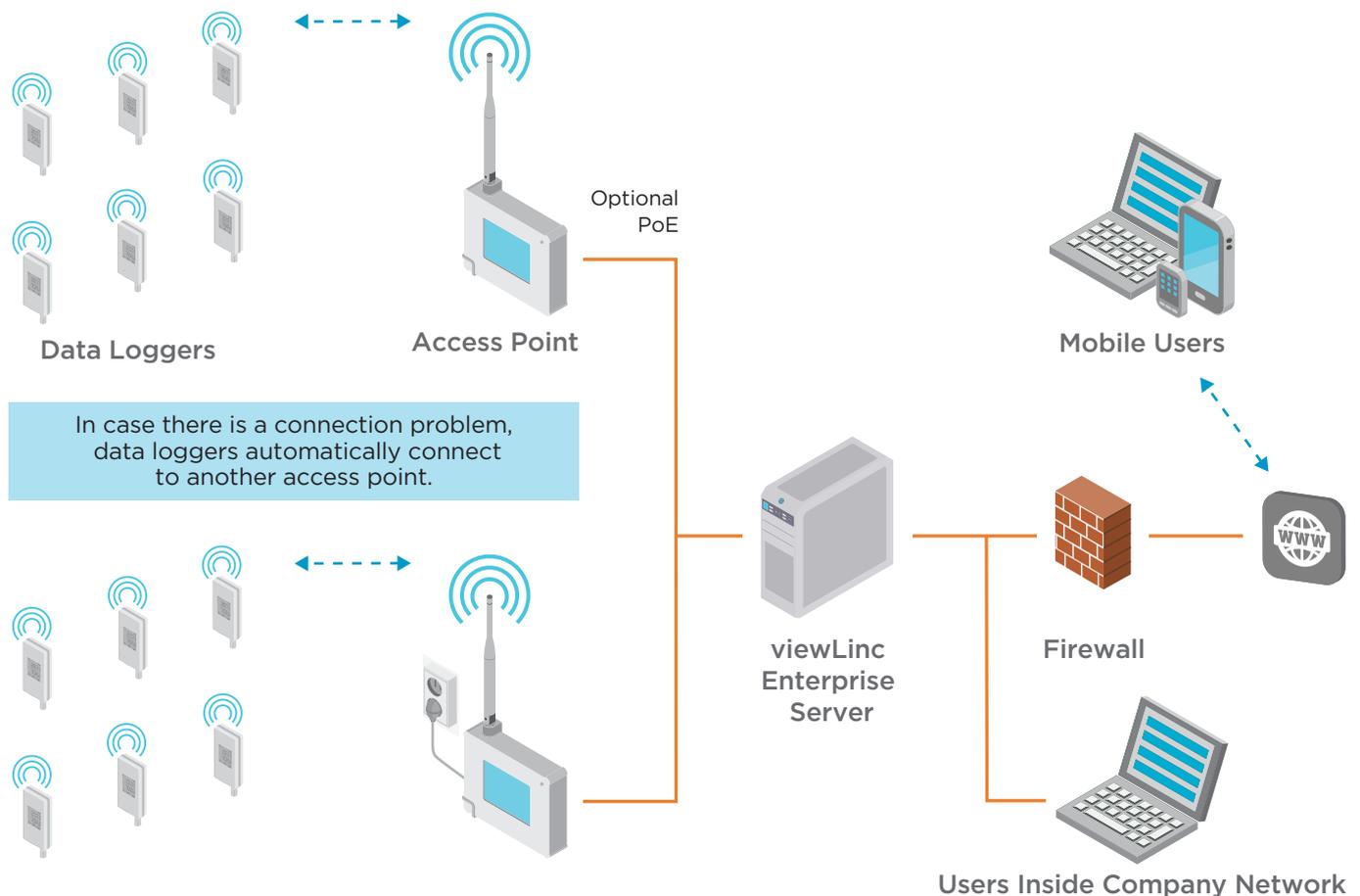


Reliable, Long-range Wireless Sensors for Environmental Monitoring

The Vaisala viewLinc Monitoring System tracks environmental conditions wirelessly using Vaisala's VaiNet wireless devices based on LoRa®* technology. By using a chirp spread spectrum (CSS)* wireless protocol, VaiNet provides robust communication that is extremely reliable over long distances and under harsh, complex and obstructed conditions. Long-range wireless communication eliminates the need for repeaters to boost signal strength. VaiNet's wireless data loggers and access points are pre-programmed to locate each other and establish communication. Less equipment and less configuration simplifies installation so users can deploy with little or no previous experience setting up networked monitoring systems.



VaiNet access points allow users to view live data from up to 32 data loggers.



* See Terms on page 3.



