Provenance challenge 3 and Taverna

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Information Management Group

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Provenance Challenge 3 meeting

Amsterdam, June 10-11, 2009

Interpreting the challenge

1. Implement the challenge workflow

2. Answer the core (+optional) challenge queries

3. Produce and export OPM

4. Import and consume OPM

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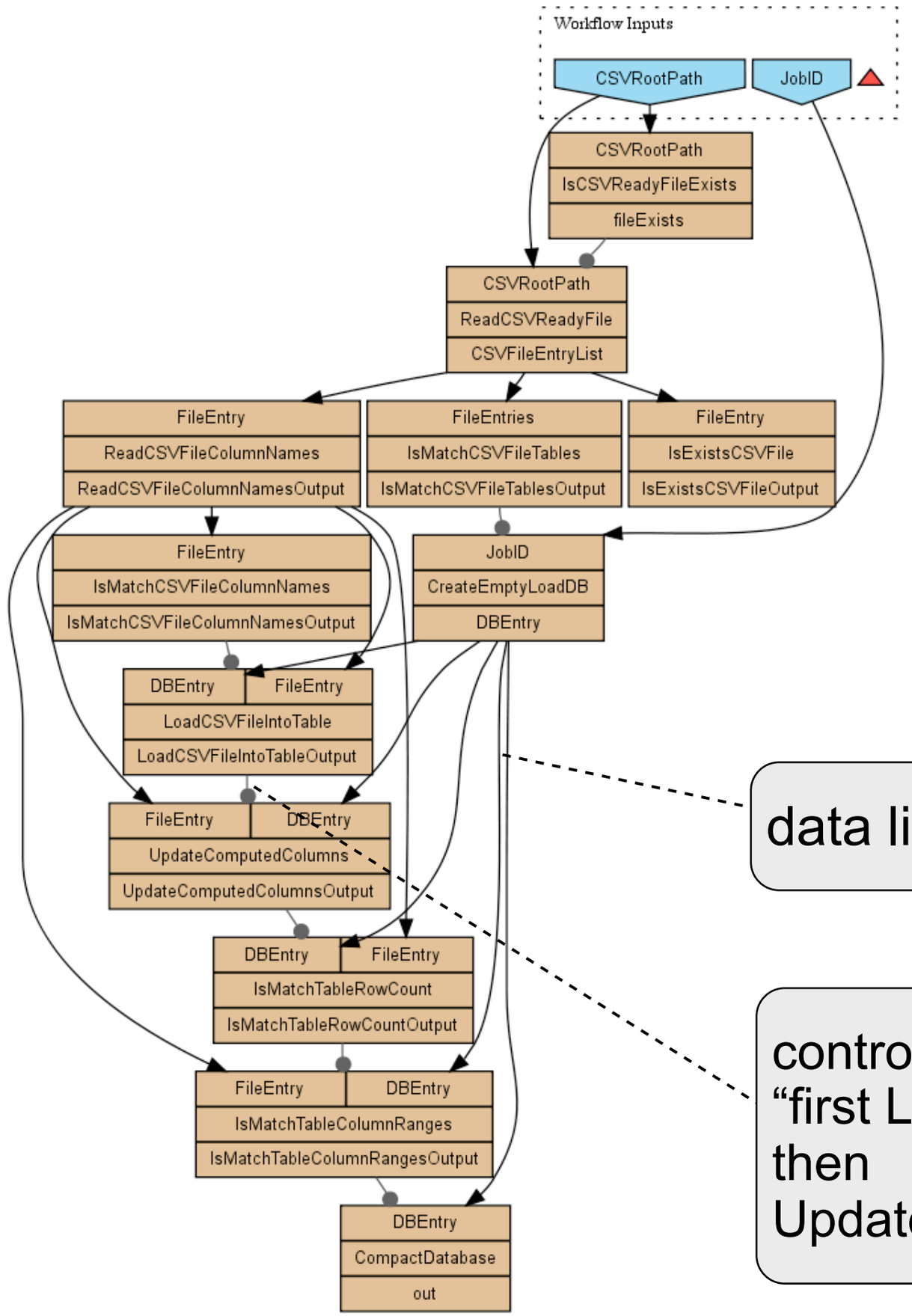
  - OPM generation is now fully integrated into TP query answering
- Map an OPM graph to an instance of a TP causal graph
- Use TP queries to answer the same challenge queries as above
  - TP query processing requires a representation of the *originating workflow*
  - This required generating the “minimal plausible originating dataflow” (**MPOD**) for the OPM graph

The challenge workflow as a Taverna dataflow



data links

control links:
“first LoadCSVFileIntoTable, then UpdateComputedColumns”

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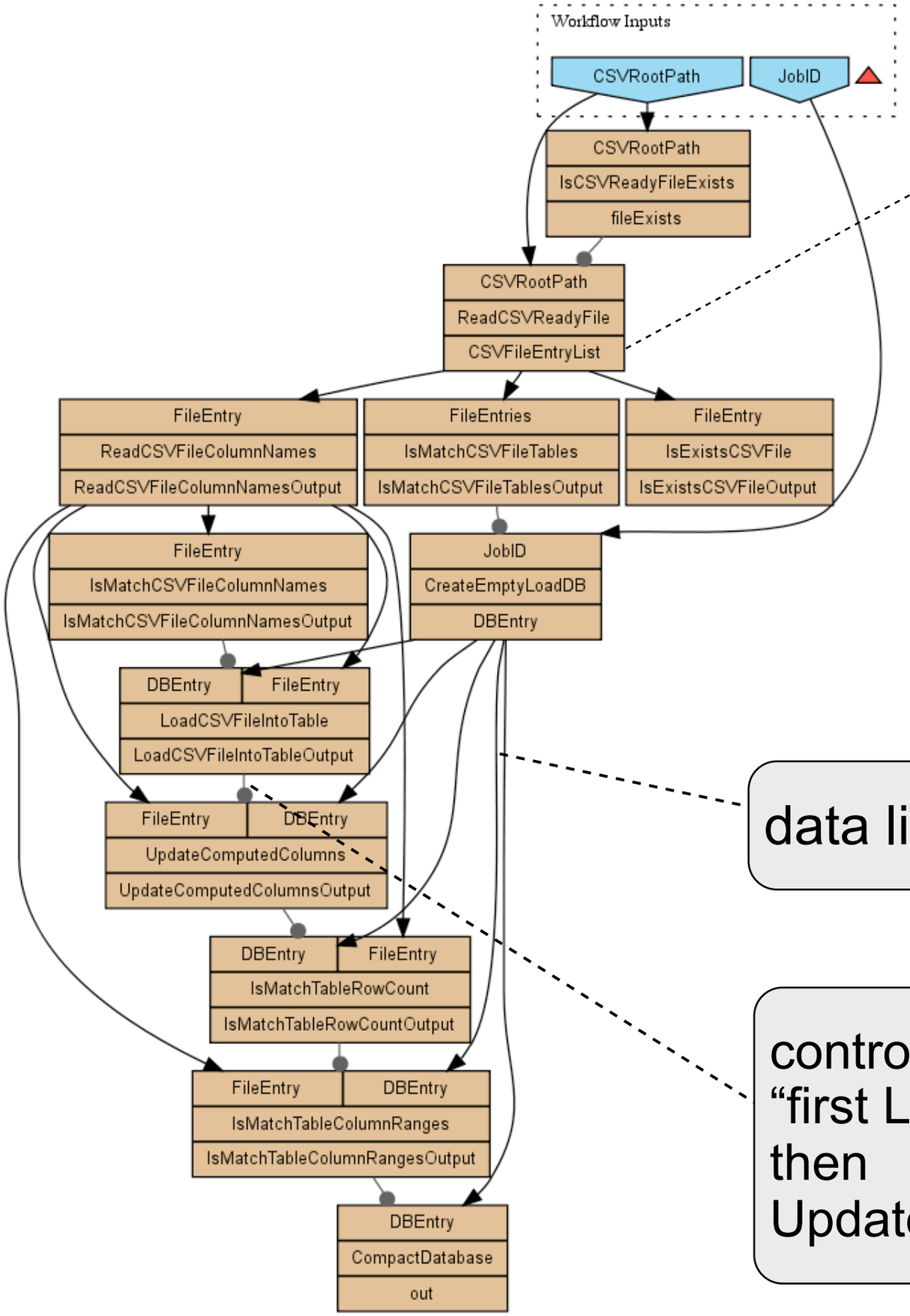

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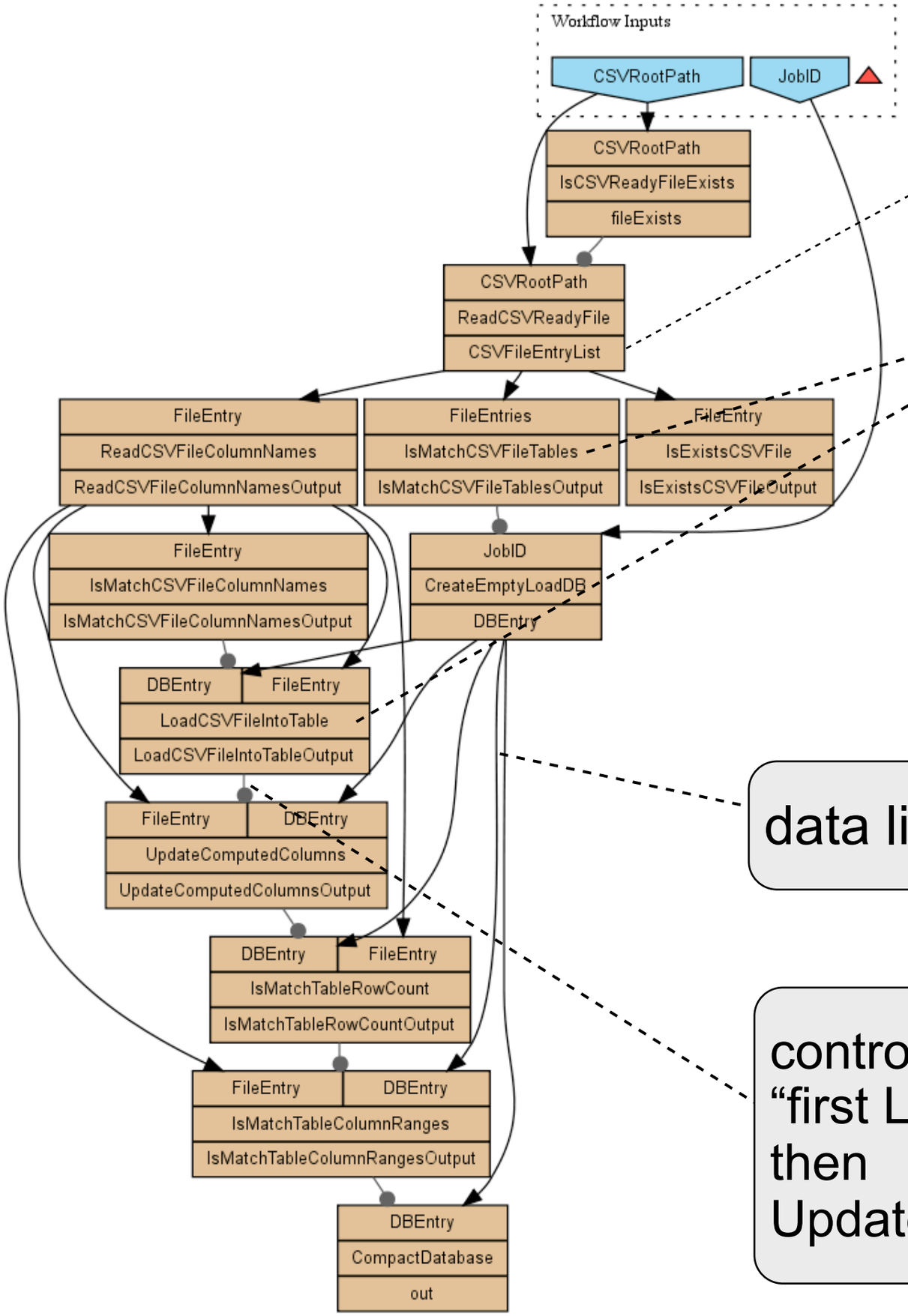

