TECHNICAL SOLUTIONS DOCUMENT

LigoWave Wireless Solutions for Fish Farms

Introduction

Modern fish farms are equipped with a variety of machinery to automate operations and maximize efficiency. A key part that links all of the fish farm's technologies together is network infrastructure. It not only enables direct contact among the different operations sites, but also delivers data from the sensors, surveillance cameras, and other equipment to the central office.

How Fish Farms Benefit from Wireless Networks?

Wireless networks allow farms to centralize farming operations, this way ensuring faster, safer, easier, and more efficient work:

- gain direct access to data from various sensors installed in the fish cages;

- observe underwater activity in the fish cages using IP cameras;

- oversee above-water operations and keep the premises safe. Security camera footage can be sent to a local surveillance room or relayed to a security agency that guards the farms;

- control the feeding systems and other farm equipment from a remote computer.

Also, fish farms are often located in remote areas that do not have fixed broadband. A wireless network would help facilitate the introduction of internet access to the territory, in turn allowing fish farms to benefit from an onsite administrative office that is connected to the rest of the world.

Finally, wireless networks provide the framework necessary for communication. Fish farms can take advantage of localized voice services that would allow the central office, farming sites, and feeding barge to communicate with each other.

How Do Wireless Networks Work in Fish Farms?

A typical fish farm includes a land-based central operations office and one or more offshore farming sites reachable by an ocean boat. The topology may vary depending on the specific fish farm requirements, but the most likely architecture in this case would be the following:

The central operations office houses the main IT-infrastructure that is used for fish farm systems control and video surveillance stream playback. Other equipment such as a network video recorder and voice service devices would also be included here.

In most cases, fish farms are built in areas that do not have fixed broadband. Hence, it is necessary to build a wireless trunk link with the nearest internet network—this is where the wireless outdoor bridge comes into play.

The base station is deployed facing the farming sites on a pole near the central operations office. It communicates wirelessly with the client devices found on each of the farming sites.

The onsite wireless client devices are connected to local switches using cables. These switches route the various traffic to and from the devices around the farm:

- one-way data streams coming in from the under/above-water sensors and surveillance cameras, which are connected using underwater and outdoor Ethernet cables;

- two-way communication with the onsite systems and voice services equipment using regular Ethernet cables.

Fish farm infrastructure may vary depending on the needs and requirements:

Feeding barges may be equipped with wireless client devices, this way extending internet access and voice services to the ocean boats, as well as enabling wireless communication with the sensory systems on the fish cages. Depending on the distance between the sites and the central base station, additional wireless devices may need to be installed on the farming sites to ensure the feeding barges are always within the coverage area.

Fish farms have the option of running optical fiber along with the underwater electrical cables that power the farming sites. However, this is the more expensive solution, the cost of which generally does not justify the benefit. Wireless solutions, on the other hand, are proven to provide not only cost-efficiency, but also flexibility and the necessary performance in enabling communication.

Depending on the layout and distribution of the sites, multiple central base stations may be required to cover the entire fish farm area.
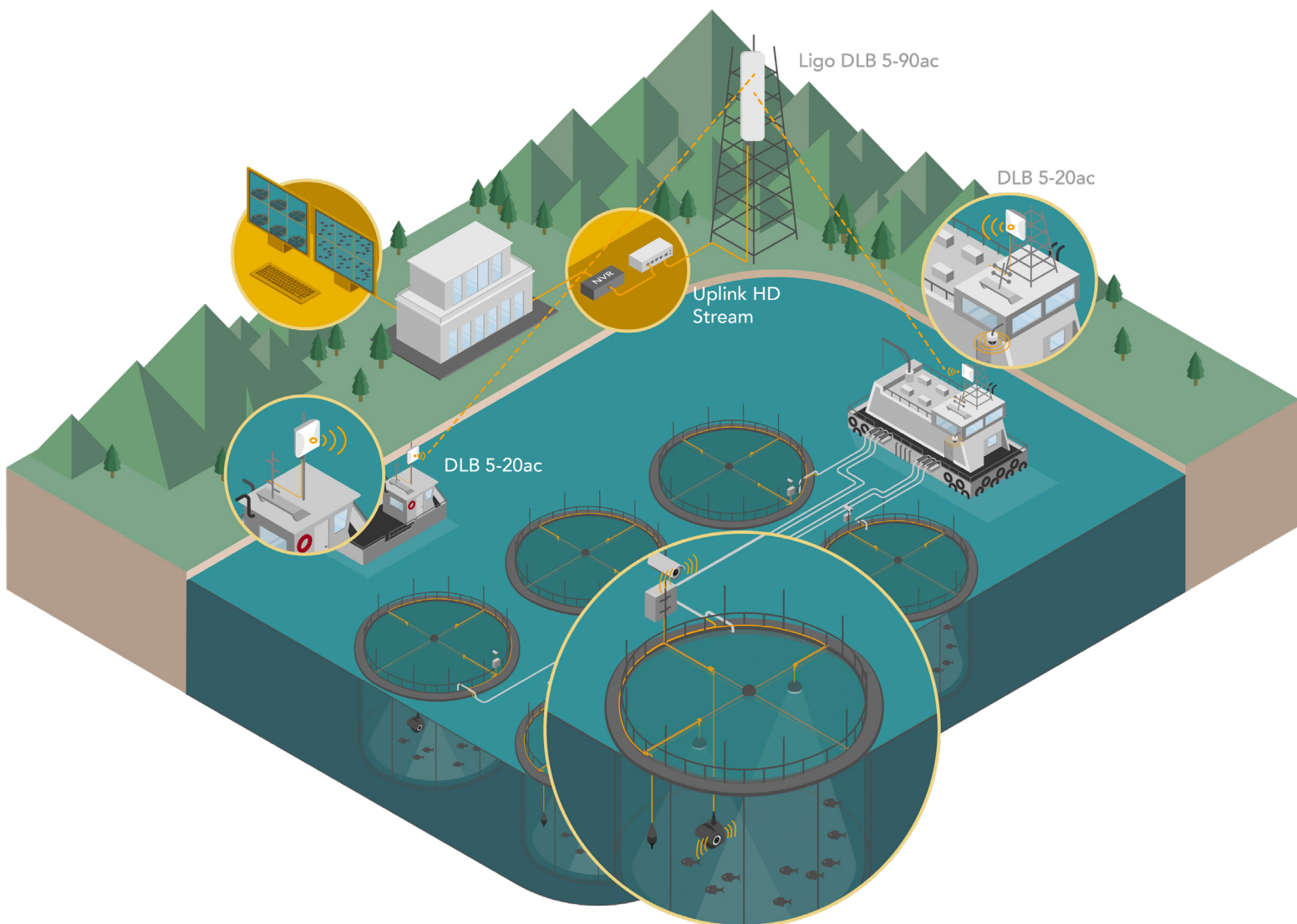
How Can LigoWave Help with Your Wireless Fish Farm Network?

