

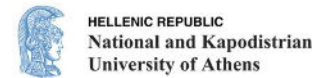
ToRDIS

Trustworthy and Resilient Decentralised Intelligence for Edge Systems



GOAL

Significantly ease the complexity and reduce the effort of building correct and efficient heterogeneous swarms.



Energy Communities



Intelligent Homes



Satellite Swarms



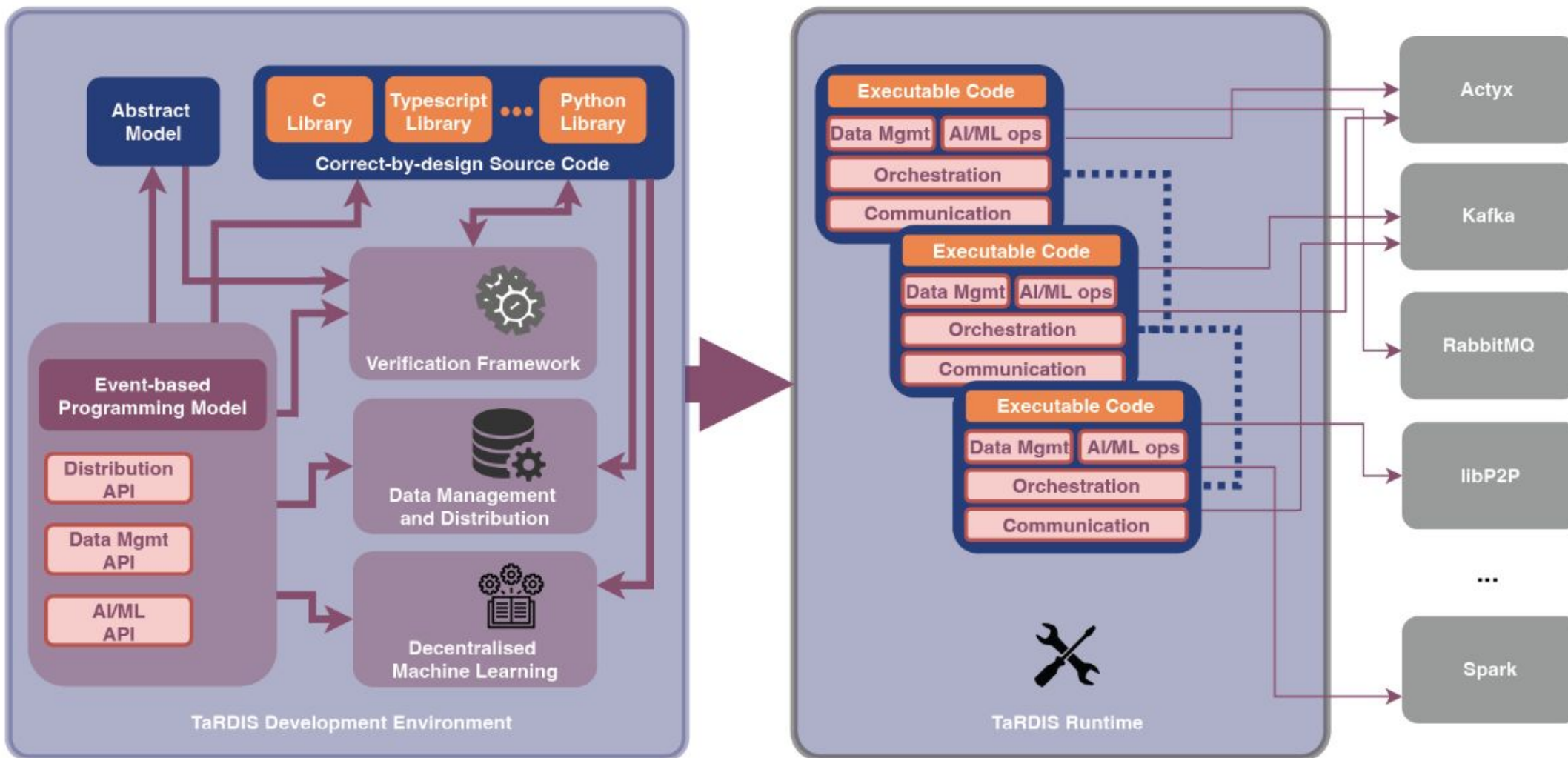
Smart Factories



TaRDIS Toolbox



Developer



Intelligent Homes



Concept:

The smart home paradigm usually includes a **range of highly heterogeneous devices** designed to work together as a **swarm**, through **artificial intelligence (AI)** algorithms, to assist us and make our lives more comfortable.

Concerns:

