Universität Stuttgart

Partial Execution of Mashup Plans During Modeling Time

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IPVS
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Motivation

Motivation (I)

The Big Data Problem

- Increasing amount of data
- Data sources are oftentimes heterogeneous, distributed, and dynamic
- Coping with the *Big Data Problem* enables higher efficiency, effectiveness for problem-solving and leads to higher profits

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Details: Poster Session ☺

Basic Concepts

FlexMash:
How does it work?

FlexMash – How does it work? (I)

The FlexMash method

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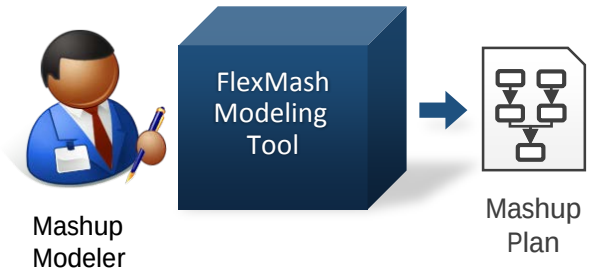
The FlexMash method



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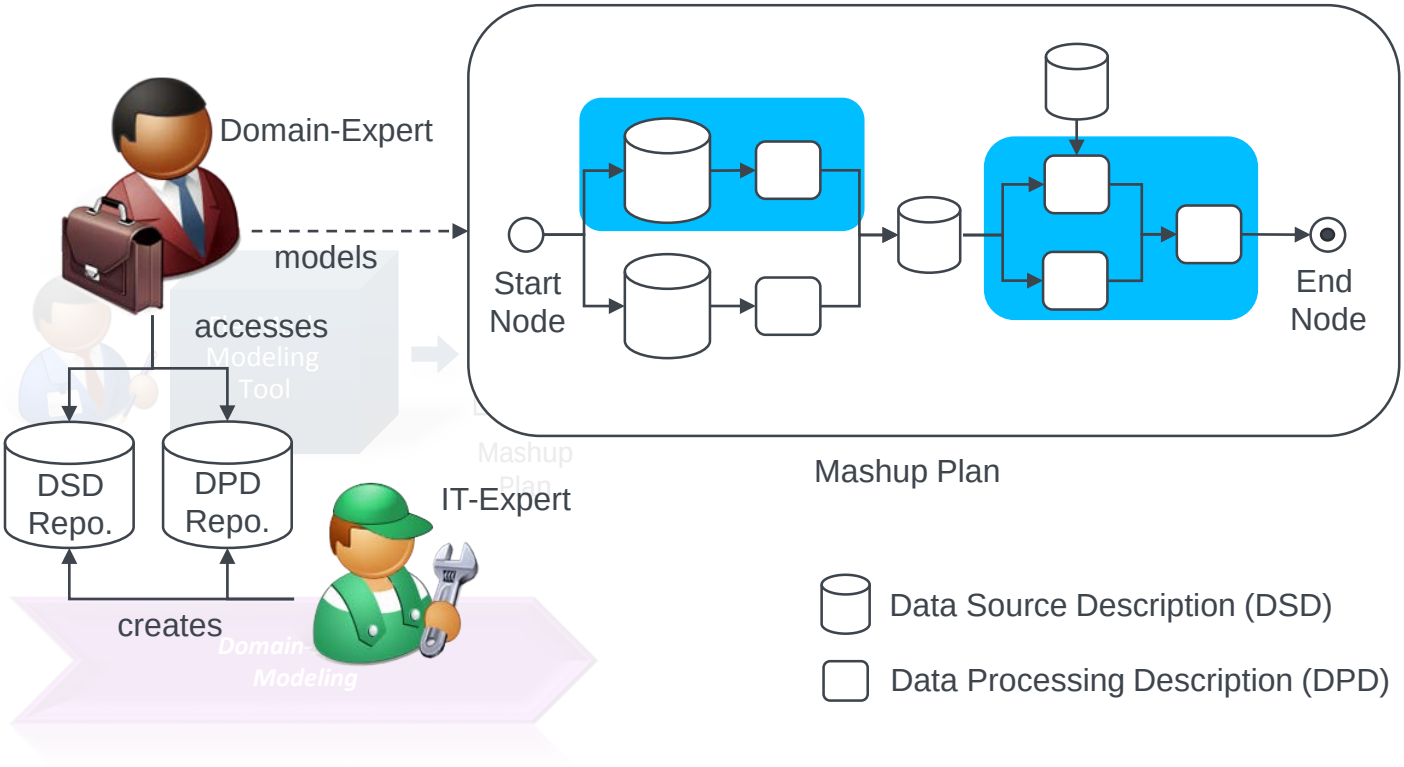

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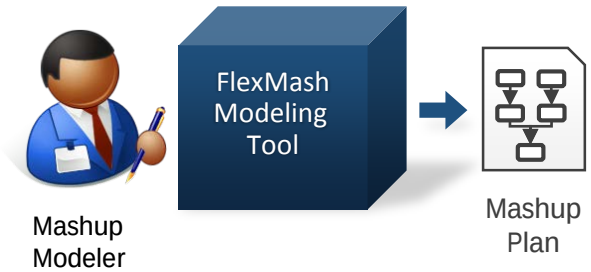

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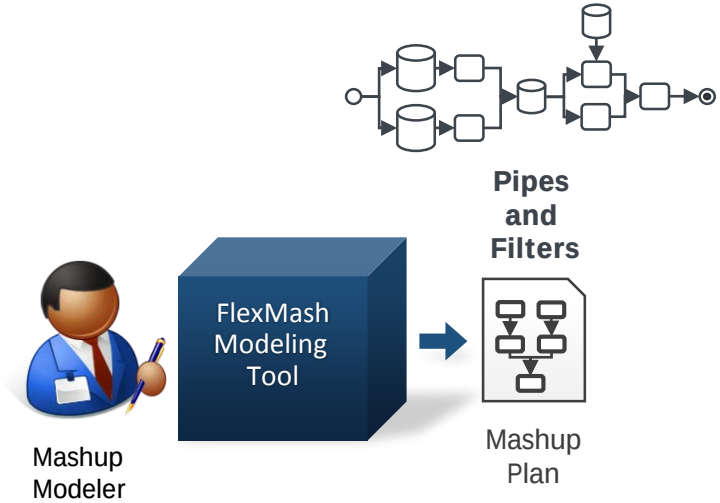

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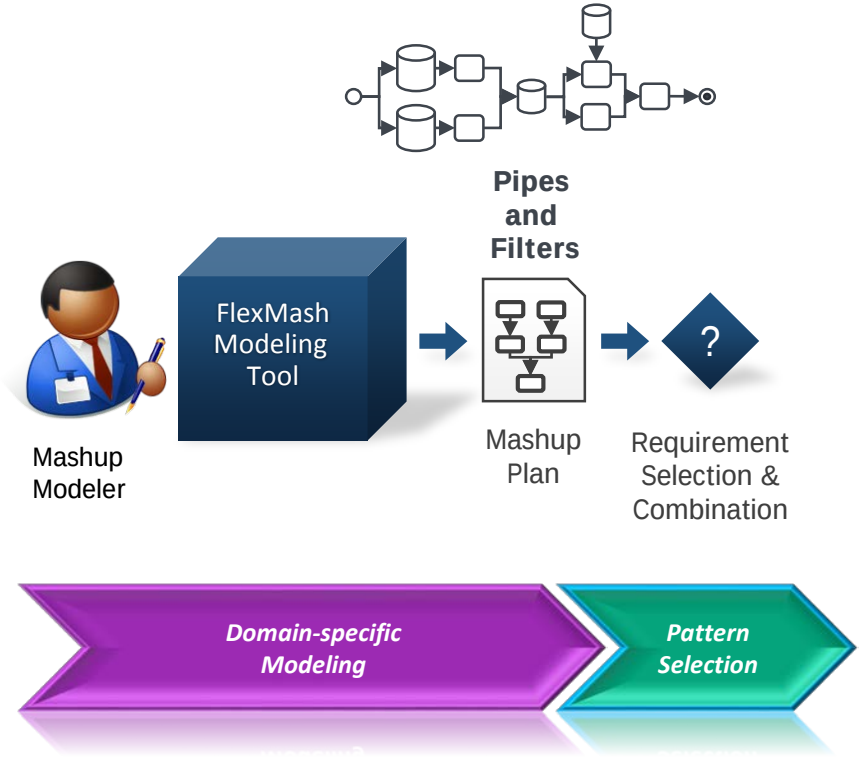

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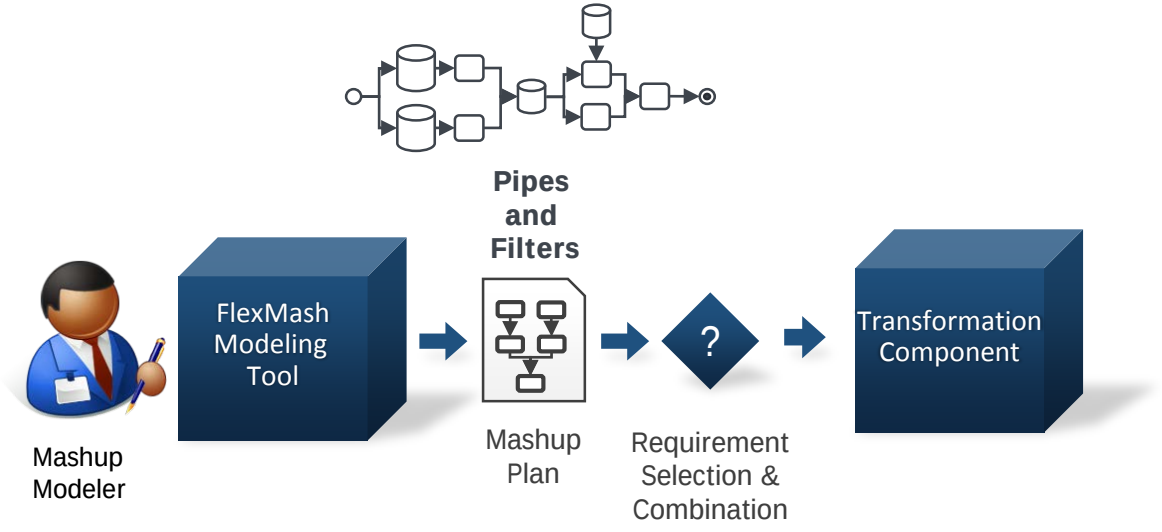

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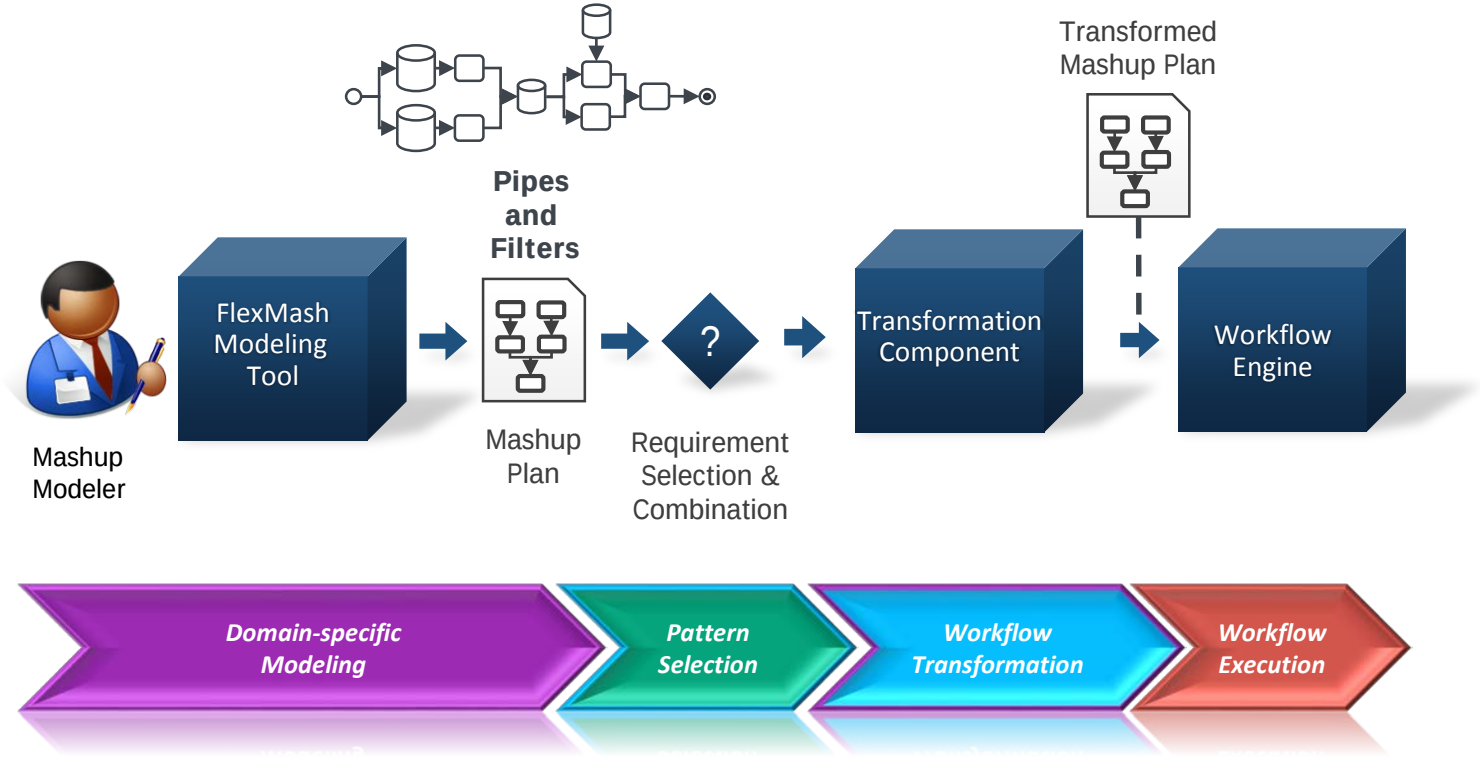
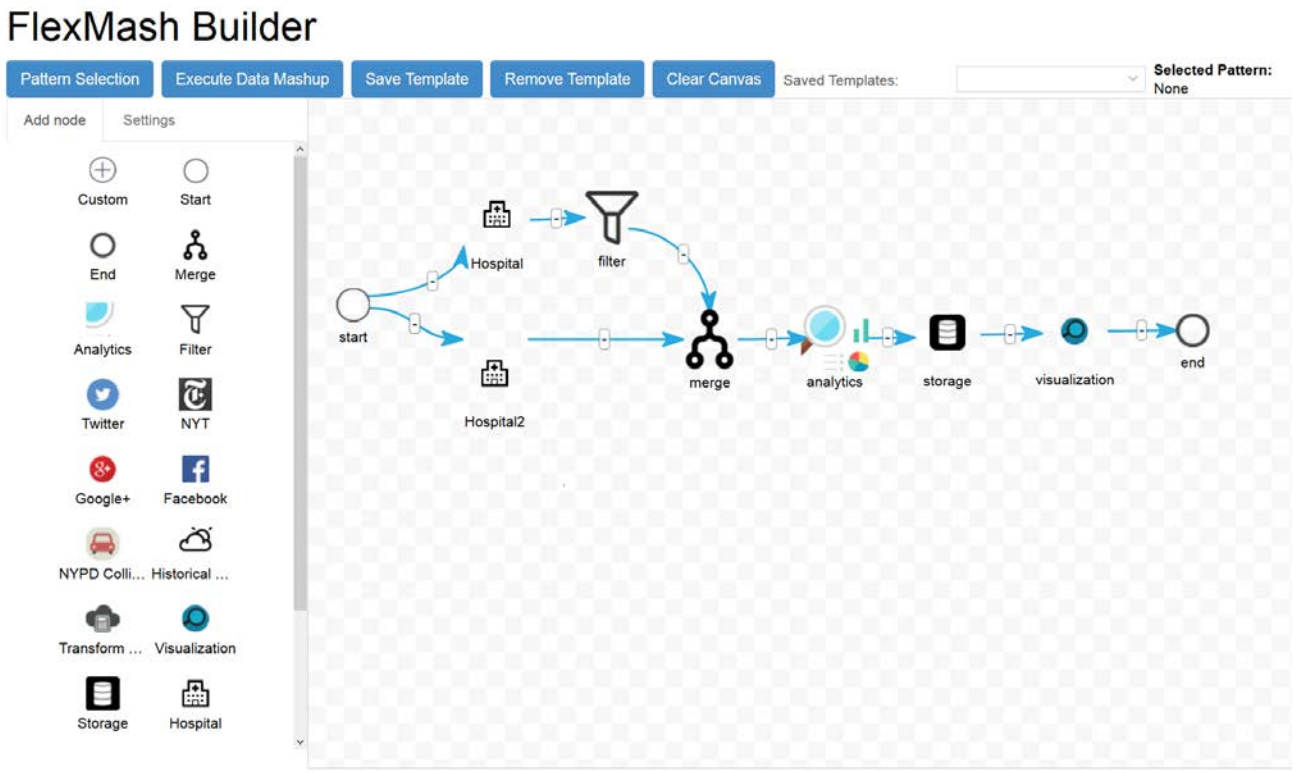


