Universal Patterns: Blue Prints for Data Modeling

Presented by Paul Agnew,
Universal Data Models, LLC
PURPOSE

Share
WHAT WE ARE GOING TO COVER

- Introduction
- Patterns
  - Declarative Role,
  - Contextual role,
  - Status,
  - Classification
- Conclusion
MY PROMISE

• Understanding
• Application
• Involvement
• Answers
WHAT IS A PATTERN?

A template or guide for making something else.
A Pattern Language
Towns · Buildings · Construction

Christopher Alexander
Sara Ishikawa · Murray Silverstein
WITH
Max Jacobson · Ingrid Fiksdahl-King
Shlomo Angel
EXAMPLES OF STANDARD UNIVERSAL DATA MODELS

These are common data model constructs applicable to most enterprises:

- People and organization models
- Product models
- Order models
- Work effort and project mgmt models
- Shipment models
- Invoicing models
- Accounting and budgeting models
- E-Commerce models
UNIVERSAL PATTERNS FOR DATA MODELING
SPECIFIC MODELING VS. GENERALIZED MODELING
WHEN SHOULD I USE A SPECIFIC OR GENERALIZED PATTERN?

• Specific – Understand requirements
• Generalized – Flexibility
• Why not Conceptual, logical or physical?
• Use Both?
• Plug and play approach
THE PATTERNS

- Declarative Roles
- Contextual Roles
- Status
- Classification

Recursive Pattern
Contact Mechanism
Business Rules
Identifiers (work in progress)
DECLARATIVE ROLES PATTERNS

People and Organizations wear many different hats!
LEVEL 1 DECLARATIVE ROLES

DECLARATIVE ROLE
- DECLARATIVE ROLE ID: ID (PK)
- ORGANIZATION NAME: CHAR
- LAST NAME: CHAR
- FIRST NAME: CHAR

CUSTOMER
- CUSTOMER ID: ID (PK)
- ORGANIZATION NAME: CHAR
- LAST NAME: CHAR
- FIRST NAME: CHAR
- CREDIT LIMIT: MONEY

SUPPLIER
- SUPPLIER ID: ID (PK)
- ORGANIZATION NAME: CHAR
- TAXATION IDENTIFIER: CHAR

PARTNER
- PARTNER ID: ID (PK)
- ORGANIZATION NAME: CHAR
- LAST NAME: CHAR
- FIRST NAME: CHAR
- PARTNER TYPE ID: ID (FK)

EMPLOYEE
- EMPLOYEE ID: ID (PK)
- LAST NAME: CHAR
- FIRST NAME: CHAR
- EMPLOYEE NUMBER: CHAR
# LEVEL 1 DECLARATIVE ROLES

<table>
<thead>
<tr>
<th>Organization Name</th>
<th>Last Name</th>
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<th>Credit Limit</th>
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<tbody>
<tr>
<td>ABC Corporation</td>
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<table>
<thead>
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<th>Organization Name</th>
<th>Taxation Identifier</th>
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</thead>
<tbody>
<tr>
<td>ABC Corporation</td>
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<tr>
<td>Kantowitz Computers</td>
<td>T5645-23</td>
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<table>
<thead>
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<th>Organization Name</th>
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<th>First Name</th>
<th>Partner Type (ID)</th>
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<td>ABC Corporation</td>
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<td></td>
<td>Silver (02)</td>
</tr>
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<td>Matrix Services</td>
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<table>
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<th>First Name</th>
<th>Employee Number</th>
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<tr>
<td>Corr</td>
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</tr>
<tr>
<td>Percy</td>
<td>Caroline</td>
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</table>

**CUSTOMER**
- CUSTOMER ID (PK)
  - ORGANIZATION NAME CHAR
  - LAST NAME CHAR
  - FIRST NAME CHAR
  - CREDIT LIMIT MONEY

**SUPPLIER**
- SUPPLIER ID (PK)
  - ORGANIZATION NAME CHAR
  - TAXATION IDENTIFIER CHAR

**PARTNER**
- PARTNER ID (PK)
  - ORGANIZATION NAME CHAR
  - LAST NAME CHAR
  - FIRST NAME CHAR
  - PARTNER TYPE ID (FK)

**EMPLOYEE**
- EMPLOYEE ID (PK)
  - LAST NAME CHAR
  - FIRST NAME CHAR
  - EMPLOYEE NUMBER CHAR
Level 2

Declarative Roles

DEclarative Role 1
* DECLARATIVE ROLE 1 ID ID (PK)
* PARTY ID ID (FK)

Declarative Role 2
* DECLARATIVE ROLE 2 ID ID (PK)
* PARTY ID ID (FK)

Declarative Role 3
* DECLARATIVE ROLE 3 ID ID (PK)
* PARTY ID ID (FK)

