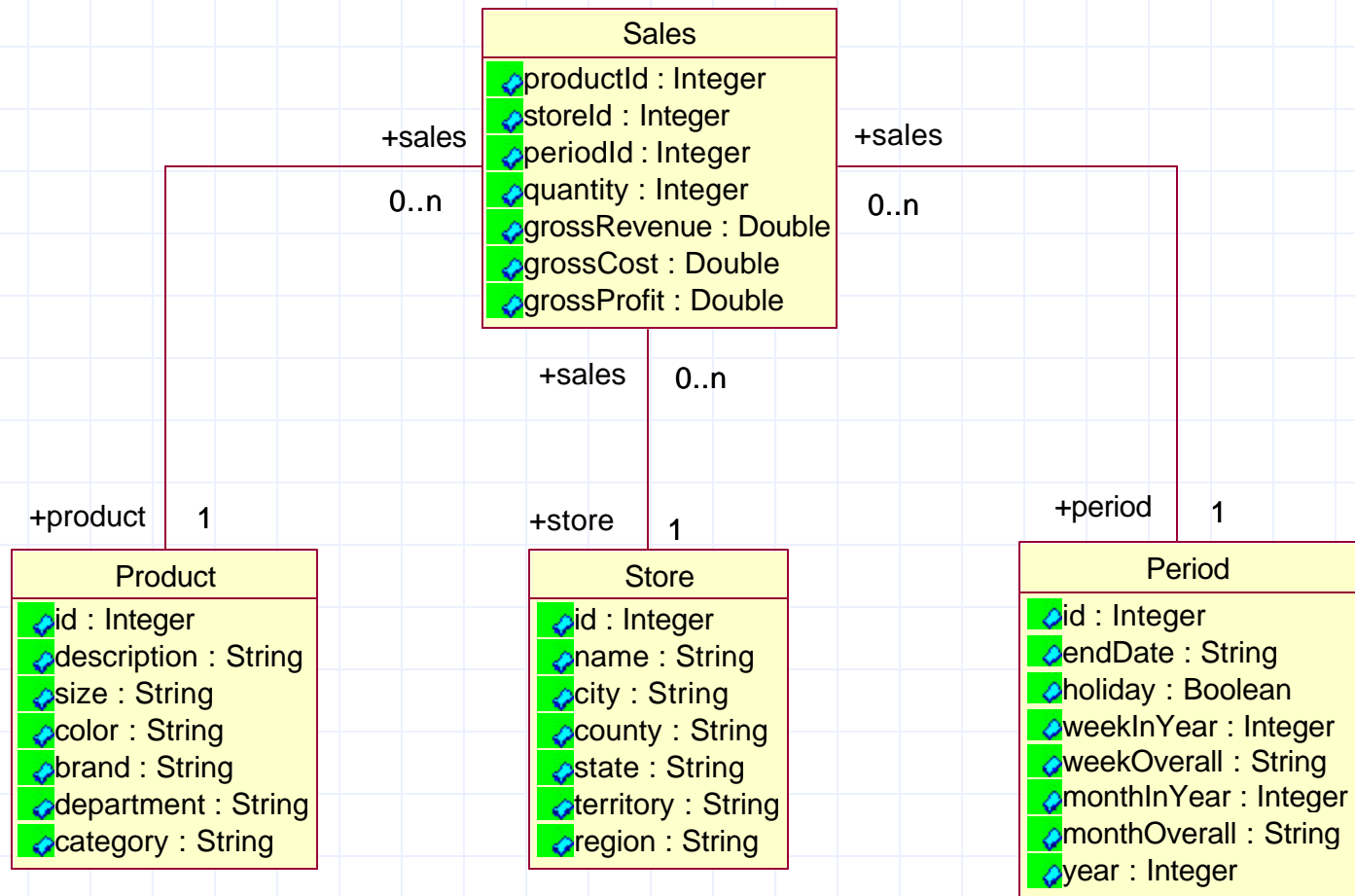
# OLAP Metadata Interchange

# Scenario: CwmStore (OLAP)

CwmStore Star Schema (M1)

Sales: "instance" of Cube

Product, Store, Period: "instances" of Dimension



# OLAP Metadata Interchange

## ◆ Interchange partners:

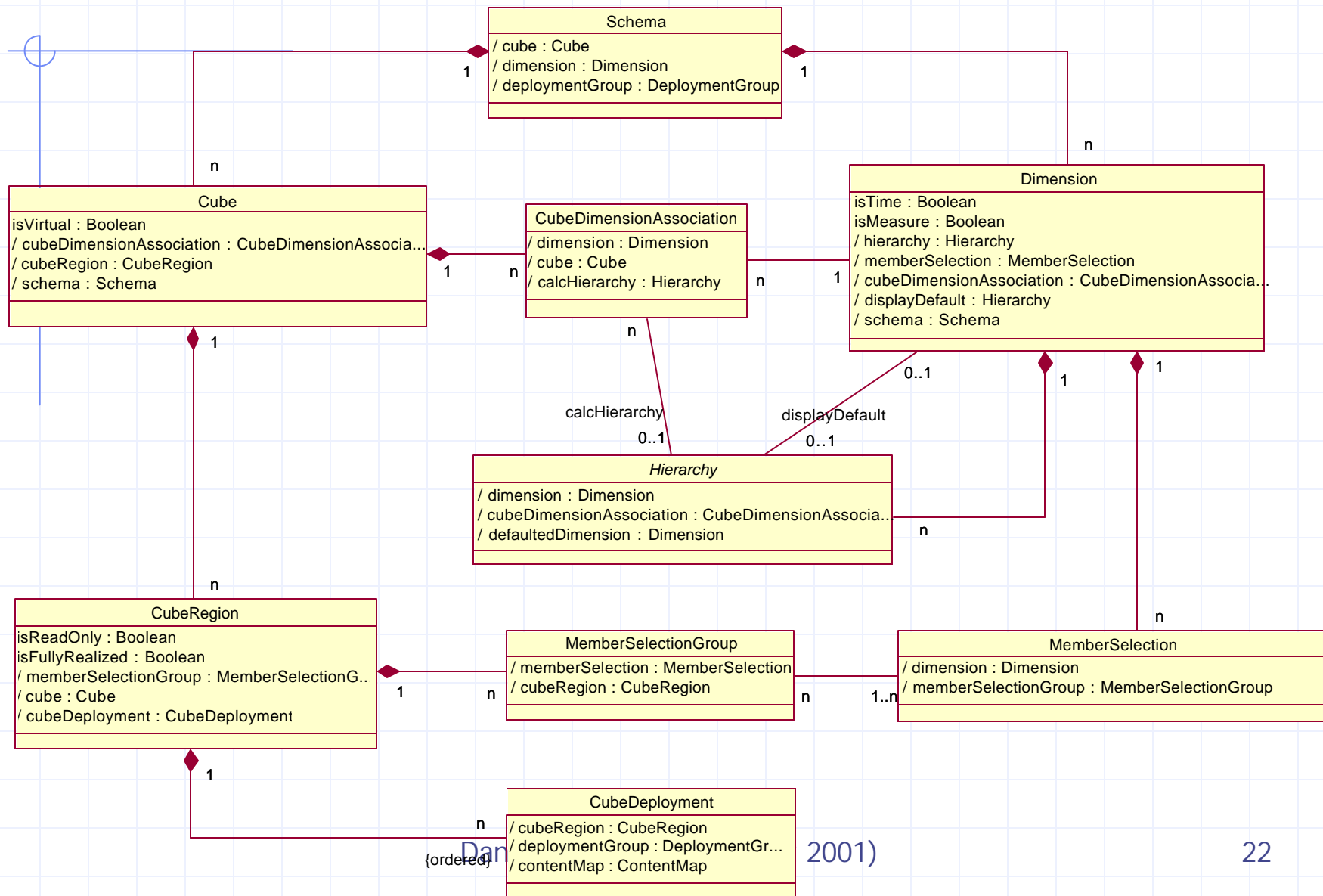
- Oracle Warehouse Builder →
- Hyperion Application Builder/Essbase, Oracle Sales Analyzer

