

Schema of Prototype

The input Relational database schema is:
(primary keys are underlined, foreign keys are prefixed with “*”)

PL_INFORMATION (PL_INFORMATION_SEQNO, ISSUE_DATE,
DATE_LAST_MODIFIED, LAST_MODIFIED_BY, PL_STATUS, PL_HEADER_RE-
MARKS, SHIPMENT_DATE, EXPECTED_ARRIVAL_DATE)

PL_LINE_INFORMATION (*PL_INFORMATION_SEQNO, PL_LINE_INFORMA-
TION_SEQNO, PACKAGE_TYPE, LENGTH_UNIT_OF_MEASURE,
HEIGHT_UNIT_OF_MEASURE, WEIGHT_UNIT_OF_MEASSAGE)

PL_LINE_DETAIL (*PL_INFORMATION_SEQNO, *PL_LINE_INFORMATION_SEQNO,
*ORDER_NUMBER, ITEM_NUMBER, TOTAL_PACKED_QTY, TO-
TAL_GROSS_WEIGHT, TOTAL_VOLUME, TOTAL_VOLUME_LENGTH, TOTAL_VOL-
UME_WIDTH, TOTAL_VOLUME_HEIGHT)

ORDER_INFORMATION (ORDER_NUMBER, BRAND, DIVISON, CUSTOMER_OR-
DER_NUMBER, CUSTOMER_NUMBER, ORDER_TYPE, MODEL_NUMBER, MOD-
EL_DESCRIPTION, ORDER_DATE, ORDERED_QTY, RICE+PRE_UNIT, DISCOUNT)

BULKORDER(*ORDER_NUMBER, CUSTOMER_NAME, SIZE_INDEX, ORDERED_QTY,
UNIT_PRICE)

TAILORMADEORDER(*ORDER_NUMBER, CUSTOMER_NAME, SIZE_INDEX, OR-
DERED_QTY , UNIT_PRICE)

The flattened XML document schema is:

```
<!ELEMENT db-casestudy (PL_INFORMATION, PL_LINE_INFORMATION, PL_LINE_DE-
TAIL, ORDER_INFORMATION, BULKORDER, TAILORMADEORDER)>
<!ELEMENT PL_INFORMATION EMPTY>
<!ATTLIST PL_INFORMATION
  t-pl_information.c-PL_INFORMATION_SEQNO ID #REQUIRED
  PL_INFORMATION_SEQNO CDATA #REQUIRED
  ISSUE_DATE CDATA #REQUIRED
  DATE_LAST_MODIFIED CDATA #REQUIRED
  LAST_MODIFIED_BY CDATA #REQUIRED
  PL_STATUS CDATA #REQUIRED
  PL_HEADER_REMARKS CDATA #REQUIRED
  SHIPMENT_DATE CDATA #REQUIRED
  EXPECTED_ARRIVAL_DATE CDATA #REQUIRED>
<!ELEMENT PL_LINE_INFORMATION EMPTY>
<!ATTLIST PL_LINE_INFORMATION
  t-pl_information.c-PL_INFORMATION_SEQNO IDREF IMPLIED
  t-pl_line_information.c-PL_INFORMATION_SEQNO.c-PL_LINE_INFORMA-
TION_SEQNO ID #REQUIRED
  PL_INFORMATION_SEQNO CDATA #REQUIRED
  PL_LINE_INFORMATION_SEQNO CDATA #REQUIRED
  PACKAGE_TYPE CDATA #REQUIRED
  LENGTH_UNIT_OF_MEASURE CDATA #REQUIRED
  WIDTH_UNIT_OF_MEASURE CDATA #REQUIRED
  HEIGHT_UNIT_OF_MEASURE CDATA #REQUIRED
  WEIGHT_UNIT_OF_MEASURE CDATA #REQUIRED>
<!ELEMENT PL_LINE_DETAIL EMPTY>
<!ATTLIST PL_LINE_DETAIL
  t-pl_line_information.c-PL_INFORMATION_SEQNO.c-PL_LINE_INFORMA-
TION_SEQNO IDREF IMPLIED
  t-order_information.c-ORDER_NUMBER IDREF IMPLIED
  PL_INFORMATION_SEQNO CDATA #REQUIRED
  PL_LINE_INFORMATION_SEQNO CDATA #REQUIRED
  ORDER_NUMBER CDATA #REQUIRED
  ITEM_NUMBER CDATA #REQUIRED
  TOTAL_GROSS_WEIGHT CDATA #REQUIRED
  TOTAL_VOLUME_WIDTH CDATA #REQUIRED
  TOTAL_VOLUME_HEIGHT CDATA #REQUIRED>
<!ELEMENT ORDER_INFORMATION EMPTY>
<!ATTLIST ORDER_INFORMATION
  t-order_information.c-ORDER_NUMBER ID #REQUIRED
  ORDER_NUMBER CDATA #REQUIRED
  BRAND CDATA #REQUIRED
  DIVISION CDATA #REQUIRED
  ORDER_TYPE CDATA #REQUIRED
  MODEL_NUMBER CDATA #REQUIRED
```

```
MODEL_DESCRIPTION CDATA #REQUIRED
ORDER_DATE CDATA #REQUIRED
ORDERED_QTY CDATA #REQUIRED
PRICE_PRE_UNIT CDATA #REQUIRED
DISCOUNT CDATA #REQUIRED>
<!ELEMENT BULKORDER EMPTY>
<!ATTLIST BULKORDER
  t-order_information.c-ORDER_NUMBER IDREF IMPLIED
  ORDER_INFORMATION_ID CDATA #REQUIRED
  CUSTOMER_NAME CDATA #REQUIRED
  SIZE_INDEX CDATA #REQUIRED
  ORDERED_QTY CDATA #REQUIRED
  UNIT_PRICE CDATA #REQUIRED>
<!ELEMENT TAILORMADEORDER EMPTY>
<!ATTLIST TAILORMADEORDER
  t-order_information.c-ORDER_NUMBER IDREF IMPLIED
  CUSTOMER_NAME CDATA #REQUIRED
  SIZE_INDEX CDATA #REQUIRED
  ORDERED_QTY CDATA #REQUIRED
  UNIT_PRICE CDATA #REQUIRED>
</ORDER>
```

