

Maestro MaestroLink™ Server

Engineered for the harsh underground mine environment.



The MaestroLink™ Server is a networked based software platform that monitors all of Maestro's equipment underground and enables troubleshooting from surface as well as real-time measurements and trending functions. It can detect network problems, communication problems, and sensor problems using the diagnostic data.

MaestroLink™ Server

Reduce your operating capital
with real time diagnostics



Drive down mine OPEX using MaestroLink™ Server for simplifying maintenance

Maestro Digital Mine manufactures Industrial Internet of Things (IIoT) devices for ventilation monitoring and control as well as last mile digital networks for the underground mining sector.

The next evolution in enabling technologies led Maestro to develop a **platform that monitors the health condition of all Maestro's digital IIoT devices and networks – anytime and anywhere.**

MaestroLink™ Server is the innovative on premise-based monitoring platform that enables control room operators and maintenance teams to monitor and manage devices via smartphone, tablet or computer in real-time.

Maestro's IIoT devices utilize embedded webservers along with digital technology right down to each individual sensor, enabling remote

diagnostics for solving maintenance problems as well as assuring sensor calibration compliance. This software platform provides a secure multi-instance web-based interface to monitor and record the health of any **Vigilante AQS™** or **Zephyr AQS™** air quality monitoring stations; **DustMon™ PM** particulate monitor; and the **Plexus PowerNet™** "last mile" underground communication network. Every Maestro IIoT digital device provides multi-variable data, and also a complete suite of diagnostic data.

It saves time and cost by providing miners the ability to poll the diagnostics and then turn the data into tangible actions from surface before going underground. The support team will go underground the first time with the proper tools, spare parts and equipment to do the maintenance once instead the industry standard requiring multiple trips.

This diagnostic data provides in-depth information regarding the IIoT device right down to the sensor level resolving current and future problems and ensuring proper sensor calibration; notification when sensors are about to expire; and finding sensors that are reading unusual or bad information.

Identify and manage problems before they occur

Enabling better business decisions and user confidence

Industry research through client engagement and experience discovered that once new hardware is installed underground, it often does not deliver on its full promise of consistent and accurate data to ultimately drive better business decisions. Part of the long-standing problem is assuring that the original data is valid, which then in turn, drives end user confidence. **The requirement to properly diagnose the equipment in real-time becomes essential to keep up with operational production demands.** With the addition of new digital solutions, the automation and electrical maintenance department is tasked to solve ever more complex problems with resources that have not increased in proportion to the number of sensors and systems that they are expected to support.

MaestroLink™ Server was developed to fill the gap between the requirement of maximizing reliable and accurate operational data while reducing the impact and workload of the maintenance and support team.

The screenshot displays the MaestroLink Server v2.1 interface. The main window shows a table of Air Quality Stations (AQS) for a Plexus Network. The table has columns for Location, CO, NO2, Airflow 1, Humidity 1, and Temperature. The NO2 sensor at 1700 LEVEL (1700-AIT-002) is highlighted in red, indicating a 'Sensor Error'. A pop-up window titled '1700 LEVEL - 1700-AIT-002 - Sensor Missing' provides details on the error, including a description, potential errors, potential issues, potential fixes, and a maintenance action plan.

Location	CO	NO2	Airflow 1	Humidity 1	Temperature
1700 LEVEL	1700-AIT-001 0.0 ppm	1700-AIT-002 Sensor Error		43.0 %	22.9 Deg C
1600 LEVEL	1600-AIT-005 0.0 ppm		1600-FIT-007 -1.77 kcfm	41.2 %	24.1 Deg C
1500 LEVEL	1500-AIT-003 0.0 ppm	1500-AIT-004 0.0 ppm		43.2 %	23.2 Deg C

1700 LEVEL - 1700-AIT-002 - Sensor Missing

Error Description
Gas sensor is not communicating with the Vigilante/Zephyr AQS.

Potential Errors

Missing sensor	Sensor connection	Cable damage	Termination resistor	Cable termination	Digital sensor base
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Potential Issues:

- Gas sensor missing from configured port.

Potential Fixes:

- Reconnect or replace gas sensor to properly configured port. See MaestroLink "Air Quality Stations" tab and select "Details" to view the gas sensor type and range.

Maintenance Action Plan
Required tools and components to bring underground for a successful one-visit repair:

- Plug-in terminal (part number HGC-TERM-006)
- Digital sensor base (part number HGC-GSB-001)

MaestroLink™ Server is your factory trained Maestro technologist and engineer, working 24-7 assuring maximum uptime of each digital device.

Reduce your operating capital with real time diagnostics

Once installed, **MaestroLink™ Server** reaches out on the network to find and self populate the IIoT devices and network nodes and begins to monitor both the data and advanced diagnostics of the devices.

MaestroLink™ Server, located on surface, automatically polls all the devices underground for both the data and diagnostics and unpacks it into a user-friendly format with overview screens to quickly understand the complete synopsis of the installed devices. The polling rate is fully configurable by the user to allow coarse or fine granularity as required.

