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***

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

Data exchange marketplaces

AMdEX

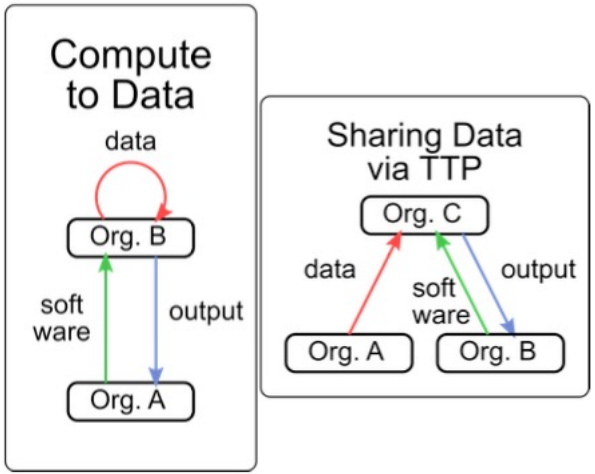
AMdEX translates your data sharing agreements into machine-readable policies, that can automatically be enforced.

Use cases:

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

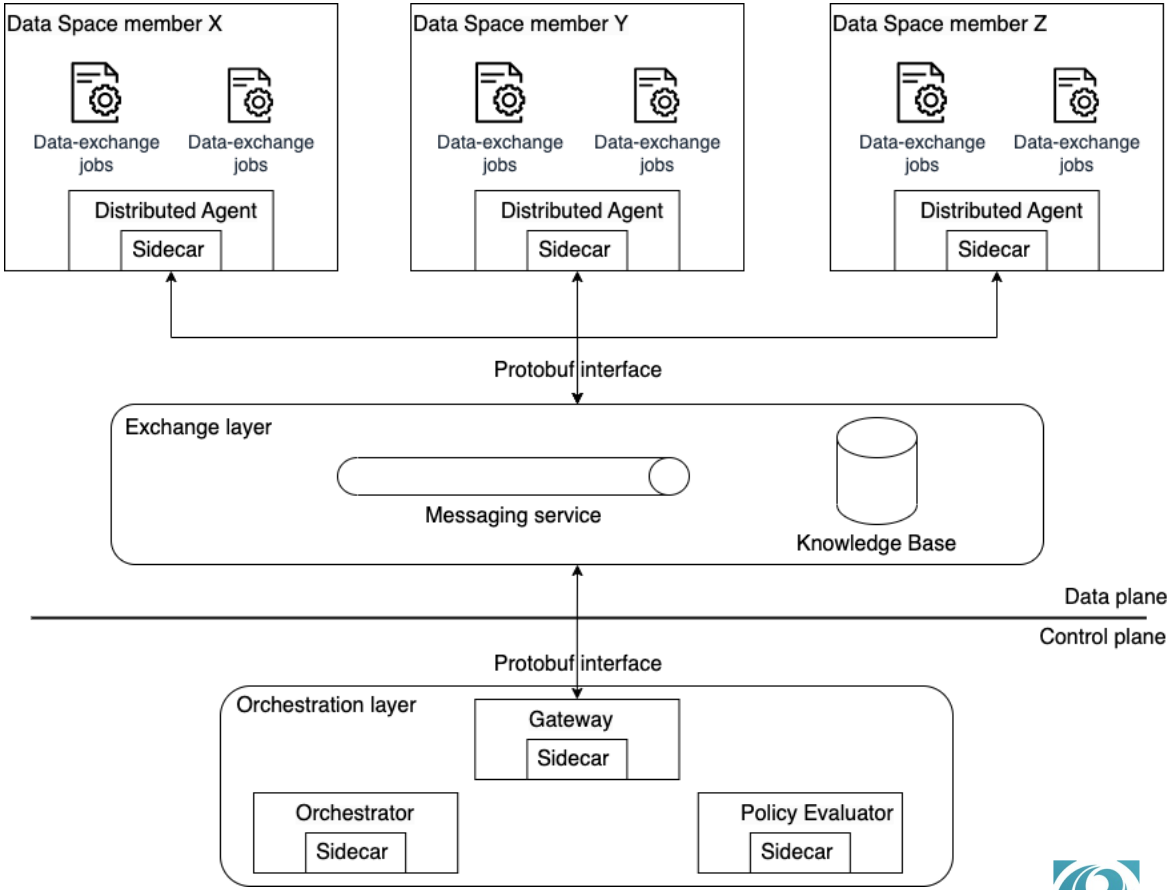
Goal

- 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***

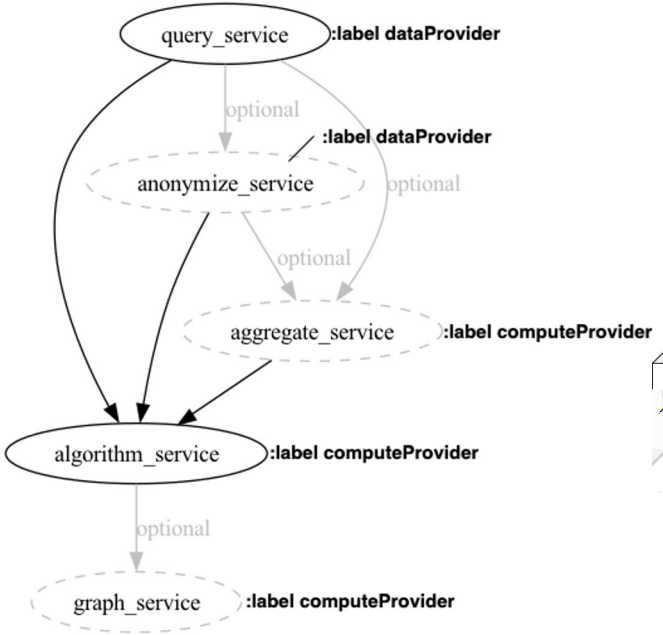


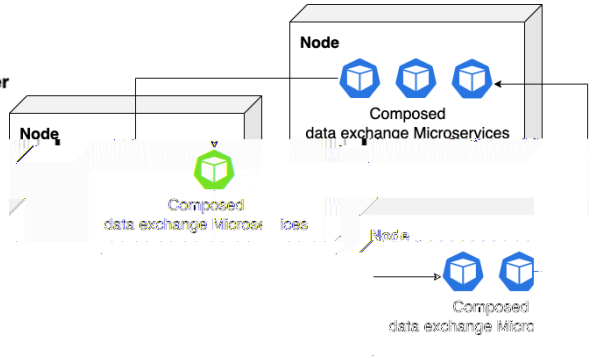
Archetypes[1]

