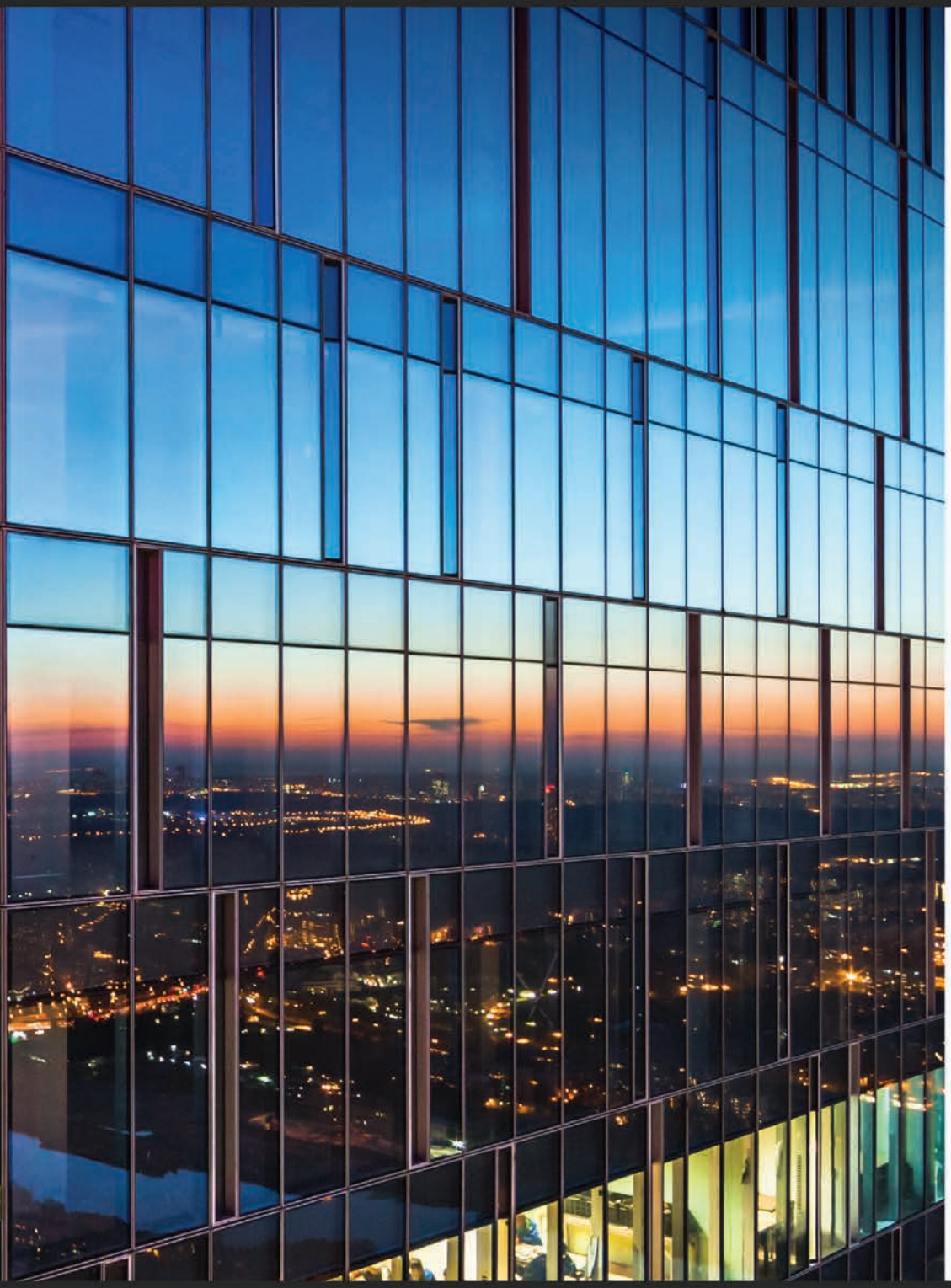


ATAL

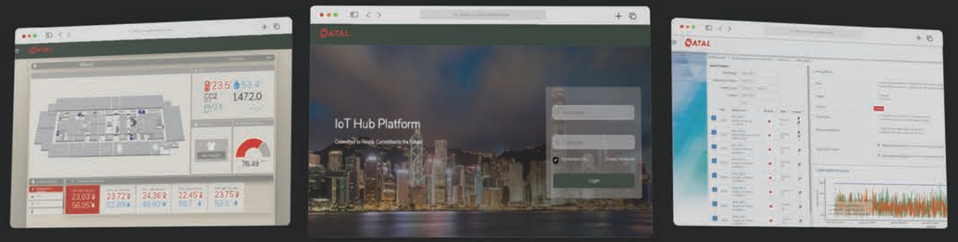
SMART BUILDING PLATFORM

DIGITAL TWIN

Transforming the Ways
of Managing Your Buildings

The explosive growth in technological advances is leading us to a new era of building management at a rapid pace. New patterns of living and working have emerged which have presented new possibilities for smart city development. In line with the Smart City vision of the HKSAR Government, our passion lies in empowering our city to grow by embracing innovation to achieve an optimised built environment. With our R&D team of qualified IT specialists, software engineers, data scientists, and energy and green building experts, we integrate big data, analytics techniques, machine learning, and artificial intelligence (AI) into the Smart Building Platform that is tailored to your business needs.

Make the Vision of Smart Building a Reality



The Platform creates people-centric environments driven by advanced technologies. By combining domain knowledge and AI technologies, all building systems and IoT-enabled devices are integrated into the centralised cloud-based platform for streamlining facility management. More than billions of