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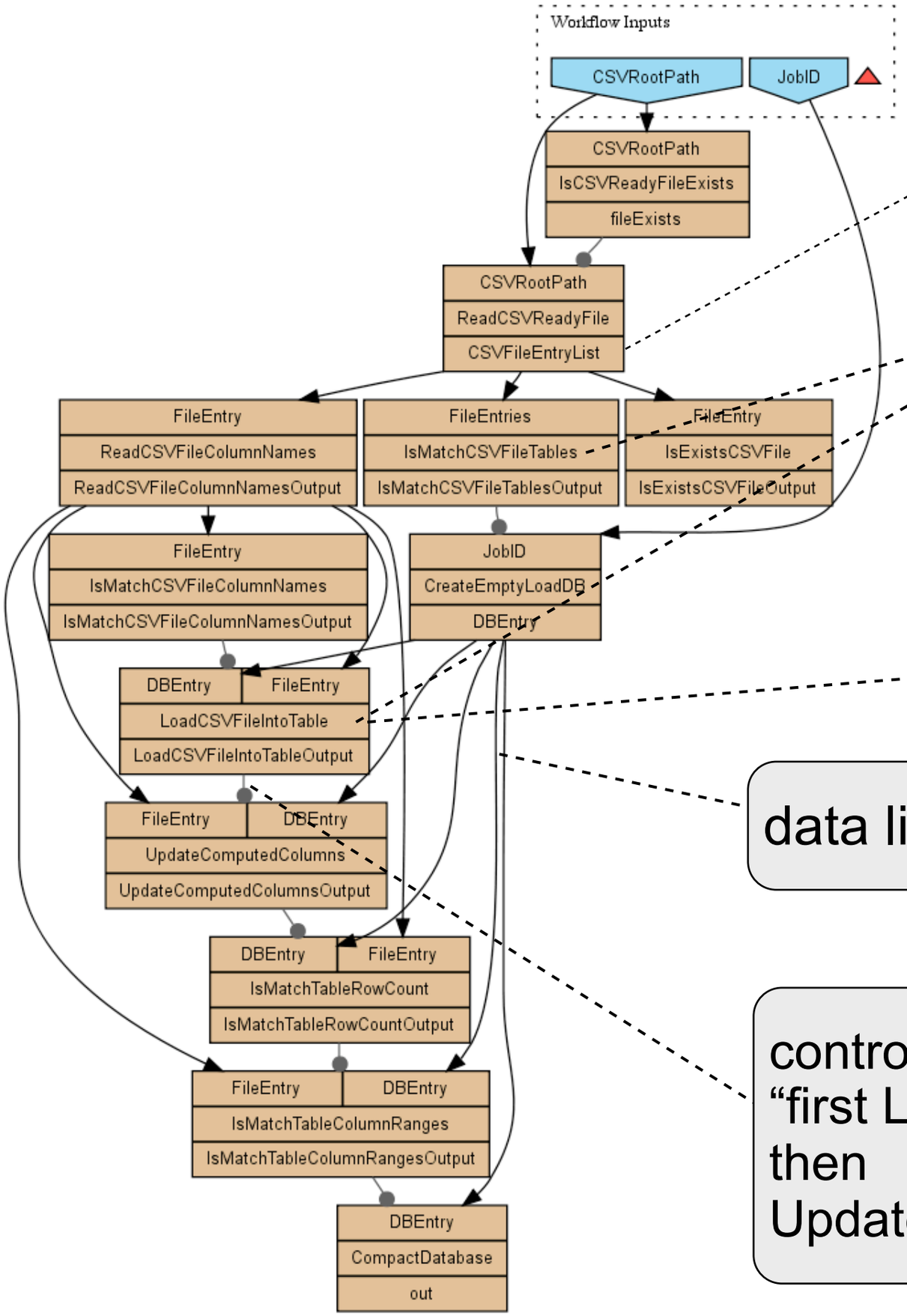

this produces a list...

...these consume one item of the list at a time....

the resulting iteration over the lists occurs automatically

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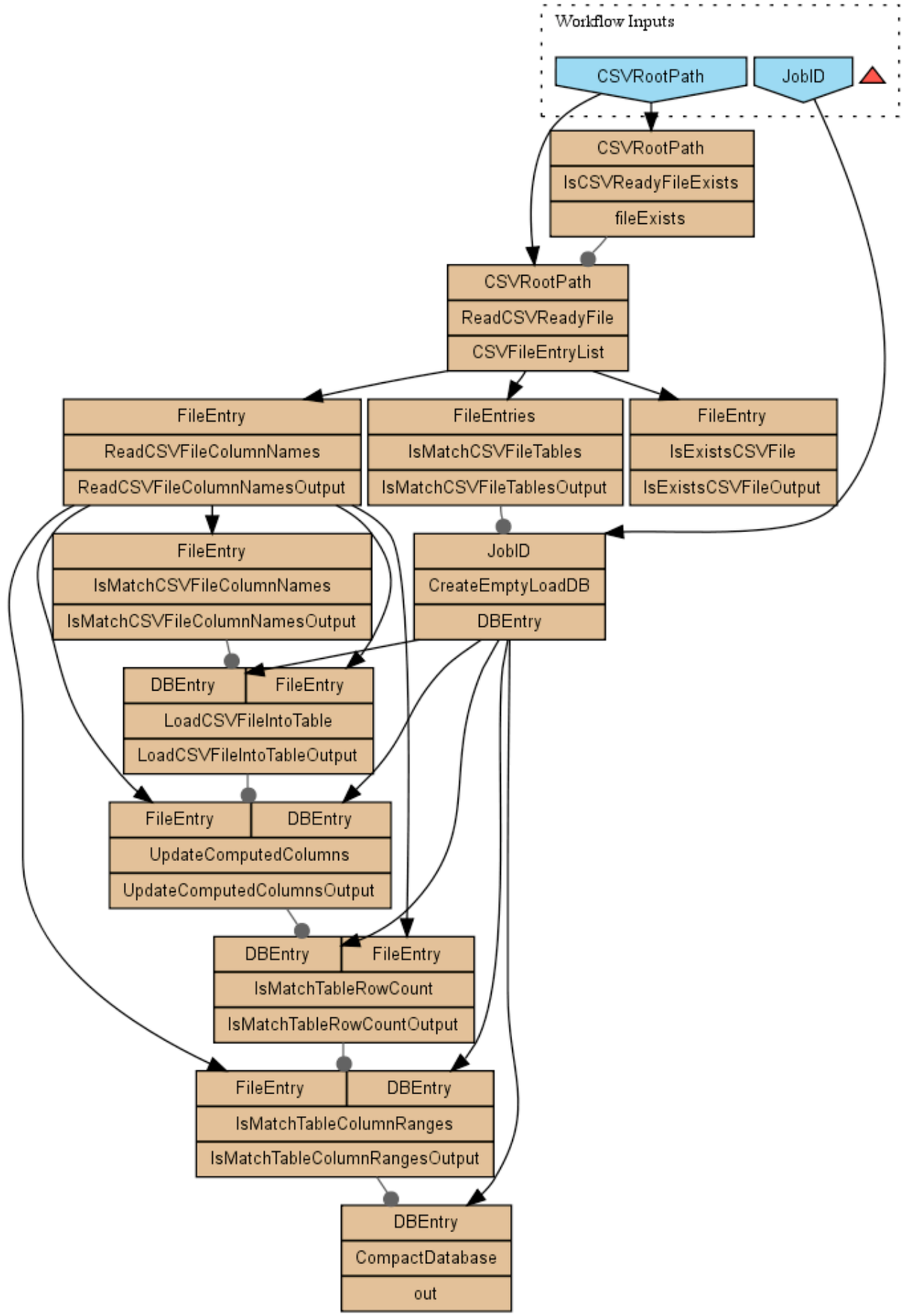
TP query model and new requirements



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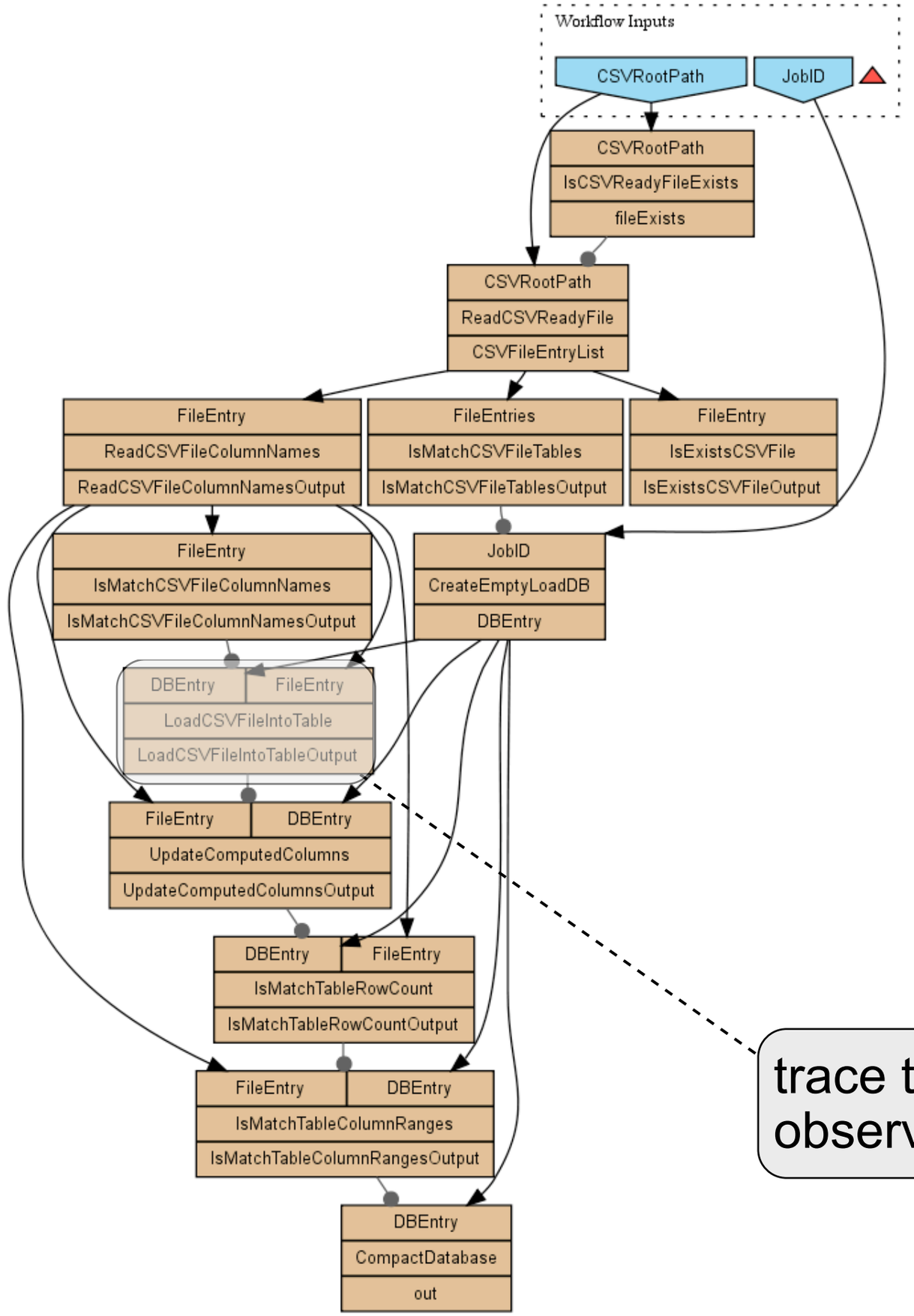

