

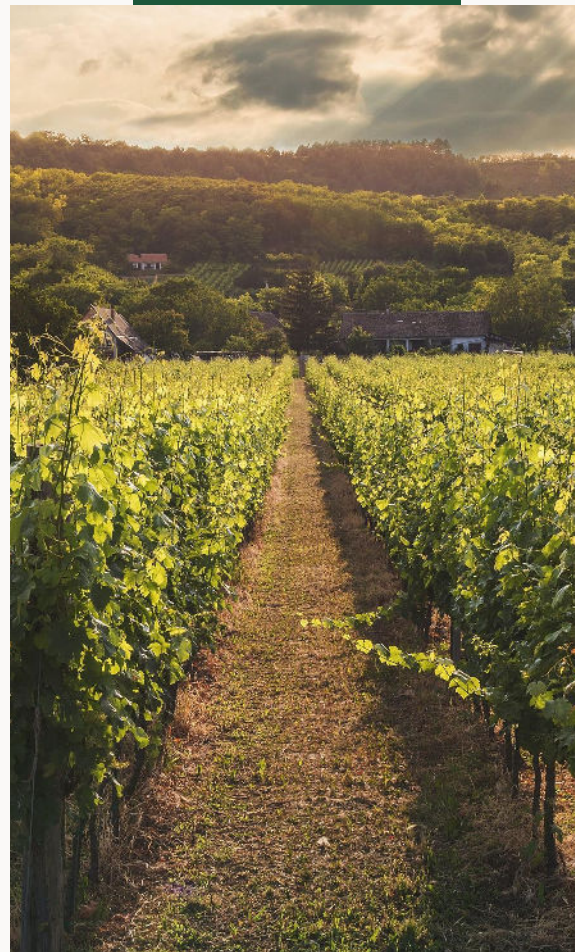


Smart Viticulture

**Cloud-Edge-IoT Innovations in Agriculture and Crisis
Management**

Andy Edmonds, Terraview GmbH, CTO

Feb 20th, 2024





Terraview mission started in 2019 with a vision to create a solution to aid farming decisions based on large amount of historical and current data

Company history



May 2019

Company formed; angel round raised!
Globally distributed team setup and implementation of TerraviewOS begins.




2nd Quarter 2021

1st TerraviewOS prototype launched, pilot users from Spain onboarded



2nd quarter 2022

Company consolidation begins within Terraview GmbH, Switzerland 



3rd quarter 2023

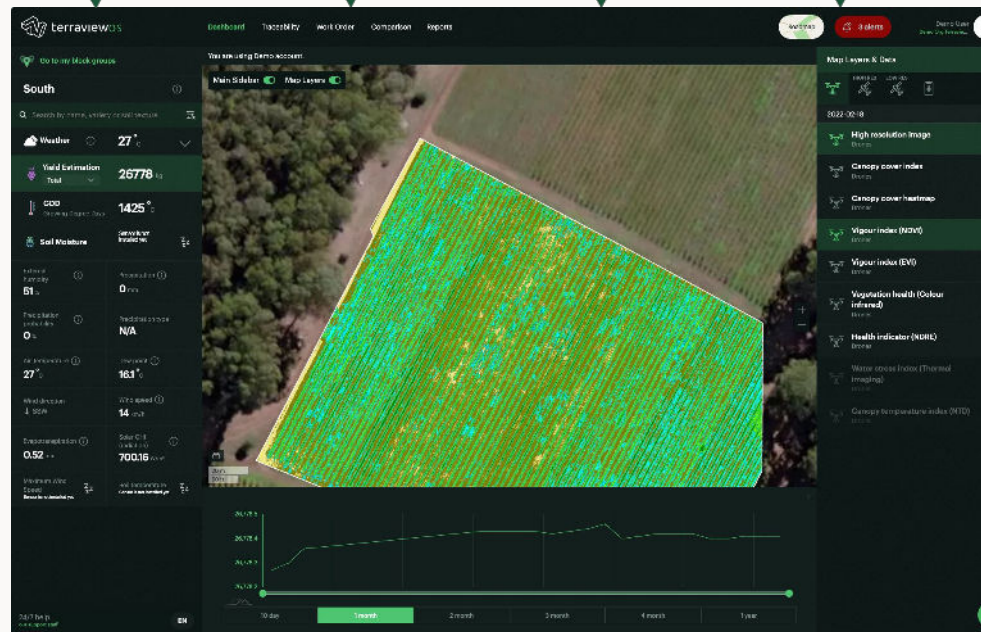
Terraview GmbH grows to 20 employees, 2 products and 32 paying customers from Australia, Spain, USA, France, Mexico on-boarded

Existing Product: TerraviewOS



One stop intelligence platform for complete farmland management

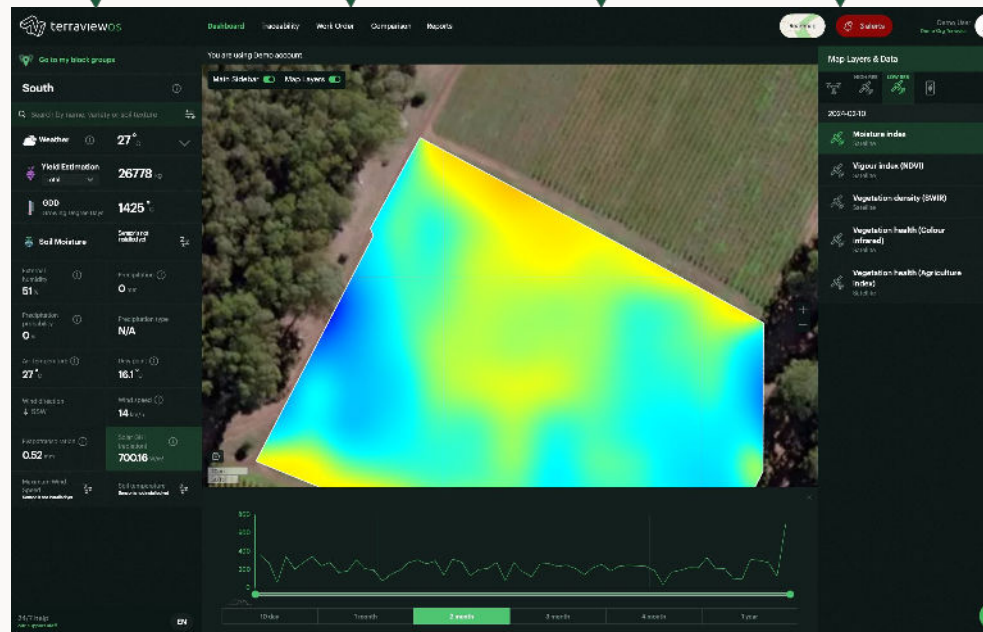
- **Satellite:** Automated index processing pipeline for Maxar, PlanetLab, Landsat, Sentinel2
- **Drone:** Multispectral and thermal payload automated processing for MicaSense, Flir, Perrot & DJI drone payloads
 - RGB derivative agri-indices support



