Business School
UNIVERSITY OF COLORADO DENVER

Information Systems Program

Module 4
Materialized View Processing and Design

Lesson 3: Query Rewriting Rules

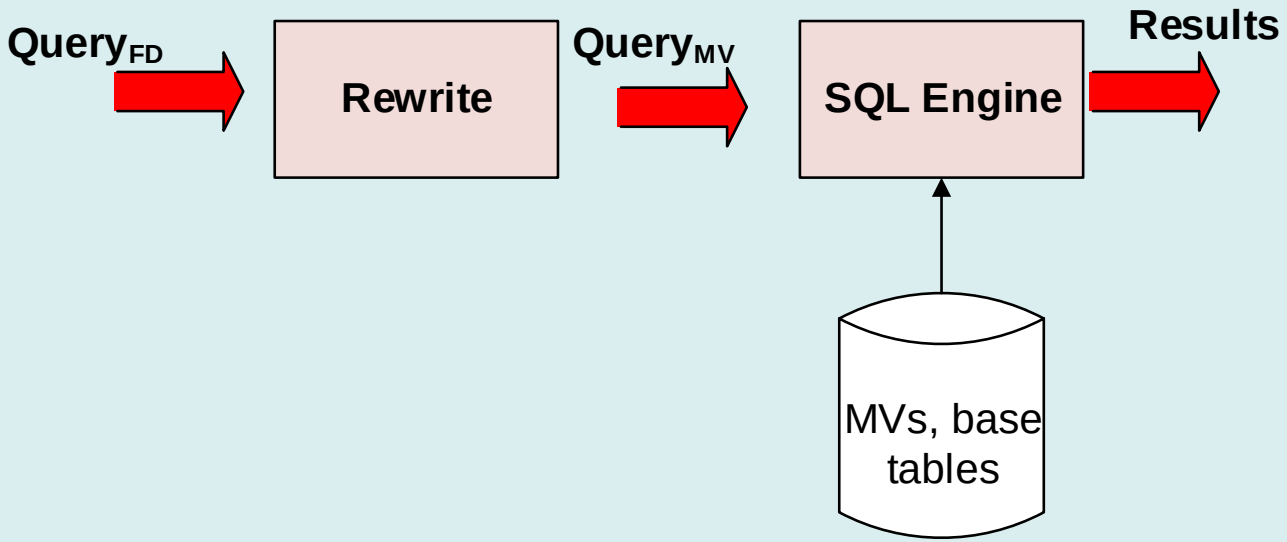
Lesson Objectives

- Explain query rewriting process
- Apply matching rules
- Reflect on complexity of query rewriting compared to query modification

Query Rewriting Overview

- Substitution process matching materialized view and query
- Replace fact and dimension tables in a query with a materialized view
- More complex than query modification process for traditional views
- Evaluate performance improvements over the original query

Query Rewriting Process



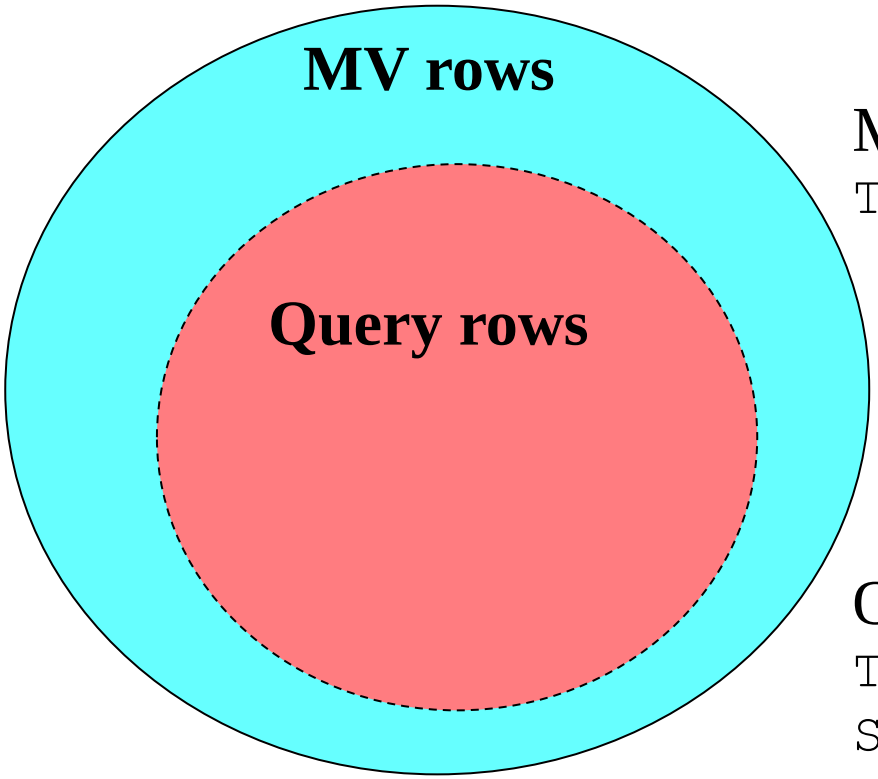
Query$_{FD}$: query that references fact and dimension tables

