



# **Industrial IoT Gateway for Environmental Monitoring Internet of Things**

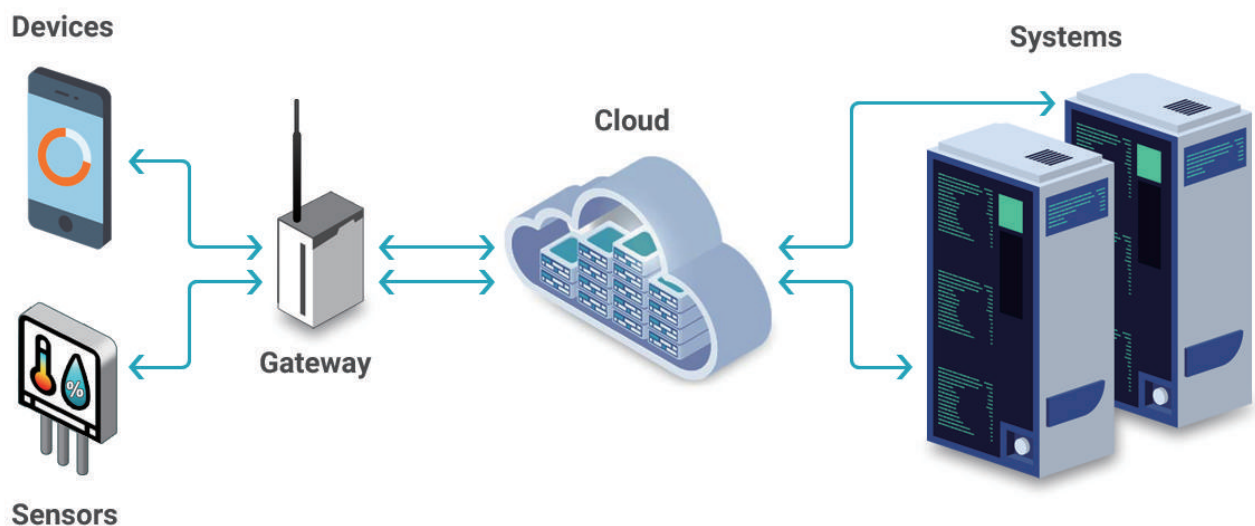
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Back in 1982, a young researcher wanted to quench his thirst on a blazing summer day. So he walked some distance to get to a vending machine only to find that all drinks had already sold out. It was a light bulb moment for the young researcher, he installed sensors that can remotely report storage quantity and temperature so he will always know how many drinks are in the machine and if they were cold enough to enjoy. Some say this is the first online machine that resembled the concept of Internet of Things (IoT)!

Ever since then, IoT has been growing at an immense rate. In the past decade, the number of IoT devices has increased exponentially from around 15 billion in 2015 to an estimated 75 billion in 2025. This figure suggests that the IoT network is only going to get more complex than ever and your choice in implementing a capable and appropriate IoT gateway is critical in the efficiency of your IoT application and network.



Collecting real-time data, an IoT gateway is positioned at the edge between devices/ sensors and cloud applications/ systems. The industrial IoT gateway is no different and is implemented to acquire real-time operational statuses via industrial-specific data acquisition channels and analytically present valuable operation insights to improve efficiency, and in the process may predict or prevent problems. Although the practical application of the industrial IoT is extremely diversified, however, the core essential elements remain the same. Of which, an industrial IoT gateway plays the role as the data gatekeeper between operational technology (OT) to information technology (IT). The industrial IoT gateway acquires data, processes local data, translates data/ communication protocols, secures data for transport, sends translated data to the cloud, and also allows data to flow back to OT devices for a probable action. To execute functions, an industrial IoT gateway must have the following capabilities: built-in industrial-specific data acquisition channels, edge computing, data wrangling, data encryption, pre-certified by wireless carriers, support for cloud communications and the ability to survive in harsh/ rugged industrial environments.

