ATLAS

AGRICULTURAL INTEROPERABILITY AND ANALYSIS SYSTEM

Meeting Name | +++

Venue, Date | +++

ATLAS Reference Architecture

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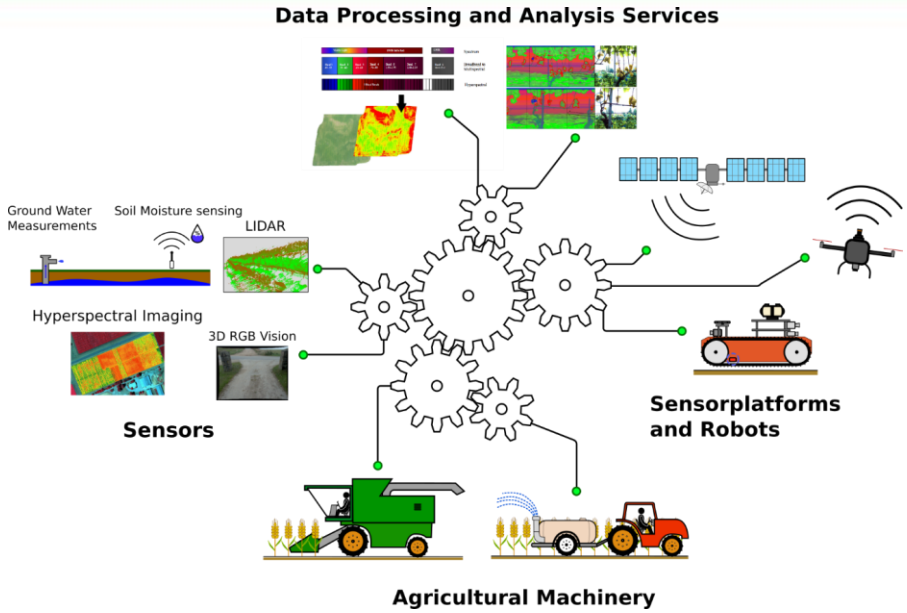
Interoperability in digital Agriculture



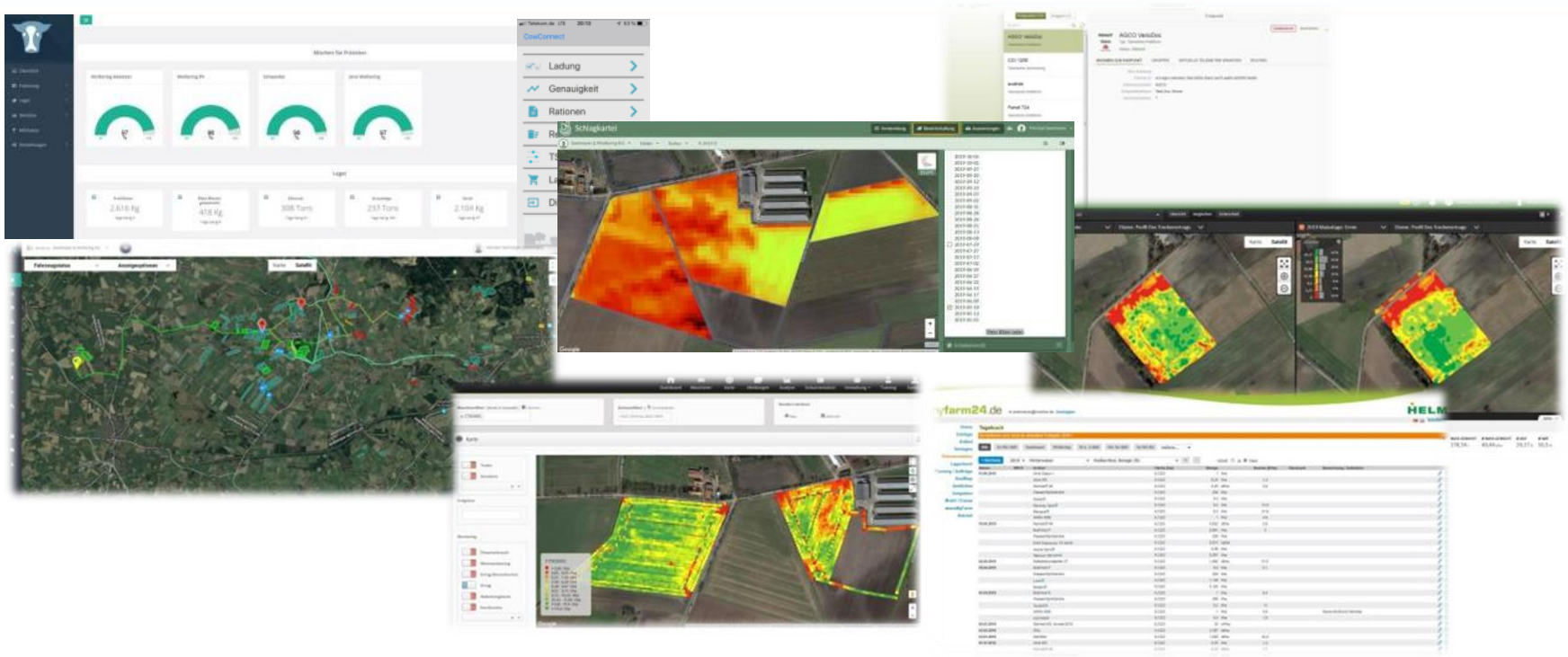
- **Very heterogeneous landscape of machines, sensors and data platforms**
- **Exchange of data between all entities is a key-capability**

