

# Solution Brief

Energy and Utilities

Intel® Core™ Processors

Intel® Iris® Xe Graphics

Intel® Ethernet Controller I225-LM



## Optimizing the TCO and Efficiency of Sewage and Water Management in a Major Taiwanese City

**MiTAC leverages the power of Intel® hardware to create an intelligent, fully integrated cloud platform that unifies, simplifies, and enhances the operations of sewage and water treatment plants in a major city in northwestern Taiwan.**

Access to clean water and effective sanitation systems is a cornerstone of sustainable development. As outlined in the United Nations Sustainable Development Goal (SDG) 6<sup>1</sup>, achieving universal access to water and sanitation is vital for public health, economic growth, and environmental sustainability. Furthermore, both industries and governments are increasingly focusing on ESG (Environmental, Social, and Governance) considerations to attract new-age investments that accelerate sustainable growth. Water conservation and treatment is a key pillar of these considerations. However, despite advancements in technology and processes, many urban areas continue to deal with water management challenges, including inefficient monitoring, sub-optimal predictive maintenance schedules, and constant variations in water quality arising from factors such as pH, chemical oxygen demand (COD), and suspended solids (SS).

In this northwestern Taiwanese city, the complexity of managing water resources is evident, with over 20 sewage and water treatment plants spread across the region, catering to its industrial, residential, and commercial infrastructure. As each of these plants operates under differing system architectures, the city faces significant challenges in integrating these facilities into a cohesive system, leading to inefficiencies and delays in addressing water quality issues. Legacy water and sewerage management infrastructure often falls short, resulting in higher operational costs and suboptimal responses to critical events. A technology-focused approach becomes essential to address these concerns while ensuring the city's growth does not come at the expense of its water resources.

MiTAC Information Technology Corp., a master systems integrator with experience in large-scale Information and Communications Technology (ICT) projects, addresses these challenges with the **Integrated Smart Sewerage and Water Management Cloud** platform. This advanced solution harnesses the power of Intel's powerful platforms and technologies to consolidate operations from multiple facilities into a single platform, facilitating real-time monitoring, predictive analytics, uninterrupted operations, and optimized resource management.