Exemplary Mashup Plan



Partial Execution of Mashup Plans

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- **Goal of this paper:**
  - **partial execution** of Mashup Plans **during modeling time**
  - "increasing" the **efficiency**
  - enable to **show intermediate results**

Partial Execution of Mashup Plans

Goals and Contribution

- Contributions
  - Transformation and execution of single nodes
  - Showing states of execution (unprocessed, in progress, done)
  - Showing intermediate results

  ➔ First step for partial execution of Mashup Plans

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  ➔ First step for partial execution of Mashup Plans

- Challenges
  - Staleness of data
  - Constant changes in the Mashup Plan
  - Dependencies in the model

Related Work

Related Work

- Sonntag, M., Karastoyanova, D.: Model-as-you-go: An Approach for an Advanced Infrastructure for Scientific Workflows. Journal of Grid Computing, 2013
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  - ➔ Inspiration for this work
  - ➔ We apply these concepts to Mashup Plans, i.e., on an abstraction level on top of workflows
  - ➔ We further enable implicit execution ☺

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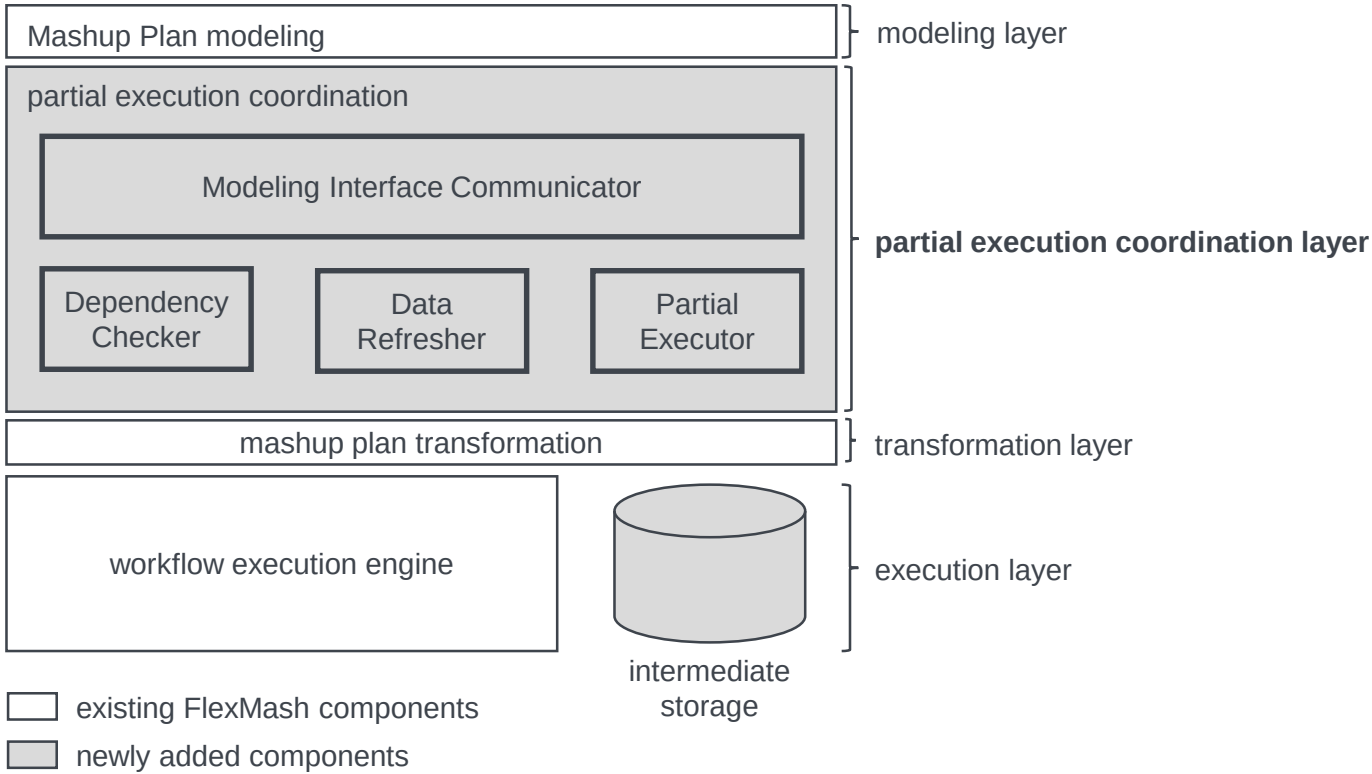
(R6) User feedback

Architecture



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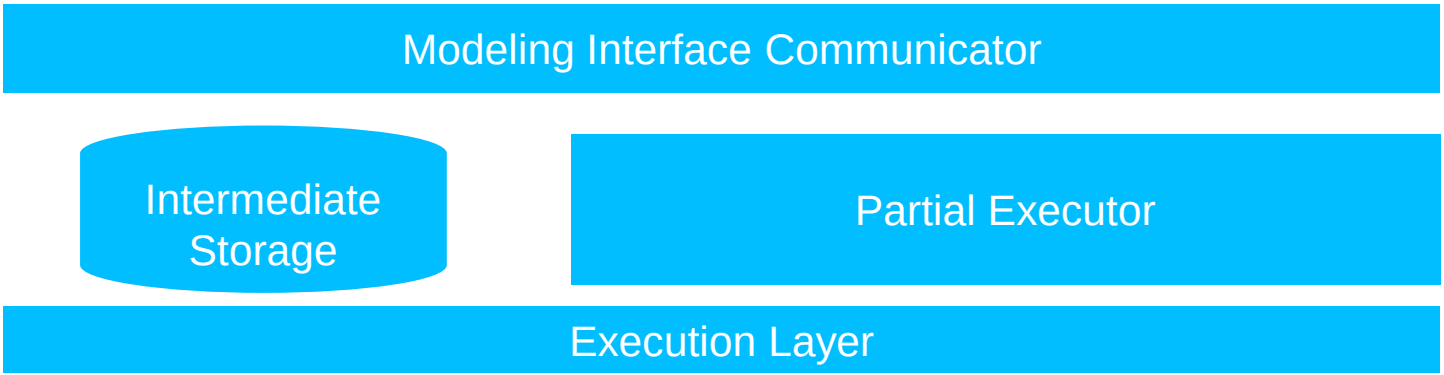
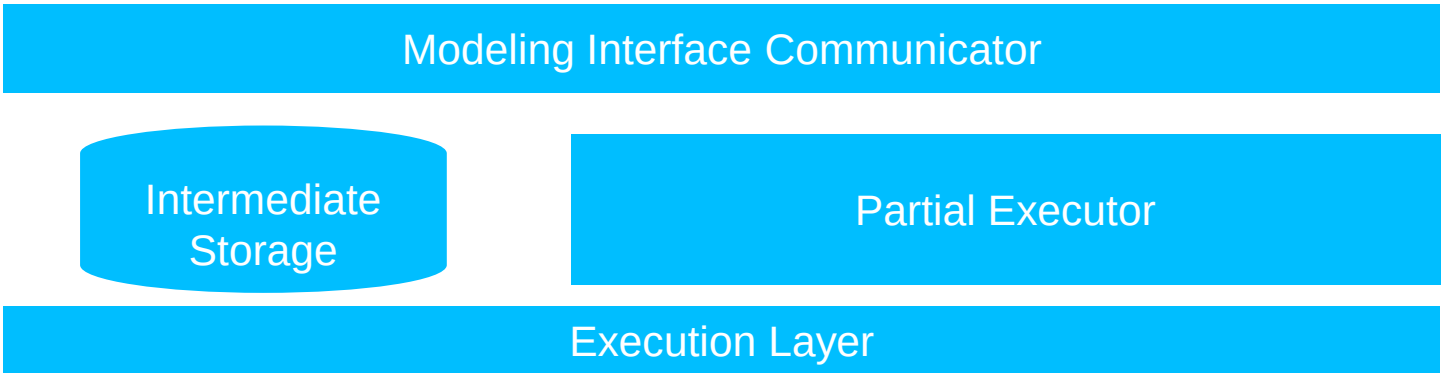


Simple Example

table: patients

MySQL



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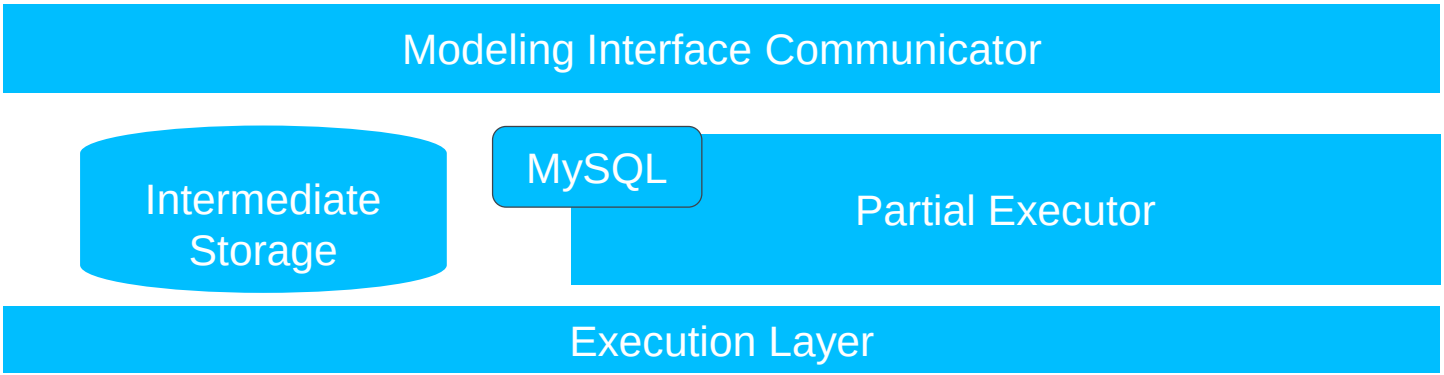

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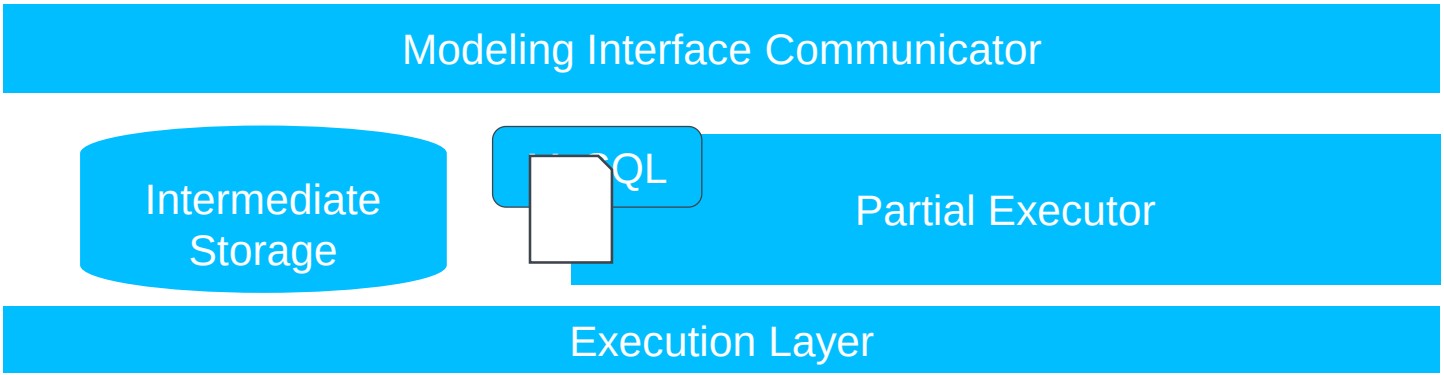

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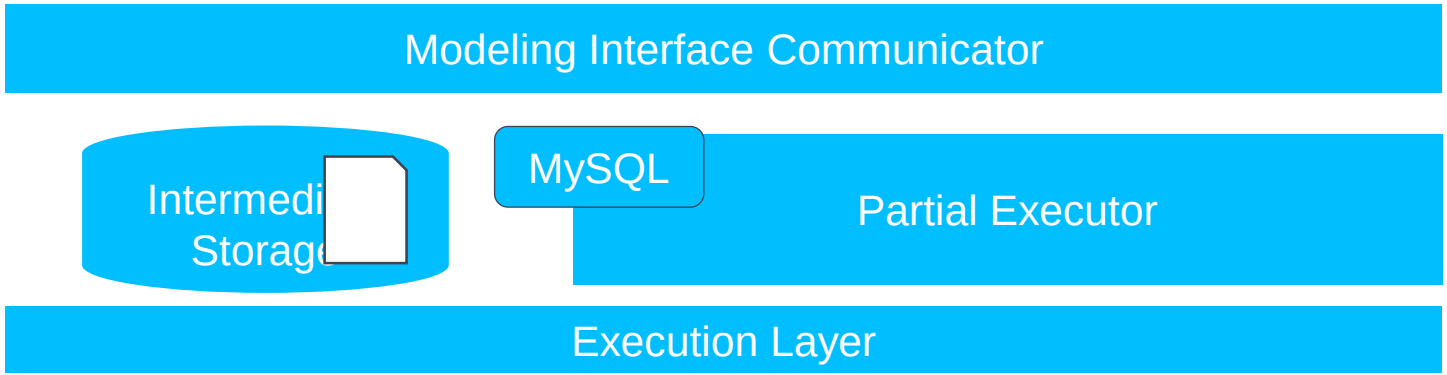

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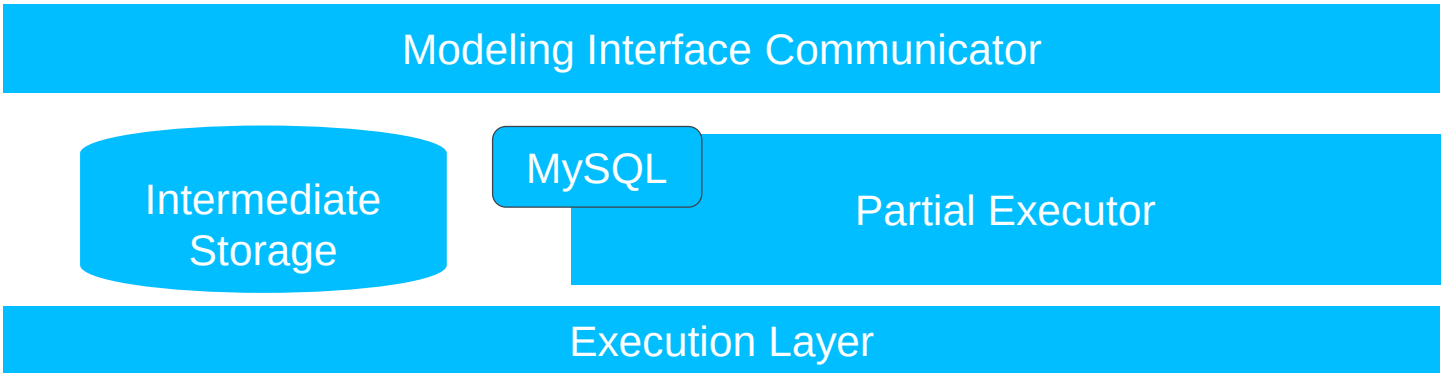

