

## A simple database supporting an online book seller

### Tables about Books and Authors

```

CREATE TABLE Book (
  Isbn          INTEGER,
  Title         CHAR[120] NOT NULL,
  Synopsis      CHAR[500],
  ListPrice     CURRENCY NOT NULL,
  AmazonPrice   CURRENCY NOT NULL,
  SavingsInPrice CURRENCY NOT NULL, /* redundant */
  AveShipLag    INTEGER,
  AveCustRating REAL,
  SalesRank     INTEGER,
  CoverArt      FILE,
  Format         CHAR[4] NOT NULL,
  CopiesInStock INTEGER,
  PublisherName CHAR[120] NOT NULL, /* remove NOT NULL if unpublished ok */
  PublicationDate DATE NOT NULL,
  PublisherComment CHAR[500],
  PublicationCommentDate DATE,
  PRIMARY KEY (Isbn),
  FOREIGN KEY (PublisherName) REFERENCES Publisher,
  ON DELETE NO ACTION, ON UPDATE CASCADE,
  CHECK (Format = 'hard' OR Format = 'soft' OR Format = 'audi'
        OR Format = 'cd' OR Format = 'digital'),
  /* alternatively, CHECK (Format IN ('hard', 'soft', 'audi', 'cd', 'digital')) */
  CHECK (AmazonPrice + SavingsInPrice = ListPrice),
  FOREIGN KEY (Isbn) REFERENCES WrittenBy (Isbn), /* Isbn not PK of WrittenBy */
  CHECK (Isbn IN (SELECT Isbn FROM WrittenBy))
)

CREATE TABLE Author (
  AuthorName CHAR[120],
  AuthorBirthDate DATE,
  AuthorAddress ADDRESS,
  AuthorBiography FILE,
  PRIMARY KEY (AuthorName, AuthorBirthDate)
)

CREATE TABLE WrittenBy (/*Books are written by authors */
  Isbn INTEGER,
  AuthorName CHAR[120],
  AuthorBirthDate DATE,
  OrderOfAuthorship INTEGER NOT NULL,
  AuthorComment FILE,
  AuthorCommentDate DATE,
  PRIMARY KEY (Isbn, AuthorName, AuthorBirthDate),
  FOREIGN KEY (Isbn) REFERENCES Book,
  ON DELETE CASCADE, ON UPDATE CASCADE,
  FOREIGN KEY (AuthorName, AuthorBirthDate) REFERENCES Author,

```

```

)
    ON DELETE CASCADE, ON UPDATE CASCADE
)

```

```

CREATE TABLE Publisher (
    PublisherName CHAR[120],
    PublisherAddress ADDRESS,
    PRIMARY KEY (PublisherName),
    CHECK (PublisherName IN (SELECT PublisherName FROM Book))
)

```

```

/*

```

ensure participation constraint of Publisher in Book

```

CREATE ASSERTION PublisherBookConstraint
CHECK (NOT EXISTS (SELECT *
                    FROM Publisher P
                    WHERE P.PublisherName
                           NOT IN (SELECT B.PublisherName
                                    FROM Book B)))

```

ensure participation constraint of Books in WrittenBy

```

CREATE ASSERTION BookWrittenByConstraint
CHECK (NOT EXISTS
      (SELECT *
        FROM Book B
        WHERE B.Isbn NOT IN (SELECT W.Isbn FROM WrittenBy W)))

```

ensure participation constraint of Authors in WrittenBy

```

CREATE ASSERTION AuthorWrittenConstraint
CHECK (NOT EXISTS
      (SELECT *
        FROM Author A
        WHERE A.AuthorName, A.AuthorBirthDate
              NOT IN (SELECT W.AuthorName, W.AuthorBirthDate
                      FROM WrittenBy W)))

```

```

*/

```

### **Tables about Customers and Customer Service**

```

CREATE TABLE Customer (/* Customers identified by email address */
    CustEmailAddr CHAR[120],
    CustName CHAR[120] NOT NULL,
    CustPassword CHAR[20] NOT NULL,
    PRIMARY KEY (CustEmailAddr),
    CHECK (CustEmailAddr IN (SELECT CustEmailAddr FROM Account))
)

```

-- Customers can request notification about new books by an author

```
CREATE TABLE AlertTo (
  CustEmailAddress CHAR[120],
  DateOfAlertRequest DATE NOT NULL,
  AuthorName CHAR[120],
  AuthorBirthDate DATE,
  PRIMARY KEY (UserEmailAddr, AuthorName, AuthorBirthDate),
  FOREIGN KEY (AuthorName, AuthorBirthDate) REFERENCES Author
    ON DELETE CASCADE, ON UPDATE CASCADE,
  FOREIGN KEY (CustEmailAddr) REFERENCES Customer
    ON DELETE NO ACTION, ON UPDATE CASCADE
)
```

```
CREATE TABLE Account (/* Customers can have zero or more accounts */
  CustEmailAddr CHAR[120],
  CreditCardNumber INTEGER,
  ShippingAddr ADDRESS NOT NULL,
  DateOpened DATE NOT NULL,
  PRIMARY KEY (CustEmailAddr, CreditCardNumber),
  FOREIGN KEY (CustEmailAddr) REFERENCES Customer
    ON DELETE CASCADE, ON UPDATE CASCADE
)
```

/\*

ensure participation constraint of Customer in Accounts – every customer have at least one account

```
CREATE ASSERTION CustomerAccountConstraint
CHECK (NOT EXISTS (SELECT *
                   FROM Customer C
                   WHERE C.CustEmailAddr
                   NOT IN (SELECT A.CustEmailAddr FROM Account A)))
```

\*/

### **Tables about Purchases and Shipments**

-- Transaction (purchases) are made on a customer account

```
CREATE TABLE Transaction (
  TransNumber INTEGER,
  OrderDate DATE,
  PaymentClearanceDate DATE, /* if NULL, then payment has not cleared */
  CustEmailAddr CHAR[120] NOT NULL,
  CreditCardNo INTEGER NOT NULL,
  PRIMARY KEY (TransNum),
  FOREIGN KEY (CustEmailAddr, CreditCardNo) REFERENCES Account
    ON DELETE NO ACTION, ON UPDATE CASCADE,
  CHECK (TransNumber IN (SELECT TransNumber FROM Shipment))
)
```

```

CREATE TABLE Shipment (/* A record of purchases awaiting or when shipment */
  ShipId INTEGER,
  ShipCost CURRENCY,
  ShipDate DATE,          /* if this is NULL, then not shipped yet */
  TransNumber INTEGER NOT NULL,
  PRIMARY KEY (ShipId),
  FOREIGN KEY (TransNumber) REFERENCES Transaction
    ON DELETE CASCADE, ON UPDATE CASCADE
)

/*
ensure participation constraint on Transaction in Shipment (at least one shipment
per transaction
CREATE ASSERTION TransactionsShipmentConstraint
CHECK (NOT EXISTS (SELECT *
                    FROM Transaction T
                    WHERE T.TransNumber NOT IN (SELECT S.TransNumber
                                                FROM Shipment S)))
*/

CREATE TABLE BookShipment (/* A quantity of book associated with a shipment and
                             therefore transaction */
  Quantity    INTEGER,
  ShipId      INTEGER,
  Isbn        INTEGER,
  PRIMARY KEY (ShipId, Isbn),
  FOREIGN KEY (ShipId) REFERENCES Shipment
    ON DELETE CASCADE, ON UPDATE CASCADE,
  FOREIGN KEY (Isbn) REFERENCES Book
    ON DELETE NO ACTION, ON UPDATE CASCADE
)

```