Swarm Minimum Broker: an approach to deal with the Internet of Things heterogeneity

Global IoT Summit 2018

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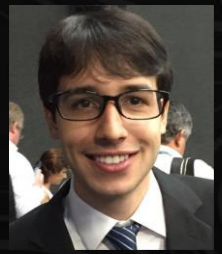
OUR TEAM


Scientific counselors







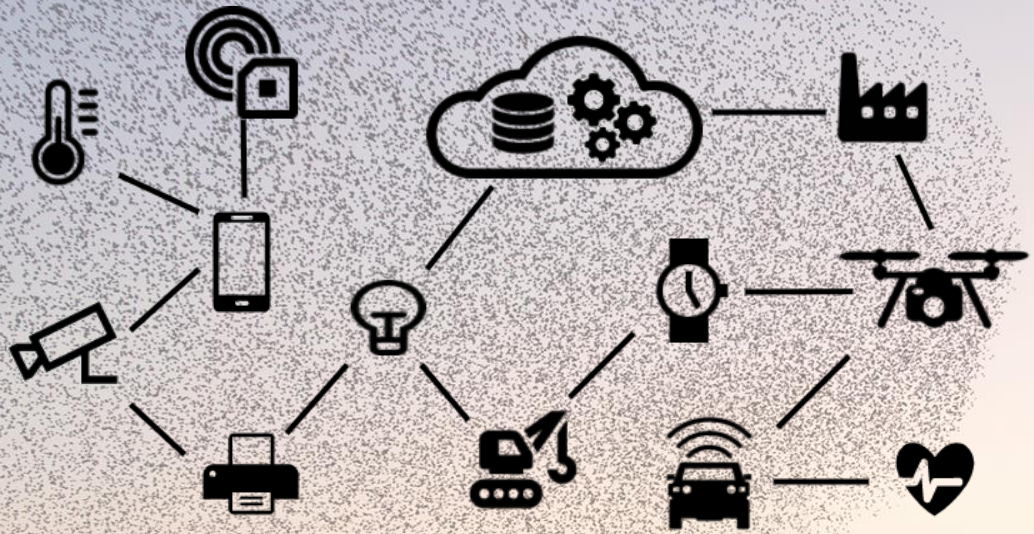
Researchers





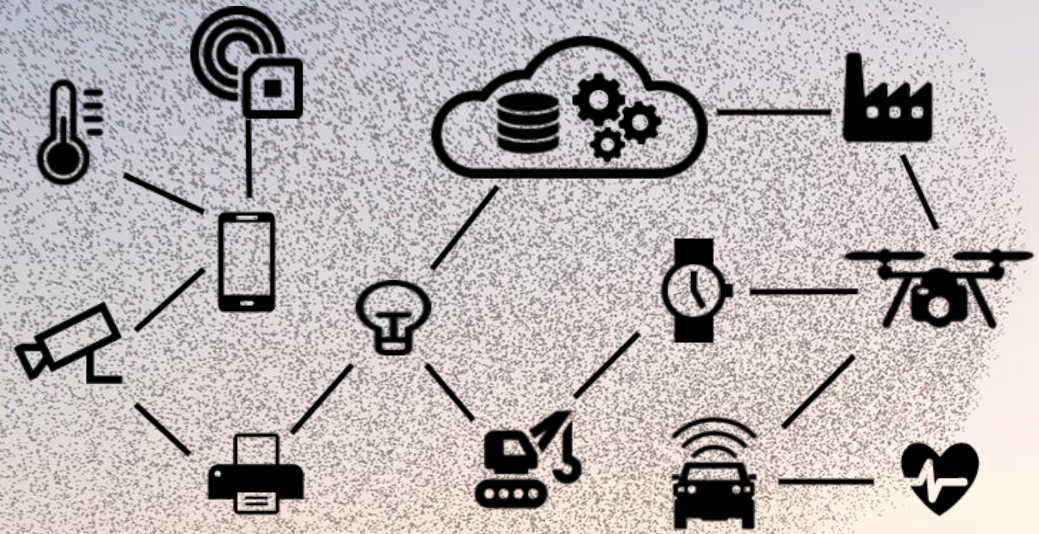
Interns and trainees

Current IoT is cloud-centric



The Swarm

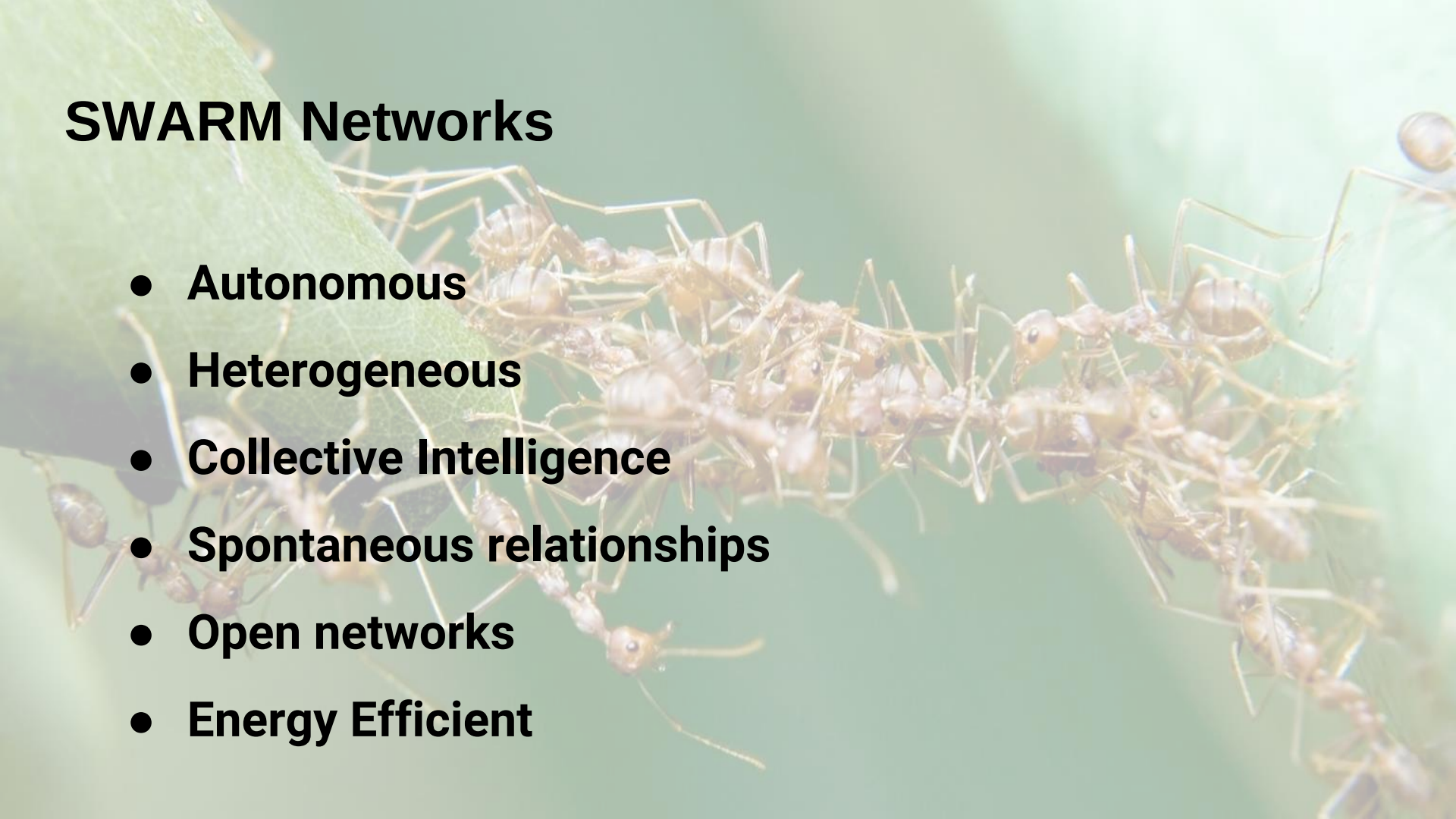
- The Swarm is **edge-centric**
