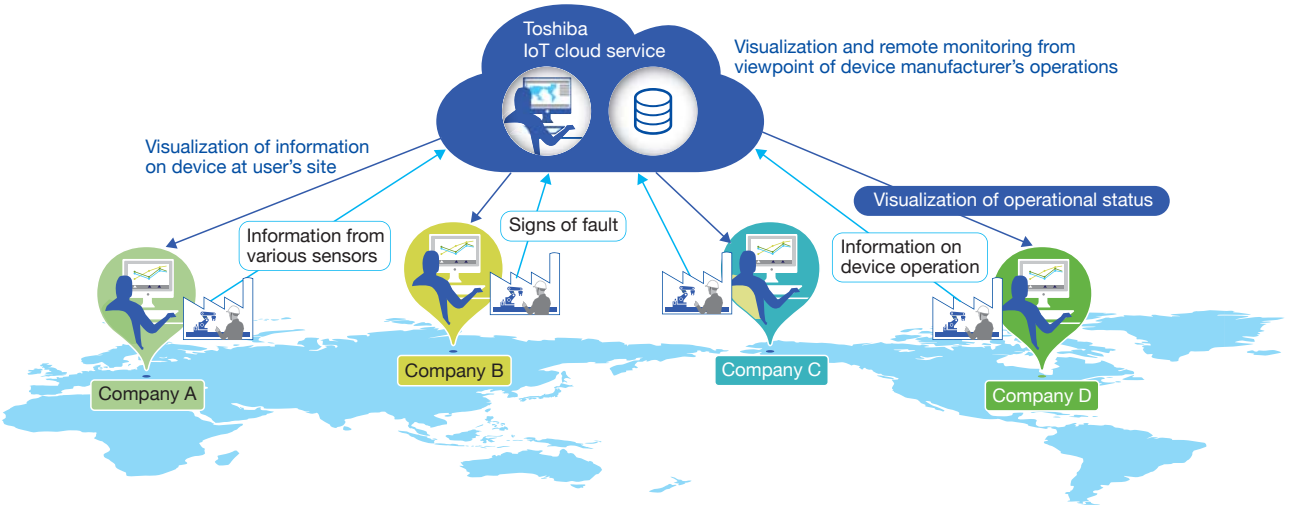
"IoT Standard Pack" to Facilitate Visualization and Remote Monitoring of Industrial Devices and Equipment



Features of IoT Standard Pack visualization and remote monitoring solution

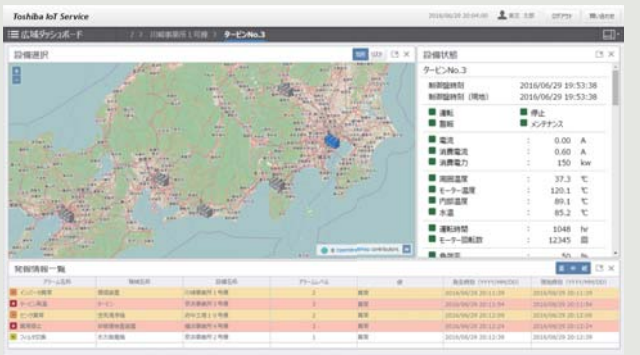
Toshiba's "IoT Standard Pack" is an Internet of Things (IoT) solution that assists users in quickly realizing an IoT service. The IoT Standard Pack is based on "SPINEX," Toshiba's new IoT architecture that draws on our experience in and knowledge of a wide range of industries and business areas, including manufacturing and social infrastructure. This IoT solution allows users to realize visualization and remote monitoring of industrial devices and equipment in a very short period of time.

The IoT Standard Pack provides templates that contain information on the attributes and interfaces of each type of device to be monitored as well as information on each data type. These templates help to simplify on-site setup and inspection and allow users to begin an IoT operation simply by connecting devices to an edge gateway, significantly reducing the time required for preparation.