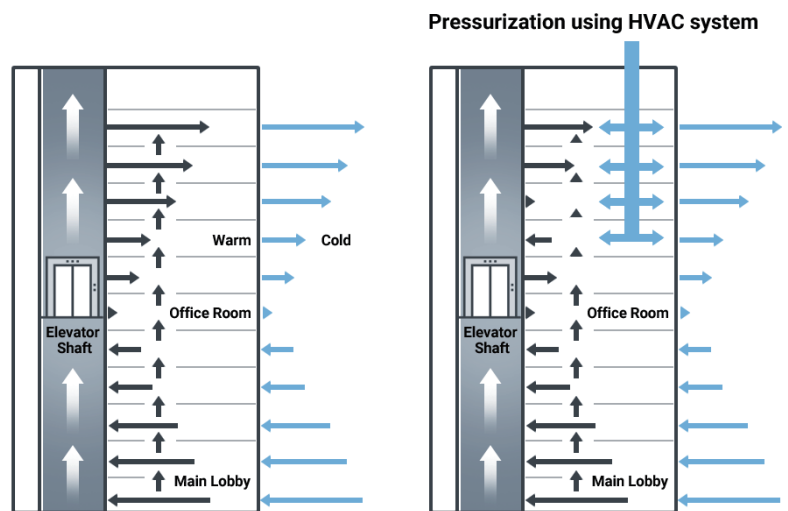
## Environment Monitoring in a High Rise Building – Elevator Shaft Heat/ Pressure Regulation

While there are many reasons to implement an environmental monitoring system, such as comfort in ambient temperature and lighting, being energy efficient also has its benefits. According to the US Energy Information Administration (EIA), the cost of electricity will continue to rise in all private and public sectors in the foreseeable future.

To efficiently manage a modern high rise office building, the industrial IoT system must be able to monitor and collect environment data (data acquisition) > process and digest the collected data > analytically filter and categorize the data > based on cloud application data analysis, provide practical and actionable insight data. You can set up sensors to pick up everything and anything quantifiable. This may include noise levels, lighting, temperature, humidity, air particles; building OT systems such as water, electricity, security, etc. The combination and exchange of the data will generate useful data that may help to improve the building’s operating efficiency. Essentially, the more accurate and efficient your industrial IoT gateway is, the better you can understand the building statuses and operate the building with efficiency and on minimum electricity (cost).

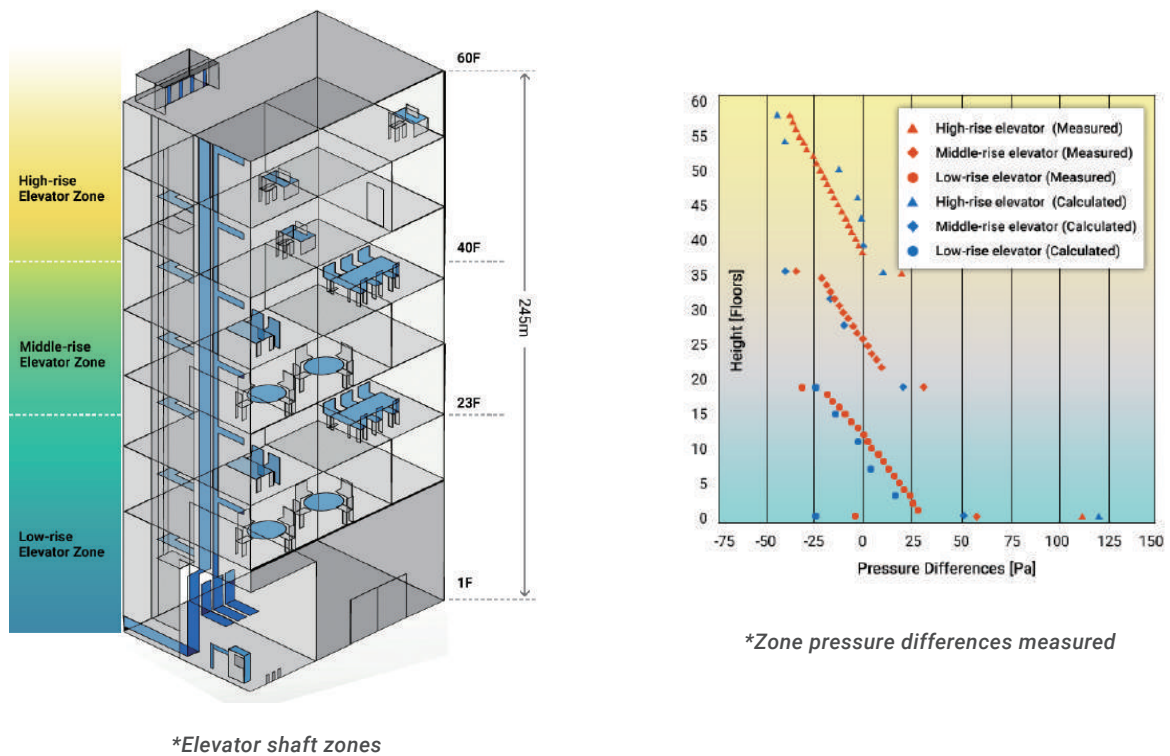
One of the most common environmental monitoring applications is heating, ventilation air-conditioning (HVAC) in a high rise building. Due to the complexity of HVAC applications, the Industrial IoT gateway deployment location environment conditions may be extreme. For example, industrial IoT gateways installed for HVAC may be installed in the basement or close to the high rise office building’s boiler. The industrial IoT gateway may be required to operate continuously at high