Existing Product: TerraviewOS

One stop intelligence platform for complete farmland management

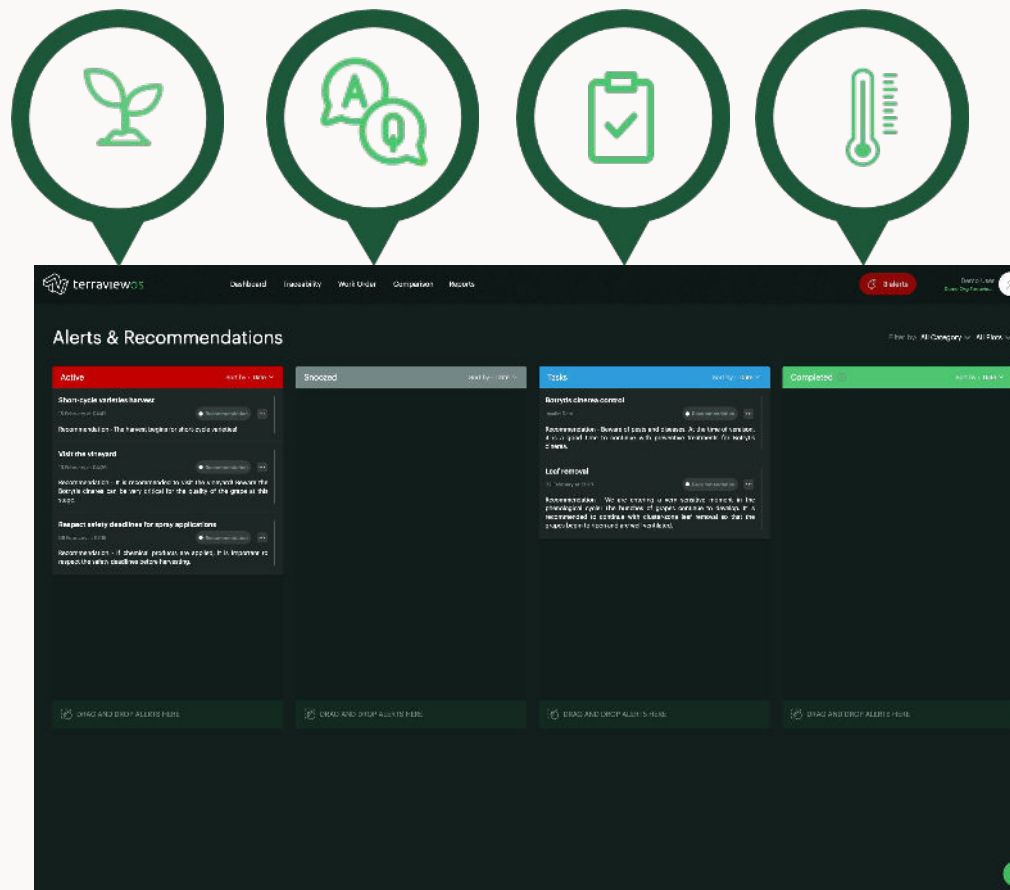
- Numerous hardware vendor integrations for physical **IoT sensor data ingestion**: Mait, Arable, Metos, Cesens, Quampo, Ranch, Fyllo, Plantae, and several more ...
- **Weather data feed integrations**: OWM, Tomorrow.io, Meteocat, and others
- **Robotic integration**: AGreenCulture, Robotnik



Existing Product: TerraviewOS

One stop intelligence platform for complete farmland management

- Advanced rule engine supports alerting subsystem for weather and diseases
- Rules based on how a human agronomy experts think and deal with numerous data they see!



Existing Product: TerraviewOS

One stop intelligence platform for complete farmland management

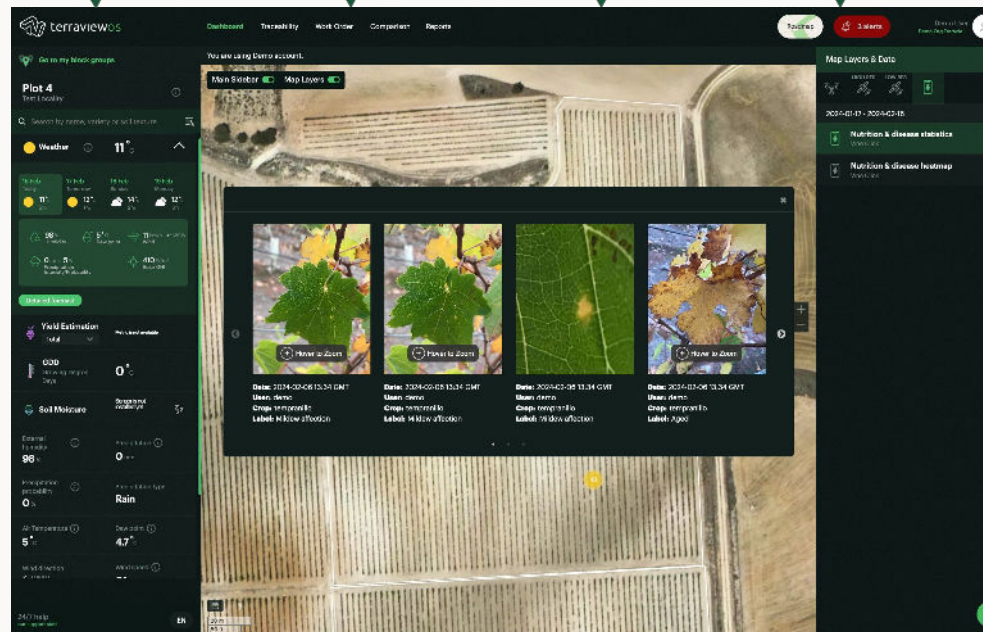
- Comprehensive traceability module
- Allows for tracking of machines, chemicals, nutrients, labour manpower, managerial staff, and all relevant farm task planning and tracking!
 - via Kanban
- Robotic fleet management and task allocations
- Automated compliance reporting to relevant government departments: initially launching with Spain - other countries soon
- Lifecycle Assessment (LCA)... soon



Existing Product: TerraviewOS

Key capability: field scouting and companion mobile applications

- ML based disease and nutrition deficiency identification
- Data is made available back in the platform for centralized analysis by management, agronomy teams