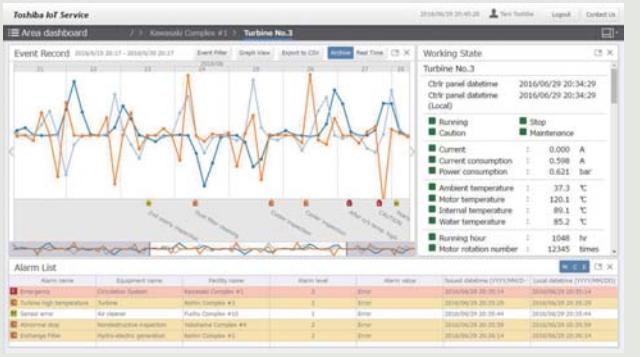
While gateways at the edge of the network are configured to perform high-speed communication with various devices as well as initial data processing (including monitoring of measured values and failure detection), a cloud server focuses on intelligent processing such as rule setting based on an analysis of big data. This distributed processing approach makes it possible to optimize overall remote monitoring.

The IoT Standard Pack incorporates intuitive, easy-to-use visualization and remote monitoring screens based on the user experience (UX) design methodology; middleware for processing big data that provides fast and efficient storage to servers; high-quality products and technologies derived from a worldwide open partnership; and global network connectivity.

We will continue to provide industrial IoT solutions that support digital transformation.

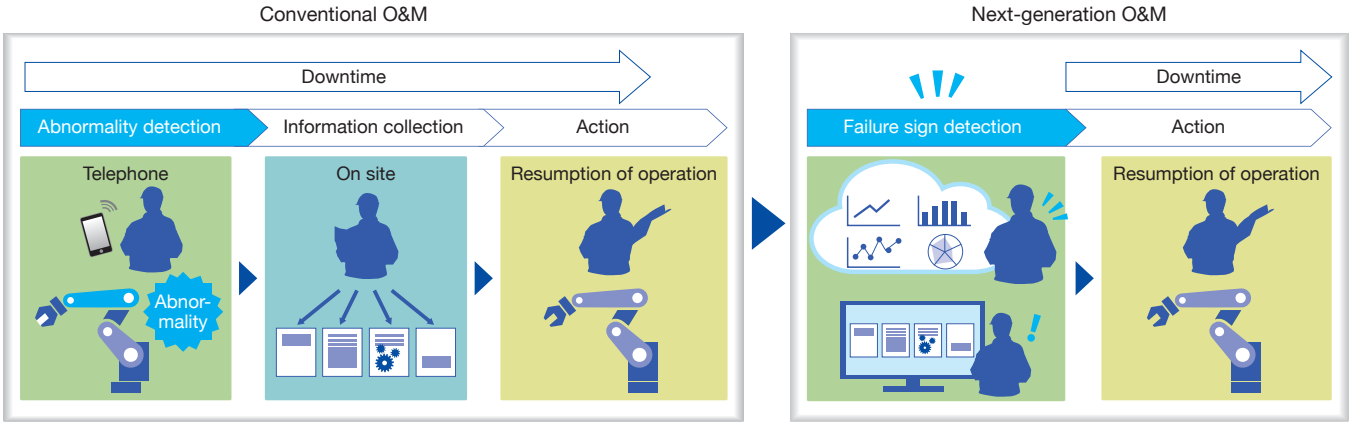


Example of remote monitoring display using map



Example of device monitoring display

"Meister Visualizer Suite for O&M" O&M Solution Supporting Maximization of Utility Value of Products



- Various distributed information such as machine drawings or configurations is collected after a failure has occurred.
- A long time is required from determination of an action plan to its implementation, increasing the loss during downtime.

- Information necessary for O&M is available within one system.
- Equipment downtime is minimized by failure sign detection in advance and prompt action.

Sophistication of O&M of manufacturing and other industrial equipment

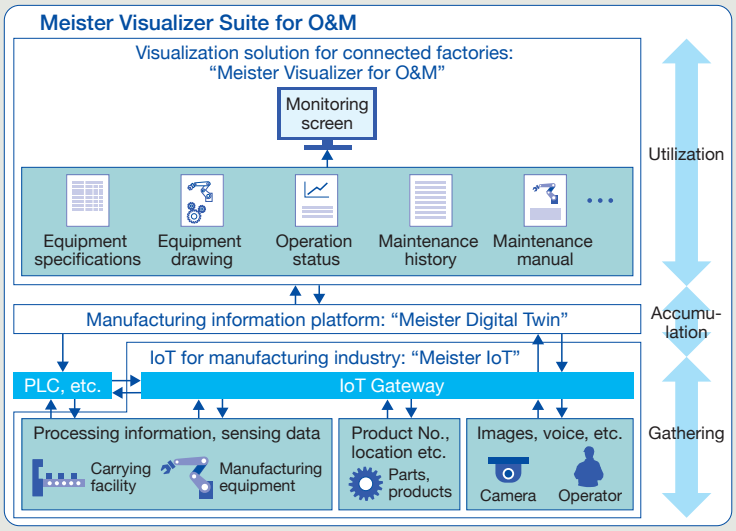
Toshiba has released "Meister Visualizer Suite for O&M," which improves the efficiency of operation and maintenance (O&M) of products through remote monitoring and maintenance in the use phase.