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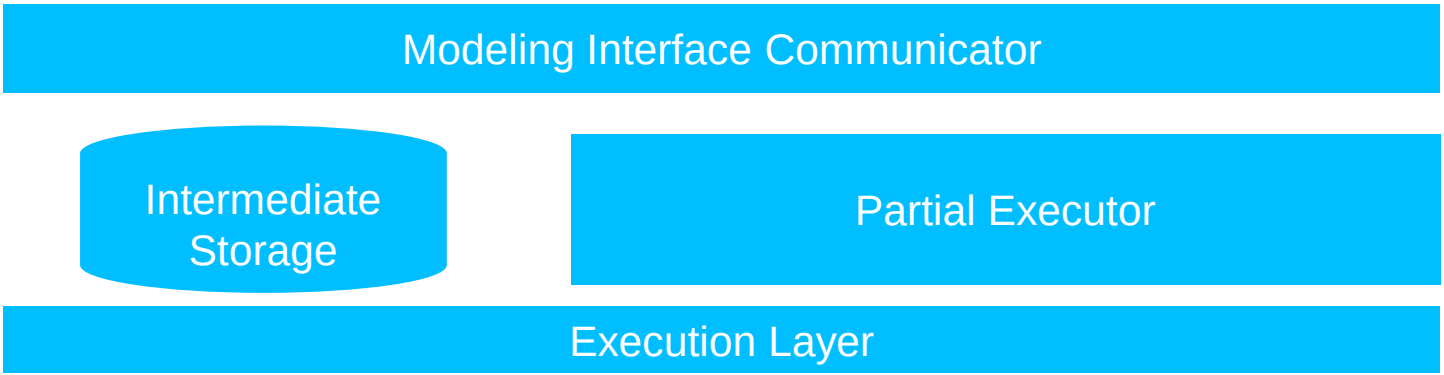

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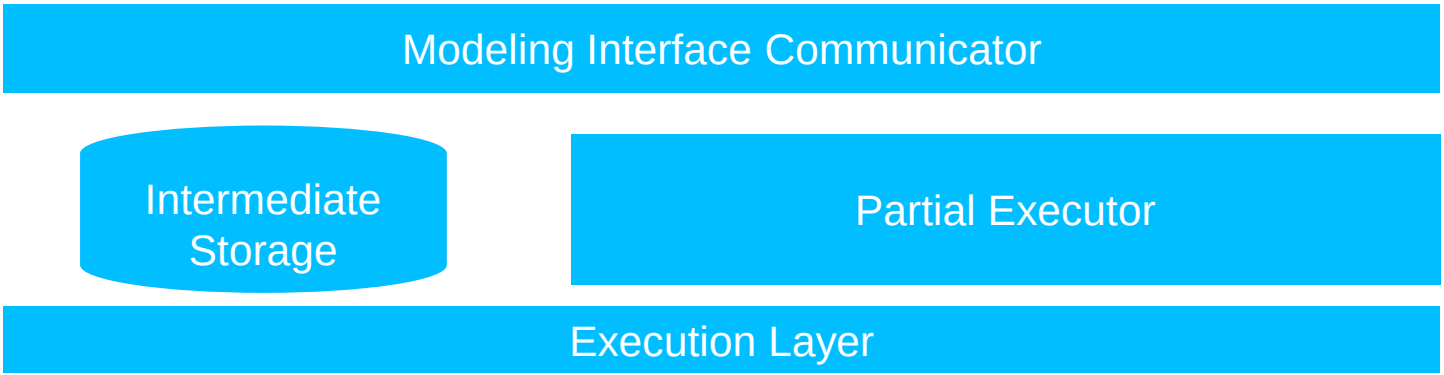

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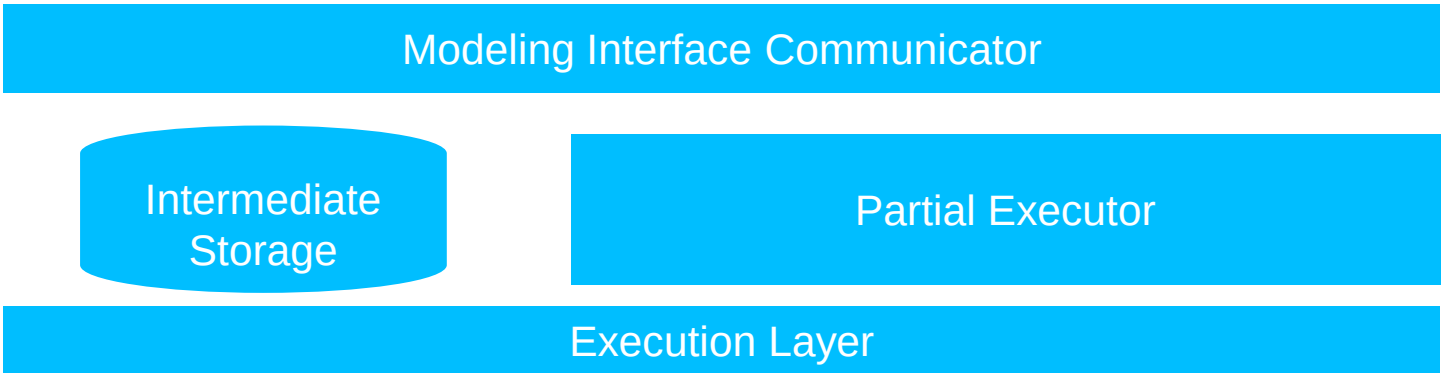

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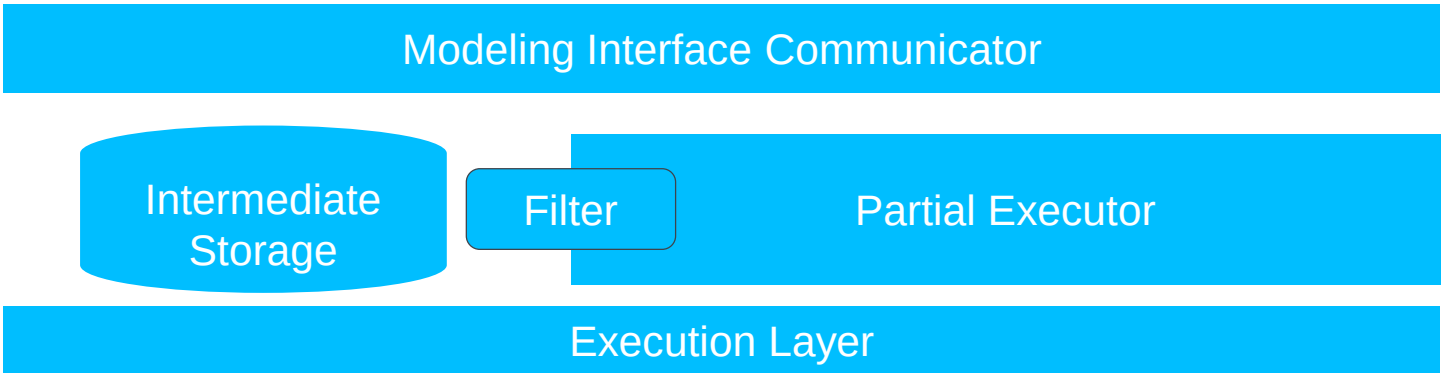

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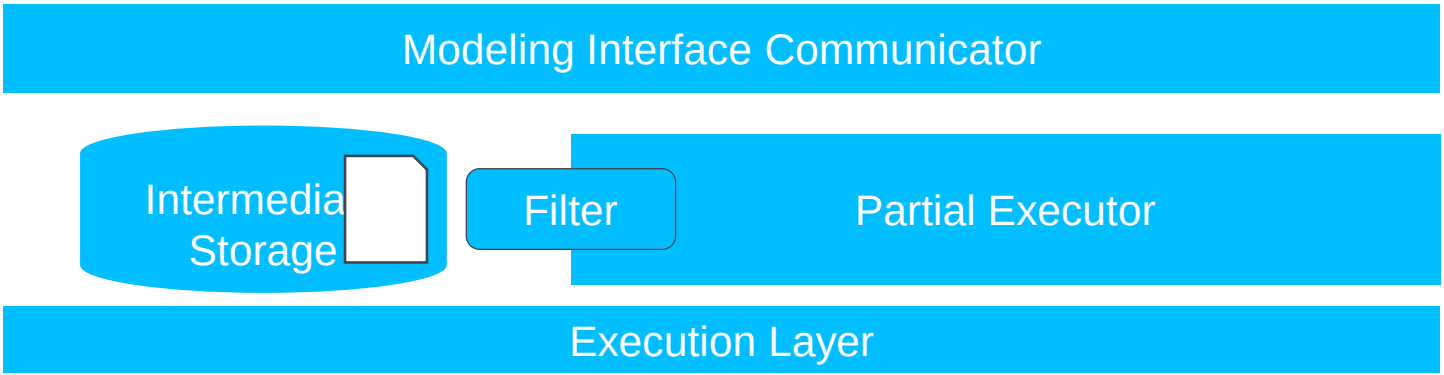

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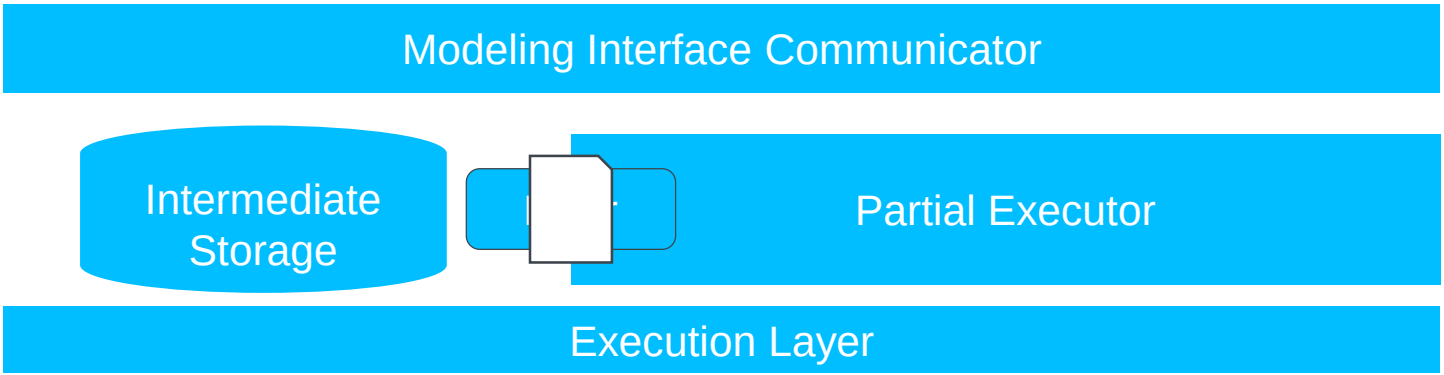

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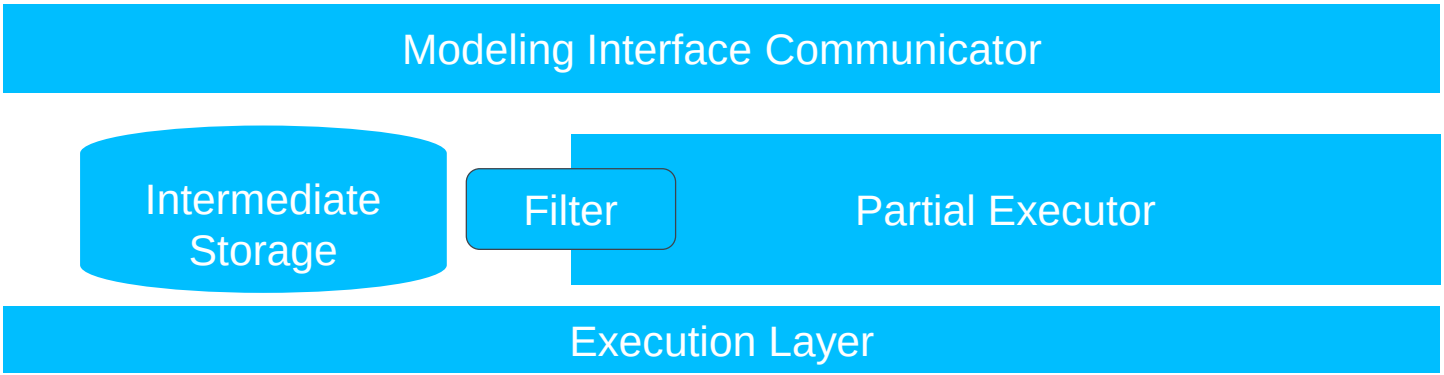

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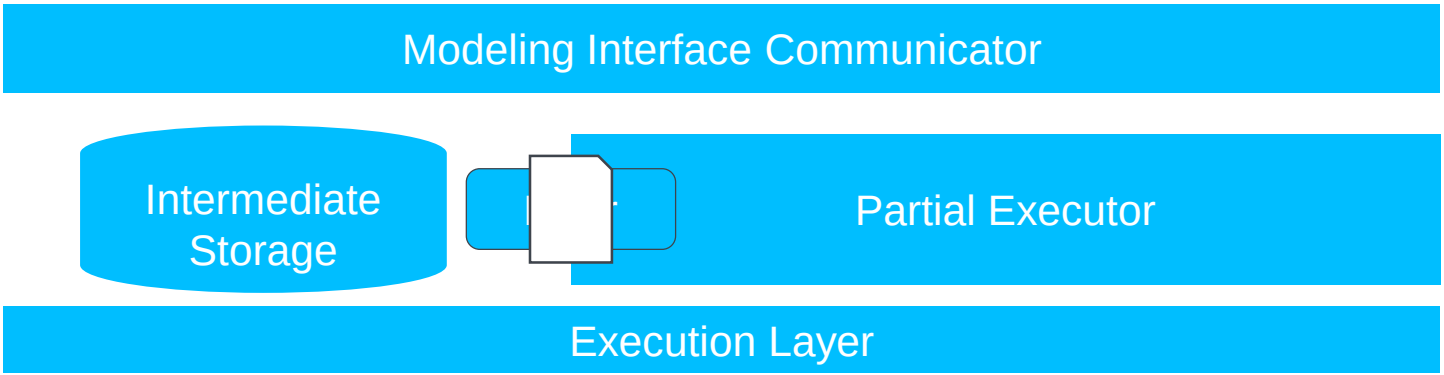