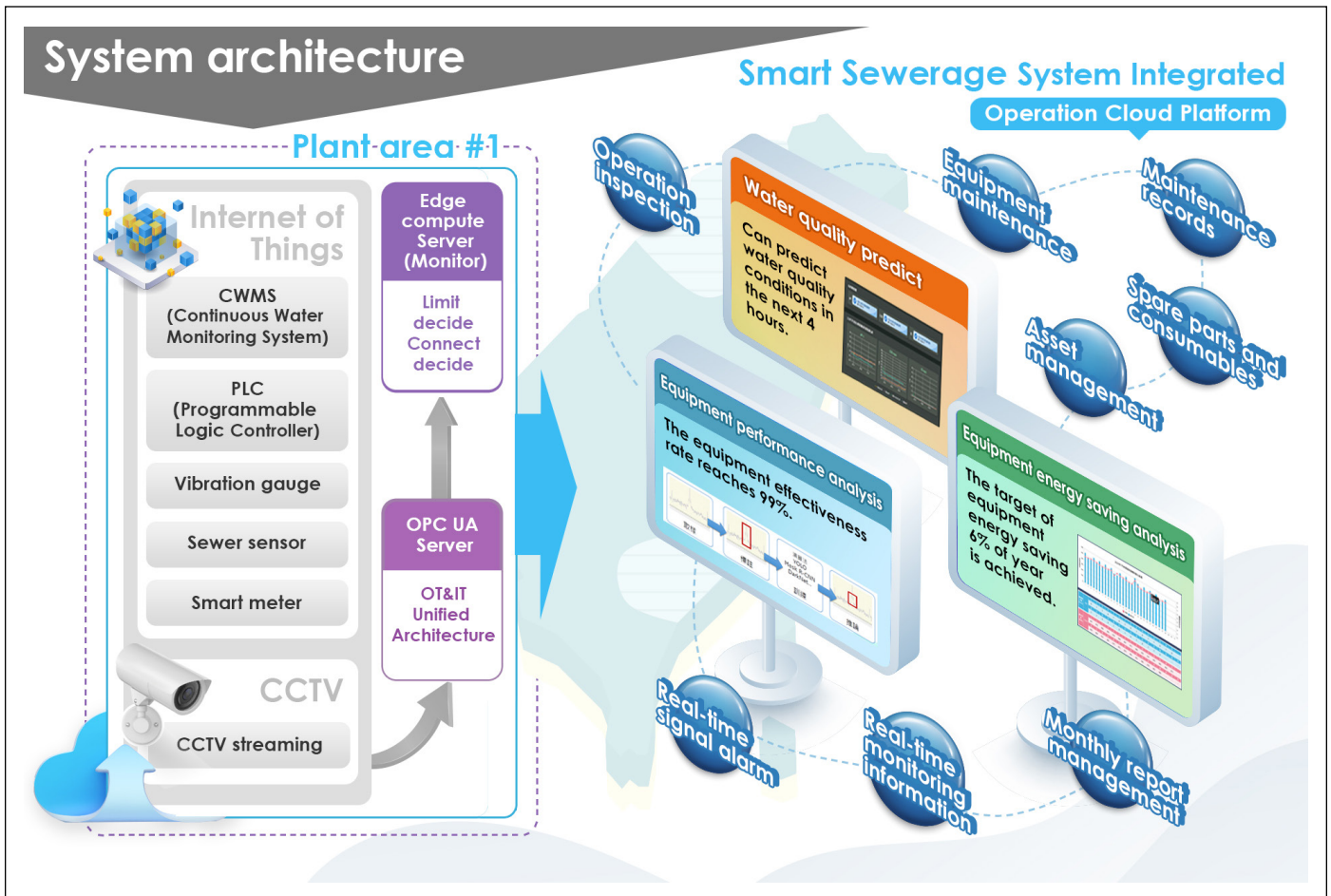


Figure 1: An overview of the Integrated Smart Sewerage and Water Management Cloud platform

## Taking an Integrated Approach to Water and Sewerage Management

The MiTAC Integrated Smart Sewerage and Water Management Cloud platform offers an end-to-end, unified approach to water and sewerage management, integrating predictive analytics and real-time monitoring to enhance operational efficiency. This platform empowers municipalities to manage water resources more effectively, ensuring the high availability and performance of critical water management systems.

At the platform’s core are its advanced IoT and AI capabilities, which enable seamless integration and intelligent analysis of vast amounts of data from multiple facilities. The platform monitors operational signals from 20 sewage and water treatment plants, providing real-time insights and predictive analytics without extensive manual intervention. This capability allows for accurate predictions of changes in water quality due to eutrophication, sedimentation, suspended solids, industrial contamination, droughts, and other mitigating factors that affect the pH, COD, and SS<sup>2,3,4</sup>, up to four hours in advance. These predictions enable timely responses to potential issues and ensure the continuity of operations, even in adverse or unfavorable operating conditions.

The platform also focuses on equipment performance and energy-saving analysis. By simulating the ideal operating parameters of each processing unit under different monitoring conditions, the platform achieves optimal water quality treatment. It also incorporates automatic maintenance and repair schedules, along with a real-time early warning system, to ensure the uninterrupted operation of all the equipment.

Integrating these industry-leading capabilities, the MiTAC Integrated Smart Sewerage and Water Management Cloud platform empowers authorities to enhance their water management practices. The platform fosters collaboration among water plant managers, operators, and decision-makers, ensuring critical water management assets’ confidence, governance, and scalability.

Through this integrated approach that enables seamless coordination through innovative technological solutions, the MiTAC platform reduces downtime caused by overutilization of equipment and significantly enhances the overall efficiency and sustainability of water management systems. By continuously analyzing and optimizing equipment performance, the platform helps municipalities optimize energy costs and reduce operational inefficiencies, thereby reducing the overall total cost of ownership (TCO) of the city’s sewage and water management infrastructure.