PARTY
PARTY ID ID (PK)

acting as

ORGANIZATION
CURRENT ORGANIZATION NAME CHAR

acting as

PERSON
CURRENT LAST NAME CHAR
CURRENT FIRST NAME CHAR
DATE OF BIRTH DATE

acting as

CUSTOMER
* CUSTOMER ID ID (PK)
* PARTY ID ID (FK)
CREDIT LIMIT MONEY

acting as

SUPPLIER
* SUPPLIER ID ID (PK)
* PARTY ID ID (FK)
TAXATION IDENTIFIER CHAR

acting as

PARTNER
* PARTNER ID ID (PK)
* PARTY ID ID (FK)
PARTNER TYPE ID ID (FK)

acting as

EMPLOYEE
* EMPLOYEE ID ID (PK)
* PARTY ID ID (FK)
EMPLOYEE NUMBER CHAR

acting as

PARTY
PARTY ID ID (PK)

acting as

ORGANIZATION
CURRENT ORGANIZATION NAME CHAR

acting as

PERSON
CURRENT LAST NAME CHAR
CURRENT FIRST NAME CHAR
DATE OF BIRTH DATE
Level 2 Declarative Roles

<table>
<thead>
<tr>
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<tr>
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<td>Gold (01)</td>
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<th>Party Id</th>
<th>Employee Number</th>
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</thead>
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<td>123-232-232</td>
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<tr>
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</table>

<table>
<thead>
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<th>Party Id</th>
<th>Organization. Current Organization Name</th>
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</thead>
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<tr>
<td>1</td>
<td>ABC Corporation</td>
</tr>
<tr>
<td>2</td>
<td>Kantowitz Computers</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Party Id</th>
<th>Person. Current Last Name</th>
<th>Person. Current First Name</th>
<th>Person. Date of Birth</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Percy</td>
<td>Caroline</td>
<td>1/2/1980</td>
</tr>
<tr>
<td>4</td>
<td>Corr</td>
<td>Una</td>
<td>5/6/1983</td>
</tr>
<tr>
<td>5</td>
<td>Matrix Services</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Level 3 Declarative Roles

PARTY ROLE
PARTY ROLE ID ID (PK)
* PARTY ID ID (FK)(UID)
* ROLE TYPE ID ID (FK)(UID)
* FROM DATE DATE (UID)
* THRU DATE DATE

DECLARATIVE ROLE 1
DECLARATIVE ROLE 2
DECLARATIVE ROLE 3

PARTY ID ID (PK)

PERSON
- FIRST NAME CHAR
- LAST NAME CHAR
- DATE OF BIRTH DATE

ORGANIZATION
- NAME CHAR

ROLE TYPE
ROLE TYPE ID ID (PK)
- NAME CHAR

CUSTOMER
- CREDIT LIMIT MONEY

SUPPLIER
- TAXATION IDENTIFIER CHAR

PARTNER
- PARTNER TYPE ID ID (FK)

EMPLOYEE
- EMPLOYEE NUMBER CHAR

for
acting as
classified by

a classification for within

further broken down into

for
acting as
classified by

a classification for within

further broken down into
### Level 3 Declarative Roles

<table>
<thead>
<tr>
<th>Party Role Id</th>
<th>Party Id</th>
<th>Role Type Id (Role Type.Name)</th>
<th>Customer. Credit Limit</th>
<th>Supplier. Taxation Identifier</th>
<th>Partner Type Id (name)</th>
<th>Employee.Employee Number</th>
<th>From Date</th>
<th>Thru Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
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</tr>
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<td>1</td>
<td>4 (Supplier)</td>
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<td>A1234-23</td>
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<td></td>
<td></td>
<td>1/2/2009</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>5 (Partner)</td>
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<td>Silver</td>
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<td>1/2/2009</td>
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<tr>
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<td>4/4/2000</td>
</tr>
</tbody>
</table>

### Diagram

- **Party Role**: ID (PK) - Party ID
- **Role Type**: ID (PK) - Role Type ID
- **Customer**: ID (PK) - Customer ID
- **Supplier**: ID (PK) - Supplier ID
- **Partner**: ID (FK) - Partner ID
- **Employee**: ID (PK) - Employee ID
- **Person**: ID (PK) - Person ID
- **Organization**: ID (PK) - Organization ID

### Table

<table>
<thead>
<tr>
<th>Party Id</th>
<th>Organization. Current Organization Name</th>
<th>Person. Last Name</th>
<th>Person. First Name</th>
<th>Person. Date of Birth</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ABC Corporation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Kantowitz Computers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>Percy</td>
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</tr>
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<td>5/6/1983</td>
</tr>
<tr>
<td>5</td>
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<td></td>
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</tbody>
</table>

### Role Type

<table>
<thead>
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<th>Name</th>
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<td>Customer</td>
</tr>
<tr>
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<tr>
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<td></td>
<td>Partner</td>
</tr>
<tr>
<td>6</td>
<td>1 (Person Role)</td>
<td>Employee</td>
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</tbody>
</table>
Something to think about – Declarative Roles

CCI customers are mainly organizations such as distributors, retail stores, and large organizations. On rare occasions they sell to individual customers. The CEO wants to know who their customers are! They also want to know which customers are also suppliers. They want information on their partners, many who use CCI computers in larger solutions. They are also keenly interested in knowing about their sales force, other employees, and other human resources such as contractors.