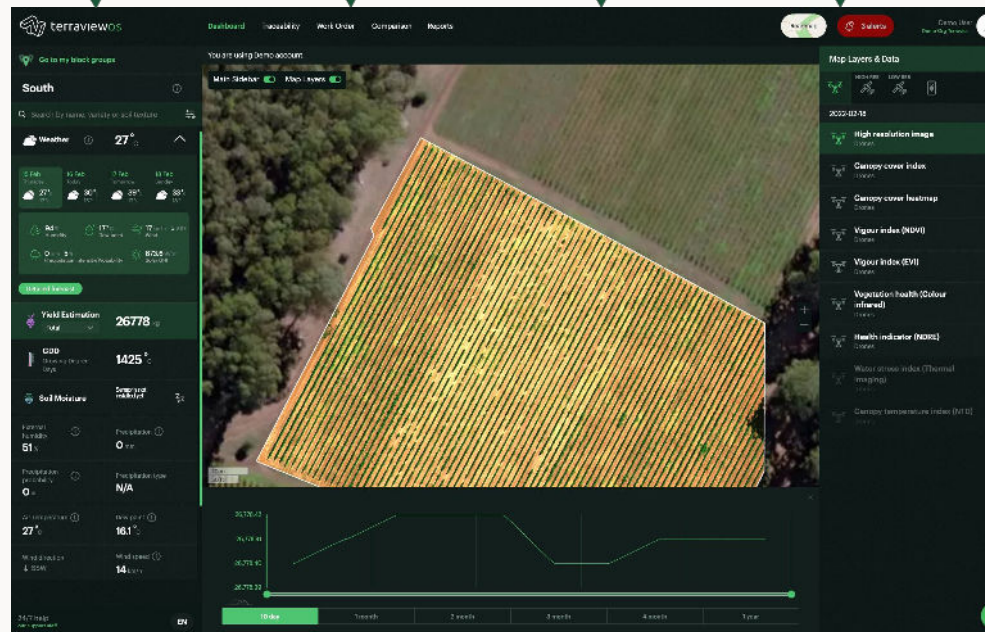


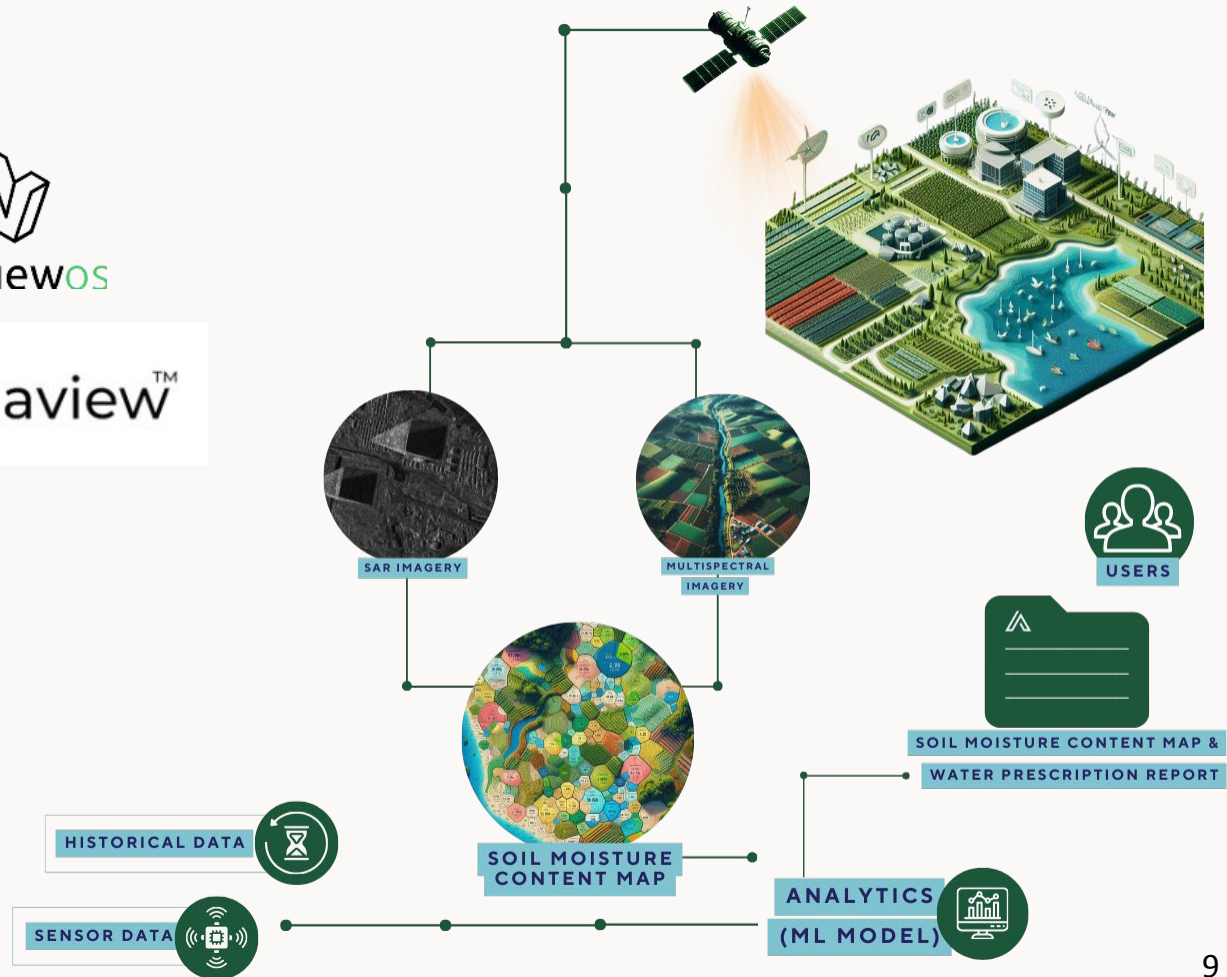
Existing Product: TerraviewOS



Key capability: harvest intelligence

- Growing degree days data
- Continual **yield projections** adjusted weekly based on evolving weather patterns
 - multiple models: global, regional, customer specific!
- Virtual weather station deployment if physical hardware is not deployed
 - provides: evapotranspiration data too!
 - Hourly and 15-day forecasts





Aquaview

- Globally 70% of freshwater consumption is for irrigation!
- 90% of water used for irrigation is wasted!
- With Aquaview and TerraviewOS we are targeting SDGs 6, 12 and 13

70%

Global fresh water used for irrigation
purposes!