[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

How it works



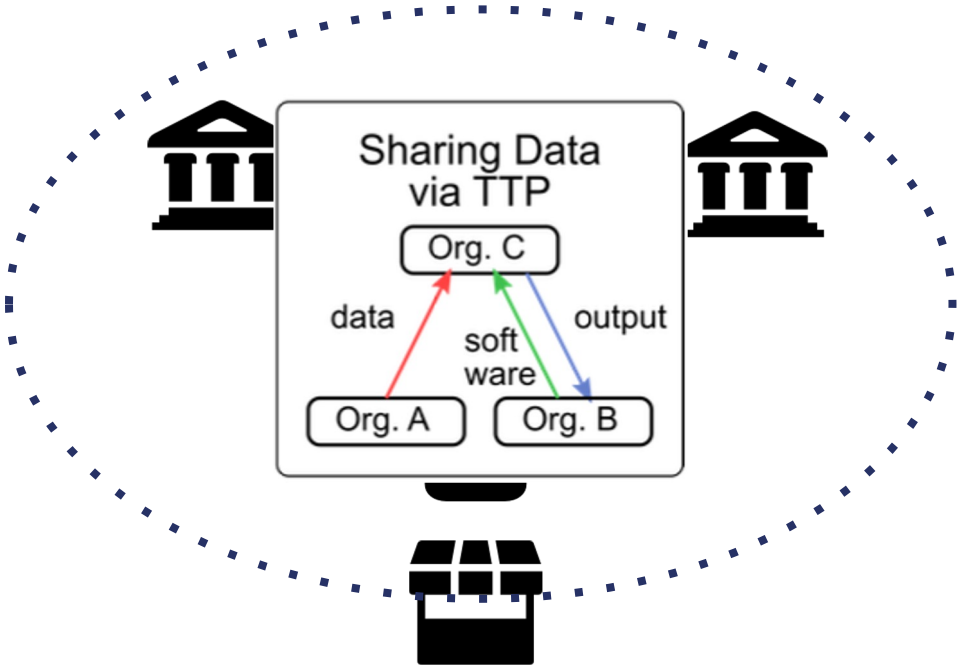


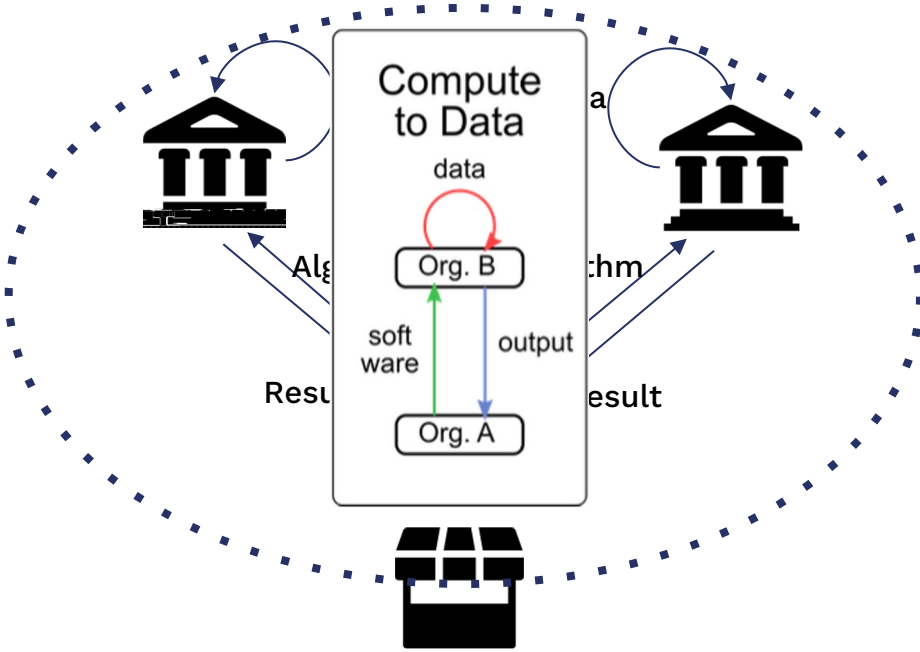
1.
Check policy and additional requirements