temperatures of 50 to 60 degrees, 24 hours a day and 365 days a year. Meeting the extreme environmental demand has its benefits as it also means the Industrial IoT gateway is so much more reliable. The “reliability” factor comes in handy where environmental conditions may be moderate, but the system is however located at hard-to-reach places to maintain, such as on the building’s rooftop acquiring data from the water tank or in an elevator shaft, monitoring pressurization. To collect a complete and top to bottom elevator shaft pressure and temperature conditions, hundreds or thousands of sensors may need to be deployed in the elevator shaft, and industrial IoT gateways must be strategically placed to complement the sensors.



*\*Typical air pressure in high rise building*

Traditional process and predictive control utilize virtual sensors and are somewhat sufficient. As these are critical systems of a high rise office building, there may be hundreds of sensors placed in the elevator shaft and so how much more flexible and efficient would it be, if they were able to monitor and control real-time data from all sensors simultaneously? The deployed sensors will be able to draw up a real-time 3D definition model of the elevator shaft, output the values of the model to a human-machine interface (HMI) dashboard to display detailed information, such as the pressure in a particular zone or on a particular floor.



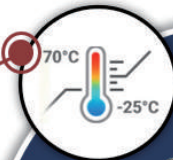
The aim of elevator shaft pressure monitoring is for “stack effect”, where the buoyancy of heated air has a draft effect moving upward. The effect offers natural heating ventilation during cold seasons (where excess heat can be regulated into colder office levels) while during the hot season, it may cause elevator malfunctions, excess heat load and may aid in the spread of fire (fire hazard)\*. So being able to monitor 24/7 in real-time and auto-regulate excess pressure in the elevator shaft of a high rise office building are benefits aplenty.

Specific applications aside, even for general applications where gateways are deployed at your fingertips in large volumes, the maintenance cost and time required will be significant. Therefore, **robustness and reliability** are undoubtedly mandatory requirements of an industrial IoT gateway.

## Essential Elements of an Industrial IoT Gateway

### Operating in harsh environments

- ▶ Processor works from **-40°C to +105°C**
- ▶ System specification: **-25°C~70°C**



### Fits into confined spaces

- ▶ Compact dimensions
- ▶ Metal DIN-rail clip

### Designed for various power sources

- ▶ Work with the existing one
- ▶ Also powered by PoE PSE



### Minimum maintenance

- ▶ Fanless
- ▶ Cable free



**Survival in harsh environments** is almost a given quality for industrial IoT gateways as they are often placed close to sensors that may detect extreme conditions which means they are also exposed to similar conditions 24/7. Industrial IoT gateways need to have a wide operating temperature that ranges from -25°C up to 70°C or so while the processor can withstand an even wider temperature range, such as from -40°C to +105°C.

**Wide range industrial power acceptability** plays an important role in the industrial IoT gateways' deploy-ability as more than often, the hard-to-reach locations have limited electrical distribution networks for power points. Hence the ability to accept wide range power input or other forms of power (such as PoE) can make deployment that much more convenient and deploy-able.

**Real-time data acquisition** is fundamental for industrial IoT gateways. With different data acquisition channels such as digital/ analog, Ethernet (Modbus, MQTT, TCP, etc.), serial connections, various data sources can be acquired from sensors or systems. Traditional OT systems transmit a steady flow of data that is comprehensible between controllers (PLC, RTU, SCADA, etc.) to sustain operations. In an industrial IoT network environment, the OT systems send a large amount of data directly to IT cloud systems for analysis.

