Architectural Solutions in Data Integration

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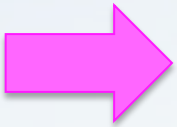
Thanks to Anton Deik for helping me preparing this lecture

Architectural Solutions in Data Integration



Part 1: Application-driven Integration Architectures

Part 2: Information Integration Architectures

Part 3: What Integration Criteria to Use

Keywords: Data Integration, Application-driven Integration, Data-driven Integration, Web Services, RPC, Publish & Subscribe, Consolidation, Data Warehouse, Data Integration, Service Oriented Architecture , Virtual Data Integration, Query complexity, heterogeneity

Different Solutions

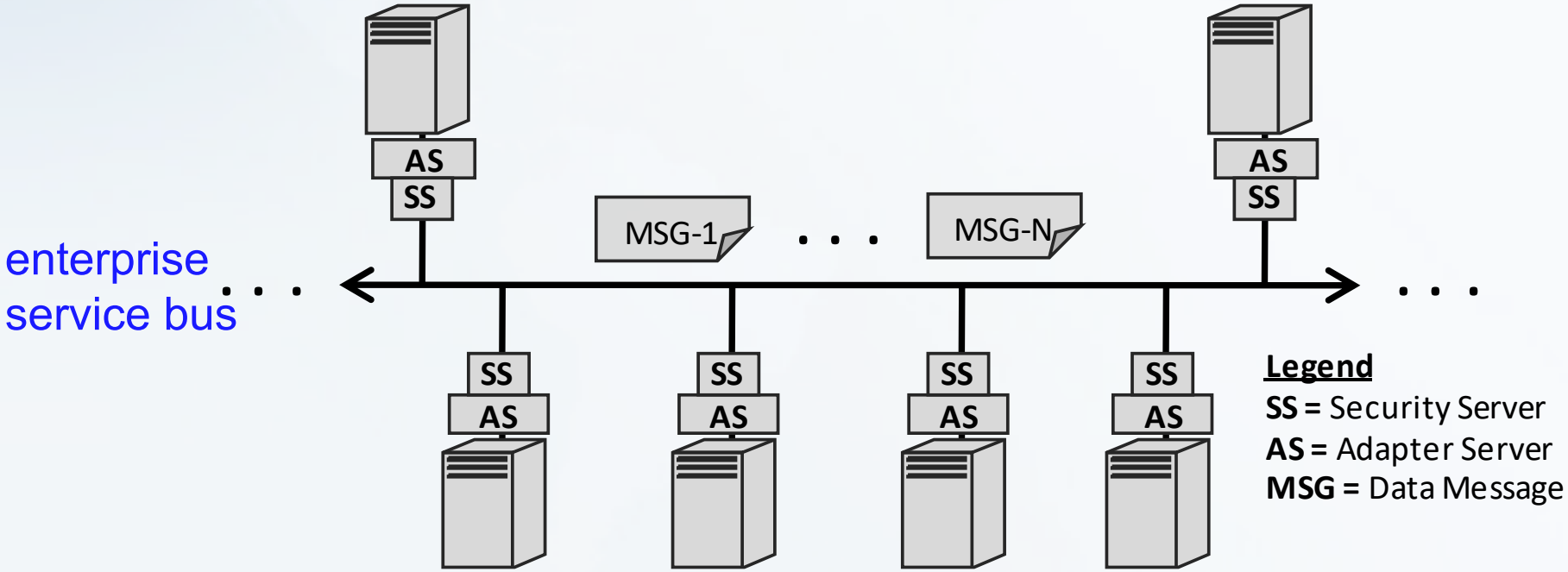
Two families of solutions for the integration issue:

- **Application-driven Integration**
  - Various types of middleware (e.g. Web Services, Remote Procedure Call (RPC), Publish & Subscribe) that achieve reconciliation through application to middleware communication

- **Data-driven Integration**
  - Various types of data reconciliation and integration
    - Consolidation
    - Data Fusion
    - Data Integration

