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Efficient, portabLe And Secure orchesTration for reliable servICes

ELASTIC and European Smart Networks and Services (SNS)

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Project Identity Card

Project Consortium: 13 partners

Project Type:
Research & Innovation Action

Duration: 36 Months

Start Date: 1 March 2024

Total Budget: €3,999,990

ELASTIC Consortium

1. POLYTECHNEIO KRITIS (**TUC**)
2. ERICSSON AB SE (**ERS**)
3. OY L M ERICSSON AB (**ERF**)
4. TELEFONICA INVESTIGACION Y DESARROLLO SA (**TID**)
5. THALES SIX GTS FRANCE SAS (**THS**)
6. THALES DIS FRANCE SAS (**THD**)
7. INTERUNIVERSITAIR MICRO-ELECTRONICA CENTRUM (**IME**)
8. ULTRAVIOLET CONSULT DOO (**UVC**)
9. AALTO KORKEAKOULUSAATIO SR (**AAL**)
10. LUNDS UNIVERSITET (**LUN**)
11. ABSTRACT MACHINES SAS (**AMA**)
12. PRIVREDNO DRUSTVO ZENTRIX LAB DRUSTVO SA OGRAN (**ZEN**)
13. POLITECNICO DI TORINO (**TOR**)

13 consortium partners **8** countries

5 Academic & research organisations
5 Industrial partners
3 SMEs

ERF, AAL
ERS, LUN
IME
TUC
THS, THD, AMA
TID
ZEN, UVC
TOR

Motivation

6G communication networks

Important to **ensure efficient and effective orchestration** of its broad range of services and resources

Edge cloud computing

Increasingly important as the data volumes rise with the number of the connected devices

Security in 6G

Critical issue in 6G services due to privacy and confidentiality of sensitive data

Challenges

1

Security of lightweight and portable executable isolation

- Secure portable and lightweight workloads
- Improve orchestration monitoring latencies

2

Efficient and secure serverless orchestration over a heterogeneous continuum

- Fast and secure orchestration services

3

Privacy-preserving multi-party confidential computing

- HW CPU extensions for creating secure enclaves

4

Portable and secure workload distribution and execution over constrained far-edge IoT devices

- Efficient process orchestration and execution over 6G networks

Our mission

ELASTIC aims to enhance **efficiency and security of service orchestration** within the highly distributed and heterogeneous context of **cloud-fog-edge continuum** technologies.

ELASTIC will focus on **combining** impactful **key technologies** from modern **cloud-native ecosystems** to enhance **service orchestration** and **security** over **6G networks**.

Objectives

1. Analyse **executable isolation techniques**, and **improve efficiency**, **portability**, and **security** for secure **in-network cloud and edge** computing across the entire lifecycle
2. Research and design **secure, architecture-agnostic serverless FaaS orchestration** for diverse artifacts and workloads. Ensure **data authenticity** and **trusted digital interactions** in dynamic service environments
3. Implement a **secure, privacy-preserving, architecture-agnostic execution environment** utilising confidential computing and privacy-enhancing technologies to ensure secure services on a programmable platform for multi-stakeholders
4. Design and implement **efficient, secure edge and far-edge (IoT) workload orchestration** for critical **6G infrastructure**, ensuring **reliability, trust, and resilience** in a globally connected continuum of heterogeneous environments facilitated by network and IT system convergence for future digital services
5. Facilitate **6G standardization**, **exploitation**, and **dissemination** of developed technologies, aligning with **EU supply capabilities** for efficient, secure, and privacy-preserving service deployment

ELASTIC key tools and functionalities

WebAssembly (Wasm)

- High efficiency and security of cloud orchestration
- High service portability
- Support a variety of programming languages
- Lightweight computation

Serverless Function-as-a-Service (FaaS)

- High scalability and efficient architecture
- Responsiveness and adaptability to conditions changes
- Automatic scaling up or down
- Latency reduction

Confidential Computing

- Trusted Execution Environments (TEEs)
- Cryptographic CPU HW extensions
- Sensitive data protection
- Unauthorised code access protection

eBPF/XDP

- Real-time monitoring and security scanning
- Low-latency network packet processing

Framework that combines all the above tools across cluster-based environments

Pilot 1
Smart Connected Factory of the Future

IoT data fabric solution for hyper-scale data processing in a 6G timeframe

Tools:

- eBPF for security vulnerabilities
- WebAssembly and FaaS security frameworks
- Hardware-based, embedded low-power modules for security issues detection

ELASTIC goals & scenarios:

- In-transit **IoT data processing using FaaS**
- Use **lightweight virtualisation** to minimise processing **latency** and **resource utilisation**
- Deploy ELASTIC **stateless and minimal-state** processing on **resource-constrained device clusters**
- Deploy **privacy-aware mechanisms** for sharing threat information among distinct ELASTIC instances

Pilot 2
IT/OT - Privacy-preserving confidential computing platform to migrate on-premise sensitive IT services to the cloud

Confidential computing for secure migration of sensitive services to the cloud

Tools:

- VM-based Trusted Execution Environments
- HW platform abstractions
- Wasm containers
- eBPF monitoring

ELASTIC goals & scenarios:

- Automated handling (i.e., creation and initialisation of confidential VM)
- TEE abstractions to use any CSP infrastructure (e.g., Gardeners to start irrigation)
- Handle remote attestations
- Software Management Agents (SMAs) for confidential VMs

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