Press Release

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An Autonomic Manager to face unpredictability and re-train AI models in Process Industry

Complexity, instability and unpredictability pose key-challenges for developing innovative solutions in the process industry, affecting their value chain. The technological advancement proposed by the s-X-AIPI project involves augmenting AI systems with self-management capabilities. The s-X-AIPI Autonomic Manager, developed by ENGINEERING, has a central role as an autonomous AI Data pipeline coordinator and decision maker, who adopts MAPE-K framework and supports the implementation of Self-X abilities, as proposed by autonomic computing including self-configuration, self- optimisation, self-healing and self-protection.

This will be realized by an adaptation loop, which enables "learning by doing" using MAPE-K model, as a continuous Monitoring-Analyzing-Planning-Execution flow based on the Knowledge of the AI system under control, continuously observing pipeline operations and facilitating experiential learning via Human-in-the-Loop interaction.

To integrate autonomic computing features across the entire AI system, the Autonomic Manager proposed in s-X-AIPI primarily engages with both the AI pipelines and the AI Methods designed to empower the pipelines with self-X abilities. Additionally, the Autonomic Manager adheres to the principles of Human-in-the-Loop interaction, seeking input from operators such as Data Scientists, IT Operators, or Plant Operators, whenever needed.

AI pipelines are complex systems that ingest and process data in several steps. Each of these steps produces a set of metadata: performance indicators that reflect the status of the entire AI system. Hence, thanks to these metadata analysed with defined AI Methods, the Autonomic Manager can monitor the system, plan and execute tasks to meet the required self-X abilities.

A domain-agnostic initial version of the Autonomic Manager' has been developed, to be furtherly tailored in four different Autonomic Managers on the basis of the four Use Cases' needs in the s-X-AIPI selected domains, namely Asphalt, Steel, Pharmaceutical and Aluminium manufacturing Process Industries.

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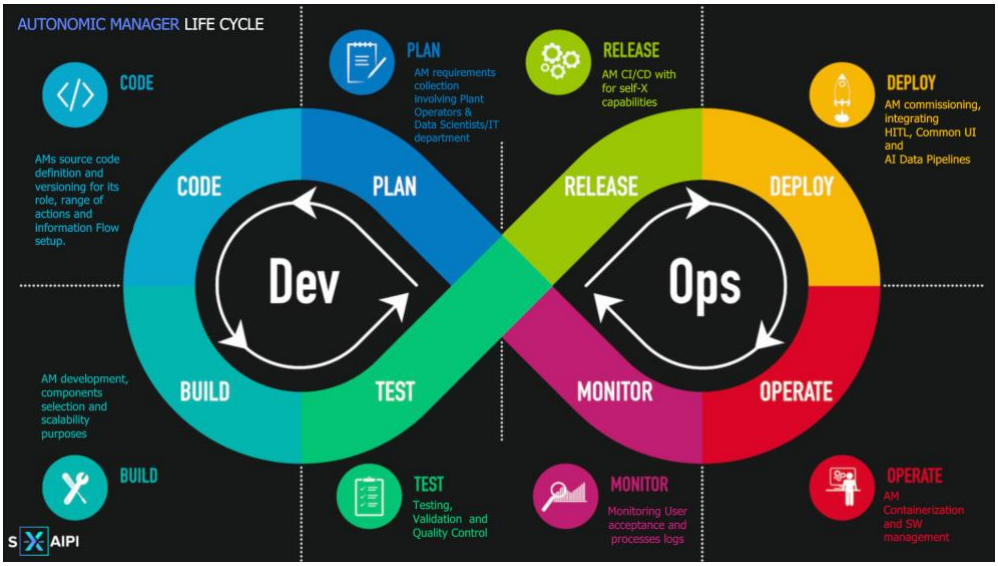
The Autonomic Manager proposed by ENGINEERING in the context of the s-X-AIPI project identifies the following key design elements:

- A *Domain-agnostic infrastructure*, based on Open-Source components, mainly represented by Apache and FIWARE, but open to the connection with proprietary solutions.
- A *Flexible* tool, capable of processing Plant Production Data or Metadata in real time, enabling AI Pipelines self- configuration.
- A *Scalable* instrument which enables either edge or cloud- based applications.
- A *Replicable* software system to any sector related to Process Industry and widely, Manufacturing Industry.
- A *Tailored-based* infrastructure to be customized based on industrial needs.

The s-X-AIPI Autonomic Manager has been designed ensuring a culture of collaboration and shared responsibility among key technology providers and operational teams in the consortium, in line with DevOps principles.



The Autonomic Manager, in collaboration with the AI methodologies developed within the project, enables self-X capabilities, ensuring quality control laboratory analysis, resource planning, waste management and energy efficiency in Process Industry.

The domain-agnostic infrastructure has been currently demonstrated and it is available in s-X-AIPI GitHub repository: GitHub - Engineering-Research-and-Development/s-X-AIPI-Autonomic-Manager.

A deeper effort to customise the solution based on Use Cases' needs, to test it and finally validate it, will be part of the future phases of s-X-AIPI project.

About the project

Project full name: self-X Artificial Intelligence for European Process Industry digital transformation
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