Application-driven Integration

1- Service Oriented Architecture Scenario

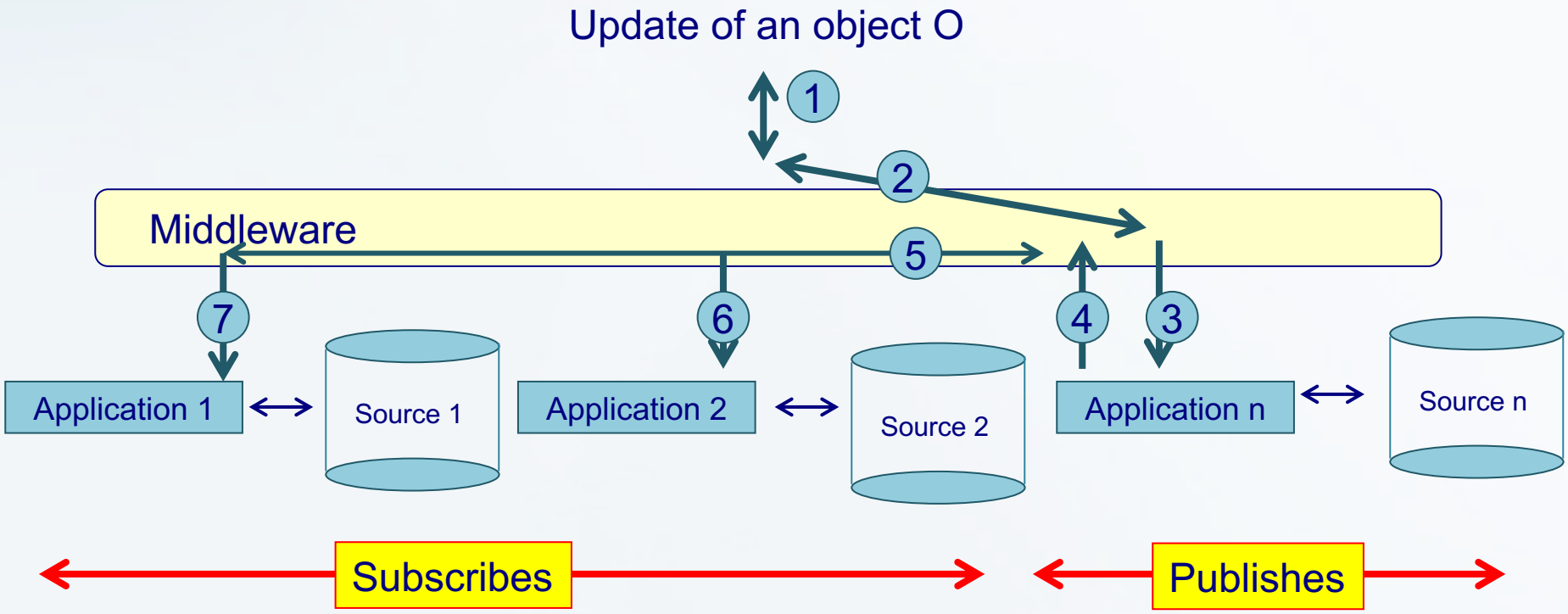


Application-driven Integration

Based on Carlo Batini [13]

2- Publish-Subscribe Architecture Scenario

- Update via the middleware, then publish this update, other application that subscribe to receive updates, will also update their sources.
- Typical application-driven integration architecture for integration of updates.



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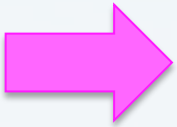
Part 1: Application-driven Integration Architectures