Farmers have lots of things to manage

Complex Farms with multiple Sites

- **Example from an ATLAS project partner, this is a normal farm setup**

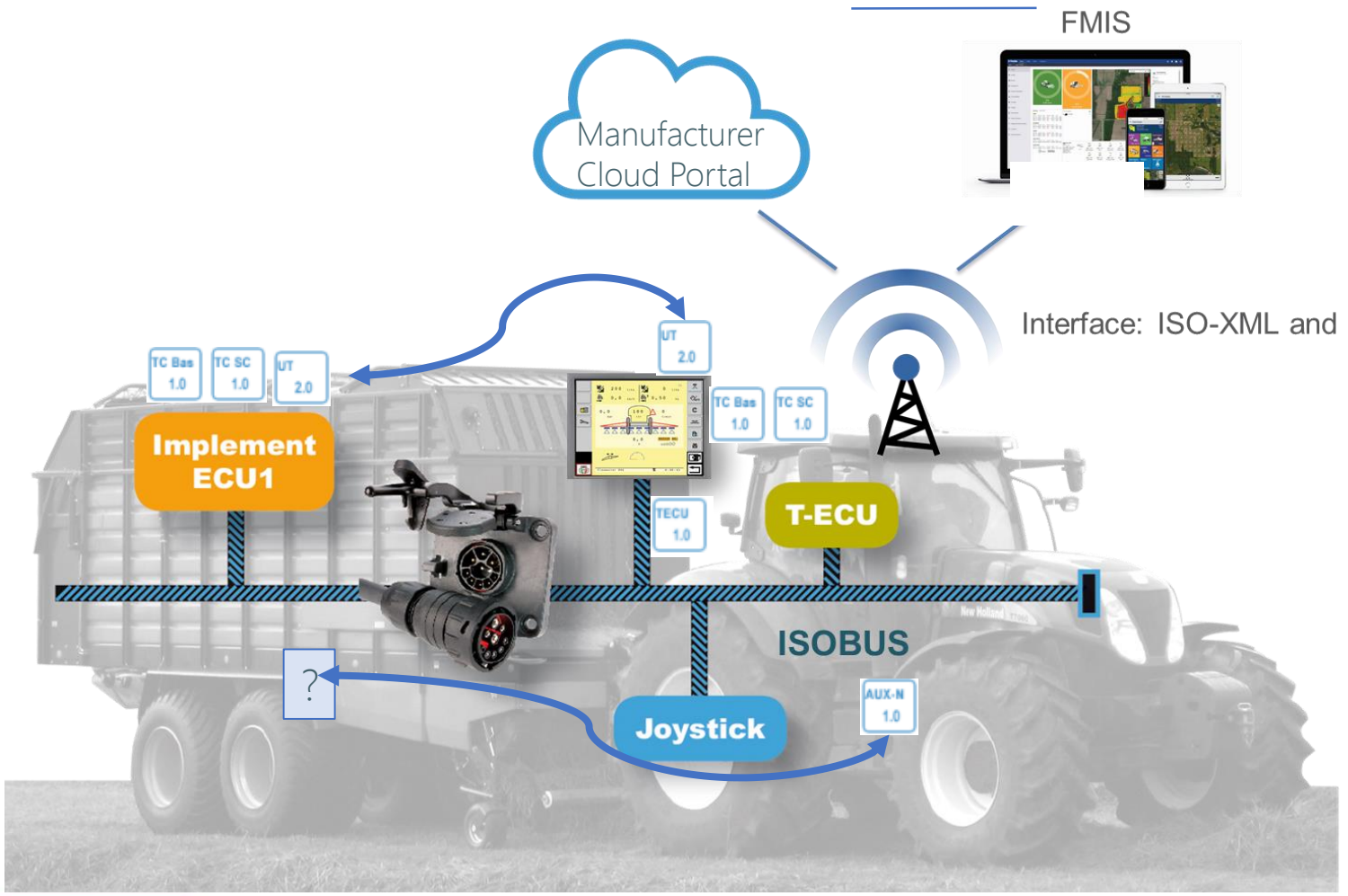
Multiple Software Tools in Use



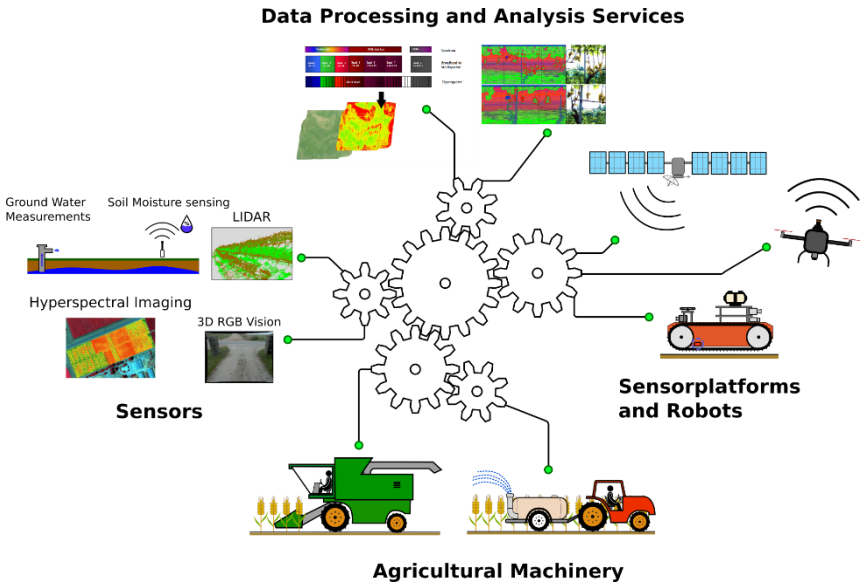
- **Example: One Farm, 7 different Software Systems**
- **This will probably increase in the future**