operational data generated from multiple sources are ingested into a common data lake for analysis of building operations to make real-time for optimum performance. Smart applications catered for different purposes can be built upon the platform which can be implemented to address to your specific challenges from energy saving and maintenance optimisation to space utilisation and emergency response. The individual mobile apps designed for facility management (FM) personnel and tenants respectively facilitate preventive maintenance and enable direct control of their environment for personalised temperature and lighting preferences. These capabilities provide a user-centric approach that connects everyone in the building with the building, elevates building functionalities and ensures energy savings, indoor comfort, and occupant well-being.

Assembling the Architecture

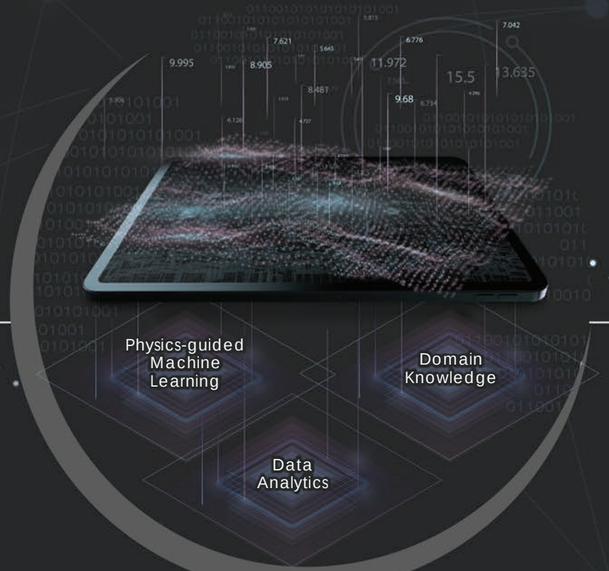
The architecture applied in the Platform is a framework of four fundamental layers, including data collection, analytics, applications & modules, and visualisation. The seamless integration between IoT-enabled devices and building systems make a unified infrastructure for building digitalisation.