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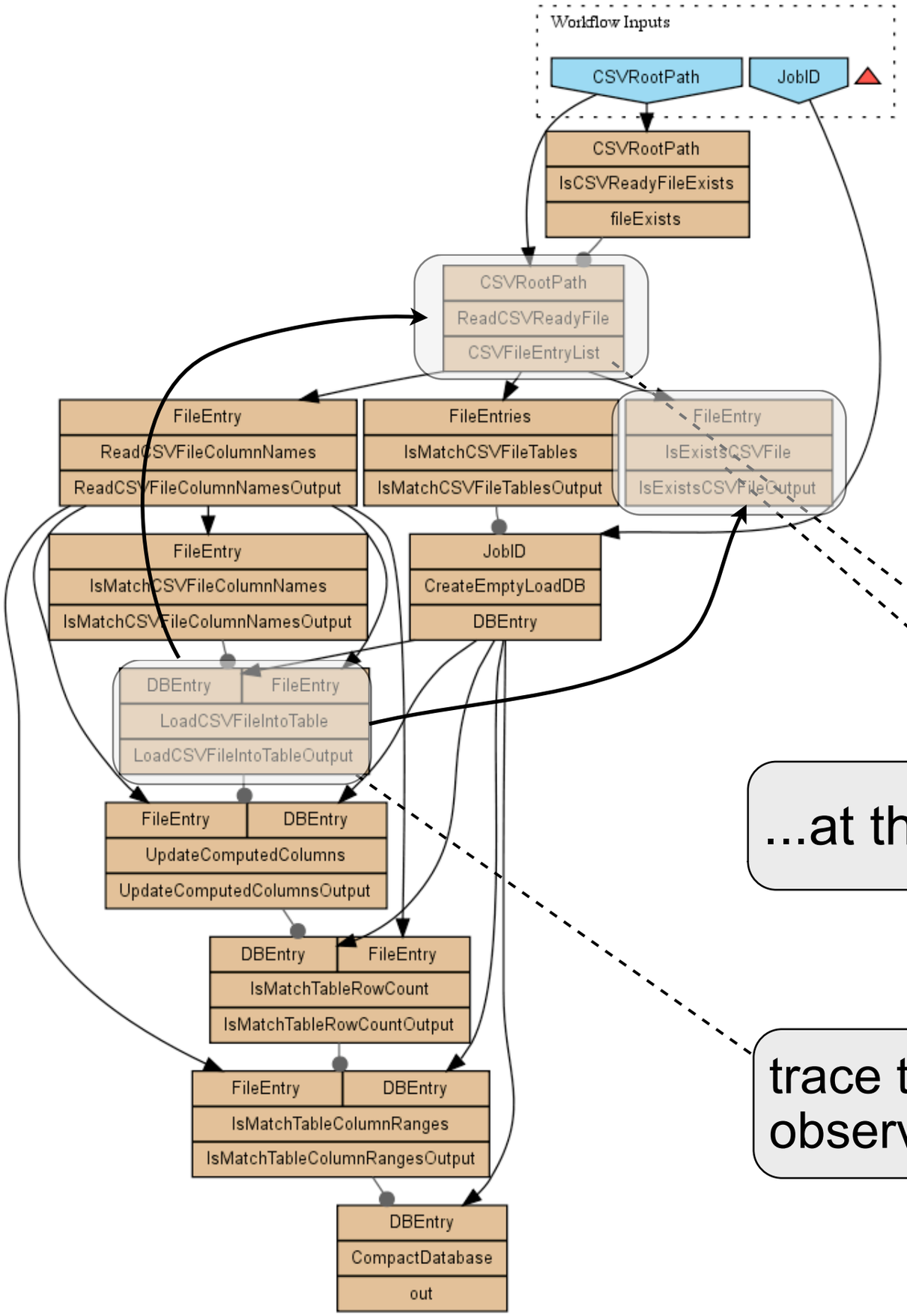

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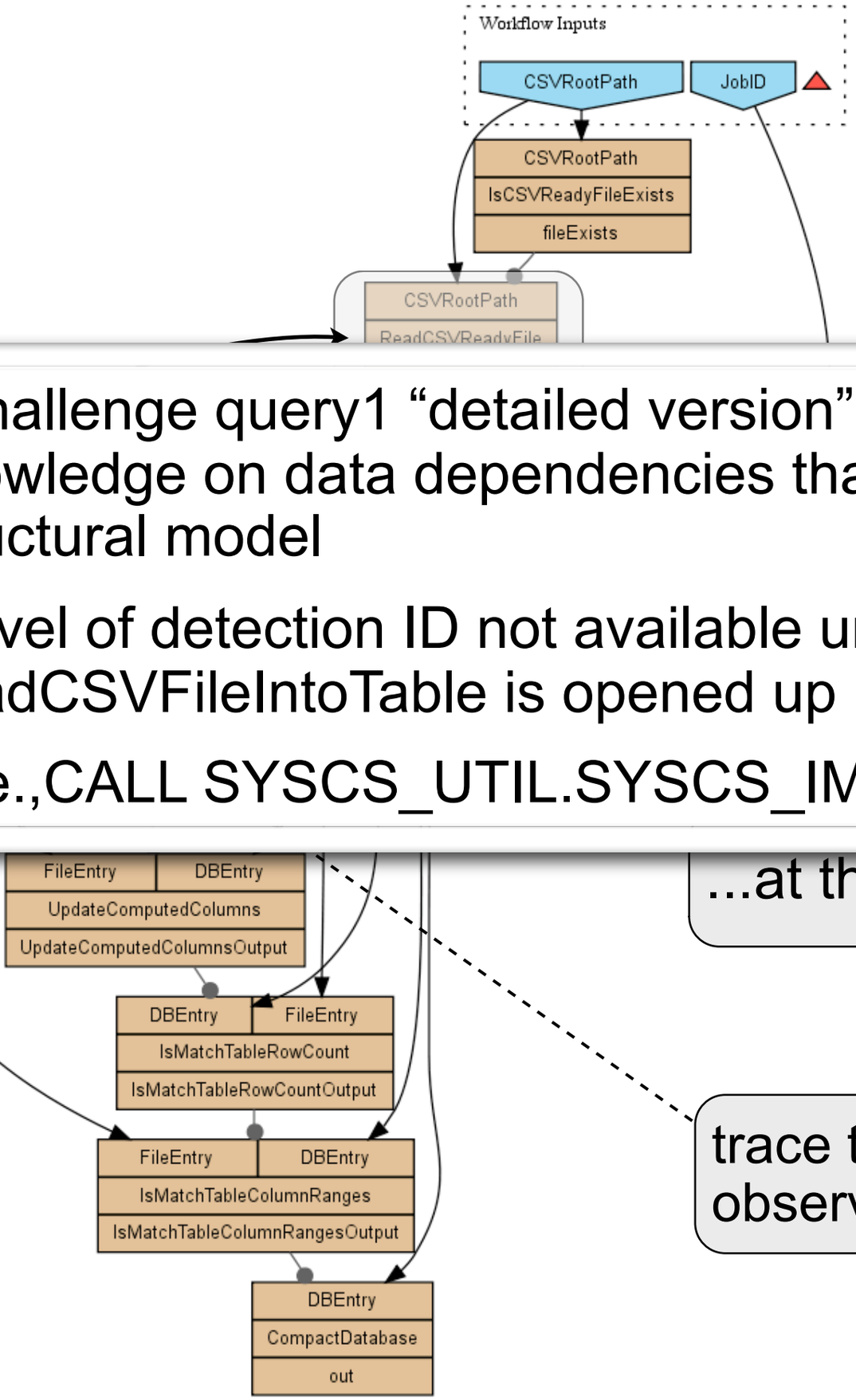


- queries are purely structural, no semantics
- queries can be answered only ...at these points in the workflow

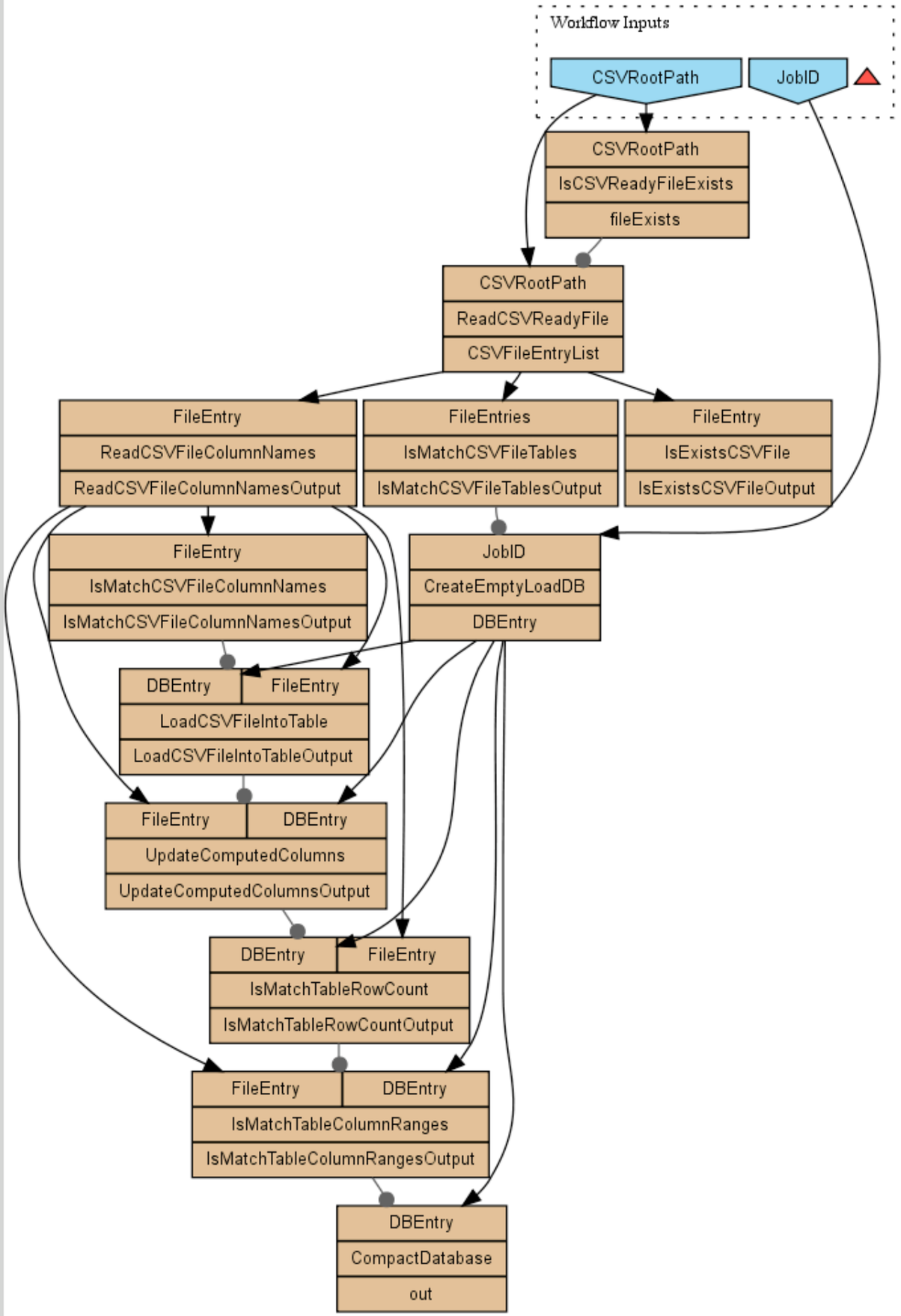
trace the lineage of values observed here...