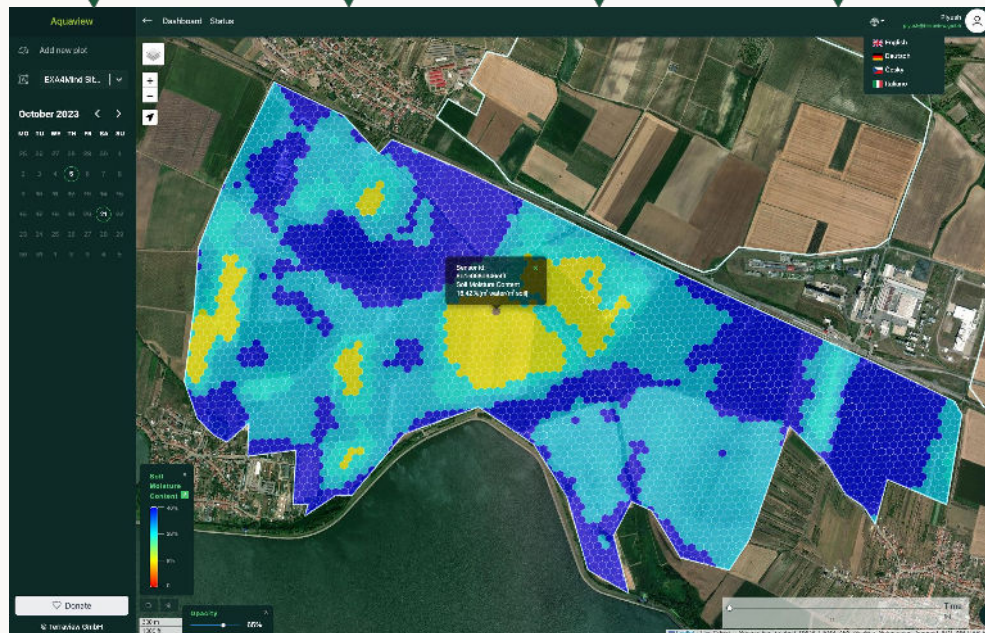
terraviewOS

Existing Product: Aquaview



Sensor-less soil moisture mapping & analysis

- Proprietary, proven and validated algorithm
- Winner of Gravity05 challenge with TWE use case
- **+/- 1.5% accuracy compared to ground truth obtained with high quality physical soil moisture sensors**
- ML engine allows backfilling and forward projections of soil moisture status
- ML engine allows for moisture profile at various depths - up to same depths of high-quality probes



Impact!

through processing data at scale!



Timeliness

We ingest ~250K data points daily into terraview platform!
>70 TB of data comprising of post-processed moisture content analysis, elevation datasets, and soil type information!



Information

Expert system + AI/ML system provides timely information to our users, alerts sent via push notifications, SMS, emails, and desktop alerts!



Impact first

With Aquaview we are in impact first mode
launched free
to help minimize water wastage in agriculture globally!

Key Facts

Data sets

Valid as of Feb 2024



TERRAGREEN



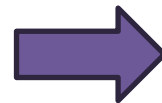
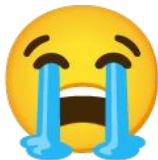
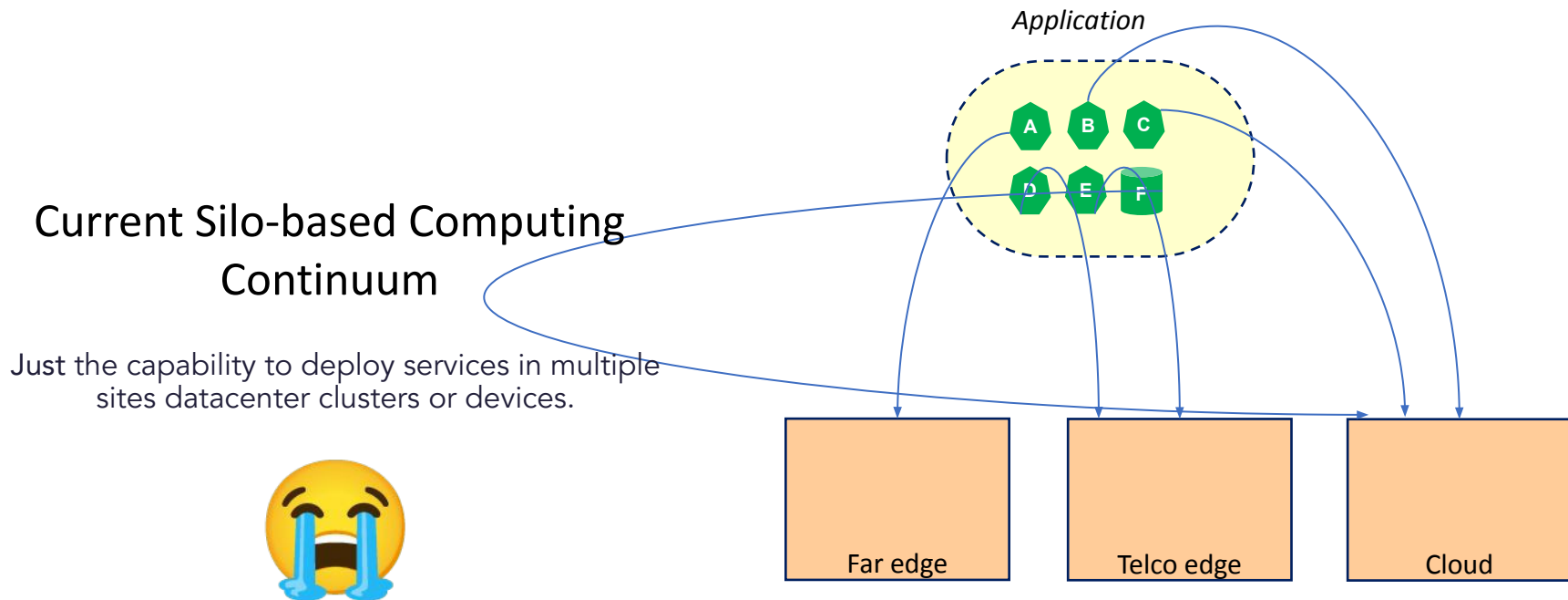
26000 Hectares of vineyards onboarded

>3 TB of sensors, weather, map data, and growing.

>70 TB of soil moisture content dataset and growing

1 Eurostar, 1 6G SNS, 4 Horizon Next projects ongoing

The FLUIDOS computing continuum

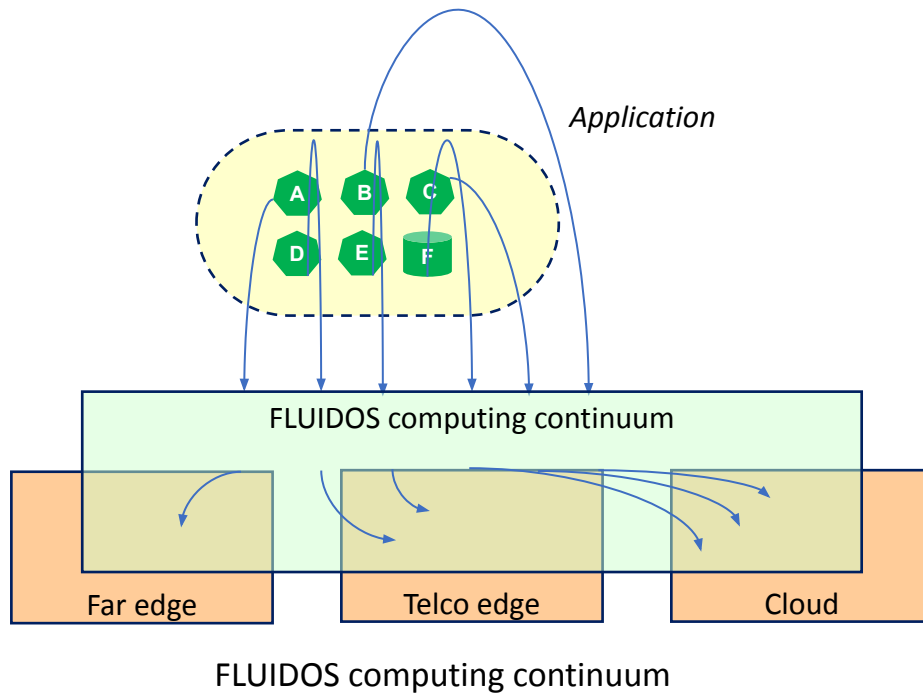


The FLUIDOS computing continuum



multiple technological,
administrative domains and
boundaries,
transparent

*Deployment, Communication, &
Resource availability*



Smart Viticulture, FLUIDOS & Terraview

CURRENT APPROACH

- No simple and integrated network fabric over cloud continuum.
- No easy way to define and manage a cloud continuum application.
- No security privacy or trust.