- Cloud is not the main participant
- Constitute a **P2P network of small resource devices.**



The Swarm:

a P2P Network

The Swarm network is composed of **intelligent individuals** that behave similarly to a society, showing an **organized behavior** that results in an emergent **collective intelligence**.



SWARM Networks

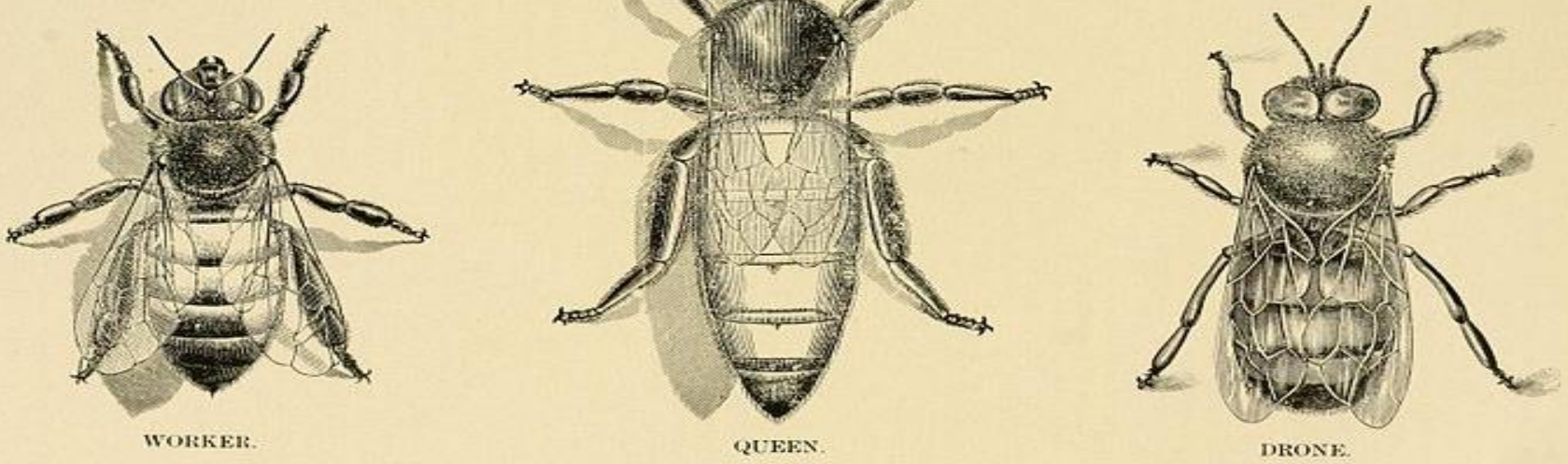
- Autonomous
- Heterogeneous
- Collective Intelligence
- Spontaneous relationships
- Open networks
- Energy Efficient

