Data Warehousing with Perl

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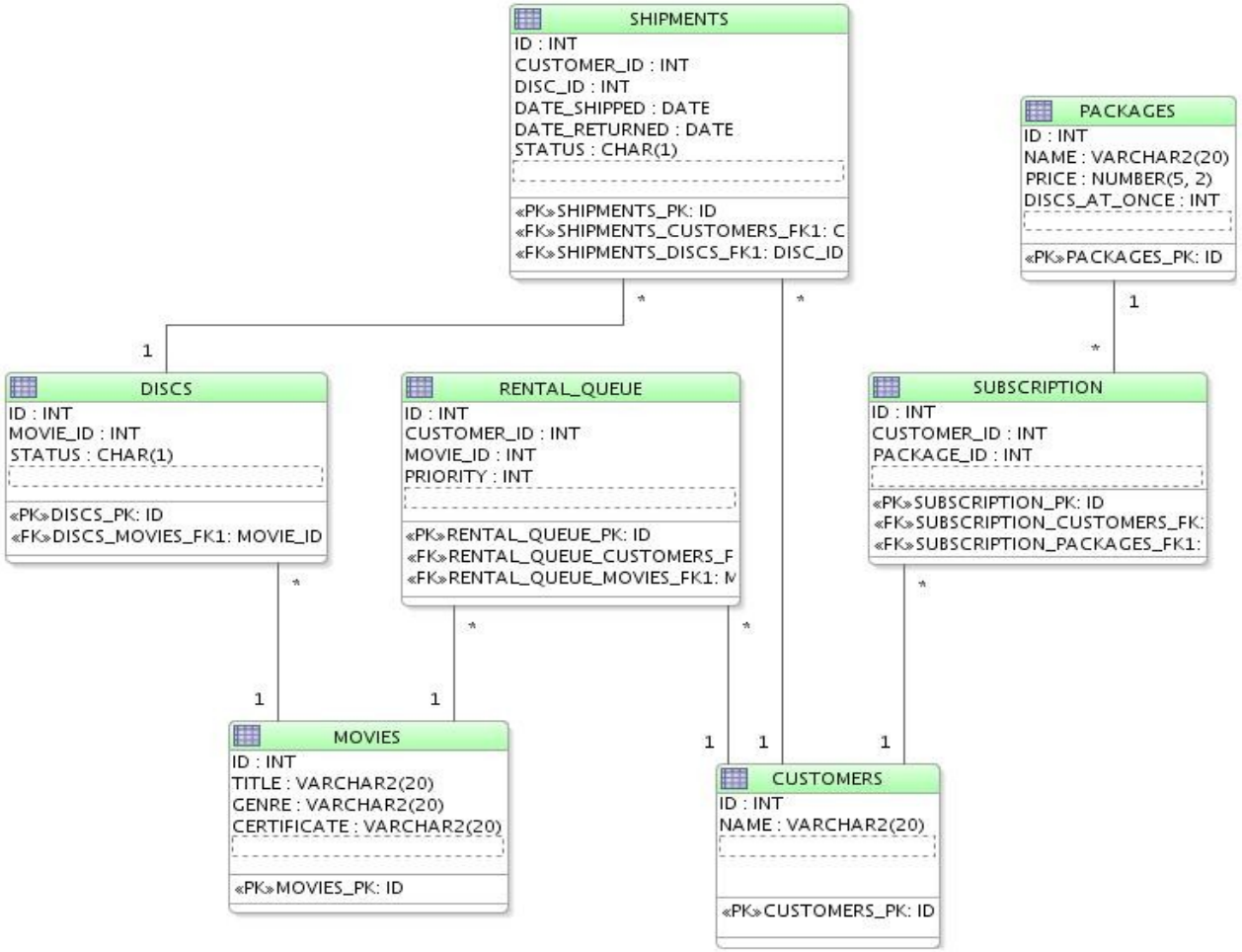
- **An example operational schema**
- **Some typical reporting questions**
- **Answering with the operational database**
- **Introduction to Star schemas**
- **ETL : Extract, Transform and Load**
- **Answering with the Reporting database**
- **Things I have learnt**

