Survey Report on Real-time Data Warehouses

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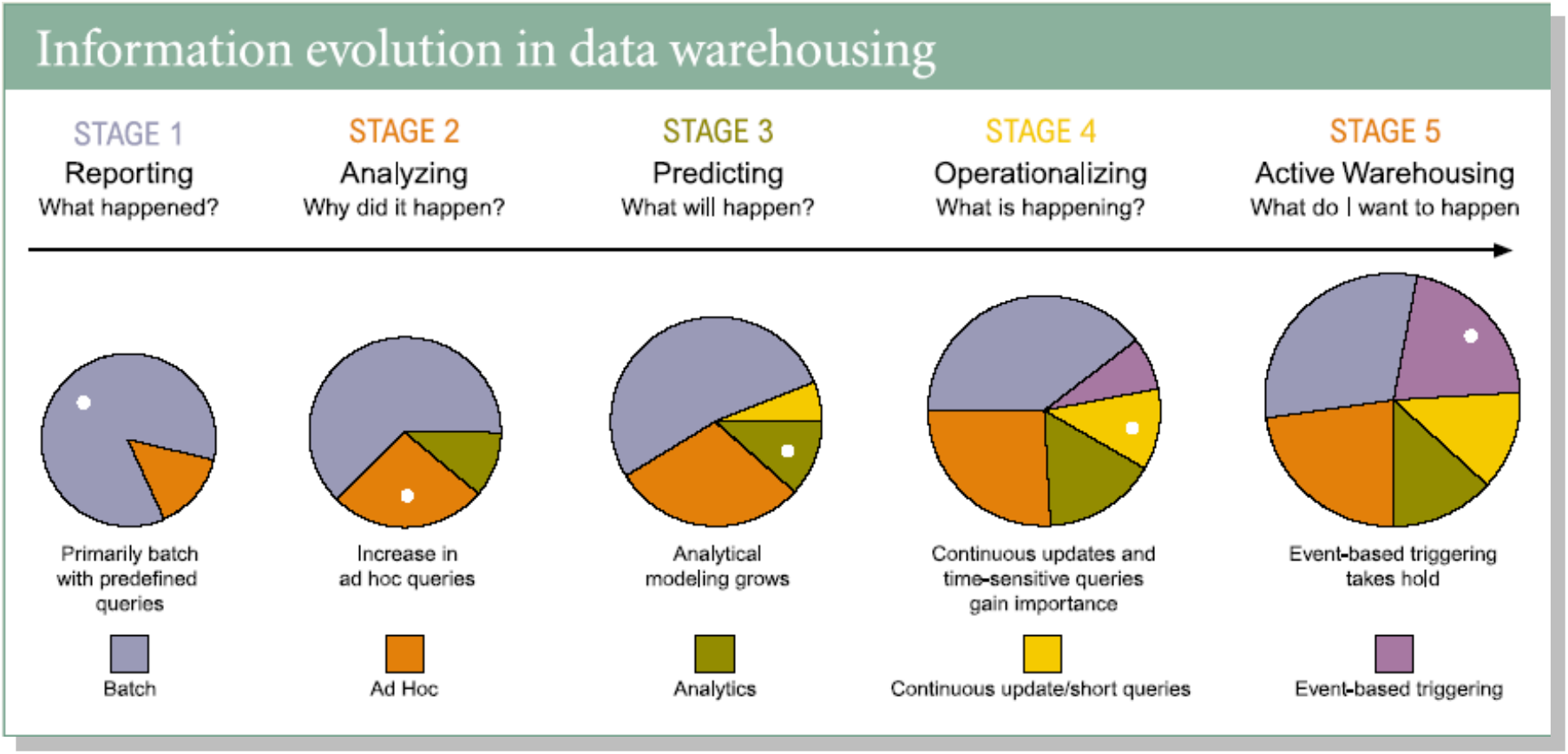
Oct 19, 2006

Outline

- **Project introduction**
- **Real-Time Data Warehousing: Challenges and Solutions**
- **Our Research Work**
- **Reference**

Project Background

1 Reporting → 2 Analysis → 3 Prediction → 4 Operationalize → 5 Activate



Project Objective

- **Scalable, Real-Time and Active MPP based Data Warehouse For Telecommunications Industry**
  - advance the Real-Time Active Data Warehouse (RTADW) technology on a scalable, parallel database system platform
  - demonstrate its applicability in tackling emerging business system challenges in the telecommunication industry.