The Problem: **Heterogeneity**

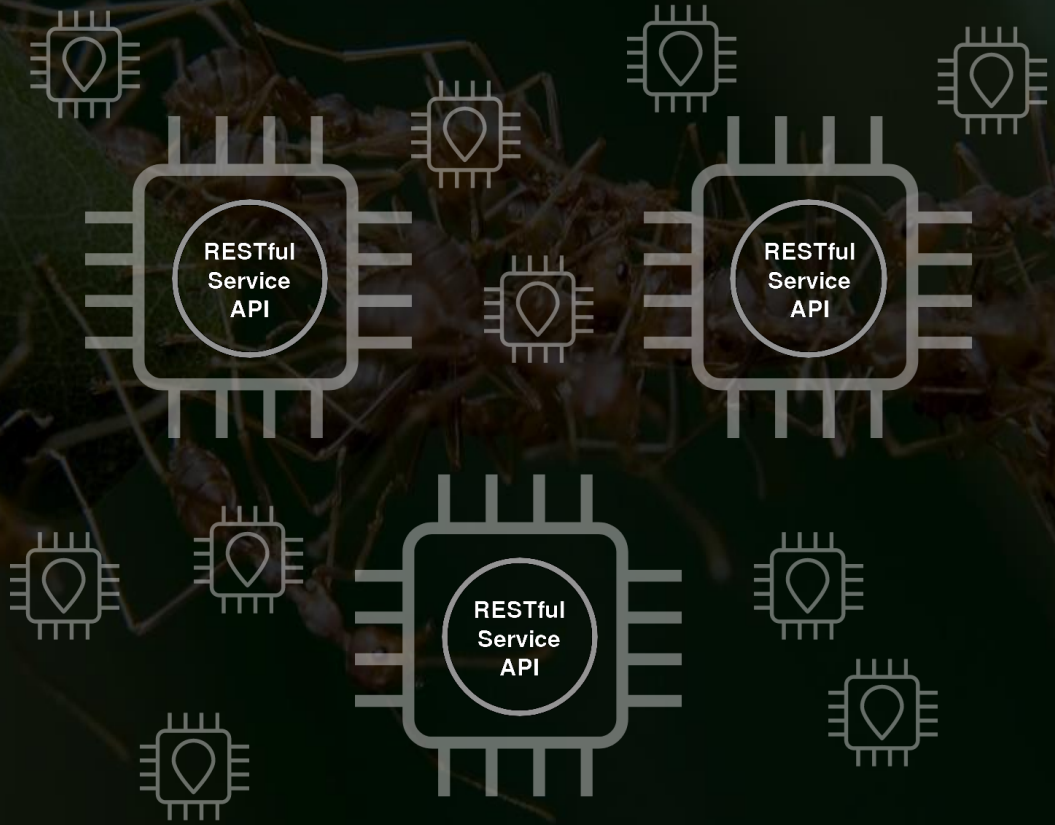
One of the main problems for **IoT implementations**

In this paper we address on resource heterogeneity, with a focus on **low constraint devices**

The Edge of the Edge



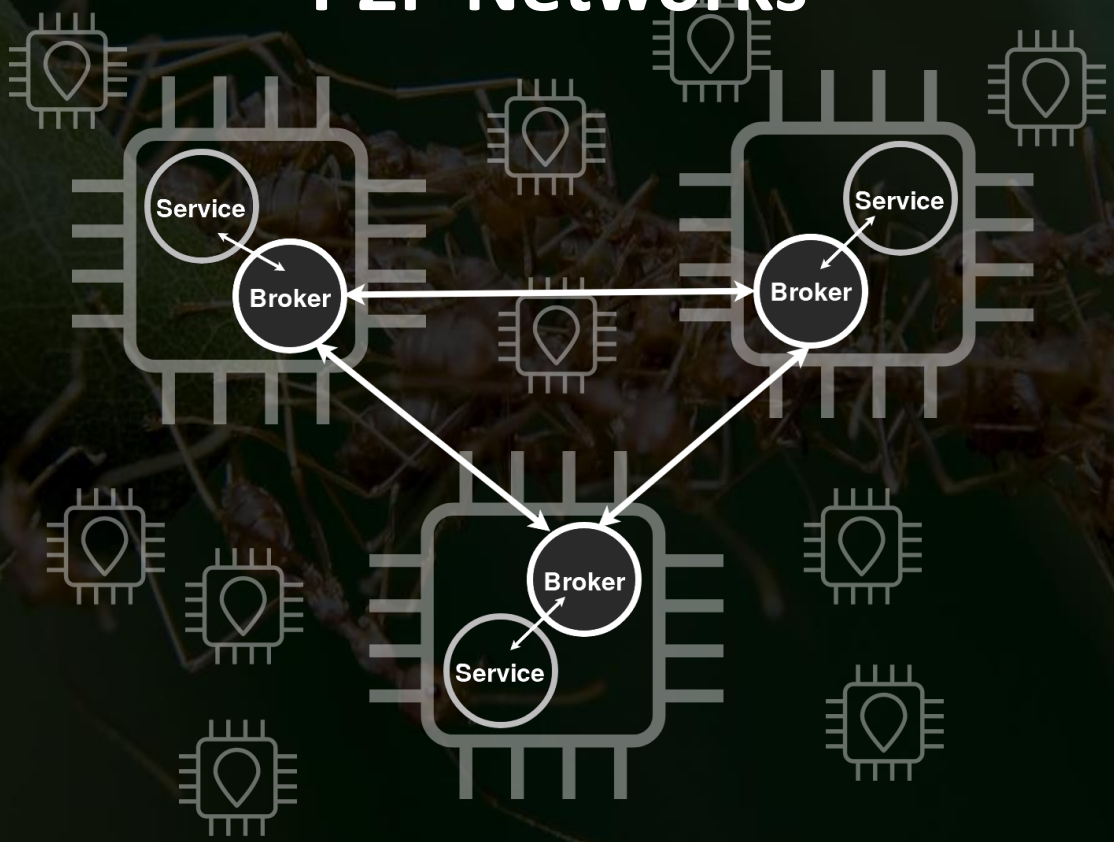
In Swarm:
Device functionalities are wrapped by Services