Multi-Vendor Fleet Operations

Typical connected ISOBUS System

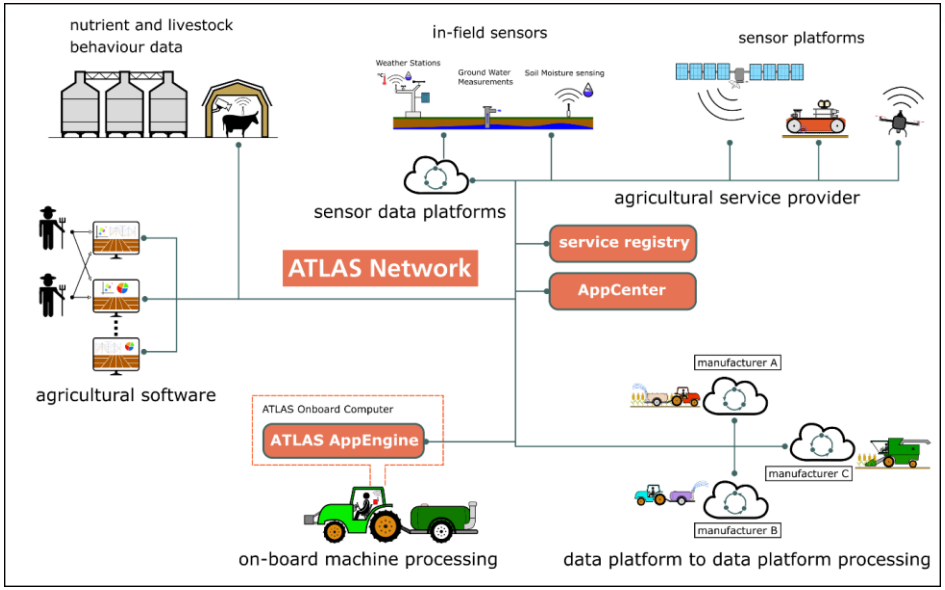


ATLAS Concept and Goals



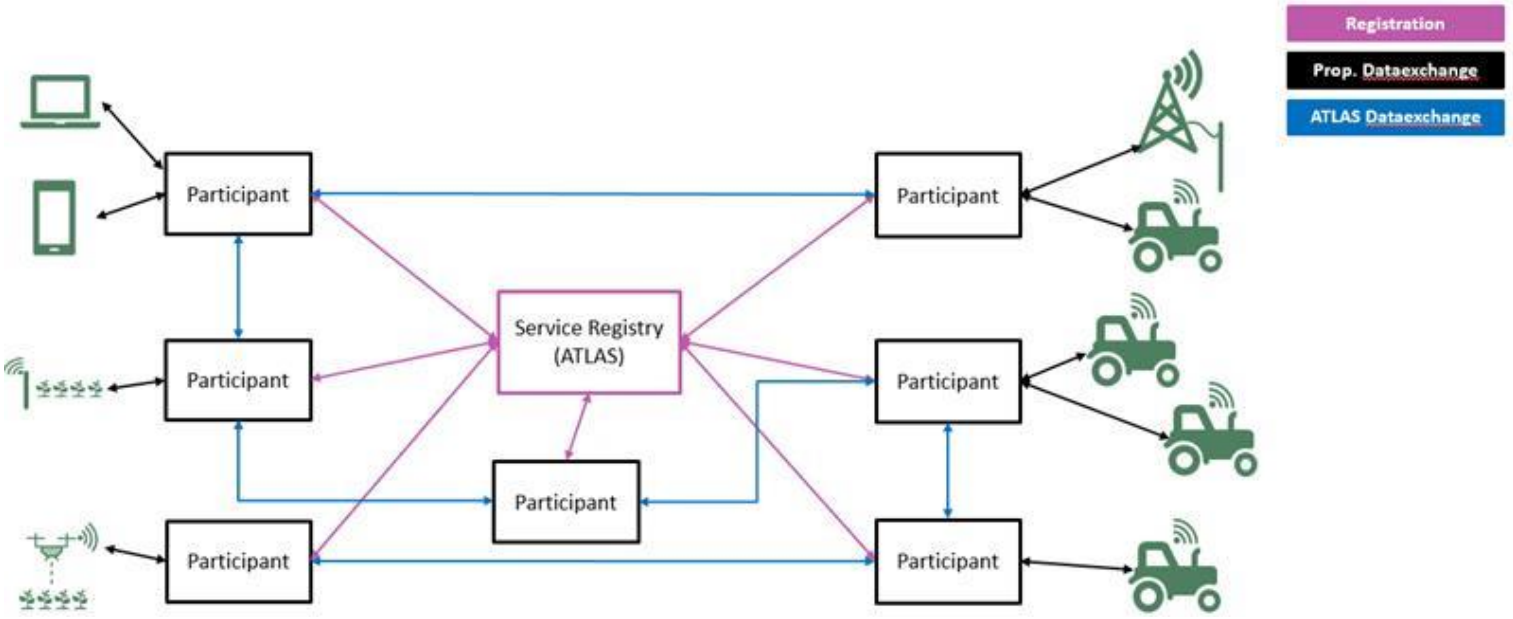
- **Interoperability between**
  - Agricultural machines, sensors and data services
- **Standardized and extensible interfaces for data exchange**
- **Full control over the data through the farmer**

ATLAS Interoperability Architecture