Some of their suppliers are also customers and partners. CCI don’t know how to gauge the risk of a supplier going under. They usually know how much they owe a supplier, but if the supplier is also a customer, how much does that mean we owe, because they might owe us? But before they can figure out who owes them what, we need to help them figure out what relationships they have to other organizations and people outside and inside of their company.

The CIO wants us to create a quick statement of scope of all of the roles that we need to capture for the enterprise as a whole. This has to be easily explained to any business person. As time is off the essences he also wants us to create a working prototype that can quickly be leveraged into a full-blown system.

HOW WOULD YOU DEVELOP A DATA MODEL FOR THE ABOVE SCENARIO THAT CAN BE EASILY EXPLAINED TO A BUSINESS REPRESENTATIVE AND BE USED FOR A PROTOTYPE.
CONTEXTUAL ROLES PATTERNS

How people or organizations are involved.
Level 1 Contextual Roles Pattern

SALES ORDER
SALES ORDER ID ID (PK)
* PLACING CUSTOMER NAME CHAR
 o SALES PERSON NAME CHAR
* SHIP TO CUSTOMER NAME CHAR
 o BILL TO CUSTOMER NAME CHAR

INVOICE
INVOICE ID ID (PK)
 o BILL TO CUSTOMER NAME CHAR
* SENDER OF NAME CHAR

PERFORMANCE REVIEW
PERFORMANCE REVIEW ID ID (PK)
* EMPLOYEE CHAR
* INTERNAL ORGANIZATION CHAR
 o MANAGER CHAR
 o MENTOR CHAR
 o COMMENTS DESC
 o MEETS-NEEDS INDICATOR IND

PROJECT
PROJECT ID ID (PK)
* PROJECT NAME CHAR
 o PROJECT SPONSOR CHAR
* PROJECT WORKER CHAR
 o PROJECT LEAD CHAR

ENTITY
ENTITY ID ID (PK)
* CONTEXTUAL ROLE 1 CHAR
* CONTEXTUAL ROLE 2 CHAR
 o CONTEXTUAL ROLE 3 CHAR
 o CONTEXTUAL ROLE 4 CHAR
## Level 1 Contextual Roles Pattern

### Sales Order

<table>
<thead>
<tr>
<th>Sales Order Id</th>
<th>Placing Customer Name</th>
<th>Sales Person Name</th>
<th>Ship to Customer Name</th>
<th>Bill to Customer Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>00001</td>
<td>ABC Corporation</td>
<td>Caroline Percy</td>
<td>ABC Corporation</td>
<td>ABC Corporation</td>
</tr>
<tr>
<td>00002</td>
<td>Matrix Services</td>
<td>Una Corr</td>
<td>Kantowitz Computers</td>
<td>Matrix Services</td>
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### Invoice

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<tbody>
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<tr>
<td>9990002</td>
<td>Matrix Services</td>
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### Performance Review

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<tr>
<th>Performance Review Id</th>
<th>Employee</th>
<th>Internal Organization</th>
<th>Manager</th>
<th>Mentor</th>
<th>Meets-Needs Ind</th>
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<tbody>
<tr>
<td>0111</td>
<td>Caroline Percy</td>
<td>Sales</td>
<td>Dan Smith</td>
<td>Nadine Girard</td>
<td>Y</td>
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<tr>
<td>0112</td>
<td>Una Corr</td>
<td>Sales</td>
<td>Caroline Percy</td>
<td>Neena Davies</td>
<td>N</td>
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### Project

<table>
<thead>
<tr>
<th>Project Id</th>
<th>Project Name</th>
<th>Project Sponsor</th>
<th>Project Worker</th>
<th>Project Lead</th>
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<tbody>
<tr>
<td>90903</td>
<td>Hardware Sales effort</td>
<td>Dan Smith</td>
<td>Caroline Percy</td>
<td>Dan Smith</td>
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<tr>
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<td>Hardware Sales effort</td>
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<td>Dan Smith</td>
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Level 1 Contextual Roles Pattern, Relationships
Level 1 Contextual Roles Pattern, Relationships

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<th>Sales Order Id</th>
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<tbody>
<tr>
<td>001</td>
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<tr>
<td>002</td>
<td>002 (Matrix Services)</td>
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<td>1/3/2009</td>
</tr>
</tbody>
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---

**SALES ORDER**

- **SALES ORDER ID**
  - ID (PK)
- **SALES PERSON ID**
  - ID (FK)
- **SALES ORDER DATE**
  - DATE

**PLACING CUSTOMER**

- **PLACING CUSTOMER ID**
  - ID (PK)
- **SALES ORDER ID**
  - ID (FK)/(UID)
- **FROM DATE**
  - DATE
- **THRU DATE**
  - DATE

**BILL TO CUSTOMER**

- **BILL TO CUSTOMER ID**
  - ID (PK)
- **SALES ORDER ID**
  - ID (FK)/(UID)
- **FROM DATE**
  - DATE
- **THRU DATE**
  - DATE

