TRANSPARENT APPLICATION DEPLOYMENT IN A SECURE, ACCELERATED AND COGNITIVE CLOUD CONTINUUM

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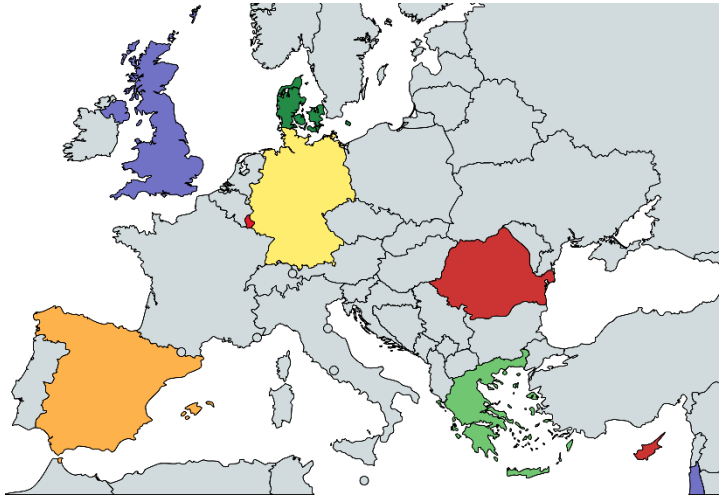
Project Administrative Information (1/2)

- **Project Name**: Transparent application development in a secure, accelerated and cognitive cloud continuum
- **Call identifier**: ICT-40-20 on “Cloud Computing: towards a smart cloud computing continuum”
- **Project Type**: Research & Innovation Action (RIA)
- **Grant Agreement Number**: 101017168
- **Project Coordinator**: Institute of Communication and Computer Systems – ICCS
- **Duration**: 36 months (01/01/2021 – 31/12/2023)

Project Administrative Information (2/2)

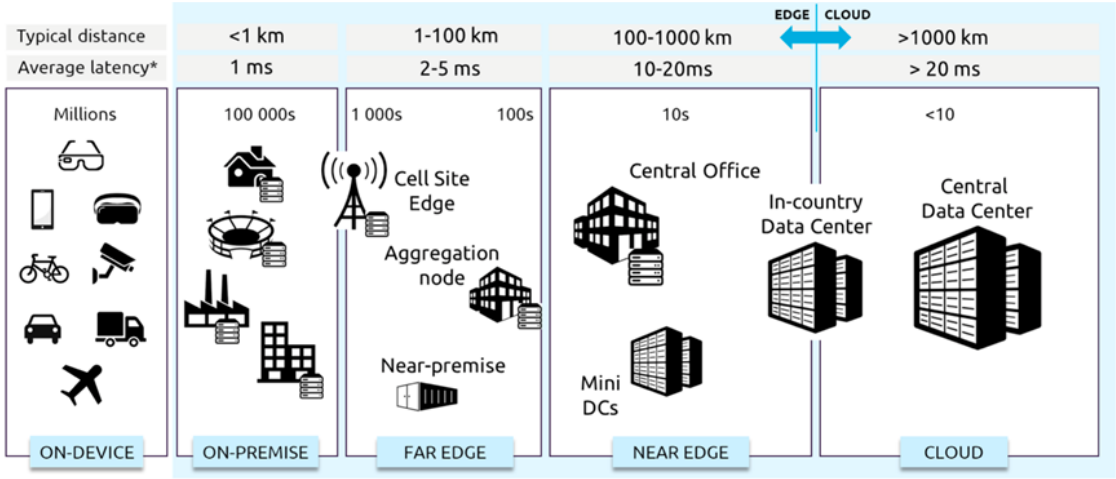
- 11 Partners
  - 5 research institutes: **ICCS, USTUTT, AUTH, IDEKO, UVT**
  - 4 SMEs: – **CC, INB, INNOV, NBFC**
  - 2 industrial partners: **MLNX, INTRA**



- Partner Roles
  - Edge, acceleration and security: **MLNX, CC, AUTH, NBFC**
  - Application profiling, HPC, resource orchestration and telemetry: **ICSS, USTUTT, INNOV, UVT**
  - Integration and use cases: **INTRA, CC, INB, IDEKO**

