LINZ CENTER OF MECHATRONICS

EUREKA Test.EPS

TESTING AND VERIFICATION METHODS FOR AUTOMATED DRIVING FUNCTIONS AND EPS

DisDAQ - A Modular and Distributed Measurement and Processing System for Industrial Process Optimization

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Problem Statement:

Requirements for industrial process optimization:

- Additional information and knowledge of the industrial process is required
- Could be gained through additional sensors
  - Retrofitting

Open questions in retrofitting:

- Which type of sensors?
- Which clamping or installation position?
- Which sensor sensitivity, dynamics, sampling rate, etc.?

Solution:

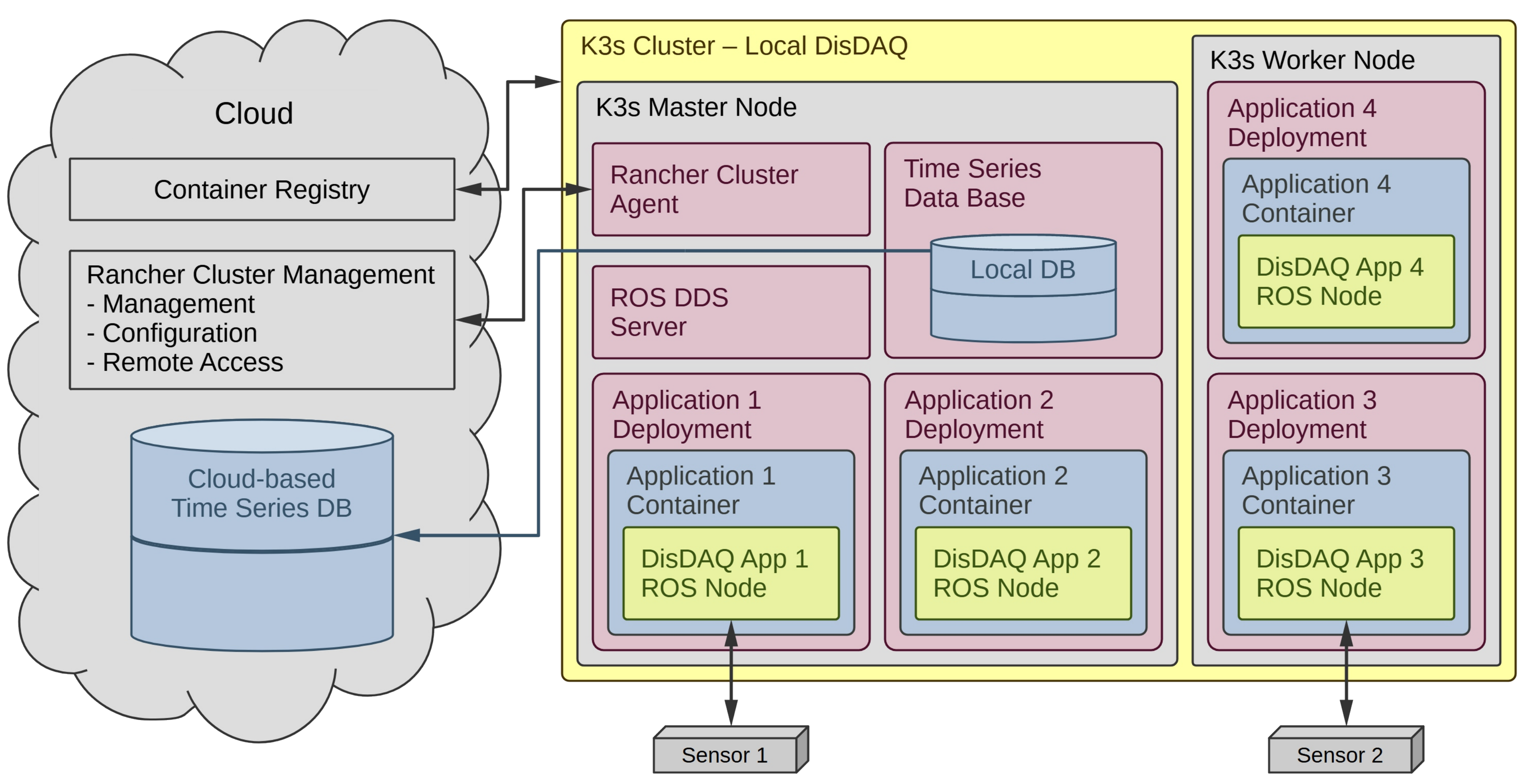
- Distributed Data Acquisition and Algorithms Quiver - **DisDAQ**
- Seamless integration of raw data aggregation across a scalable set of spatially distributed sensors
- Synchronized and reliable data acquisition and edge data processing
- Fast, simple, and flexible configuration and measuring
- Online visualization for life data and event feedback
- As of now, a large variety of sensors already is supported