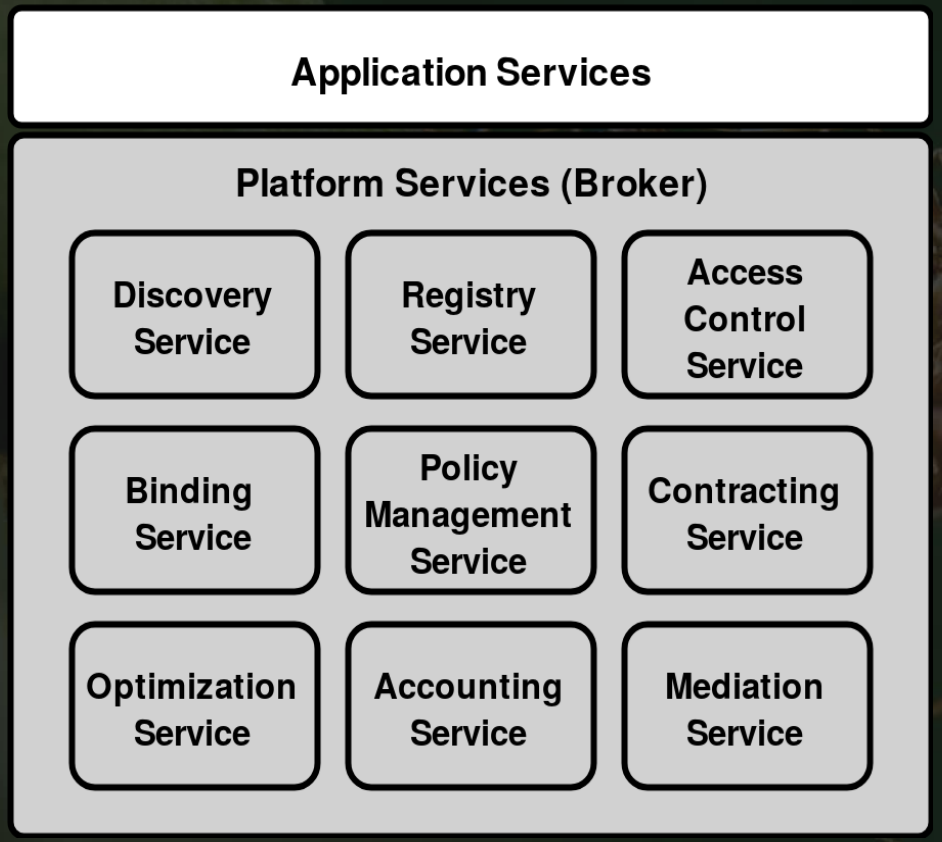


The Swarm Broker

Device + Broker = Swarm Insect

Broker: a communication mediator on P2P Networks



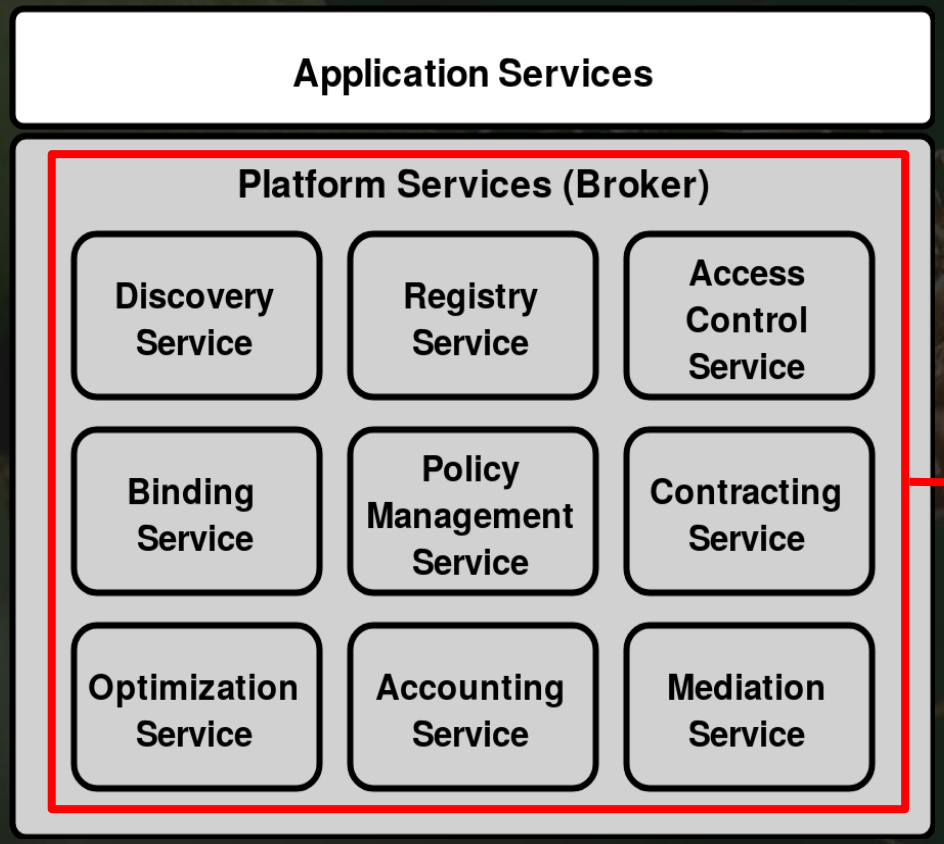


Broker architecture

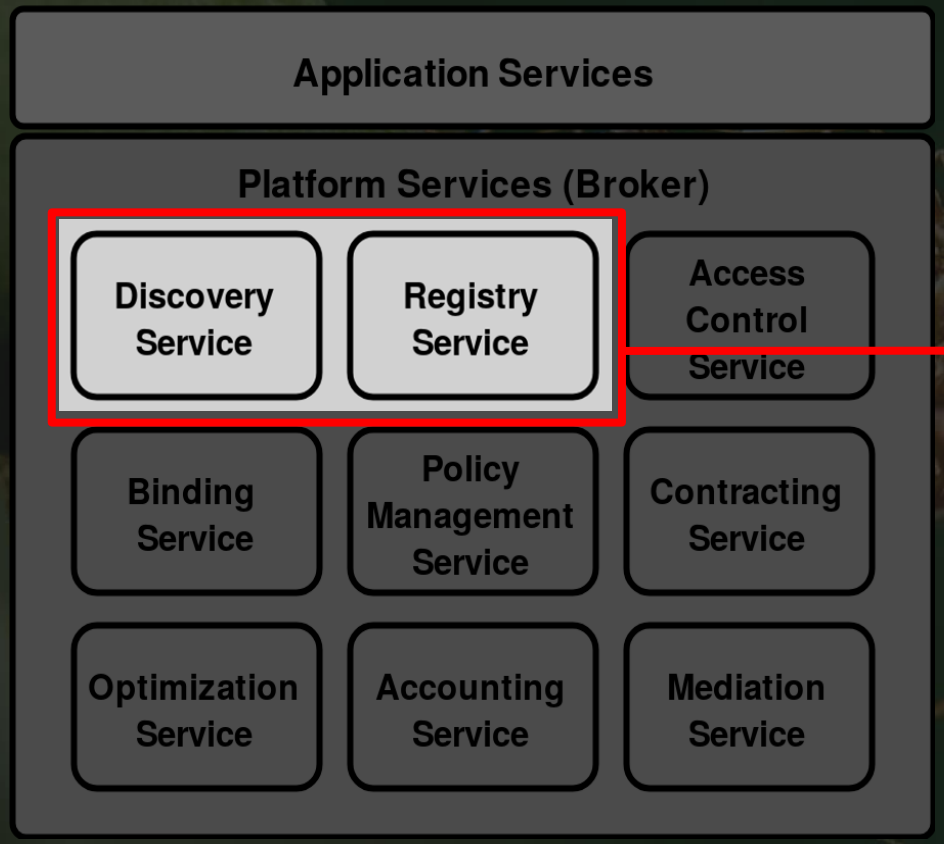
elixir

Java

2 implementations