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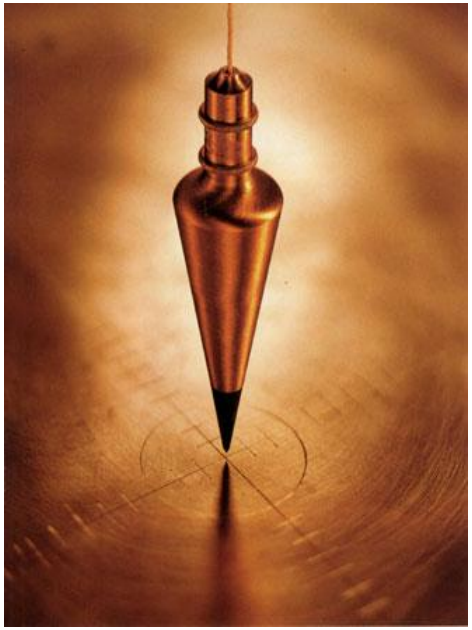
Real-Time Data Warehousing: Challenges and Solutions



1. – enabling real-time ETL
2. – modeling real-time fact tables
3. – OLAP queries vs. changing data
4. – scalability & query contention

Challenge 1：Enabling Real-time ETL

ETL in batch mode

– almost all ETL tools and systems, whether based on off-the-shelf products or custom-coded, operate in a batch mode.