Vaisala VaiNet Temperature and Humidity Data Logger RFL series

The Vaisala VaiNet Wireless technology uses sub-GHz frequencies to provide better signal propagation in environmental monitoring applications. Most industrial monitoring systems equipped with wireless devices use some sort of redundancy to protect against any single point of failure in a network of data loggers. VaiNet creates redundancy by distributing the signal load across several network access points. The wireless signal strength between access points and data loggers determines the optimum data path. Access points use Power over Ethernet (PoE) DC to reduce cabling and allow easy connection to a UPS*. A separate power supply is provided for installations where PoE is not available. Additionally, each RFL series data logger is fully wireless, powered by batteries to ensure that the system continues monitoring during power outages. Each logger can maintain up to thirty days of data if the wireless network loses connectivity, and the access points provide additional data storage should the Ethernet LAN fail. As soon as the network is restored, data loggers and access points automatically backfill all historical data to the monitoring system software to ensure gap-free historical records. The advantages of sub-GHz wireless technologies are compelling when considering the extensive use of other frequencies. By communicating outside the heavily trafficked 2.4 GHz bands, VaiNet's signals are less vulnerable to interference. Another advantage of sub-GHz wireless communication is that low frequency signals mean longer range and better penetration. Barriers

typical to industrial and warehouse environments — cement block walls, metal shelving, heavy duty equipment, liquid products, foil packs — cannot obstruct a lower-frequency signal. Importantly, the long range of the VaiNet signal allows for effective coverage in larger facilities with less networking equipment. Reliable data transmissions also means fewer transmission retries, which saves on power.

Secure Data across a Private Network

VaiNet provides all the benefits of spread spectrum wireless technology including resistance to interference, interception and multi-path fading (reflections). Using the chirp signal to spread the RF energy over a wider band allows for reliable communications even when signal levels are below the background noise floor. It also reduces disruptions from overlapping signals the same frequencies.

Wireless device registration is handled by the monitoring software. Whenever a new data logger is added to the system, it is automatically identified by an access point, which forwards the logger's information to viewLinc. Once accepted in viewLinc, data loggers will stay synchronized, even in situations where other nearby VaiNet networks overlap. Measurements from data loggers are encrypted before they are transmitted between devices. The access point and the viewLinc enterprise server verify that data has been received correctly. Once data is verified, it is stored to the secure database where it is protected from tampering and loss.

Key Benefits

- VaiNet is based on Vaisala's proprietary wireless protocol that operates on a sub-GHz ISM band to prevent signal interference with WLAN applications and assure high penetration in complex environments.
- Indoor wireless signal range in a typical warehouse environment exceeds 100 m (300 ft.).
- VaiNet uses a simple network topology, either basic star or multi-star. This makes troubleshooting easy because there are no repeaters, signal boosters, or mesh networking to complicate installation or troubleshooting.
- Each VaiNet access point supports up to 32 RFL wireless data loggers.
- VaiNet data are encrypted to protect against eavesdropping, data tampering, and transfer errors.
- Data loggers are "plug and play" requiring no local configuration.
- Wireless monitoring eliminates the risk of damaged or accidentally disconnected cabling, especially in high-traffic areas.
- VaiNet increases deployment speed and reduces the need for expensive Ethernet connectivity for each data logger.
- VaiNet is adaptable to changing business needs because data loggers are not tied down by existing network infrastructure. Loggers are easily moved as monitoring needs change.
- Data loggers have a typical battery life of 18 months, eliminating the need for costly battery replacements between annual calibrations.
- Each data logger uses 2 standard AA alkaline 1.5 Volt batteries.

* See Terms on page 3.

Simple Topology, Easy Deployment

VaiNet technology is designed as a multi-star network topology.* The access points are connected to the software in a star configuration and each access point can support its own “star” of data loggers. The long-range capability of VaiNet allows alternate signal paths from data loggers to access points in the event of disrupted communications.

No passwords or key phrases need to be configured during installation because, unlike many Wi-Fi monitoring systems that require manual setup, VaiNet data loggers connect to the system as soon as they are turned on. To ensure optimal battery life in normal operations, RFL data loggers automatically conserve transmission attempts during system installation.

This feature, along with other attributes like automatic recovery from power and network outages, makes VaiNet purpose-built for critical monitoring applications. Designed for industries that require gap-free historical data from controlled environments, VaiNet uses cutting-edge wireless networking technology to provide a reliable, resilient, and secure monitoring system.

Key Terms

- **PoE:** Power over Ethernet allows one cable to provide both data and electrical power to devices such as wireless access points. Benefits of PoE include longer cable lengths and elimination of the need for nearby power outlets.
- **UPS:** Uninterruptible Power Supply (or Source) provides stored energy that supplies electricity in the event of a power failure.
- **ISM bands:** Industrial, Scientific and Medical (ISM) radio bands (part of the radio spectrum) were originally reserved for non-telecommunications use, e.g., microwaves, radar and medical equipment.
- **Chirp Spread Spectrum (CSS):** Chirp Spread Spectrum is a digital modulation technique that allows structuring of data transmitted along multiple radio frequencies. “Chirp” refers to a type of radio signal that uses the entire bandwidth of the spread spectrum to broadcast making it resistant to any change of frequency. “Spectrum” refers to the range of frequencies used, and “Spread” means that a signal uses a wider band of frequencies, rather than the narrow band traditionally used for signal transmission.
- **Network Topology** describes how network components are arranged and connected, often using a diagram to depict the physical or logical structure of the network. Network topology maps typically depict star, ring, mesh, or other shapes. The map describes the physical nature of the network and some qualities of the device connectivity.
- **Access Point (AP)** generally refers to a device (also known as a gateway) that enables communication between wired and wireless parts of a network. Access points typically allow communication between devices using different network standards. For example, VaiNet access points connect the viewLinc enterprise server (which uses Ethernet) to the RFL data loggers (which use LoRa).
- **LoRa®** is a proprietary radio frequency communication protocol that uses a low-power signal to achieve extremely long-range, interference-resistant communications. This technology has been licensed by Vaisala to create a private network for the VaiNet wireless monitoring devices, and further enhanced by additional protocol layers to produce a robust wireless method of environmental monitoring, reporting and alarming.

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