Still needs **simplification** for devices with **very small resources**



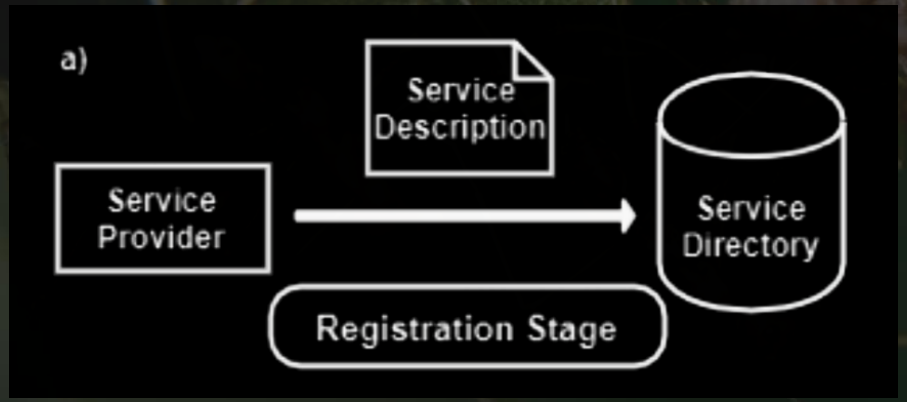
The Minimum Broker

The minimum software modules for a device to participate in the Swarm network

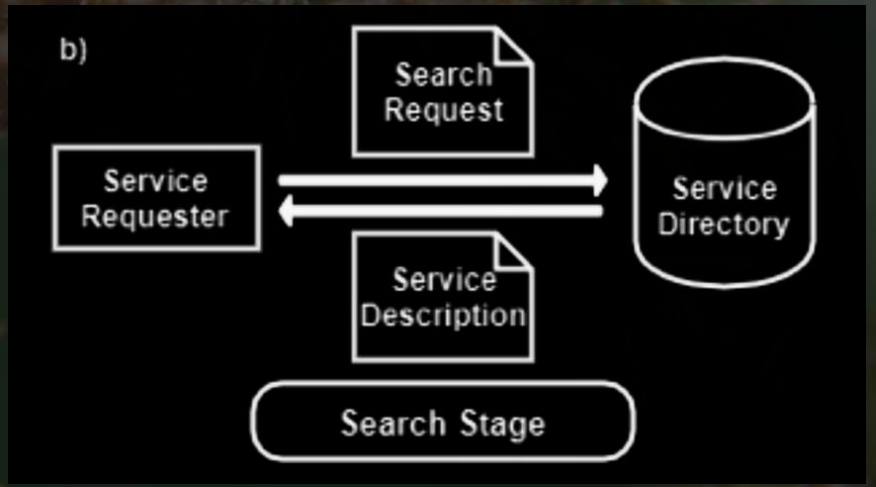
Special for resource constrained devices

