

Applying OpenTelemetry Metrics to Monitor Urban Air Quality Sensors

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Today, many smart city projects integrate an air quality monitoring component, however, particularly in the IoT field, the observability property of the system appears less mature compared to other software domains. Many systems depend heavily on vendor-specific technologies, making unified visibility rather difficult. This happens because current solutions collect many environmental parameters, but provide fewer data on the status of the sensor, reliability, or other operational performance.

In this paper, we investigate whether OpenTelemetry (OTel), an open-source tool for observability, can improve monitoring of urban air quality in a sensor network. To test this, we have designed a digital twin setup where we capture both environmental data and sensor-specific health information such as battery status, connectivity problems, and unusual sensor readings. The setup is a lightweight version of a smart city with different urban zones, sensor types and realistic operational scenarios.

Our analysis suggests that OpenTelemetry could improve real-time issue detection and may also offer better maintenance and management of IoT deployments at large scale.

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