Solution Blueprint
Intel® IoT Gateways
An Advanced Gateway Solution for the Distributed Systems of the IoT Era

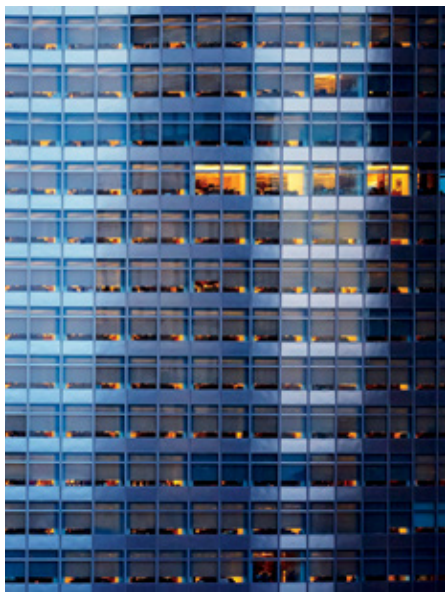
SECURE FACILITY MANAGEMENT SOLUTION FOR LARGE SITES

Key features of joint solution from Intel and Fujitsu

- Facility management solutions are dominated by distributed system configurations that incorporate gateways.
- Fujitsu's distributed service platform technology features a dynamic provision of optimal control across entire distributed systems.
- Intel® IoT Gateways are a new gateway platform for the IoT era.
- The joint solution from Intel and Fujitsu provides flexible facility management.
- The joint solution has huge potential that extends beyond management of major facilities.

Flexible facility management based on real-time site information

Along with having the ability to display information based on current conditions and facility staff deployment, it is also crucial that facilities such as office buildings, shopping malls, and theme parks that attract large numbers of people are able to mount a rapid and customer-oriented response when unexpected incidents occur. The answer to these facility management requirements lies in monitoring solutions that incorporate devices able to obtain real-time information about what is happening, such as surveillance cameras and detectors to track people. Through the real-time collection of information such as people's movements, number of people present at each location, and the location and length of any queues that form, such solutions enable a flexible response to a constantly changing situation. The technology for site monitoring has also been advancing rapidly in recent years. This has included, for example, the emergence of solutions that consolidate monitoring data from multiple sites in the cloud to enable integrated management from a command center. This provides a broad overview of monitoring data collected from each site and facilitates efficient management with oversight of the entire facility.



Challenges for existing monitoring solutions

As large facilities in particular have a very large number of devices such as surveillance cameras or detectors for tracking people, the direct hosting in the cloud of monitoring data from these devices places a heavy burden on the network and center system. Accordingly, the recent trend has been toward distributed systems that utilize gateways (intermediate servers) installed at each site to perform intelligent data compression and other forms of preprocessing at the downstream stage prior to passing data in the cloud for storage. In other words, there is a natural trend toward the use of such distributed systems to maximize computing capacity across the network.

Meanwhile, the ability to take full advantage of the benefits provided by distributed systems is lost if the system settings and configuration cannot be modified quickly in response to the constantly changing on-site situation and customer requirements. For example, situations can arise during a routine operation in which detection of detailed features, such as the color or design of clothing, is urgently needed when looking for a lost child, while providing a macro overview from the surveillance video of things like congestion levels or other aspects of people's movements. Situations like this that arise without warning can be dealt with through the instant reconfiguration of detection functions in the gateway. As facilities become larger, however, making manual adjustments to settings is no longer viable because of the corresponding increase in the numbers of surveillance cameras and gateways at the site. As a result, it becomes difficult to achieve flexible system operation based on the situation on the ground, and for this reason existing distributed systems do not always satisfy the requirements of facilities management.

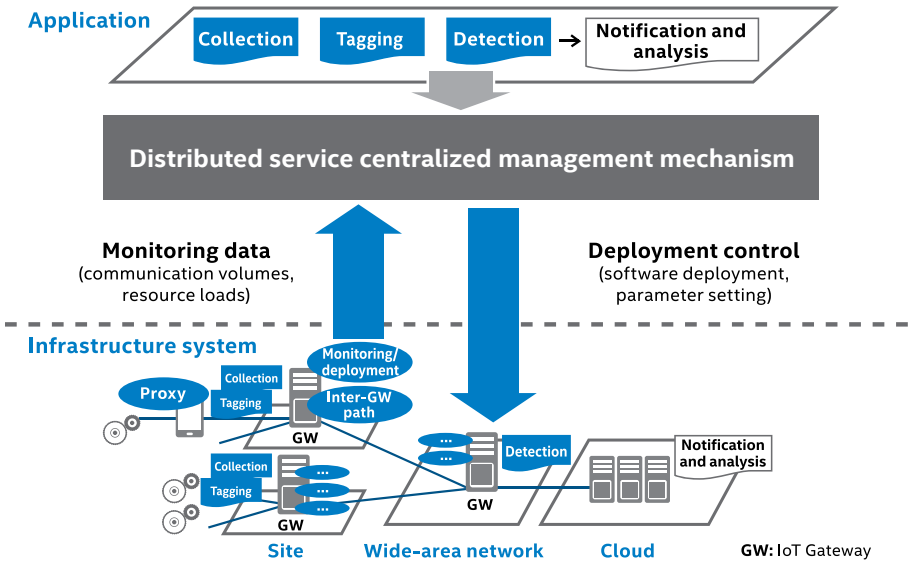


Fig. 1: Block diagram of distributed system

Leading-edge facilities management solution developed through collaboration between Intel and Fujitsu