## MiTAC's Integrated Smart Sewerage and Water Management Cloud Platform at a Glance

### A Single Platform for All Facilities

- Consolidates thousands of sets of operating signals from 20 plants<sup>5</sup>.
- Utilizes cutting-edge AI, IoT, and 5G technology to unify the monitoring and management of all plants.

### Real-Time Water Quality Prediction

- Capable of predicting water quality conditions up to four hours in advance<sup>5</sup>.
- Enables proactive management and timely responses to potential issues.

### Automatic Maintenance and Real-Time Alerts

- Incorporates automatic maintenance and repair schedules.
- Establishes a real-time early warning system to ensure smooth operations.

### Seamless Data Analysis and Management

- Unifies the water sampling frequency to standardize the data collected during water sampling across plants.
- Replaces paper forms used during manual inspection with e-forms for more accurate data collection.
- Integrates data from sensors, IoT devices, and cloud based systems.
- Provides a comprehensive view and advanced analytics for decision-makers.

### Energy Saving Analysis

- Implements equipment energy-saving strategies.
- Optimizes power consumed and reduces overloads and system downtime.

### Optimizes Operating Parameters

- Simulates optimal operating parameters for each processing unit under different conditions.
- Achieves optimal water quality treatment and operational efficiency.

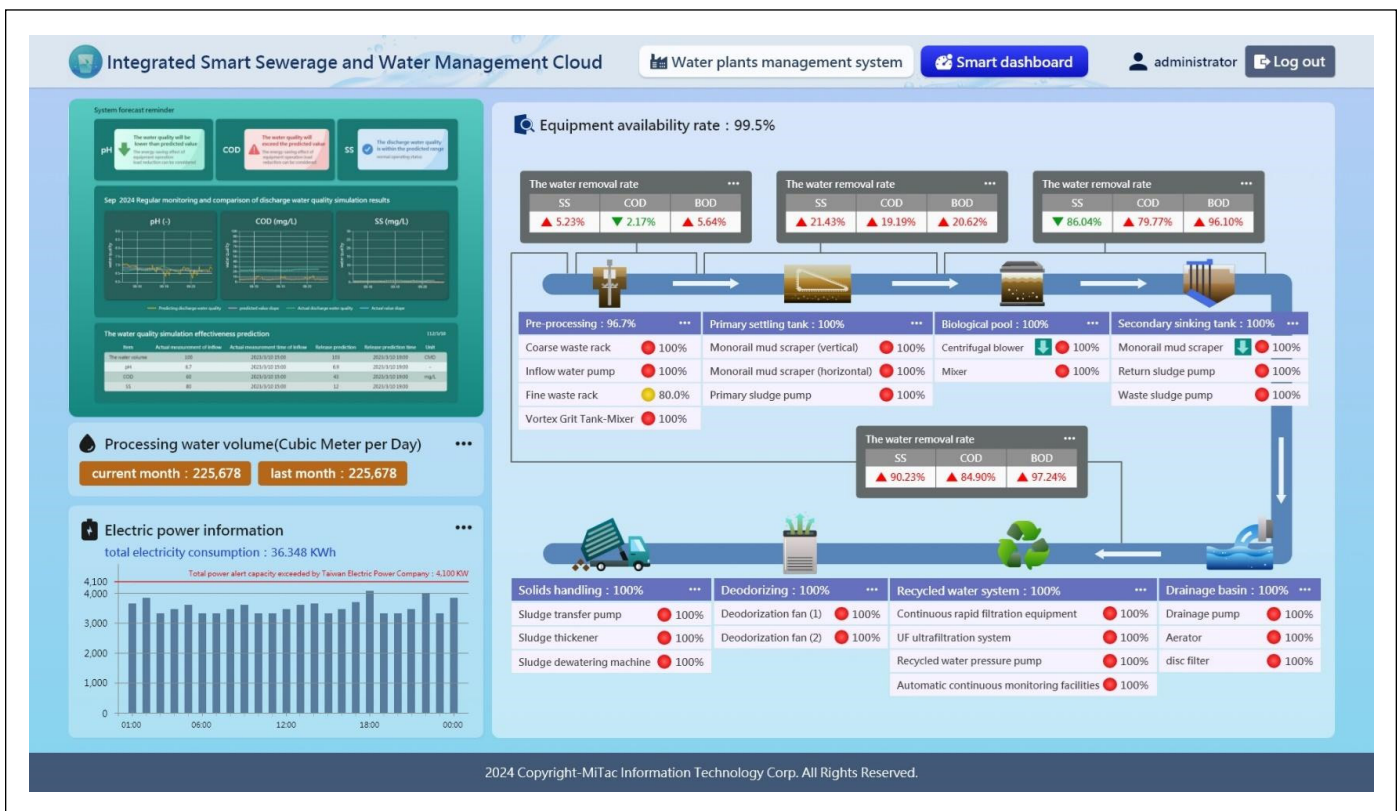


Figure 2. A screen grab of the real-time smart dashboard displaying the various parameters monitored by the Integrated Smart Sewerage and Water Management Cloud platform