– ETL process typically involves downtime of the data warehouse

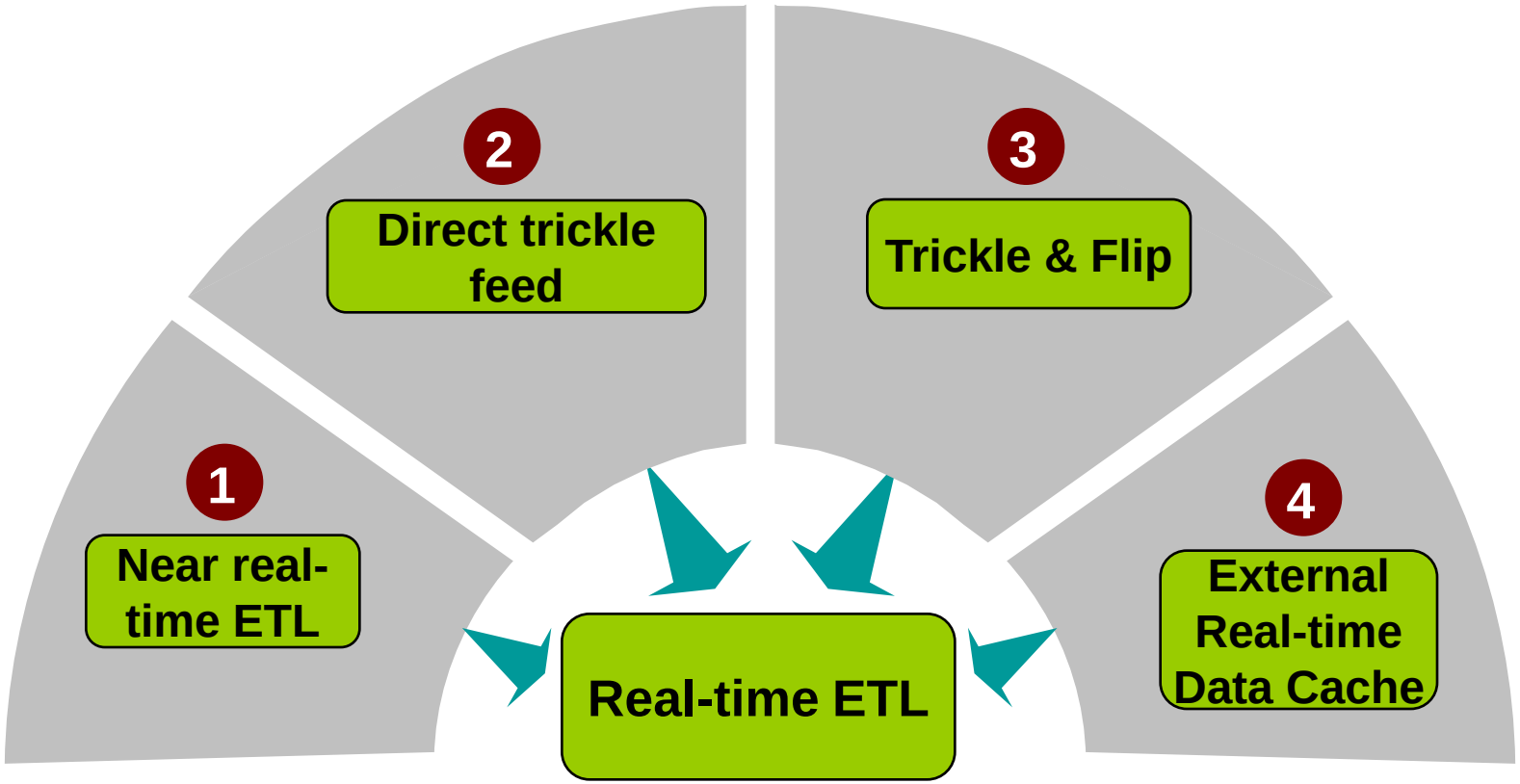
Problem Statement

Real-time ETL

– there can't be any system downtime

– The requirements for continuous updates with no warehouse downtime are generally inconsistent with traditional ETL tools and systems.