---

**CUSTOMER**

- **CUSTOMER ID**
  - ID (PK)
- **CUSTOMER NAME**
  - CHAR

**SALES PERSON**

- **SALES PERSON ID**
  - ID (PK)
- **LEAD FIRST NAME**
  - CHAR
- **LEAD LAST NAME**
  - CHAR

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<table>
<thead>
<tr>
<th>Placing Customer Id</th>
<th>Customer Id (Customer Name)</th>
<th>Sales Order Id</th>
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<td>001 (ABC Corporation)</td>
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<td>003</td>
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<table>
<thead>
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<th>Sales Person Id</th>
<th>Lead First Name</th>
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<tr>
<td>00111</td>
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<td>Percy</td>
</tr>
<tr>
<td>00112</td>
<td>Una</td>
<td>Corr</td>
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<table>
<thead>
<tr>
<th>Customer Id</th>
<th>Customer Name</th>
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<tbody>
<tr>
<td>001</td>
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<td>002</td>
<td>Matrix Services</td>
</tr>
<tr>
<td>003</td>
<td>Kantowitz Computers</td>
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</table>
Level 2 Contextual Role Pattern

ENTITY
- ENTITY ID (ID FK)
  - PARTY ROLE ID (ID FK)

SPECIFIC CONTEXTUAL ROLE
- PARTY ROLE ID (ID FK)
  - ENTITY ID (ID FK (UID))
  - FROM DATE (DATE (UID))
    - THRU DATE (DATE (UID))

PARTY ROLE
- PARTY ROLE ID (ID FK)
  - PARTY ID (ID FK (UID))
  - ROLE TYPE ID (ID FK (UID))
  - FROM DATE (DATE (UID))
  - THRU DATE (DATE (UID))

DECLARATIVE ROLE 1

DECLARATIVE ROLE 2

CUSTOMER
- CREDIT LIMIT (MONEY)

ORGANIZATION
- NAME (CHAR)

PERSON
- LAST NAME (CHAR)
- FIRST NAME (CHAR)

ROLE TYPE
- ROLE TYPE ID (ID FK)
  - PARENT ROLE TYPE ID (ID FK)
  - NAME (CHAR)
Level 2 Contextual Role Pattern

<table>
<thead>
<tr>
<th>Sales Order Id</th>
<th>Party Role Id (name)</th>
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<tbody>
<tr>
<td>00001</td>
<td>3 (Caroline Percy)</td>
<td>3/2/2009</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Placing Customer Id</th>
<th>Customer Id (Customer Name)</th>
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<td>$100,000</td>
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<td>002</td>
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<td>$250,000</td>
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<table>
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</tr>
<tr>
<td>004</td>
<td>4 (Una Corr)</td>
<td>.09</td>
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<table>
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<tr>
<th>Party Id</th>
<th>Organization. Current Organization Name</th>
<th>Person. Last Name</th>
<th>Person. First Name</th>
<th>Role Type. Name</th>
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<tbody>
<tr>
<td>1</td>
<td>ABC Corporation</td>
<td></td>
<td></td>
<td>Customer</td>
</tr>
<tr>
<td>2</td>
<td>Kantowitz Computers</td>
<td></td>
<td></td>
<td>Customer</td>
</tr>
<tr>
<td>3</td>
<td>Percy</td>
<td>Caroline</td>
<td>Sales Person</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Corr</td>
<td>Una</td>
<td>Sales Person</td>
<td></td>
</tr>
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</table>
Level 2 Contextual Role, Party Only

ENTITY
- ENTITY ID ID (PK)
  - PARTY ID ID (FK)

CONTEXTUAL ROLE 1
- CONTEXTUAL ROLE 1 ID ID (PK)
  - PARTY ID ID (FK)(UID)
  - ENTITY ID ID (FK)(UID)
  - FROM DATE DATE (UID)
  - THRU DATE DATE

PARTY
- PARTY ID ID (PK)

ORGANIZATION
- NAME CHAR

PERSON
- LAST NAME CHAR
- FIRST NAME CHAR

CONTEXTUAL ROLE 2
- CONTEXTUAL ROLE 2 ID ID (PK)
  - PARTY ID ID (FK)(UID)
  - ENTITY ID ID (FK)(UID)
  - FROM DATE DATE (UID)
  - THRU DATE DATE

SALES ORDER
- SALES ORDER ID ID (PK)
  - SALES ORDER DATE DATE
  - SALES PERSON PARTY ID ID (FK)

PLACING CUSTOMER
- PLACING CUSTOMER ID ID (PK)
  - PARTY ID ID (FK)(UID)
  - SALES ORDER ID ID (FK)(UID)
  - FROM DATE DATE (UID)
  - THRU DATE DATE

PARTY
- PARTY ID ID (PK)

ORGANIZATION
- NAME CHAR

PERSON
- LAST NAME CHAR
- FIRST NAME CHAR

BILL TO CUSTOMER
- BILL TO CUSTOMER ID ID (PK)
  - PARTY ID ID (FK)(UID)
  - SALES ORDER ID ID (FK)(UID)
  - FROM DATE DATE (UID)
  - THRU DATE DATE

SALES ORDER
- SALES ORDER DATE DATE

for

placed by

with a requested bill to

sold by

for

with the placer of

for

the placer of

the requested bill to

the requested bill to

salesperson for

for

LEVEL 2 CONTEXTUAL ROLE, PARTY ONLY

Proprietary and confidential information of Universal Data Models, LLC
Level 3 Contextual Roles Pattern