1
Smart Sensors

measuring a wide range of indoor environment parameters and monitoring building operations

2
Analytics

feeding raw data into algorithms to extract insights with deep learning and AI technologies



3
Applications & Visualisation

custom-built innovative applications and modules tailored to provide holistic property management while enabling users to interact with relevant data and capture a summary of big pictures with complex details at the same time

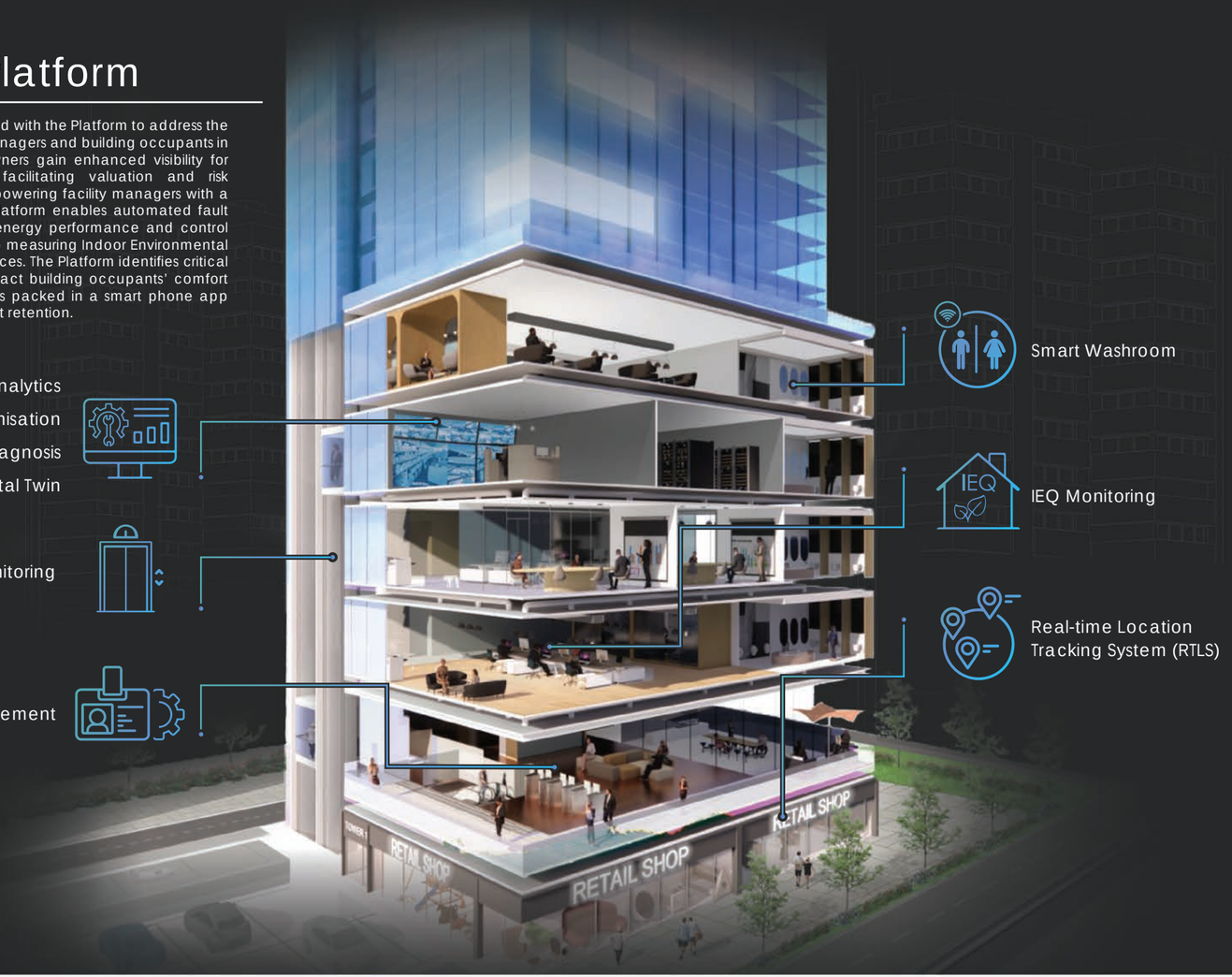
ESG-centric Smart Building Platform

Building functionalities are holistically optimised with the Platform to address the pressing needs of property owners, facility managers and building occupants in response to arising challenges. Property owners gain enhanced visibility for closer tracking of buildings' health in facilitating valuation and risk management of their property portfolio. Empowering facility managers with a holistic view of building performance, the Platform enables automated fault detection and monitoring of data quality, energy performance and control stability. Incorporating big data analytics into measuring Indoor Environmental Quality (IEQ) helps achieve healthier workplaces. The Platform identifies critical factors in the physical environment that impact building occupants' comfort and well-being. Value-added digital services packed in a smart phone app improve user experience in maximising tenant retention.

Video Analytics
Energy Optimisation
Automatic Fault Detection & Diagnosis
Digital Twin

Lift Monitoring

Visitor Management



Smart Washroom

IEQ Monitoring

Real-time Location Tracking System (RTLS)

Property Owners

- Improved Asset Performance
- Increased Property Value
- Effective Risk Management

Facility Managers

- Proactive Maintenance
- Streamlined Operation
- Reduced Manual Works

Building Tenants

- Optimal Comfort
- Improved Well-being
- Personalised Services

Applications and Analytics

AI-enabled Digital Twin

An ESG-centric Platform for Smart Facility Management

