# Demo distributed computing

# Monolithic architecture

Complete software product runs in one single application, on one machine.

# Microservice architecture

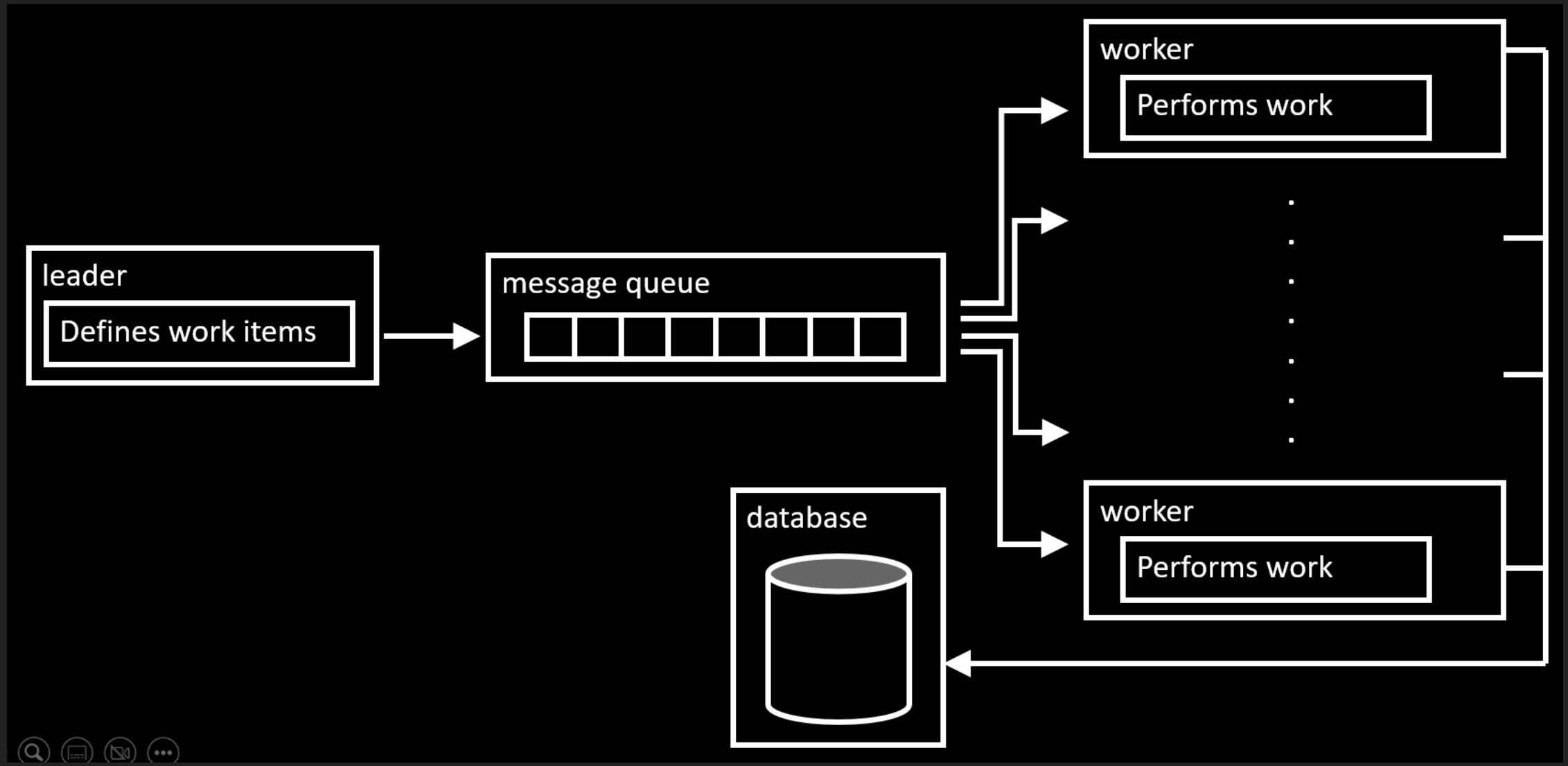
Software product is split into component, and can run across different machines.