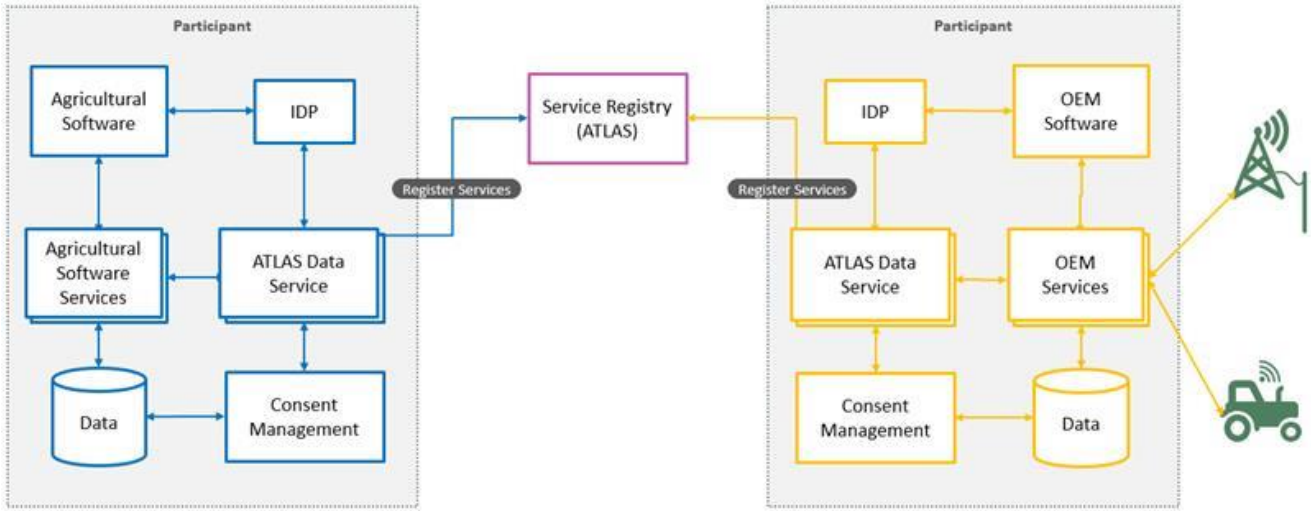
- **High-level reference architecture**
  - Collaborative development process between industry partners, software developers, agricultural service providers
- **Designed along concrete use-cases**
- **Two basic concepts complementing each other:**
  - Data-platform based data exchange and processing
  - On-board / on-site computing and processing capabilities