Mandatory Environmental, Social & Governance (ESG) disclosures for the purpose of complying with a growing wave of ESG regulations is an increasing challenge for organisations. Integrating ESG aspects into the day-to-day decision-making process has become essential for a business's long-term success. Integrating AI and machine learning into Digital Twin enables the system to perform data analytics for ESG insights and business intelligence. AI-based optimisation for energy efficiency builds a strong foundation in facilitating ESG reporting to demonstrate corporate responsibility.

AI-driven Algorithms for Optimisation

Our AI-enabled Digital Twin deigned for the built environment is a virtual representation of a building that uses artificial intelligence to simulate and analyse real-world operation and performance. The Digital Twin is connected to physical systems for data collection to train machine learning algorithms. The AI-enabled Digital Twin adapts and evolves through experiences of performing a range of tasks to make predictions about the operation, identify potential problems, and suggest solutions for optimisation across the property portfolio in real-time.

Data Lake for Large-scale Data Analytics

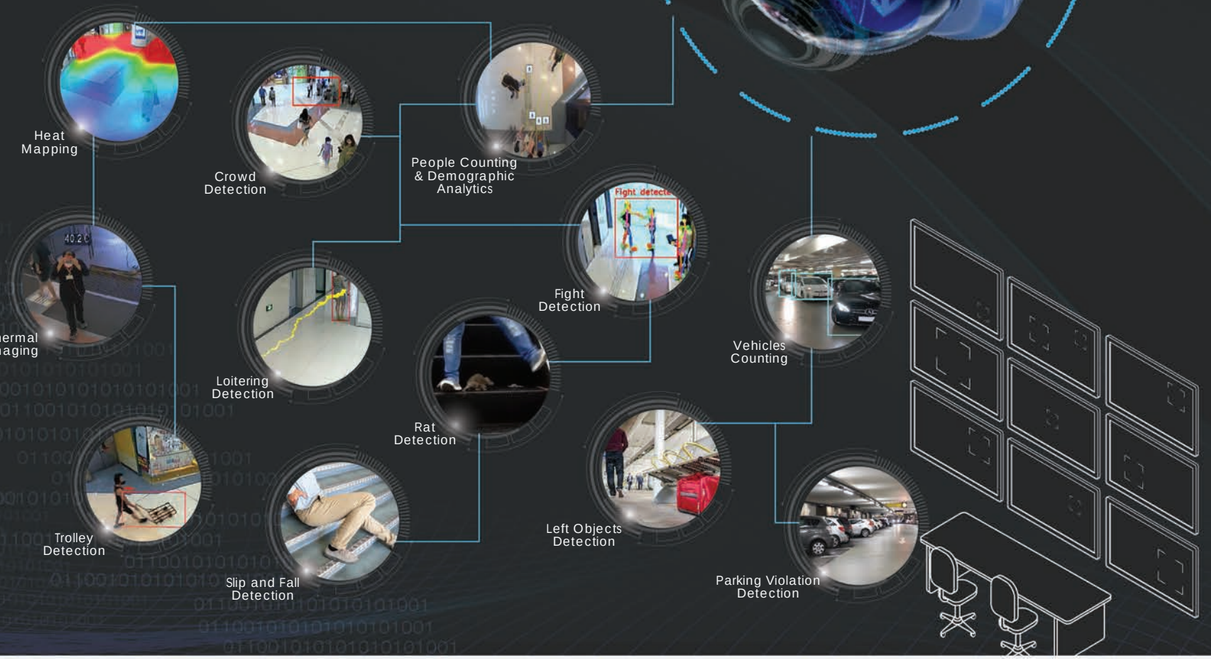
The large volumes and variety of data collected from each individual system are stored in our Data Lake with enhanced capacity and processing abilities for data analytics. Unlike traditional data warehouses which are designed for structured data, our Data Lake solution is designed to handle a wide variety of data types, including structured, semi-structured and unstructured data for easy access, management, and analysis. Our Data Lake allows the flexibility to store data in a variety of formats, including text, images, audio and video, making it an ideal solution for facility management. As the amount of data generated by buildings continues to grow, our Data Lake is able to perform large-scale data processing to derive insights and make data-driven decisions.