Challenge 1：Enabling Real-time ETL



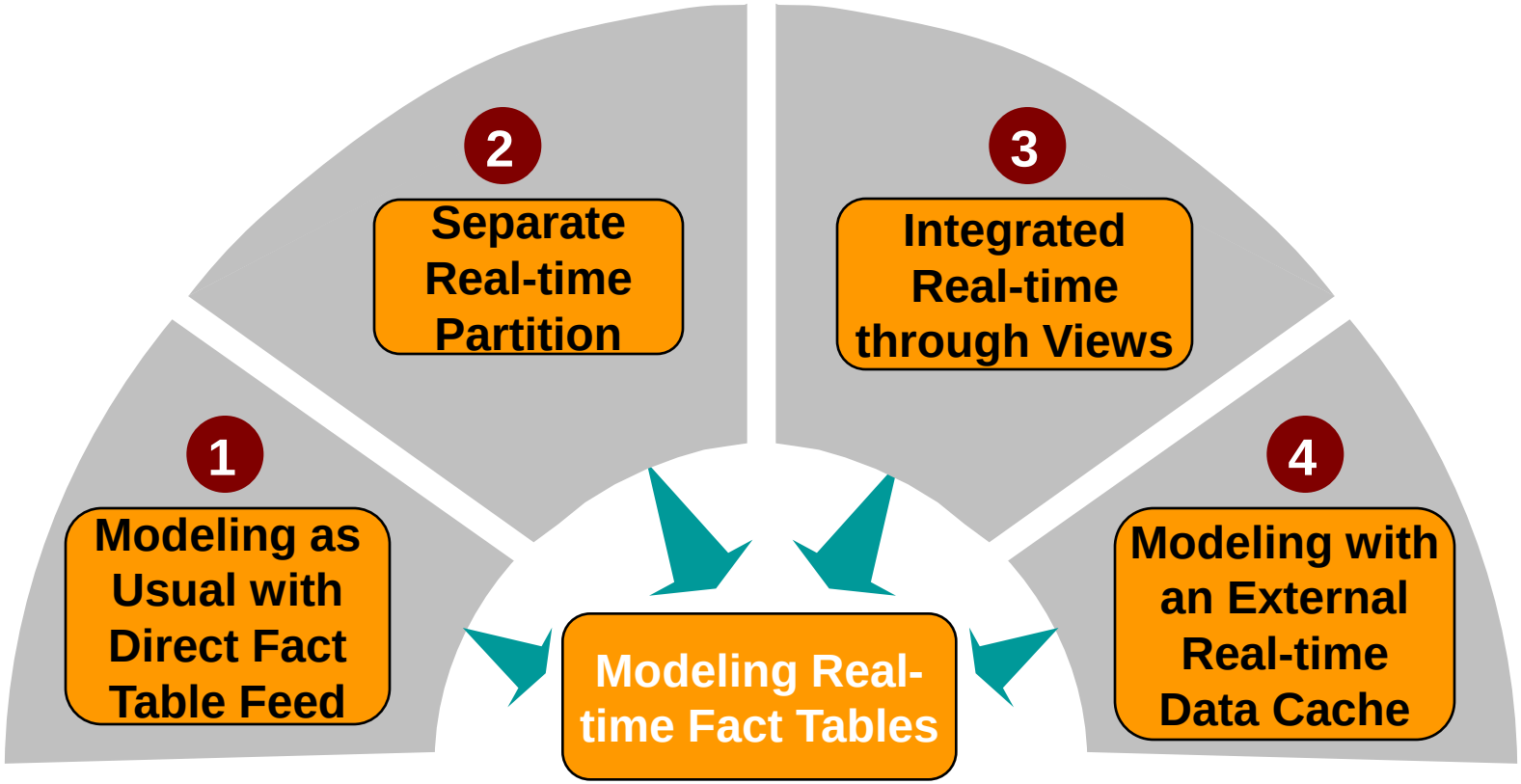
Challenge 2：Modeling Real-time Fact Tables