- challenge query1 “detailed version” seems to require more knowledge on data dependencies than those obtained from this structural model

- level of detection ID not available unless query black box in LoadCSVFileIntoTable is opened up

- i.e.,CALL SYSCS_UTIL.SYSCS_IMPORT_TABLE (?,?,?,?,?,?,?)

Integrated OPM generation as part of TP query



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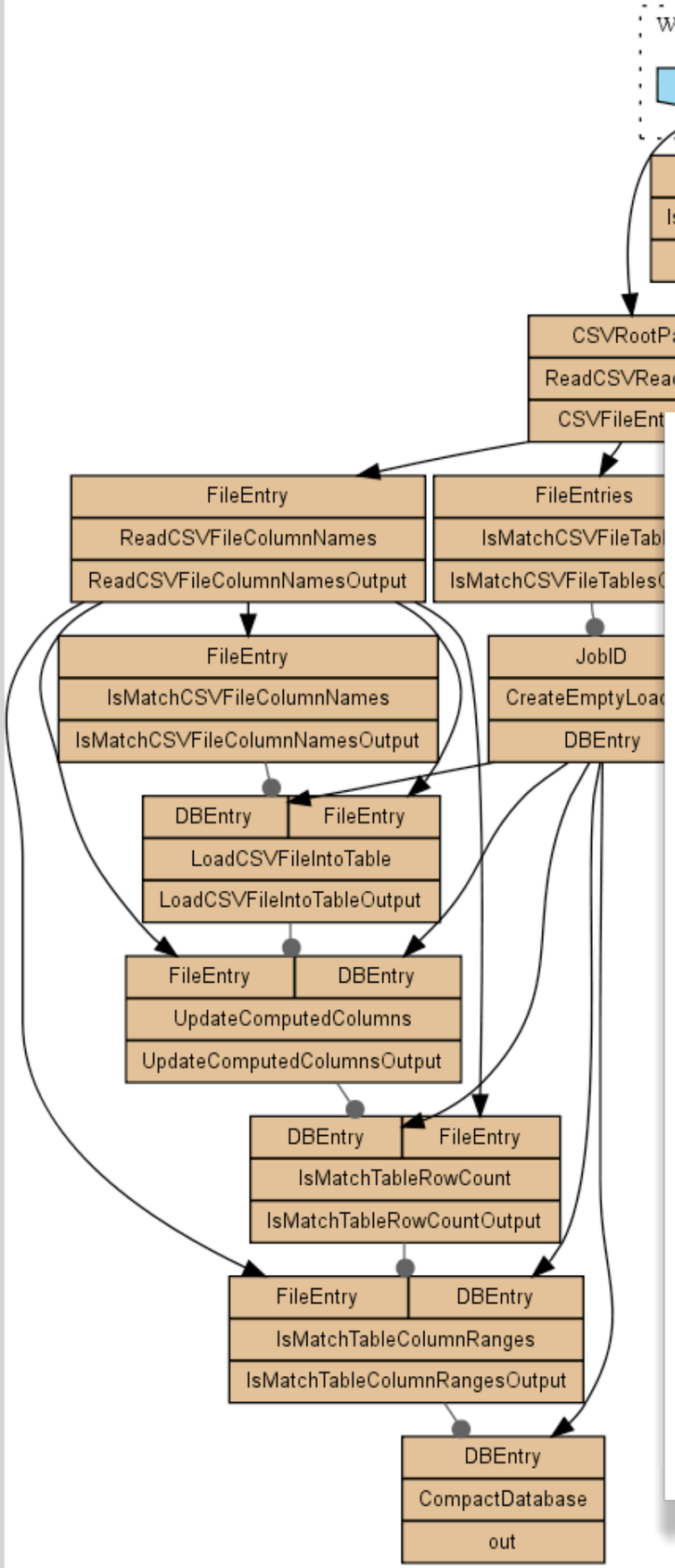
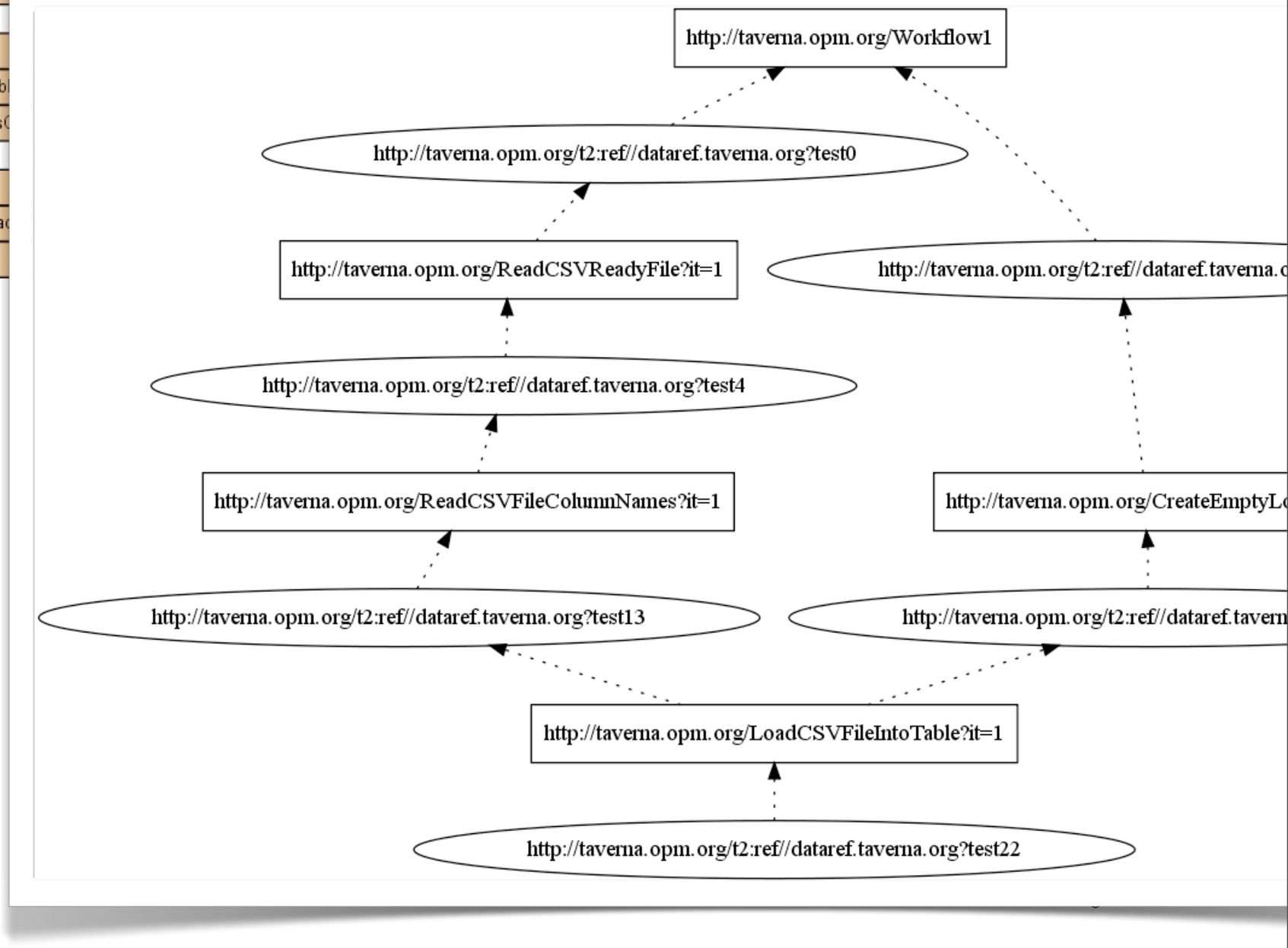
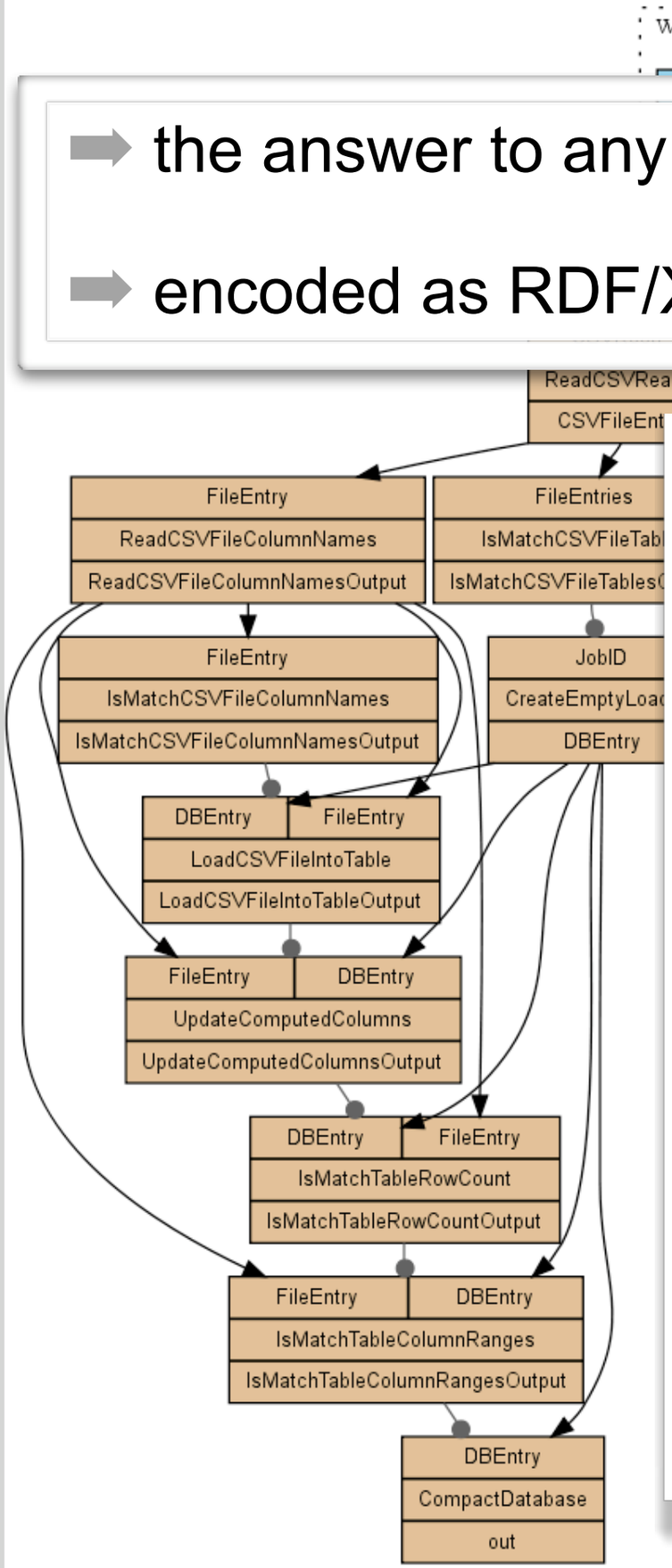
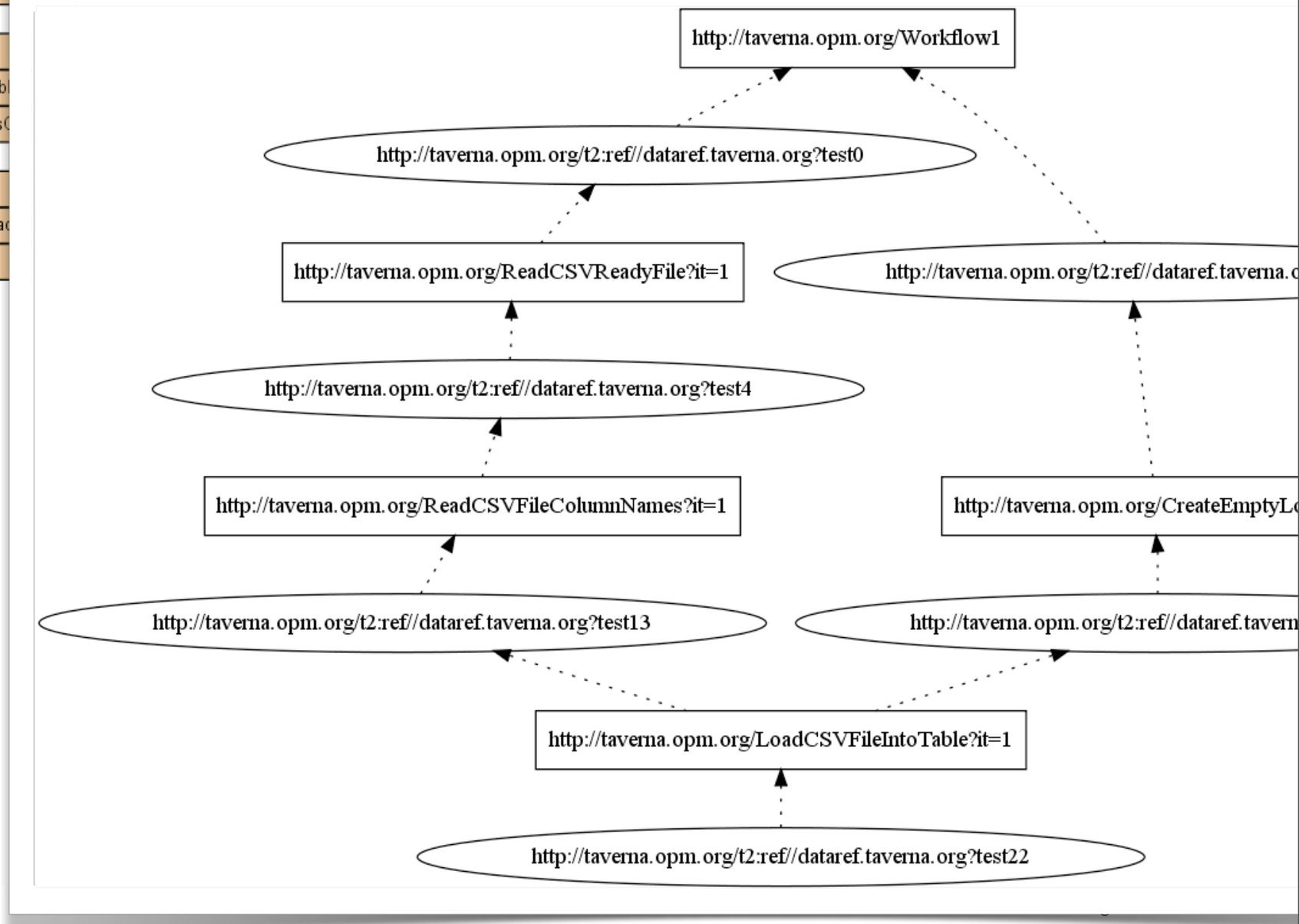




