

Better Air Quality Monitoring Leads to Healthier Lives

Smart Cities and Industry Gain Real-Time, Low-Cost Monitoring with Intel®-Based Bosch Air Quality Micro Climate Monitoring System (MCMS)



“With access to comprehensive air quality data, city leaders are equipped to quickly and easily take action.”

Tackle Local Air Quality Challenges Globally

Today's urban areas are experiencing rapid growth at an exponential rate. By 2030 the global population of major cities (10 million+) is expected to grow from 3.2 billion to nearly 5 billion—more than 60 percent in less than 15 years.¹ The natural results of hyperdensification (crowded cities, more waste, dense energy consumption) can adversely affect air quality.² Alarming, nearly 7 million people died in 2012 as a result of air pollution exposure³ (one in eight deaths globally) according to a recent study by the World Health Organization. This mandates the implementation of highly efficient air quality management solutions to ensure a sustainable, high quality of life for urban citizens.

Unfortunately, the lack of accurate, real-time air quality data leaves city officials with inadequate resources to tackle these pressing problems. Using Intel® IoT technology, Bosch has created the Micro Climate Monitoring System (MCMS), a real-time, low-cost, and highly localized air quality monitoring solution that helps manage air quality around the world in ways that have never been possible before.

Disrupting Air Quality Monitoring Technology

Historically, air quality monitoring solutions have been bulky, expensive to buy, expensive to maintain, and impractical to adopt for widespread deployment. Additionally, current air quality management technology often cannot provide the critical analytical link between the cause and effect of pollution.

The Bosch IoT-based MCMS is optimized for speedy deployment with minimal additional infrastructure investment at one-hundredth the size of traditional air quality monitoring stations. While such systems might cost anywhere from USD 150K to 250K, the end-to-end MCMS system—including software, sensors, and services—runs at significantly less cost. The sensor devices also are extremely light and easy to install and relocate to numerous locations within an urban area, making them suitable for high-impact air pollution mitigation studies.

Major advances in sensor technologies, fueled by Intel IoT-based solutions, have brought game-changing improvements to the pollution monitoring table:

- Reliable, real-time data accuracy
- Time- and location-based trend analysis
- Easy-to-use data gathering tools
- In-depth back-end analytics
- Low-cost implementation

These benefits and the unprecedented flexibility of the Bosch IoT-based MCMS offer up numerous end uses:

- **Smarter regional air quality monitoring.** With real-time alerts and recommendations on ideal indoor/outdoor fitness conditions, local government officials can issue warnings and alerts locally or regionwide and use the data to create ongoing, rich trend analysis and data visualization.
- **Smarter activity scheduling.** Real estate developers, school districts, and employers can offer residents, students, and workers the ideal times for indoor/outdoor fitness activities with forecasted microclimate conditions within building complexes or around entire neighborhoods. Traffic lights can be optimized during heavy commute and pollute times to improve roadway congestion. MCMS can send real-time alerts and notifications to computers, tablets, and smartphones on ambient air quality and make recommendations based on multiple parameters, including air pollution, temperature, humidity, and noise levels.
- **Smarter worker safety.** Business and industry can use MCMS to help them meet regulatory, environmental, and worker safety requirements for dust emissions control or to continuously monitor highly toxic gases such as NOx, CO, and SO₂ on limited-footprint, short-term work sites. The dynamic, field-replaceable sensors are built for weatherproof, outdoor use. MCMS also can be seamlessly integrated with a real-time safety and tracking system to meet compliance monitoring requirements.

Intel® IoT Platform

The Intel® IoT Platform is an open, standards-based, end-to-end reference model and family of products that enable third-party solutions. It gives cities the capability and connectivity to build on a rock-solid IoT foundation. Proven Intel scalability, security, performance, and remote manageability make it the right fit for immediate deployments, while simultaneously future-proofing any city's IoT-powered air pollution management roadmap.

Intel®-Based Air Quality Monitoring: Affordable. Always On. Data Rich.

The Bosch IoT-based MCMS solution eases both financial constraints and implementation complexities for city governments. With a combination of on-premise edge sensors and Intel IoT Platform technologies, the Bosch air quality monitor offers up huge improvements in cost, weight, size, and power consumption compared to other traditional monitoring stations.

The Bosch IoT-based air quality monitor also aids in unorganized data gathering and management, enabling powerful, real-time analytics to help government officials interpret changes in air quality and make immediate decisions. Built-in data transfer protocols powered by Intel Security deliver more secure, trusted data from all devices—providing protection against tampering and man-made errors.