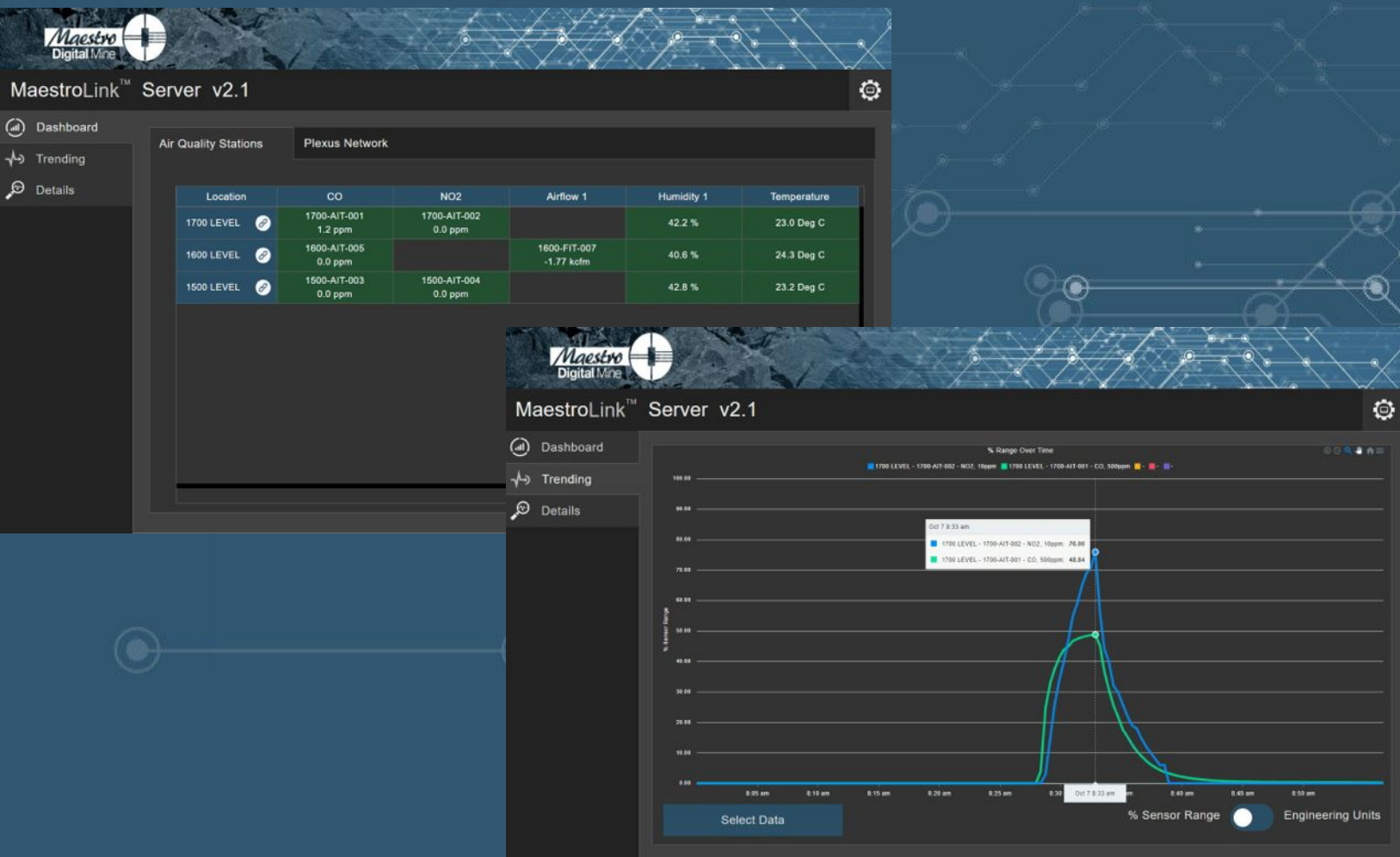
MaestroLink™ Server is your factory trained Maestro technologist and engineer, working 24-7 assuring maximum uptime of each digital device.

Thousands of different diagnostic data points have been gathered and evaluated over the entire life of each IoT device in both a laboratory and underground environment by our product

development and service team. These digital samples have been correlated to turn symptoms into possible diagnosis opportunities, all without the need to go underground.

MaestroLink™ Server then provides an action list of items to bring underground to resolve the challenge in a single visit. All the required part numbers of the tools and components are listed. This data can be printed or pulled into a maintenance system software or emailed to the person responsible.

MaestroLink™ Server can either be a user installed software solution or a pre-configured and combined hardware and software solution. Under most conditions **MaestroLink Server** resides in the Control Room or Mine Operations Center. The real-time performance networking characteristics are less intense for industrial protocols and the equipment is in an environmentally controlled area, cabinet, or control room.



We make the complex, simple!

Mine Wide Benefits of *MaestroLink™* Server

Health, Safety & Hygiene

Assuring that all gas, wet bulb temperature, worker heat stress and dust monitoring sensors are properly calibrated and in full compliance with regulations helping to keep workers safe.