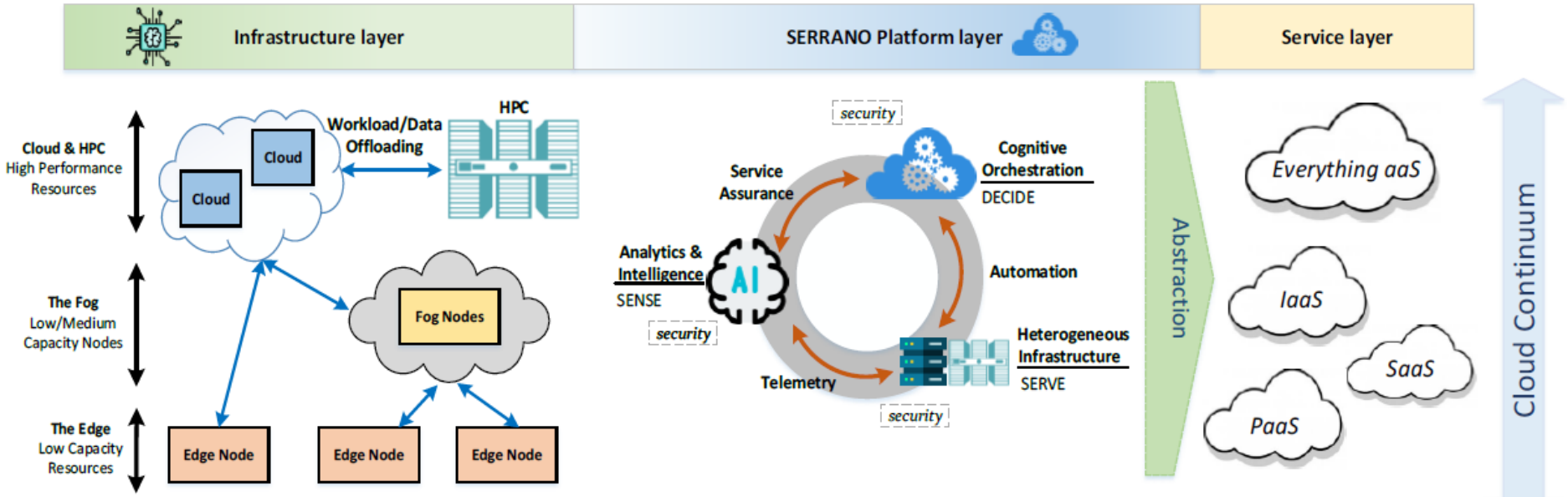
Motivation

- Traditionally the abundant cloud computing resources handle the processing and storage workload of monolithic applications
  - This model cannot adequately address the strict and dynamic requirements of emerging new applications
- Edge computing is a computing paradigm that brings computation and data storage closer to the sources of data
  - Multiple resources at edge with heterogeneous characteristics (CPUs, GPUs, Mini DC, FPGA, ASICs, Storage nodes)



SERRANO vision

- SERRANO targets disaggregated and federated infrastructures consisting of edge, cloud and HPC resources through the development of the SERRANO Platform
- An abstraction layer will automate the operation and full exploitation of the available diverse resources, enabling transparent application deployment
- SERRANO platform will be a self-optimizing system that continuously adapts, over an infinite time horizon control loop
- SERRANO platform will enable the creation of a plethora of IaaS, PaaS, SaaS services targeting today's and future's cloud/edge/HPC computing markets