The facilities management solution based on a distributed system approach provides a quick fix for the numerous challenges facing existing monitoring solutions by combining Fujitsu's leading-edge distributed service platform technology with high-performance Intel® IoT Gateways. Fujitsu's distributed service platform technology automatically modifies gateway settings based on the on-site situation and allocates distributed processing to gateways in an optimal fashion. Intel IoT Gateways, meanwhile, provide an advanced gateway solution that makes full use of the benefits of Fujitsu's distributed service platform technology.

Fujitsu's distributed service platform technology provides optimal control of distributed systems based on actual conditions

Fujitsu's distributed service platform technology performs automatic control to keep the overall distributed system in an optimal configuration by relocating to the gateways some of the functions that have previously been centralized in the cloud. The cloud acts as the host for centralized system-wide management functions and performs supervisory management of the functions located in the gateways and their associated settings. All of the gateways, meanwhile, run an agent that monitors the communication volume and other loads on the gateway itself, and receive instructions from the centralized management functions.

Fig. 1 shows a block diagram of the distributed system. The system uses the agents to provide tight integration between the gateways and the centralized management functions on the cloud, and performs optimal control based on the gateway workloads.

As shown in **Fig. 2**, the centralized management functions on the cloud are made up of five separate functions: collection and detection, optimal deployment calculation, performance simulation, connection control, and redeployment control. These automatically maintain optimal deployment of resources across the system. The first step is to collect monitoring data from each agent and determine its gateway workload. Based on this collected data, the system then identifies those gateways with a light load and communication capacity to spare so that they can be prioritized for taking on computationally heavy functions such as camera video processing.

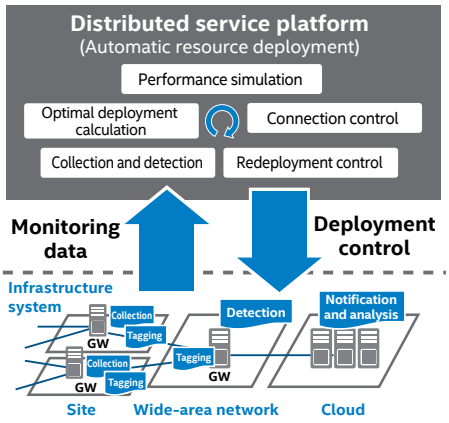


Fig. 2: Main functions of distributed service platform

When an unexpected incident occurs, the optimal deployment calculation is used to determine which functions to allocate to each gateway based on instructions from service operators and others. Example optimization constraints include response time and communication volume. Users are able to prioritize these constraints for the optimal deployment calculation as required. It is also generally true that the volume of calculations required increases rapidly as the number of gateways rises and the system configuration becomes more complex. In response, Fujitsu's distributed service platform technology uses a proprietary algorithm to execute the calculation quickly. Next, a performance simulation is first conducted to confirm that the calculated deployment will in fact provide adequate performance, and then the actual redeployment control function is executed while also ensuring that system-wide consistency is maintained, including the gateways and the network connections between them.

Joint solution enables facilities management to adapt dynamically to the situation

Fujitsu's distributed service platform technology achieves dynamic control of the gateways through high-level coordination between the centralized management functions on the cloud and the agents on the gateways. Furthermore, by performing coordinated control of not only gateways but also their associated communication systems, the technology is able to reassign gateway functions instantaneously in order to maintain an optimal configuration while still maintaining control over the overall distributed system. Through this beneficial combination of Fujitsu's distributed service platform technology and Intel IoT Gateways, the system is able to respond flexibly to the diverse requirements that arise from the sites and from facilities management considerations.

Furthermore, a facilities management solution that incorporates the joint solution from Intel and Fujitsu (**Fig. 3**) is able to respond promptly, not only under normal circumstance, but also when unanticipated incidents occur. One example is to perform analysis and recognition of surveillance camera video on the gateways to detect things like people's movements or congestion levels, and then to forward the results to the cloud. This way, when an unexpected emergency occurs, such as a missing child, the various detection functions used during routine operation can be temporarily suspended and operation switched over to sending real-time surveillance camera video to the cloud. Because the real-time transmission of video data places a heavy load on the network, data output from cameras that are not involved in the search for the missing child can be halted to prioritize sending to the center information that is relevant to the emergency.

