

# Tutorial Summary

## Heterogeneous Architecture and Communication Protocol for Irrigation Water Quality Monitoring in Precision Agriculture Solutions

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The introduction of technological solutions in agriculture allows reducing the use of resources and increasing the production of the crops. However, monitoring the quality of the water for irrigation is a feature that should be included in Precision Agriculture (PA) systems. Water scarcity has led to the use of wastewater and contaminated water for the irrigation of crops, which can lead to health problems in the population if the water is not correctly treated and purified. Therefore, the aim of water quality monitoring in PA is to ensure the safety of the produce for human consumption. However, the remote location of most fields presents a problem for providing wireless coverage to the sensing nodes and actuators deployed on the fields and the irrigation water canals.

This tutorial addresses the problem of enabling wireless communication among the electronic devices deployed for water quality and field monitoring through a heterogeneous communication protocol and architecture. We will discuss the architecture, which presents a tree topology for hybrid LoRa/WiFi multi-hop networks, and the areas of interest for the monitoring activities, comprised of the canal and field areas. The heterogeneous communication protocol will be presented, including the description of the different messages and alerts that can be generated by the system. The performance results for experimental tests performed with low-cost devices will be provided as well. Lastly, additional tests and functionalities for PA systems will be discussed.