– where the real-time data is stored

– how best to link it into the rest of the data model

Problem Statement

Challenge 2：Modeling Real-time Fact Tables



Challenge 3:OLAP Queries vs. Changing Data

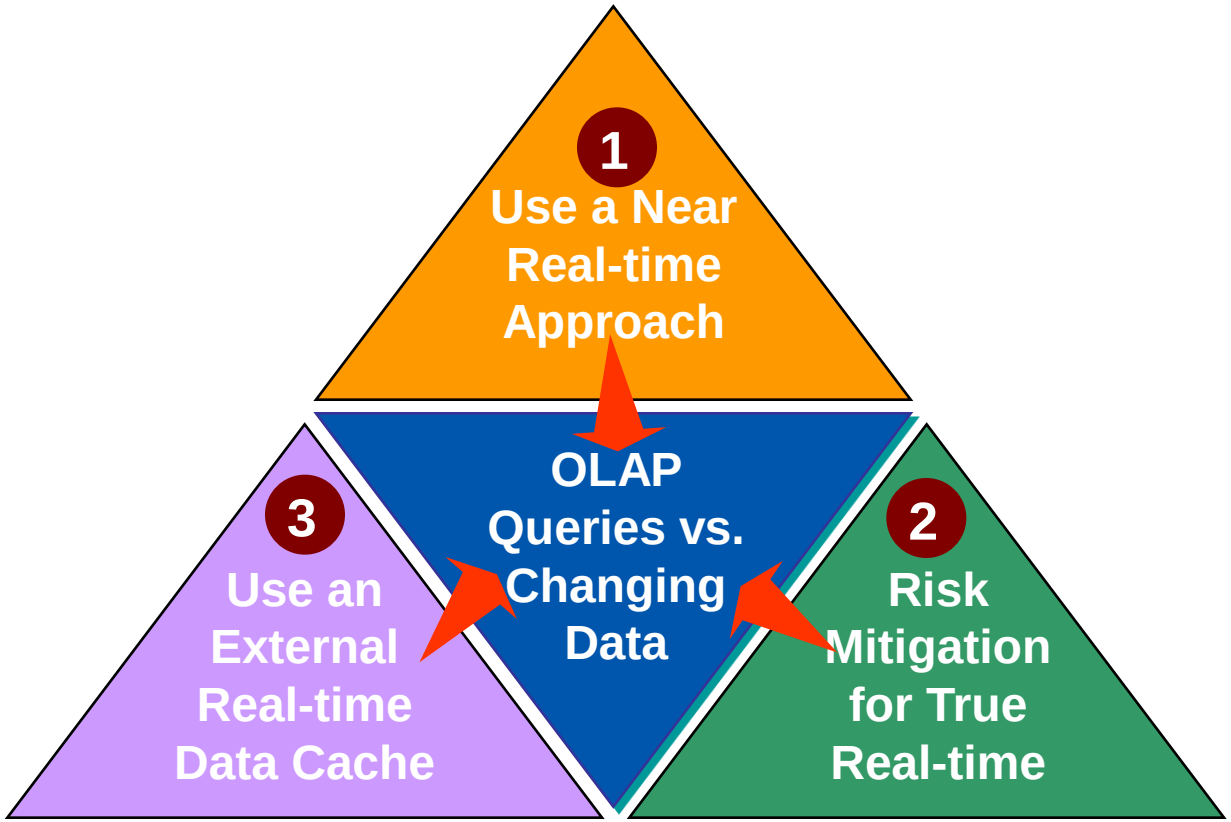
– OLAP and Query tools were designed to operate on top of unchanging, static historical data

– the results may be negatively influenced by data changes concurrent to query execution