## ◆ Interchanged metadata:

- CWM/OLAP
- CWM/Transformation
- CWM/Relational

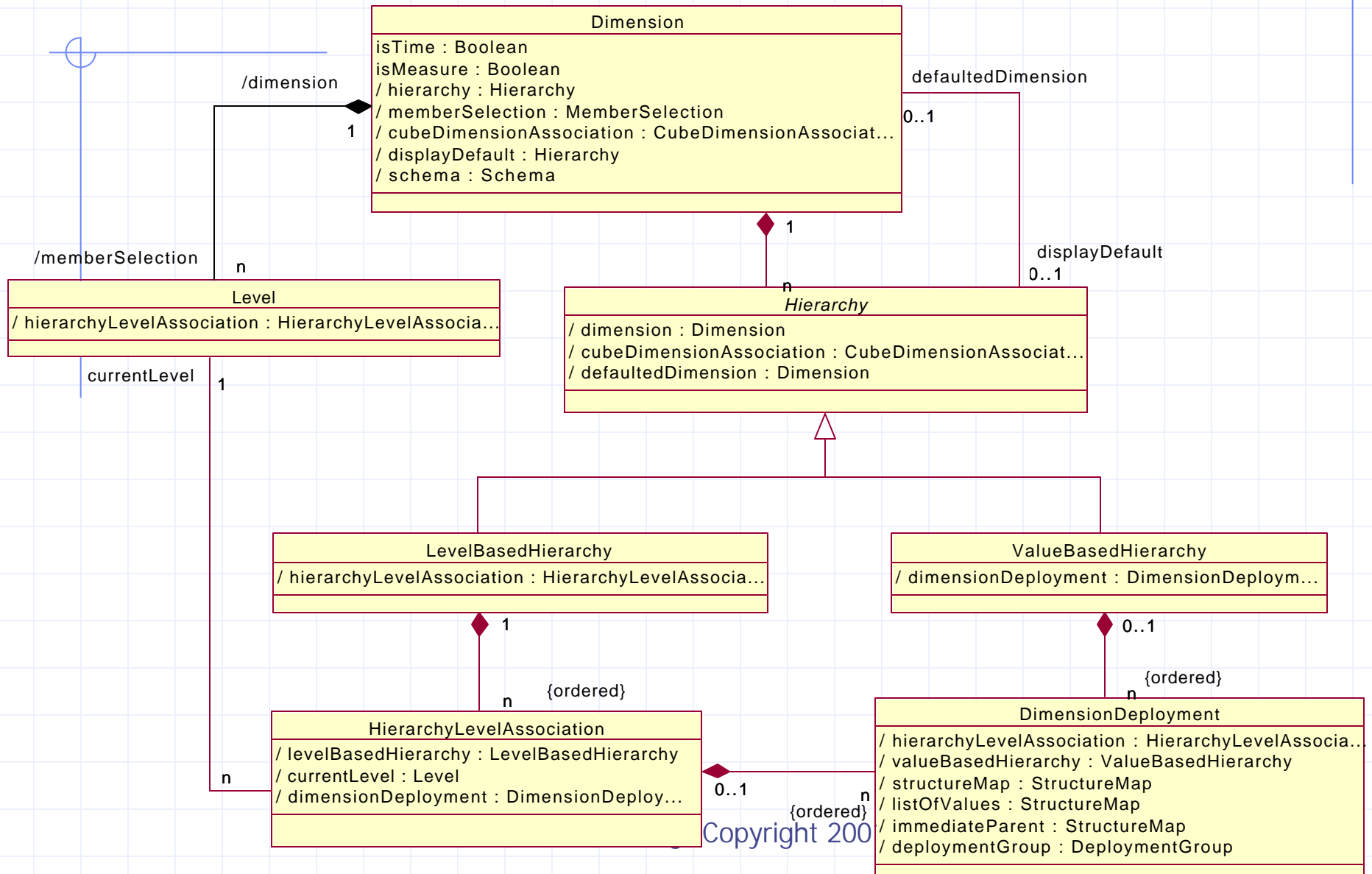
# CWM/OLAP - 1

Figure 14-1 OLAP Metamodel: Major Classes and Associations



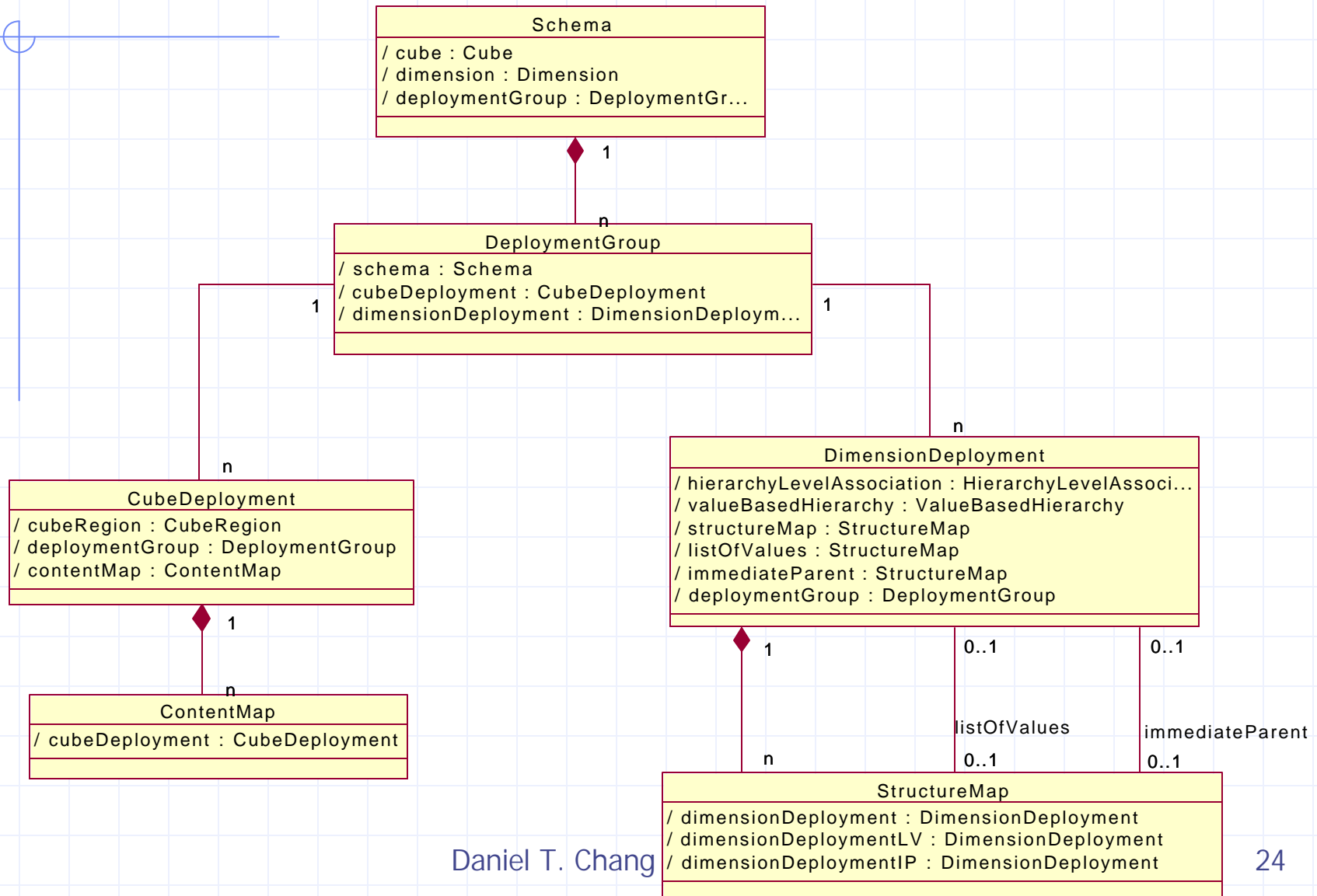
# CWM/OLAP - 2

Figure 14-2 OLAP Metamodel: Dimension and Hierarchy



# CWM/OLAP - 3

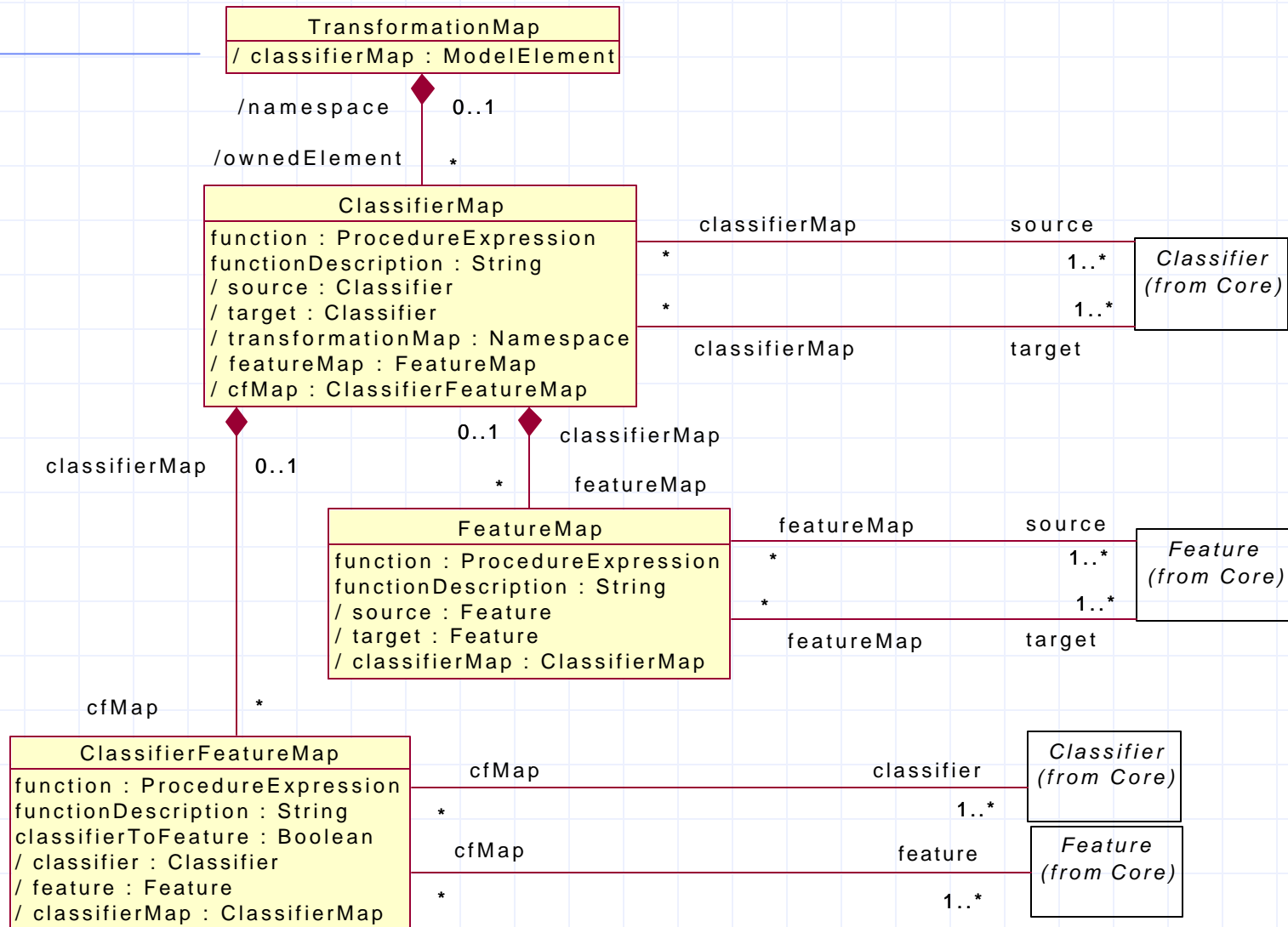
Figure 14-4 OLAP Metamodel: Deployment Mapping Structures





# CWM/Transformation

Figure 13-3 Transformation Relationships - 2



# Oracle\_OLAP.xml - 1

```
<CWMOLAP:Schema xmi.id="X1306" name="CWMDemo"
  visibility="public" isSpecification="false" namespace="X1229">
  <CWM:Namespace.ownedElement>
    <CWMOLAP:Dimension xmi.id="X1323" name="Period"
      visibility="public" isSpecification="false" namespace="X1306">
      <CWMOLAP:Dimension.cubeDimAssoc>
        <CWMOLAP:CubeDimAssoc xmi.idref="X1429"/>
      </CWMOLAP:Dimension.cubeDimAssoc>
```

# Oracle\_OLAP.xml – 2

```
<CWM:Namespace.ownedElement>
```

```
<CWMTFM:TransformationMap xmi.id="X1449" visibility="public"  
  isSpecification="false" namespace="X1323">
```

```
<CWM:Namespace.ownedElement>
```

```
<CWMTFM:ClassifierMap xmi.id="X1450" visibility="public"  
