

ELASTIC Project Celebrates a Successful First Year of Advancing Secure and Efficient Service Delivery for 6G Infrastructures

The **ELASTIC project**, funded by the **Smart Networks and Services Joint Undertaking (SNS JU)** under the European Union's Horizon Europe research and innovation programme (Grant Agreement No. 101139067), proudly marks the completion of its **first year** with substantial progress in research and technical development. Bringing together a multidisciplinary consortium of leading research institutions, technology companies, and industry experts, ELASTIC is setting the foundation for **next-generation service orchestration** across edge, fog, and cloud environments—supporting the transformation toward secure and efficient 6G infrastructures.

Driving the Future of Secure and Intelligent Edge Computing

ELASTIC is designed to address some of the most pressing challenges in the 6G era, including the **secure execution of distributed workloads**, **intelligent orchestration across heterogeneous platforms**, and **privacy-preserving data processing**. At the core of the project's innovation is a **conceptual architecture**, developed during the first year, that defines a modular and flexible framework built on five interrelated functional blocks:

- **Management & Orchestration** – Manages services across cloud-fog-edge infrastructures with an emphasis on scalability, efficiency, and security.
- **Isolation** – Secures application execution using Trusted Execution Environments (TEEs), hardware abstraction layers, WebAssembly (Wasm), and eBPF.
- **Communication** – Enables secure and low-latency data exchanges through encryption and efficient microservices.
- **Trust & Access Control** – Ensures authenticated access via remote attestation and dynamic access control policies.
- **Monitoring & Detection** – Provides continuous security oversight and rapid detection of threats through real-time anomaly monitoring.

Leveraging cutting-edge technologies such as **Wasm**, **Confidential Computing**, **Function-as-a-Service (FaaS)**, and **eBPF/XDP**, ELASTIC delivers a **portable, secure, and high-performance execution environment** for emerging edge computing scenarios.

Technical Progress Across Work Packages

Throughout its first year, ELASTIC has achieved major technical milestones across its Work Packages (WPs), laying the groundwork for future integration and demonstration.

- **WP1: Efficient, Portable, and Secure Executable Isolation** - Significant advancements were made in isolation mechanisms, including stack smashing protection, Control Flow Integrity (CFI), and eBPF vulnerability detection. Current efforts focus on secure workload migration in distributed edge environment and the development of intelligent security for real-time analysis.
- **WP2: Serverless FaaS Orchestration with Architecture-Agnostic In-Network Execution:** The team developed the **Propeller Orchestrator**, a novel orchestration platform for Wasm-based serverless workloads. Research, also, explored confidential AI, Kubernetes-native orchestration, and WASI-based hardware acceleration.
- **WP3: Privacy-Preserving, Portable, and Efficient Execution Using Confidential Computing** - Work focused on the specification of a hardware abstraction layer for portable execution, evaluating Wasm runtimes in TEEs, and improving remote attestation protocols to support privacy-preserving workloads across platforms.
- **WP4: Efficient, Portable, and Secure Edge Workload Orchestration** - Efforts targeted lightweight workload execution in far-edge IoT environments, combining WebAssembly, Federated Learning, and secure ML techniques. Key outcomes include an edge-based hardware-based Intrusion Detection System (IDS) using eBPF.
- **WP5: ELASTIC Demonstrators** - The project's technological innovations will be validated through two demonstrators. Demonstrator 1 presents an IoT data fabric seamlessly integrated into a 6G-native infrastructure, mapping advanced manufacturing use cases that include predictive maintenance and real-time analytics at the edge.. Demonstrator 2 explores the secure migration of sensitive IT services to the cloud using confidential computing, enabling privacy-preserving access control, credential protection, and operational log processing for enterprise systems.
- **WP6: Dissemination, Standardisation, and Exploitation** - The ELASTIC consortium has actively contributed to research results dissemination, community engagement, and ecosystem building. Over the past year, the project published nine peer-reviewed papers, and participated in more than 20 international events, including conferences, workshops, and collaborative technical forums.

To support this progress, ELASTIC held its first External Expert Advisory Board (EEAB) meeting, where all the achievements of the first year were presented, and valuable feedback was collected to guide the project's next steps.

Looking Ahead: Ambitions for Year Two

As ELASTIC moves into its second year, the project will continue the development of its core technological components, define and refine the targeted use cases, and begin the integration of these technologies into the two real-world demonstrators. A key milestone will be the release of the project's Minimum Viable Platform (MVP), showcasing the first consolidated outcomes of ELASTIC's innovation framework. Parallel efforts will focus on strengthening contributions to ongoing standardisation activities and deepening engagement with relevant industrial stakeholders and open-source communities. These activities will reinforce ELASTIC's role in shaping the future of secure, efficient, and privacy-aware edge-cloud orchestration for 6G infrastructures.

Learn More

Stay informed on ELASTIC's progress and explore project updates, publications, and events at <https://elasticproject.eu>.

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