The target XML database schema is:

```
<!ELEMENT db-casestudy (PL_INFORMATION, ORDER_INFORMATION)>
<!ELEMENT PL_INFORMATION (PL_LINE_INFORMATION*)>
<!ATTLIST PL_INFORMATION
  PL_INFORMATION_SEQNO CDATA #REQUIRED
  ISSUE_DATE CDATA #REQUIRED
  DATE_LAST_MODIFIED CDATA #REQUIRED
  LAST_MODIFIED_BY CDATA #REQUIRED
  PL_STATUS CDATA #REQUIRED
  PL_HEADER_REMARKS CDATA #REQUIRED
  SHIPMENT_DATE CDATA #REQUIRED
  EXPECTED_ARRIVAL_DATE CDATA #REQUIRED>
<!ELEMENT PL_LINE_INFORMATION (PL_LINE_DETAIL)>
<!ATTLIST PL_LINE_INFORMATION
  PL_INFORMATION_SEQNO CDATA #REQUIRED
  PL_LINE_INFORMATION_SEQNO CDATA #REQUIRED
  PACKAGE_TYPE CDATA #REQUIRED
  LENGTH_UNIT_OF_MEASURE CDATA #REQUIRED
  WIDTH_UNIT_OF_MEASURE CDATA #REQUIRED
  HEIGHT_UNIT_OF_MEASURE CDATA #REQUIRED
  WEIGHT_UNIT_OF_MEASURE CDATA #REQUIRED>
<!ELEMENT PL_LINE_DETAIL EMPTY>
<!ATTLIST PL_LINE_DETAIL
  idref1 IDREF IMPLIED
  PL_INFORMATION_SEQNO CDATA #REQUIRED
  PL_LINE_INFORMATION_SEQNO CDATA #REQUIRED
  ORDER_NUMBER CDATA #REQUIRED
  ITEM_NUMBER CDATA #REQUIRED
  TOTAL_GROSS_WEIGHT CDATA #REQUIRED
  TOTAL_VOLUME_WIDTH CDATA #REQUIRED
  TOTAL_VOLUME_HEIGHT CDATA #REQUIRED>
<!ELEMENT ORDER_INFORMATION (BULKORDER, TAILORMADEORDER)>
<!ATTLIST ORDER_INFORMATION
  id1 ID #REQUIRED
  ORDER_NUMBER CDATA #REQUIRED
  BRAND CDATA #REQUIRED
  DIVISION CDATA #REQUIRED
  ORDER_TYPE CDATA #REQUIRED
  MODEL_NUMBER CDATA #REQUIRED
  MODEL_DESCRIPTION CDATA #REQUIRED
  ORDER_DATE CDATA #REQUIRED
  ORDERED_QTY CDATA #REQUIRED
  PRICE_PRE_UNIT CDATA #REQUIRED
  DISCOUNT CDATA #REQUIRED>
<!ELEMENT BULKORDER EMPTY>
```

```
<!ATTLIST BULKORDER
  CUSTOMER_NAME CDATA #REQUIRED
  SIZE_INDEX CDATA #REQUIRED
  ORDERED_QTY CDATA #REQUIRED
  UNIT_PRICE CDATA #REQUIRED>
```

```
<!ELEMENT TAILORMADEORDER EMPTY>
```

```
<!ATTLIST TAILORMADEORDER
  CUSTOMER_NAME CDATA #REQUIRED
  SIZE_INDEX CDATA #REQUIRED
  ORDERED_QTY CDATA #REQUIRED
  UNIT_PRICE CDATA #REQUIRED>
</ORDER>
```