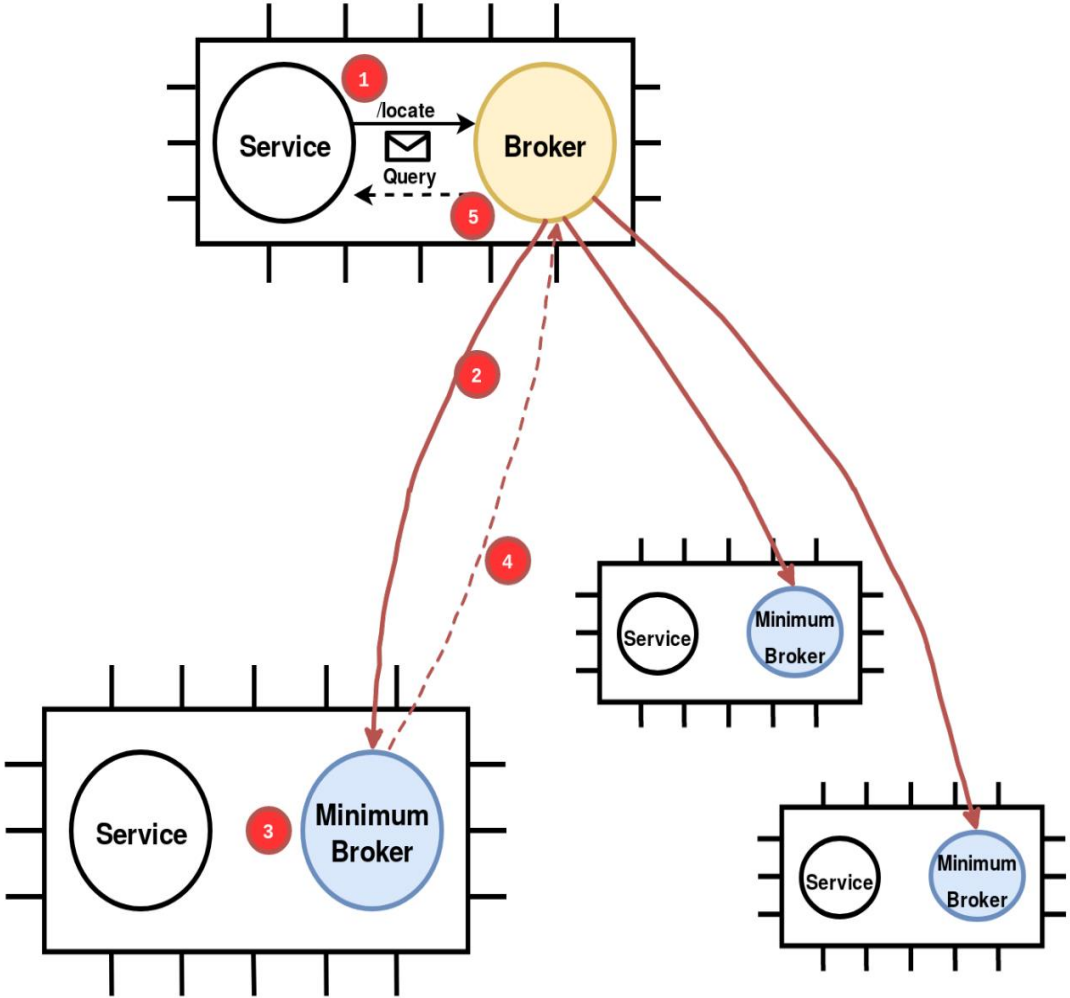
Minimum necessary services: registration and discovery

Stage **1**:
Service **registers** itself into
Service Directory



Stage **2**:
Service **searches** the
Service Directory for other service





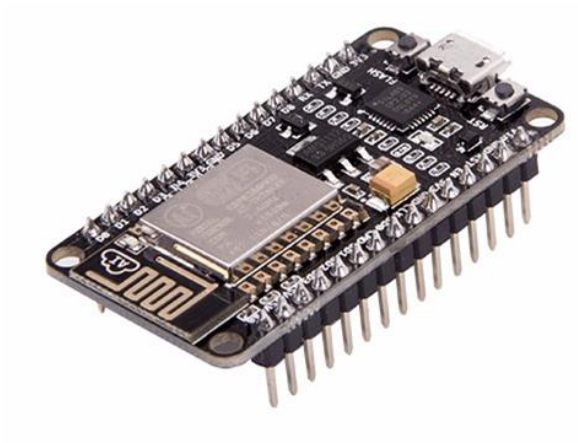
The full locate process in 5 steps:

(1) A service asks Broker (originator) to find a service in the network.
(2) The originator Broker sends a multicast request to the local network.
(3) A **Minimum Broker** receives the multicast SSDP request and searches for the requested service.
(4) If **Minimum Broker** finds the service it sends a response to the requester broker(unicast SSDP)
(5) The originator Broker sends a response to the requester with the services best descriptions found.
(6) A direct communication is established from service to service after the matching.