– relational OLAP tools are particularly sensitive to this problem

Problem Statement

Challenge 3:OLAP Queries vs. Changing Data

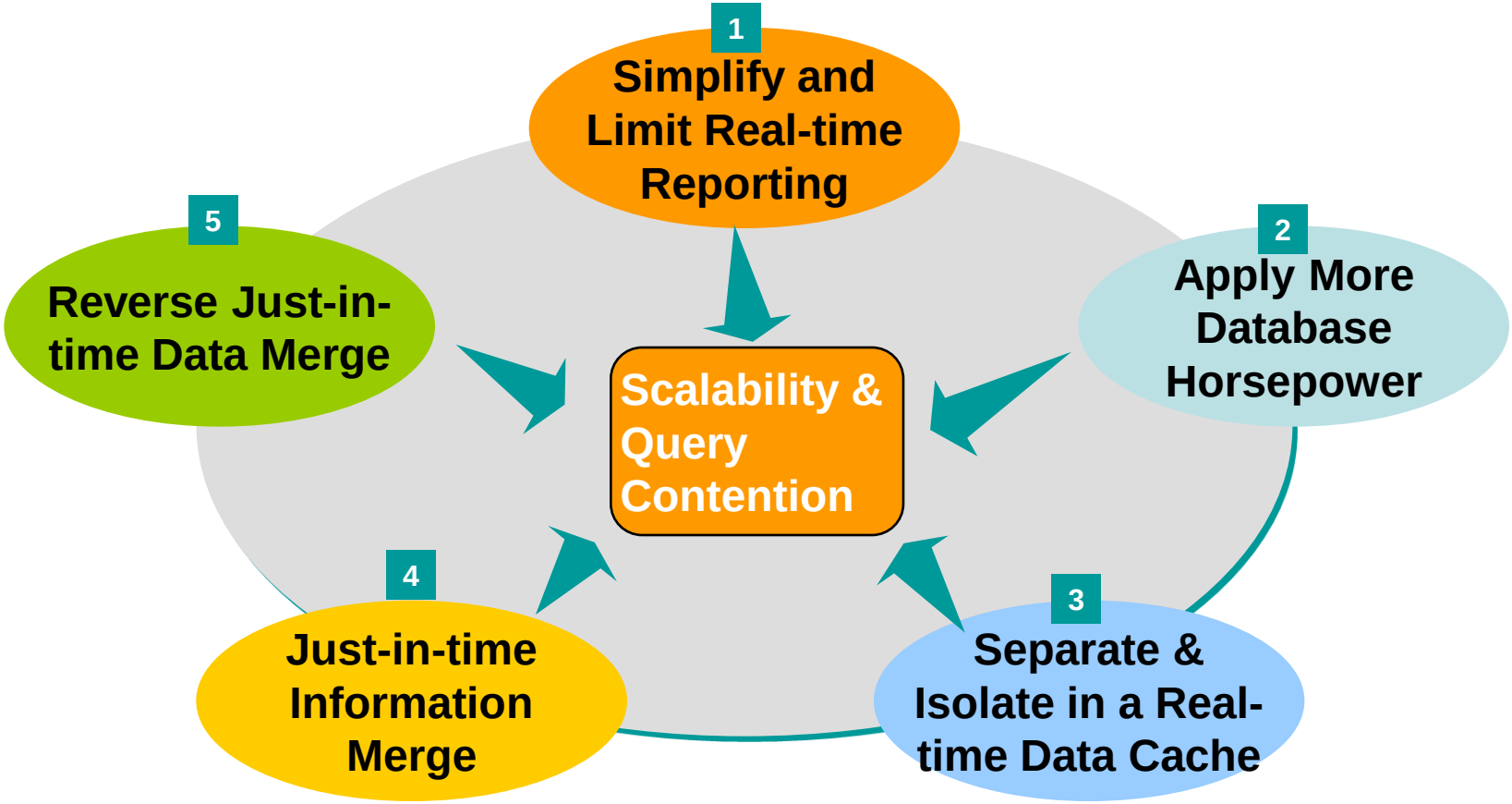


Challenge 4: Scalability & Query Contention

Problem Statement

1. the issue of query contention and scalability is the most difficult issue facing organizations deploying real-time data warehouse solutions.
1. in a real-time system, the additional burden of continuously loading and updating data further strains system resources.
1. the contention between complex selects and continuous inserts tends to severely limit scalability

Challenge 4: Scalability & Query Contention



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Introduction

- *OLAP and Query tools:*
  - designed to operate on top of unchanging, static historical data
  - assume that the underlying data is not changing
  - the results they produce may be negatively influenced by data changes concurrent to query execution

In some cases, this can lead to inconsistent and confusing query results, which is called *internal inconsistency of report*.

Introduction

```
0:00    create table TEMP1(
        Category_Id LONG, DOLLARSALES DOUBLE)
0:01    insert into TEMP1
        select all.[Category_Id] AS Category_Id,
          sum (all.[Tot_Dollar_Sales]) AS DOLLARSALES
         from [YR_CATEGORY_SLS] all
         group by  all.[Category_Id]
0:05    create table TEMP2 (ALLPRODUCTSD DOUBLE)
0:06    insert into TEMP2
        select sum((all.[Tot_Dollar_Sales]) AS
        ALLPRODUCTSD
        from [YR_CATEGORY_SLS] all
```

```
0:08    select distinct pa1.[Category_Id] AS Category_Id,
            all.[Category_Desc] AS Category_Desc,
            all.[DOLLARSALES] AS DOLLARSALES,

(pa1.[DOLLARSALES]/pa2.[ALLPRODUCTSD])
        AS DOLLARSALESC
        from    [TEMP1] pa1,
                [TEMP2] pa2,
                [LU_CATEGORY] all
        where
pa1.[Category_Id]=all.[Category_Id]
0:09    drop table TEMP1
0:10    drop table TEMP2
```