An example operational schema



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Typical reporting questions

- **How many customers have we got?**
- **How many discs have we shipped?**
- **How many customers did we have on this package last month?**
- **What's the 28day retention of this package?**
- **Which titles do we have too many discs for?**

Answering with the operational database

- **How many customers have we got?**
  - SELECT COUNT(*) FROM customers WHERE status ='Y'
- **How many discs have we shipped?**
  - SELECT COUNT(*) FROM dispatches WHERE date_shipped = NOW()
- **How many customers did we have on this package last month?**
  - Add transaction tables for package changes
- **What's the 28day retention of this package?**
  - Add transaction tables to customers
- **Which titles do we have too many discs for?**
  - Probably pull the data into Perl to manipulate

Alternative: Reporting schema

- **Take the operational data, and transform it**
- **Do this every night**
- **Time based series of data**
- **Much easier to report on**
- **Key aggregates already calculated**
- **Design the schema for ease of querying**
  - Use a Star schema

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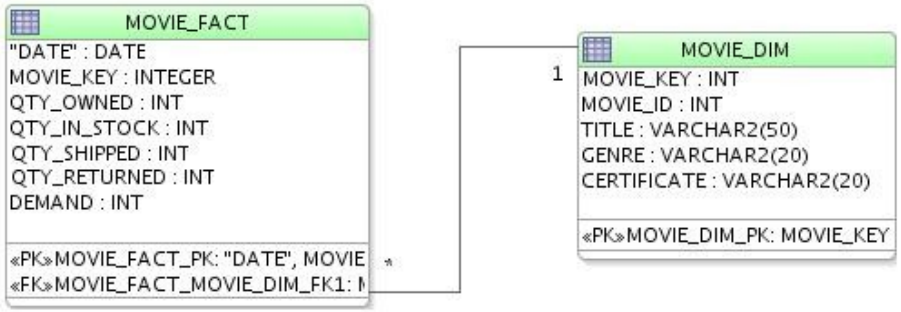
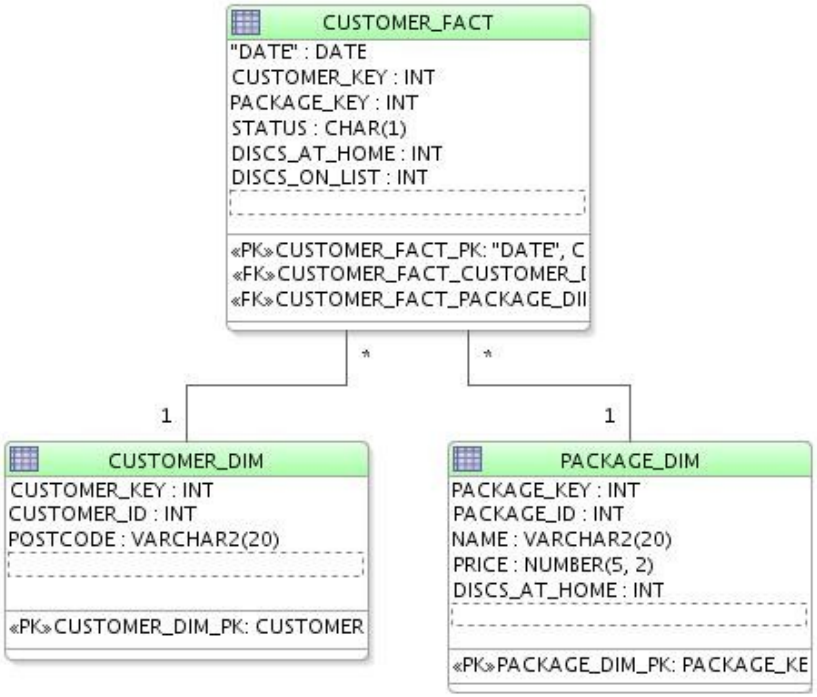
Introduction to Star schemas

- **Fact tables**
  - Contain measurements – how many of this title are on the shelf
  - Grain: eg one row per movie per day
- **Dimension tables**
  - Data element – for example, static information about a movie
  - Shared across fact tables
  - Can contain data from more than one operational table – title, genre, classification
- **Create surrogate keys for joins, not the operational PK/FK**
- **Don't snowflake**
- **Denormalise!**