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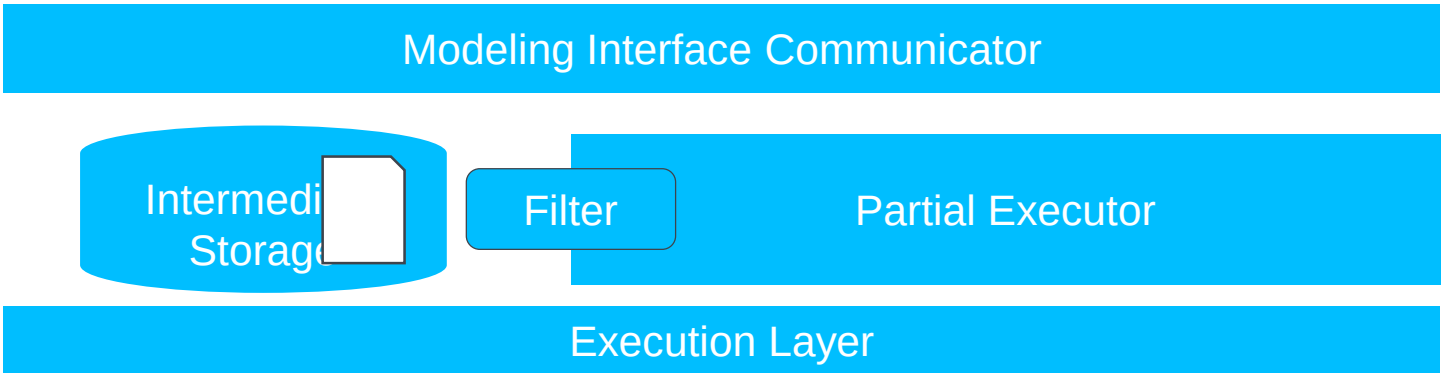

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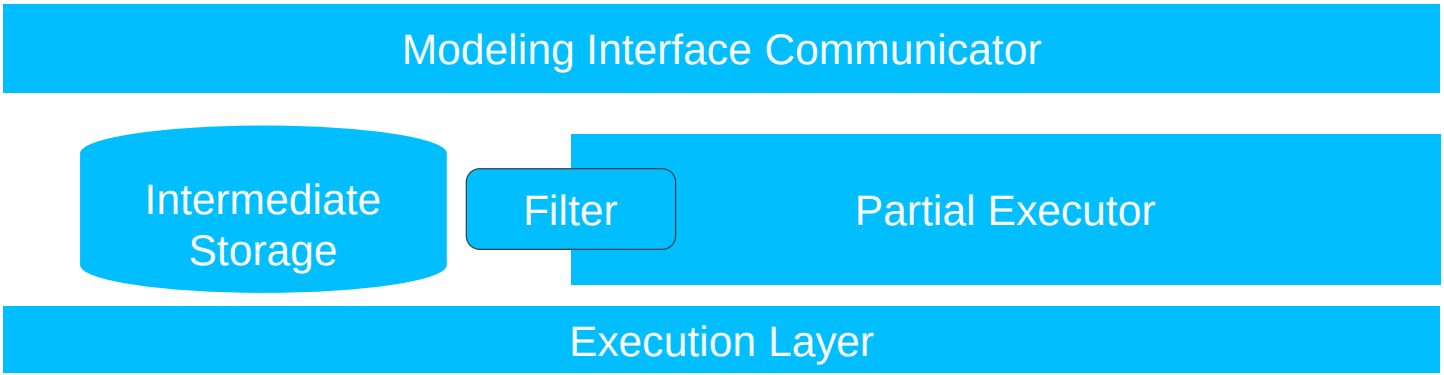

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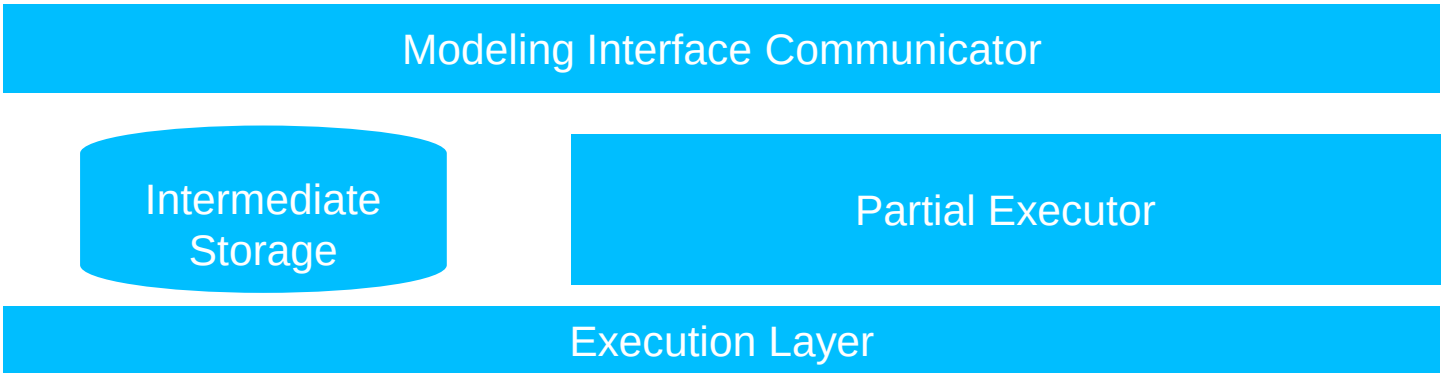

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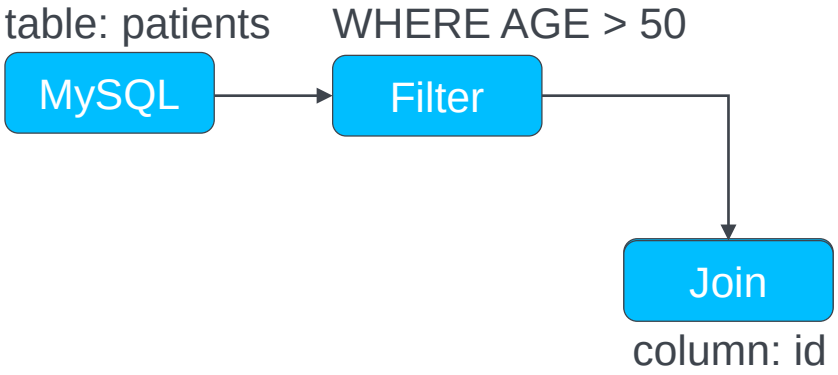

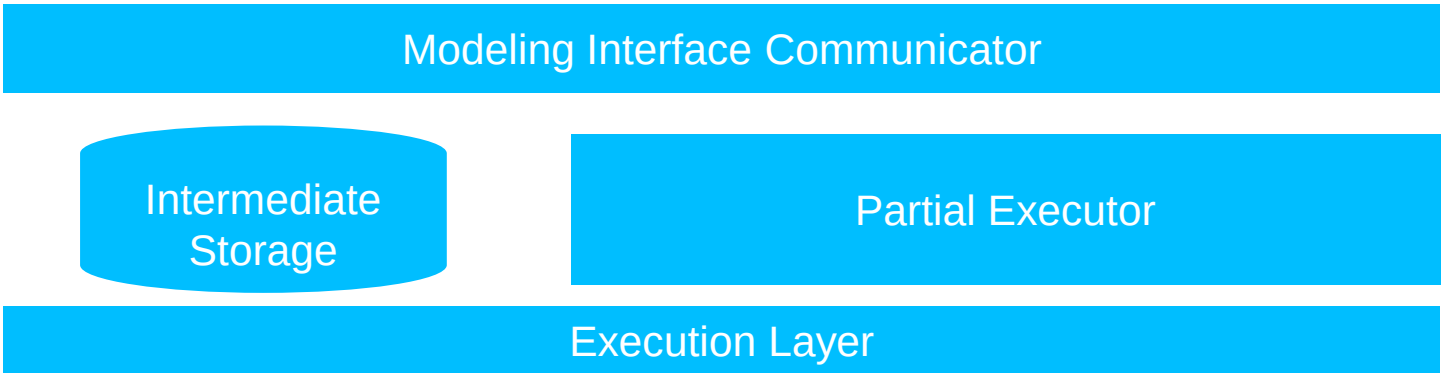

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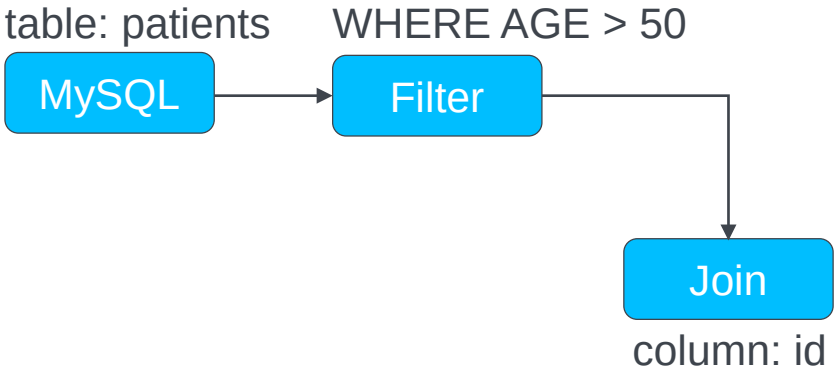

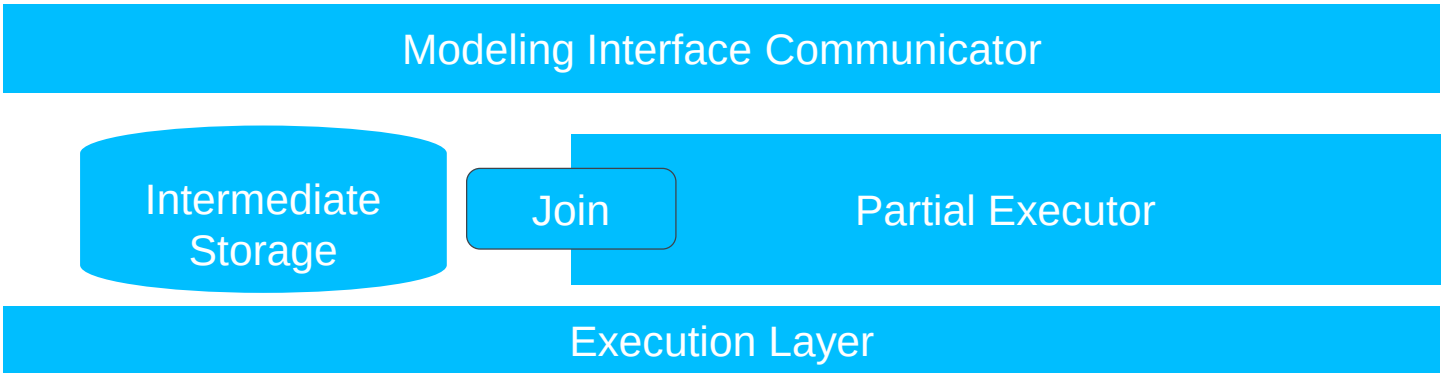

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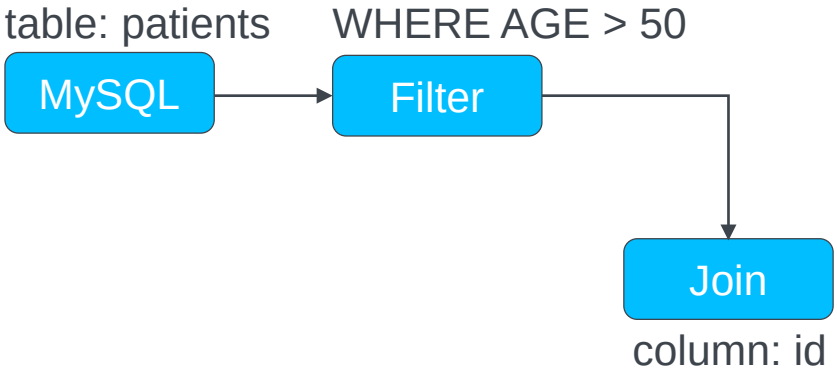

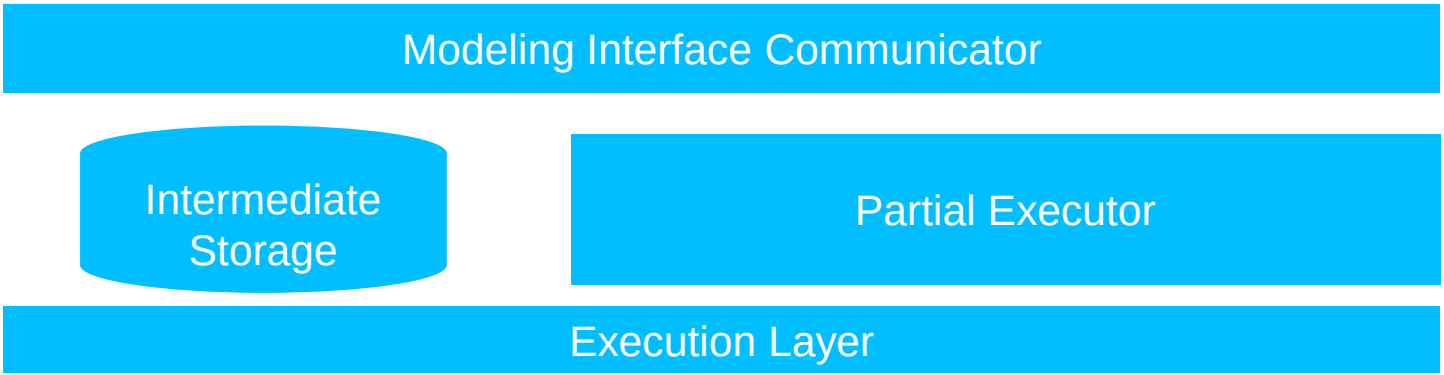

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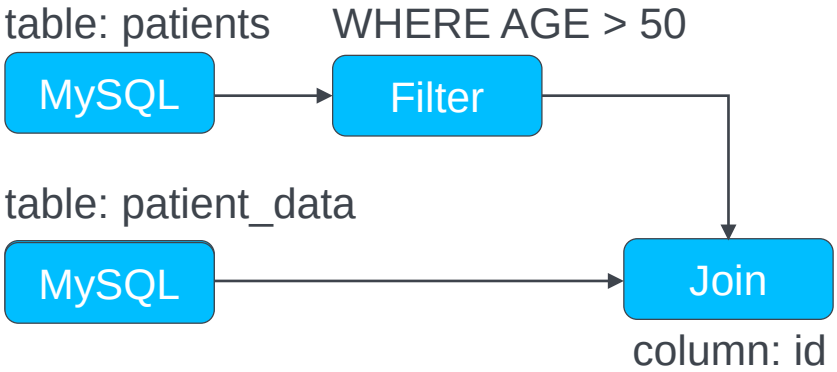

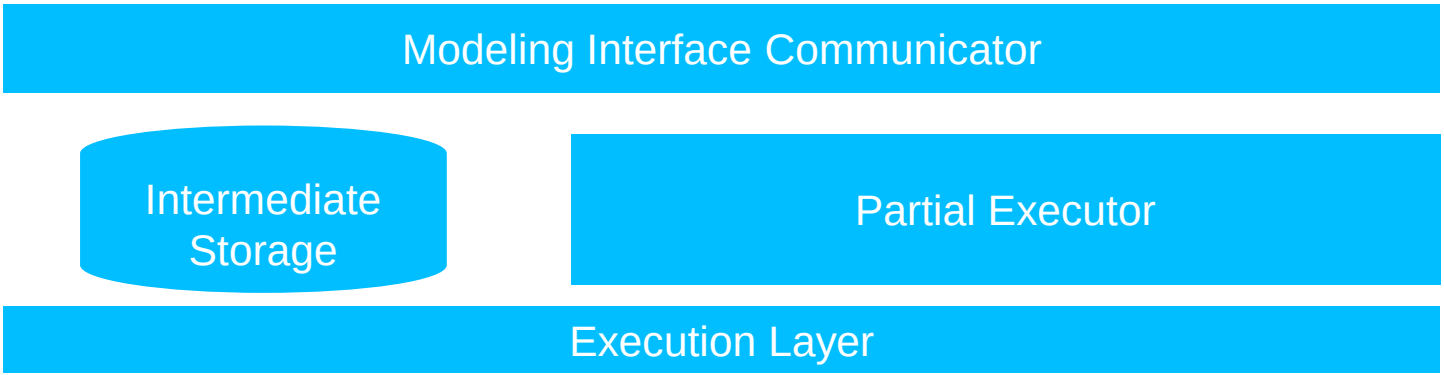

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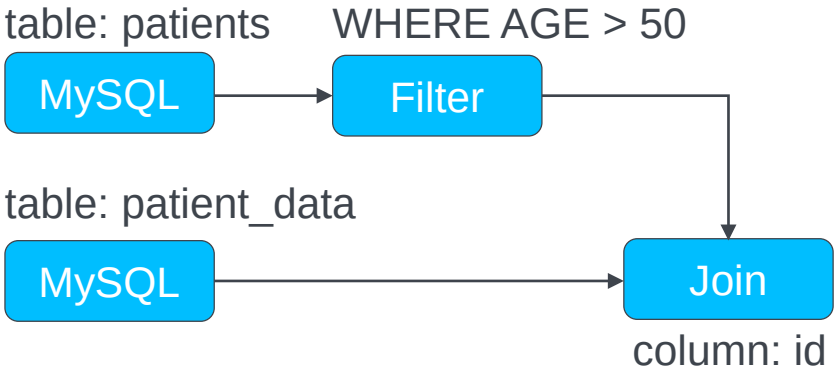

