



H.F.R.I.
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Research & Innovation

Description of the funded research project
1st Call for H.F.R.I. Research Projects to Support Faculty Members &
Researchers and Procure High-Value Research Equipment

Title of the research project: Dataflow optimization revisited

Principal Investigator: Anastasios Gounaris

Reader-friendly title: DataflowOpt

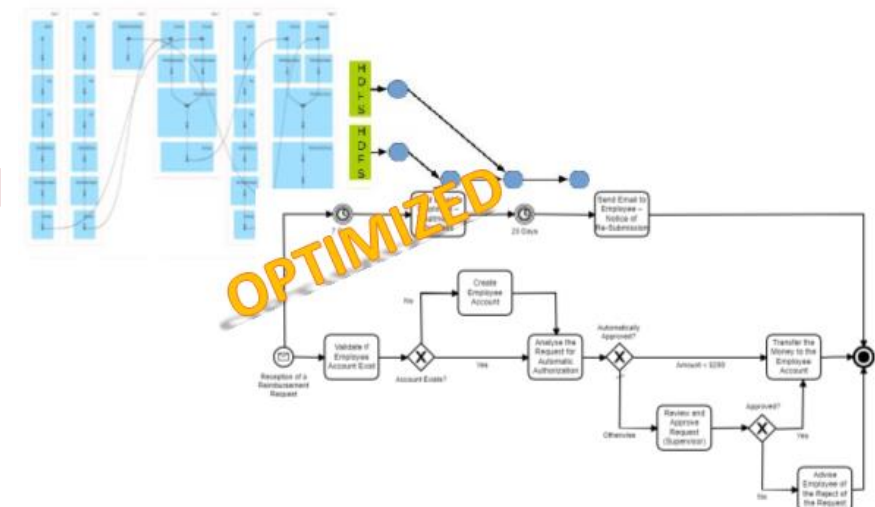
Scientific Area: Mathematics and Information Sciences

Institution and Country: Aristotle University of Thessaloniki, Greece

Host Institution: Dept. of Informatics

**Project webpage:
<https://datalab.csd.auth.gr/projects/dataflowopt/>**

**Budget: 169.089,14 €
Duration: 36 months**



Research Project Synopsis

The overarching aim of DataflowOpt is to capitalize on significant preliminary results in the area of dataflow optimization by the investigators and reshape the way dataflow optimization is approached addressing the significant limitations, state-of-the-art solutions suffer from.

The broader technical goal is to make cost-based automated dataflow optimization functionality available to designers with a view to facilitating and strengthening the adoption of advanced analytics by a much broader community in practice, from SMEs to big scientific laboratories.

An additional goal of this proposal is to avoid re-inventing the wheel and provide concrete proof-of-concept technical results regarding the confluence of Business Process Management (BPM) and big data management methods for process re-engineering through transferring techniques from dataflow optimization.

Project originality

DataflowOpt blends together a unique set of techniques that achieve:

- *Extensions to current optimization algorithms, so that they can work efficiently in combination.*
 - *Development of cost models that better reflect execution time, resource consumption, throughput, monetary cost and latency in both dataflows and business processes to both describe flow execution and drive optimizations.*
- *Development of efficient semi-automated techniques for acquisition of the necessary metadata, with focus on task cost per invocation, selectivity and dependency constraints.*
 - *Concrete proof-of-concept regarding the value in blending together dataflow and business process optimization in a way that avoids re-inventing the wheel and broadens the scope of flow optimization proposals.*
- *Successful application of the DataflowOpt techniques to all case studies envisaged to yield performance benefits of several factors and satisfaction of KPI goals.*

Expected results & Research Project Impact

- **Novel algorithms:** the first main result category of the solutions consists of algorithms, which are further divided into two classes. (A) DAG optimization techniques, which will cover the combinations of at multiple KPIs and cross-level optimization types. All algorithmic solutions will be of low polynomial complexity in the number of DAG vertices and the number of alternatives. (B) Metadata acquisition, which aims to provide a systematic way to extract the statistical and dependency information required by the algorithms in (A). A key characteristic of the proposed solutions is that they are transferred from advanced data management to business process optimization.
- **Complete system prototype:** we aim to incorporate the solutions into a real system, examining alternatives such as Apache Storm. The prototype will be open source as well and reach TRL 4.
 - **Thorough Evaluation:** the effectiveness of the solutions will be verified through extensive experimentation, using established benchmarks, such as TPC-DI, TPC-DS, BigBench and business process flows.

The importance of this funding

Through H.F.R.I. funding, 3 researchers are involved to achieve the project goals. The research described cannot be carried out without this funding and, as such, the funding is of paramount importance.



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