Applications and Analytics

Video Analytics

Safeguard Public Safety, Bring Business Insights

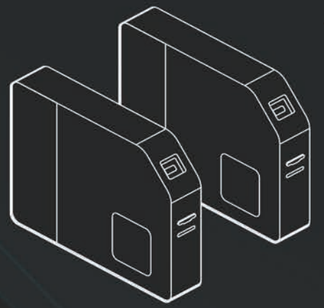
Our AI-based Video Analytics module analyses video data collected from multiple targeted locations, transforming large volumes of unstructured data into intelligence and actionable insights. It covers a wide range of applications beyond crime prevention and accidents management. By leveraging video analytics technologies, customer demographics and their shopping behaviours can be captured for further analysis instantly. This solution is ideal for places with high traffic and population density to engage shoppers, and enhance crowd security and operation efficiency.



Visitor Management

Heightened Security with Effortless User Experience

Our Visitor Management solution allows you to easily welcome guests into the facility by seamlessly integrating with a variety of workflows. It allows organisations to streamline the visitor check-in process through ID scanning, visitor pre-registration and easy authentication.



1

- Tenant logons to the mobile
- Input visitor's information

OR

- Visitor registers at self-service kiosk

2

- Dynamic QR code

3

- Gain access at the turnstiles

Applications and Analytics

Energy Optimisation

Maximise Energy Savings with AI

This ICT award-winning module is an all-in-one intelligent system leveraging big data analytics and machine learning (ML) for achieving building energy efficiency and sustainable development. ATAL's Dynamic Optimisation is built upon the basis of self-trained physics-guided ML models using actual operating data. This ensures energy performance of the whole chiller plant being optimised in real-time, using advanced modelling and optimisation techniques. Buildings can achieve up to 30% energy savings on chiller plant operations with the use of the module, depending on the building types and the buildings' current energy performance.

Physics-guided Machine Learning

- Guided by the physical principles to ensure accuracy
- Current models can evolve as new data are accumulated
- Eliminate time-consuming manual calculation

Dynamic Optimisation

- Real-time determination of optimal control setting
- Reflect actual performance using operation data
- Adaptive to sudden changes in equipment status
- Cooling load prediction

Automatic Fault Detection & Diagnosis (FDD)

Discover, Investigate, Rectify Faults via Machine Learning

Our FDD solution is an in-house developed, model-based algorithm for automatic detection and diagnosis of faults, including abnormal plant operation, equipment deterioration, as well as temperature and flow sensor faults. Our solution not only summarises the faults being detected, but also provides actionable intelligence to rectify those faults.