2.
Generate microservice chain

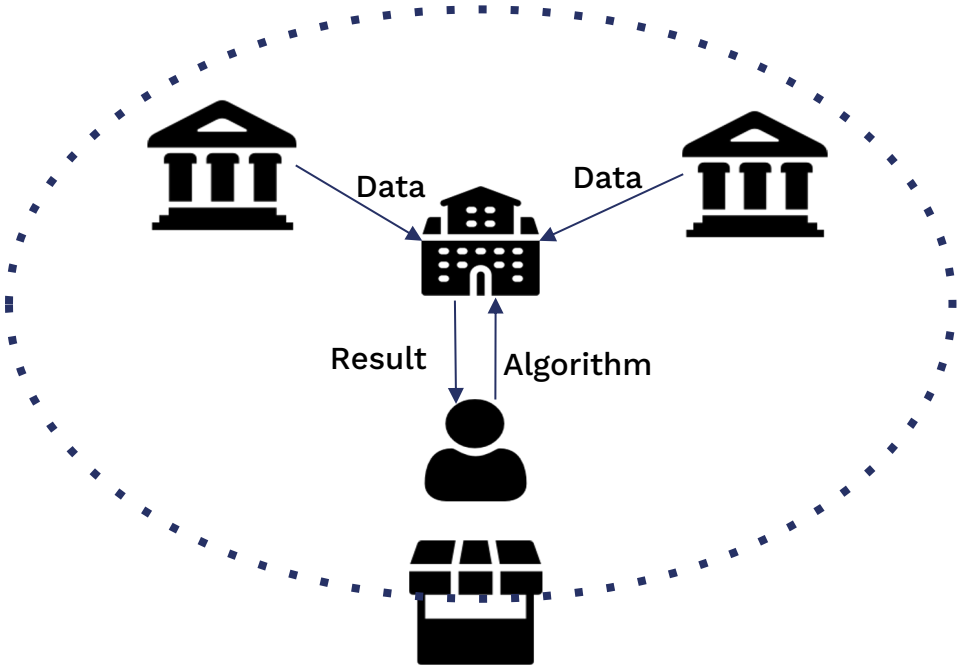
3.
Create single-use data-exchange jobs

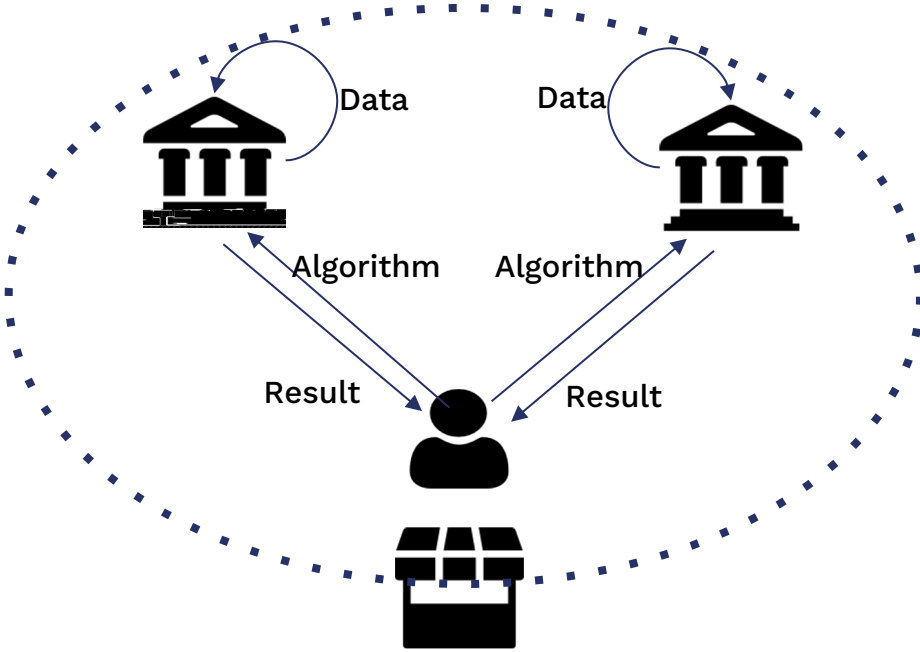
DEMO


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


Compute
to Data
data
Org. B
soft
ware
output
Org. A

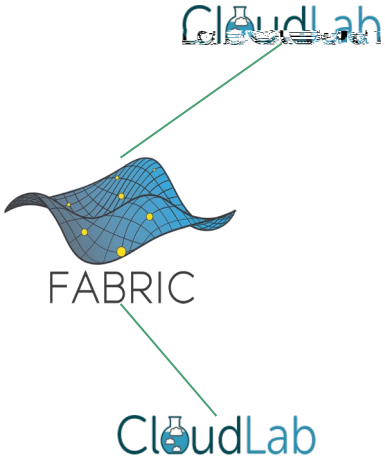
DEMO


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

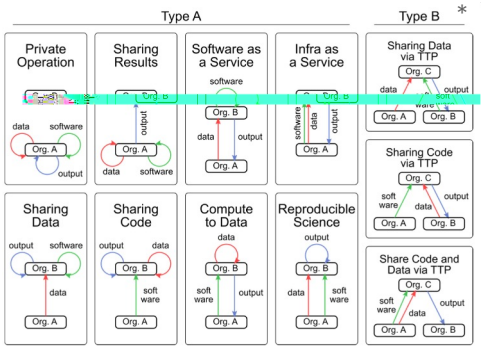


How to use

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.