### Data transmission between OT & IT through wireless connectivity

This data transmission between OT and IT is vital because the IT system's analytic data have a "cause and effect" action that it directly correlates to the optimization of field site OT systems. And how do OT data from field sites acquired by the industrial IoT gateway get to IT systems?

**Data connectivity** of course, but it's ideal to have the connection field-tested and pre-certified so when deployed outside the testing ground, the connection is viable (4G/ LTE reception, WiFi signal compatibility, etc.).


### Data storage

But what happens when the network connection or the cloud service is down? The industrial IoT gateway should also have the ability to store data. The data can be temporarily stored in the industrial IoT gateway and the upload process may resume once the connection is restored. The ability to store data also reduces the chances of data loss and excess data transfer.

### Computing at the edge and data encryption

Imagine a high rise office building with air, water, electrical, security, etc., with thousands of sensors and over hundreds of OT systems, you will be looking at a lot of OT device data. To have the ability to filter unnecessary or “no-need to send data”, it will speed up and reduce transmission costs. So how are data classified as unnecessary or “no-need to send data”? This is where a next-generation industrial IoT gateway’s ability to compute at the edge comes in. The acquired data can be processed and determined which data can be decided onsite and which data need to be encrypted and send off for cloud analytics. The onsite processed data offers immediate action/ reaction to on-site events and because this data is retained, it reduces the amount of raw data sent. Meanwhile, encryption processes are on the way for need-to-be send data to reduce security risks. Finally, the encrypted main data reaches the cloud application for analytics, the mass data can be organized and extracted, then be presented on a dashboard, a key HMI that displays your sensors/ OT systems’ reading and statuses offering insights that allow you to manage and tweak your industrial IoT system.

## Neousys IGT Series Industrial IoT Gateway for Environment Monitoring




**Built-in data acquisition channels**




**Certified Connectivity Solution**



**True industrial-grade design**



**Edge Computing & Value-added Applications**



The Neosys IGT series is a next-generation industrial IoT gateway, a full-on computing platform with pre-installed Debian that meets industrial requirements and can withstand harsh industrial environment deployment. It features industrial specialized data acquisition channels that can accept most industrial analog channels 0 ~ 10V or 4 ~ 20mA output. Many microprocessors on the market have built-in analog input channels but most of them only support 0 ~ 3.3V, which is not in the range of most industrial sensors. The Neosys IGT contains a variety of acquisition channels to connect to and collect data from In-situ sensors and OT devices. With the collected data, Neosys' industrial IoT gateway IGT series utilizes its ability to compute at the edge to offer the following:

- ◆ **Data wrangling.** It is the process where the raw data is transformed into a comprehensible format that may offer insight analytical statistics to your operation.
- ◆ **Data encryption.** This ensures your data is free from being hijacked during transmission.
- ◆ **Field site decision making** is also enabled by edge computing to respond almost instantly. Such as activating a contingency plan when the temperature of the boiler enters a particular range and issuing an urgent shut down when the temperature of the boiler exceeds the set threshold.

For data that were not able to be processed on-site, they are encrypted and sent off via a verified network to the cloud for analytic processes. This is where **compatibility with cloud applications and packages** become instrumental and is an additional benefit of Neosys IGT series industrial IoT gateway. The sent encrypted data is processed at the cloud and displayed on an HMI dashboard to give you a supervisory view of your edge sensors and devices that can extract useful data to further improve overall system efficiency. With over fifty-thousand solutions packages including some of the biggest names such as C/C++, Python, Modbus, HTTP, Apache, Node-RED, etc., I'm sure you will find one that suits your needs.

With Industry 5.0 on the horizon, the current Industry 4.0, also known as the "information revolution" proactively practices the integration of devices and digitalization into everything industrial. By bringing together devices and technologies such as cyber-physical systems, IIoT, cloud analytics, big data, edge computing made monitoring and operating a two hundred meters tall office building in front of a computer screen possible. The abilities of industrial IoT gateways deployed to accurately and efficiently engage your network devices to play a pivotal role in the performance and safety of a building's HVAC system or other environmental monitoring scenarios. The Neosys Technology IGT series is a next-generation industrial IoT gateway that is extremely capable and ideal for a variety of industrial IoT applications.

\*Reference: [Resolving Stack Effect Problems in a High-Rise office Building by Mechanical Pressurization](#)

**NOTE**

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