DYNAMOS:
Dynamically Adaptive microservice-OS

Dynamic microservices for data-exchange scenario

- Master Software Engineering at the University of Amsterdam
- Create ‘atomic’ microservices, to be combined for different use cases
- Middleware to orchestrate services, restricted by ***programmable policy***

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About me

Education

Master Software Engineering - University of Amsterdam (2023)

Thesis: DYNAMOS, Dynamically Adaptive Microservice-based OS A Middleware for Data Exchange Systems

Work

Cloud consultant – (AI) developer - devOps engineer - hotel manager

Personal

Born in ‘87

Lives in Utrecht

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Data exchange marketplaces

AMdEX

AMdEX translates your data sharing agreements into machine-readable policies, that can automatically be enforced.

→

Use cases:

- SQL data analysis (hospitals, universities)
- Federate Machine Learning (airlines, predictive maintenance)
- Sharing anonymous sensor data (smart buildings)

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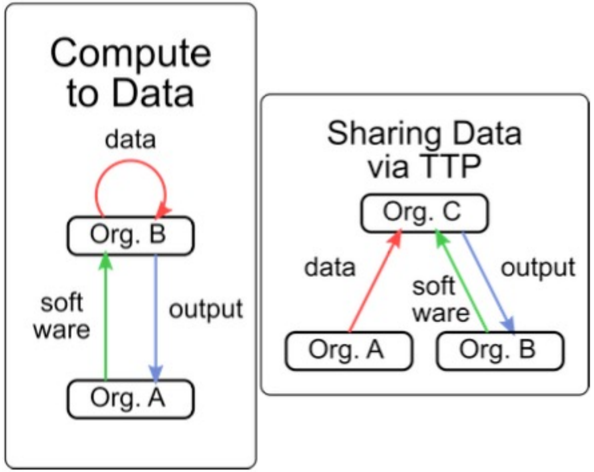
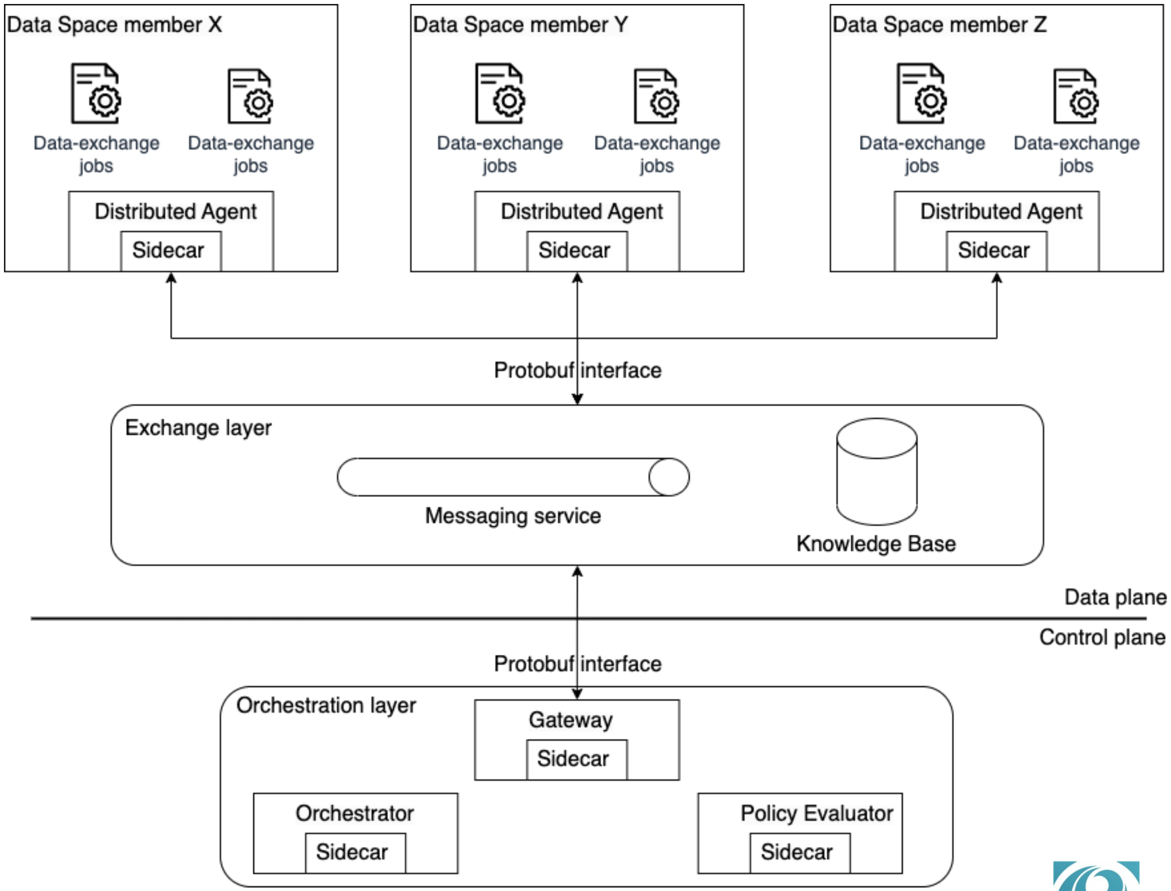
Goal

