FOSD Meeting 2026

March 23 - 27, 2026, University of Southern Denmark, Odense, Denmark

Integration of Feature Models into the Model Context Protocol (MCP) for Dynamic Configuration of Data Analysis Interfaces

Francisco S. Benítez, Francisco J. Domínguez-Mayo, J. A. Galindo, David Benavides

1. **Introduction**
2. Context
3. Proposed Solution
4. Discussion

1. Introduction to MCP

Model Context Protocol

Claude

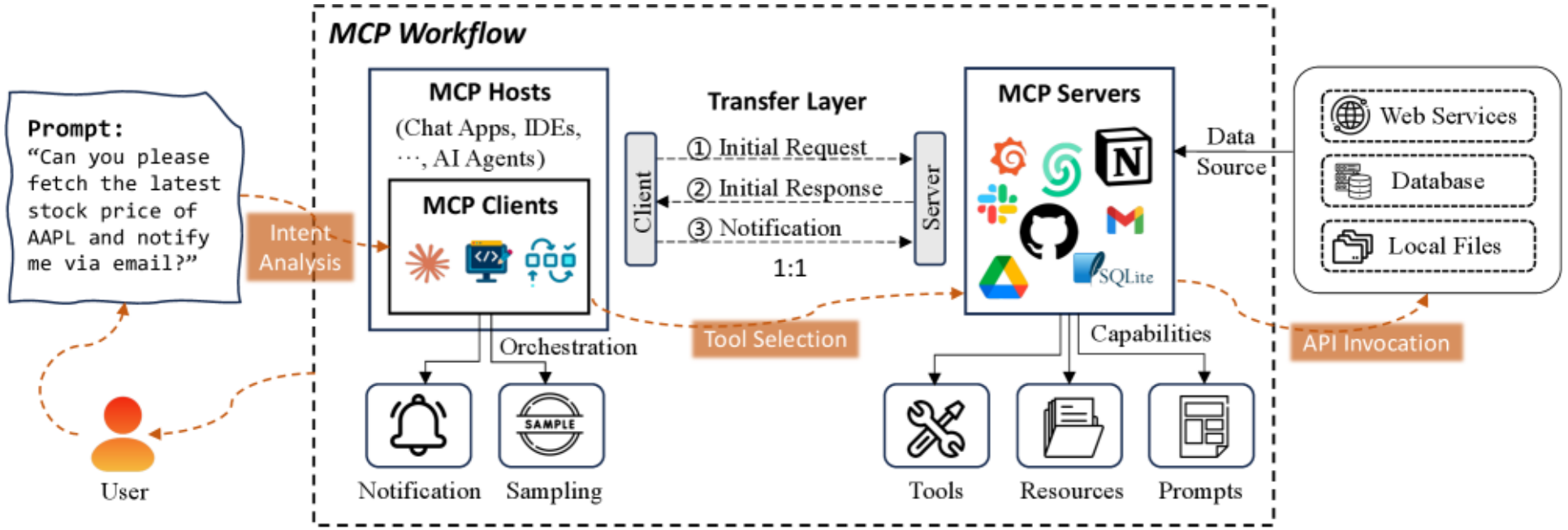
Gemini

- MCP serves as a standarized protocol for connecting AI models to **tools**
- Created by Anthropic in late 2024
- Fast adoption by industry, multiple discovery platforms

1. MCP Typical Workflow

There are three main componets involved in MCP: Host, Client and **Server**. An **MCP Server** provides functionality through three features:

- Tools
- Resources
- Prompts



[1] Xinyi Hou, Yanjie Zhao, Shenao Wang, and Haoyu Wang. 2026. Model Context Protocol (MCP): Landscape, Security Threats, and Future Research Directions. ACM Trans. Softw. Eng. Methodol. Association for Computing Machinery, New York, NY, USA.