  isSpecification="false" namespace="X1449"  
  transformationMap="X1449">
```

```
<CWMTFM:ClassifierMap.source>
```

```
<CWM:Classifier xmi.idref="X1268"/>
```

```
</CWMTFM:ClassifierMap.source>
```

```
<CWMTFM:ClassifierMap.target>
```

```
<CWM:Classifier xmi.idref="X1323"/>
```

```
</CWMTFM:ClassifierMap.target>
```

```
...
```

```
</ CWMTFM:TransformationMap >
```

```
...
```

```
</ CWM:Namespace.ownedElement >
```

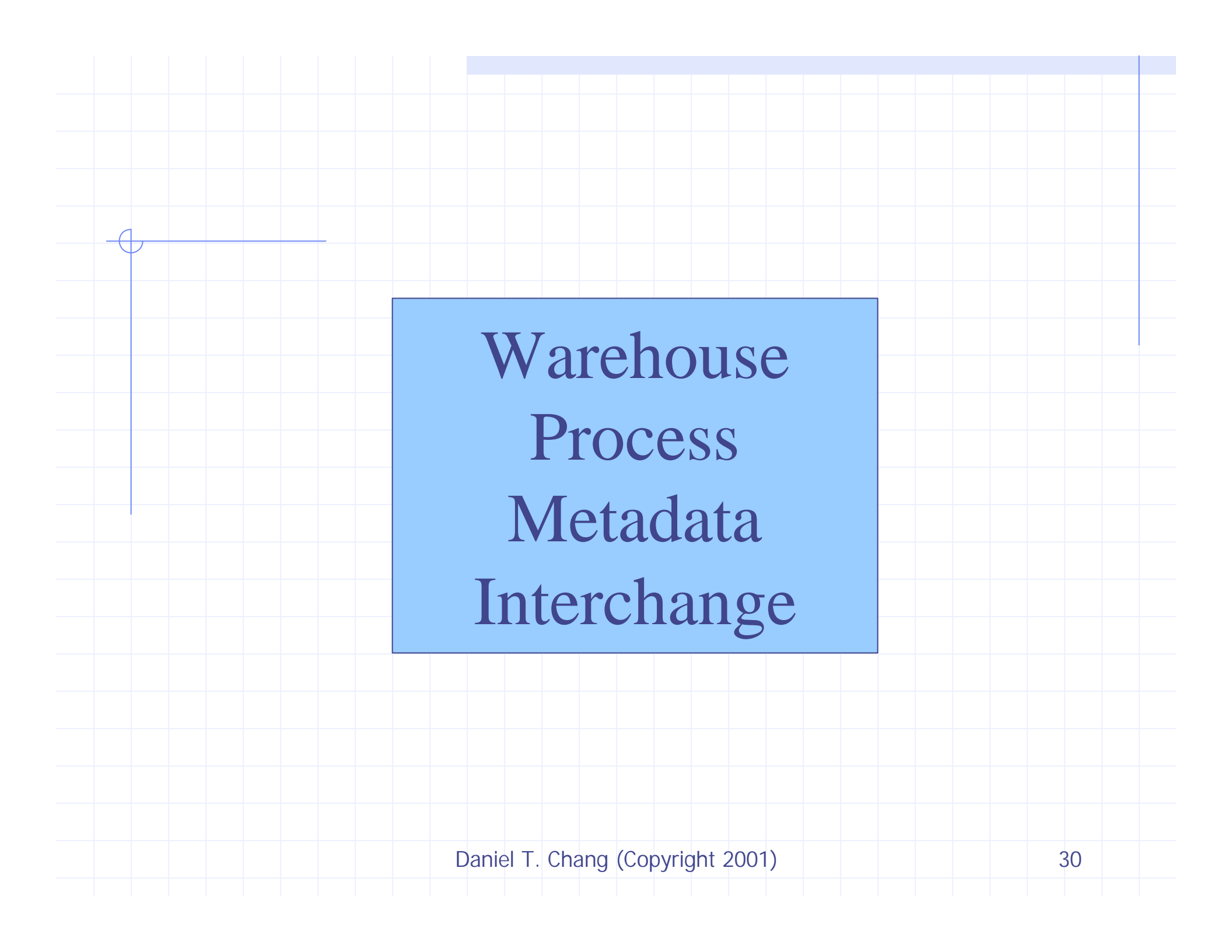
# Oracle\_OLAP.xml – 3

```
<CWMOLAP:Dimension.hierarchy >
  <CWMOLAP:LevelBasedHierarchy xmi.id="X1425" name="Standard"
    visibility="public" isSpecification="false" dimension="X1323" >
    ...
    <CWMOLAP:LevelBasedHierarchy.hierarchyLevelAssoc >
      ...
      <CWMOLAP:HierarchyLevelAssoc xmi.id="X1404"
        visibility="public"
        isSpecification="false" levelBasedHierarchy="X1425"
        currentLevel="X1349" immediateParent="X1406" >
        <CWM:Classifier.feature >
          <CWM:Attribute xmi.id="X1405" name="PRNT"
            visibility="public" isSpecification="false" owner="X1404" /
          </CWM:Classifier.feature >
        ...
      </CWMOLAP:Dimension.hierarchy >
    ...
  </CWMOLAP:Schema >
```