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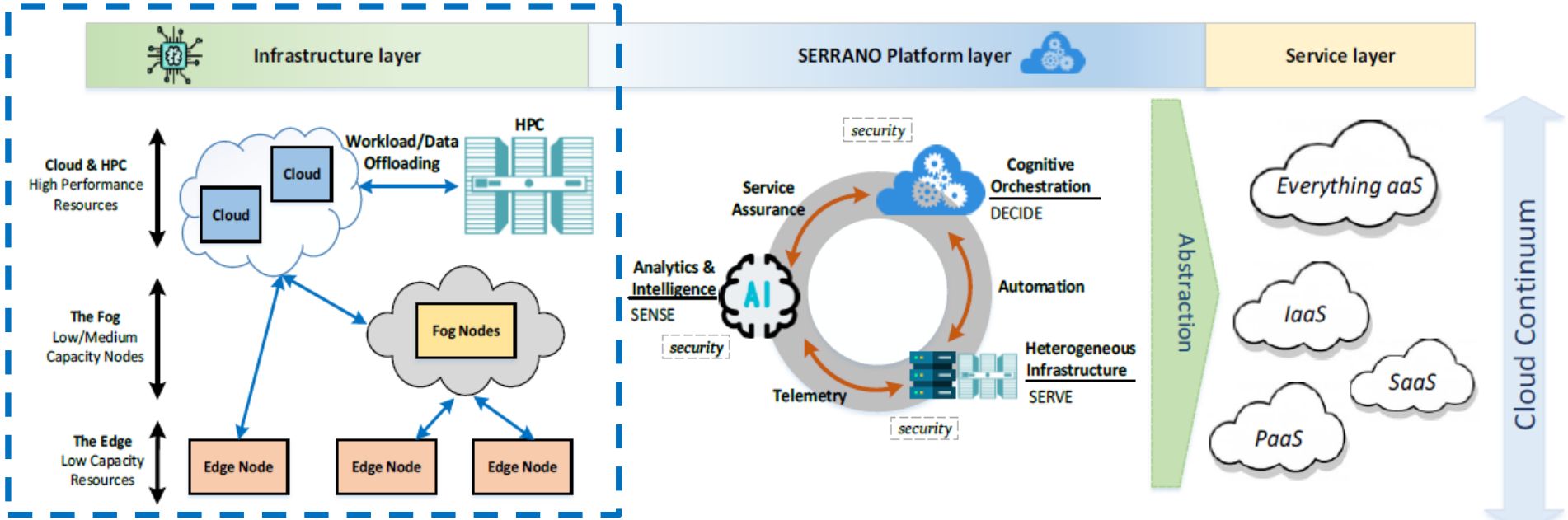

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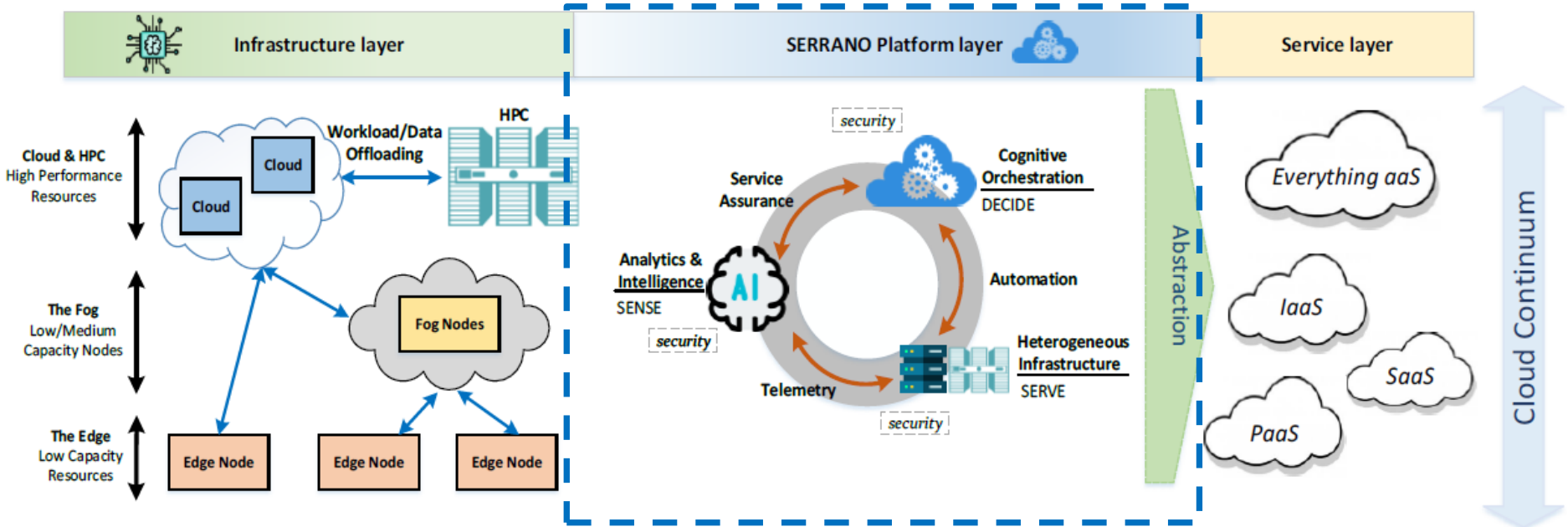