Integrated OPM generation as part of TP query

- the answer to any TP query can be viewed as an OPM graph
- encoded as RDF/XML using the Tupelo provenance API.

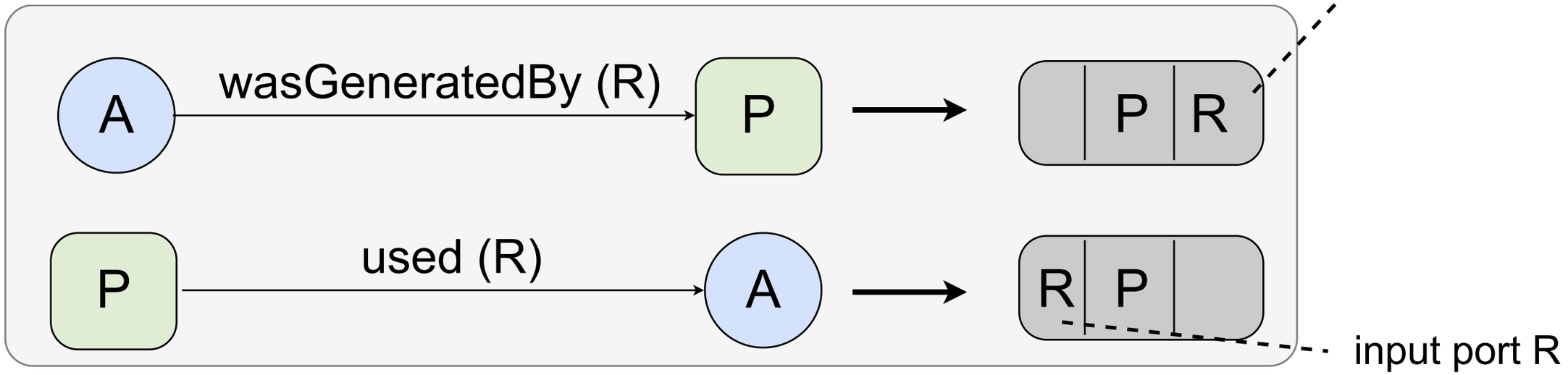




MPOD generation rules - I

MPOD = Minimal Plausible Originating Dataflow

- induced from an OPM graph
- The TP query models requires a workflow structure
- this is a first approximation...subject to refinement



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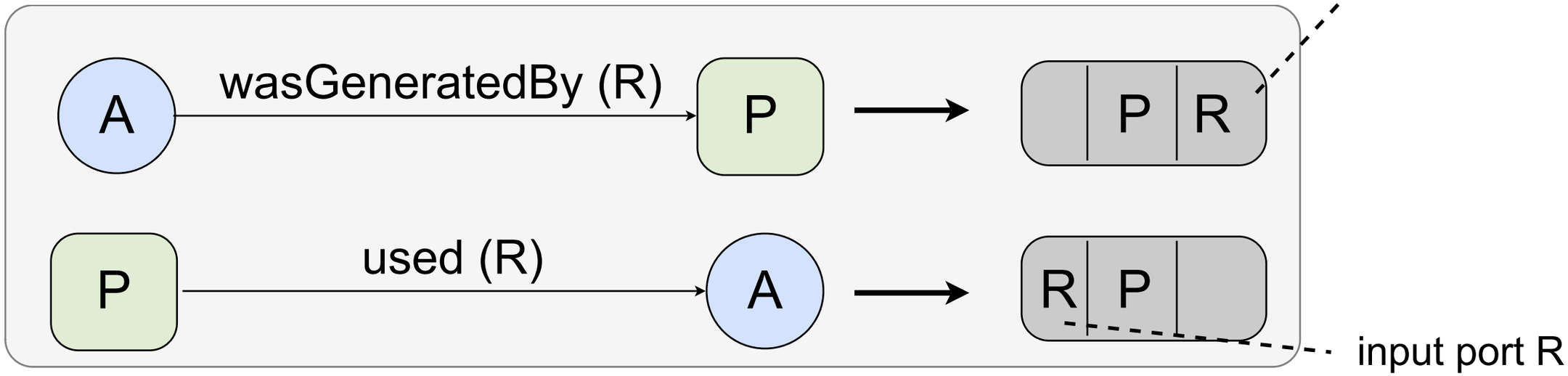
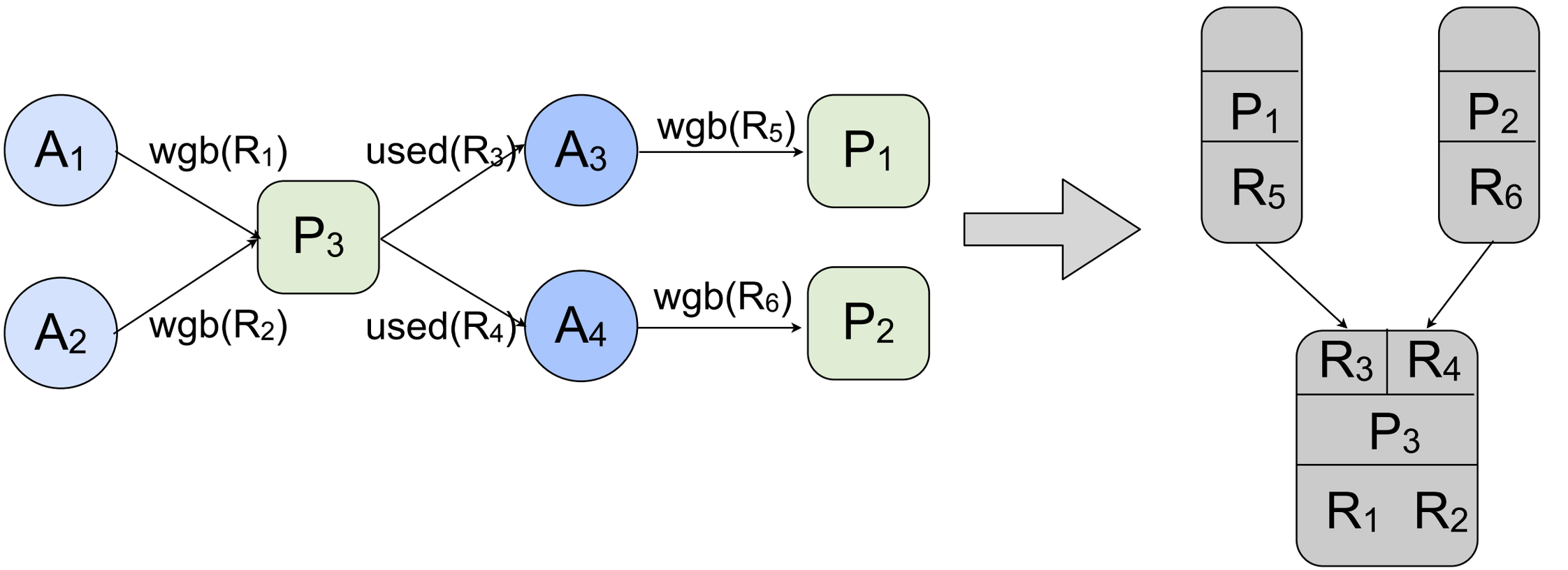
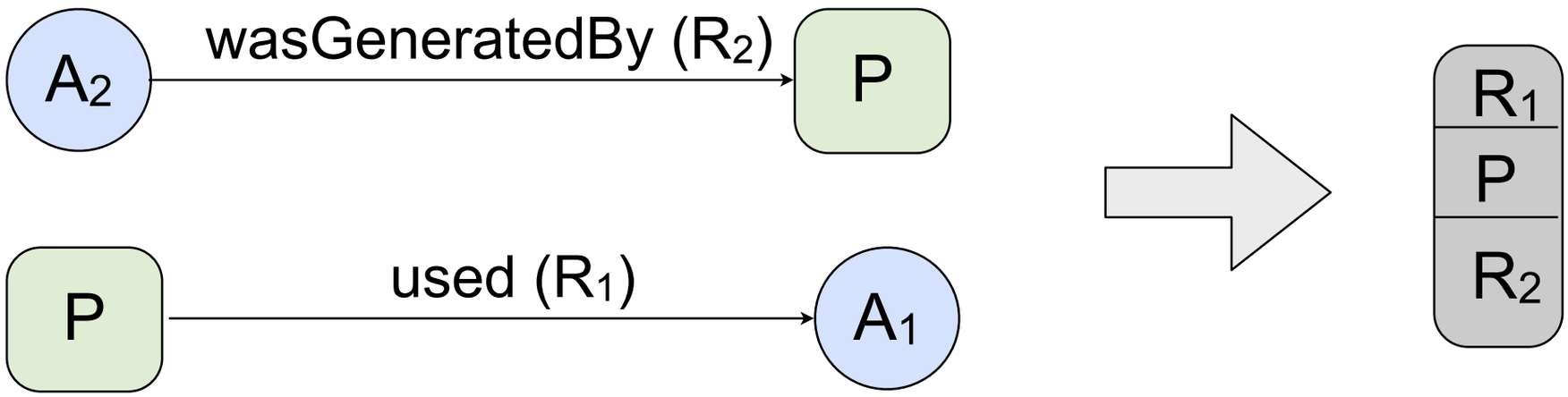