The target Object-Oriented database schema is:

```
create class PL_INFORMATION;
CREATE class PL_LINE_DETAIL;
Create class ORDER_INFORMATION;

create class PL_LINE_INFORMATION
(
    PL_INFORMATION_SEQNO varchar(20),
    PL_LINE_INFORMATION_SEQNO varchar(20),
    PACKAGE_TYPE varchar(20),
    LENGTH_UNIT_OF_MEASURE varchar(20),
    WIDTH_UNIT_OF_MEASURE varchar(20),
    HEIGHT_UNIT_OF_MEASURE varchar(20),
    WEIGHT_UNIT_OF_MEASURE varchar(20),
    PL_LINE_ass2 set of (PL_LINE_DETAIL),
    PL_LINE_ass PL_INFORMATION);

alter class PL_INFORMATION
Add attribute PL_INFORMATION_SEQNO varchar(20),
ISSUE_DATE varchar(20),
DATA_LAST_MODIFIED varchar(20),
LAST_MODIFIED_BY varchar(20),
PL_STATUS varchar(2),
PL_HEADER_REMARKS varchar(40),
SHIPMENT_TYPE varchar(20),
SHIPMENT_DATE varchar(20),
EXPECTED_ARRIVAL_DATE varchar(20),
PL_as set of (PL_LINE_INFORMATION);

alter class PL_LINE_DETAIL
Add attribute ORDER_NUMBER integer,
PL_INFORMATION_SEQNO varchar(20),
PL_LINE_INFORMATION_SEQNO varchar(20),
ORDER_NUMBER varchar(20),
ITEM_NUMBER varchar(20),
TOTAL_PACKED_QTY varchar(20),
TOTAL_GROSS_WEIGHT varchar(20),
TOTAL_VOLUME_LENGTH varchar(20),
TOTAL_VOLUME_WIDTH varchar(20),
TOTAL_VOLUME_HEIGHT varchar(20),
LINE_DETAIL_ass PL_LINE_INFORMATION,
LINE_DETAIL_ass2 ORDER_INFORMATION;

alter class ORDER_INFORMATION
Add attribute ORDER_NUMBER varchar(20),
BRAND varchar(20),
DIVISION varchar(20),
CUSTOMER_ORDER_NUMBER varchar(20),
CUSTOMER_NUMBER varchar(20),
ORDER_TPYE varchar(20),
MODEL_NUMBER varchar(20),
MODEL_DESCRIPTION varchar(40),
ORDER_DATE varchar(20),
ORDERED_QTY varchar(20),
PRICE_PRE_UNIT varchar(20),
DISCOUNT varchar(20),
ORDER_INFO_as set of (PL_LINE_DETAIL);

create class BulkOrder as subclass of ORDER_INFORMATION
(
    CUSTOMER_NAME varchar(20),
    SIZE_INDEX varchar(20),
    ORDERED_QTY varchar(20),
    UNIT_PRICE varchar(20));

create class TailorMadeOrder as subclass of ORDER_INFORMATION
(
    CUSTOMER_NAME varchar(20),
    SIZE_INDEX varchar(20),
    ORDERED_QTY varchar(20),
    UNIT_PRICE varchar(20));
```