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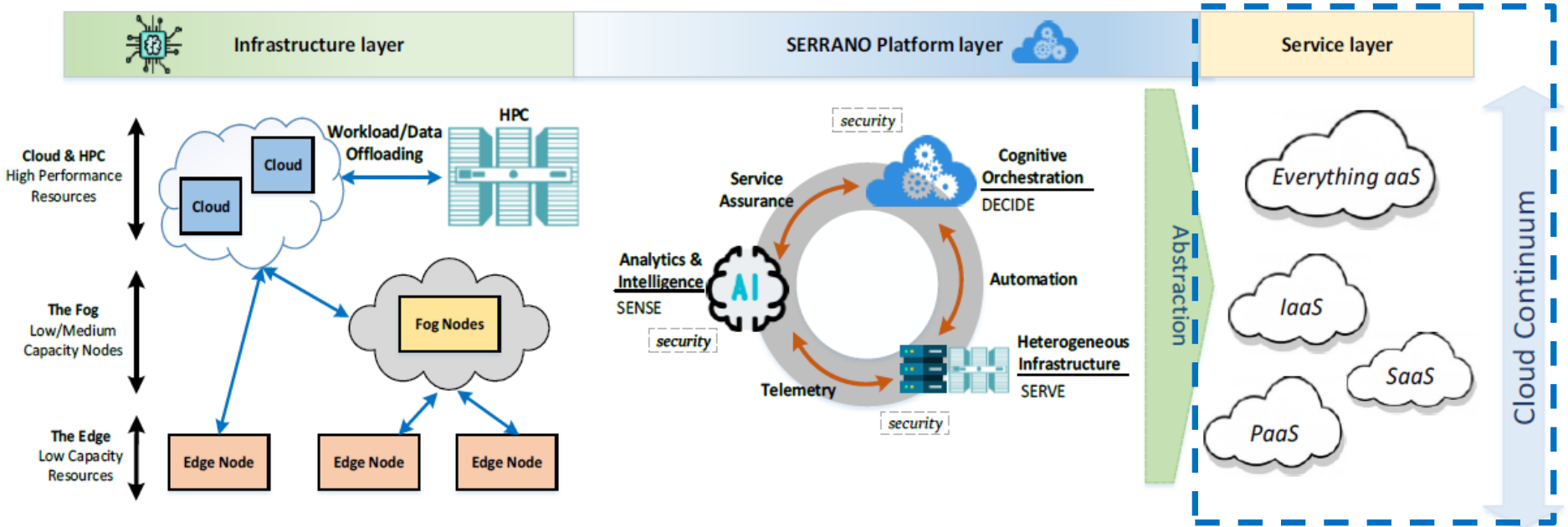
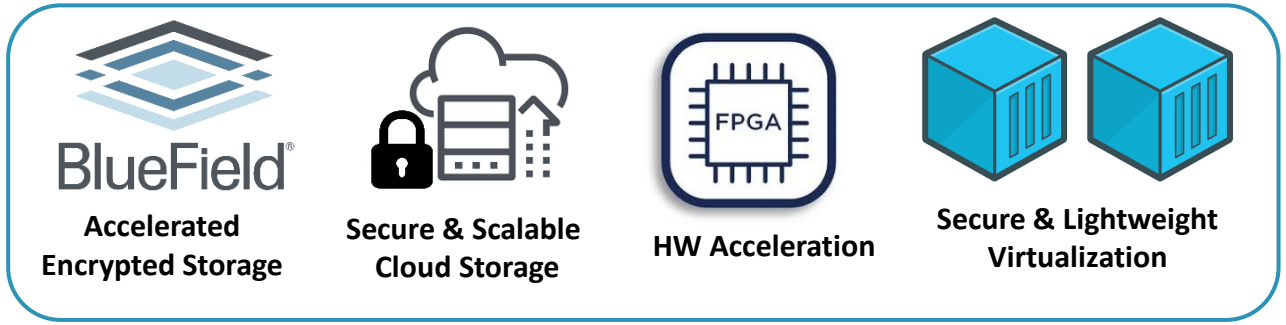