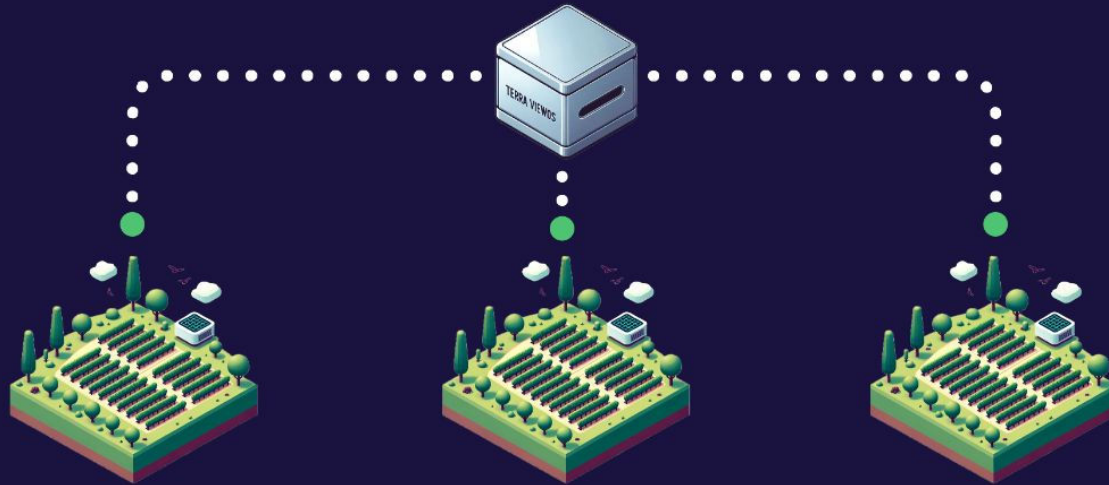
EXPECTED ADVANTAGES

- **Business continuity:** adapt to network changes, operate without uplink, and replicate for failover.
- **Security:** raw data stays local, isolation and trusted execution on network.
- **Decentralisation:** local access, no central cloud, reduced network traffic, workloads at edge and core.