Part 2: Information Integration Architectures

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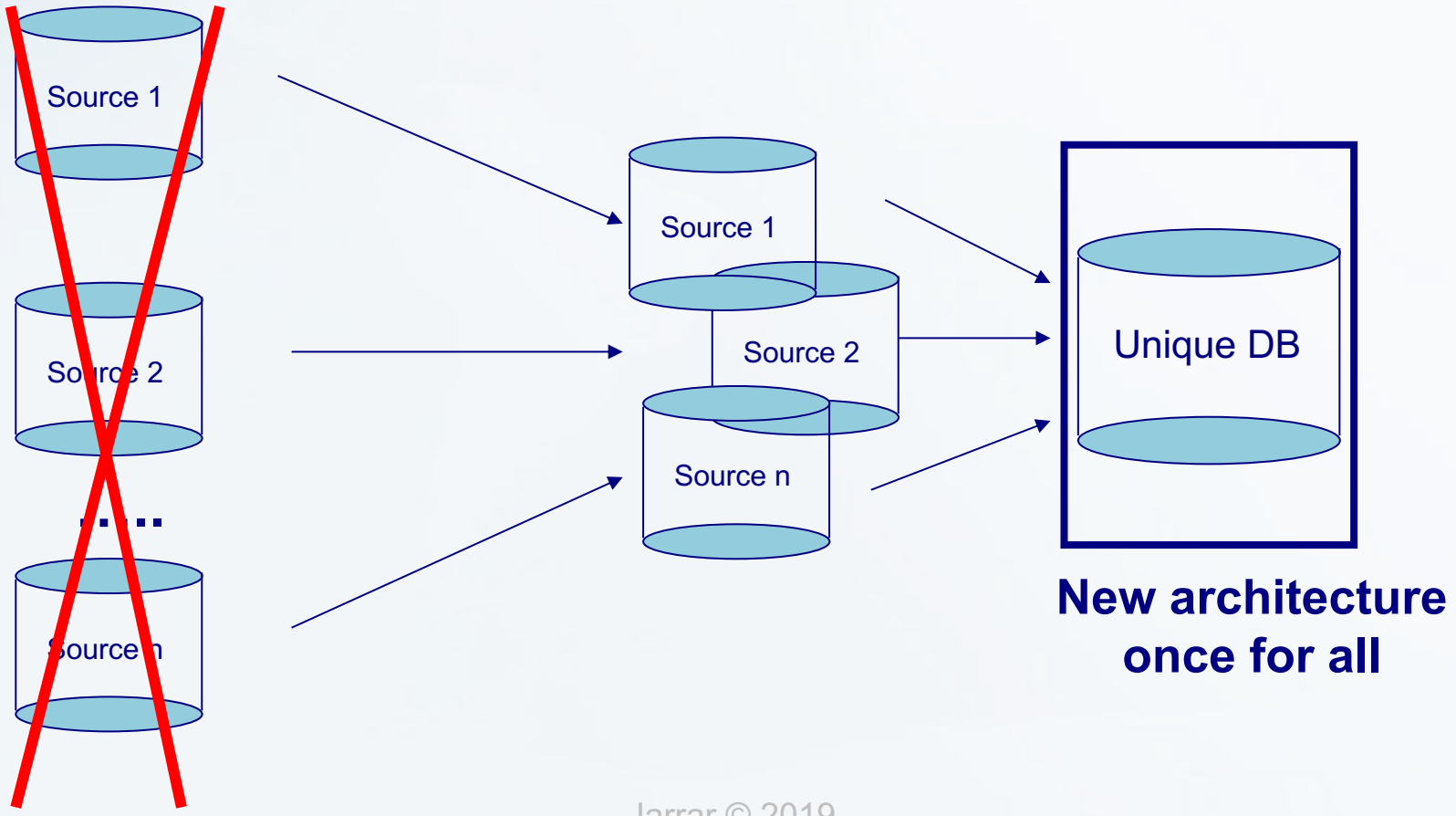
Information Integration Architectures

Based on Carlo Batini [13]