MPOD generation rules - II

Derived property:

This is usually inferred, i.e. there exist P, R_1, R_2 such that:



Note 1: if the corresponding “wgby” and “used” edges are not found, then new P, R_1, R_2 are created and added to the graph

- however, in all cases encountered so far, wasDeterminedFrom was inferred: P, R_1, R_2 appear in existing wgb(R) and used(R) edges

Note 2: wasControlledBy and wasTriggeredBy ignored for now

Note 3: a separate MPOD is created *for each account* in the OPM graph

Importing OPM for the challenge

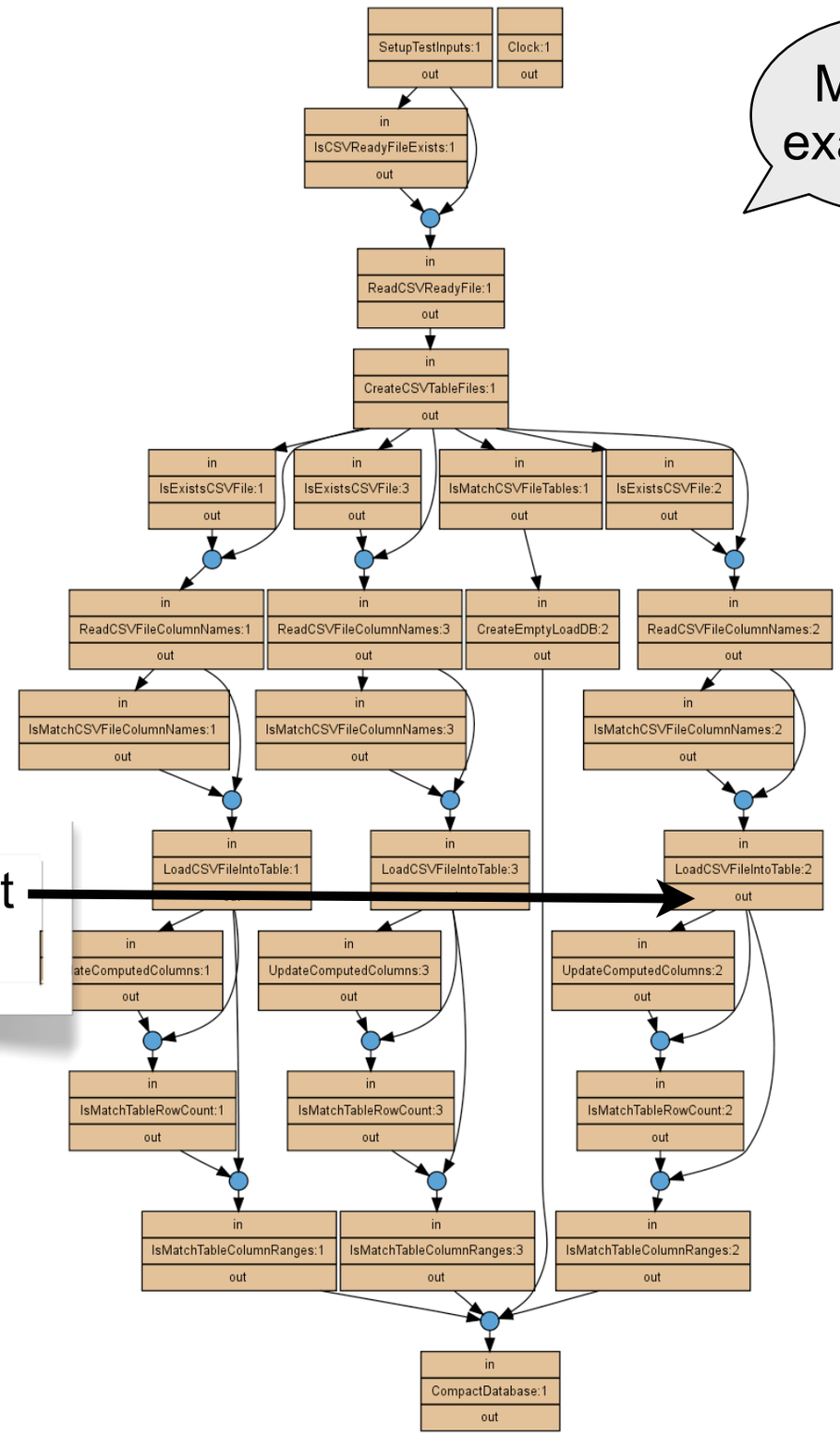
- OPM contributions successfully imported so far:
  - UC Davis
  - NCSA
  - SOTON

(links to PC3 / UoM wiki page)

- Example (UC Davis)

Which operation executions were strictly necessary for the Image table to contain a particular (non-computed) value?

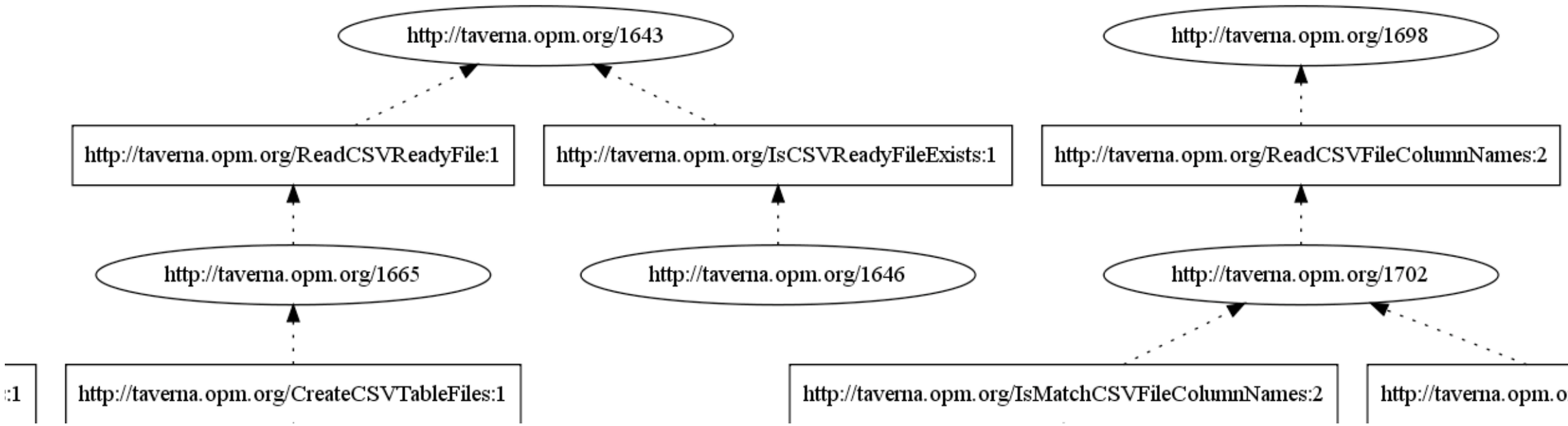
query.variables: LoadCSVFileIntoTable:2 / out
query.processors=ALL



MPOD example!