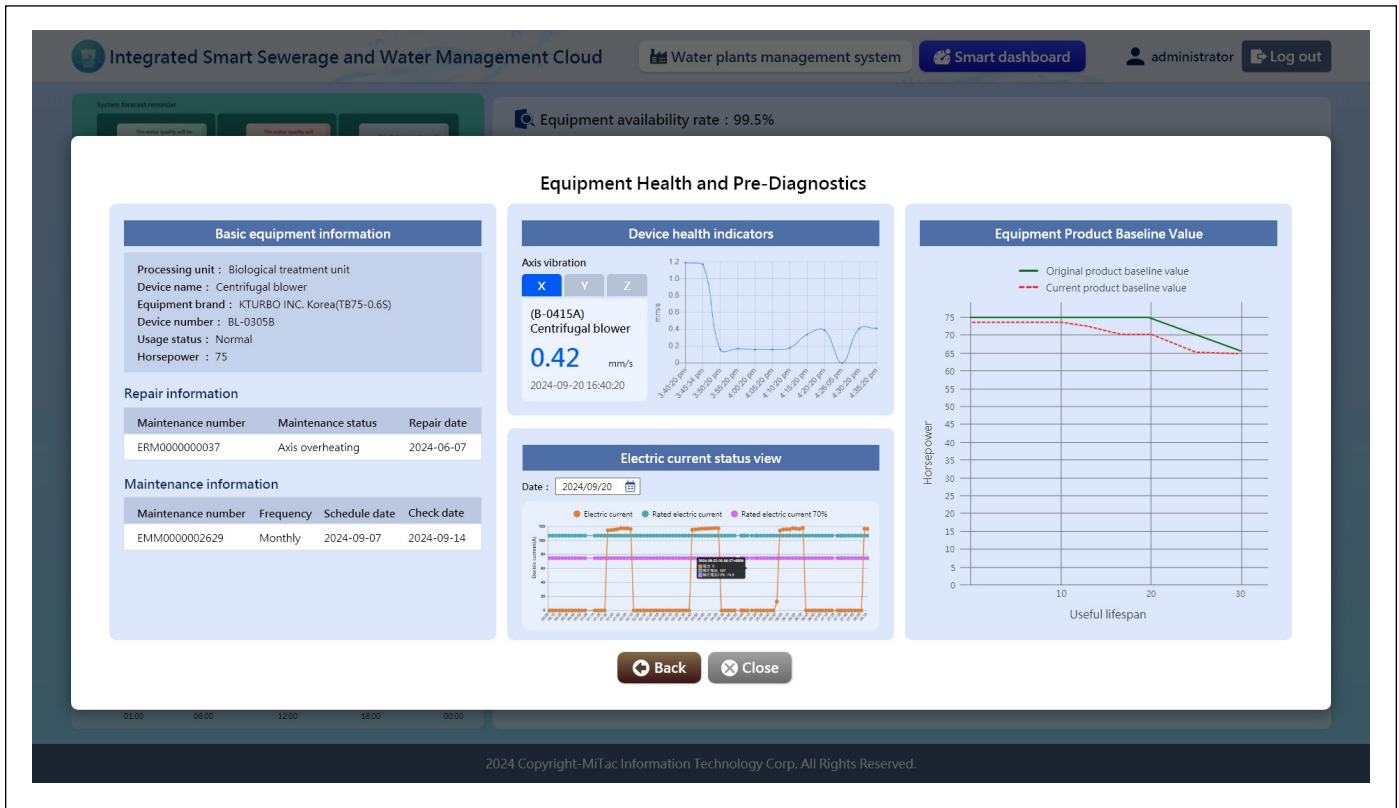


Figure 3. A screen grab of the equipment health and pre-diagnostics interface displaying equipment performance and insights on equipment optimization

### The Integrated Smart Sewerage and Water Management Cloud Platform in Action

This large city in Northern Taiwan faces significant challenges in managing its water resources, with 20 sewage and water treatment plants scattered across the region, including 86 remote, government-designated 'water source quality protection areas'<sup>4</sup>. The city's maintenance and management unit is responsible for over 2,500 pieces of machinery<sup>5</sup> and more than 10,000 sets of operational signals<sup>5</sup>. The dispersed nature of these facilities requires staff to travel extensively, making time management costly and inefficient.

Traditional approaches require a significant investment to build separate information systems for each water plant, which had to be operated and maintained by external manufacturers. The differing systems, specifications, treatment processes, and equipment types across water plants further complicated integration and management.

To address these challenges, MiTAC implemented the Integrated Smart Sewerage and Water Management Cloud platform which leverages advanced technologies to streamline and enhance water management operations. Utilizing 5G technology, the platform overcomes transmission challenges, ensuring robust and reliable communication.

IoT sensors deployed throughout the water management infrastructure continuously monitor equipment and environmental conditions, feeding data into the cloud platform for centralized monitoring and control. The system supports mobility, allowing operators to access data and control systems remotely through mobile devices, ensuring real-time updates and efficient communication. By analyzing big data and performing AI inferencing, the platform identifies patterns, predicts potential issues, and aids in decision-making, even amidst personnel changes.