Ocean-based fish farms are subject to a number of risk factors, including strong tides, high winds, direct sunlight, as well as highly humid & salty environments. LigoWave offers wireless network solutions made to withstand the intense conditions found in fish farms, without compromise to performance and practicality:

IP-Rated Casing.

All LigoWave outdoor wireless devices are housed in IP65/66 plastic or IP67 metal enclosures. The level of ingress protection ensures ample waterproofing against rainstorms, high tides, and other weather conditions. The housing itself is made of non-corrosive materials, allowing for extensive use in humid environments. Also, the IP-rated casing does not turn yellow over time due to prolonged exposure to direct sunlight.

Small Form Factor.

Much of LigoWave's next-gen hardware is designed to have a reduced physical footprint, making the wireless devices compact and light. This means that the devices are easier to deploy in places where space is limited and are significantly less affected by strong winds, reducing the chances of it being broken off its mounting.

Surge Protection.

LigoDLB is one of very few outdoor wireless networking device series of its kind that is equipped with integrated surge protection. LigoWave offers a 2kV line-to-line and 4kV line-to-ground safeguard against current spikes and surges caused by extreme environmental factors, while most other vendors provide limited surge protection, if any at all.

Over-Water Performance.

Both the 5GHz and the 6GHz range of LigoWave wireless products have been proven to provide a high level of performance in over-water scenarios. LigoWave's iPoll and W-Jet proprietary protocols reduce latency, stabilize jitter, and automatically control transmission power, this way ensuring optimum performance in various conditions, including above-water links.

Case Studies of Over-WaterScenarios Using LigoWave:

304km RapidFire 5 Wireless Link Test in Italy

The longest unamplified Wi-Fi link was set up using LigoWave's RapidFire 5GHz bridges. It extended a total of 304km, ~214km of which was over the Tyrrhenian Sea.

The RapidFire-based link performance peaked at 100Mbps and 173,693PPS with zero packet loss. Tests were done by the CISAR Italian Center for Radio Activities together with Telcomms Srl, LigoWave's partner in Italy.

3.1km LigoDLB 6ac Link in Russia

A 3.11km link was set up using the DLB 6ac wireless access point plus a 28dBi Cyberbajt DishEter external dish antennas. About 1 kilometer extended over water.