Example -- query 3 result

- Ideally, the imported graph + MPOD allow provenance queries to be submitted to the imported graph just as if it were a native TP graph
- The answer is viewed as a new OPM graph itself



Lossless mappings using OPM and MPOD

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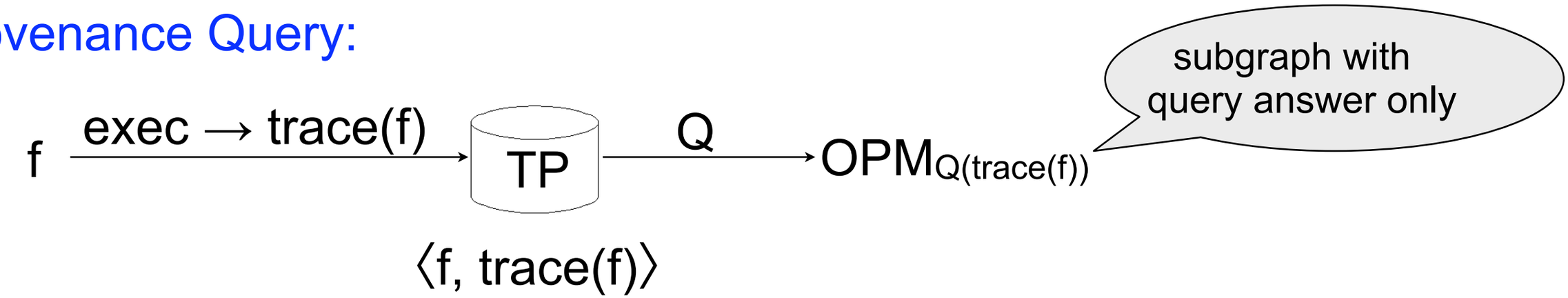
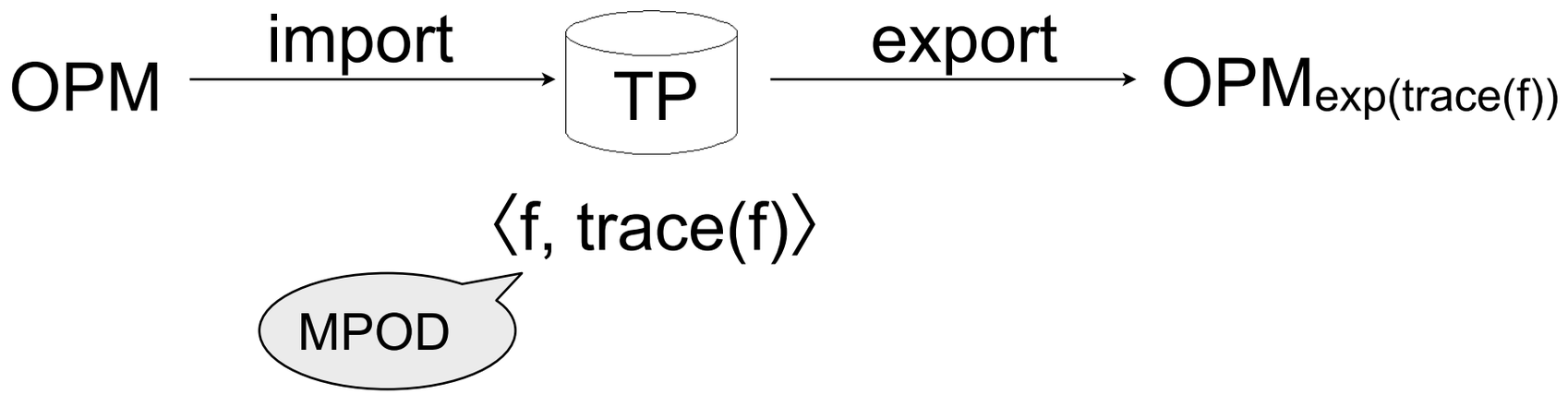


Export to OPM:

export is just a query exp(trace(f)) that returns the entire trace

Import from OPM:



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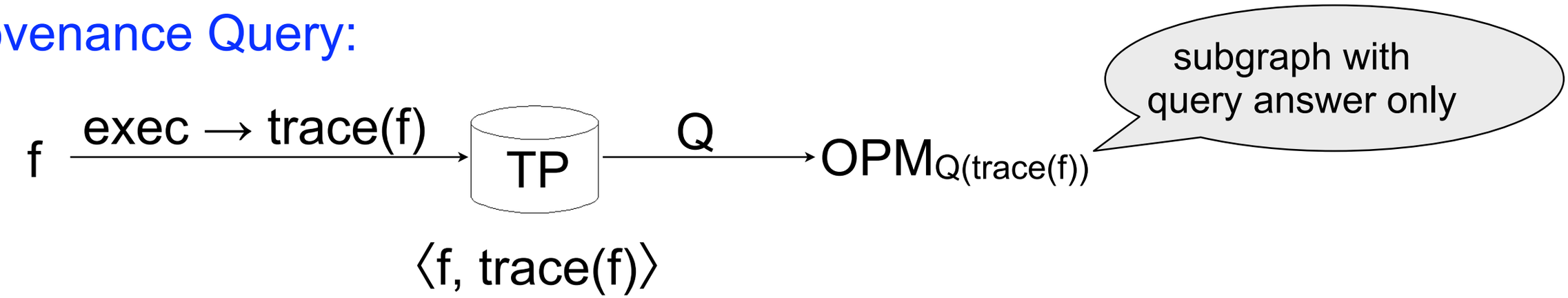

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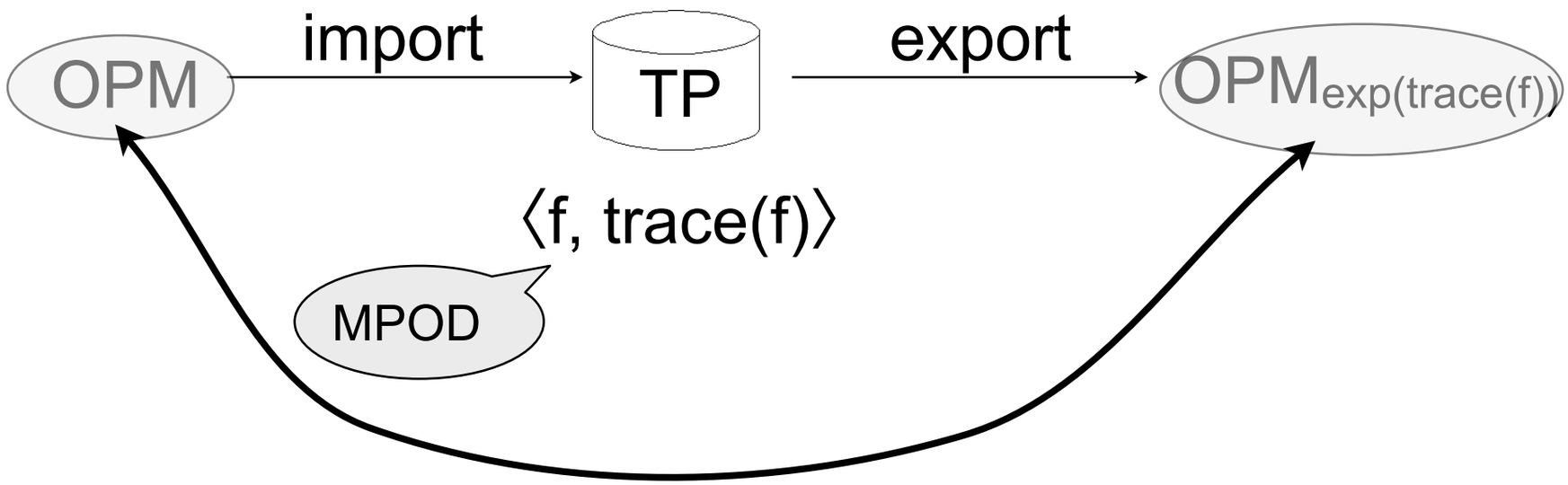
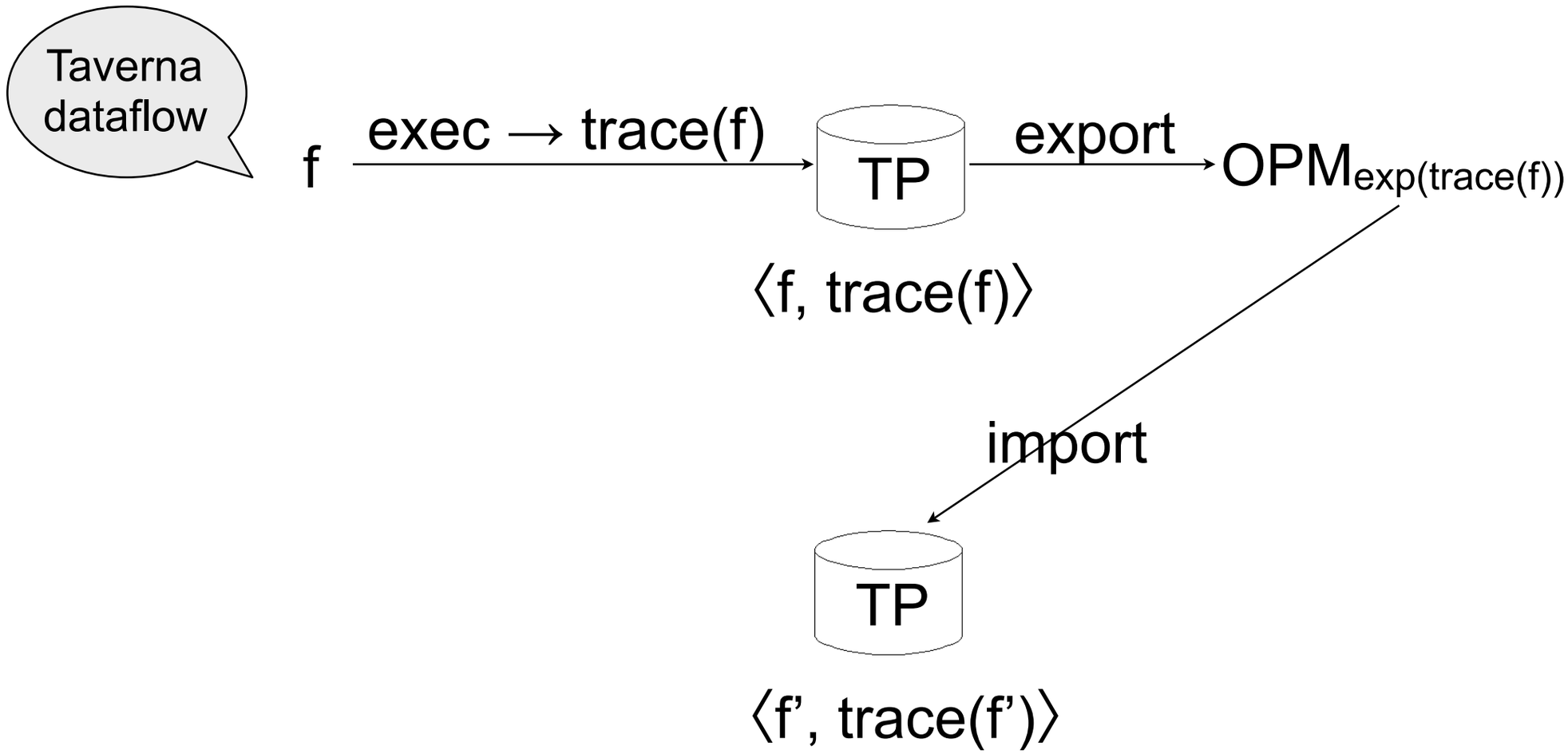


when is this transformation loss-less?