- Orchestrate microservice configurations aligned with data-sharing archetypes
- Create ***Trust;*** the system will follow policy
- Create algorithms to optimize on extra-functional properties (Green IT, server load, optimal archetype selection)
- Self-adaptivity, deployments, archetypes and configurations can change ***per request***



Archetypes[1]

[1] Shakeri, S., Veen, L.E., & Grosso, P. (2020). Evaluation of Container Overlays for Secure Data Sharing. 2020 IEEE 45th LCN Symposium on Emerging Topics in Networking (LCN Symposium), 99-108.



Data Space member X

Data-exchange jobs

Data-exchange jobs

Distributed Agent

Sidecar

Data Space member Y

Data-exchange jobs

Data-exchange jobs

Distributed Agent

Sidecar

Data Space member Z

Data-exchange jobs

Data-exchange jobs

Distributed Agent

Sidecar

Protobuf interface

Exchange layer

Messaging service

Knowledge Base

Data plane

Control plane

Protobuf interface

Orchestration layer

Gateway

Sidecar

Orchestrator

Sidecar

Policy Evaluator

Sidecar

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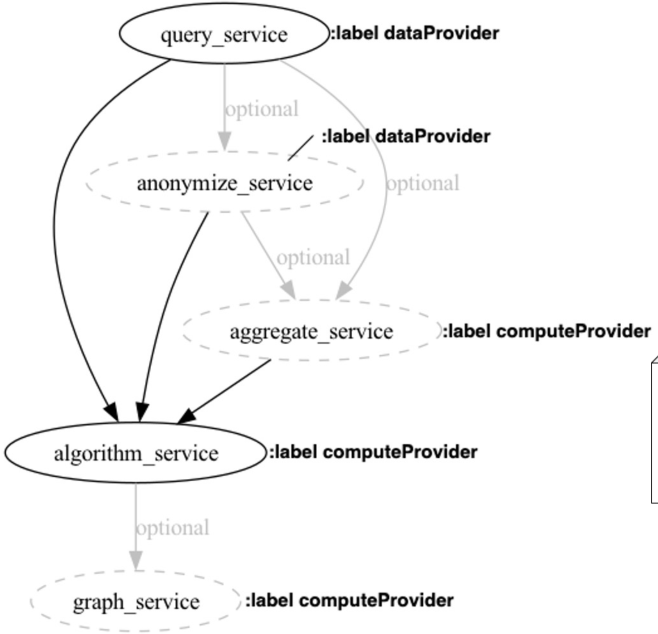
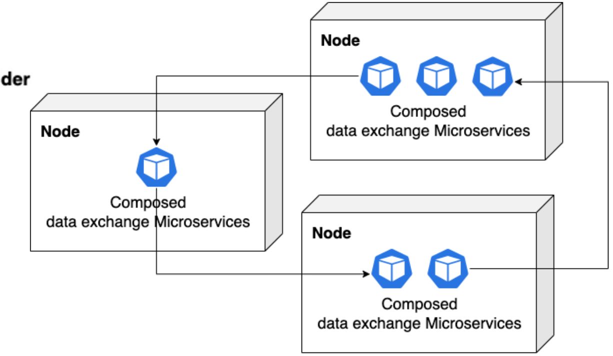
How it works




Node
Composed
data exchange Microservices
Node
Composed
data exchange Microservices
Node
Composed
data exchange Microservices

