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SWARM COMPUTE CLUSTER

HORIZON-CL4-2024-DATA-01-03

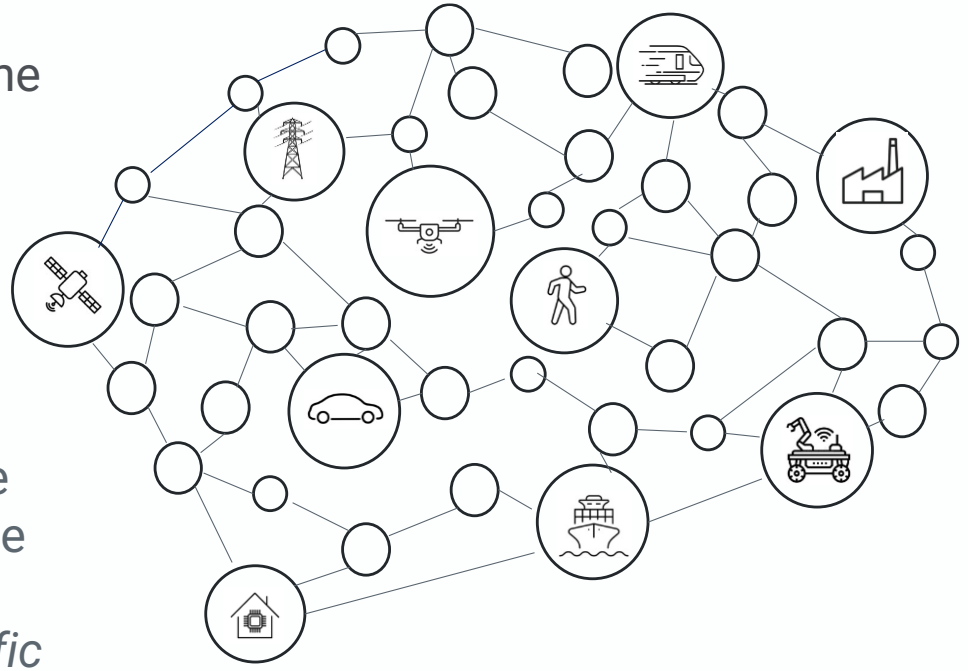
INTRODUCTION

Swarm intelligence is the collective behaviour of **decentralised**, **self-organised** systems, natural or artificial.

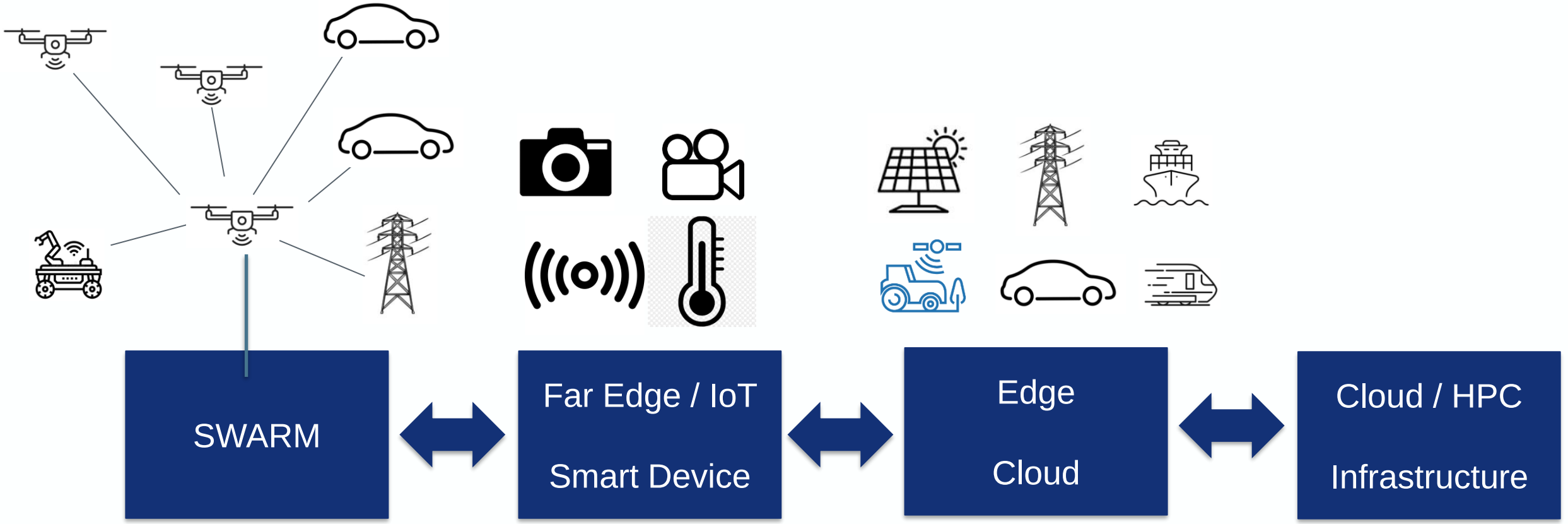
Swarm intelligence takes the full advantage of the swarm without the need of centralised control and global model and provides a great solution for large-scale sophisticated problems