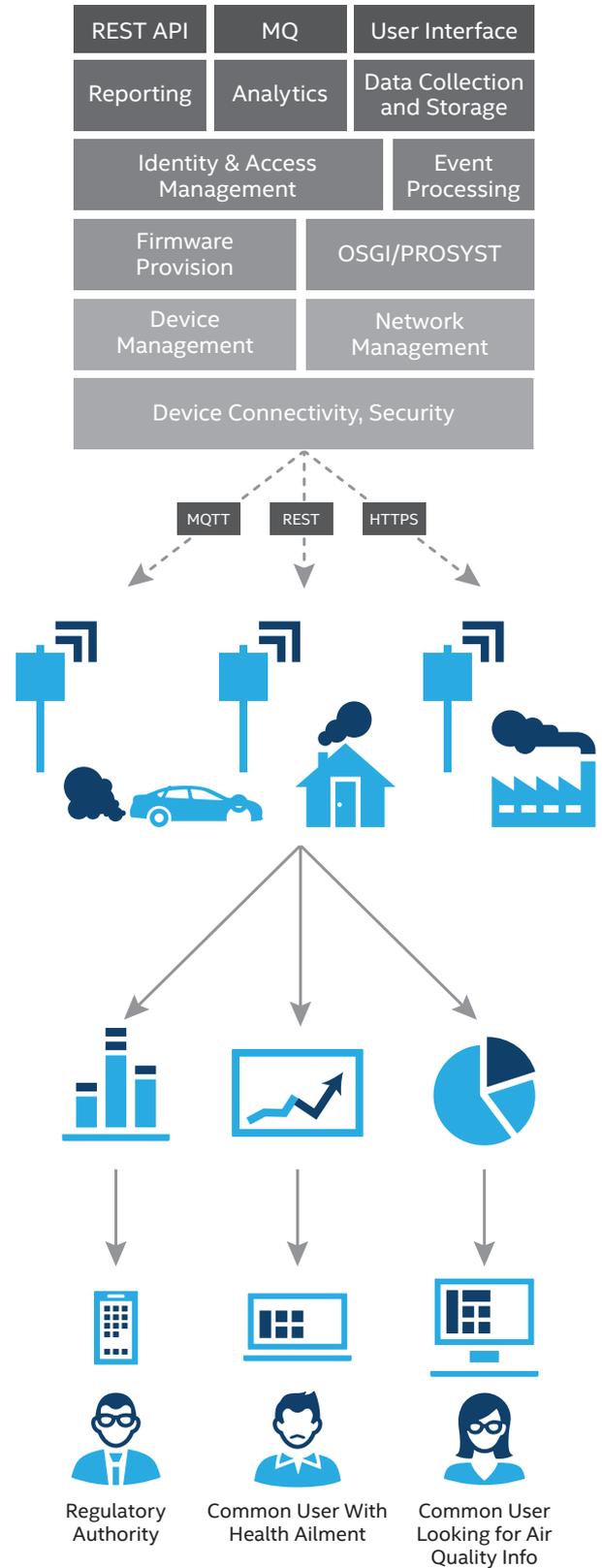


Figure 1. The Intel®-powered Bosch MCMS gathers, analyzes, and stores data and securely sends real-time alerts to computers and devices on ambient air quality.

The Bosch IoT-based MCMS includes:

- Powerful edge devices that include a Sensor Point Unit
- Intel®-based IoT gateway equipped with:
 - Compact, high-accuracy gas sensors (CO, NO, NO₂, SO₂, and O₃)
 - Particulate matter sensors (PM10, PM2.5, and PM1.0)
 - Environmental parameters (ambient temperature, relative humidity, sound, light)
 - Dynamic field-replaceable sensors
 - Rugged enclosure designed for outdoor use, IP6X compliant
 - Built-in cellular/Wi-Fi/3G/LTE for sensor and cloud networks
 - Robust security that scales from edge to cloud
 - Cloud-based analytics, data management, and visualization
- Serviceable, user-friendly design
- Monitors that track noise pollution, light intensity, and other variable pollution parameters linked to public health concerns

Intel and Bosch: A Breath of Fresh Air

Integrating technologies and protocols for networking, embedded control, and game-changing data security (see Figure 1), the Intel-powered Bosch MCMS is able to deliver:

- Data-driven air quality management solutions to the mega cities of the world
- Automated and mass-deployable air quality compliance monitoring
- Information that citizens and communities can use toward managing health
- Flexible and rich trend analysis and data visualization
- End-to-end security and policy management

In short, the Intel-powered Bosch MCMS empowers city leaders with the right tools to make a real impact on the health and well-being of their citizens.



Intel technologies' features and benefits depend on system configuration and may require enabled hardware, software or service activation. Performance varies depending on system configuration. No computer system can be absolutely secure. Check with your system manufacturer or retailer or learn more at www.intel.com.

1. "Ambient (outdoor) air quality and health," World Health Organization (WHO), September 2016, who.int/mediacentre/factsheets/fs313/en/.
 2. "World's population increasingly urban with more than half living in urban areas," United Nations Department of Economic and Social Affairs, July 2014, un.org/development/desa/en/news/population/world-urbanization-prospects.html.
 3. "7 million premature deaths annually linked to air pollution," World Health Organization, March 2014, who.int/mediacentre/news/releases/2014/air-pollution/en/.
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SYSTEM SPECIFICATIONS	
Communication	GSM (3G), Wi-Fi (2.4 GHz and 5 GHz), Ethernet ⁴
Physical construct	Dimensions: L 30 cm x W 25 cm x H 15 cm
	Weight: 4 Kg
	High durability, shock- and ingress-protected fiber-reinforced polymer enclosure
	Powers with 110V/220V AC or 12V DC
Software functionality	Ideal operating range: -20°C to +50°C, 15% to 85% RH
	Configurable sampling periods, over-the-air update, diagnostics and alerts, remote data backup, standard UI available for desktop, tablet, and mobile devices
External accessories	Also available with mounting brackets Sun shield and splash guard Compatible with external battery (12V/40Ah/36W)

Learn More about IoT

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To learn more about Intel® IoT Gateway Technology, visit intel.com/iotgateways.

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