1.
Check policy and
additional requirements

→

2.
Generate microservice
chain

→

3.
Create single-use
data-exchange jobs

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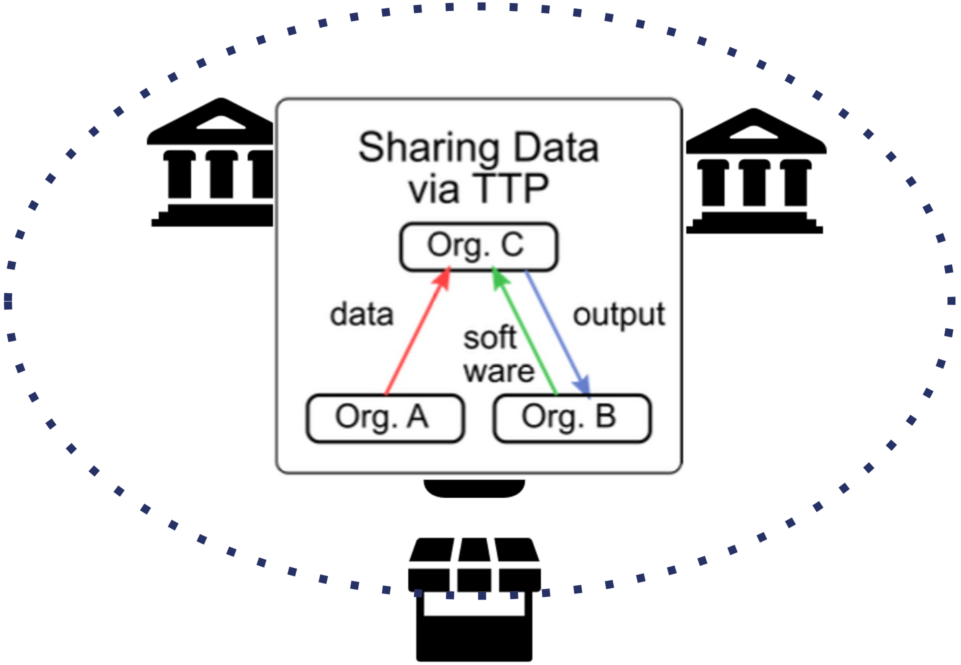
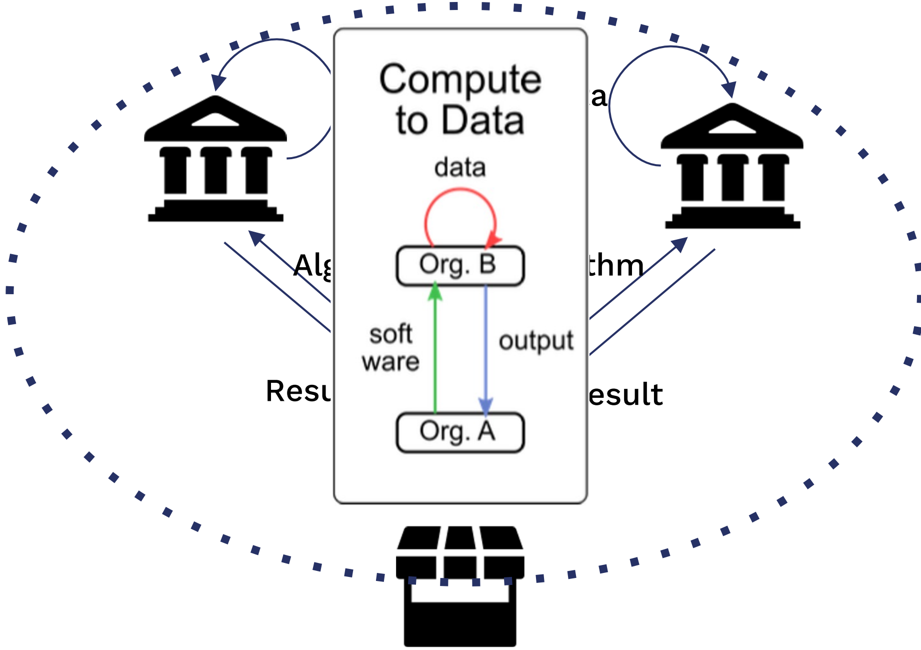
DEMO