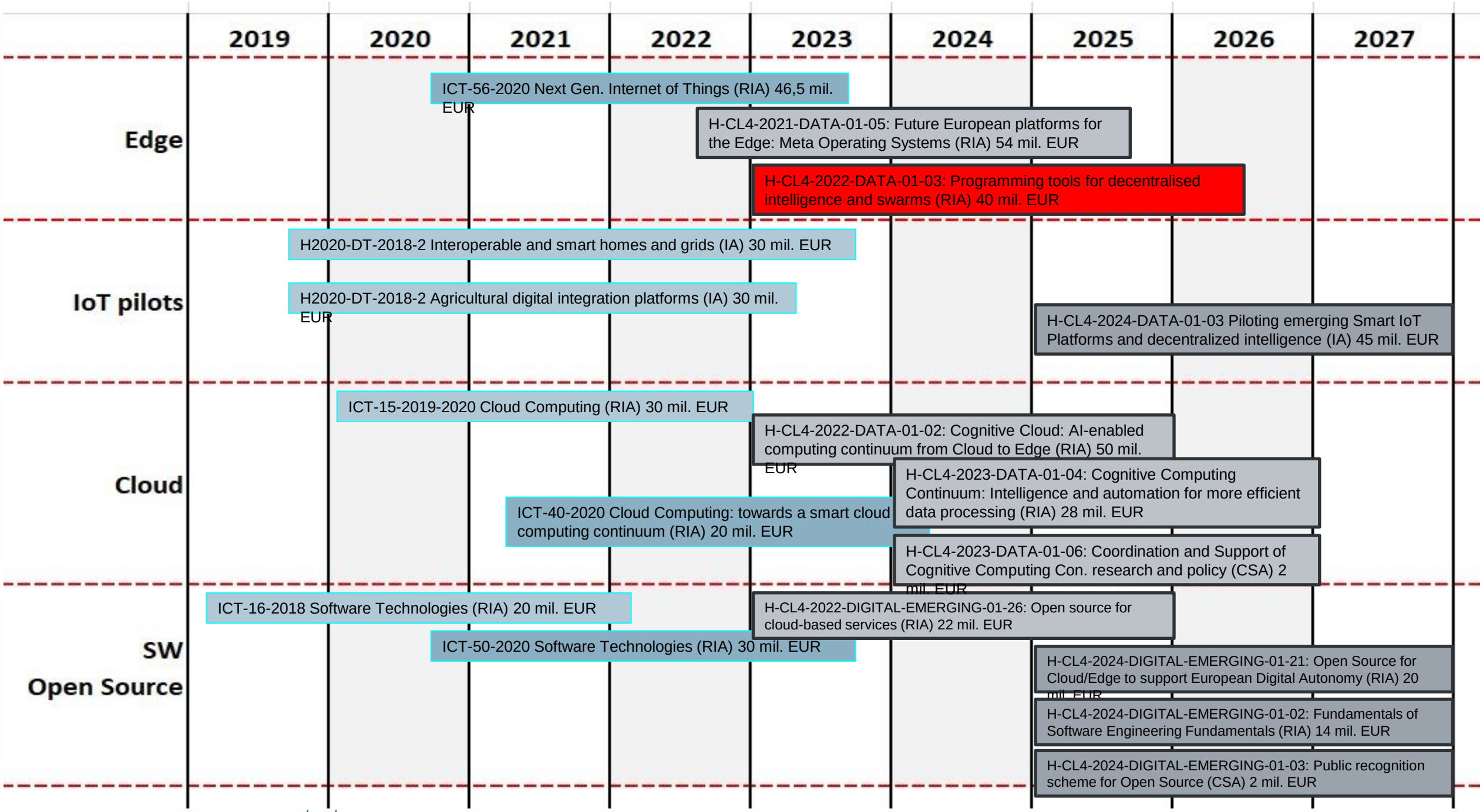
Swarm intelligence is a form of **collective learning and decision-making** based on decentralized, self-organized system

Swarm computing combines network and cloud principles to create an on-demand, autonomic and decentralized computing and storage management layer that transparently interoperates among diverse and disperse edge and cloud models and topologies. (*ATOS scientific community*)