A portable version of DisDAQ, at current used for on-site data acquisition.

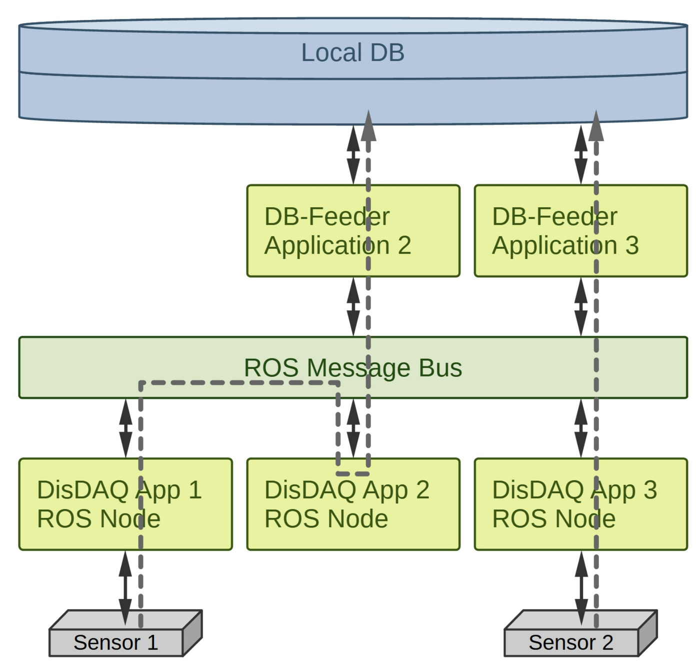
Mobile measurement scenario: weather sensors mounted on the roof of a car.

System Architecture

- Based on K3s Kubernetes cluster on Ubuntu server
- At least one K3s master node and optional K3s worker nodes
  - Each representing a physical device, e.g., an industrial PC
  - Distributed data acquisition possible



- Helm is used for packaging DisDAQ containerized applications including all necessary resources into one package
  - Sensor interface drivers and/or algorithms
- The DisDAQ and DisDAQ app packages define all cluster resources that are needed for each app to function
  - Local storage, network config, container parameters, ...
- Robot operating system 2 (ROS)
  - Underlying communication framework which connects the DisDAQ applications
  - Same time base inside the ROS network → Synchronization
- Data acquisition and processing chain → edge computing
  - Data acquisition nodes
  - Data processing nodes



Application Scenarios

- Condition Monitoring and Predictive Maintenance
  - Feasibility study including raw data acquisition with high data rate
  - Goal: optimize sensor placement, sensor type, and other important parameters (e.g. sampling rate, resolution, etc.)
  - Long-term data acquisition and data aggregation from different systems possible including machine data
- Process Optimization Scenario
  - Large-scale indoor production line
  - Goal: optimize overall production efficiency and minimize backlogs
  - Distributed long-term data acquisition necessary to train digital twin
  - Synchronized data of production times using RFID tags and readers
  - Cables for data acquisition not possible: several wireless DisDAQ devices
- Mobile Measurement Scenario
  - Recording of weather conditions during the testing of autonomous driving functions
  - Mobile environmental sensor rack developed within the project Test.EPS (www.testepsproject.eu)
  - Data acquisition of temperature, relative humidity, wind speed and wind direction, precipitation intensity and type, road surface condition, and the GNSS-based position

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Science becomes reality

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