ATLAS Service Mesh Network



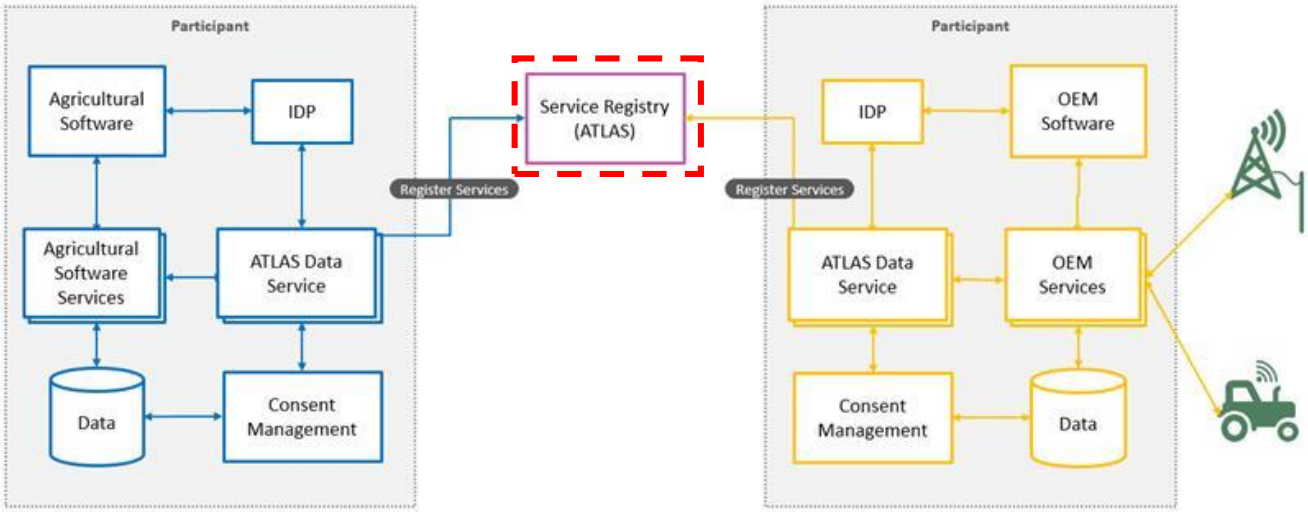
- **Each participant stays autonomous**
  - Responsible for implementing and providing services
- **Central components kept to a minimum**

ATLAS Network Participants



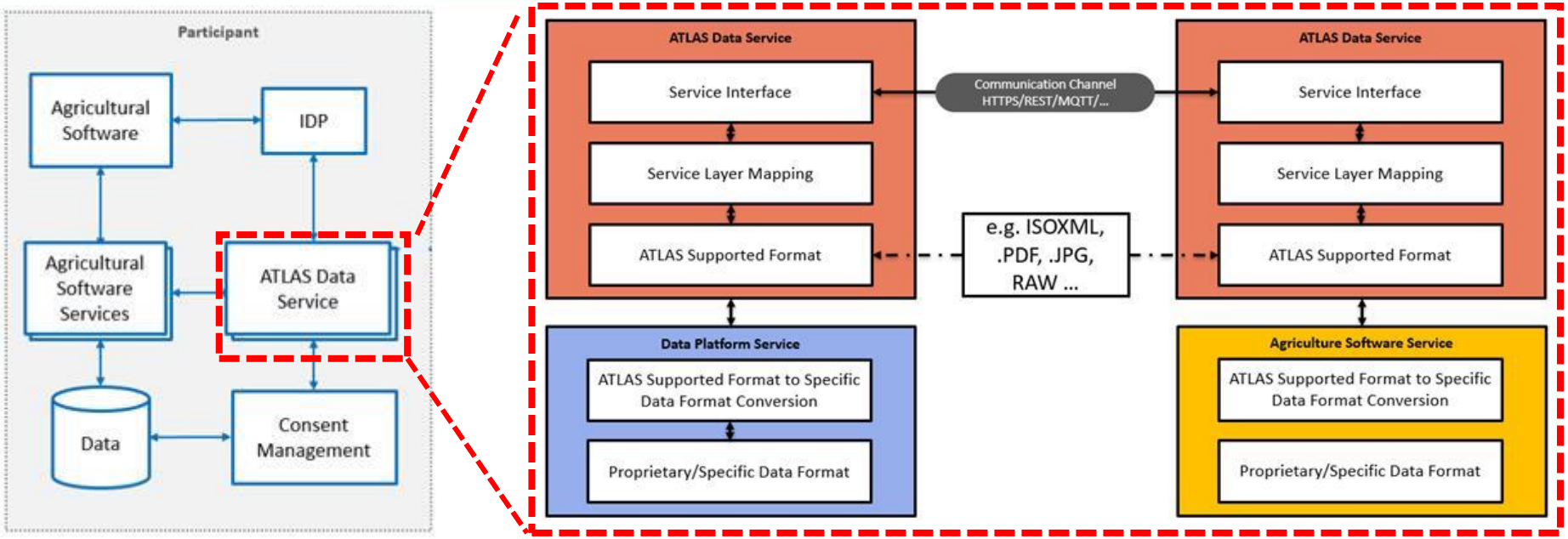
- **Participants are defined through**
  - Own software and proprietary services
  - Identity Provider (IDP) service to store and authenticate service identities
  - Consent management system
  - Data storage capabilities