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# Oracle\_OLAP.xml – 4

```
<CWMRDB:Schema xmi.id="X1231" name="CWMDemo"  
  visibility="public" isSpecification="false" namespace="X1229">  
  <CWM:Namespace.ownedElement>  
    <CWMRDB:Table xmi.id="X1268" name="Period"  
      visibility="public" isSpecification="false" isRoot="true"  
      isLeaf="true" isAbstract="false" isActive="false" isSystem="false"  
      isTemporary="false" namespace="X1231">  
      <CWM:Classifier.feature>  
        <CWMRDB:Column xmi.id="X1249" name="EndDate"  
          visibility="public" isSpecification="false" ownerScope="instance"  
          precision="0" isNullable="columnNullable" owner="X1268"  
          type="X1234"/>  
        ...  
      </CWMRDB:Column>  
    </CWM:Classifier.feature>  
  </CWMRDB:Table>  
</CWM:Namespace.ownedElement>  
</CWMRDB:Schema>
```



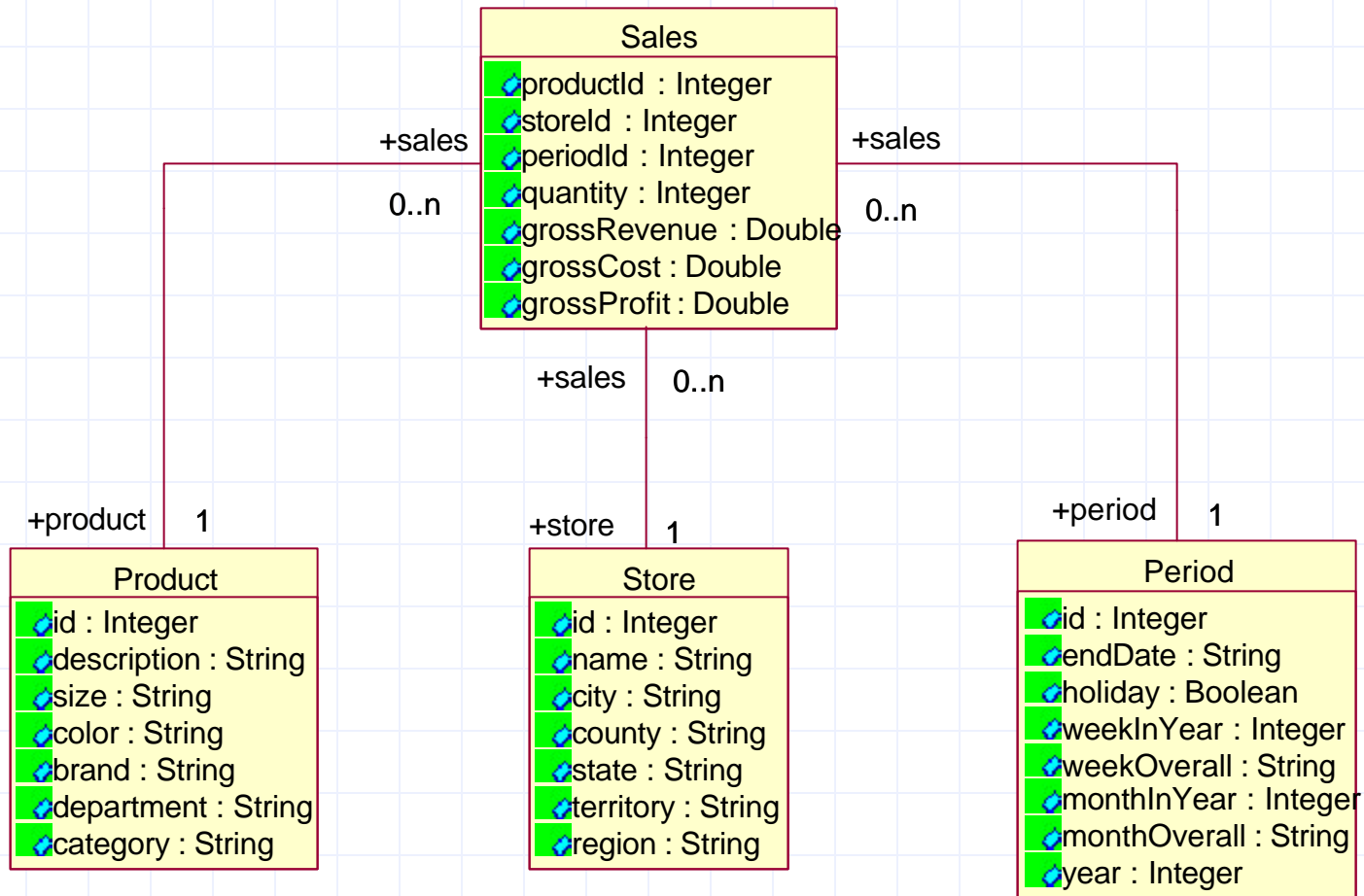
# Warehouse Process Metadata Interchange

# Scenario: CwmStore (Relational)

CwmStore Star Schema (M1)

Sales: "fact" table

Product, Store, Period: "dimension" tables



# Warehouse Metadata Interchange

## ◆ Interchange partners:

- IBM DB2 Warehouse Manager ↔
- SAS Enterprise Warehouse Administrator

## ◆ Interchanged metadata:

- CWM/Warehouse Process
- CWM/Transformation
- CWM/Relational
- CWM/Foundation





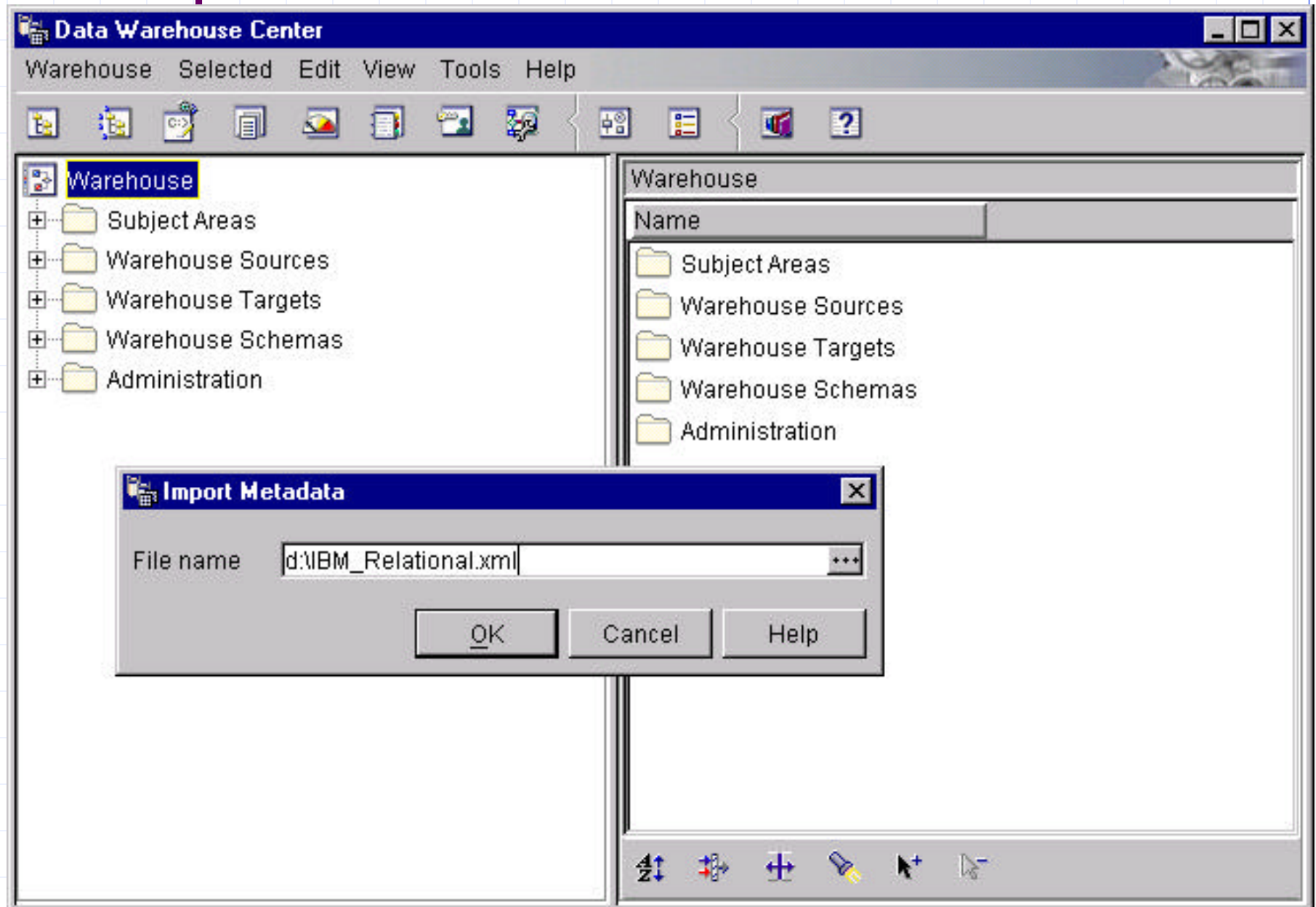
# IBM DB2 Warehouse Manager

# Scenario Steps

1. Import into DWC the **IBM\_Relational.xml** file.
2. Add a DWC target and process with steps to **replicate** each table.
3. Export the DWC process and steps to the **IBM\_WarehouseProcess.xml** file.