**ENTITY**
- ENTITY ID
- ID (PK)

**CONTEXTUAL ROLE**
- CONTEXTUAL ROLE ID
- ID (PK)
- PARTY ID
  - ID (FK)(UID)
- ROLE TYPE ID
  - ID (FK)(UID)
- ENTITY ID
  - ID (FK)(UID)
- FROM DATE
  - DATE (UID)
- THRU DATE
  - DATE

**PARTY**
- PARTY ID
  - ID (PK)

**ROLE TYPE**
- ROLE TYPE ID
  - ID (PK)
- PARENT ROLE TYPE ID
  - ID (FK)
- NAME
  - CHAR

**SALES ORDER**
- SALES ORDER ID
  - ID (PK)
- SALES ORDER DATE
  - DATE

**SALES ORDER ROLE**
- SALES ORDER ROLE ID
  - ID (PK)
- PARTY ID
  - ID (FK)(UID)
- ROLE TYPE ID
  - ID (FK)(UID)
- SALES ORDER ID
  - ID (FK)(UID)
- FROM DATE
  - DATE (UID)
- THRU DATE
  - DATE

**PERSON**
- LAST NAME
  - CHAR
- FIRST NAME
  - CHAR

**ORGANIZATION**
- NAME
  - CHAR

Further broken down into the description for within the context of playing the role within the context of playing the role within the context of described by the description for further broken down into

Proprietary and confidential information of Universal Data Models, LLC
Level 3 Contextual Roles Pattern

<table>
<thead>
<tr>
<th>Sales Order Role Id</th>
<th>Party Id (Organization Name)</th>
<th>Role Type Id (Name)</th>
<th>Sales Order Id</th>
<th>From Date/Thru Date</th>
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<tbody>
<tr>
<td>001</td>
<td>1 (ABC Corporation)</td>
<td>8 (Placing Customer)</td>
<td>00001</td>
<td>1/2/2009</td>
</tr>
<tr>
<td>002</td>
<td>2 (Matrix Services)</td>
<td>8 (Placing Customer)</td>
<td>00002</td>
<td>1/3/2009</td>
</tr>
<tr>
<td>001</td>
<td>1 (ABC Corporation)</td>
<td>11 (Bill To Customer)</td>
<td>00001</td>
<td>1/2/2009</td>
</tr>
<tr>
<td>002</td>
<td>2 (Una Corr)</td>
<td>10 (Sales Person)</td>
<td>00002</td>
<td>1/3/2009</td>
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<th>Name</th>
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<td>Order Role</td>
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<td>3</td>
<td></td>
<td>Customer</td>
</tr>
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<td>8</td>
<td>11 (Order Role)</td>
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<tr>
<td>9</td>
<td>11 (Order Role)</td>
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<td>1 (Person Role)</td>
<td>Sales Person</td>
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<th>Person. Current Last Name</th>
<th>Person. Current First Name</th>
<th>Person. Date of Birth</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>ABC Corporation</td>
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<td>Kantowitz Computers</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>3</td>
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<td>Percy</td>
<td>Caroline</td>
<td>1/2/1980</td>
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<td>4</td>
<td></td>
<td>Corr</td>
<td>Una</td>
<td>5/6/1983</td>
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<td>5</td>
<td></td>
<td></td>
<td>Matrix Services</td>
<td></td>
</tr>
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Specific and Generalized (Hybrid) Contextual Roles Pattern

**ENTITY**
- ENTITY ID: ID (PK)
- PARTY ROLE ID: ID (FK)

**SPECIFIC CONTEXTUAL ROLE**
- SPECIFIC CONTEXTUAL ROLE ID: ID (PK)
- PARTY ROLE ID: ID (FK)(UID)
- ENTITY ID: ID (FK)(UID)
- FROM DATE: DATE (UID)
- THRU DATE: DATE

**PARTY ROLE**
- PARTY ROLE ID: ID (PK)
- PARTY ID: ID (FK)(UID)
- ROLE TYPE ID: ID (FK)(UID)
- FROM DATE: DATE (UID)
- THRU DATE: DATE

**GENERALIZED CONTEXTUAL ROLE**
- GENERALIZED CONTEXTUAL ROLE ID: ID (PK)
- PARTY ID: ID (FK)(UID)
- ROLE TYPE ID: ID (FK)(UID)
- ENTITY ID: ID (FK)(UID)
- FROM DATE: DATE (UID)
- THRU DATE: DATE

**DECLARATIVE ROLE 1**
- Playing the role within the context of

**DECLARATIVE ROLE 2**
- Playing the role within the context of

**PARTY**
- PARTY ID: ID (PK)

**PERSON**
- LAST NAME: CHAR
- FIRST NAME: CHAR

**ORGANIZATION**
- NAME: CHAR

**ROLE TYPE**
- ROLE TYPE ID: ID (PK)
- PARENT ROLE TYPE ID: ID (FK)
Specific and Generalized (Hybrid) Contextual Roles Pattern Example