Service Registry



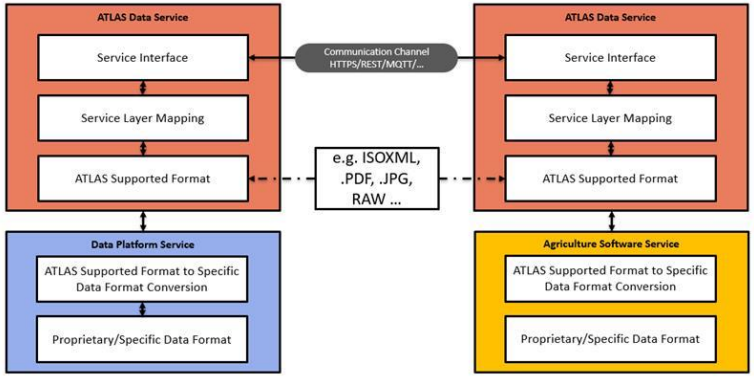
- **Central Component serving as a trusted directory**
  - Identified participants can register services upon request
  - Provided and required service capabilities are part of the request
- **Service capabilities are granular endpoint accesses**
  - Type of resource and operation (CRUD)
  - Service verifies that requested operation is within the capability scope

Data Services



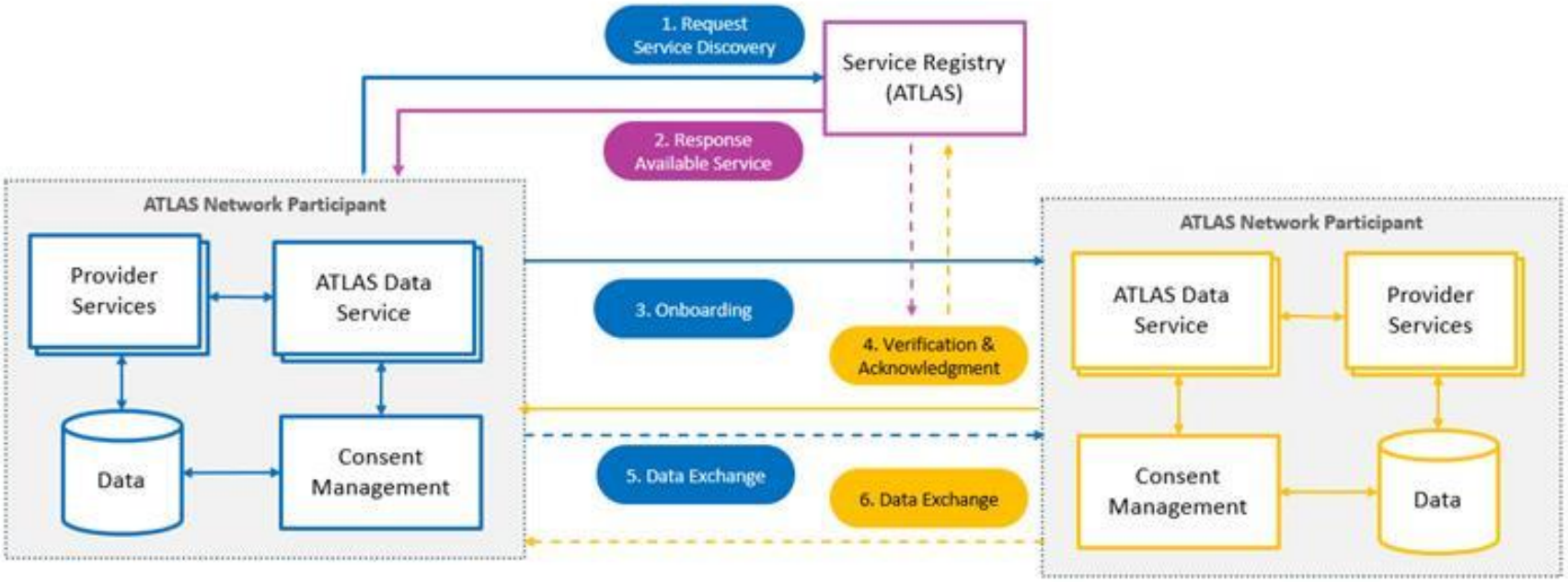
- **Data Service Instances as the central participant component**
  - Data- and transport-technology agnostic
- **Multiple Layers defined by ATLAS or (optionally) by participant**