SERRANO vision

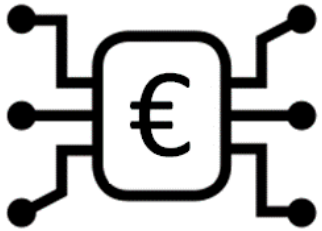
- SERRANO introduces and integrates in a single platform a number of key innovations on the edge, cloud and HPC:
  - HW/SW platforms for enhanced security and privacy
  - Hardware acceleration and approximation computing
  - Workload isolation and execution trust on untrusted resources
  - Intelligent service & resource orchestration



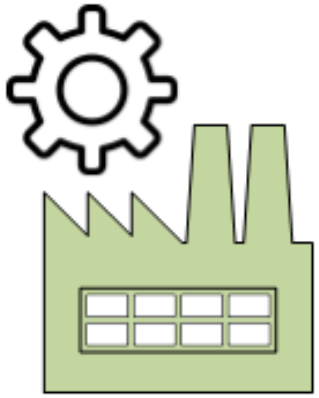
SERRANO (3) use cases

- **Secure Storage**
  - Provide secure and high-performance storage at the edge
  - Integrate SERRANO with a multi-cloud storage service

- **High-performance Fintech Analysis**
  - Apply AI and ML algorithms in financial operations
  - SERRANO will provide security and intelligent fintech app deployment



- **Machine Anomaly Detection in Manufacturing Environments**
  - Detect machine anomalies in real-time
  - SERRANO will orchestrate computations and data from high-frequency machine sensors