SALES ORDER
- SALES ORDER ID: ID (PK)
- PARTY ROLE ID: ID (FK)
- SALES ORDER DATE: DATE

for

PLACING CUSTOMER
- PLACING CUSTOMER ID: ID (PK)
- PARTY ROLE ID: ID (FK)
- SALES ORDER ID: ID (FK)
- FROM DATE: DATE
- THRU DATE: DATE

placed by

PARTY ROLE
- PARTY ROLE ID: ID (PK)
- PARTY ID: ID (FK)
- ROLE TYPE ID: ID (FK)
- FROM DATE: DATE
- THRU DATE: DATE

played by

CUSTOMER
- CREDIT LIMIT: MONEY

with a requested bill to

BILL TO CUSTOMER
- BILL TO CUSTOMER ID: ID (PK)
- PARTY ROLE ID: ID (FK)
- SALES ORDER ID: ID (FK)
- FROM DATE: DATE
- THRU DATE: DATE

sold by

SALES PERSON
- COMMISSION PERCENT NUMBER

involved in

PARTY ROLE
- PARTY ID: ID (PK)
- ROLE TYPE ID: ID (FK)
- SALES ORDER ID: ID (FK)
- FROM DATE: DATE
- THRU DATE: DATE

played by

ROLE TYPE
- ROLE TYPE ID: ID (PK)
- PARENT ROLE TYPE ID: ID (FK)
- NAME: CHAR

further broken down into

ORGANIZATION
- ID: CHAR
- NAME: CHAR
- FIRST NAME: CHAR
- LAST NAME: CHAR

described by

PERSON
- ID: CHAR
- NAME: CHAR
- FIRST NAME: CHAR
- LAST NAME: CHAR

described by
Customers place orders with CCI and it is critical to track the various people and organizations involved in the order process. Specifically, it is important to track:

- the person that placed the order
- the organization (or person) to whom the order will be delivered. The current policy is to only allow an order to be delivered to one person or organization, however, this may change in the future as CCI is considering the idea of allowing different parts of the order to be delivered to different parties,
- the salespeople involved in the order (and the percentage of the order that each salesperson is credited with)
- who is responsible for paying for the order
- the person that enters the order in their order entry system
- they are considering implementing additional processes that may include additional people involved in the order entry process such as a person that reviews the orders for accuracy, a customer service person that is designated to make sure that the fulfillment of the order happens smoothly and possible other new processes that are not yet defined.

HOW WOULD YOU DEVELOP A DATA MODEL FOR THE ABOVE SCENARIO THAT WILL BE USED FOR THE CCI ENTERPRISE DATA MODEL WHICH WILL BE A COMMON, STANDARD WAY OF MODELING THIS FOR ALL TYPES OF APPLICATIONS THROUGHOUT CCI.
Status Pattern

The States of Data.
Level 1 Status Pattern

ENTITY
- ENTITY ID
- o EVENT 1 DATETIME
- o EVENT 2 DATETIME
- o EVENT 3 DATETIME
- o EVENT INDICATOR
- o EVENT FROM DATE
- o EVENT THRU DATE

ORDER
- ORDER ID
- o ORDER DESCRIPTION
- o ORDER RECEIVED DATETIME
- o ORDER ENTRY DATETIME
- o ORDER CONFIRMATION DATETIME
- o ORDER CANCELLED DATETIME
- o ORDER OPENED FROM DATE
- o ORDER CLOSED THRU DATE
<table>
<thead>
<tr>
<th>Order Id</th>
<th>Order Description</th>
<th>Order Received Datetime</th>
<th>Order Entry Datetime</th>
<th>Order Confirmation Datetime</th>
<th>Order Cancelled Datetime</th>
<th>Order Opened From Date</th>
<th>Order Closed Thru Date</th>
</tr>
</thead>
</table>
Level 2 Status Pattern

STATUS TYPE
- STATUS TYPE ID ID (PK)
- * NAME CHAR

a status for

ENTITY
- ENTITY ID ID (PK)
- STATUS TYPE ID ID (FK)
- STATUS DATETIME DATETIME

in the state of

STATUS TYPE
- STATUS TYPE ID ID (PK)
- * NAME CHAR

ORDER STATUS TYPE
- ORDER ID ID (PK)
- STATUS TYPE ID ID (FK)
- STATUS DATETIME DATETIME
- ORDER DESCRIPTION DESC

a status for

in the state of

ENTITY
- ENTITY ID ID (PK)
- STATUS TYPE ID ID (FK)
- STATUS DATETIME DATETIME

in the state of
## Level 2 Status Pattern

<table>
<thead>
<tr>
<th>Status Type Id</th>
<th>Name</th>
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</thead>
<tbody>
<tr>
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<tr>
<td>2</td>
<td>Order Entered</td>
</tr>
<tr>
<td>3</td>
<td>Order Confirmed</td>
</tr>
<tr>
<td>4</td>
<td>Order Cancelled</td>
</tr>
<tr>
<td>5</td>
<td>Order Opened</td>
</tr>
<tr>
<td>6</td>
<td>Order Closed</td>
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</tbody>
</table>