Table 1: A multi-pass SQL statement

The description of layer-based view approach

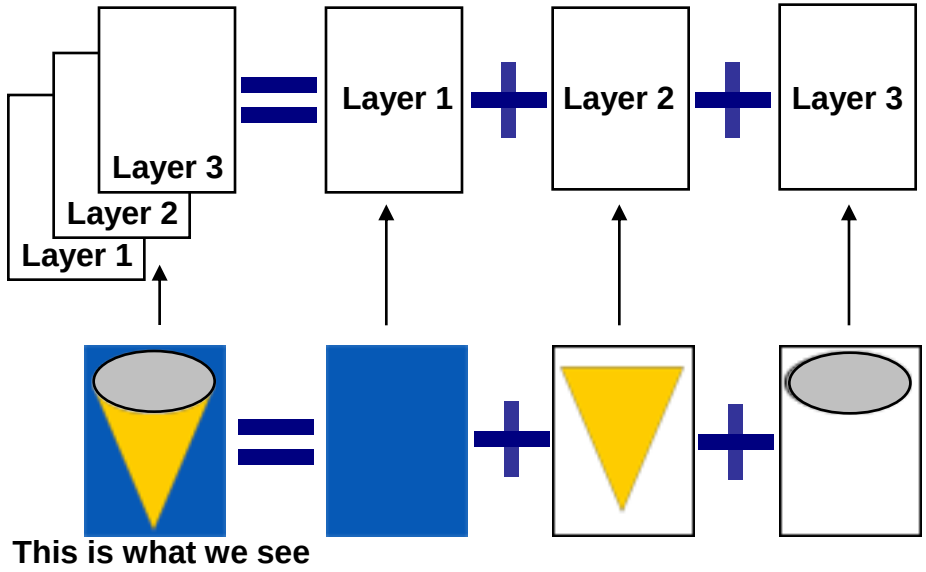

Figure *Layer technology used in painting software*

The description of layer-based view approach

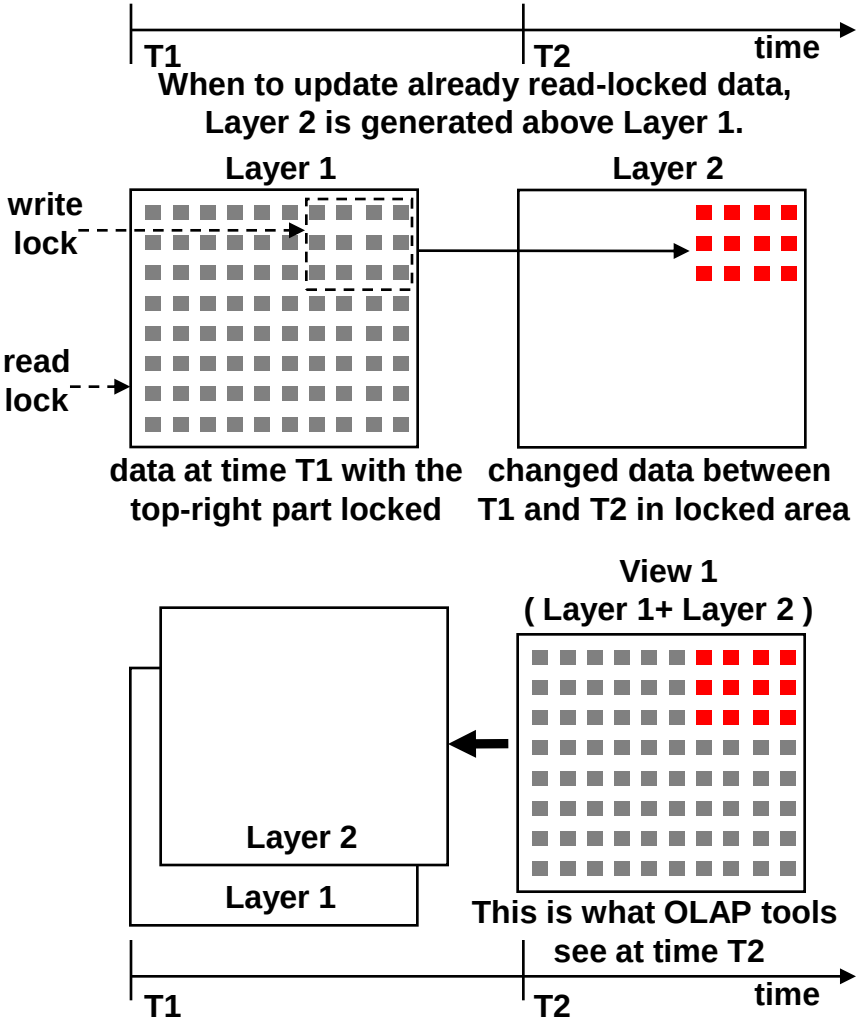

Figure *Layer technology used in this paper*

The architecture of real-time OLAP

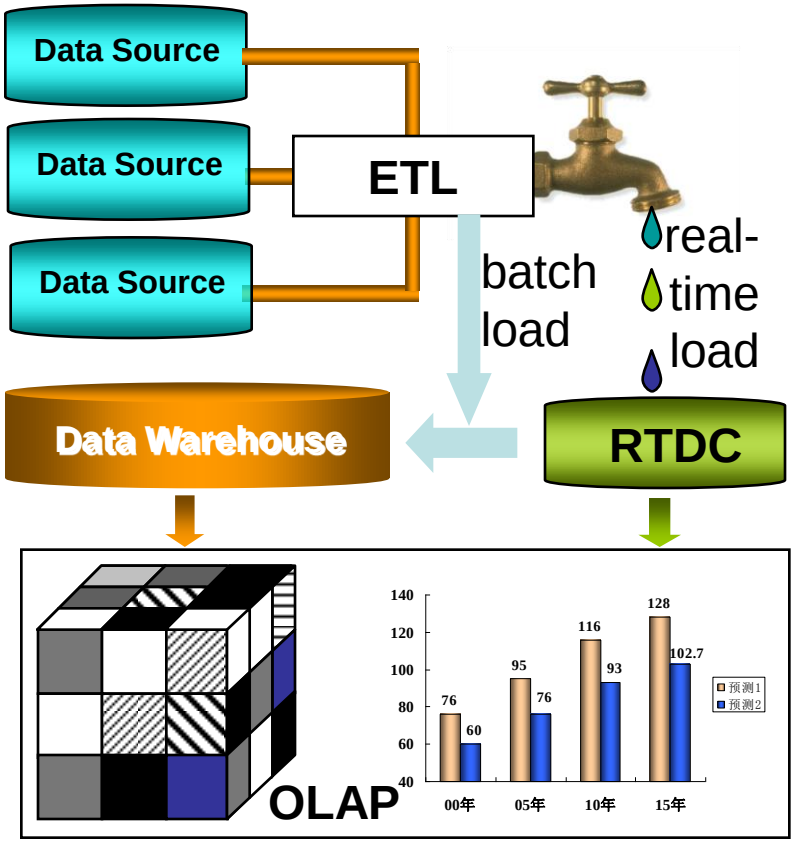

Figure *The architecture of real-time OLAP*

The architecture of real-time OLAP

- *Data modeling*
  - no special data modeling is required
  - generally modeled identically to the data warehouse
  - typically contains only the tables that are real-time.
- *Data integrating*
  - batch loading
  - change data capture
- *Data merging*
  - JIM (Just-in-time information merging)
  - RJIM (Reverse Just-in-time information merging)

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