# Current situation

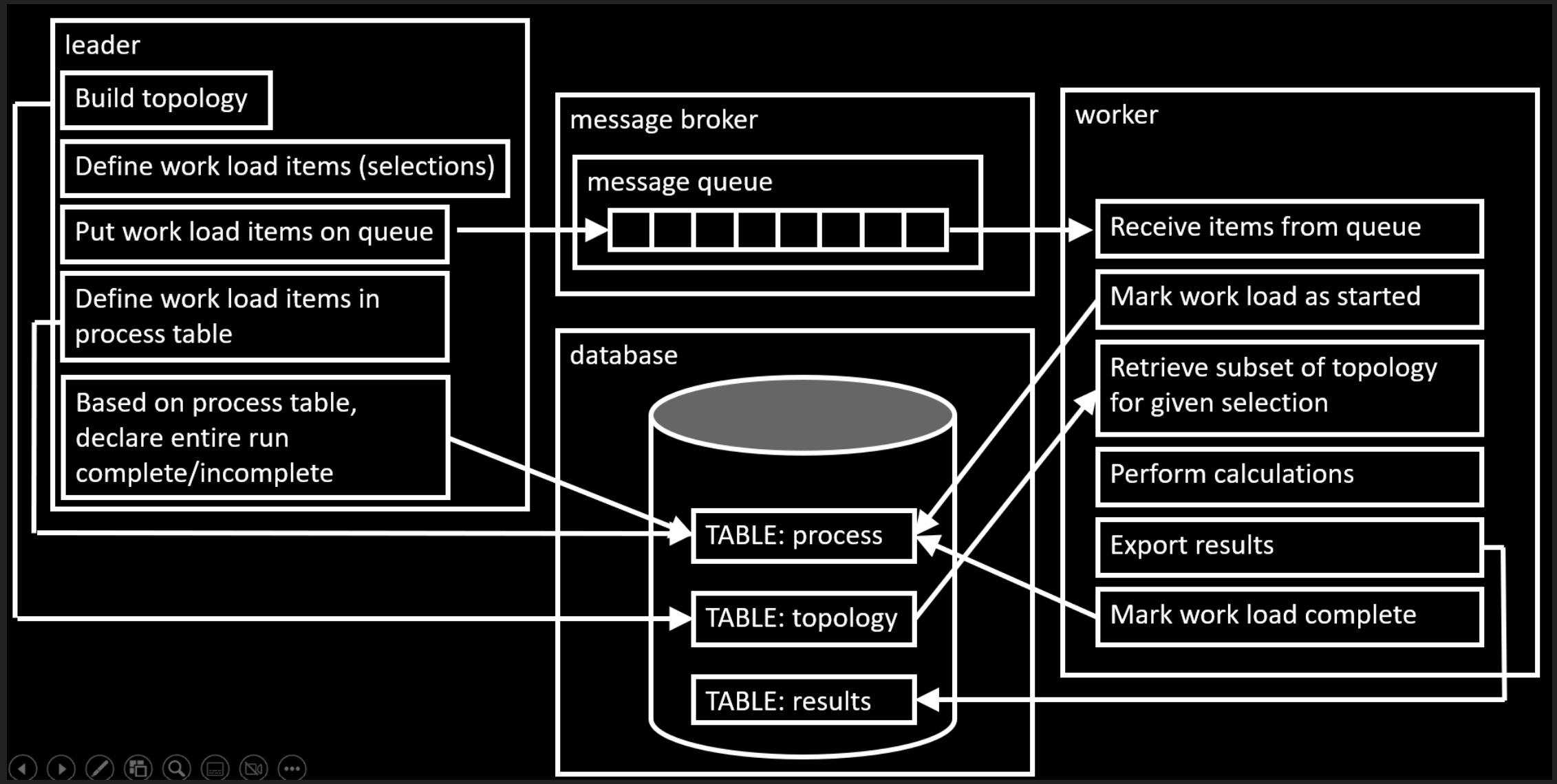
The following steps are performed in a single application

- Building topology
- Defining work load (selections)
- With a for loop, running the calculation per selection
- Exporting output data