### Status Type

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>STATUS TYPE ID</td>
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<td>4</td>
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<tr>
<td>5</td>
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<tr>
<td>6</td>
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</table>

### ORDER STATUS TYPE

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>ORDER ID</td>
</tr>
<tr>
<td>STATUS TYPE ID</td>
</tr>
<tr>
<td>STATUS DATETIME</td>
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<tr>
<td>ORDER DESCRIPTION</td>
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### ORDER

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<th>ORDER ID</th>
<th>Order Description</th>
<th>Status Type Id (Name)</th>
<th>Status Datetime</th>
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</thead>
<tbody>
<tr>
<td>001</td>
<td>Matrix disc order</td>
<td>1 (Order Received)</td>
<td>1/1/2009</td>
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<tr>
<td>001</td>
<td>Matrix disc order</td>
<td>2 (Order Entered)</td>
<td>1/2/2009</td>
</tr>
<tr>
<td>001</td>
<td>Matrix disc order</td>
<td>3 (Order Confirmed)</td>
<td>1/5/2009</td>
</tr>
<tr>
<td>001</td>
<td>Matrix disc order</td>
<td>5 (Order Opened)</td>
<td>1/1/2009</td>
</tr>
<tr>
<td>001</td>
<td>Matrix disc order</td>
<td>6 (Order Closed)</td>
<td>1/5/2009</td>
</tr>
</tbody>
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Level 3 Status Pattern

STATUS TYPE
- STATUS TYPE ID
- * NAME
  - ID (PK)
  - CHAR

ENTITY STATUS
- ENTITY STATUS ID
- * ENTITY ID
  - ID (FK)(UID)
- * STATUS TYPE ID
  - ID (FK)(UID)
- STATUS DATETIME
  - DATETIME
- STATUS FROM DATE
  - DATE
- STATUS THRU DATE
  - DATE
- * FROM DATE
  - DATE(UID)
- THRU DATE
  - DATE

ORDER STATUS
- ORDER STATUS ID
- * ORDER ID
  - ID (FK)(UID)
- * STATUS TYPE ID
  - ID (FK)(UID)
- STATUS DATETIME
  - DATETIME
- STATUS FROM DATE
  - DATE
- STATUS THRU DATE
  - DATE
- * FROM DATE
  - DATE
- THRU DATE
  - DATE(UID)

ORDER
- ORDER ID
  - ID (PK)
- ORDER DATETIME
  - DATETIME
- ORDER DESCRIPTION
  - DESC
**Level 3 Status Pattern**

<table>
<thead>
<tr>
<th>Status Type Id</th>
<th>Name</th>
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<td>4</td>
<td>Order Cancelled</td>
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<td>6</td>
<td>Order Closed</td>
</tr>
<tr>
<td>7</td>
<td>Credit Hold</td>
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</table>

### Status Type

- **ID (PK)**
  - **NAME**

### Order Status

- **ORDER STATUS ID**
  - **ORDER ID** (FK)(UID)
  - **STATUS TYPE ID**
  - **STATUS DATETIME** DATE
  - **STATUS FROM DATE** DATE
  - **STATUS THRU DATE** DATE
  - **FROM DATE** DATE
  - **THRU DATE** DATE

### Order

- **ORDER ID**
  - **ORDER DATETIME** DATE
  - **ORDER DESCRIPTION** DESC
Level 4 Status Pattern
Something to think about – Status

• After the success of data modeling in the prototyping effort and in the enterprise data model, the CIO wants to make sure that data models are used effectively within applications, specifically their new customer order application that is being developed. CCI is specifically interested in modeling status information about their customers, orders and invoices.

• The status information they are seeking involves the status (including the status and date and time of the status) of orders (sales and purchase orders) throughout the life cycle of any order (e.g.. Some of the statuses are “entered”, “active”, “cancelled”, “backordered”, and “closed”) and also invoice statuses (e.g.. “entered”, “active”, “paid”, “overdue”, “written off”)

• The CEO would like also to know what is the status of some of his bigger customers in terms of risk. In other words, which of his big customers are on a solid financial footing, and which one’s look like they could go bust? If they go bust how will this effect CCI financially? Other business representatives want to know the statuses of customers regarding when they first became a customer and how active each customer is (statuses for this are “highly active”, “moderately active” and “inactive”).

• The CIO wants us to leverage what was achieved in the previous modeling effort and integrate it into this effort. Also the CIO knows that status types change all the time so he needs a flexible model. But any solution that we come up with has to be understood and signed off by the business representatives.