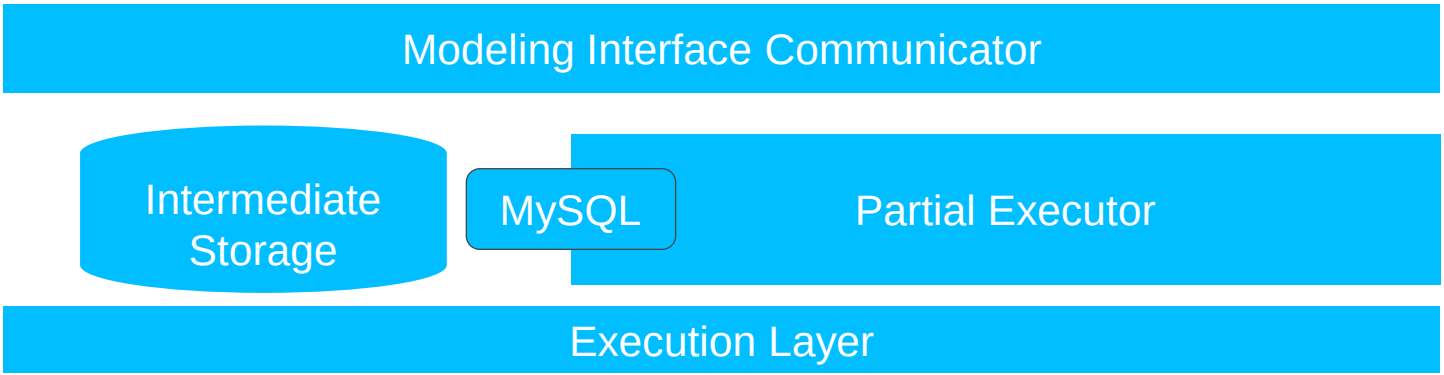

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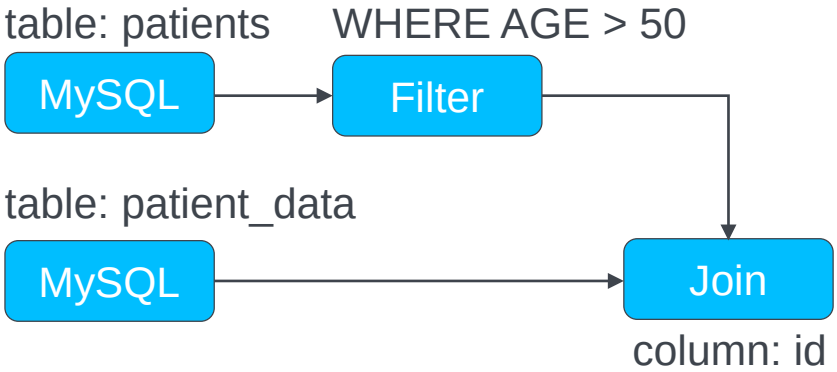

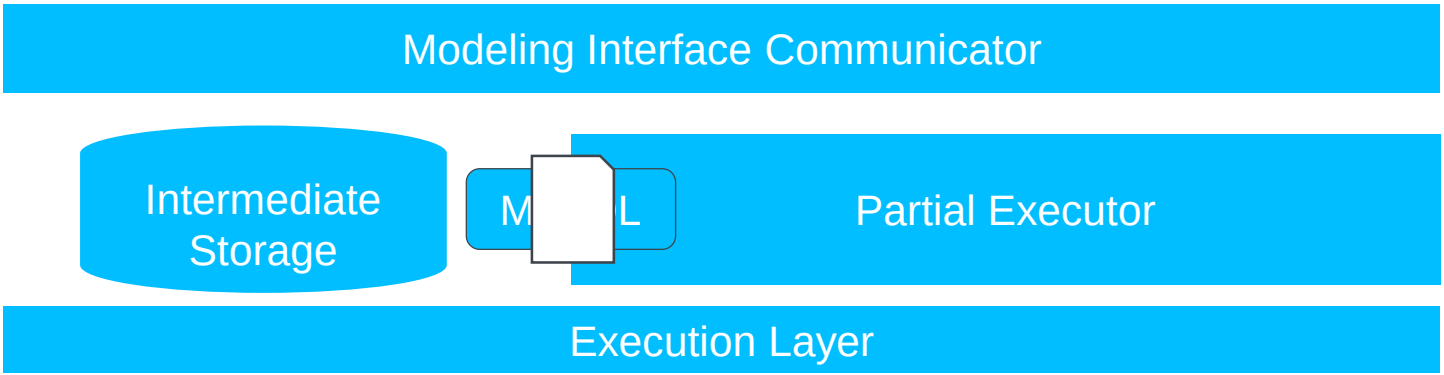

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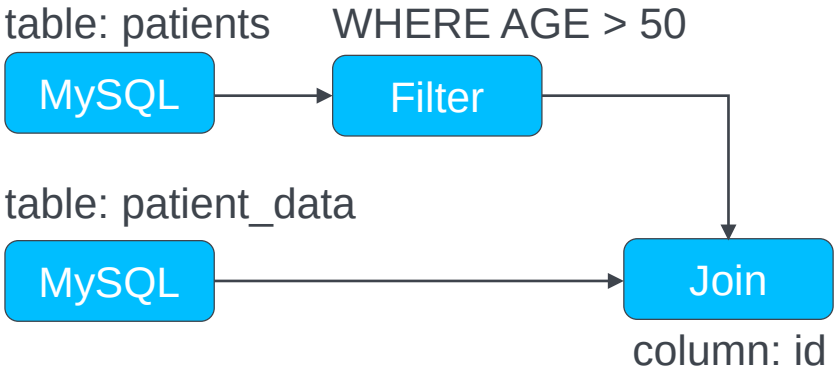

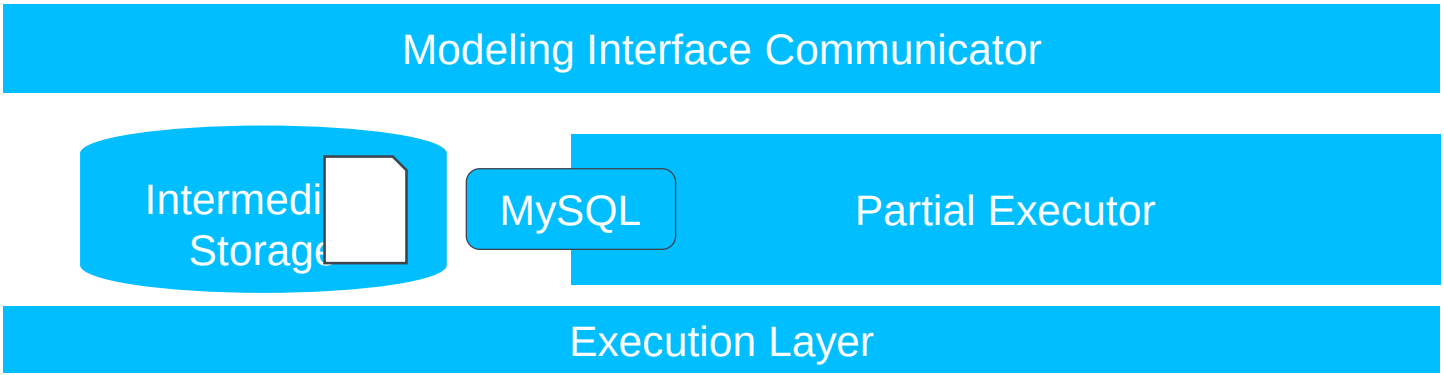

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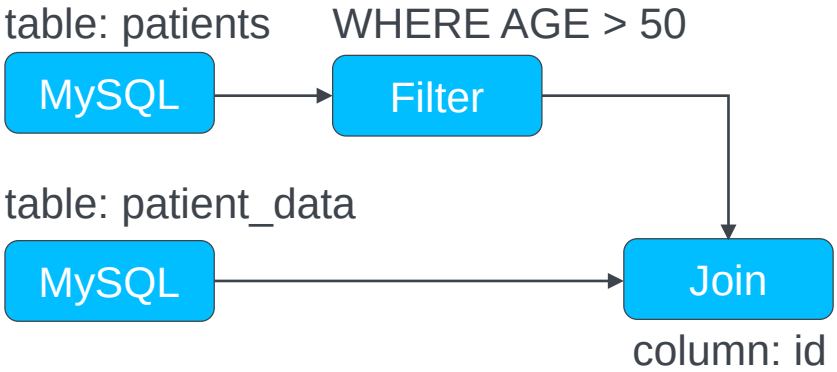

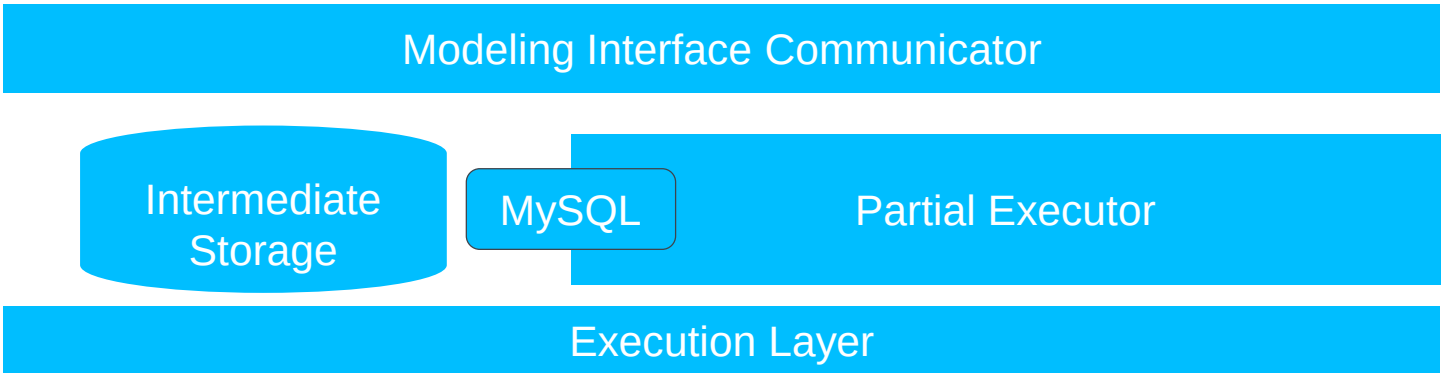

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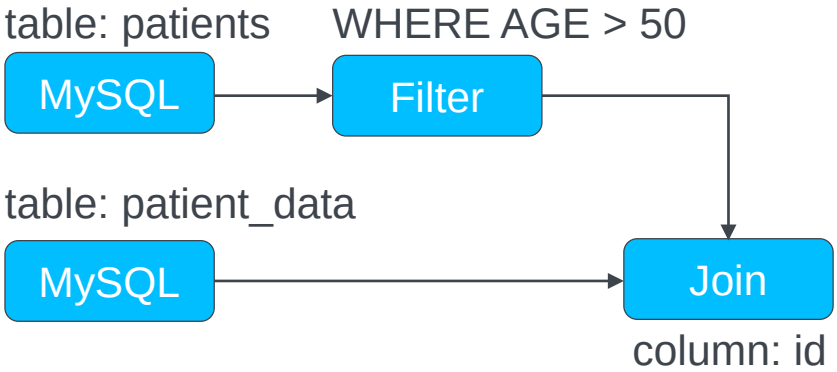

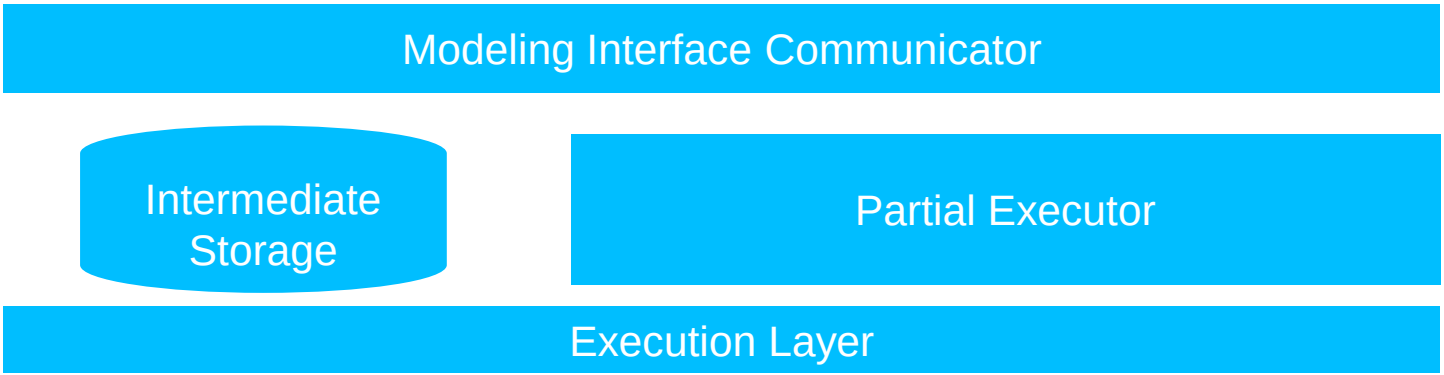

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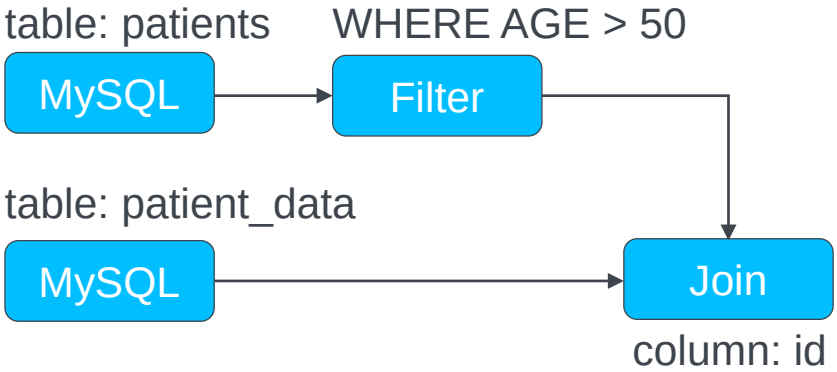