Offer Best-suited Recommendations

Provide actionable information for fixing errors and achieving optimal performance

Evaluate Severity of Detected Faults

Interpret equipment's behaviours and measure impacts on equipment operation and energy performance

Investigate Root Causes

Validate cause and effect relationships between faults and the respective outputs

Discover Unnoticed Faults

Detect underlying problems such as abnormal settings, equipment deterioration, as well as sensor biases

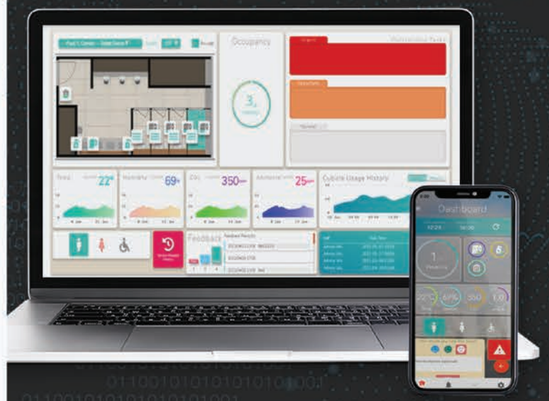
Detect Hard Faults

Identify failure of equipment and perform FDD functions on both plant operation and individual sub-components.

Applications and Analytics

Smart Washroom
The Future of Public Sanitation

Our smart washroom is an advanced and customisable solution that seamlessly integrates IoT network and devices to facilitate real-time management of manpower, air quality & cleanliness, consumables, and washroom usage, improving overall user experience.



Improving Operation Efficiency
Monitor traffic in real-time so that cleaning schedules can be adjusted accordingly

Odours & Smoke Detection
Detect the concentration of odours and density of smoke

Timely Replenishment of Washroom Consumables
Keep tracking of consumption level of toilet rolls, soap and paper towels etc., for immediate refill

Reassuring Safety
Accidental falls can be noticed by fall detection so that help can be sent immediately

Optimise Queuing Time
Display real-time vacancies for optimum users' convenience

Smart Facility Control
Manage toilet facilities (e.g. ventilation system, air-conditioner, air-filtering and lighting etc.) according to the changing conditions in washrooms, providing the best possible ambience at minimum power consumption

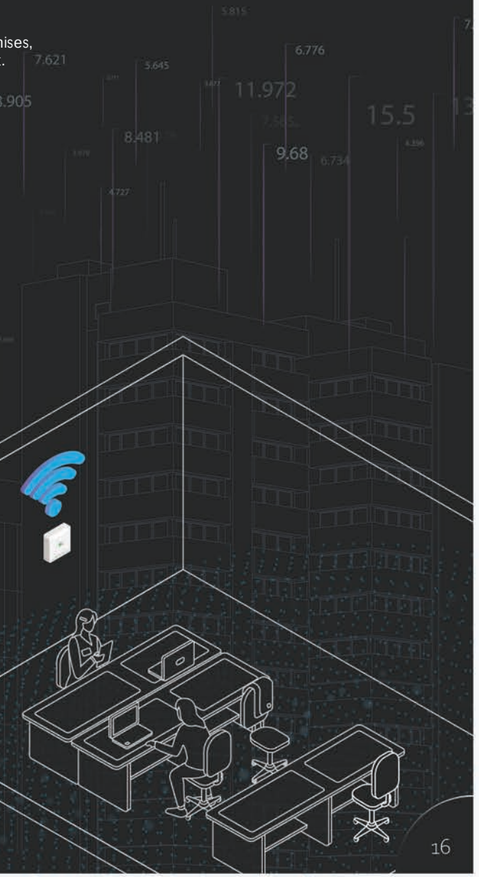
Indoor Environmental Quality (IEQ) Monitoring
Stay Ahead of the Evolving ESG Requirements

Our IEQ solutions provide insights into well-being level and IEQ performance across premises, satisfying the requirements on ESG reporting and ensuring building occupants' comfort.