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2. SensOlive Project

- R&D&i project
- Deficit irrigation system in olive groves with dendrometers and intelligent digital twins
- The project builds on prior work of AqualA, with an extended platform in develop

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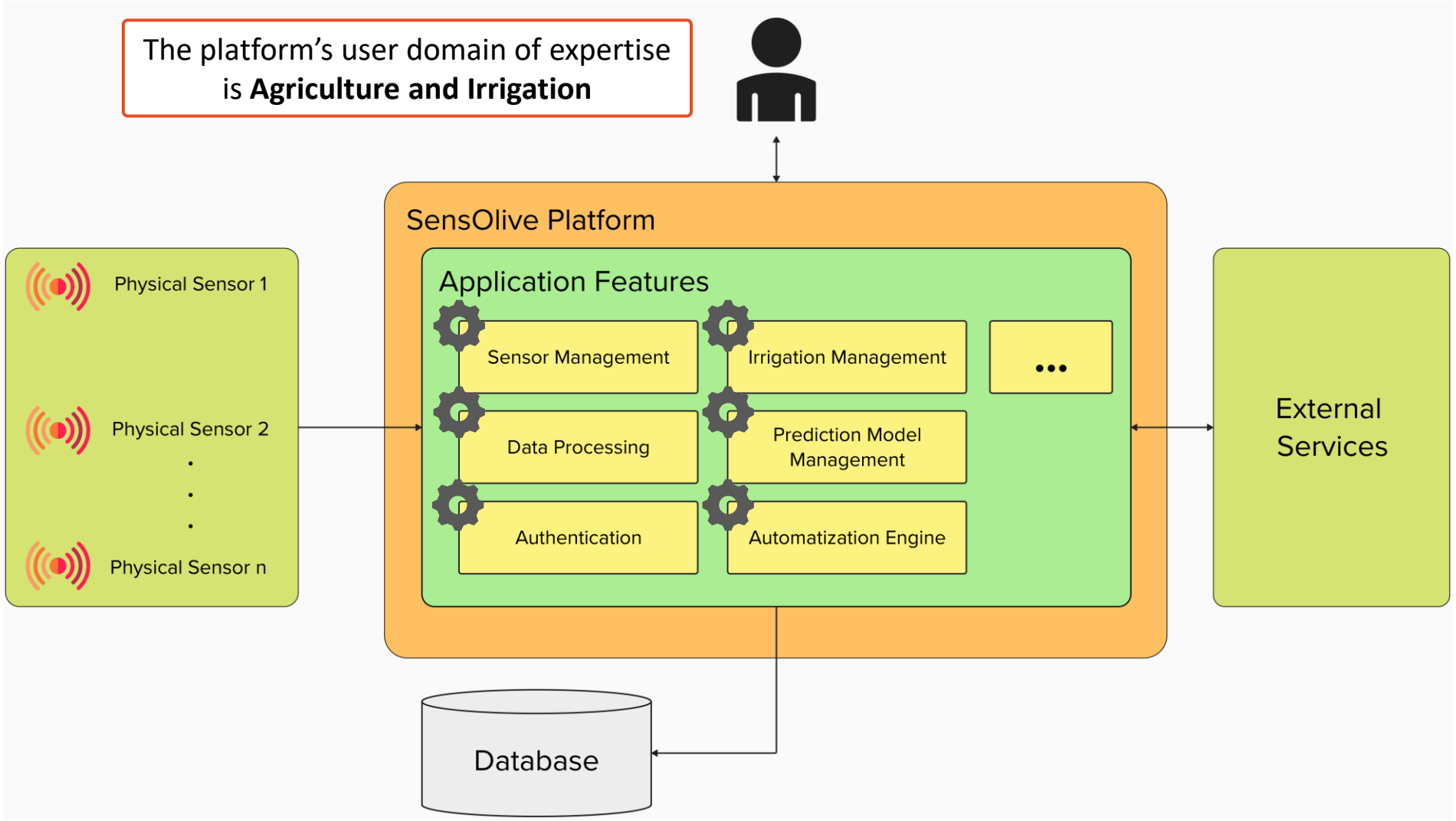
2. SensOlive Platform