Smart Viticulture, FLUIDOS & Terraview



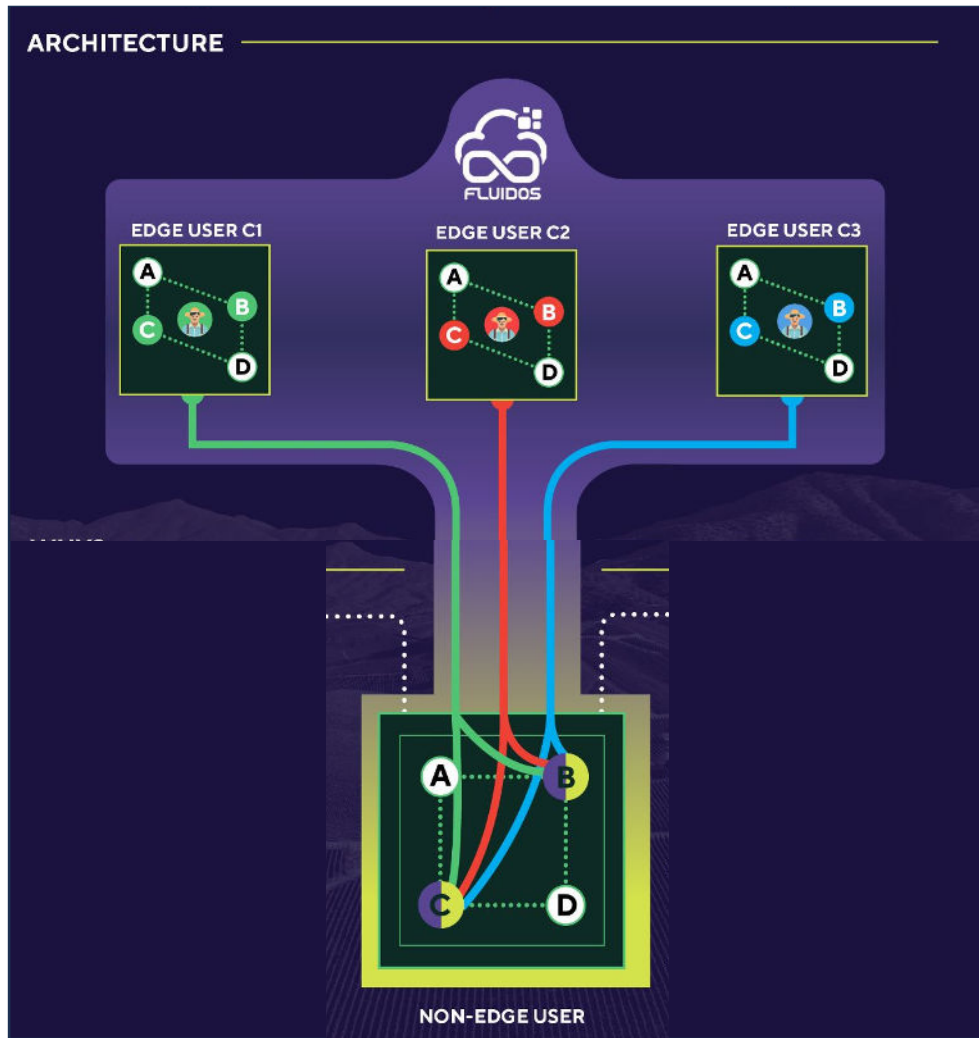
SCENARIO



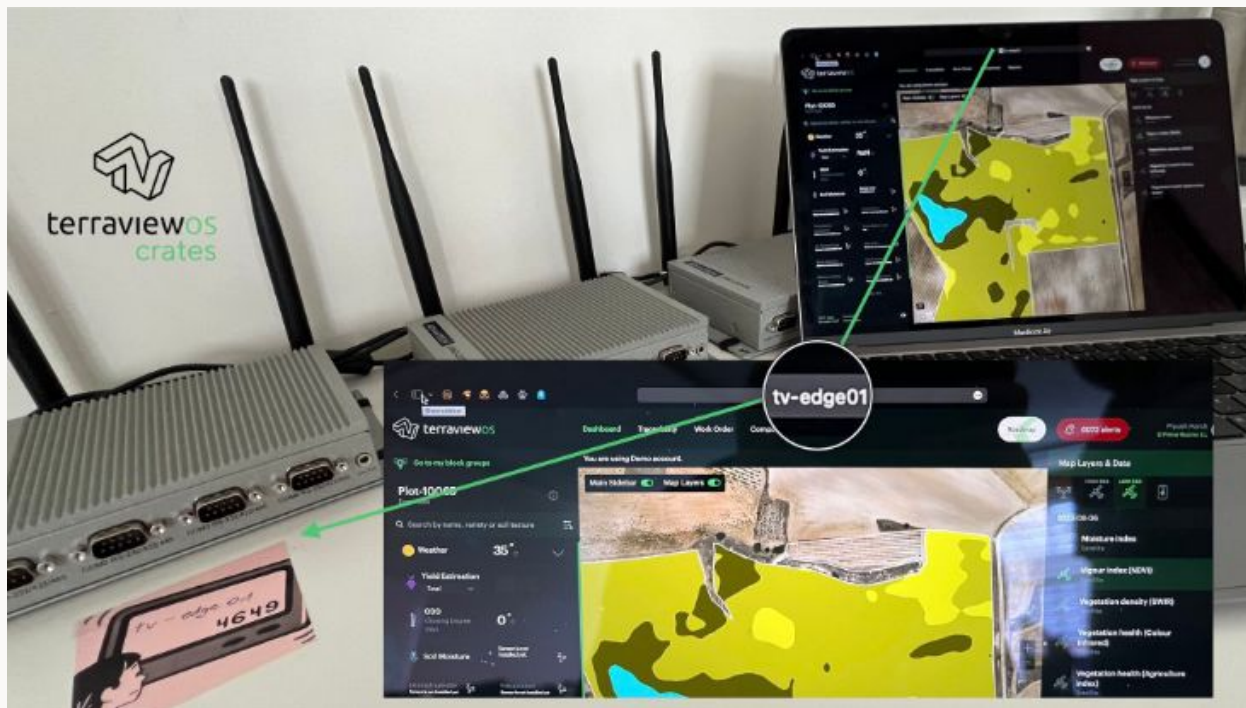
<https://fluidos.eu>



Smart Viticulture, FLUIDOS & Terraview



FLUIDOS & Terraview



Next target platforms will be drones and robotics...



terraviewOS

THANK YOU

Andy Edmonds, CTO



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<https://www.terraview.gmbh>

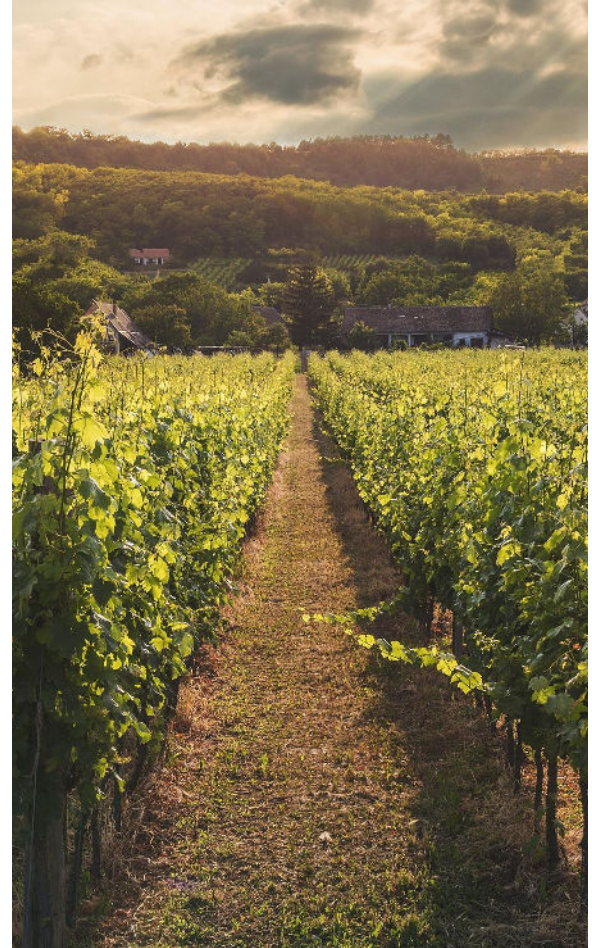


Technoparkstrasse 2, 8406 Winterthur





Backup



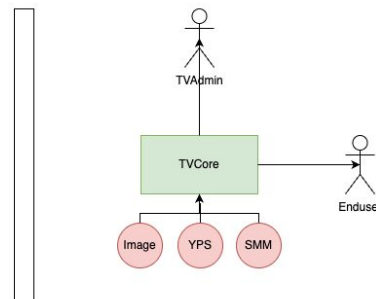
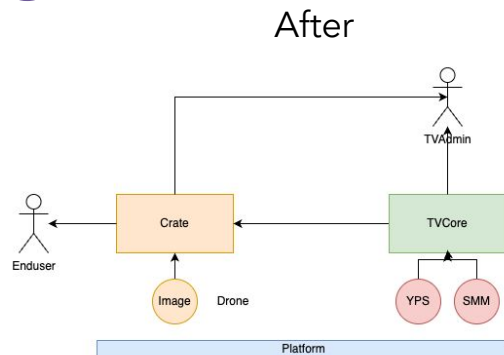


terraviewOS

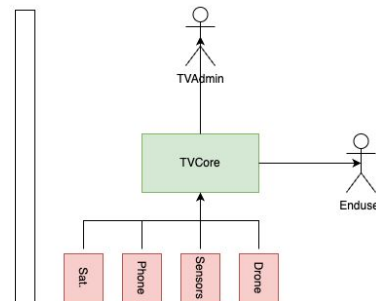
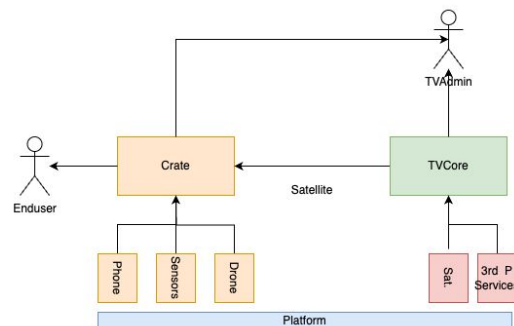
Pre- & Post Edge

What run where?