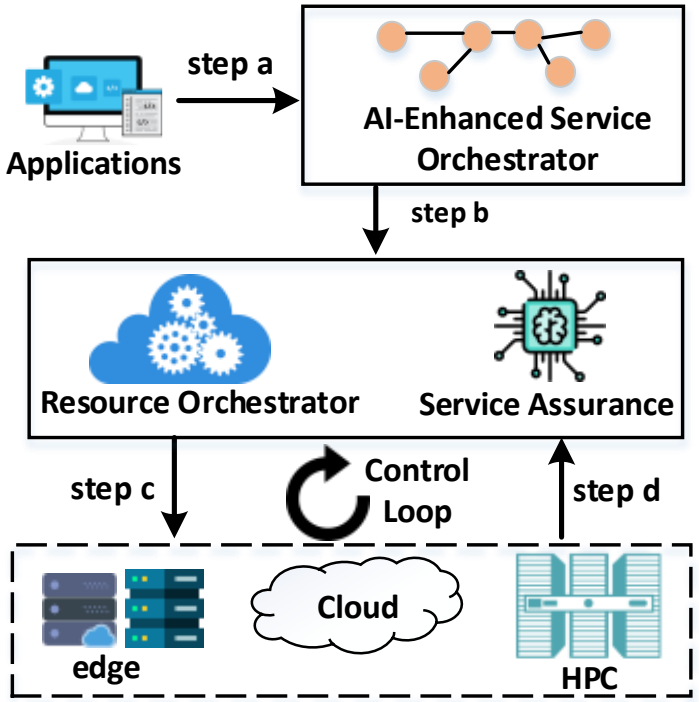
SERRANO objectives

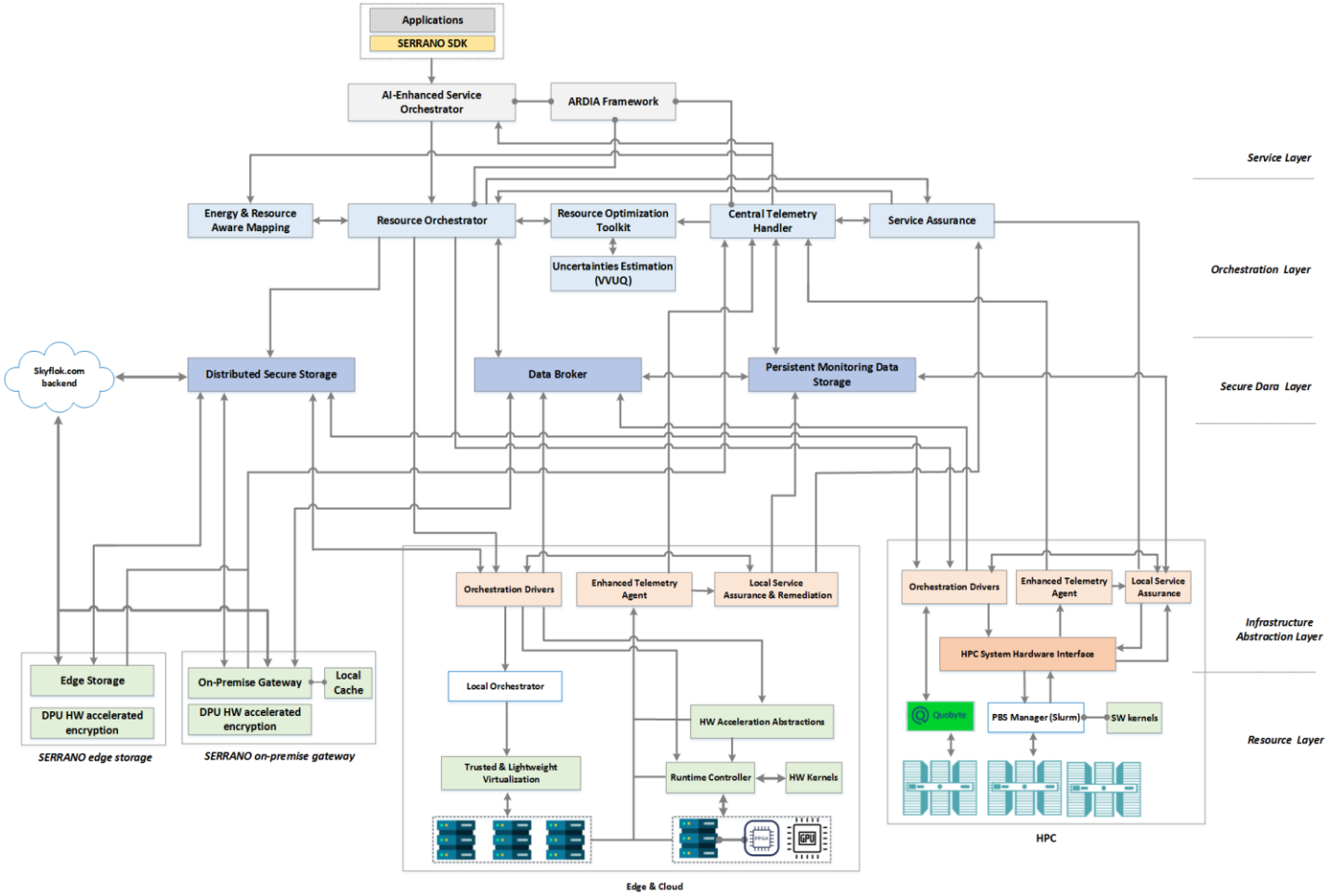
- **Objective 1**: Define an intent-driven paradigm of federated infrastructures consisting of edge, cloud and HPC resources
- **Objective 2**: Develop security and privacy mechanisms for accelerated encrypted storage over heterogeneous and federated infrastructures
- **Objective 3**: Provide workload isolation and execution trust on untrusted physical tenders.
- **Objective 4**: Provide acceleration and energy efficiency at the edge and cloud
- **Objective 5**: Cognitive resource orchestration and transparent application deployment over edge/fog-cloud/HPC infrastructures
- **Objective 6**: Demonstrate the capabilities of the secure, disaggregated and accelerated SERRANO platform in supporting highly-demanding, dynamic and safety-critical applications.