Current Platform Architecture

2. Variability in Configuration

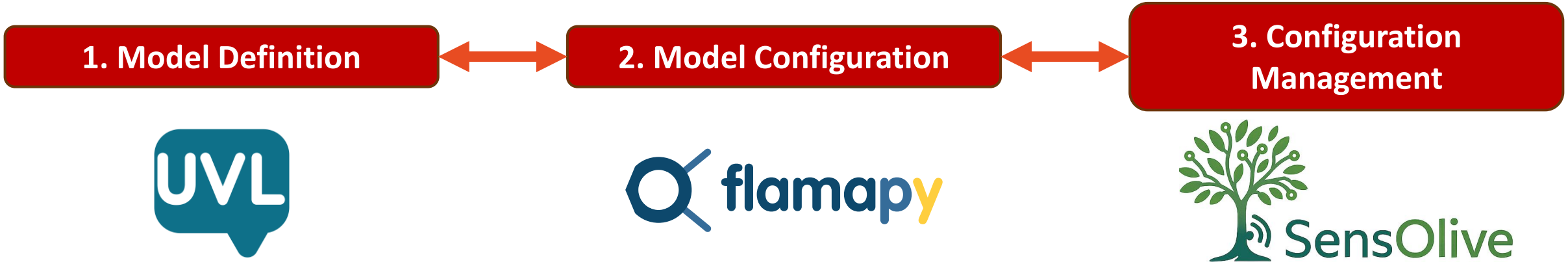
A SensOlive Component independently manages multiple configurations of a domain process. Some examples of configuration points in each module:

- Sensor Management component: Sensor Type, Location, Connection Protocol…
- Prediction Model Management: Prediction Algorithm, Input Variables, Output…
- Irrigation Management: Time, periodicity, irrigation device model, …

1. Model Definition ↔ **2. Model Configuration** ↔ **3. Configuration Management**

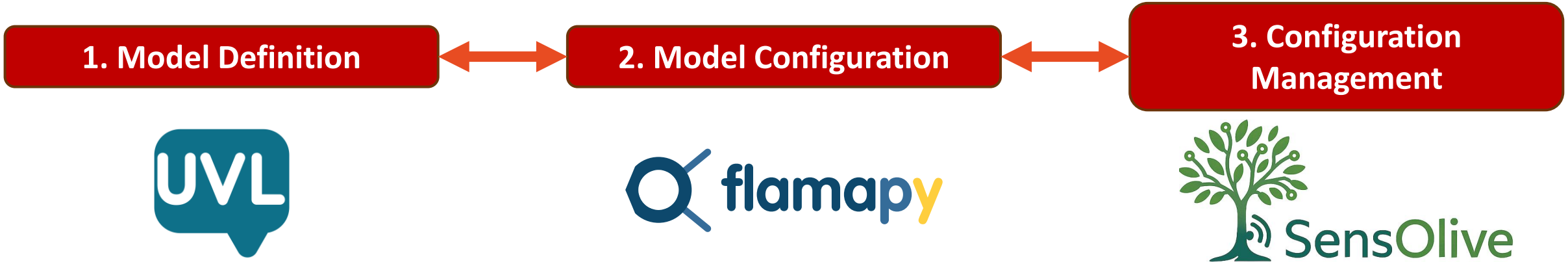
2. Variability in Configuration

Configurations for each SensOlive component are validated through AAFM operations using flamapy, as there may be cross-tree constraints.



2. Variability in Configuration

Once validated, configurations are deployed to the platform



2. Variability in Configuration

The configuration phase can become difficult and tedious for the intended users, often requiring them to cross references beween spreadsheets or paper notes.