◆ (Import the IBM\_WarehouseProcess file into SAS EWA.)

# Step 1 - 1



# Step 1 - 2

The screenshot shows the Data Warehouse Center application window. The title bar reads "Data Warehouse Center". The menu bar includes "Warehouse", "Selected", "Edit", "View", "Tools", and "Help". The toolbar contains various icons for file operations and navigation. The main interface is divided into two panes. The left pane shows a tree view of the warehouse structure, with "Tables" under "CWMSTORE" selected. The right pane displays a table list for "CWMSTORE - Tables".

Name	Schema	T:
PERIOD	GUEST	
PRODUCT	GUEST	
SALES	GUEST	
STORE	GUEST	

# Step 1 - 3

**Properties - PERIOD** [X]

CWMSTORE - PERIOD

Source Table | Columns | Warehouse Primary Key | Warehouse Foreign Keys

Specify the columns for this table.

	Column name	Data type	Length	Precision	Scale
1	PERIOD_ID	INTEGER	-	-	-
2	END_DATE	VARCHAR	32	-	-
3	HOLIDAY	CHAR	1	-	-
4	WEEK_IN_YEAR	INTEGER	-	-	-
5	WEEK_OVERALL	VARCHAR	7	-	-
6	MONTH_IN_YEAR	INTEGER	-	-	-
7	MONTH_OVERALL	VARCHAR	8	-	-
8	YEAR	INTEGER	-	-	-

Move Up

Move Down

OK Cancel Help

# Step 2 - 1

The screenshot shows the Data Warehouse Center application window. The title bar reads "Data Warehouse Center". The menu bar includes "Warehouse", "Selected", "Edit", "View", "Tools", and "Help". The toolbar contains various icons for file operations and navigation.

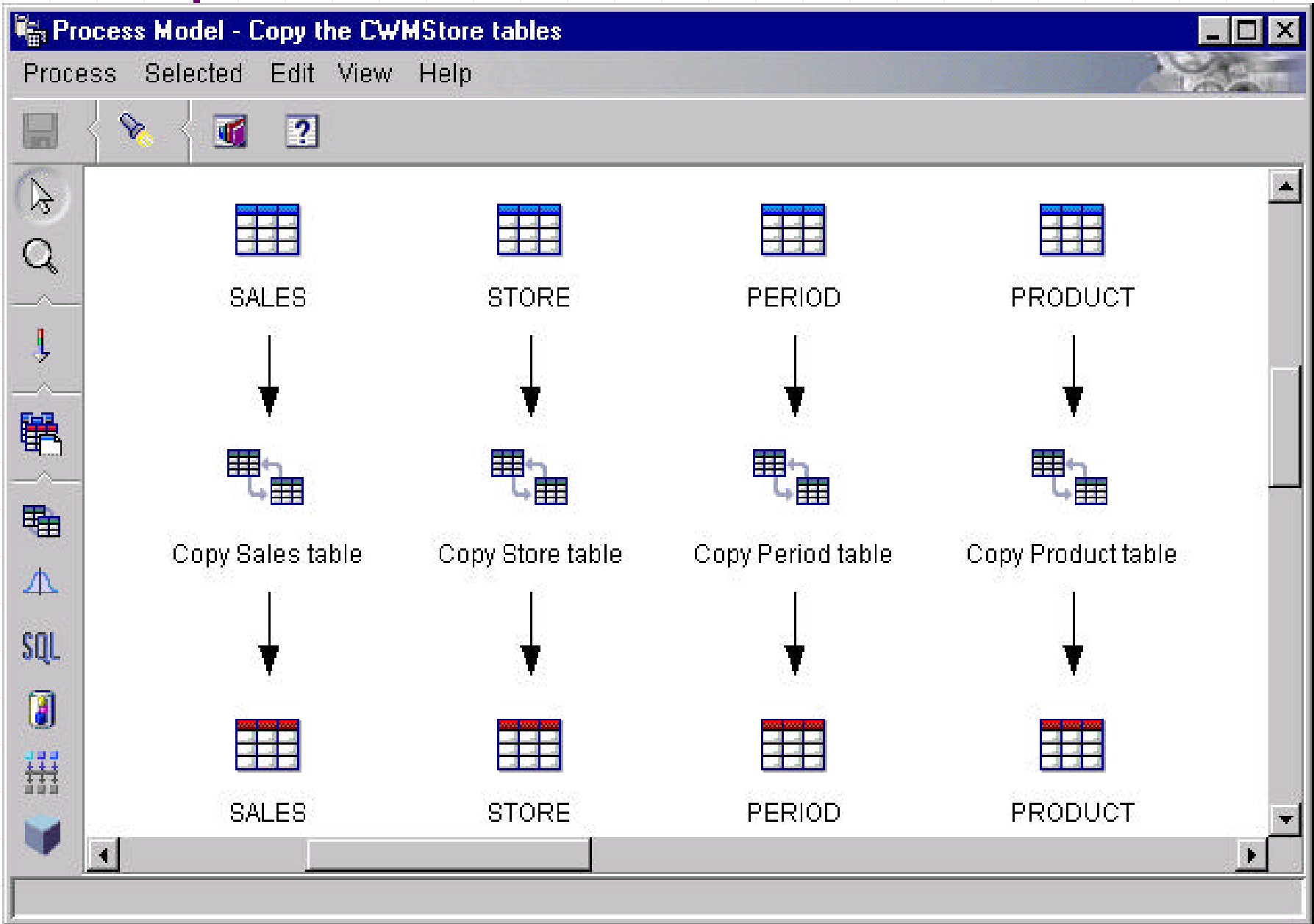
The left pane displays a tree view of the warehouse structure:

- Warehouse
  - Subject Areas
    - Copy the CWMStore tables (selected)
      - Processes
        - Copy the CWMStore tables (highlighted)
  - Warehouse Sources
  - Warehouse Targets
  - Warehouse Schemas
  - Administration

The right pane displays a table titled "Copy the CWMStore tables - Copy the CWMStore tables". The table has four columns: Name, Type, Subtype, and Modified. The data rows are as follows:

Name	Type	Subtype	Modified
Copy Sales table	Replicat...	User copy	Dece
Copy Product table	Replicat...	User copy	Dece
Copy Store table	Replicat...	User copy	Dece
Copy Period table	Replicat...	User copy	Dece
SALES			Dece
STORE			Dece
PERIOD			Dece
PRODUCT			Dece
PERIOD			Dece
PRODUCT			Dece
SALES			Dece
STORE			Dece

# Step 2 - 2



# Step 2 - 3

Properties - Copy Period table

Copy the CWMStore tables - Copy the CWMStore tables - Copy Period table

Replication | Parameters | **Column Mapping** | Processing Options

Source Columns

- GUEST.PERIOD.PERIOD\_ID after
- GUEST.PERIOD.END\_DATE after
- GUEST.PERIOD.HOLIDAY after
- GUEST.PERIOD.WEEK\_IN\_YEAR after
- GUEST.PERIOD.WEEK\_OVERALL after
- GUEST.PERIOD.MONTH\_IN\_YEAR after
- GUEST.PERIOD.MONTH\_OVERALL after
- GUEST.PERIOD.YEAR after

