MOSAIK

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An HTTP/RDF-based Agent Infrastructure for Manufacturing using Stigmergy
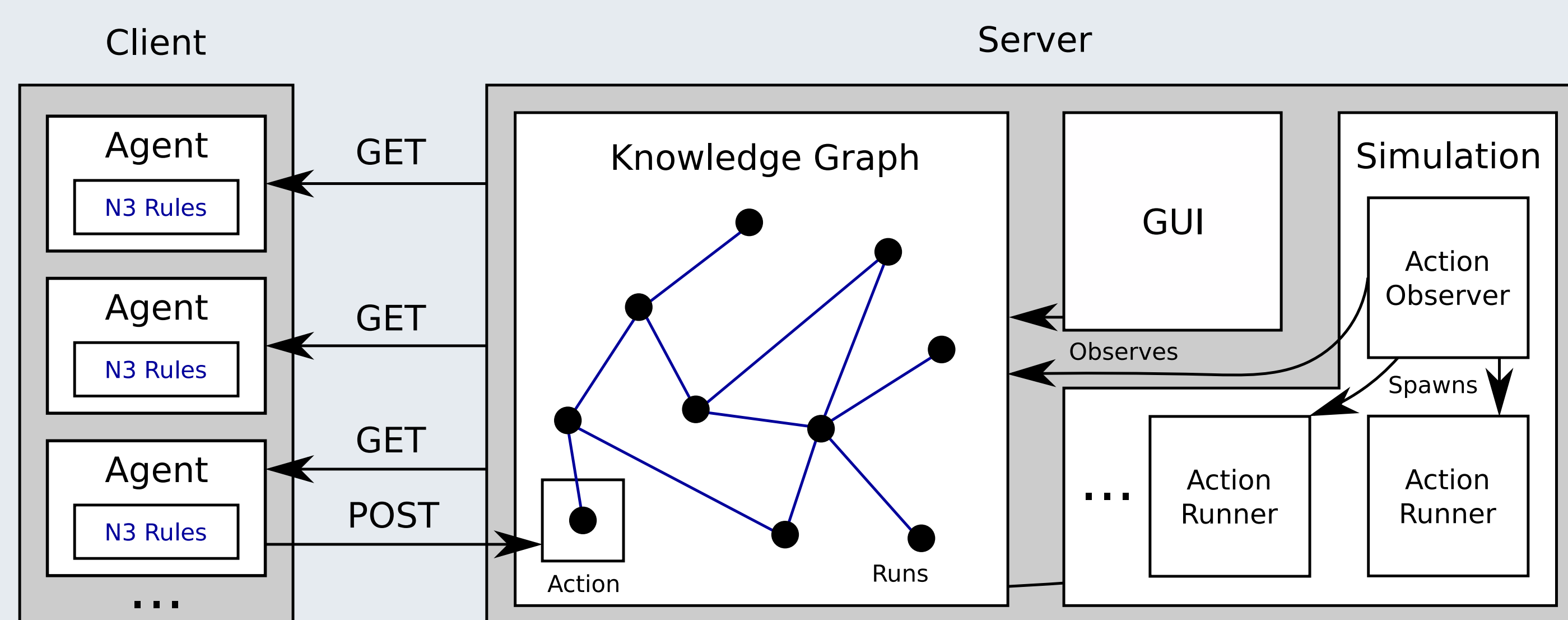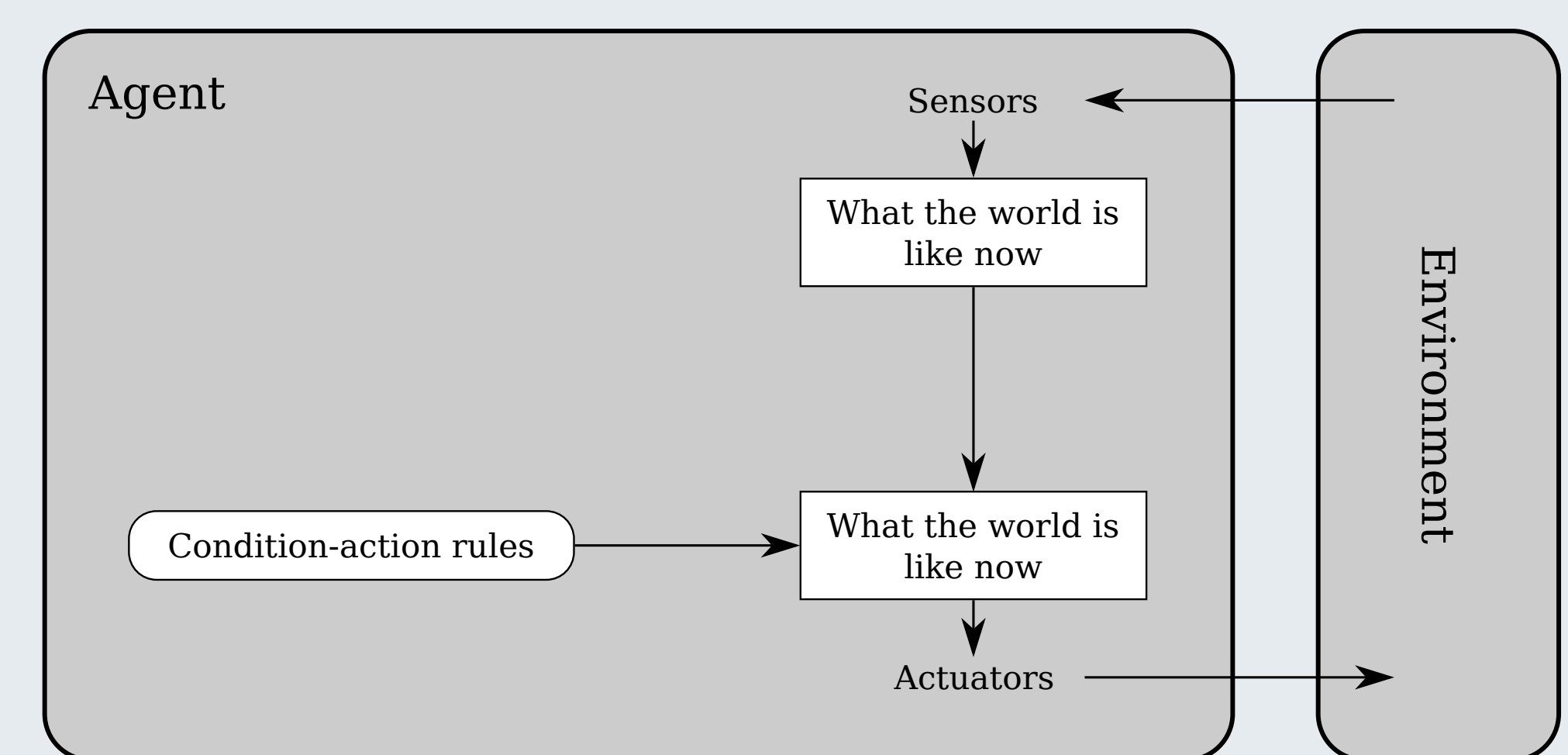