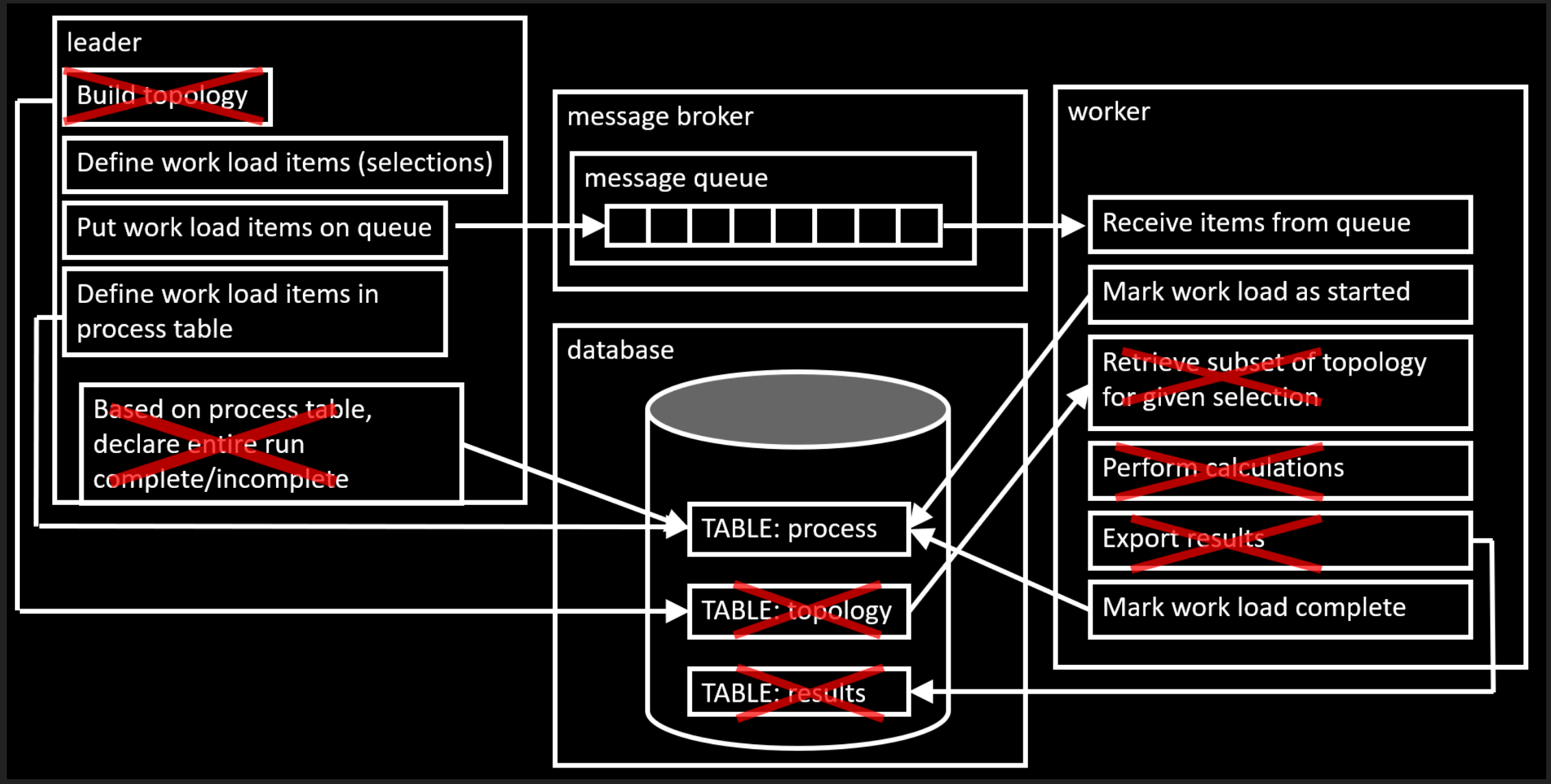
# Architecture



# Process


leader
Build topology
Define work load items (selections)
Put work load items on queue
Define work load items in process table
Based on process table, declare entire run complete/incomplete
message broker
message queue
database
TABLE: process
TABLE: topology
TABLE: results
worker
Receive items from queue
Mark work load as started
Retrieve subset of topology for given selection
Perform calculations
Export results
Mark work load complete