Sharing Data via TTP
Org. C
data
soft ware
output
Org. A
Org. B


Compute to Data
a
Alg
thm
data
Org. B
soft ware
output
Org. A
Resu
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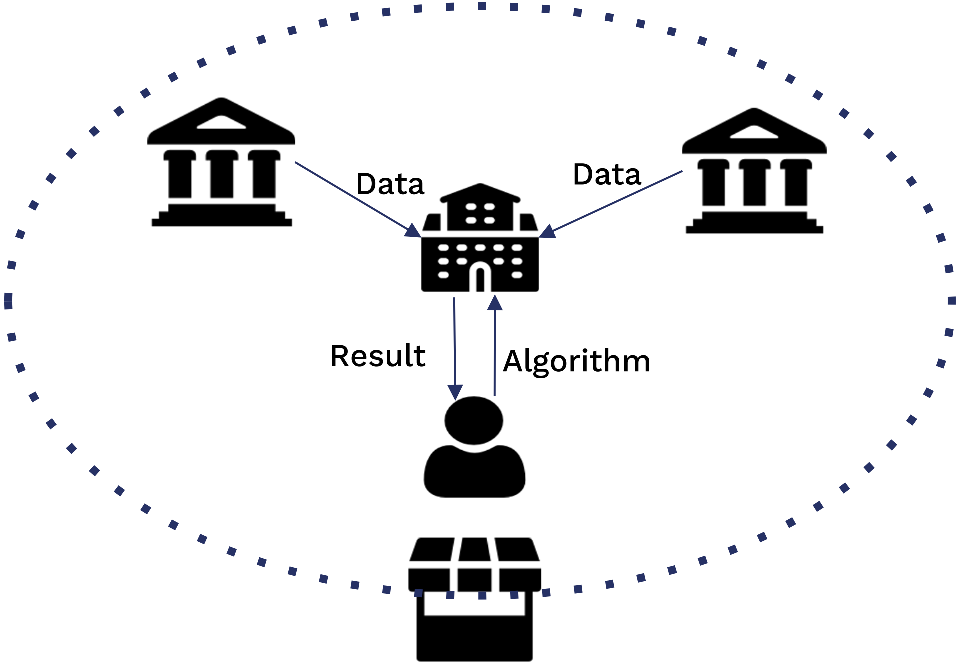
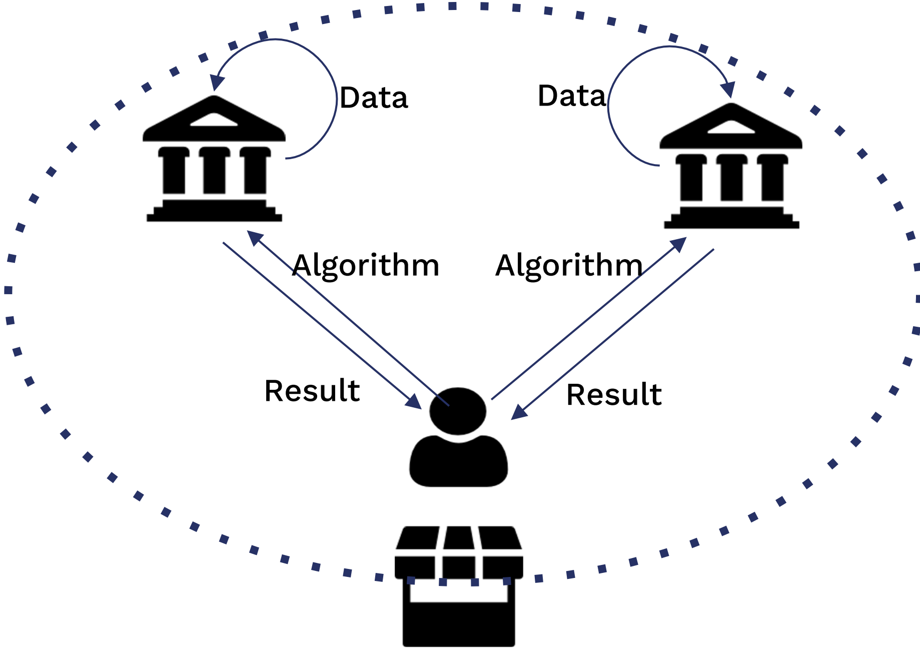
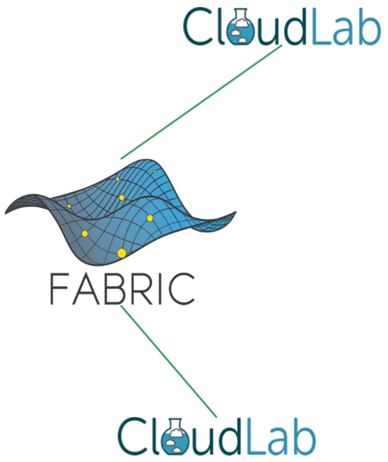
DEMO


Data
Data
Result
Algorithm


Data
Data
Algorithm
Algorithm
Result
Result

Future research

- Experiment with additional data-sharing archetypes
- Link Fabric into DYNAMOS
    - Full distributed scenarios
    - Sharing large dataset
    - Bring the control plane into the network



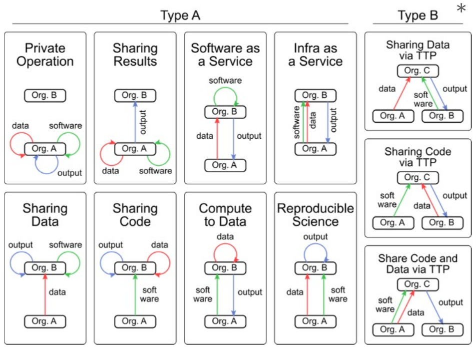
How to use

FABRIC

CloudLab

1.
Install or clone
DYNAMOS profile

2.
Clone DYNAMOS



3.
Start experiments

* Shakeri, S., Veen, L.E., & Grosso, P. (2020). Evaluation of Container Overlays for Secure Data Sharing. 2020 IEEE 45th LCN Symposium on Emerging Topics in Networking (LCN Symposium), 99-108.