TP = Taverna Provenance model

More on lossless-ness and OPM



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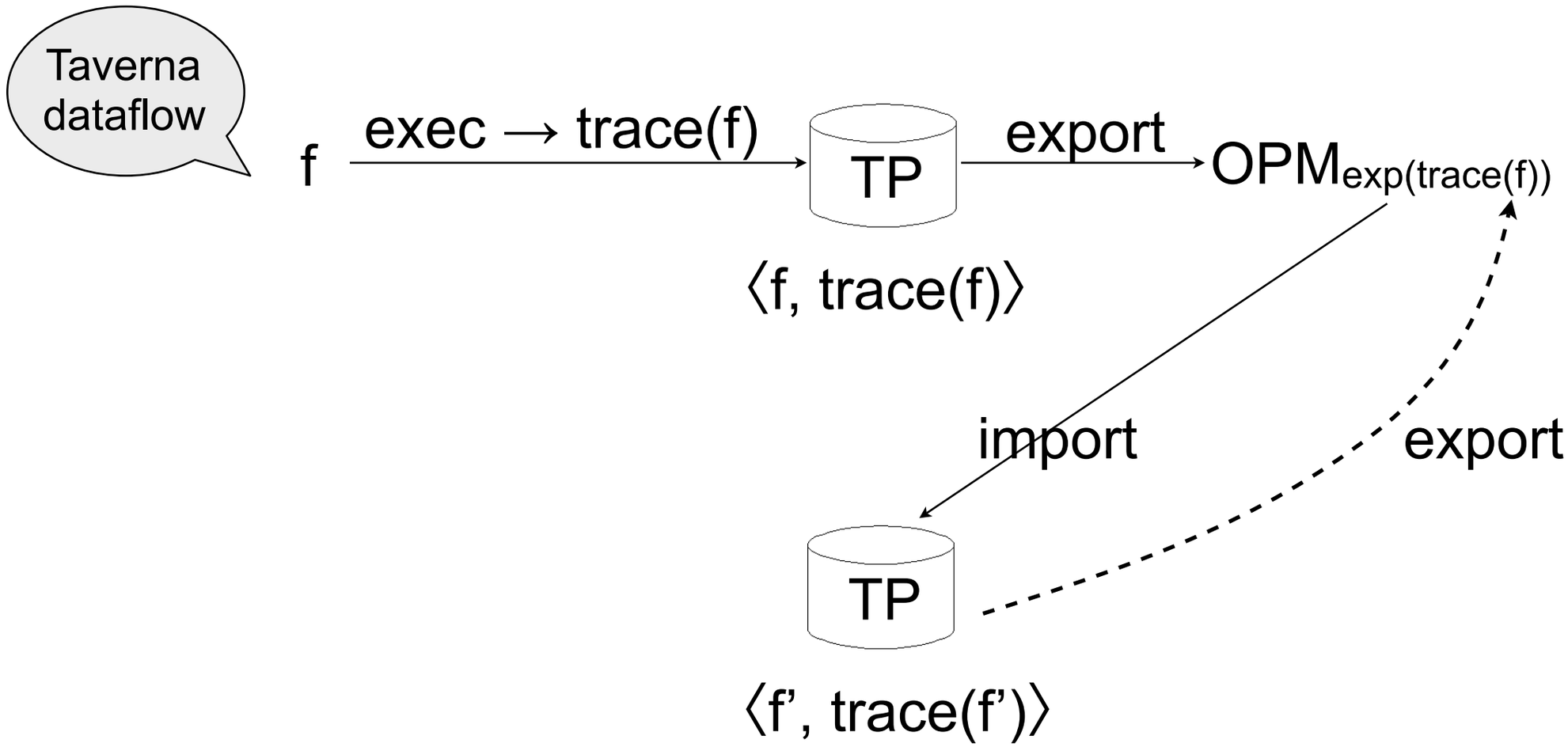

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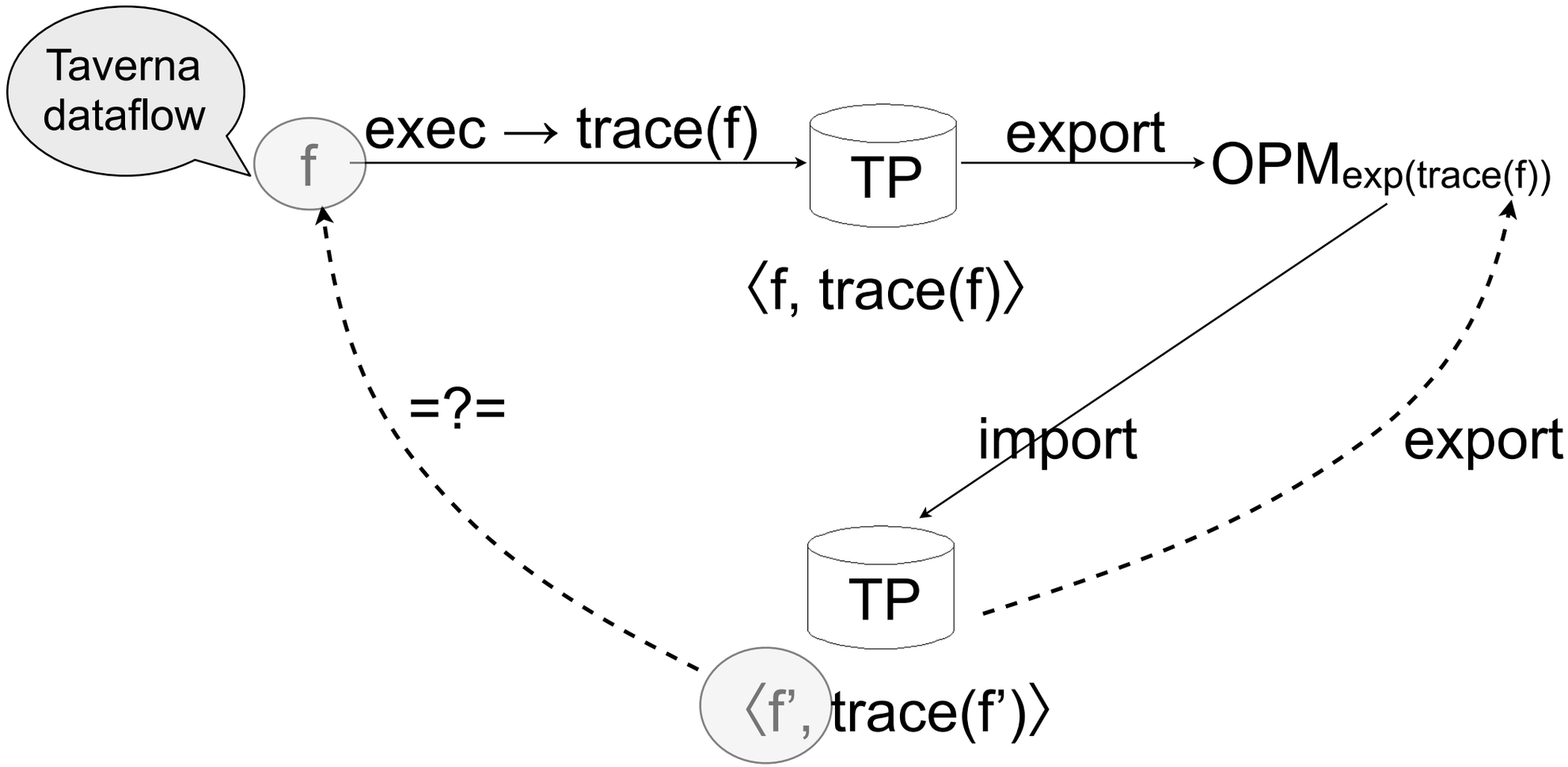

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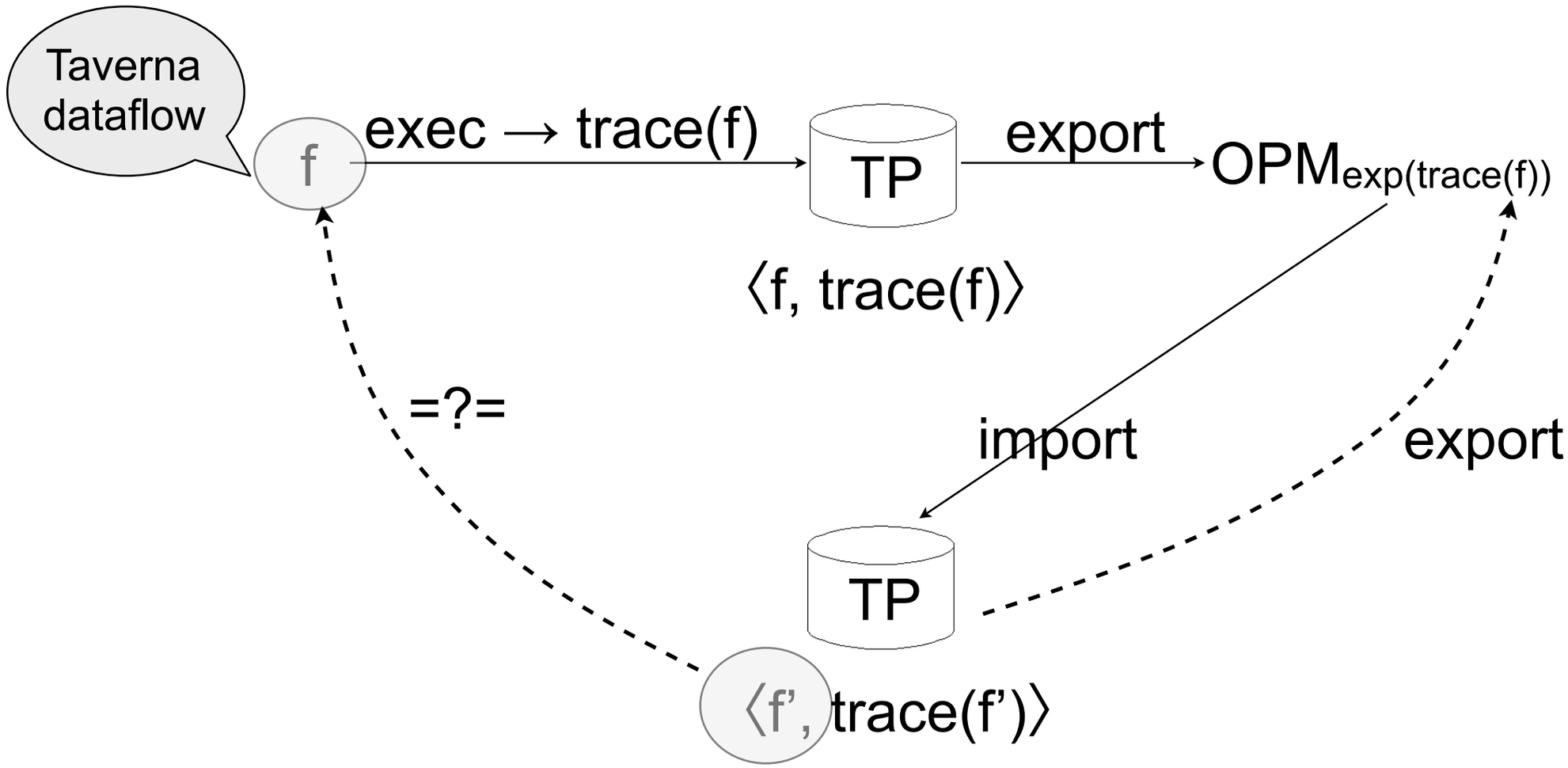

This is indeed lossless when f is itself a Taverna dataflow:

export (import (export (trace(f)))) =?= export (trace(f))

(requires proof)