Towards the achievement of the Objectives

- Defined SERRANO multi-layer architecture
- Utilize Data Processing Units (DPUs) for secure storage acceleration
- Implement the SERRANO-enhanced Storage Service for secure storage in the edge
- Employ measured boot techniques and develop a lightweight hypervisor to support various tiers of security in the edge and cloud
- Developed HW and SW accelerated kernels that utilize approximation techniques for cloud, edge and HPC along with related frameworks and tools
- Develop SERRANO abstraction layer, orchestration, monitoring and service assurance mechanisms

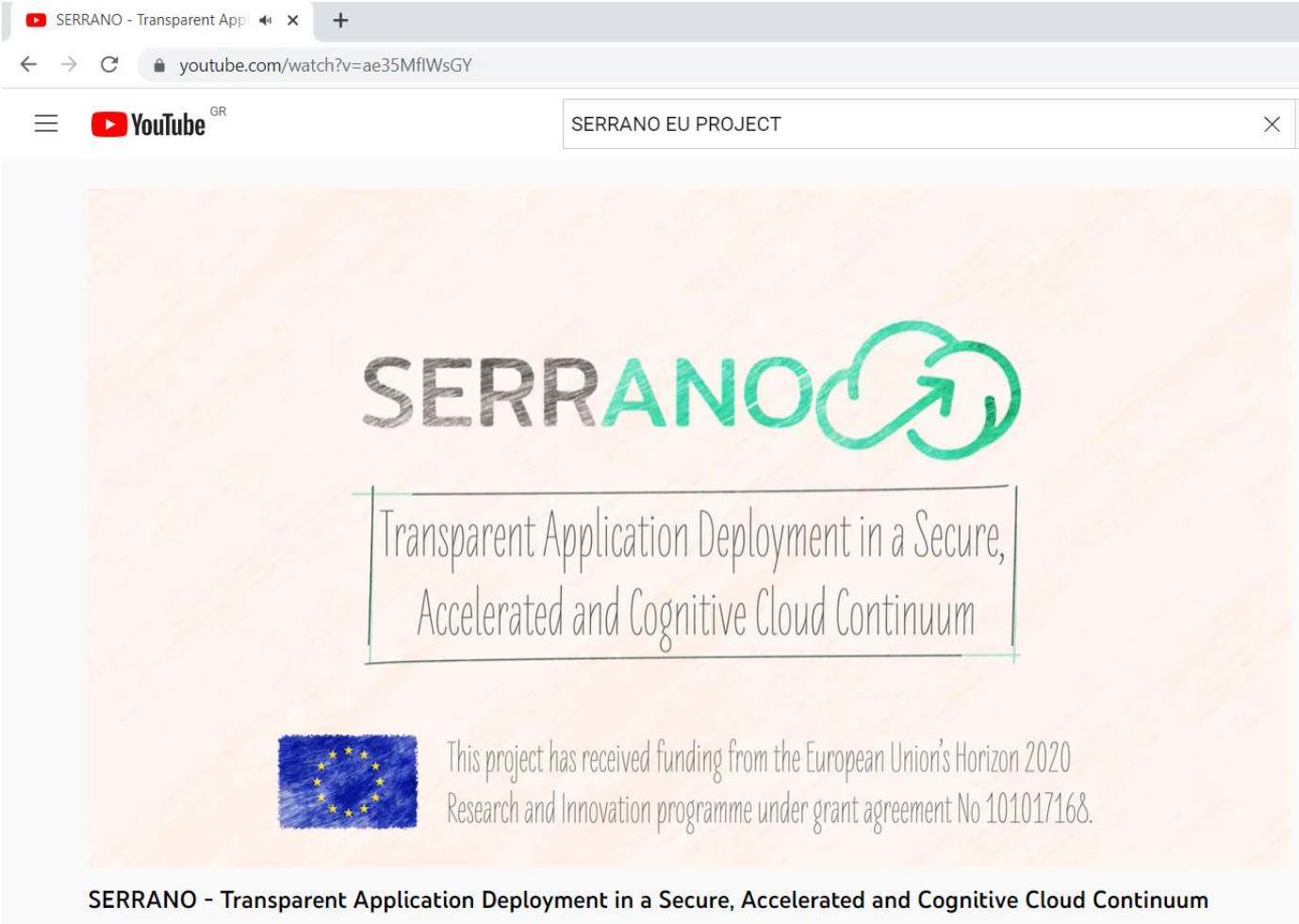
Towards the achievement of the Objectives





SERRANO video

- https://www.youtube.com/watch?v=ae35MfIWsGY



Thank you!

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