# In this demo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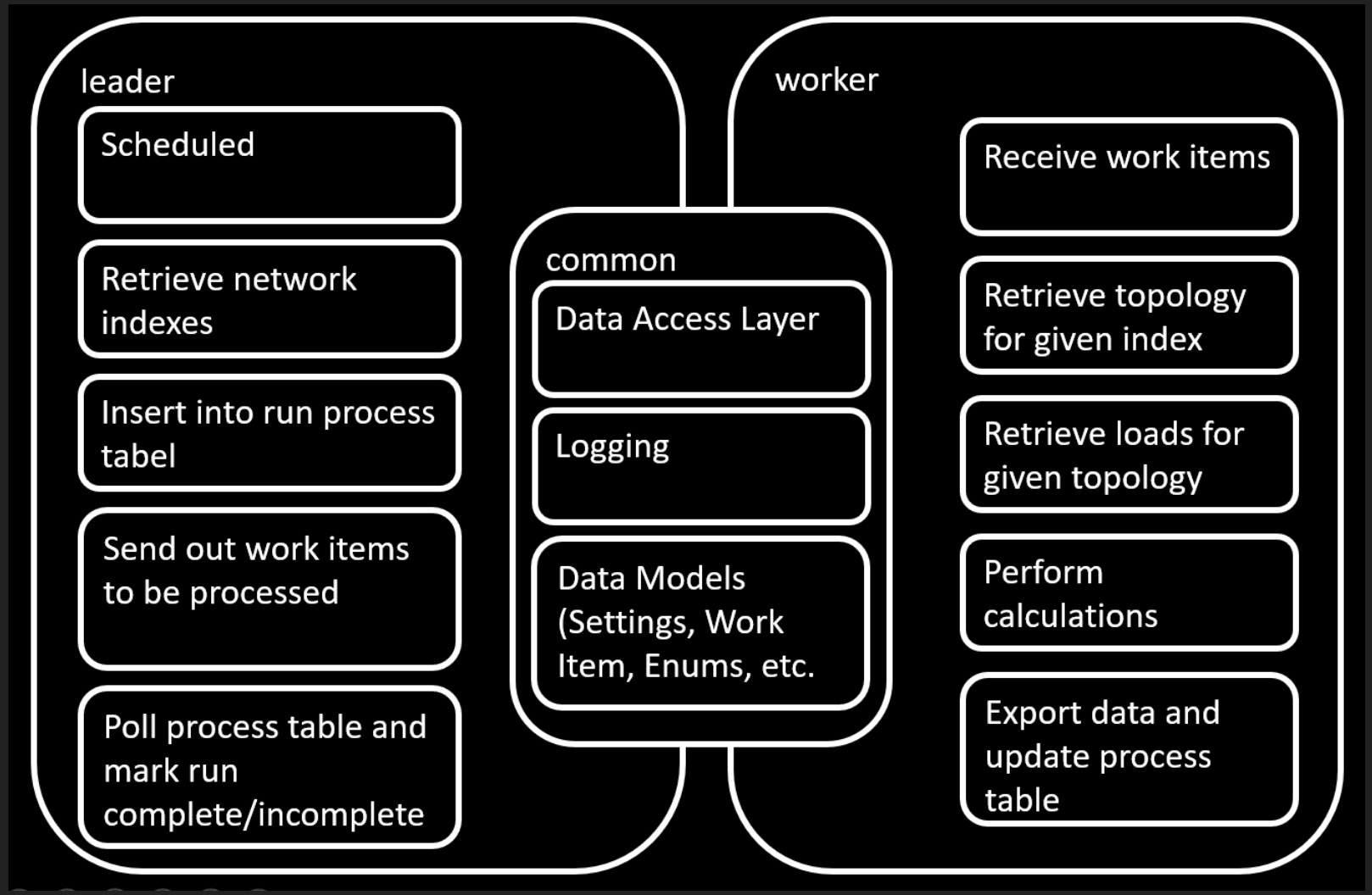
# Code Structure



# Message

- `run_id` is the id of the entire run
- `task_id` is the id of a single task or work item
- `selection`, `start_date`, `end_date` define the specifics of the work item

```
{
    'run_id': 'c1ab55ca-27d5-40e7-9899-e475f906af1c',
    'task_id': '0ce41899-a414-4920-9159-ccf223840634'
    'selection': '1',
    'start_date': '2023-01-01 00:00',
    'end_date': '2023-01-31 23:59',
}
```

# Process Table

```
mysql> use local_db; select * from run_process;
Database changed
+----+--------------------------------------+--------------------------------------+-------------+
| id | run_id                               | task_id                              | task_status |
+----+--------------------------------------+--------------------------------------+-------------+
|  1 | 2fe5a1d6-672d-4a53-b376-4591537b58e7 | 062b3ac2-154e-40d6-9ac7-a2c528bbe2e0 | FINISHED    |
|  2 | 2fe5a1d6-672d-4a53-b376-4591537b58e7 | 183fe738-664e-42f1-846b-ada83bf50780 | FINISHED    |
|  3 | 2fe5a1d6-672d-4a53-b376-4591537b58e7 | c9593d67-b055-40aa-b177-d03f5a3fa503 | FINISHED    |
|  4 | 2fe5a1d6-672d-4a53-b376-4591537b58e7 | 5d4c2da9-36a7-421a-90b8-3fa12b296f27 | STARTED     |
+----+--------------------------------------+--------------------------------------+-------------+
```

# Setup of demo

- Applications running in Docker containers
  - worker, leader
    - written in Python
  - RabbitMQ
    - open source message broker
    - base image rabbitmq
  - MySQL
    - Relational Database with 1 table

# Setup of demo

- Orchestrated with Docker Compose
- Run the whole stack with `docker compose up`

# Implementation on Openshift

- leader: like the original application, cronjob with the original schedule
- queue: deploymentconfig with constant instance of 1
- worker: deploymentconfig that scales instances based on items in the queue
  - https://github.com/onfido/k8s-rabbit-pod-autoscaler

# First steps

- Openshift implementation with 'trivial' leader, message queue and current application as a single instance worker
- Implement handling of the process with the run process table
- Move building of topology into leader
- Manually scale up worker
- Implement autoscaling of workers

# Further steps

- Building of topology in separate application
- Polling for process completion in separate application
- ...