Query$_{MV}$: rewrite of Query$_{FD}$ such that materialized views are substituted for fact and dimension tables whenever justified by expected performance improvements.

Matching Rules

Row conditions	• MV rows contain query rows. • Query conditions at least as restrictive as MV conditions
Grouping columns	• MV grouping columns contain query grouping columns.
Grouping dependencies	• Query columns match or derivable by FDs on MV columns.
Aggregate functions	• Query aggregate functions match or derivable from MV aggregate functions.

Matching for Rows



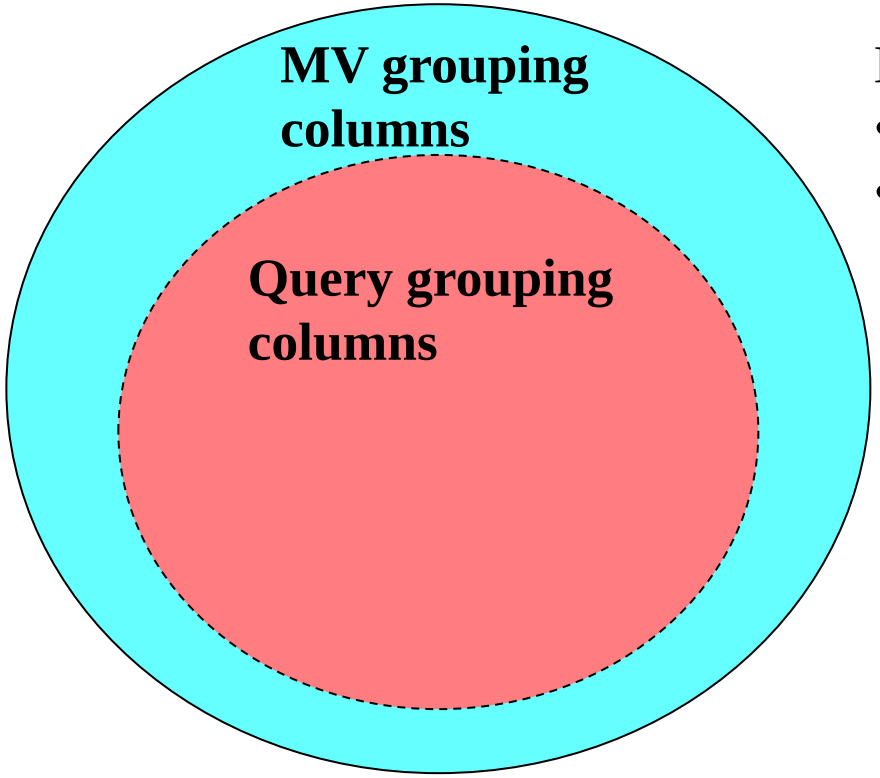
MV

```
TimeYear > 2018
```

Query

```
TimeYear = 2020 AND
StoreNation = 'USA'
```


Matching for Grouping Columns



MV grouping:
- TimeYear
- StoreCity

Query grouping:
- StoreCity

Combined Matching Example

Row conditions

MV → *Query*

TimeYear > 2018 AND StoreNation IN ('USA', 'Canada') → TimeYear = 2020 AND StoreNation = 'USA'

Grouping columns

MV → *Query*

StoreState, TimeYear → StoreState

Grouping dependencies

MV → *Query*

StoreId, TimeYear → StoreCity, TimeYear

Aggregate functions

MV → *Query*

SUM(DollarSales), COUNT(*) → AVG(DollarSales)

Summary

- Essential part of summary data management
- Matching rules for row conditions, grouping columns, grouping dependencies, and aggregate calculations
- Evaluation of rewritten queries by optimizing compiler