Edge computing hosts in each factory monitor equipment signal connections, detect abnormalities, and intelligently determine water levels in sewage lines, providing critical information for decision-makers. The platform ensures stable transmission of thousands of signals per minute, maintaining continuous monitoring and timely responses. Data integration using standardized OGC API ensures consistent and reliable services, enabling seamless management of imported water plant facilities. These combined technological processes significantly enhance the efficiency, sustainability, and reliability of water management operations, ensuring optimal performance and resource utilization.

## Intel® Hardware at the Heart of the Platform

First deployed in 2019, the MiTAC Integrated Smart Sewerage and Water Management Cloud platform initially utilized an architecture based on 7th Generation Intel® Core™ i5 processors. These processors were crucial in monitoring equipment signal connections, detecting abnormalities, and ensuring stable operations within the factories. However, to meet the growing demands for performance and efficiency, the platform underwent a significant upgrade.

To enhance the platform’s capabilities, MiTAC switched to upgraded Intel® hardware, enabling significant performance gains and optimized TCO. The upgrade also ensures more efficient real-time data analysis and intelligent decision-making. These insights are crucial for effective resource management and preventing potential issues before they escalate.

Initial Hardware	Migrated To	Benefits
7th Generation Intel® Core™ i5 Processors	11th Generation Intel® Core™ i7 Processors	Up to 3x improvement <sup>5</sup> in CPU computing performance.
Intel® HD Graphics 620	Intel® Iris® Xe Graphics	Up to 3x improvement <sup>5</sup> in internal GPU display performance.
Intel® Ethernet Controller I211-AT	Intel® Ethernet Controller I225-LM	Faster data movement and enhanced efficiency.