Automation and Operational Technology

Simple open digital integration that doesn't interfere or impact with existing SCADA/HMI/DCS/PLC/PCS systems using standard industrial communication protocols and communicates over the existing process control network.

Electrical & Instrument Maintenance

Reducing the amount of time spent diagnosing, repairing or calibrating the digital equipment and eliminating multiple trips underground for a single repair.

Production and Operations

Assuring that the miners get back to the face quicker and safely by reducing blast clearance times and providing the miners confidence that the sensors are working properly.

Mine Ventilation

Assuring that the Air Quality Stations are operating properly in order to optimize the ventilation control circuits and assure worker safety in the event of a mine fire.

Information Technology

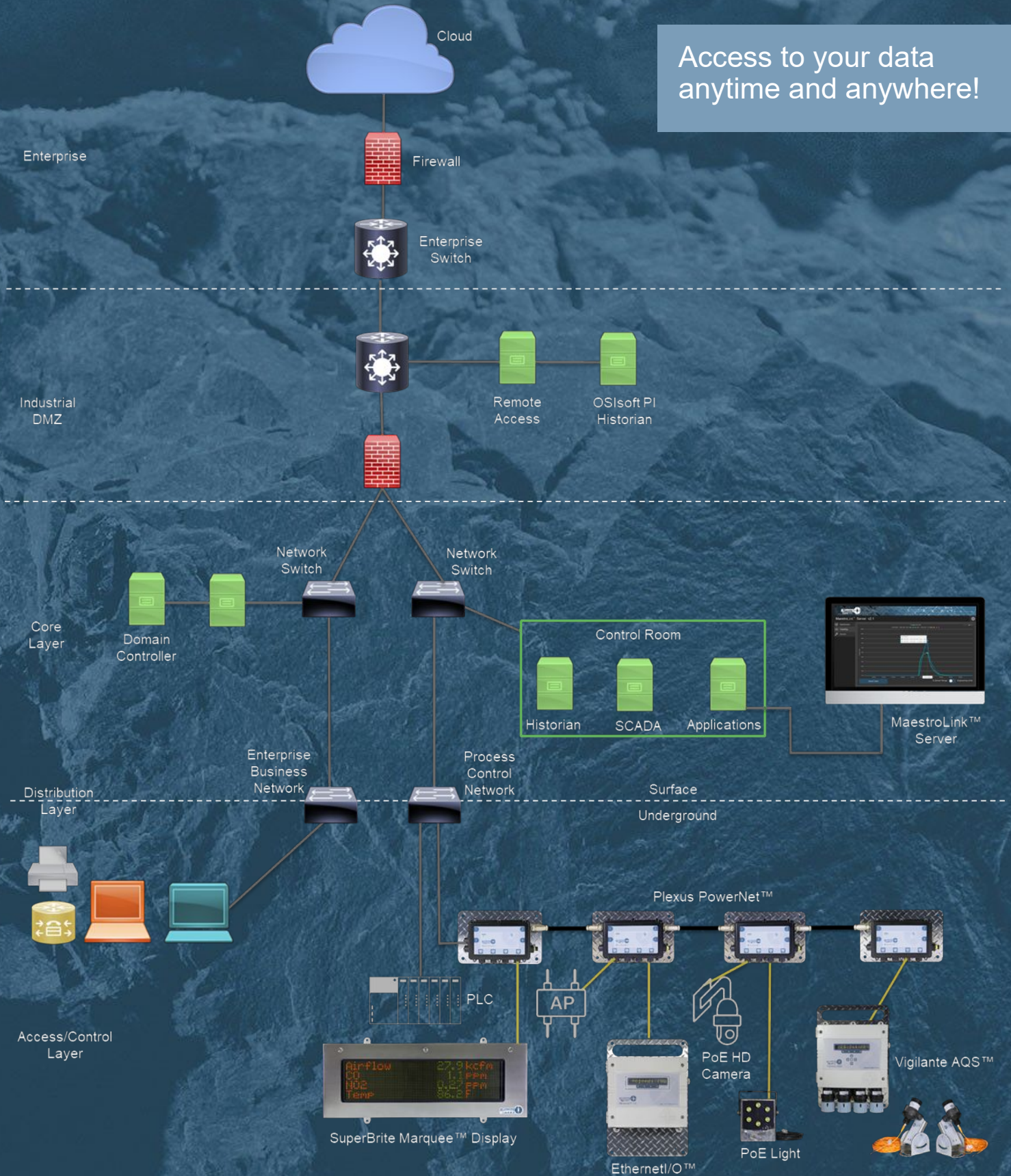
Maximum security of both IoT devices and last mile networks thereby reducing risk.

Energy Management

Properly functioning equipment assures that energy costs for the largest single electrical consumer, mine ventilation, can be optimized and controlled reducing the energy expenditures by 25-50%

How Maestro integrates into Mine Network Architecture

Access to your data anytime and anywhere!



Maestro
Digital Mine



We leave no one stranded

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Real time data means more time at the face