3- Consolidation Scenario

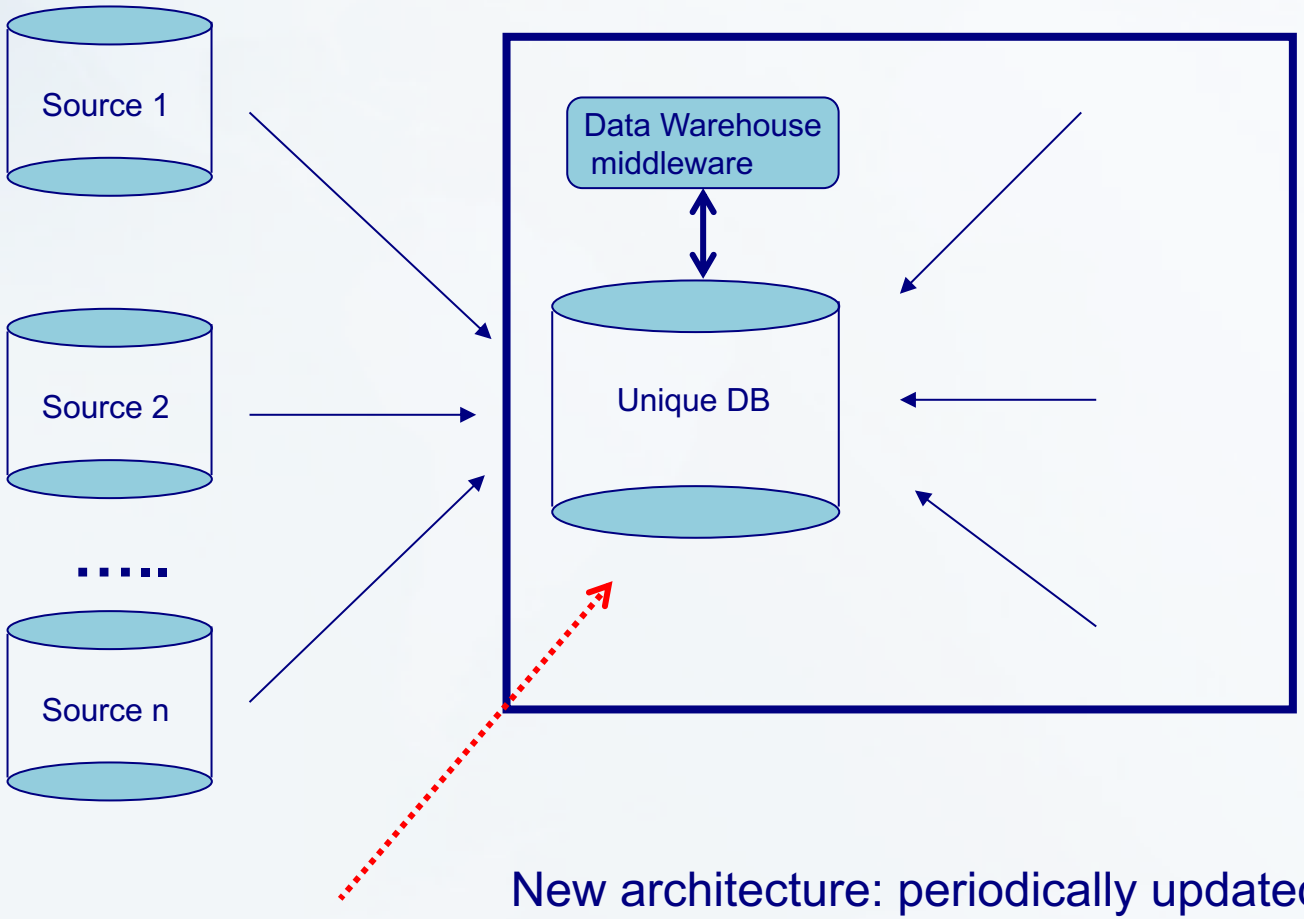
Merage all data sources into one new schema, and drop the old



Information Integration Architectures

Based on Carlo Batini [13]