Data Services - Layers



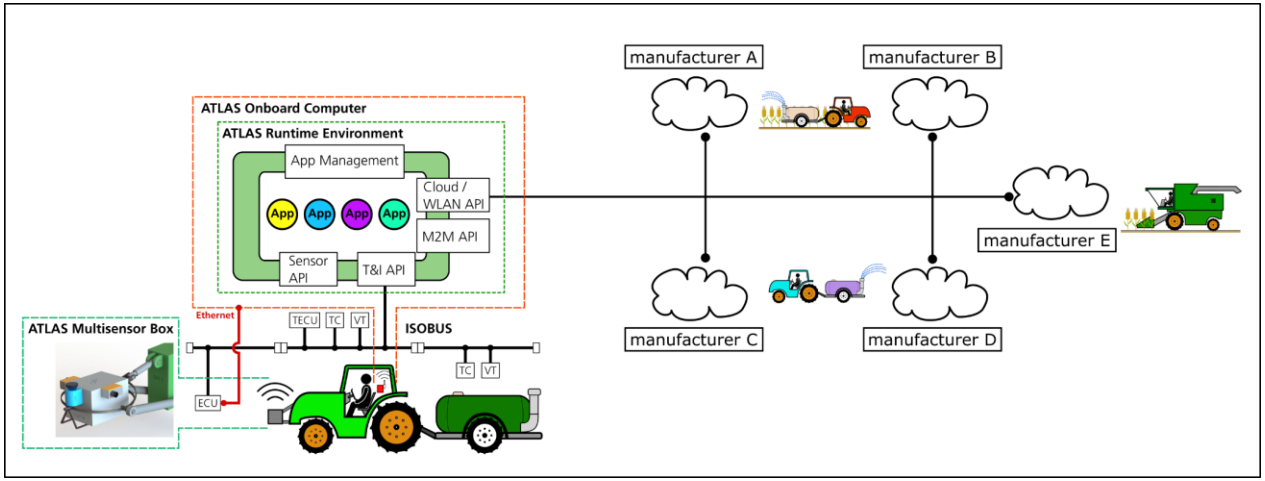
- **Service Interface**
  - Establish connection and data transport
- **Service Layer Mapping**
  - Defines a generic exchange protocol
- **Supported Format**
  - Technical message type (e.g. JPEG image, EFDI live telemetry message)
  - Information message type (purpose of the information transported)

Data Service Pairing



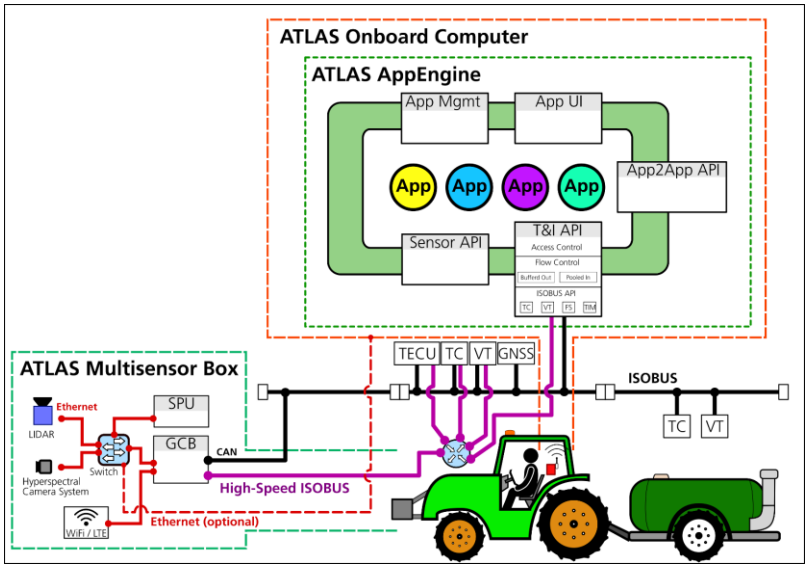
- **Service Registry as the only component known to each participant**

ATLAS AppEngine for on-board Computing



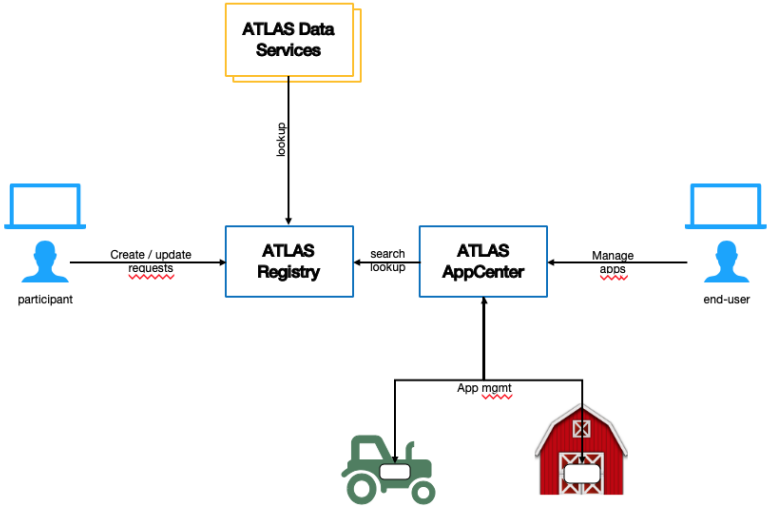
- **Provides a platform for executing applications**
  - with little or no internet connectivity
  - apps that require very low latency when processing nearby sensor data to actuate adjustments in real-time on local devices