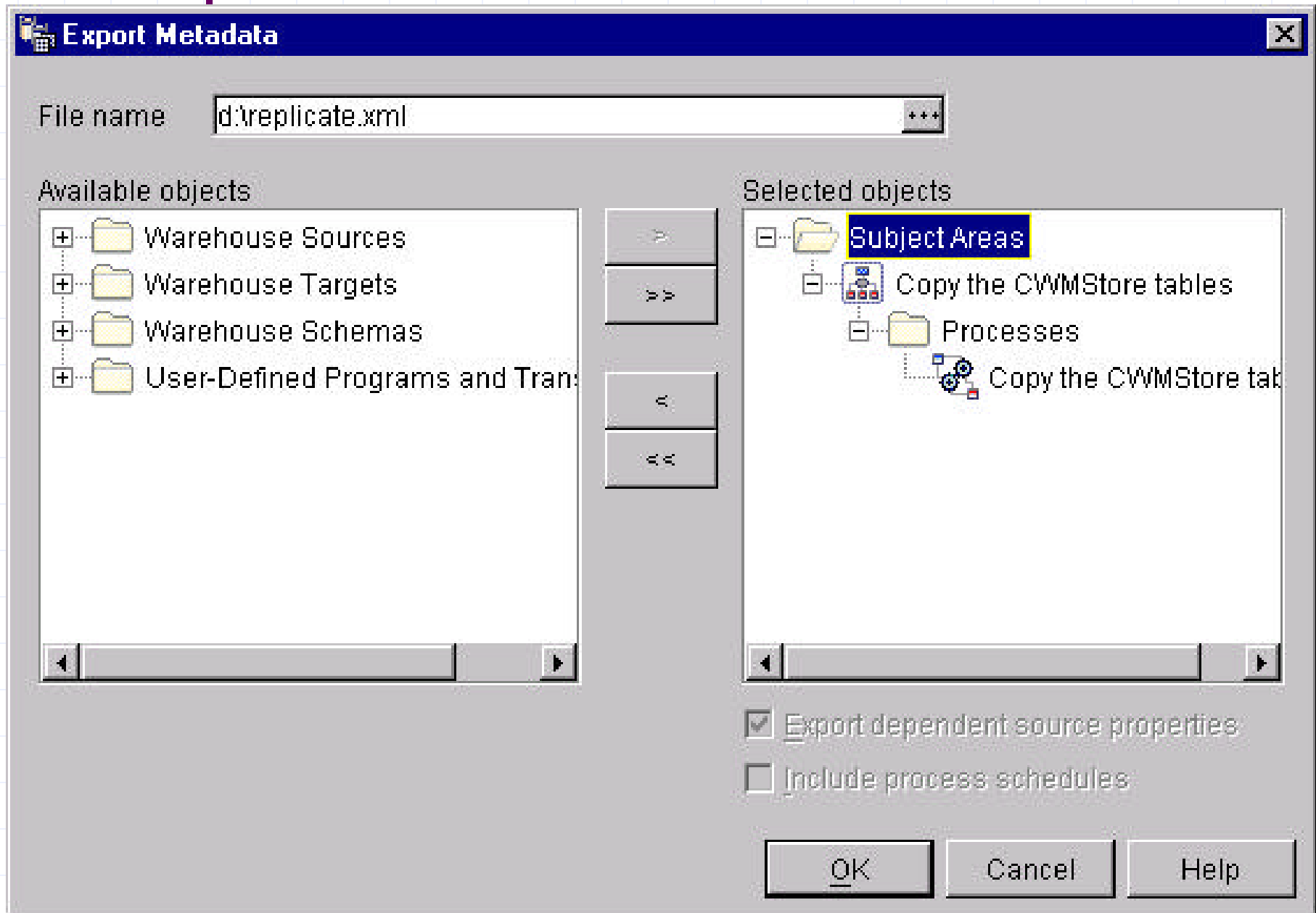
Specify the columns for this table.

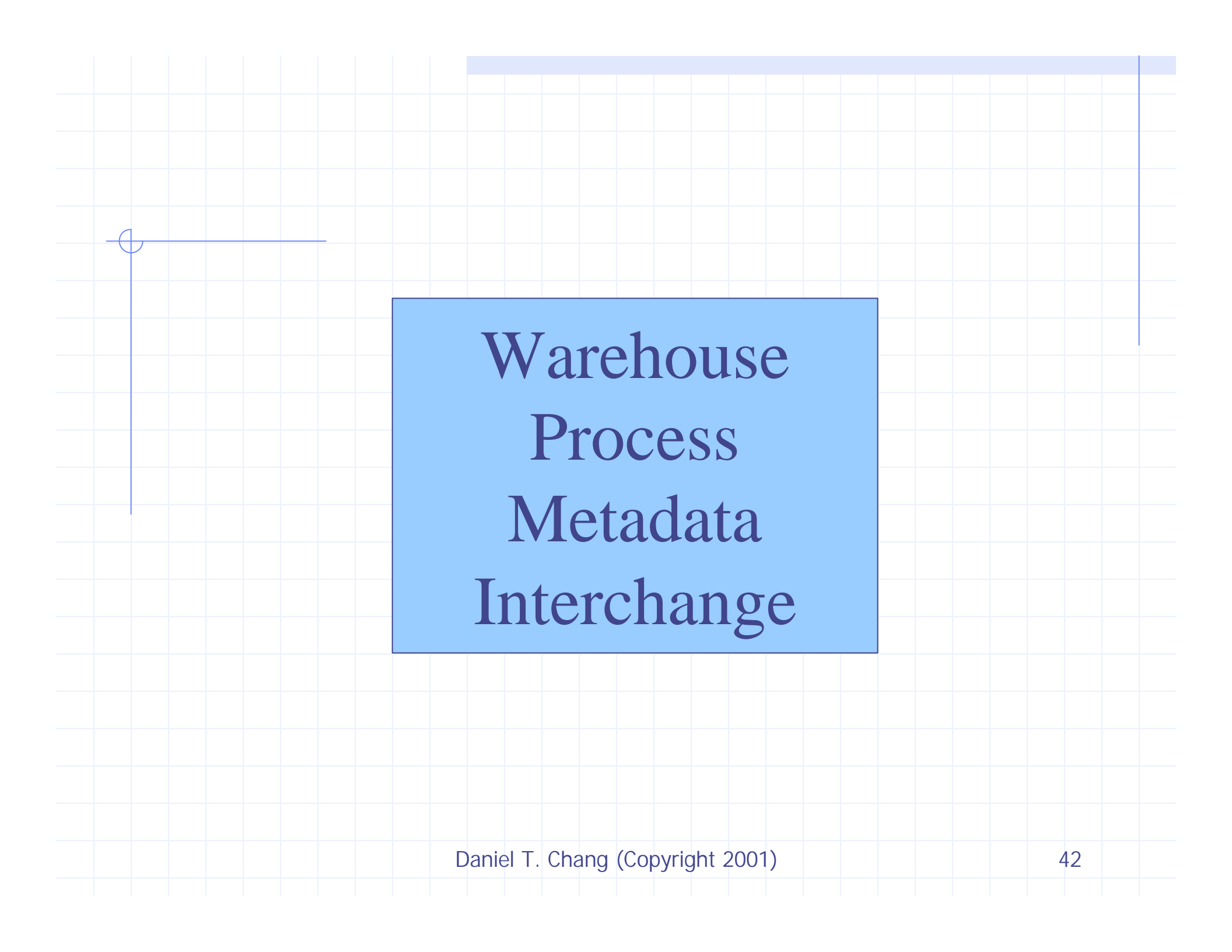
	Column name	Data type
1	PERIOD_ID	DECIMAL
2	END_DATE	VARCHAR
3	HOLIDAY	CHAR
4	WEEK_IN_YEAR	INTEGER
5	WEEK_OVERALL	VARCHAR
6	MONTH_IN_YEAR	DECIMAL
7	MONTH_OVERALL	VARCHAR
8	"YEAR"	INTEGER