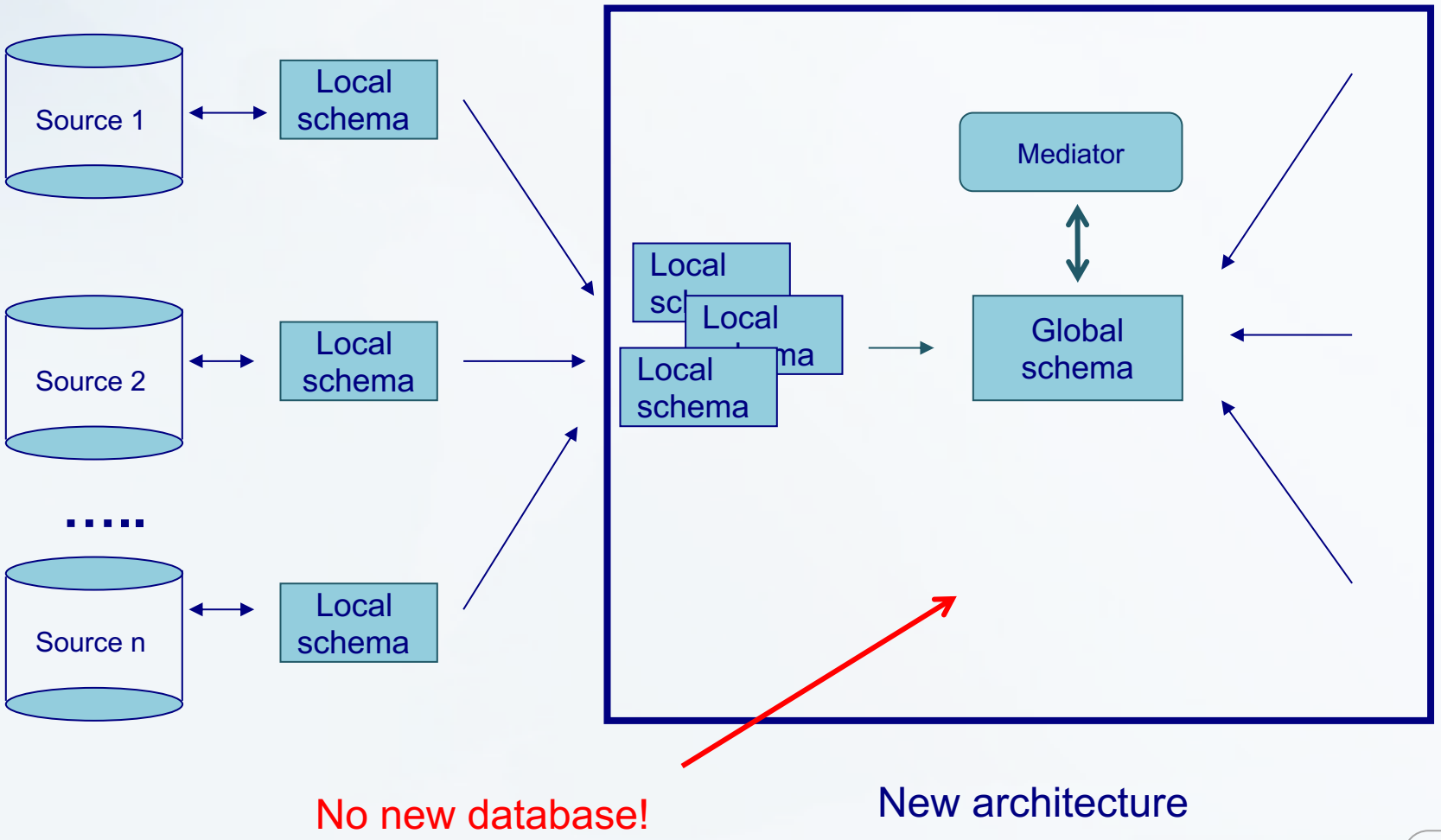
4- Data Warehouse Scenario



Information Integration Architectures

Based on Carlo Batini [13]

5- Virtual Data Integration Scenario



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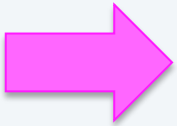

