

5G-HEART Newsletter

25th November 2022
Issue No.10

5G HEART

5G Health, Aquaculture and Transport
Validation Trials

Project website: <https://5gheart.org/>

INSIDE THIS ISSUE

1. 5G-HEART Final Event
2. Aquaculture vertical trials
3. Aquaculture trial videos
4. Summary

Follow us on social media!

Facebook: [5gheart](#)

LinkedIn: [5G-HEART EU Project](#)

Twitter: [@5gheart](#)

YouTube: [5GHEART](#)



1. 5G-HEART Final Event

The 5G-HEART project organised a public Final Event in Oulu, Finland on 17 November 2022. During the past 42 months, the 5G-HEART project has developed and executed large-scale vertical trials on top of European 5G test facilities focusing on the specific needs of innovative digital services from the healthcare, transport and aquaculture vertical industries. The Final Event presented technical results and key findings from the 5G trials conducted during the project by demonstrating and introducing over 20 specific use case scenarios from targeted vertical domains.

The day was divided into three special sessions, each focusing on one of the project's target verticals. The first half of each vertical specific session was dedicated to an overview presentation that summarised the key trialling activities performed during the project and highlighted selected vertical use cases with demonstrations on the main stage. The second half of each vertical specific session was dedicated to more informal discussions and networking as the Final Event audience visited the project's demo booths and discussed in more detail with the research groups that conducted the trials during the project.

This issue of the 5G-HEART Newsletter focuses on the aquaculture vertical and some of its key use cases and trials presented in the Final Event.

2. Aquaculture vertical trials

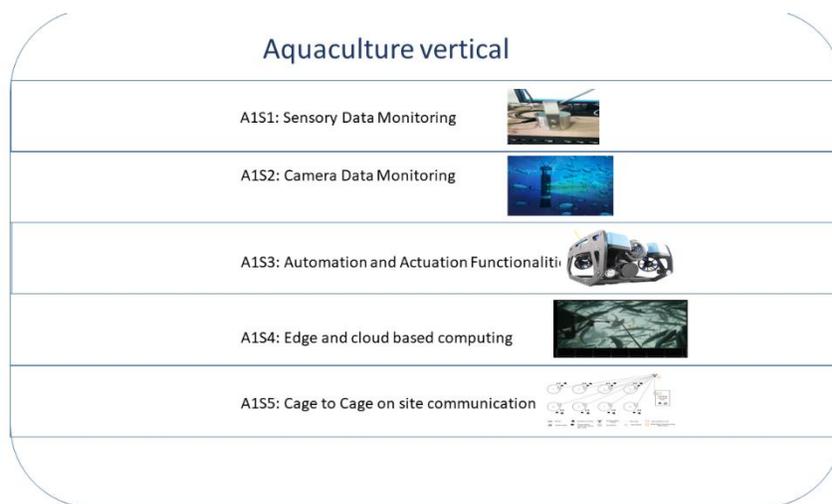
Aquaculture is one of the fastest growing animal food producing sector in the world and is an increasingly important contributor to economic growth and global food supply. The major challenges to EU aquaculture growth can be summarised to adaptation to market changes and competition, as well as need for technical improvements (maintaining health / welfare of livestock, integration of activity with the environment, optimizing resource use and spatial planning).

As of the above, new/emerging technologies and innovations in monitoring and management systems in terms of controlling and improving the feeding means to fish species can enable economically, environmentally and socially sustainable aquaculture development throughout EU and generate enhanced public and investor confidence in EU aquaculture. Therefore there is an ongoing shift in the industry to adopt advanced technology that utilises artificial intelligence, machine learning and data analytics to predict and provide the best possible care for their fish stocks.

The data that are acquired from the IoT technology, is key to tackling some of the sector's most pressing challenges, including global issues like improving fish health through better monitoring of stock and better monitoring of fish feeding. While these concerns affect some fish farms more than others, finding solutions is in the interest of everyone, whether that is to eliminate the risk of suffocation due to low oxygen levels, water pollution and unsuitable pen conditions, or parasites and disease. The farm environment can be monitored more efficiently and with greater coverage (more sensors across the site's multiple cages), enabling near real-time corrective measures to be implemented. What is more, the impacts of the farm on the surrounding environment can be followed more closely, allowing for better environmental management. Machine learning is also an effective tool, in that data acquired are then used to create predictive models leading to more confident decision-making, timely alerts and automated systems. In addition, underwater cameras are used to observe fish behaviour when feeding to help farmers determine feeding schedules and thus improve the feeding procedure. Video imaging is used also to optimise feeding, biomass estimation and disease detection.