OK Cancel Help



# Step 3

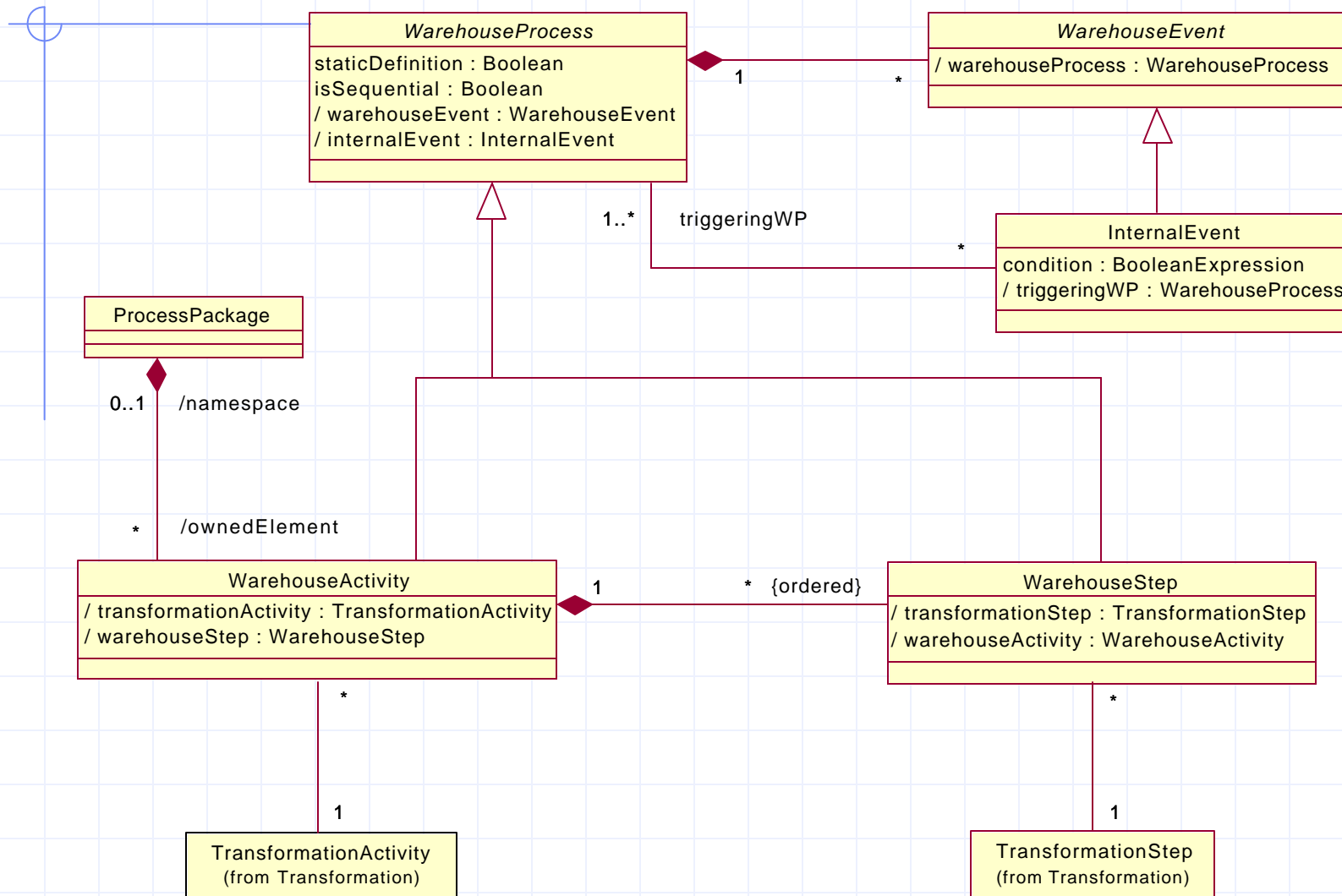




# Warehouse Process Metadata Interchange

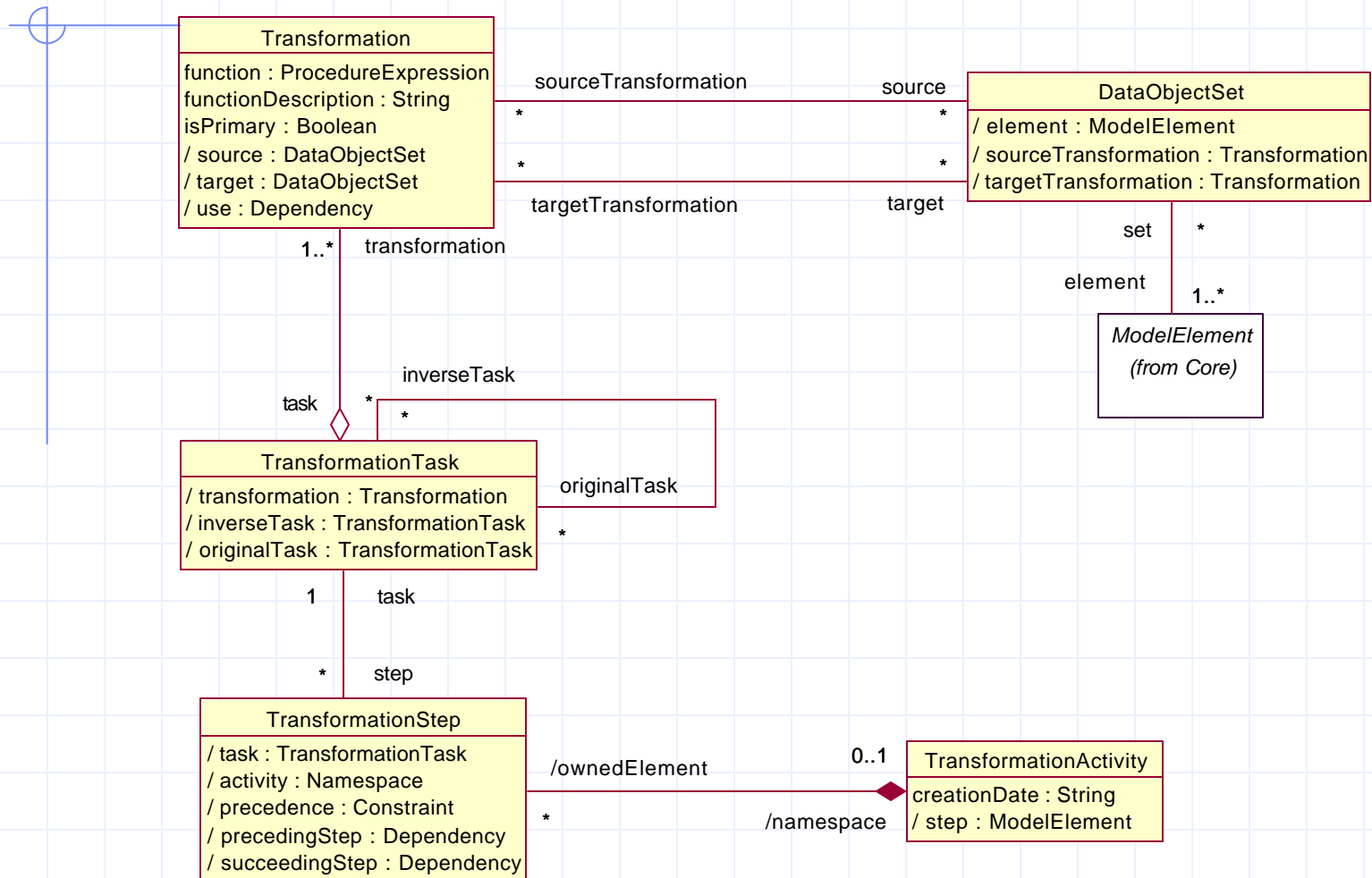
# CWM/Warehouse Process

Figure 18-1 Warehouse Process package overview.