SWARM characteristics




2019
2020
2021
2022
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2024
2025
2026
2027
Edge
IoT pilots
Cloud
SW
Open Source
ICT-56-2020 Next Gen. Internet of Things (RIA) 46,5 mil. EUR
H-CL4-2021-DATA-01-05: Future European platforms for the Edge: Meta Operating Systems (RIA) 54 mil. EUR
H-CL4-2022-DATA-01-03: Programming tools for decentralised intelligence and swarms (RIA) 40 mil. EUR
H2020-DT-2018-2 Interoperable and smart homes and grids (IA) 30 mil. EUR
H2020-DT-2018-2 Agricultural digital integration platforms (IA) 30 mil. EUR
H-CL4-2024-DATA-01-03 Piloting emerging Smart IoT Platforms and decentralized intelligence (IA) 45 mil. EUR
ICT-15-2019-2020 Cloud Computing (RIA) 30 mil. EUR
H-CL4-2022-DATA-01-02: Cognitive Cloud: AI-enabled computing continuum from Cloud to Edge (RIA) 50 mil. EUR
H-CL4-2023-DATA-01-04: Cognitive Computing Continuum: Intelligence and automation for more efficient data processing (RIA) 28 mil. EUR
ICT-40-2020 Cloud Computing: towards a smart cloud computing continuum (RIA) 20 mil. EUR
H-CL4-2023-DATA-01-06: Coordination and Support of Cognitive Computing Con. research and policy (CSA) 2 mil. EUR
ICT-16-2018 Software Technologies (RIA) 20 mil. EUR
H-CL4-2022-DIGITAL-EMERGING-01-26: Open source for cloud-based services (RIA) 22 mil. EUR
ICT-50-2020 Software Technologies (RIA) 30 mil. EUR
H-CL4-2024-DIGITAL-EMERGING-01-21: Open Source for Cloud/Edge to support European Digital Autonomy (RIA) 20 mil. EUR
H-CL4-2024-DIGITAL-EMERGING-01-02: Fundamentals of Software Engineering Fundamentals (RIA) 14 mil. EUR
H-CL4-2024-DIGITAL-EMERGING-01-03: Public recognition scheme for Open Source (CSA) 2 mil. EUR

The Projects

The OpenSwarm project triggers the next revolution in data-driven systems by developing true collaborative and distributed smart nodes in three technological pillars:

- efficient smart nodes
- energy-aware Artificial Intelligence (AI)
- energy-aware swarm programming.

The SmartEdge project aims to achieve dynamic integration of decentralized edge intelligence while prioritizing reliability, security, privacy, and scalability. This will be realized through a semantic-based interplay of edge devices in a cross-layer toolchain, allowing seamless and real-time distribution of autonomous intelligence swarms.

TaRDIS's primary goal is to significantly ease the complexity and reduce the effort of building correct and efficient heterogeneous swarms.
TaRDIS focuses on supporting the correct and efficient development of applications for swarms and decentralised distributed systems, by combining a novel programming paradigm with a toolbox for supporting the development and executing of applications.

The OASEES project will deliver a European, fully open-source, decentralized, and secure Swarm programmability framework for edge devices and leveraging various AI/ML accelerators (FPGAs, SNNs, Quantum) while supporting a privacy-preserving Object ID federation process.

The INCODE project will deliver a wide-open, secure and trusted IoT-to-edge- to-cloud compute continuum that will realize the true potentials of edge intelligence. The project will design and develop an open platform for the deployment and dynamic management of end-user applications, over distributed, heterogeneous and trusted IoT-Edge node infrastructures, with enhanced programmability features and tools.

Use Cases

OpenSwarm

Renewable Energy Community

Human Workers in Harvesting Wild Food

Ocean Noise Pollution Monitoring

Environment, Health, and Safety in Industry

Moving Network in Trains

INCODE

Smart logistics at terminal stations

Utilities Inspection

SMART worker assistant

SmartEdge

Cooperative Perception for Driving Assist

Active-option zone management

Smart Factories with Intelligent Mobile Robots

Smart Factory with Low-Code Edge Intelligence

Edge/Swarm Intelligence in Health

TaRDIS

Intelligent Homes

Highly resilient factory shop floor digitalisation

Multi-level smart charging & Grid Balancing (EDP)

Distributed navigation for LEO satellite constellations (GMV)

OASEES

Analysis of Voice, Articulation and Fluency disorders in Parkinson using Disease Edge/Swarm Intelligence

EVs fleet and Grid Optimization using Edge/Swarm Intelligence

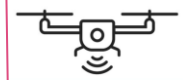
Drone Inspection using Edge/Swarm Intelligence

Robotic Swarm at a Smart Factory using Edge/Swarm Intelligence

Structural Safety for Buildings and Critical Infrastructure using Edge/Swarm Intelligence

Smart Energy harvesting and Predictive Maintenance Wind turbines using Disease Edge/Swarm Intelligence

Use Case Domains

OpenSwarm									
smartedge									
ToRDIS									
OASEES									
INCODE									

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THANK YOU FOR YOUR ATTENTION!

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Questions

- "How does OASEES leverage swarm intelligence and privacy-preserving technologies to enhance the efficiency and security of distributed computing environments?"