- Image processing



- Data ingestion



System Architecture

Components added

- Cache
- Sync Service
- File Monitor Svc
- Licensing Service

Modified

- Orange

As-is

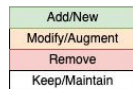
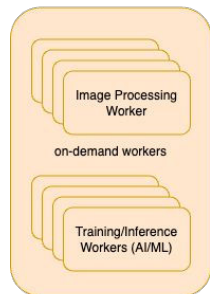
- White

Platform

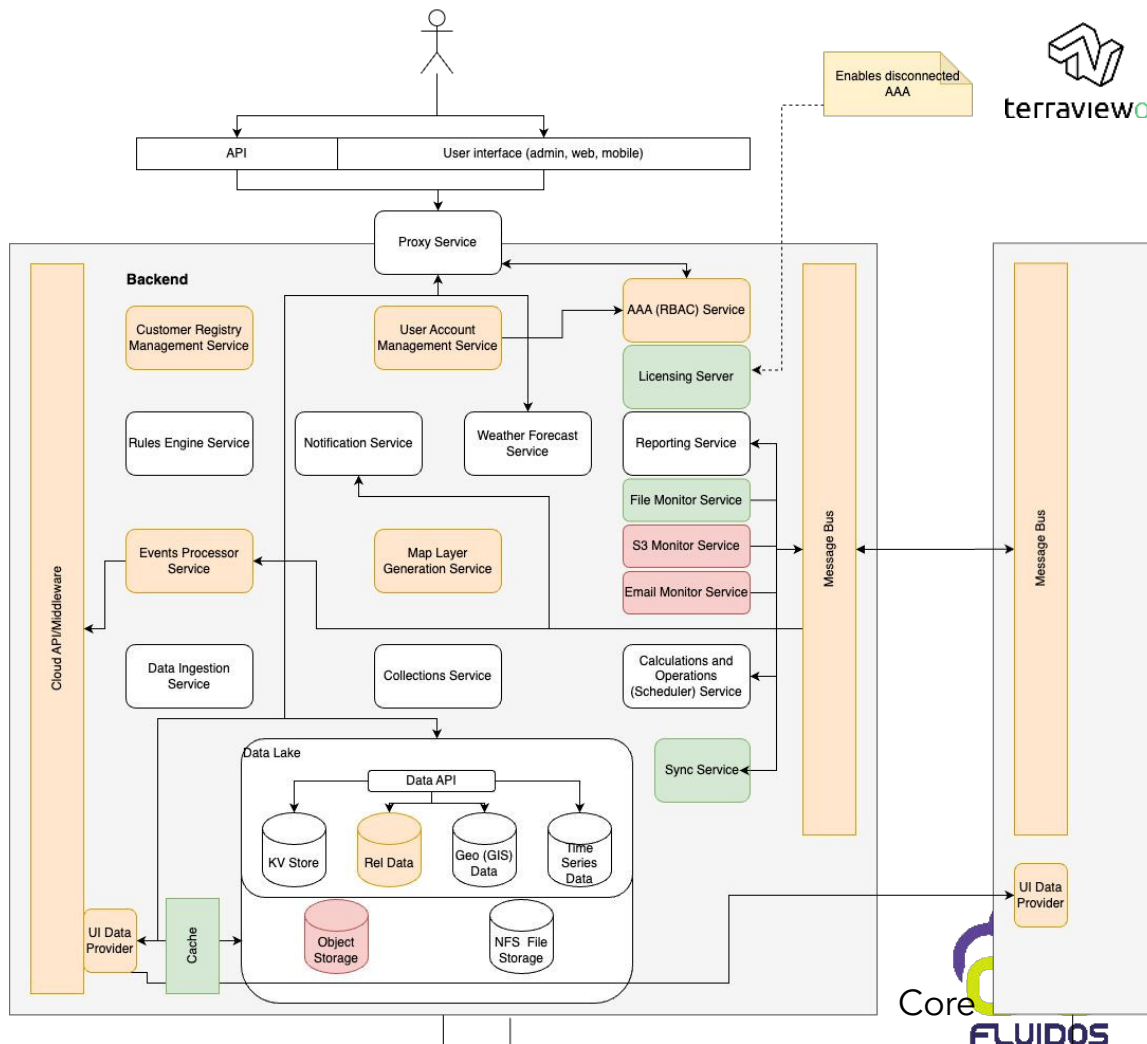
- FLUIDOS

FD Features

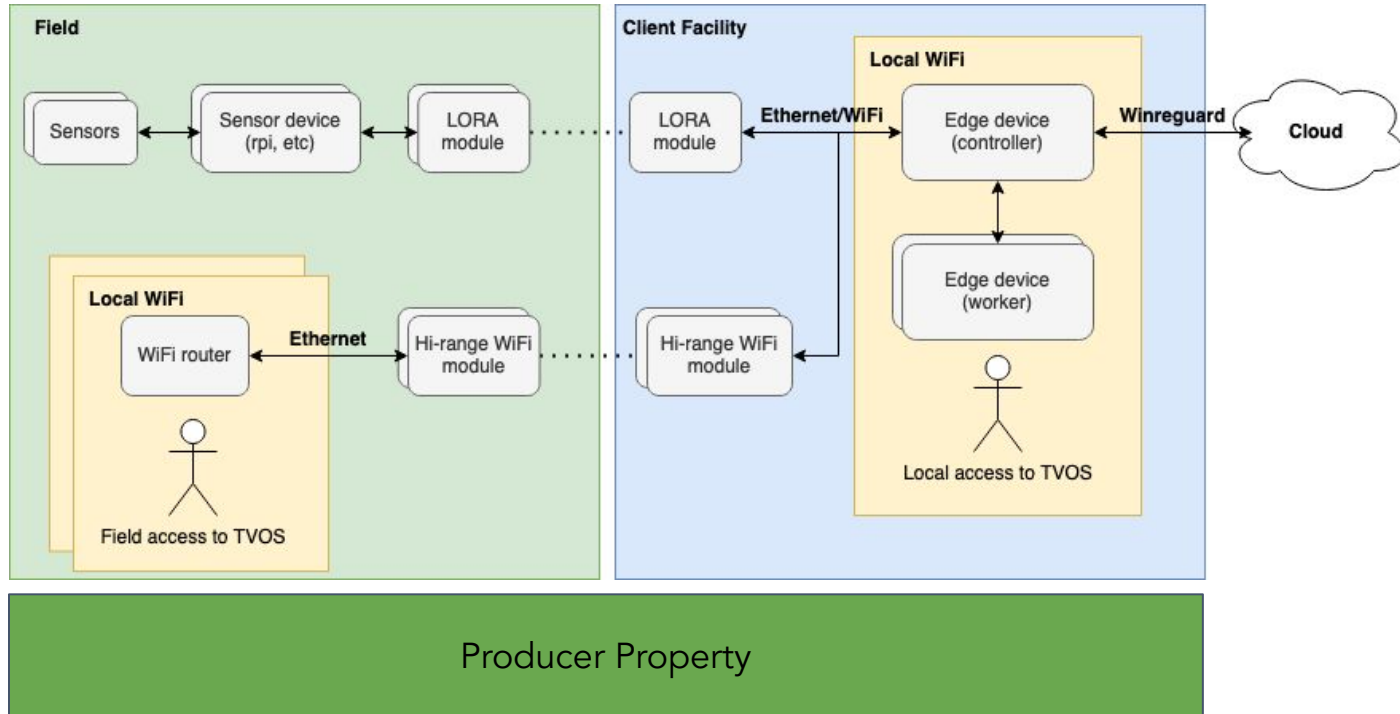
- Orchestration
- Broker
- TEE



Edge



Deployment Architecture





- Integration of TPM/TEE
 - Cysec's ArcaOS
- No "fancy" GPU needed
- To be protected by external elements via IP67 enclosure