Figure 4: The migration benefits delivered by the system at a glance

### Intel® Core™ Processors:

Integrating Intel® technology into the Integrated Smart Sewerage and Water Management Cloud platform not only enhanced performance and efficiency but also ensured compatibility and scalability. The incorporation of Intel® Core™ processors empowered the platform with robust real-time inferencing capabilities both on-premises and at the edge. This integration significantly improved the solution’s adaptability across diverse computing environments, ensuring it can seamlessly handle varying workloads and data processing requirements. By leveraging Intel’s advanced technologies, the platform delivers consistent high performance, enabling municipalities to manage water and sewerage operations with greater precision and reliability.

### Intel® Iris® Xe integrated GPU:

Intel® Iris® Xe integrated GPUs bring a revolutionary leap in AI performance, delivering up to 5x enhanced performance<sup>6</sup> (up to 7.1 TOPS). The AI/DL instruction set, including VNNI (Vector Neural Network Instruction), significantly enhances inferencing workload performance<sup>6</sup>, particularly for computer vision (CV) and AI applications. Furthermore, the Intel® Deep Learning Boost (Intel® DL Boost)-powered AI engine offers advanced AI features such as additive AI, hyper encode, dynamic

power share, and a unified software framework for the Intel® Iris® Xe integrated GPU. This integration provides enhanced vision inferencing capabilities, making it ideal for video analytics, machine vision, deep learning, and AIoT applications. Additionally, the platform also supports the Intel® Distribution of OpenVINO™ Toolkit, accelerating edge AI deployment and reducing time-to-market for innovative AI solutions.

### Intel® Ethernet Controller I225-LM:

The Intel® Ethernet Controller I225-LM includes advanced interrupt-handling features to reduce CPU overhead.

By leveraging these advanced Intel® technologies, the MiTAC Integrated Smart Sewerage and Water Management Cloud Platform ensures high performance, reliability, and scalability to address the complex needs of modern water management systems, enabling sustainable and efficient operations.

## Delivering Positive Outcomes and Tangible Benefits to the City

The MiTAC Integrated Smart Sewerage and Water Management Cloud platform offers a multitude of benefits

and impactful features that empower municipalities to efficiently manage and optimize their water and sewerage operations.

### Comprehensive System Integration:

The robust platform powered by 11th Generation Intel® Core™ i7 processors integrates operating signals from multiple factory areas into a single system. This comprehensive integration ensures seamless monitoring and management of water resources, streamlining workflows and enhancing operational efficiency. By consolidating diverse data sources, the platform simplifies the management of water treatment processes and enables quicker, more informed decision-making.

### High Equipment Effectiveness:

The platform ensures a high equipment effectiveness rate, reaching 99%<sup>5</sup>. This high level of effectiveness translates to reduced downtime, improved reliability, and enhanced operational performance. Maintaining optimal functionality of equipment minimizes service interruptions and ensures smooth, efficient operations, which is crucial for meeting regulatory compliance and maintaining public trust.

### Improved Productivity:

Automation of water sampling, electronic forms, and immediate data entry improve overall productivity. The platform also streamlines workflows and enhances the speed and efficiency of sewage and water management operations. By minimizing manual labor and reducing the potential for human error, the system allows staff to focus on more strategic tasks, further improving operational productivity.

### Resource Optimization:

Thanks to real-time water quality prediction and 24x7 monitoring of factors such as pH, COD, and SS, the platform helps water treatment plants optimize the number of acidity regulators, bacterial additives, coagulants, flocculants, and other chemical additives required to maintain or improve water quality.

### Targeted Energy Savings & Optimized TCO:

The platform achieves an annual equipment energy savings target of 6%<sup>5</sup>. This significant reduction in energy consumption contributes to lower total TCO and supports long-term sustainability which in turn brings the city closer to meeting its energy efficiency goals. By optimizing energy use and reducing operational costs, the platform ensures that water management operations are not only efficient but also economically viable in the long term.

These benefits highlight how the MiTAC Integrated Smart Sewerage and Water Management Cloud platform enhances operational efficiency, reduces costs, and promotes sustainable water management practices.