The water did not interfere with the link's performance and stability, even with a lower transmit power. It reached 460Mbps with approx. 90,000 packets per second.
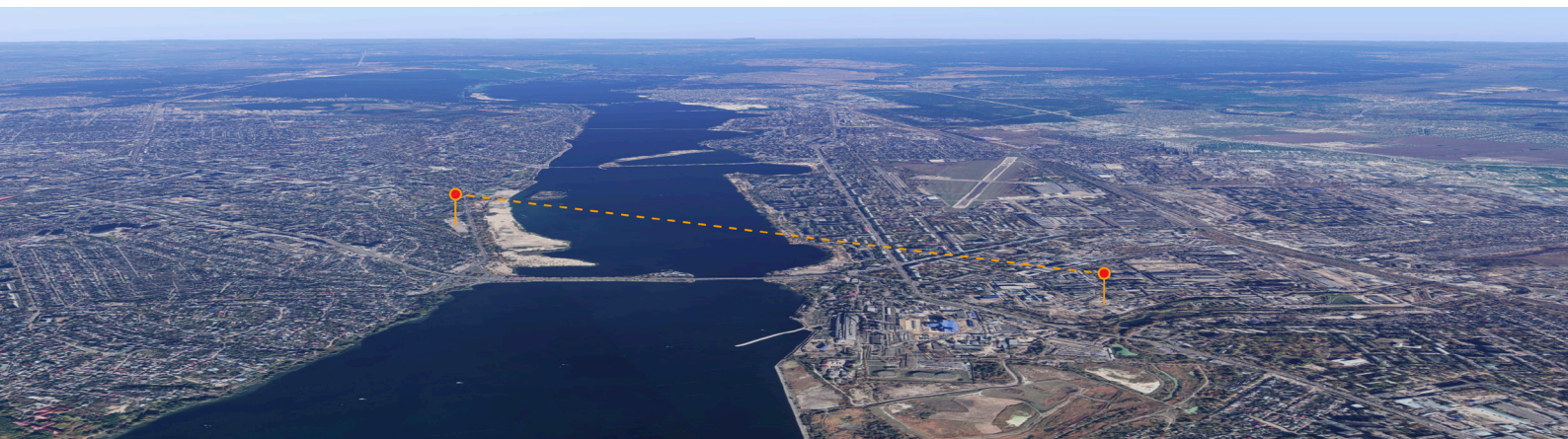
Reliable Performance.

The 802.11ac-based hardware ensures high-packet throughput with up to 256-QAM. Performance is boosted with the iPoll and W-Jet proprietary protocols, which optimize client device activity and prioritize mission-critical data—info and processes that drive fish farm operations. This improves data transfer efficiency and effectively saves processing power, allowing for a higher CPE count—upwards of 70 client devices per base station spread across numerous fish farming sites.

Security.

On top of credential-based logins and AES-128 data encryption, LigoWave provides management frame protection. It defends the network against rogue packets that could disrupt the farm's network, this way stopping farming operations and surveillance streams. Also, data is transferred using iPoll (DLB series) and W-Jet (PTP/PTMP series) protocols, meaning that the proprietary signaling mechanisms add an extra layer of security against unauthorized access.

Simplified Deployment.

Since cost is a significant factor in wireless networking, LigoWave offers a set of tools and features to minimize time and money spent on network setup and maintenance:

- Setup Wizard, which guides users through initial LigoPTP device configuration.

- LigoWave OS, a built-in intuitive GUI that allows users to directly set up and manage individual devices.

- Infinity Controller, wireless cloud-based network management for manual and automated setup, control, maintenance, and monitoring of wireless LigoWave networks.

- Simple Mode, a GUI mode that shows all of the essential device settings in one window.

- Built-In Tools—Spectrum Analyzer, Site Survey, Link Test, Antenna Alignment, and Ping&Trace—included in LigoWave outdoor devices and accessed through their GUI.

- Innovative Mounts that provide alignment flexibility and require minimal effort with installing the devices on poles or walls.

Featured Products

LigoDLB 5-90ac

Wireless short-to-mid range base station with an integrated 90° sector antenna & IP66 casing.

LigoPTP RapidFire 5

Wireless PTP bridge for heavy-duty long-distance industrial applications with an IP67-rated metal casing.

LigoDLB 5-20ac

Wireless short-to-mid distance bridge with an integrated 20dBi directional panel antenna & IP66 casing.

LigoDLB 5-15ac

Wireless short-to-mid distance bridge with an integrated 15dBi directional panel antenna & IP65 casing.

Infinity Controller

The Infinity Controller is LigoWave's proprietary network management platform for end-to-end network control. It is used to speed up and simplify device setup, control, and upkeep with a suite of network installation and management tools.

The Infinity Controller facilitates:

Configuration

LigoWave-based networks can be set up remotely using a web browser (Cloud Controller Service) or Linux CLI/ VM VirtualBox (Privately-Hosted Controller). Once initial onsite device installation and connection are done, the rest of the network configuration can be done offsite from the farm's central operations office.

Management

The Controller centralizes network management operations, allowing users to make on-demand adjustments to the various network and device parameters over the same platform. It also expands upon LigoWave device functionality by providing Controller-exclusive features like network alerts and client statistics.

Monitoring

Remote network monitoring provides general device information, periodic device statistics, history, maps functionality, and customizable LigoDLB alerts, which notify the user about device status changes, Tx/Rx packet failures, signal level drops, and other network events. This allows fish farms to keep a close eye on their networks as well as the equipment found in them.

Interested in setting up robust fish farm network infrastructure necessary for improving communication and increasing operations efficiency?

Go for LigoWave wireless networking solutions available with your local distributors. Get in touch for a quote today.

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LigoWave

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