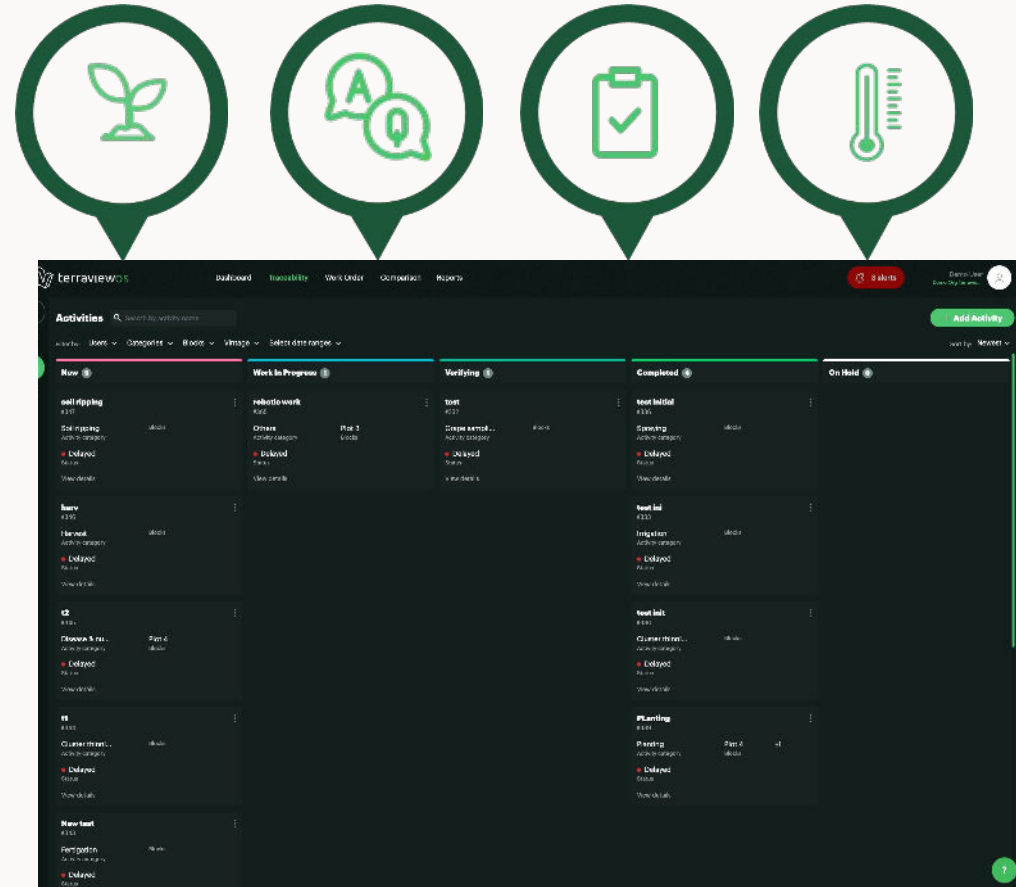
System Hardware

Memory	Built-in 4GB DDR3L 1333MHz (Up to 8GB)	Built-in 4 GB DDR3L, 1866 MHz (Up to 8 GB)
Graphics Engine	Intel HD Graphics	Intel HD Graphics 500
Ethernet	Intel® i210/ Realtek i8119i GbE, 802.1Qav, 802.1AS, 802.3az	
Hardware Security	TPM2.0 (Optional)	
Storage	1 x mSATA shared with mPCIe socket 1 x 2.5" SATA HDD drive bay (Max. height 9.5 mm)	
Expansion	2 x Full size mPCIe slots	
Bios	AMI UEFI (64 Mbit)	
Watchdog Timer	Programmable timer with 255 intervals (1 ~ 255 sec)	

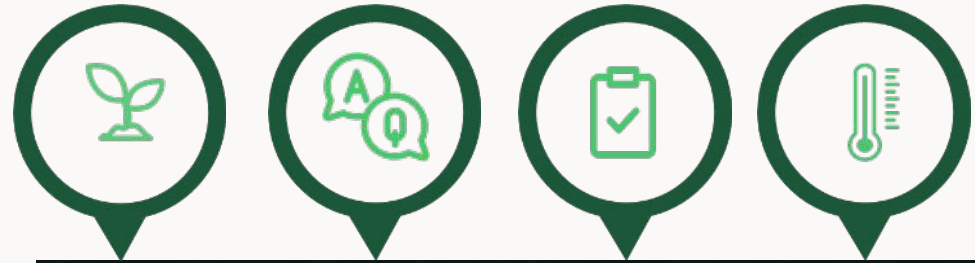
Existing Product: TerraviewOS

One stop intelligence platform for complete farmland management

- Kanban style work planning view
- Multi role access - managers, workers, viticulturist...

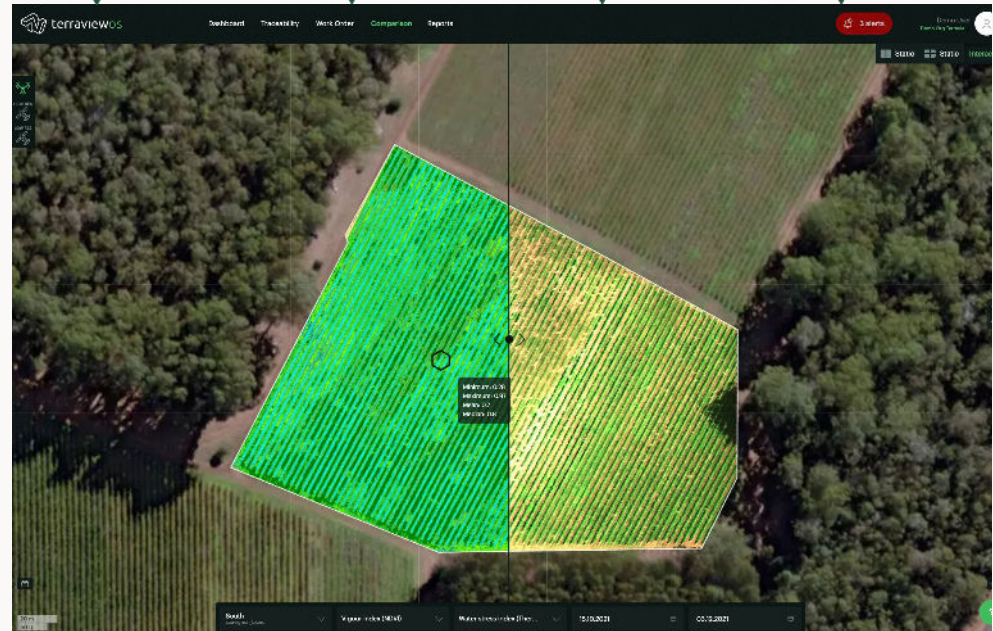


Existing Product: TerraviewOS



Key capability: comparison

- 2-way and 4-way comparisons possible
- Multi year comparison, multi-index



Existing Product: Aquaview



Aquaview virtual moisture probes: 30mt radius



Provides increased actionable points for better water use efficiency approaches at 1/10th cost compared to HW approach!