HOW WOULD YOU DEVELOP A DATA MODEL FOR THE ABOVE SCENARIO THAT WILL BE USED AS A COMMON, STANDARD WAY OF MODELING THIS FOR ALL TYPES OF APPLICATIONS THROUGHOUT CCI.
Classification Pattern

The classification of data.
Level 1 Classification
Patterns

<table>
<thead>
<tr>
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<tbody>
<tr>
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<tr>
<td>* ENTITY TYPE 1</td>
<td>CHAR</td>
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<td>CHAR</td>
</tr>
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PRODUCT

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<tr>
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<td>o REQUIRED DISK SPACE</td>
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# Level 1 Classification Patterns

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<th>Product Family</th>
<th>Product Line 1</th>
<th>Product Line 2</th>
<th>Disk Capacity</th>
<th>Color</th>
<th>Required Disk Space</th>
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<td>Hardware</td>
<td>Disk Drives</td>
<td>Home Use</td>
<td>Commercial Use</td>
<td>200 GB</td>
<td>Black</td>
<td></td>
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<tr>
<td>002</td>
<td>Standard Memory Card</td>
<td>Hardware</td>
<td>Computer Memory</td>
<td>Home Use</td>
<td>Home Business</td>
<td>1GB</td>
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<th>Product Family Id (Type Name)</th>
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<tbody>
<tr>
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<td>200 GB</td>
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<td>200 GB</td>
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<td>02 (Disk Drives)</td>
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<td>Standard Memory Card</td>
<td>1GB</td>
<td></td>
<td></td>
<td>02 (Hardware)</td>
<td>06 (Computer Memory)</td>
</tr>
</tbody>
</table>

**Product Type Id** | **Name**
--- | ---
02 | Hardware
04 | Accessory
06 | Software

**Product Family Id** | **Name**
--- | ---
02 | Disk Drives
04 | Carrying Case
06 | Computer Memory

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<th>Thru Date</th>
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<td>02 (Home Use)</td>
<td>1/2/2009</td>
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<tr>
<td>2</td>
<td>001</td>
<td>04 (Commercial Use)</td>
<td>1/4/2009</td>
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Level 3 Classification Pattern
Level 3 Classification Pattern

<table>
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<th>Product Category Id (Name)</th>
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<tbody>
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<td>001 (Save Disk 2000)</td>
<td>01 (Hardware)</td>
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<td>200</td>
<td>001 (Save Disk 2000)</td>
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<table>
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<tr>
<th>Product Id</th>
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<th>Disk Capacity</th>
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<tr>
<td>001</td>
<td>Save Disk 2000</td>
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<td>Black</td>
<td>200 GB</td>
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<tr>
<td>002</td>
<td>Standard Memory Card</td>
<td>1GB</td>
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<td></td>
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PRODUCT CATEGORY CLASSIFICATION
PRODUCT CATEGORY CLASSIFICATION ID
* PRODUCT ID
* PRODUCT CATEGORY ID
* FROM DATE
  o THRU DATE

PRODUCT CATEGORY
PRODUCT CATEGORY ID
* PARENT PRODUCT CATEGORY ID
* PRODUCT CATEGORY TYPE ID
* FROM DATE
  o THRU DATE
* NAME

PRODUCT CATEGORY TYPE
PRODUCT CATEGORY TYPE ID
* PRODUCT NAME

<table>
<thead>
<tr>
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<th>Thru Date</th>
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Hybrid Classification Pattern
Something to think about- Classifications

- With the success of their order entry application, CCI decides to develop a new customer and product information application system and the below represent some of the key data requirements for this system.
- CCI needs to maintain classifications of their customers by size, industry, loyalty class (gold, silver, bronze) and many other classifications such as minority status, # of employees, etc.
- Each of the products that CCI may be classified by product family, product type, product line. Each of these classifications can have their own structures and hierarchies, in other words a product line may roll up into another product line.
- A new head of marketing has been employed and he has some new and interesting idea’s about products. He wants the flexibility to add different product lines and product types. He also wants to have the capability to add new ways to classify products over time such as by market segment or by product usage. He also has enough data modeling experience to make him dangerous, but not particularly useful!
- The Idea of a product family is set in stone at CCI. It is so integrated into all other systems that to change the structure of it would have a cascading effect on many other systems in CCI. It is a core concept that can’t be touched.
- The CIO needs a flexible model that allows the new marketing manager the flexibility to create any new classification, but a model that does not slaughter the holy cow of “Product Family”. The business now trusts IT to produce good data models and they have become more accustomed to seeing and understanding more generalized data models. But should you still produce a specific data model as well as a generalized data model?
- The CIO also wants to kill two birds with one stone. Master Data Management (MDM), has appeared on his radar. He asks you what the data model look like in terms of master data management and if we can use the same data model for master data management as for this new customer and product information application.
- The CIO wants this model integrated with everything else that we have modeled so far.

HOW WOULD YOU DEVELOP A DATA MODEL FOR THE ABOVE SCENARIO THAT CAN BE USED NOT ONLY FOR THE CUSTOMER AND PRODUCT INFORMATION APPLICATION BUT ALSO FOR THE MASTER DATA MANAGEMENT APPLICATION.
Conclusion

• What can we learn from the patterns approach?

• Different models for different purposes
  – Specific – understanding
  – Generalized – flexibility

• A model is never right or wrong, it is only useful or not useful

• The plug and play approach of patterns
Contact us anytime!

- Feel free to email Len Silverston or Paul Agnew at lsilverston@univdata.com, pagnew@univdata.com
- New vol. 3 book, published Jan 09
  The Data Model Resource Book, Volume 3: Universal Patterns in Data Modeling
- More about Universal Data Models offerings
  - Our webs site www.universaldatamodels.com
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