## Future Applications of the Solution

Building on its success, the MiTAC Integrated Smart Sewerage and Water Management Cloud platform is set to be replicated<sup>7</sup> in larger Taiwanese cities by the end of

this year, demonstrating its scalability and adaptability for larger urban areas. Looking forward, MiTAC plans to integrate advanced AI for equipment performance analysis and energy conservation, further optimizing city infrastructure while reducing carbon emissions. The platform will also be deployed to monitor green energy solutions, such as solar and biomass plants, and optimize the generation of sustainable electricity. These future applications position this solution and its collaborators as key players in advancing smart city infrastructure.



## Learn More

1. Explore the Intel® hardware and technology mentioned in this solution brief:
  - [Intel® Core™ Processors](#)
  - [Intel® Iris® Xe Integrated GPUs](#)
  - [Intel® Ethernet Controller I225-LM](#)
  - [Intel® Distribution of OpenVINO™ Toolkit](#)
2. Visit [Intel® Industry Solutions Builders](#) for partner enablement insights and resources.
3. Discover more about the [MiTAC Integrated Smart Sewerage and Water Management Cloud platform](#).

About MiTAC	About Intel
<p>MiTAC Information Technology Corp. a distinguished subsidiary of MiTAC Holdings Corporation, is a reputable and professional IT solutions provider with a remarkable track record spanning over four decades. As part of the MiTAC-SYNNEX Group, established in 1945, MiTAC’s business scope covers a wide array of industries, including computers, consumer electronics, IT channels, system integration, software development, etc.</p> <p>Learn more about MiTAC’s solutions here:  <a href="https://www.mitac.com">https://www.mitac.com</a></p>	<p>Intel (NASDAQ: INTC) is an industry leader that focuses on developing technologies that change the world, drive global progress, and enrich human lives. Driven by Moore’s Law, Intel is dedicated to the continuous innovation of semiconductor design and manufacturing to provide customers with solutions to major challenges. By integrating intelligence with the cloud, network, edge, and various computing devices, Intel unlocks the potential of data and helps improve both business and society.</p>

## Sources:

- 1: [United Nations](#)
- 2: [Climate change affecting water quality | Taipei City Times](#)
- 3: [Analysis of Factors Influencing the Trophic State of Drinking Water Reservoirs in Taiwan | MDPI](#)
- 4: [Ministry of Environment, Taiwan](#)
- 5: [MiTAC Information Technology Corp.](#)
- 6: Results have been estimated or simulated based on internal Intel® analysis and are provided for informational purposes only. Any difference in system hardware or software design or configuration may affect actual performance. All dates and plans are subject to change without notice. For more complete information about performance and benchmark results, visit [intel.com/benchmarks](http://intel.com/benchmarks). Performance results are based on testing as of the date set forth in the configurations and may not reflect all publicly available updates.
- 7: [Taoyuan City’s Invisible Infrastructure Managed Intelligently | MiTAC](#)



### Notices and Disclaimers:

Intel is committed to respecting human rights and avoiding complicity in human rights abuses. See Intel’s Global Human Rights Principles. Intel’s products and software are intended only to be used in applications that do not cause or contribute to a violation of an internationally recognized human right.

Performance varies by use, configuration, and other factors. Learn more at [www.Intel.com/PerformanceIndex](http://www.Intel.com/PerformanceIndex)

Performance results are based on testing as of dates shown in configurations and may not reflect all publicly available updates. See backup for configuration details. No product or component can be absolutely secure.

Your costs and results may vary.

Intel technologies may require enabled hardware, software, or service activation.

Intel disclaims all express and implied warranties, including without limitation, the implied warranties of merchantability, fitness for a particular purpose, and non-infringement, as well as any warranty arising from course of performance, course of dealing, or usage in trade.

Intel does not control or audit third-party data. You should consult other sources to evaluate accuracy.

© Intel Corporation. Intel, the Intel logo, and other Intel marks are trademarks of Intel Corporation or its subsidiaries. Other names and brands may be claimed as the property of others.