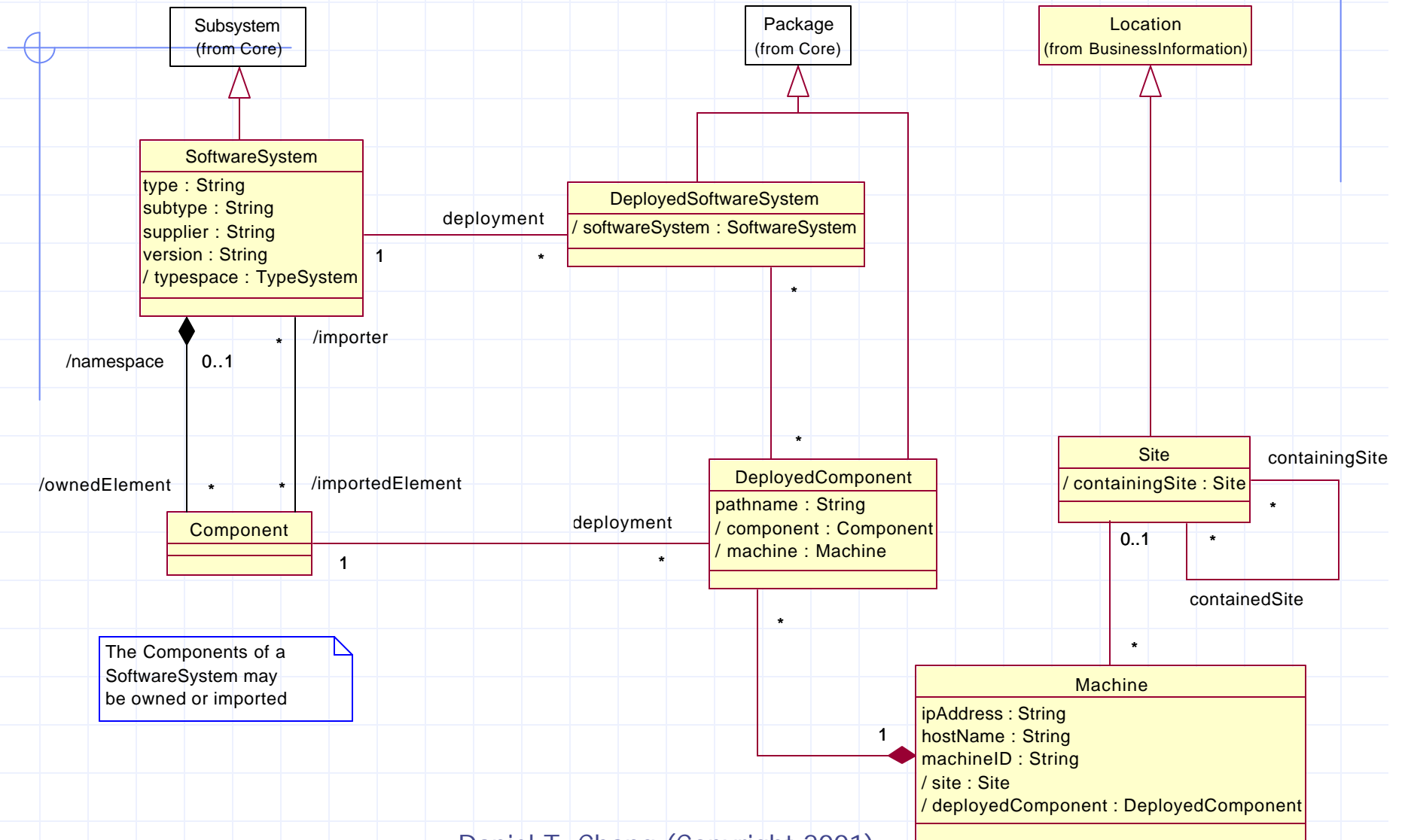
# CWM/Transformation

Figure 13-2 Transformation Relationships - 1



# CWM/Software Deployment

Figure 8-7-1 SoftwareDeployment metamodel



The Components of a SoftwareSystem may be owned or imported

# IBM\_WarehouseProcess.xml – 1

```
<CWM:SoftwareSystem xmi.id="_1" name="DWC">
  <CWM:Namespace.ownedElement>
    <CWM:Component xmi.id="_1.1" name="IWH2AGENT"
      namespace="_1"/>
    <CWM:SoftwareSystem xmi.id="_1.2" name="Replication"
      namespace="_1">
      <CWM:Namespace.ownedElement>
        <CWM:Component xmi.id="_1.2.4" name="User copy"
          namespace="_1.2">
          <CWM:Classifier.feature>
            <CWM:Operation xmi.id="_1.2.4.5" name="User copy"
              owner="_1.2.4" supplierDependency="_43 _50 _57 _64">
              <CWM:BehavioralFeature.parameter>
                <CWM:Parameter xmi.id="_1.2.4.5.1" name="Replication Control
                  Database" behavioralFeature="_1.2.4.5" type="_4">
                </CWM:Parameter>
              ...
            </CWM:SoftwareSystem >
```

# IBM\_WarehouseProcess.xml - 2

```
<CWM:ResponsibleParty xmi.id="_7" name="Default DWC User"
  modelElement="_8"/>
<CWM:Package xmi.id="_8" name="Copy the CWMStore tables">
  <CWM:Namespace.ownedElement>
    <CMMWHP:WarehouseProcess xmi.id="_8.1" name="Copy the
      CWMStore tables" namespace="_8" clientDependency="_21 _27
        _28 _29 _30 _31_33 _34" transformationActivity="_35 _44 _51
          _58">
      <CWM:ModelElement.taggedValue>
        <CWM:TaggedValue xmi.id="_8.1.1" tag="PROCESSTYPE"
          value="1" modelElement="_8.1"/>
      </CWM:ModelElement.taggedValue>
    </CMMWHP:WarehouseProcess>
  </CWM:Namespace.ownedElement>
</CWM:Package>
```

# IBM\_WarehouseProcess.xml - 3

```
<CWMTFM:TransformationActivity xmi.id="_35" name="Copy Period
table">
  <CWM:Namespace.ownedElement>
    <CWMTFM:TransformationStep xmi.id="_35.1" name="Copy Period
table" namespace="_35" task="_36"/>
  </CWM:Namespace.ownedElement>
</CWMTFM:TransformationActivity>
<CWMTFM:TransformationTask xmi.id="_36" name="Copy Period table"
transformation="_38">
  <CWM:Classifier.feature>
    <CWM:Operation xmi.id="_36.6" name="" owner="_36">
      <CWM:BehavioralFeature.parameter>
        <CWM:Parameter xmi.id="_36.6.1" name="Replication Control
Database" behavioralFeature="_36.6" type="_4">
          </CWM:Parameter>
        ...
      </CWM:BehavioralFeature.parameter>
    </CWM:Operation>
  </CWM:Classifier.feature>
</CWMTFM:TransformationTask >
```



# IBM\_WarehouseProcess.xml - 4

```
<CWMTFM:TransformationMap xmi.id="_38" name="Copy Period table"
  target="_39" source="_40" clientDependency="_43">
  <CWM:Namespace.ownedElement>
    <CWMTFM:ClassifierMap xmi.id="_38.1" name="Copy Period table"
      namespace="_38" target="_22.10.4" source="_11.10.4">
      <CWMTFM:ClassifierMap.featureMap>
        <CWMTFM:FeatureMap xmi.id="_38.1.1" name="Copy Period
          table" classifierMap="_38.1" target="_22.10.4.15"
            source="_11.10.4.15">
          ...
        </CWMTFM:FeatureMap>
      </CWMTFM:ClassifierMap.featureMap>
    </CWMTFM:ClassifierMap>
  </CWM:Namespace.ownedElement>
</CWMTFM:TransformationMap>
<CWMTFM:DataObjectSet xmi.id="_39" name="Output"
  targetTransformation="_38" element="_22.10.4"/>
<CWMTFM:DataObjectSet xmi.id="_40" name="Input"
  sourceTransformation="_38" element="_11.10.4"/>
```

# IBM\_WarehouseProcess.xml - 5

```
<CWMRDB:Catalog xmi.id="_22" name="REPSTORE">
  <CWM:Namespace.ownedElement>
    <CWMRDB:Schema xmi.id="_22.10" name="GUEST"
      namespace="_22">
      <CWM:Namespace.ownedElement>
        <CWMRDB:BaseTable xmi.id="_22.10.4" name="PERIOD"
          namespace="_22.10" supplierDependency="_33">
          <CWM:Classifier.feature>
            <CWMRDB:Column xmi.id="_22.10.4.15" name="PERIOD_ID"
              length="5" scale="0" precision="5"
              isNullable="columnNoNulls" owner="_22.10.4" type="_32">
            ...
          </CWMRDB:Column>
        </CWM:Classifier.feature>
      </CWMRDB:BaseTable>
    </CWM:Namespace.ownedElement>
  </CWMRDB:Schema>
</CWM:Namespace.ownedElement>
</CWMRDB:Catalog >
```



# Conclusion

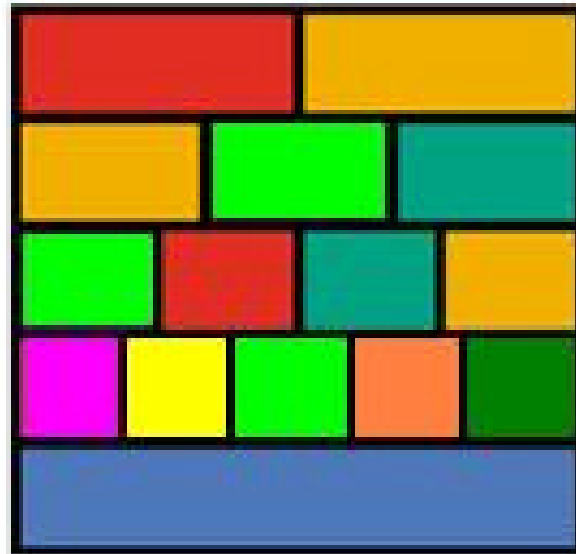
# CWM: Past and Present

## ◆ Past

- **OMG Adopted Specification:** 3/10/2000
- **CWM FTF:** 3/10/2000 – 3/2/2001
- **CWM Enablement Showcase:** 12/22-23/2000, 3/6-7/2001
- **CWM 1.0:** 3/2/2001

## ◆ Present

- **CWM RTF:** 3/2/2001 – present
- **CWM Web Services RFP:** 3/1/2001 - present



**C W M**

common warehouse metamodel

<http://www.cwmforum.org>

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