Market-Leading 15-in-1 Sensor

It manages 15 elements of IEQ, including air, temperature, lighting, acoustic and spatial quality, which aims to achieve the best possible environment according to WELL Building Standard.

- Temperature
- Relative Humidity
- CO_2
- PM1.0
- PM2.5
- PM10
- TVOC
- CO
- NO_2
- HCHO
- O_3
- Illuminance
- Noise
- Motion
- Ammonia



Applications and Analytics

Real-time Location Tracking System (RTLS)

Enhanced Visibility into Operations for Streamlining Workflow

Our pioneering expertise in end-to-end RTLS solutions enables universal tracking across premises to provide instant visibility on operational processes and handling capacity which helps improve overall performance for reduced search time, more efficient tracking, and optimised utilisation rate.

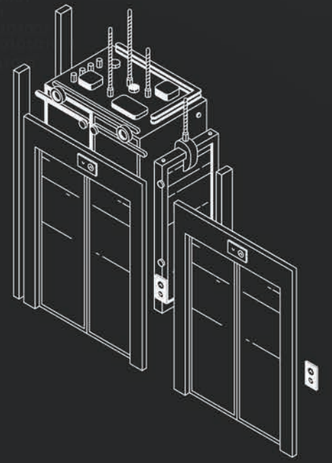
Lift Monitoring

Ensuring Lift Reliability through IoT-enabled Predictive Maintenance

IoT-connected lift monitoring solution keeps real-time tracking of equipment status to provide a holistic view of operation performance in facilitating predictive maintenance.

Real-time Overview of -

- Equipment Status
- Demand
- Traffic Performance
- Availability
- Detecting early signs of equipment failure
- Maximising equipment lifespan
- Flexibility to schedule maintenance



Swire's Premises

Pacific Place
Taikoo Place
Taikoo Plaza
Citygate

Indoor Environmental Quality (IEQ) monitoring is crucial to our health and wellbeing. We have completed deploying the IEQ Monitoring Systems in several prestigious buildings under Swire Properties — first in Taikoo Place, then in Pacific Place, Citygate and Taikoo Plaza, following the successful deployment in Taikoo Place.

We built an Internet-of-Things (IoT) network by adopting LoRaWAN Wireless Technology to minimise the wiring work while providing a stable data connection. On top of the network, we introduced our market-leading 15-in-1 IEQ sensors that can monitor up to 15 IEQ parameters, including thermal quality (temperature / humidity), air quality (PM1.0 / 2.5 / PM10 / CO2 / CO / TVOC / Ozone / NO2 / HCHO / Ammonia), lighting quality, noise and occupancy, etc., in one small box.

The web-based dashboard helps users visualise the real-time IEQ condition of the buildings. Our self-developed software also enables customisation of the user interface which can be tailored to specific client needs.

Among the project challenges was an extremely tight schedule, with only one month to complete in some cases. We tackled by lean equipment supply, best-in-class project management and flexible workforce reallocation. To match the fitting out work and interior design of client premises, our team had to customise the colour or pattern on the IEQ sensor boxes in some instances. In addition, customisation of the dashboard user interface also required finetuning our software.

IEQ is getting increasingly important, especially if the client plans to benchmark their buildings to the WELL standard or other certifications. As the community gets ever more interested in IEQ, we are capable of creating shared value as one of the IEQ market leaders, especially in Class A commercial buildings. We look forward to working further on IEQ projects to contribute to a healthier and more comfortable indoor environment for the community.

LoRaWAN Network Infrastructure

Smart Building Platform

Indoor Environmental Quality Monitoring

Water Consumption Monitoring

Water Leakage Monitoring

Central Market

93 Queen's Road

Revitalisation of historic buildings is always challenging as it has to preserve the building's legacy while giving it a renewed sense of purpose for public enjoyment. This blending of old and new underlies our work to revitalise Central Market, a Grade 3 historic building with a total floor area of about 122,000 square feet.