IoT is used to collect real-time information on biomass - the weight and length of a fish - to monitor growth and alter feeding levels accordingly. Systems that enable analysis of disease spreading monitoring, without the need to handle fish, reduce the need for staff to visit sites - improving health and safety within the business and minimizing expenditure on travel.

The underlying report details the aquaculture vertical trials of the 5G-HEART project which are implemented in Greece and Norway. They are structured in five scenarios which are: the A1S1: "Sensory data monitoring" that uses sensors to monitor the quality of the sea water, A1S2: "Camera data monitoring" that uses underwater cameras to monitor the feeding and health of fish, A1S3: "Automation and Actuation Functionalities" that uses a drone to monitor the fish cage, A1S4: "Edge and cloud based computing", that uses edge computing for the quick processing of the data and processes, and A1S5: "Cage to cage on site communication" that uses communication between cages.



The above first three scenarios are conducted in Greece in the aquaculture farm of Skironis by utilizing the 5G-EVE infrastructure and all the scenarios except the A1S3 are conducted in Norway in different fish farms by utilizing the 5G-VINNI infrastructure.

3. Aquaculture trial videos

Several videos focusing on the 5G-HEART aquaculture vertical use cases have been prepared to demonstrate the implementations of the final trials as well as to present key results from them. A short summary of the videos is presented in the subsections below. The videos can be found from the 5G-HEART website at <https://5gheart.org/dissemination/videos/> and directly from the project's YouTube channel by following links provided for the different videos below.

Greek aquaculture trials

The aquaculture trials at the Greek pilot site focused on the utilisation of sensory and camera data services when monitoring the fish cages at remote locations. The trials also included experiments with automation and actuation functionalities required in the operation of an underwater drone used to inspect the condition of the physical fish cage infrastructure.

A video titled “5G-HEART Aquaculture - Greece” (https://youtu.be/FA9_PaCWFo0) presents the final trials and key findings from the Greek pilot site.

Norwegian aquaculture trials

The aquaculture trials at the Norwegian pilot site focused on the utilisation of sensory and camera data services when monitoring the fish cages at remote locations. The trials also experimented on the utilisation of technology enablers such as edge/cloud computing and 5G-based cage to cage on site communication to facilitate deployment of local AI-powered applications at remote sites.

A video titled “5G-HEART Aquaculture - Norway” (<https://youtu.be/Y3iK4EoUqog>) presents the final trials and key findings from the Norwegian pilot site.

Aquaculture site surveillance

In the 360° aquaculture site camera monitoring case, the camera stream was processed by a server to provide streams of low and high resolution for a requested field of view (360° or smaller). The processed streams were transmitted via the 5G network to the application client (the operator). While the operator changed the field of view, lower quality video was visualised for minimizing the delay and high resolution stream was presented when the field of view was stabilised to optimise the quality of the video shown.

A video titled “5G-HEART Aquaculture - Surveillance” (<https://youtu.be/90c0HQfWCjw>) presents the final trials and key findings from this use case.

Aquaculture vertical KPI measurements

A KPI measurement framework based on the hardware and software probes running the Two-Way Active Measurement Protocol (TWAMP) was deployed at the Greek aquaculture pilot site for collecting and analysing network KPIs related to the trialled use cases. The measurement environment is cloud based and scalable, providing real-time monitoring for the most relevant KPIs related, e.g., to throughput, packet loss, latency and jitter. The system enables the user to set up measurements as well as to collect and view the measurement results in variety of formats through the provided dashboard.

A video titled “ACTA KPI measurements ecosystem for 5G-HEART” (<https://youtu.be/3Fa4iAgQXOg>) presents the measurement setup utilised in the final trials of the aquaculture vertical at the Greek pilot site.

4. Summary

This issue of the 5G-HEART Newsletter focused on the 5G-HEART Final Event held 17 November 2022 and provided an overview to the aquaculture vertical trials that were presented during the event. This issue of the newsletter also introduced a selection of use cases from the aquaculture vertical with links to videos highlighting the implementations of their final trials and achieved key results.