Example schema for movies



Example schema for customers



Tracking changes in dimensions

- **Type 1: Just update the dimension**
  - Loses historic data
  - Good for true facts, like movie title
- **Type 2: Create a new dimension row**
  - Keeps history, more data
  - Source Primary Key is not unique in the dimension
  - Allows tracking of changes
  - For example, price of a package
- **There are other methods**
  - But I haven't used them

Extract, Transform and Load

- **Extract from source database**
  - For example, take a snapshot
- **Transform into data warehouse format**
- **Load into data warehouse**
  - Separate step, because this step will slow the Data Warehouse

Transform: an example

- **Update the movie_dim dimension and get a mapping from movie_id to movie_key**
  - DBIc: update_or_create for type 1, find_or_create() for type 2
- **Do calculations on source to get facts, indexed by movie_id**
- **Build movie_fact rows based on measures and keys**

Answering with the Reporting database

- **How many customers have we got?**

```
SELECT COUNT(*)
FROM customer_fact
WHERE status='ACTIVE'
AND date = NOW()
```

- **How many discs have we shipped?**

```
SELECT SUM(shipped)
FROM movie_fact
WHERE date=NOW()
```

Reporting: customer numbers

- **How many customers did we have on this package last month?**

```
SELECT COUNT(*) FROM customer_fact
JOIN package_dim USING (package_key)
WHERE customer_fact.date = '2009-06-01'
AND package_dim.package_id = 23
```

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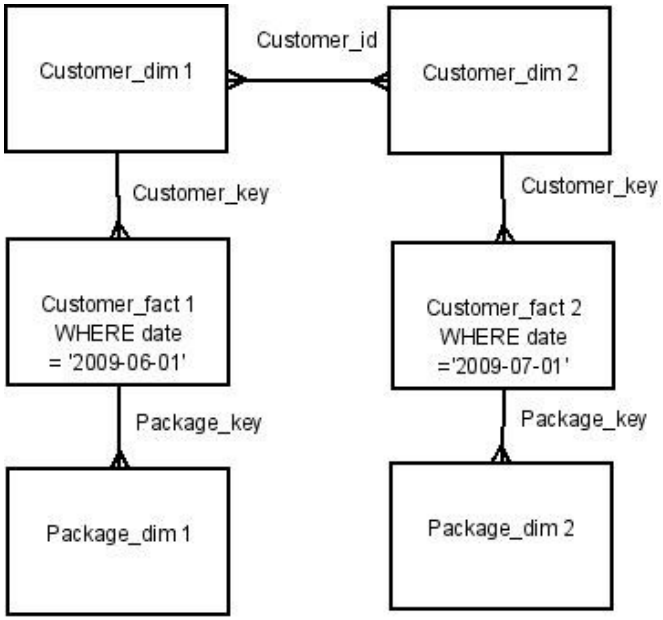
Reporting: retention

- **What's the 28day retention of this package?**

```
SELECT c2.STATUS, COUNT(*)
FROM customer_fact cf1
JOIN package_dim p ON p.package_key = cf1.package_key
JOIN customer_dim cd1 ON cf1.customer_key = cd1.customer_key
JOIN customer_dim2 cd2 ON cd2.customer_id = cd1.customer_id
JOIN customer_fact cf2 ON cd2.customer_key = cf2.customer_key
WHERE cf1.date = NOW() - INTERVAL 28 day
AND cf2.date = NOW()
 AND p.package_id = ?
```



Reporting: disc usage

- **Which titles do we have too many discs for?**

```
SELECT movie_id, COUNT(*) AS num_days
FROM movie_fact
JOIN movie_dimension USING (movie_key)
WHERE discs_in_stock > 10
AND date BETWEEN '2009-02-01' AND '200902-28'
HAVING num_days > 27
```

  - Scans 1 row per movie per day, rather than all shipments and returns that might cross that time period

Things I have learnt

- **Uses masses of disk space**
  - Eg, 1 row per customer (active and cancelled) per day, for a month, can be 100 million rows. 100 bytes a row = 10Gb/month growth
- **Instrument the ETL, to track individual steps for when it slows down**
- **Ensure you can rebuild a failed build**
- **Try and split the process into idempotent steps**
  - This makes rerunning a failed build easier


Thank you
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