In four months' time, we deployed the Smart Building Platform with IoT sensors installed throughout the building to enable smart property management functions including people counting, traffic management, water leakage detection and indoor environmental quality (IEQ) monitoring as well as bin usage measurement. The system also shows occupancy status at washrooms for better management – all for enhancing visitors' experience. We also installed security equipment and provided network connectivity for the operation of the point-of-sale system.

This challenging project had to be completed in four months. We promptly mobilised a full team to help the client resolve numerous site difficulties. As the building is historic, we had to check carefully the areas marked for preservation so that the architecture would not be altered or damaged during the works. Extra protection structures were put in place at specific spots.

We are delighted to have helped in transforming Central Market into a thriving "Playground for All" and "21st Century Marketplace" at the heart of the community.

- LoRaWAN Network Infrastructure
- Smart Building Platform
- People Counting
- People Flow Analytics
- Water Leakage Monitoring
- Indoor Environmental Quality Monitoring
- Washroom Occupancy Detection
- Digital Signage
- e-Directory
- Fall Detection

Hong Kong Convention and Exhibition Centre (HKCEC)

1 Expo Drive

The project entails upgrading HKCEC's Building Management System (BMS) with IoT infrastructure and applications. It covers replacing the original BMS at Phases 1 and 2 and the Atrium Link Extension of HKCEC with a new custom-designed BMS, installing IoT sensors in the Grand Hall, exhibition halls and public hallways. The works have enabled centralised control of real-time monitoring, measuring and optimisation of the building's performance.

Using IoT technologies, wireless sensors are connected to the central BMS via a LoRaWAN gateway for transmitting real-time data on water leakage, temperature, humidity and indoor air quality, while users can easily access the data from a cloud-based platform to obtain actionable insights and intelligence for auditing, analysing and reporting purposes. The digitised process has tremendously enhanced HKCEC's ability to manage risk and streamline workflow for greater efficiency and effectiveness.

IoT has also strengthened preventive maintenance. The upgraded preventive maintenance system is designed to simplify maintenance operations by automatically generating work schedules and periodic maintenance reports based on the data collected from the BMS. With real-time data monitoring and analysis, unexpected breakdowns can be greatly reduced while equipment can be maintained in good working condition much more effectively. Meanwhile, as we have transformed the building's paper-based drawings and manuals management system into a fully digitised database, the storage, search and viewing of manuals and maintenance records have become much faster and easier. The digitised system also enables users to readily access contents from anywhere, anytime in a more structured manner.

Overall project implementation was smooth and successful, without interfering with HKCEC's busy day-to-day operations even during the replacement and integration of the entire BMS. This is the first IoT network at HKCEC which marks an important milestone for the prestigious venue to achieve ambient intelligence on a much bigger scale. The sophisticated platform is ready to support HKCEC as it grows in the long run to meet escalating demand for world-class exhibition services.

LoRaWAN Network Infrastructure

Smart Building Platform

Indoor Air Quality Monitoring

Water Leakage Detection

Temperature & Humidity Monitoring

Preventive Maintenance System

Drawings and Manuals Management System

Queen Elizabeth Hospital

30 Gascoigne Road

Queen Elizabeth Hospital is one of Hong Kong's largest and busiest acute general hospitals with over 2,000 beds and a staff force of about 7,000.

The deployment of the IoT-based Real-time Location Systems (RTLS) provides advanced solutions to better assist with daily operations. Our Indoor Positioning System locates medical assets, tracks motion patterns, and measures time spent in each predetermined zone via mobile devices (i.e., tags and beacons) using IoT technologies. RTLS provides instant visibility on operational processes and handling capacity which helps improve overall performance for reduced search time, more efficient work order tracking, and optimised utilisation rate.

The demand for healthcare has grown significantly over the past two years. Our RTLS system and IoT-enabled devices can effectively alleviate staff burdens and improve overall operation efficiency.

Real-time Location Systems (RTLS)

Smart Building Platform

Information, Communications & Building Technologies

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