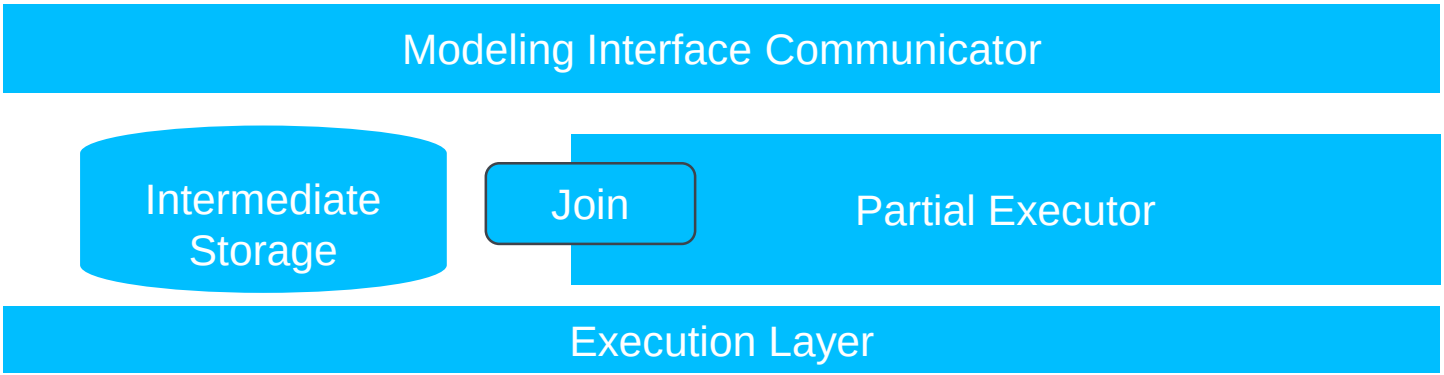

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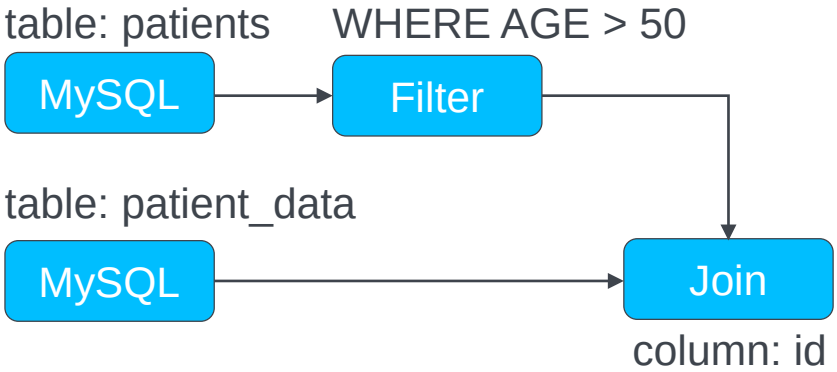

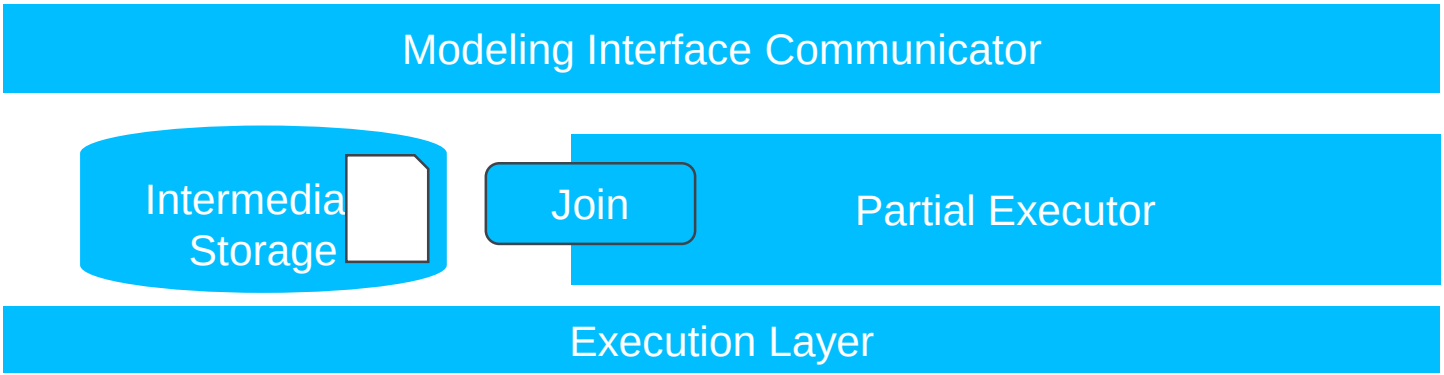

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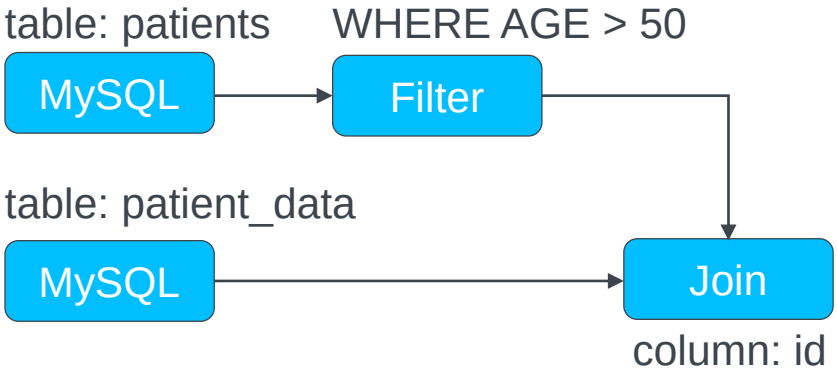

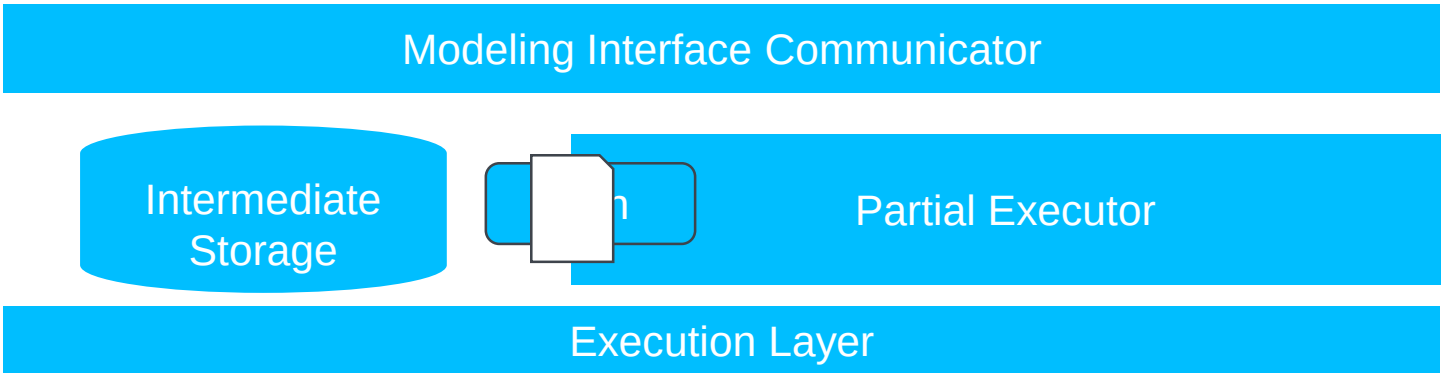

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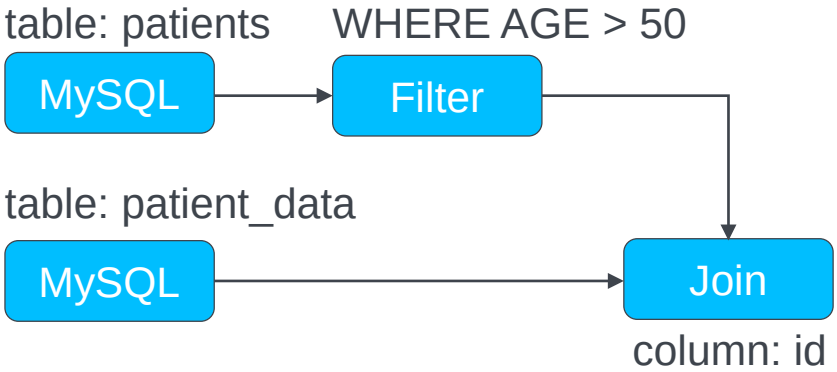

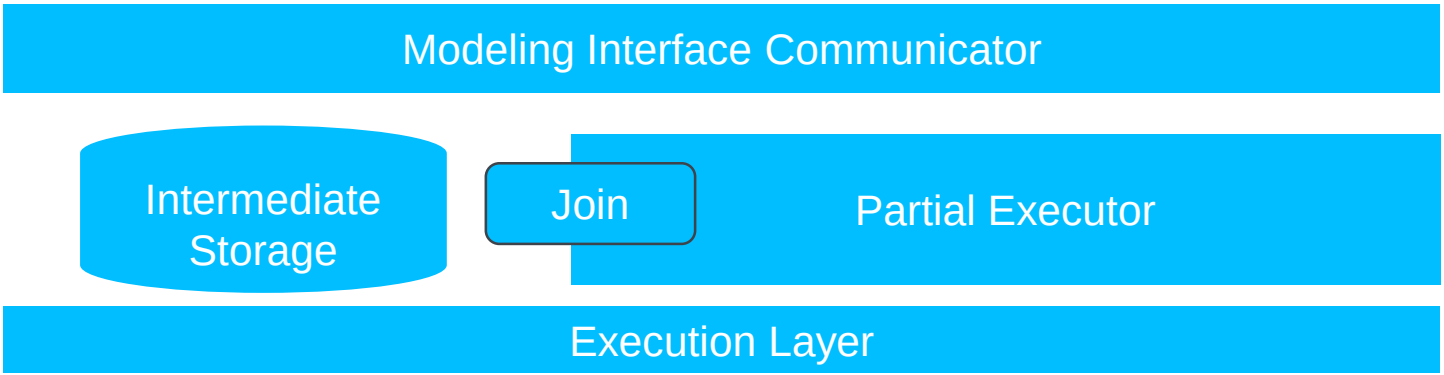

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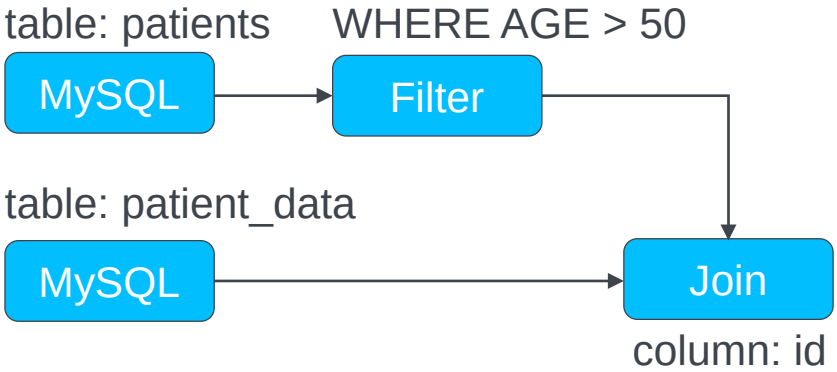

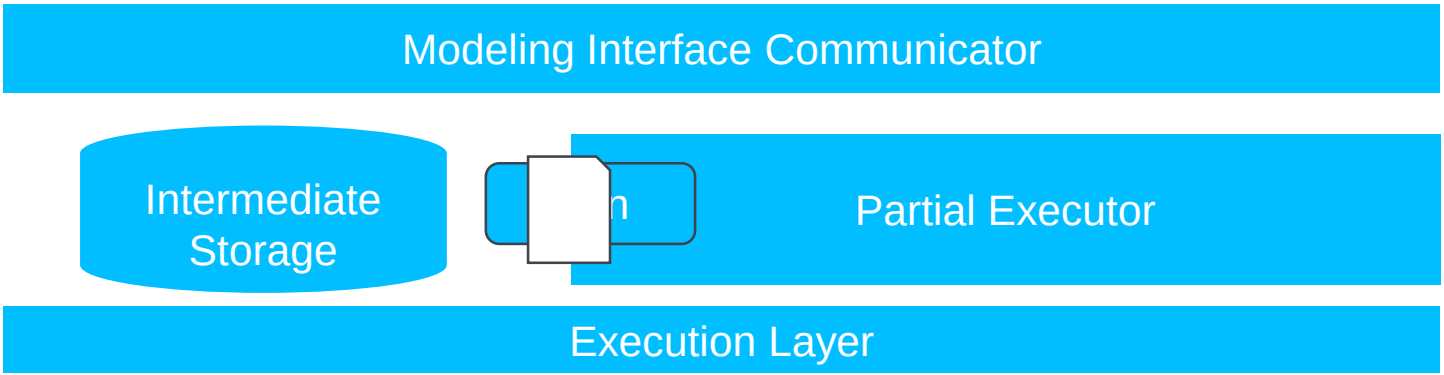

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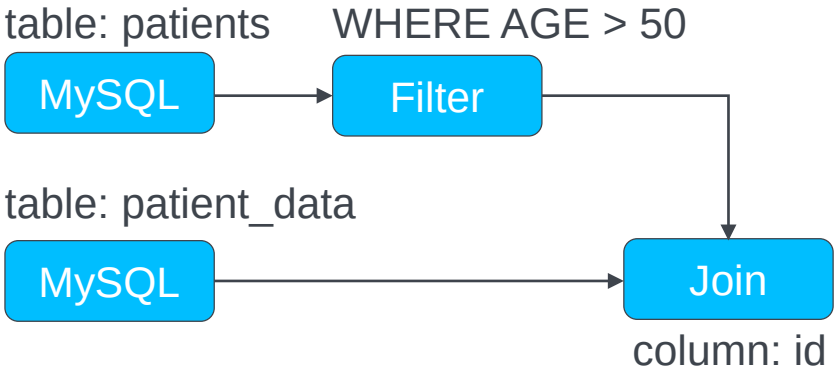

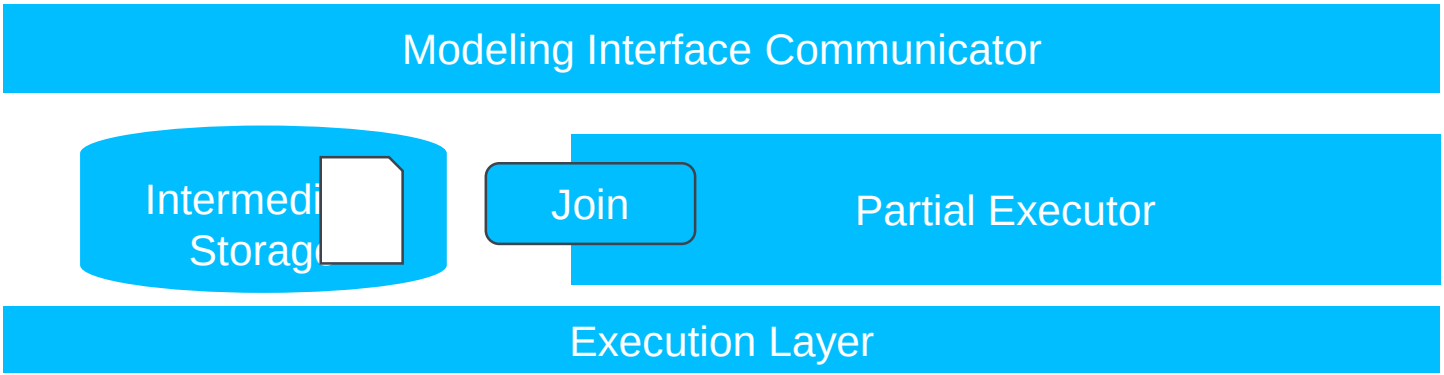

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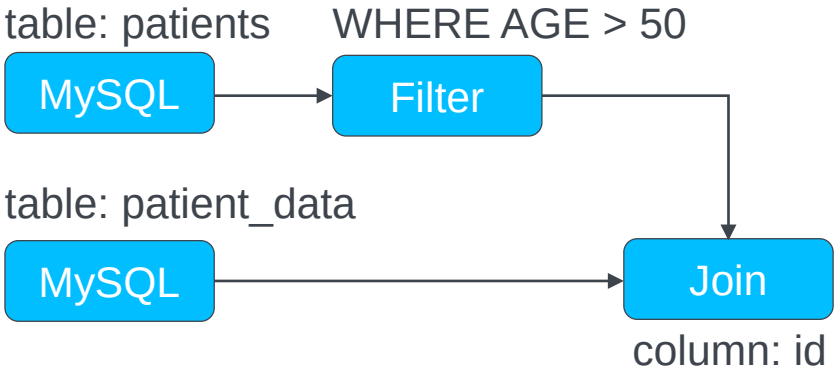

