



CityBox 2.0 Air Quality Station and City Sensor Gateway

cityBox 2.0 combines environmental monitoring, wireless sensor-network connectivity and cloud communication in a modular outdoor platform. It can collect measurements from its own sensors while serving as a gateway for nearby E-IOT devices. Solar-power and battery-storage options support installations where a permanent wired supply is unavailable.

Products shown

- **cityBox 2.0 controller and gateway board** — The central PCB combines processing, communication modules and external connection terminals. The illustrated assembly includes NeoCortec mesh connectivity and a Fibocom MA510 cellular modem.
- **Battery and power-management board** — The board on the left provides multiple cylindrical-cell holders and charging and power connections for the station's energy-storage subsystem.
- **Environmental sensor enclosure** — The large white louvred housing provides a ventilated protective structure for the sensing assembly, helping reduce direct solar exposure while allowing air exchange.
- **Air-quality sensor module** — The upper-right assembly shows a Sensirion sensor integrated onto an interface board. The measured quantities are airborne particulate matter and CO2 levels, along with temperature and humidity.

- **Illustrated solar-powered installation** — The background shows a solar panel and mounting arrangement, demonstrating the concept of an independently powered outdoor monitoring station.

Product features and operation

Environmental monitoring and gateway functions

cityBox 2.0 brings two functions together: measuring conditions at the station and collecting data from distributed sensors nearby.

The local sensing assembly provides environmental measurements, while the gateway interfaces connect additional E-IOT nodes to the same cloud infrastructure. This allows one installation to support several monitoring tasks and share its communication and power resources.

The modular design can be adapted to the location, required measurements and available energy supply.

Air-quality and environmental sensing

The station can accommodate selected air-quality and environmental sensors. Depending on the installed modules, these may provide particulate-matter measurements, temperature, relative humidity or other supported air-quality indicators.

The application associates each reading with its sensor type, unit and measurement time. This is important when combining different sensing technologies: particulate concentrations, gas measurements and calculated air-quality indices describe different aspects of the environment.

The actual measurement set, accuracy and calibration requirements are defined by the installed sensors. The platform should therefore be configured around the intended monitoring task rather than assuming that every station measures every pollutant.

Ventilated outdoor enclosure

The louvred housing allows ambient air to circulate around the sensing assembly while shielding it from direct sunlight and some weather exposure. This helps provide a more representative measurement environment than a sealed enclosure exposed to the sun.

Sensor placement must preserve the required airflow and avoid heat from electronics influencing temperature readings. Sensors with dedicated air inlets, outlets or fans also require an unobstructed flow path.

The environmental protection of the complete station depends on its construction, sensor openings, cable entries and mounting arrangement.

Gateway for distributed city sensors

NeoMesh connectivity allows cityBox 2.0 to collect messages from compatible sensor nodes distributed around the installation. Intermediate nodes can relay data, extending the network beyond a direct radio connection to the station.

This supports a shared infrastructure for applications such as environmental monitoring, lighting-status reporting and external sensor acquisition. Compatible interface nodes can bring measurements from soil, water-level or noise sensors into the same E-IOT system.

The station can forward these readings alongside its own measurements, with device identifiers preserving the origin of each data point.

Cellular communication and E-IOT Cloud integration

The illustrated MA510 modem provides a cellular uplink using NB-IoT or LTE-M, with optional 2G fallback according to network availability and configuration. This allows deployment without relying on local Wi-Fi or wired Internet access.

Station firmware prepares measurements and status information for transmission to the E-IOT Cloud. The cloud application can display current values, retain historical records and compare trends across multiple locations.

Where supported by the firmware, bidirectional communication also enables remote configuration or commands to compatible connected devices.

Solar power and battery storage

The solar-powered configuration uses a photovoltaic panel to supply energy and recharge the station's battery subsystem. Stored energy supports operation during darkness or periods of reduced sunlight.

Power-management circuitry coordinates charging and supply to the electronics. The energy budget must account for the controller, cellular communication, mesh activity and sensor loads, including any fans or sensor warm-up periods.

Solar-panel capacity, battery capacity and reporting intervals must be matched to the installation and expected seasonal conditions. Autonomous operation depends on sufficient harvested energy over time.

Measurement scheduling and diagnostics

The station can coordinate sensor acquisition and data transmission according to the application's reporting requirements. Sensors that require stabilization or continuous operation must be handled differently from those suitable for intermittent measurement.

Where implemented, supply-voltage readings, battery information, sensor status and communication diagnostics help operators assess station health alongside the environmental data.

This makes it easier to distinguish a genuine environmental change from a sensor fault, power shortage or interrupted connection.

Deployment and data interpretation

Location selection affects both measurement quality and communication reliability. Nearby exhaust outlets, walls, vegetation and local heat sources can influence readings, while shading affects solar generation.

Consistent installation practices help make data from different stations comparable. The platform supports distributed observation and trend analysis; suitability for formal reference measurements depends on the complete sensor configuration, calibration and validation.

Typical applications

- Distributed urban air-quality monitoring.
- Environmental observation near roads and transport facilities.
- Monitoring around schools, campuses and public spaces.
- Industrial-site and logistics-area environmental monitoring.
- Solar-powered sensing at locations without a wired supply.
- Shared gateways for nearby NeoMesh sensor networks.
- Smart-city demonstrations and customized municipal IoT installations.