Proof of Concept: **Smart-Office**

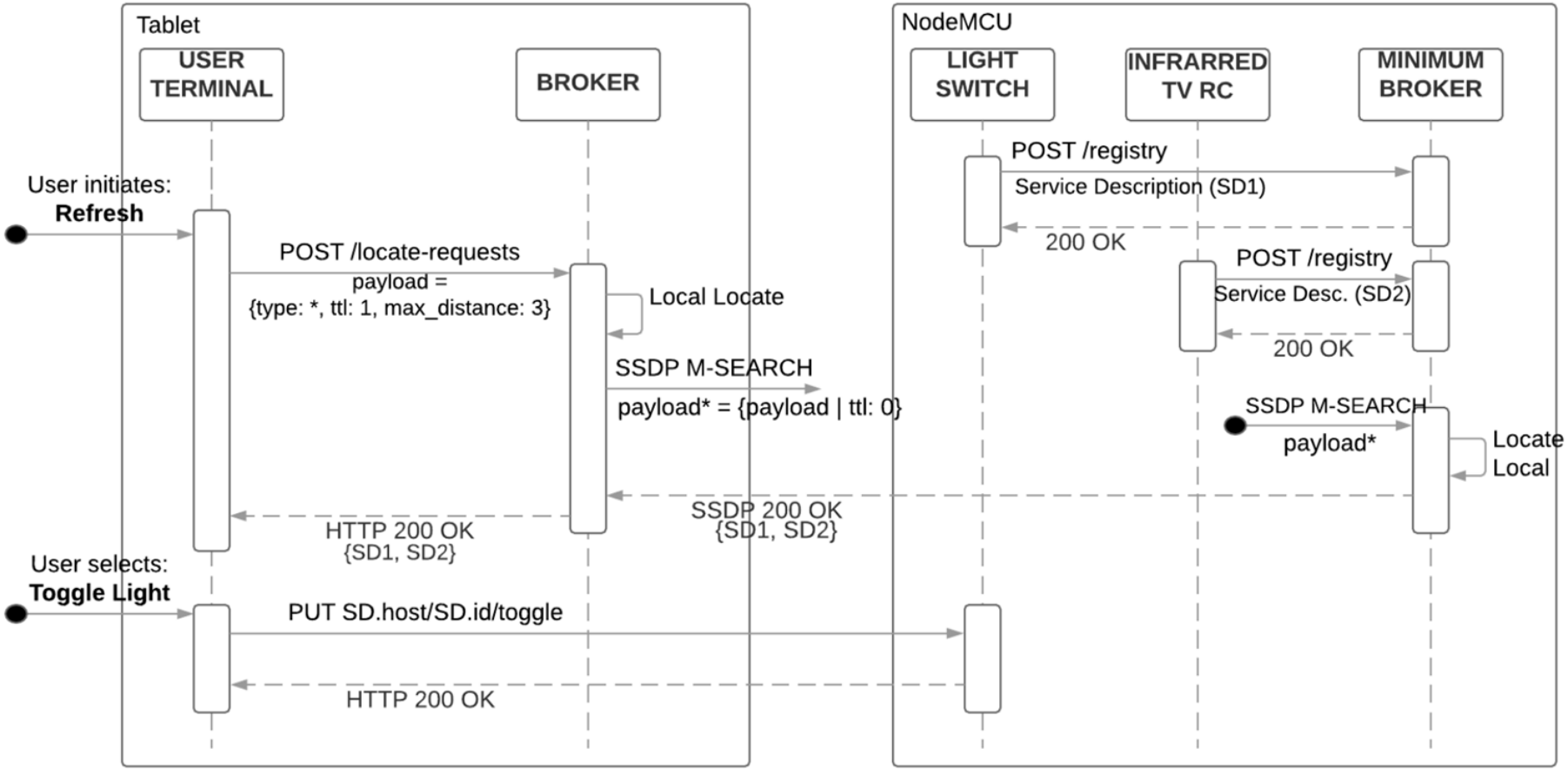
Ambient controller	Common Broker	Light Switch	Infrared Receptor	**Minimum Broker**

Android Tablet



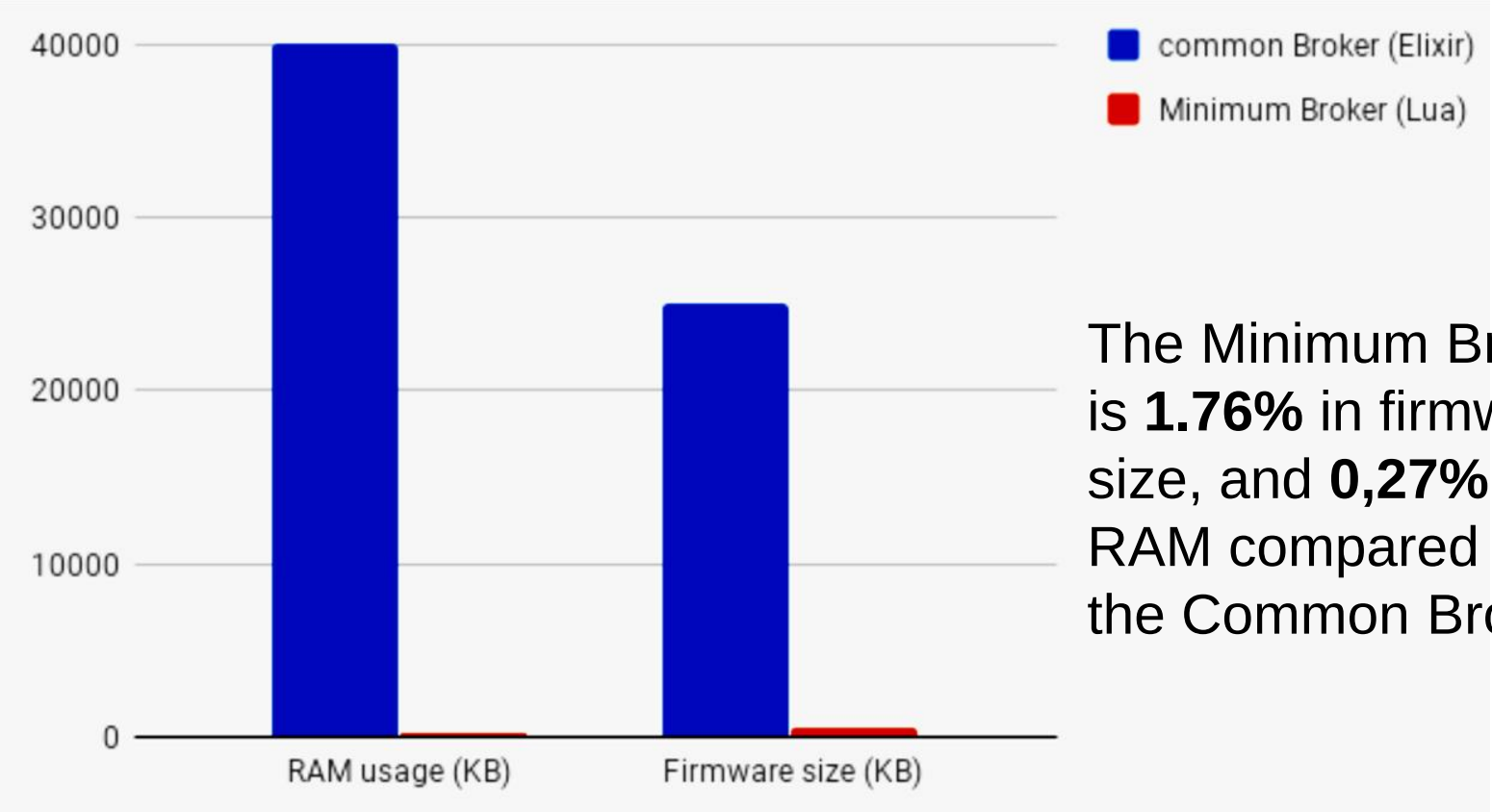
NodeMCU
https://en.wikipedia.org/wiki/NodeMCU