ATLAS Apps



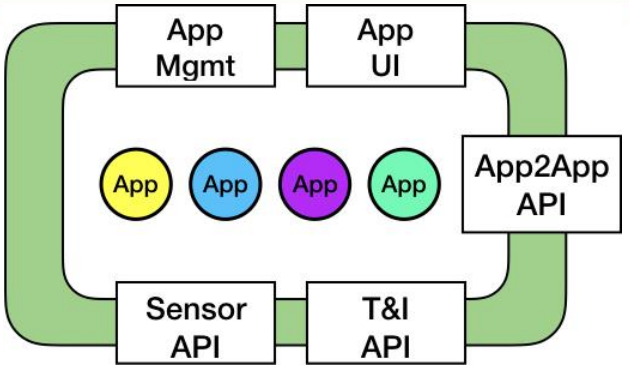
- Apps run within the AppEngine on an onboard computer
- Different type of Apps: Real-time apps, job-apps, utility apps, platoon apps
- Apps come with a cloud-based companion service registered to the Service Registry

ATLAS AppCenter



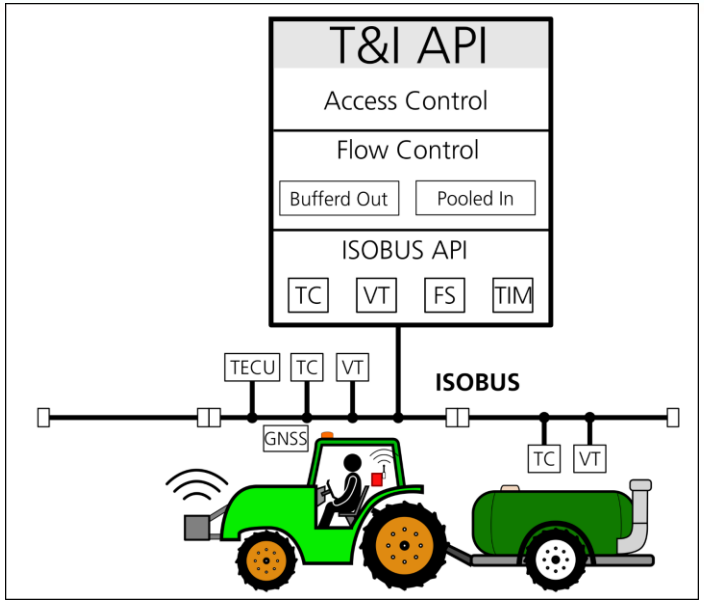
- **AppCenter provides a user interface to**
  - browse and search for apps
  - install, update and uninstall apps on the respective AppEngines.
- **App publication via companion services**
  - AppCenter connects to Service Registry to retrieve information on available apps

AppEngine SDK



- **Mediation layer for apps**
  - Interact with the environment
  - Abstracting low level technologies and transport
- **Sensor API**
  - Abstracts the low-level connectivity layers to and from sensors
- **Tractor and Implement (T&I) API**
  - Retrieve information or send controls to the machinery based on existing standards (ISOBUS, TIM, Steering and Sequence Control)
- **App2App API**
  - abstracts the low-level connectivity layers (e.g. various 802.11 variants) for inter communication between sibling platoon apps

AppEngine SDK – T&I API



- **API to access machinery specific functionality**
  - Read from / write to the ISOBUS
- **Access control and flow control layers for safety and security**
  - No direct access to the ISOBUS from the AppEngine

Certification and Safety

- **Different AppEngine instances may offer different type of features**
  - AEF ISOBUS certification required for AppEngine implementations destined to be installed on tractors and connecting to ISOBUS, TIM or Steering/Sequence Control
- **Some app functions can impact machinery operations in a potential hazardous way**
  - Example: setting tractor's speed, unfolding implements
- **Apps requiring high safety class permissions will have to undergo a stricter certification process before being approved**

Summary

- **ATLAS interoperability reference architecture with two basic concepts:**
  - Data platform based data exchange and processing
  - On-board computing and processing capabilities through a self-contained computing platform
- **Only two central components**
  - Service Registry and AppCenter
- **Implementations of the architecture will be conducted along concrete use cases**

Thank you!

WP3 - ATLAS Reference Architecture

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