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Stigmergy

A communication paradigm for multi-agent systems where agents are not allowed to communicate directly but only indirectly by modifying their environment.

This idea is taken from nature where e. g. ants, which are following simple instincts, are using pheromones to mark paths in the process of (very efficiently) foraging food.

Using stigmergy has several advantages including no need for explicit synchronization between the agents and a clear separation of concerns.

Simple-Reflex Agents

In our approach we want to take the idea of stigmergy even further and try to shift as much complexity out of the agents into the environment.

The specific type of agent we want to use for our system is called simple-reflex agent.

It is the simplest form of an agent where the agent decides based on a set of simple condition-action rules, which action to take next.

Based on: Russell, S., Norvig, P. Artificial Intelligence. A Modern Approach.

Communication Architecture

Simple-reflex gents (on the client-side) are querying the state of the Knowledge Graph and trying to match their rules. If they can apply a rule, they send a HTTP POST request to change the Knowledge Graph.

On the server side RDF Knowledge Graph maintains the state of the environment (current location of all forklifts & products, state of the workstations, etc.). Furthermore all possible, active and completed actions are contained.

Also on the server runs a simulation part, which mimics the behaviorof the stations and forklifts, and a GUI.

Online Demo

We have built a demonstrator for the communication infrastructure. A running instance of our demonstrator with is publicly available. The GUI includes hyperlinks for all artifacts to their RDF representations.

https://purl.org/mosaik/demo