1. Model Definition ↔ **2. Model Configuration** ↔ **3. Configuration Management**

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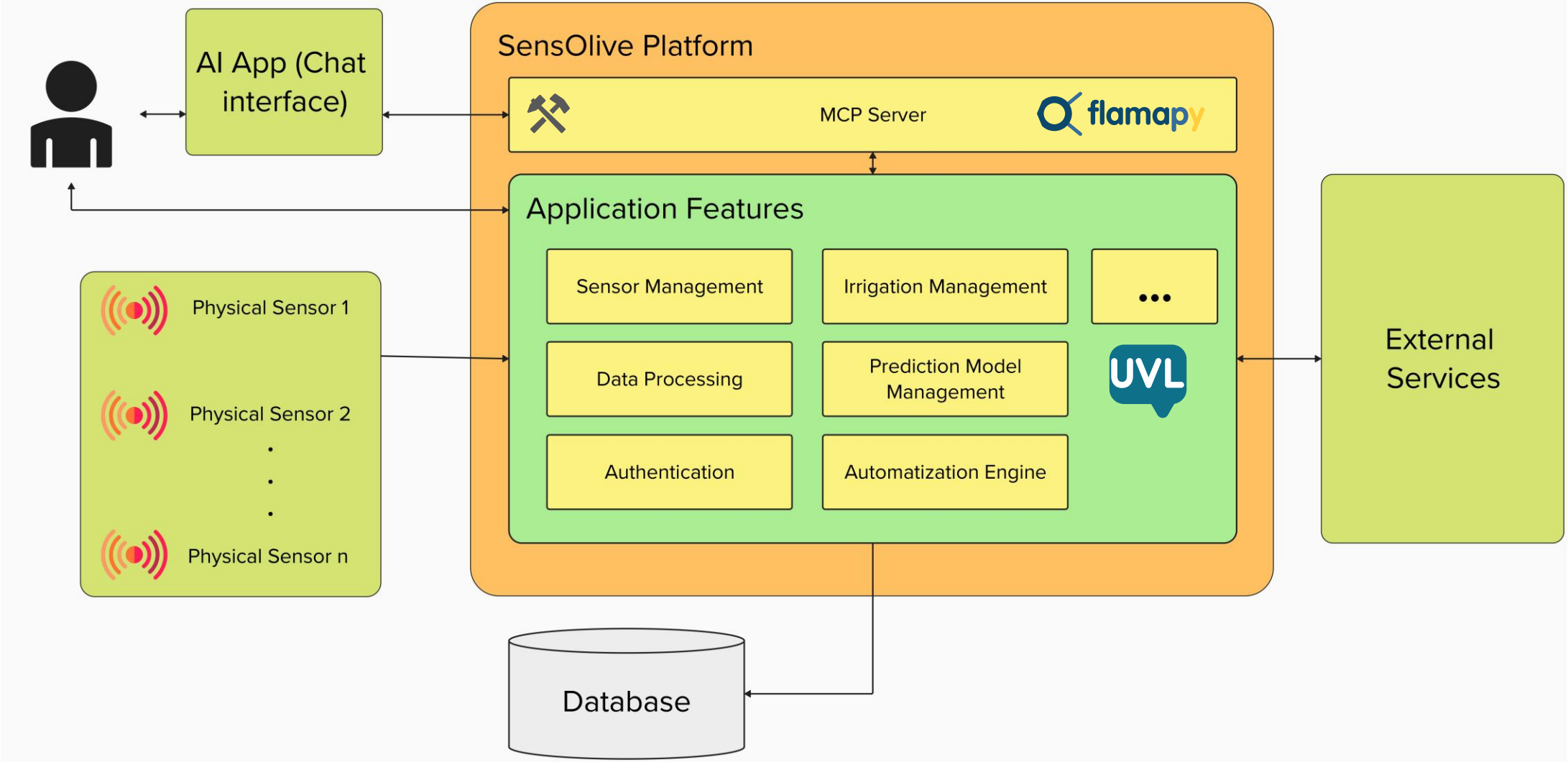
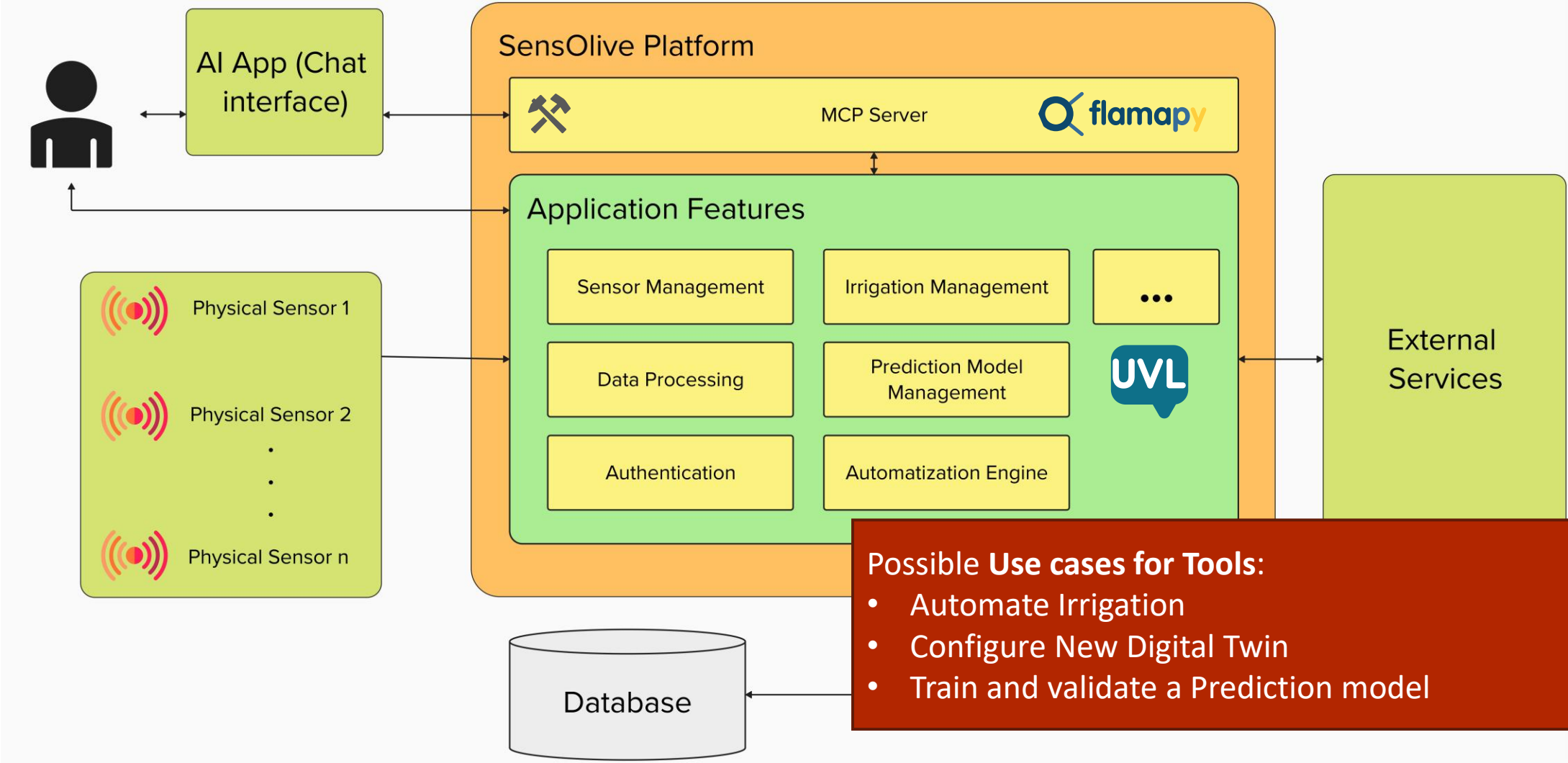
3. Proposed solution