1. Privacy of personal information;
2. Heterogeneity of computational resources.

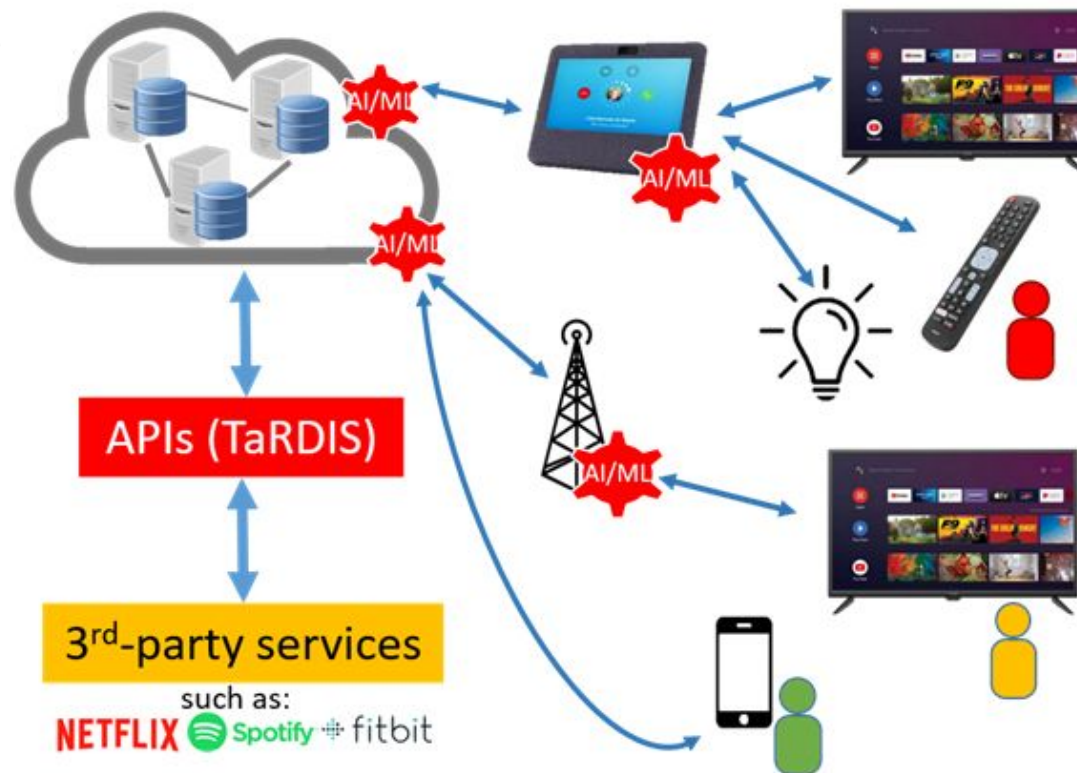
Goal: Exploit the **hierarchies** in the system in order to:

1. develop a privacy-preserving federated learning framework;
2. allow resource-constrained devices to participate in the FL training (through Split Learning).

TaRDIS toolkit will be used to **abstract the infrastructure, data distribution, and learning algorithms** from the developer.

Benefits:

1. **Collaborative intelligence** irrespective of heterogeneity in local data, resources, learning goals, etc.;
2. A **correct-by-design development environment** implementing privacy-preserving solutions.



Smart Factories



Concept:

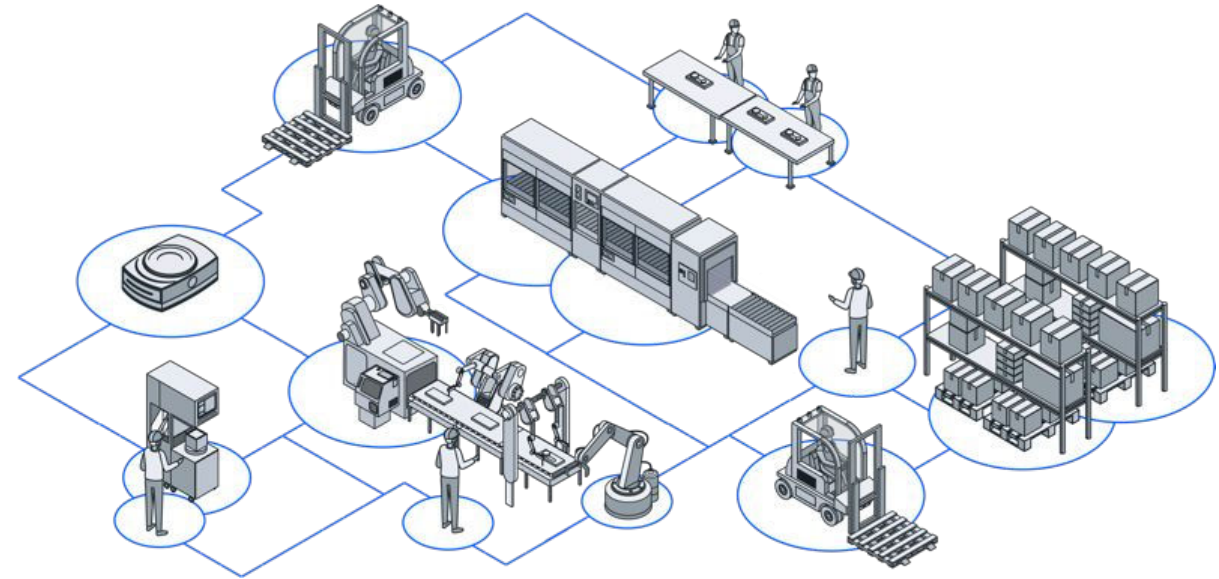
Next-generation factories are built from **intelligent components** (stationary machines, fixed and mobile robots, ground and air drones, humans) that **collaborate autonomously** to perform mission-critical tasks without central infrastructure. Data flows peer-to-peer, using LAN (wifi) or WPAN (IEEE 802.15) connections.

Implementing this dynamic machine-to-machine cooperation **correctly and resiliently** is made possible by TaRDIS through protocol design, analysis, verification, and validation tools. Rigid classical automation approaches (i.e. PLCs) lack the flexibility and agility to efficiently express such high-level orchestration.

Local-first data storage, communication, and computation are realised based on the Actyx middleware as a local peer-to-peer software stack that takes full advantage of mesh networking, with the option of sending data to the cloud for archival and analysis.




Benefits:

Next-generation factories can much more quickly react to changing market demands (**agility**) down to variability between production orders or *lot size one* (**flexibility**). All processes become not only fully transparent but intelligently steerable in real-time, allowing **stringent optimization of resource usage and minimizing waste**.



Research Collaborations



-  **Protocol Labs** [Interoperation with libp2p being developed in TaRDIS]
-  **outsystems** [Use of replicated data types developed in TaRDIS for collaborative app development]
- **number**  [Implementing TaRDIS decentralized protocols into the Iroh communication solution]