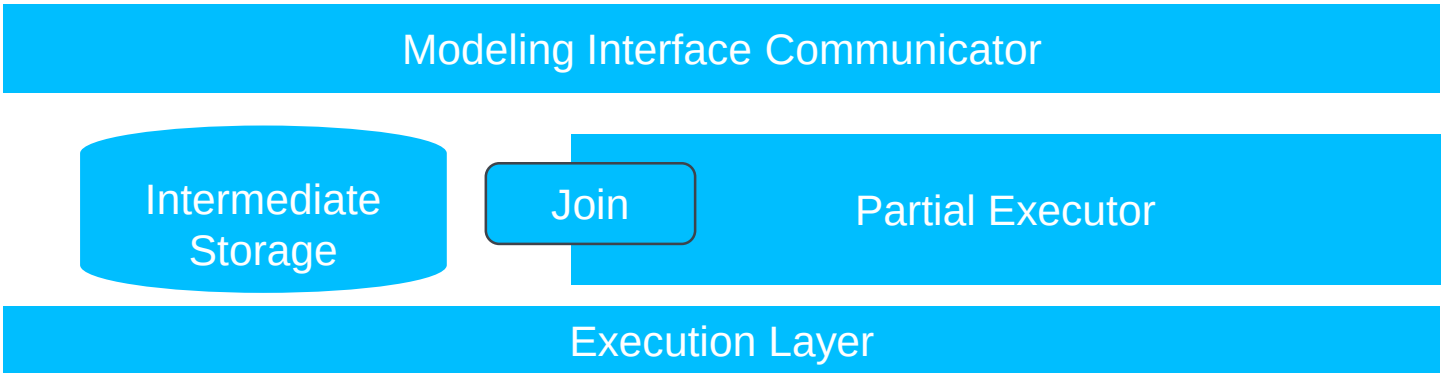

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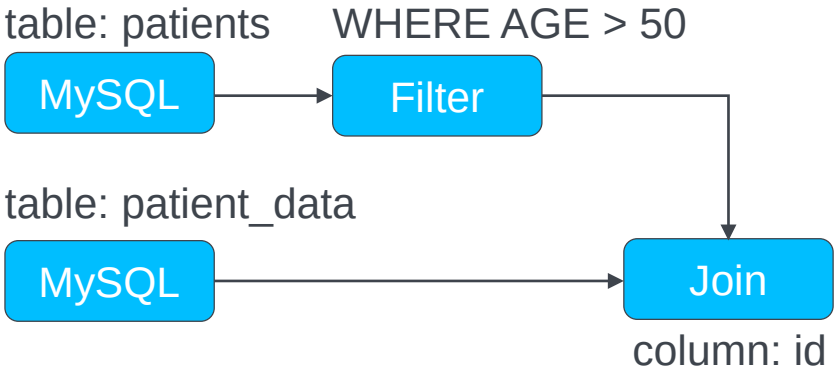

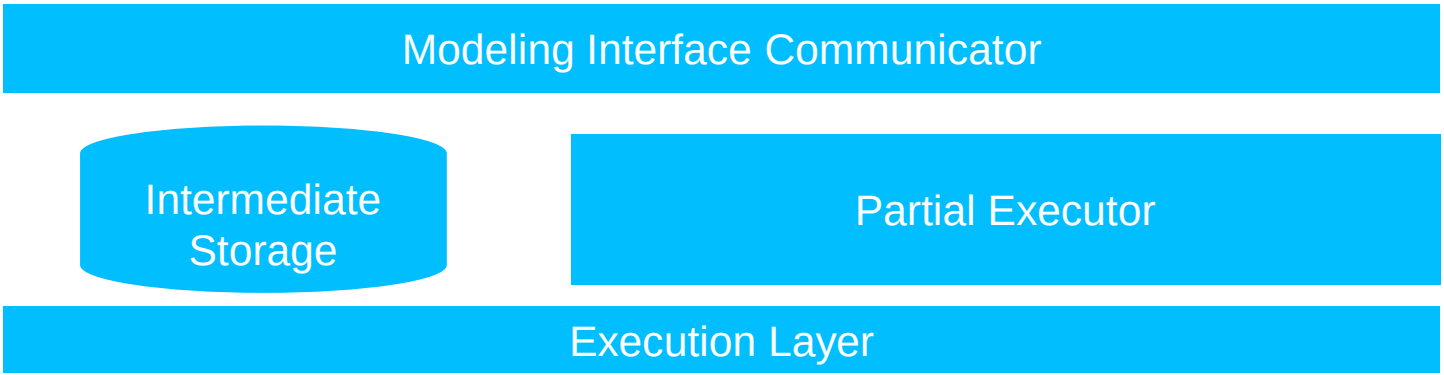

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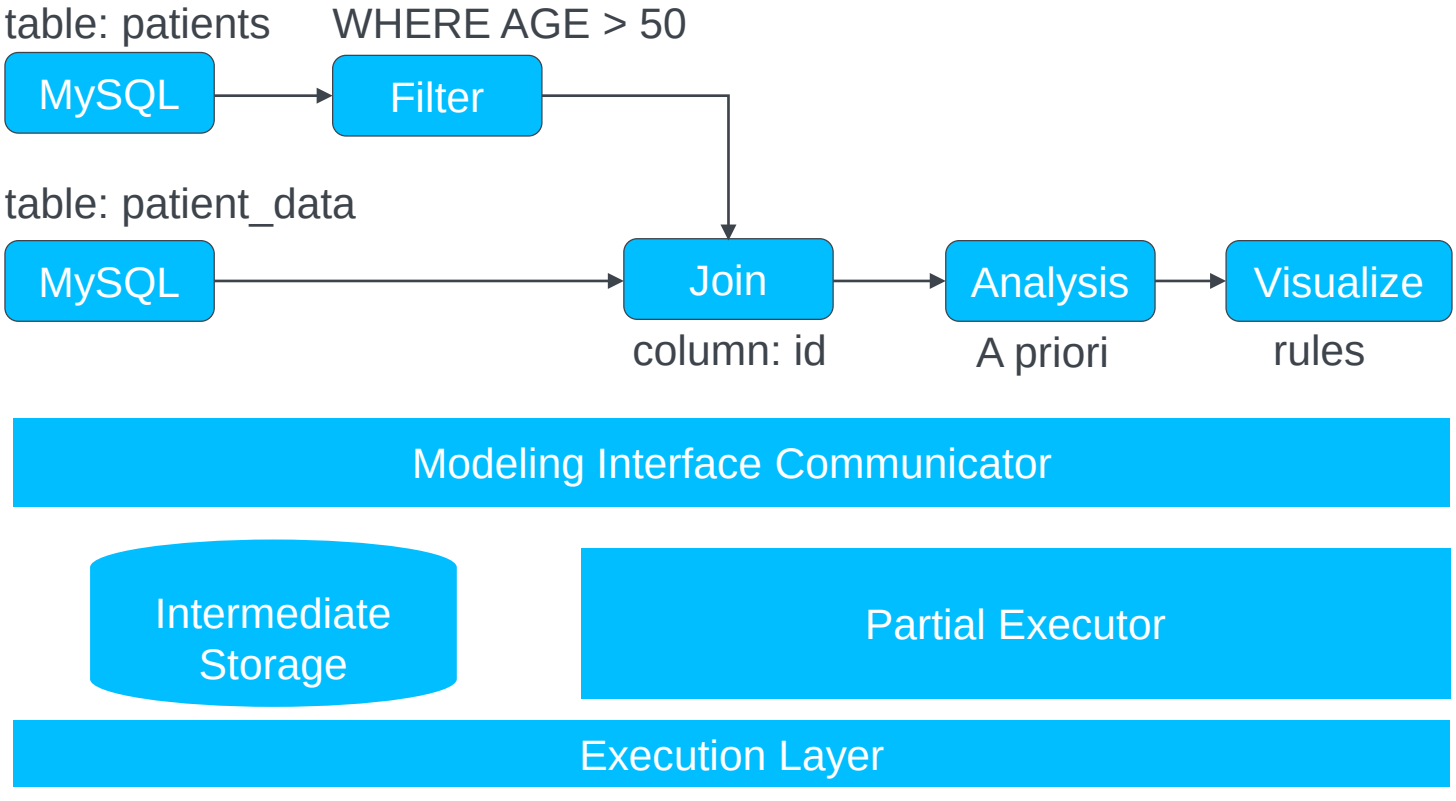
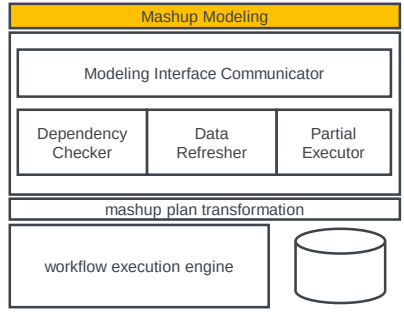


FlexMash Modeling Layer Adjustments



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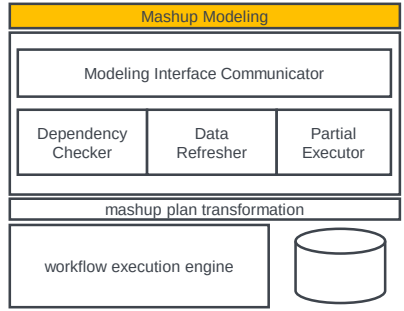

- Current state of execution

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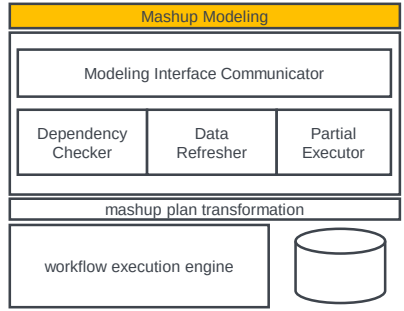

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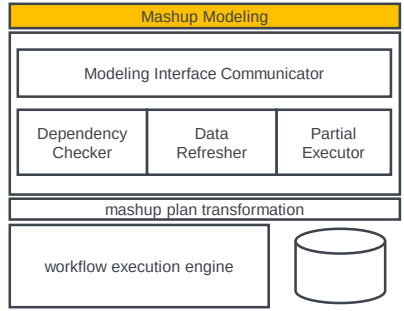

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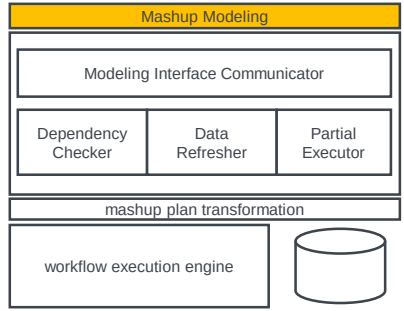

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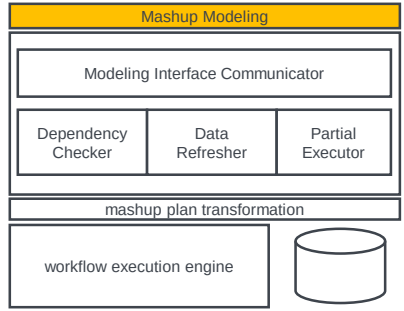

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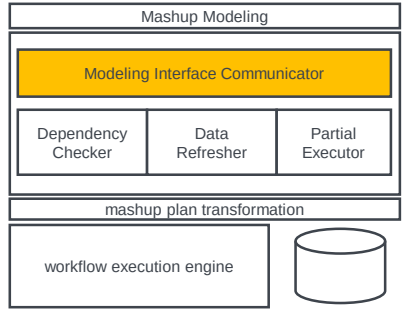
- Implicit execution instead of manual triggering
- Means to define lifetime of data in the data source nodes of the plan

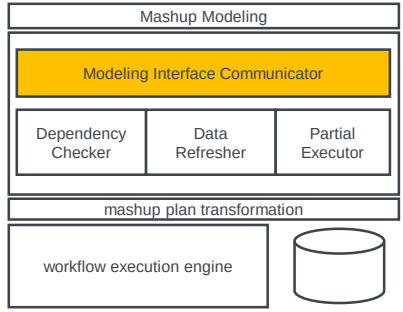
- State of execution is stored in the Partial Executor component

Modeling Interface Communicator



Modeling Interface Communicator

- Interface to the modeling layer



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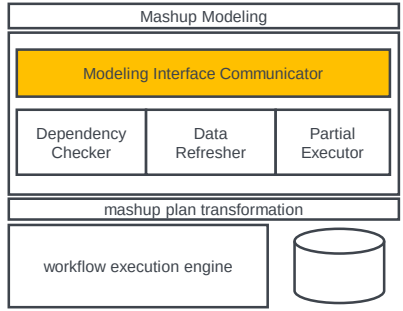
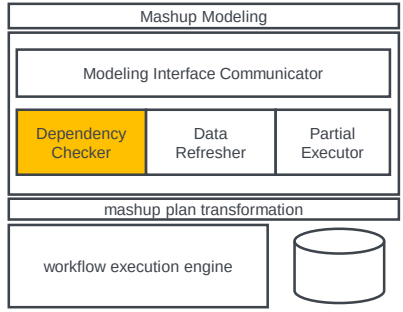
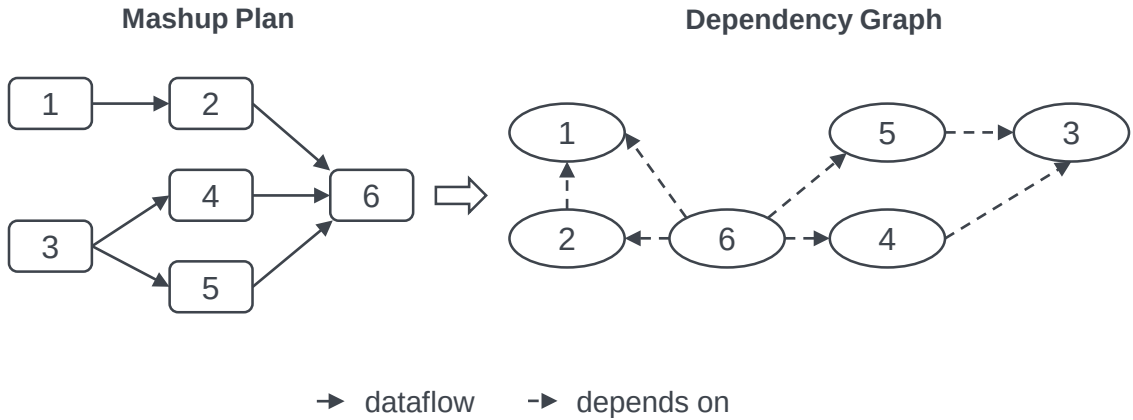


- Interface to the modeling layer
- Handles all the communication with the modeling layer
  - Delivers intermediate results
  - Offers information about the current state of execution
  - Coordinates all components

Dependency Checks



- Dependencies checked based on dependency graphs



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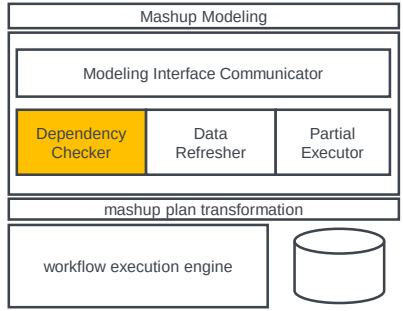