The target Network database schema is:

```
database NDB1 {
  data file "NDB1.000" contains Network_DBMS;
  data file "NDB1.001" contains PL_INFORMA-
TION;
  data file "NDB1.002" contains PL_LINE_INFOR-
MATION;
  data file "NDB1.003" contains PL_LINE_DETAIL;
  data file "NDB1.004" contains ORDER_INFOR-
MATION;
  data file "NDB1.005" contains BULKORDER;
  data file "NDB1.006" contains TAILORMADEOR-
DER;
  key file "NDB1.k01" contains Pl_information_seq-
no;
  key file "NDB1.k02" contains A;
  key file "NDB1.k03" contains B;
  key file "NDB1.k04" contains C;
  key file "NDB1.k05" contains D;
  key file "NDB1.k06" contains E;

  record Network_DBMS { }
  record PL_INFORMATION {
char SHIPMENT_DATE[31];
char PL_STATUS[31];
char SHIPMENT_TYPE[31];
char ISSUE_DATE[31];
char DATE_LAST_MODIFIED[31];
char EXPECTED_ARRIVAL_DATE[31];
char LAST_MODIFIED_BY[31];
char PL_HEADER_REMARKS[31];
key char Pl_information_seqno[31];
  }
  record PL_LINE_INFORMATION {
char WIDTH_UNIT_OF_MEASURE[31];
char LENGTH_UNIT_OF_MEASURE[31];
char PACKAGE_TYPE[31];
char HEIGHT_UNIT_OF_MEASURE[31];
char PL_LINE_INFORMATOIN_SEQNO[31];
char WEIGHT_UNIT_OF_MESSAGE[31];
char PL_INFORMATOIN_SEQNO[31];
compound key A {
PL_INFORMATOIN_SEQNO;
PL_LINE_INFORMATOIN_SEQNO; }
}
  record PL_LINE_DETAIL {
char TOTAL_VOLUME_WIDTH[31];
char PL_LINE_INFORMATION_SEQNO[31];
char TOTAL_VOLUMEN_HEIGHT[31];
char TOTAL_PACKED_QTY[31];
char TOTAL_VOLUME_LENGTH[31];
char ITEM_NUMBER[31];
char ORDER_NUMBER[31];
char TOTAL_GROSS_WEIGHT[31];
char PL_INFORMATION_SEQNO[31];

  PL_INFORMATION_SEQNO;
  PL_LINE_INFORMATION_SEQNO;
  ORDER_NUMBER; }
}
  record ORDER_INFORMATION {
char PRICE_PRE_UNIT[31];
char DIVISION[31];
char ORDER_DATE[31];
char CUSTOMER_ORDER_NUMBER[31];
char ORDER_TPYE[31];
char MODEL_NUMBER[31];
char MODEL_DESCRIPTION[31];
char CUSTOMER_NUMBER[31];
char BRAND[31];
char DISCOUNT[31];
char ORDER_NUMBER[31];
char ORDERD_QTY[31];

  compound key C {
ORDER_NUMBER; }
}
  record BULKORDER {
char PRICE_PRE_UNIT[31];
char ORDER_DATE[31];
char CUSTOMER_NAME[31];
char UNIT_PRICE[31];
char CUSTOMER_ORDER_NUMBER[31];
char ORDER_TPYE[31];
char ORDER_NUMBER[31];
char SIZE_INDEX[31];
char ORDERED_QTY[31];
char DIVISION[31];
char MODEL_NUMBER[31];
char MODEL_DESCRIPTION[31];
char BRAND[31];
char CUSTOMER_NUMBER[31];
char DISCOUNT[31];
char ORDERD_QTY[31];

  compound key D {
ORDER_NUMBER; }
}
  record TAILORMADEORDER {
char PRICE_PRE_UNIT[31];
char ORDER_DATE[31];
char CUSTOMER_NAME[31];
char UNIT_PRICE[31];
char CUSTOMER_ORDER_NUMBER[31];
char ORDER_TPYE[31];
char ORDER_NUMBER[31];
char SIZE_INDEX[31];
char ORDERED_QTY[31];
char DIVISION[31];
char MODEL_NUMBER[31];
char MODEL_DESCRIPTION[31];
char BRAND[31];

  compound key B {
PL_INFORMATION_SEQNO;
PL_LINE_INFORMATION_SEQNO;
ORDER_NUMBER; }
}
}
```

```

char CUSTOMER_NUMBER[31];
char DISCOUNT[31];
char ORDERD_QTY[31];
compound key E {
ORDER_NUMBER; }
}
    set pl_information {
    order last;
owner Network_DBMS;
    member PL_INFORMATION;
    }
    set pl_line_information {
    order last;
owner PL_INFORMATION;
    member PL_LINE_INFORMATION;
    }
    set pl_line_detail1 {
    order last;
    owner PL_LINE_INFORMATION;
    member PL_LINE_DETAIL;
    }
}

```

```

set order_information {
order last;
owner Network_DBMS;
member ORDER_INFORMATION;
}
set pl_line_detail2 {
order last;
owner ORDER_INFORMATION;
member PL_LINE_DETAIL;
}
set BulkOrder {
order last;
owner ORDER_INFORMATION;
member BULKORDER;
}
set TailorMadeOrder {
order last;
owner ORDER_INFORMATION;
member TAILORMADEORDER;
} }

```