Part 3: What Integration Criteria to Use

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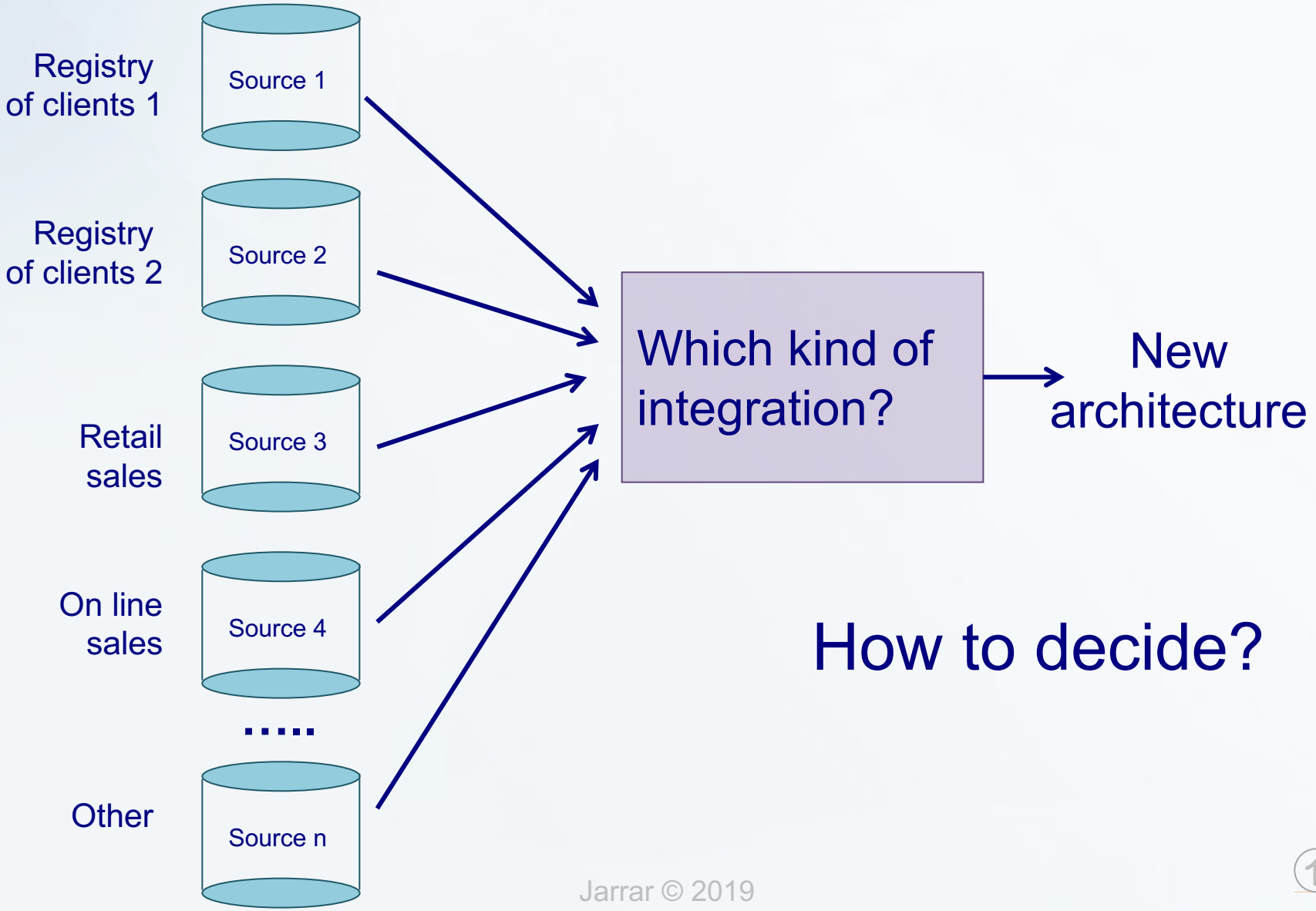
The integration problem…

Based on Carlo Batini [13]



What Integration Criteria to Use

Based on Carlo Batini [13]

1. Autonomy, the degree of independence between the different database administrators in their design choices;

2. Relevance of historical data, and consequent need to periodically store new data without deleting the old ones;

3. Query complexity, in terms of amount of data and tables visited and number of operators on them, and consequent time complexity in query execution;

4. Relevance of currency in queries, the need for queries to extract current data;

5. Economic value of integration, the relevance of having integrated information in input for business operational and decisional processes in order to produce effective outputs;

What Integration Criteria to Use

Based on Carlo Batini [13]

6. Volatility of sources, frequency of adding or deleting sources, and frequency of change of source schemas;

7. Relevance of queries w.r.t transactions, relative importance and frequency of queries with respect to changes in data;

8. Management complexity, the effort to be spent in management activities related to databases and hw-sw infrastructures, due to the corresponding complexity of the organizations using the data bases;

9. Costs of heterogeneity, hidden and explicit costs related to business processes that are due to making use of heterogeneous data.

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