Proof of Concept: **Smart-Office**



Ultra low resource consumption

Common Broker vs Minimum Broker



The Minimum Broker is **1.76%** in firmware size, and **0,27%** in RAM compared with the Common Broker.

Conclusions

High scalability of Peer To Peer networking of low constraint devices is fundamental for the Swarm **heterogeneity**

The had proposed and successfully implemented a **Minimum Broker** in low constraint devices

We illustrated a scenario with a P2P network heterogeneous low constraint Brokers.

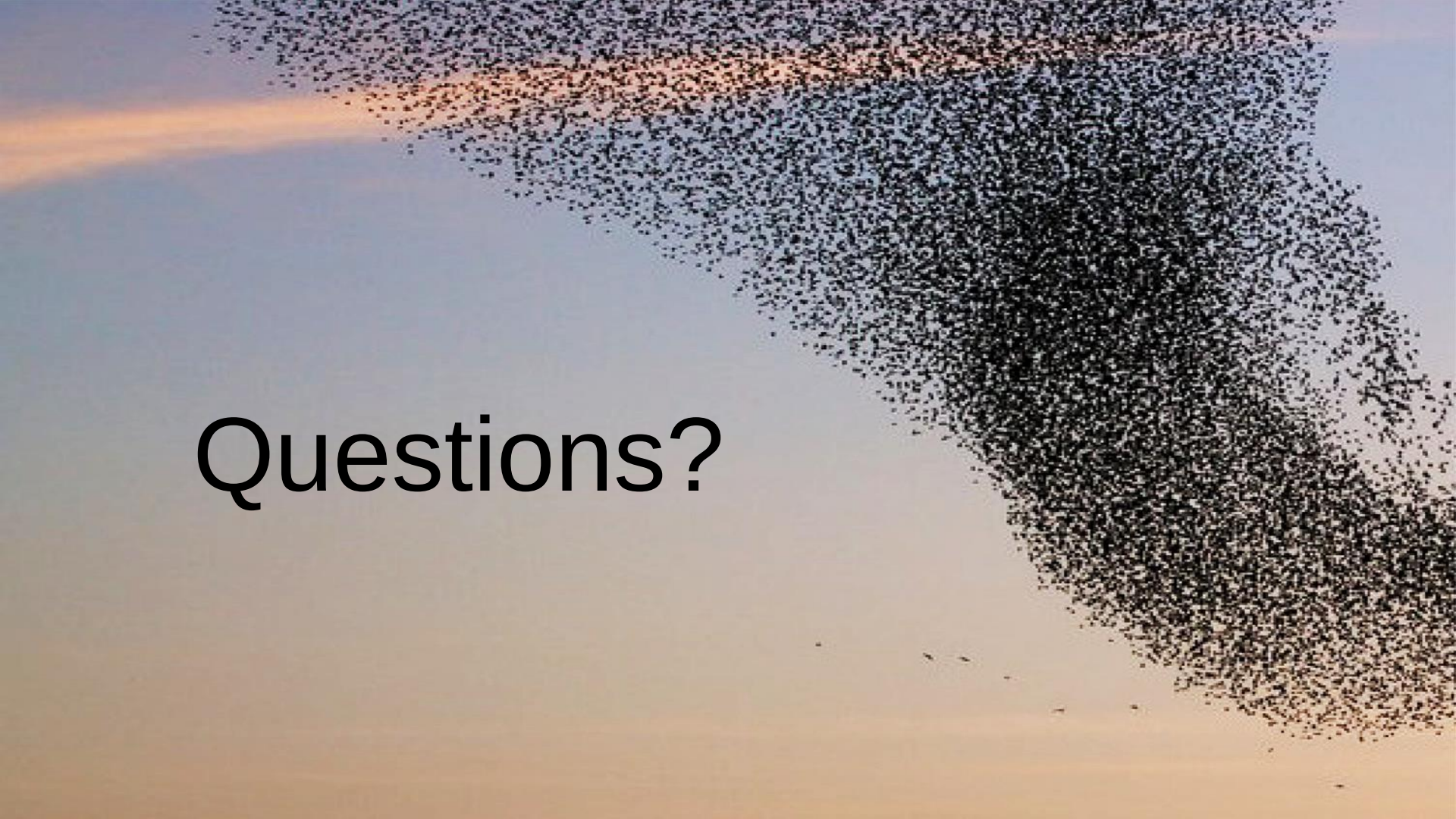
The minimum broker can bring colelive intelligence to the **Edge of the Edge** in the Cloud

Acknowledgements

Prof. Jan Rabaye UC Berkeley

USP Research Office

Insects that inspire us everyday


Questions?


Thank you
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