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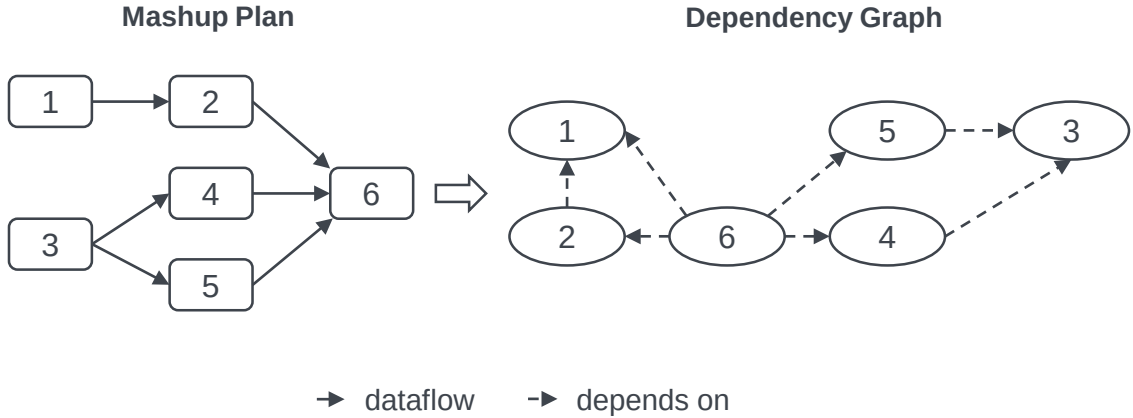
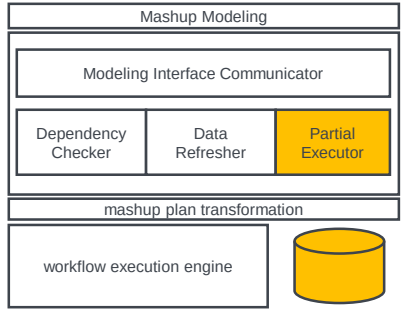


- Mashup Plan is transformed into dependency graph
- Constant updates of the graph necessary with changing Mashup Plans
- Dependency graph indicates which nodes can be executed

Partial Executor



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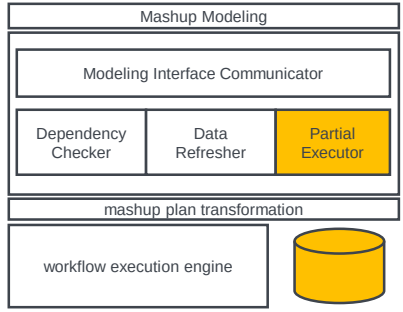

- Stores "twin" model of the Mashup Plan

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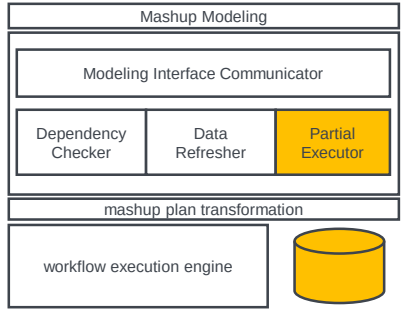

- Stores "twin" model of the Mashup Plan
  - Nodes, edges and current state of execution
  - Contains information about available intermediate results

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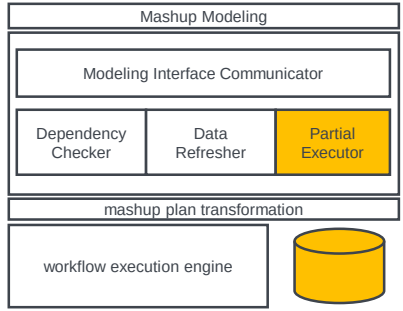

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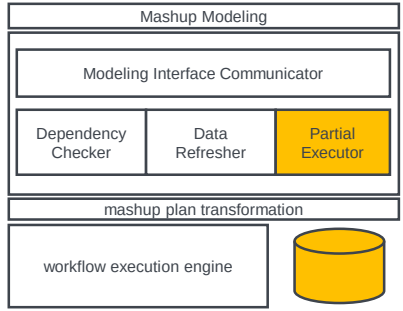

- Stores "twin" model of the Mashup Plan
  - Nodes, edges and current state of execution
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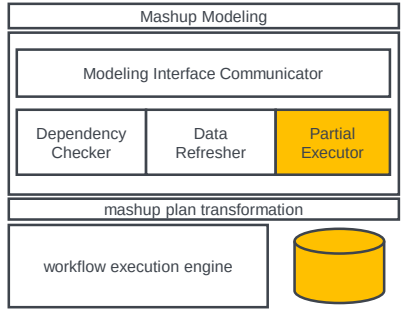
- Handles the partial execution
  - Execution triggered by Dependency Checker based on dependency graphs
  - Nodes without dependencies handed to transformation
  - Single nodes are executed in the workflow engine
  - Available intermediate results are used as input for execution

Partial Executor



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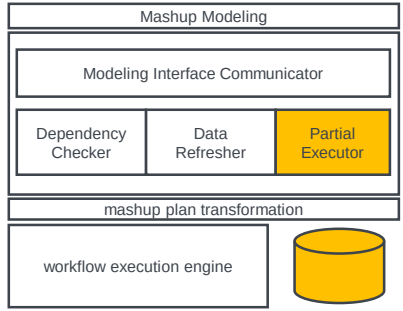

- Results
  - stored into an intermediate storage
  - handed to the front end to display intermediate results
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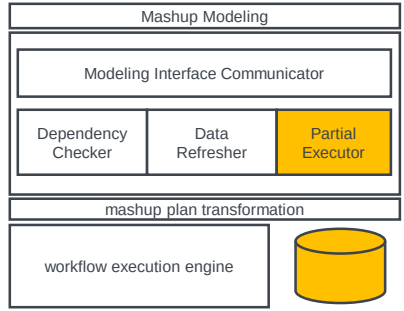

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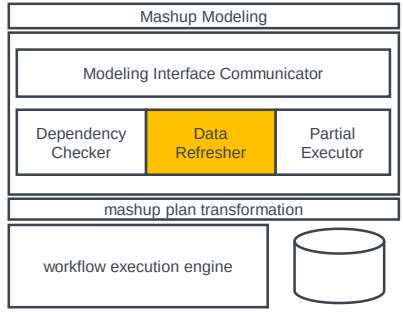
- Unsolved issue: How to cope with re-execution of currently executed (long-running) services?
  - Abort service execution and start over ➔ results are lost / costly ☹
  - Use current execution ➔ wrong results and/or stale data ☹

  ➔ Future work ☺

Data Refresher



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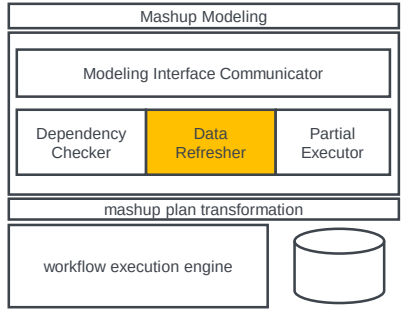

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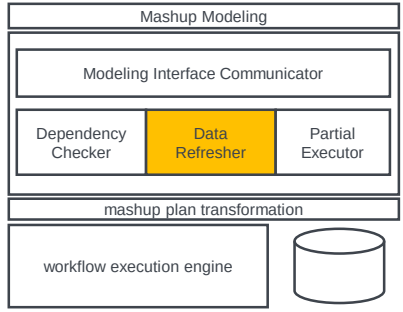

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  - Example:
    - High frequent sensor data = low lifetime
    - Non-frequent events = high lifetime

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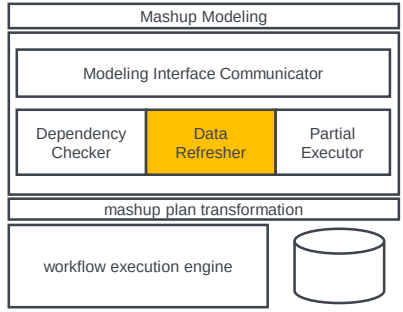

- Intermediate data becomes stale over time
- We need a means to define the lifetime of data!
  - Example:
    - High frequent sensor data = low lifetime
    - Non-frequent events = high lifetime
- Lifetime needs to be defined at the data sources on modeling level
  - Requires expert knowledge
- Data refresher removes stale data and triggers re-execution of services

Validation

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(R1) Definition of data expiration time

➔ experts can define the life time in the data source nodes

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(R6) User feedback

➔ provided through the user interface

Implementation

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- Working prototype of the introduced architecture

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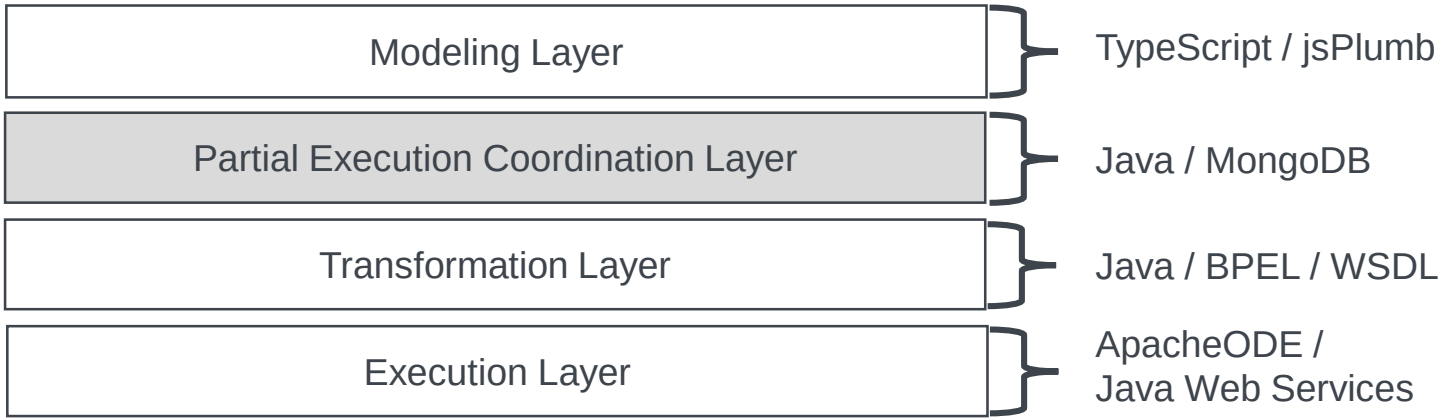
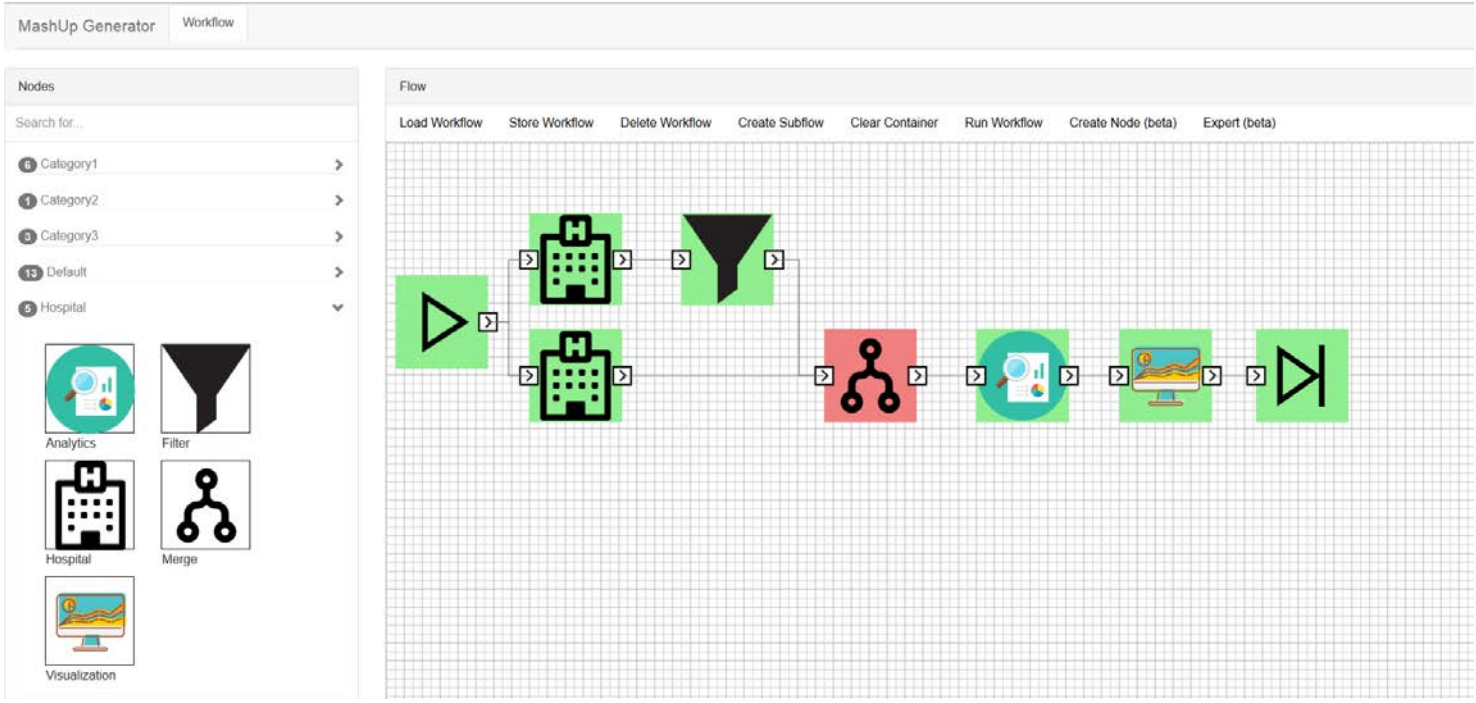
- Technologies used:



FlexMash – New UI



Conclusion and Future Work

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- "Felt" faster runtime of the Mashups

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- Future work
  - Execution of subgraphs instead of single nodes
  - User studies

CoMoRea´18

14th Workshop on Context and Activity Modeling and Recognition

- Workshop at the IEEE International Conference on Pervasive Computing (Percom)
- Focus of the workshop
  - advance the state of the art in context modeling and reasoning
  - discuss fundamental issues in context processing and management
  - identify concepts, theories and methods applicable to context modeling and context reasoning

- **Where?** Athens
- **When?** March 19th to March 23rd

- **Workshop paper submission deadline: Nov 11, 2017**

CoMoRea´18

14th Workshop on Context and Activity Modeling and Recognition

- Organizing Committee
  - Heiner Stuckenschmidt, Universität Mannheim, Germany
  - Matthias Wieland, Universität Stuttgart, Germany
  - Pascal Hirmer, Universität Stuttgart, Germany
- Advisory Board
  - Christian Becker, Universität Mannheim, Germany
  - Jadwiga Indulska, The University of Queensland, Australia
  - Daniela Nicklas, University of Bamberg, Germany
  - Daniele Riboni, University of Cagliari, Italy

Topics of interest

- Context modeling techniques and domain-specific context models
- Ontology-based approaches to context modeling and reasoning
- Ontologies of Activities and Context
- Hybrid context models and advanced issues in context modeling, including issues of information quality, ambiguity, and provenance
- Context reasoning algorithms, their complexity and accuracy
- Discovery, reuse, privacy, security and trust of context information
- Distributed and scalable context management
- Tool support for context modeling and development of context model-based applications
- Machine learning and reasoning techniques for context and activity recognition
- High Level Activity Recognition from Sensor Data
- Machine Learning and Computer Vision for Context and Activity Recognition
- Reference Datasets and Benchmarks for Activity Recognition and Context Reasoning

Universität Stuttgart

Vielen Dank!

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