Installing sophisticated video recognition or image processing in the gateways also enables a diverse variety of information to be obtained while at the same time reducing the load on the network. Examples of what can be done using surveillance camera video extend beyond detecting the movement of people or congestion levels, it can determine the color and design of clothing, read text printed on nameplates, or even identify individuals using facial recognition. Intel IoT Gateways host these advanced functions and support the flexible assignment of system capabilities to the most essential services during both emergencies and routine operation. In this way, the beneficial combination of Intel and Fujitsu technology enables the implementation of facilities management capable of providing a flexible response to a diverse range of situations.

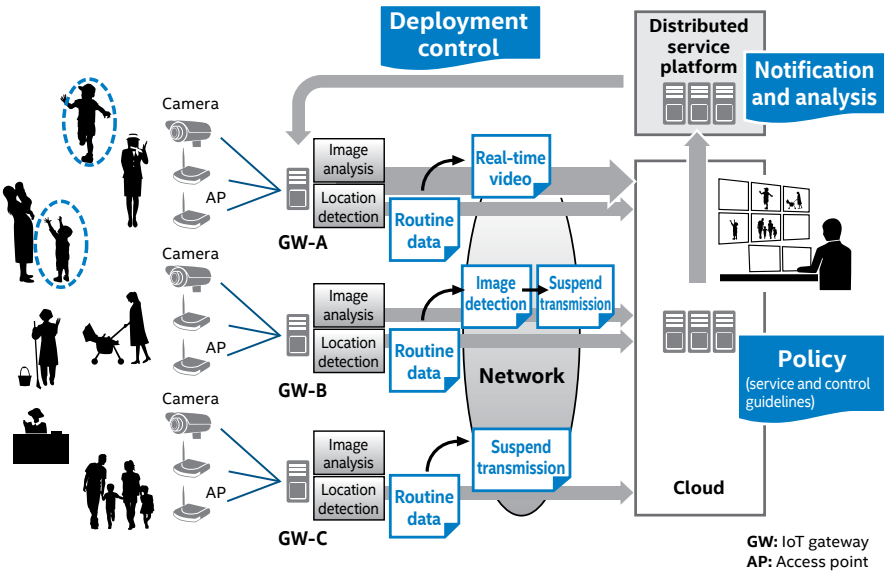


Fig. 3: Example of application of joint solution

Joint Intel and Fujitsu solution satisfies sophisticated requirements of IoT era

The joint solution from Intel and Fujitsu is likely to have an increasingly important role in IoT, which is characterized by vast quantities of data being sent back and forth. While surveillance camera data collected on-site contains a lot of unnecessary information, the solution enables appropriate sized systems to be implemented by using an on-site gateway to eliminate information of low utility or to perform simple recognition tasks, thereby significantly reducing the amount of information forwarded to the cloud. In the case of video from surveillance cameras in particular, which generate huge amounts of data, the use of gateways to host functions for detecting information of practical use, such as the movement of people or level of congestion, can be expected to deliver major improvements, including reducing network traffic, better overall system response, and cost efficiency.

The solution can also provide high security by eliminating private information contained in video at the on-site gateway.

Because it can adapt quickly to the situation on the ground, this approach of hosting a wide variety of functions for processing IoT information on gateways and providing the ability to deal with these gateways flexibly based on actual circumstances is something that has been in strong demand from the IoT world in recent times.

Along with video data from surveillance cameras, the joint solution can also deal flexibly with actuators or the sensors used to measure things like temperature, humidity, and water levels. This means it has considerable potential for uses that go beyond the management of large facilities. If surveillance cameras or other sensors were installed along shorelines and waterways, or in public facilities, they could be used to provide real-time video or on-site sensor readings during emergencies in order to disseminate civil defense information to local residents or provide them with timely guidance on how to reach safe refuge, while also being used routinely for things like weather checking or inspection purposes.

Learn more about Intel® IoT Gateways: intel.com/iotgateways

Intel® IoT Gateways provide ideal gateways

More than 85 percent of surveillance cameras and other existing equipment are based on proprietary systems. Accordingly, the practical solution is to find a way in which this existing equipment can be integrated with new intelligent infrastructure so that they can operate in tandem. Intel® IoT Gateways are an advanced solution that overcomes this challenge. The Intel IoT Gateways were developed as platforms for the future IoT era, providing integration and interoperation between existing equipment and new intelligent infrastructure, while keeping risk to a minimum.

Intel IoT Gateways are based on high-performance hardware platforms built on Intel® architecture, and they incorporate the Wind River Linux* operating system and McAfee Embedded Control* security solution. Because the hardware and software used in Intel IoT Gateways come ready-integrated and tested, the gateways enable the rapid development of IoT solutions with excellent expandability, security, and ease-of-administration that are suitable for a wide variety of practical applications. Also, the microprocessor at the heart of a gateway can be selected as required from the Intel® Quark™ SoC, Intel® Atom™ processor, and Intel® Core™ processor range in accordance with criteria such as the size and purpose of the system. As surveillance camera video processing places such a heavy computational load, the systems can put the high-performance Intel® processors to full use.

0715/KW/CMD/PDF ♻ Please Recycle 332390-002EN