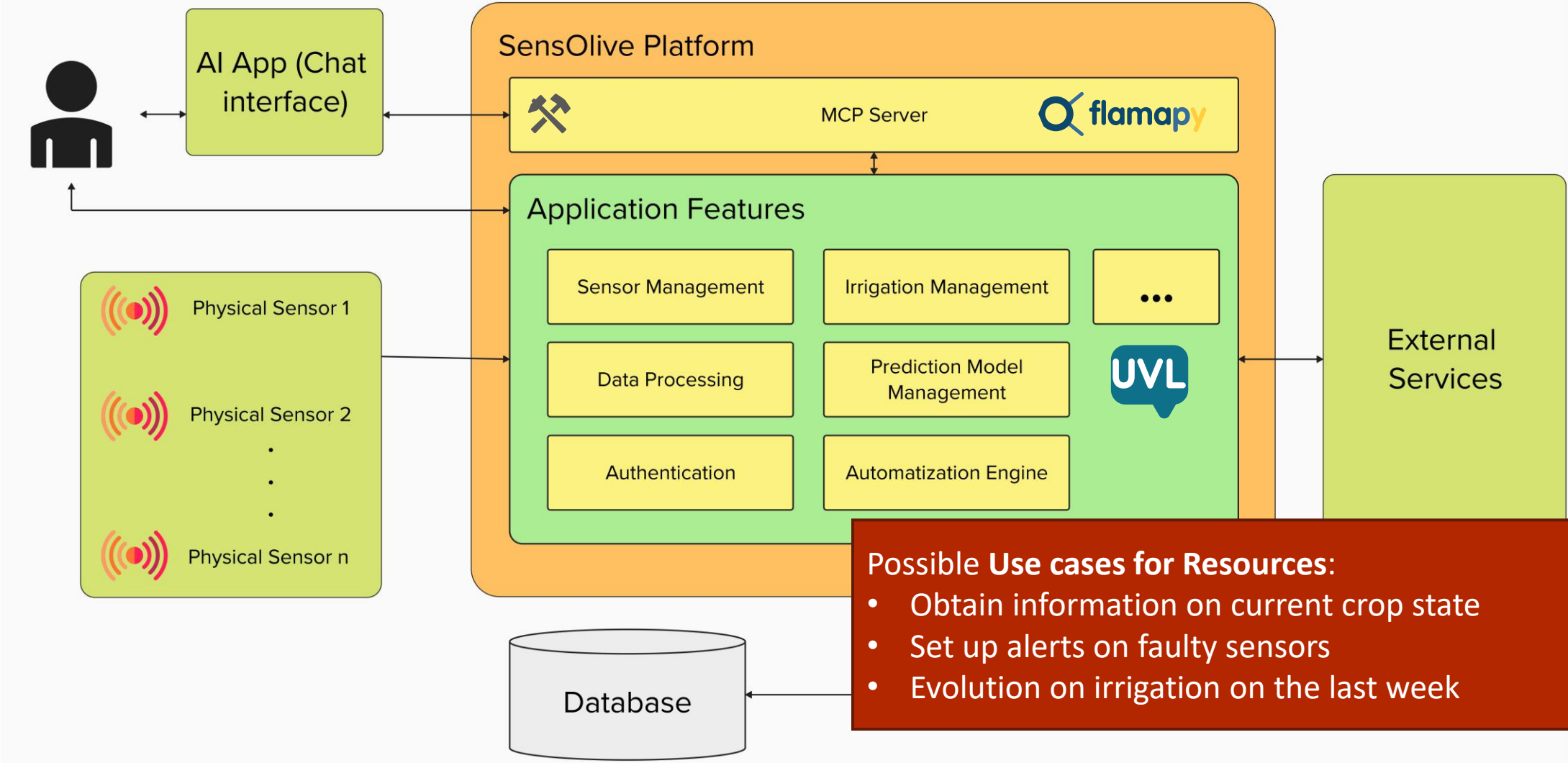
3. Use cases



Possible **Use cases for Tools**:

- Automate Irrigation
- Configure New Digital Twin
- Train and validate a Prediction model

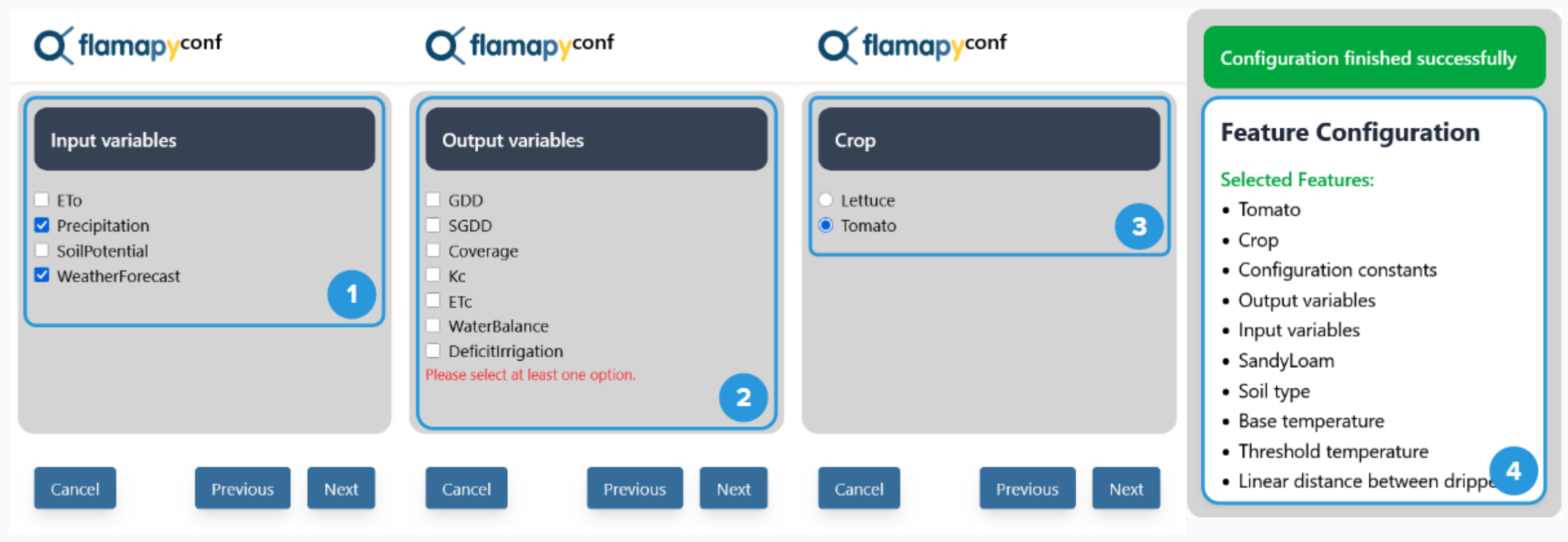
3. Use cases



Possible **Use cases for Resources**:

- Obtain information on current crop state
- Set up alerts on faulty sensors
- Evolution on irrigation on the last week

3. Back in AqualA…



Optional questions

‘Or’ questions

Alternative questions

Valid configuration

[1] Francisco Sebastian Benitez, José A. Galindo, Mireia Corell, and Francisco José Domínguez Mayo. 2025. AquaIA: Implementing Controlled Deficit Irrigation by Means of Feature Modelling Techniques. In Proceedings of the 29th ACM International Systems and Software Product Line Conference - Volume A (SPLC-A '25). Association for Computing Machinery, New York, NY, USA, 201–210. https://doi.org/10.1145/3744915.3748478

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Current implementation of Sensolive and how can MCP fit into its architecture

Re-use of tools from previous work (flamapy configurator)

MCP server for the Sensolive project.
Tools for configuring each component.
Resources to obtain information

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