It is crucial to minimize downtime due to failures of products, especially in the case of manufacturing and other industrial equipment that could cause a significant loss if failure occurs.

In order to help minimize maintenance and recovery work to minimize downtime, Meister Visualizer Suite for O&M not only detects a failure or signs of a failure of a product at an early stage through remote monitoring and control, but also visualizes various types of information including the maintenance history and related documents.

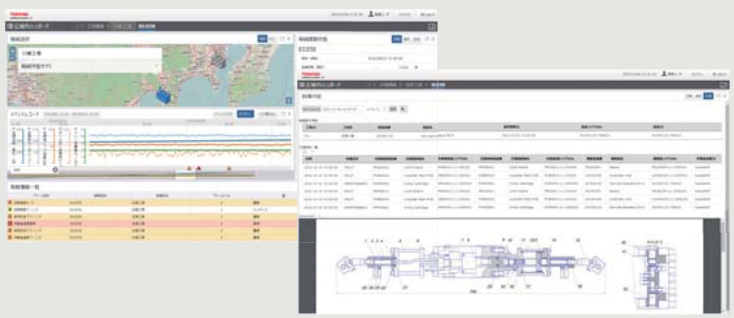
Meister Visualizer Suite for O&M incorporates "SPINEX," Toshiba's new IoT architecture, and a manufacturing information platform that we have developed based on our expertise as a manufacturing company. As a result, a cyber-physical system as advocated by Germany's Industry 4.0 and the U.S. Industrial Internet has been realized. Meister Visualizer Suite for O&M provides unified management and traceability of information throughout the product life cycle from planning to after-sales service.

We will continue to develop various solutions that support business solutions and value creation, including predictive maintenance through analysis or simulation, cost optimization for the entire product life cycle, and creation of new business models.



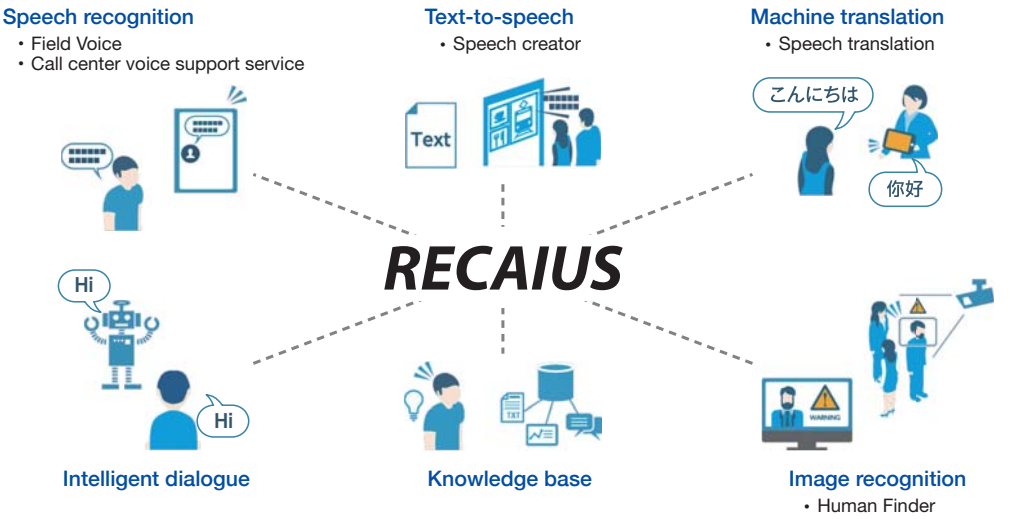
PLC: programmable logic controller

Architecture of Meister Visualizer Suite for O&M solution



Examples of user interface (UI) displays of Meister Visualizer Suite for O&M

New Services of "Communication AI RECAIUS" Including Support System for Fieldwork



Functions of and use cases applicable to RECAIUS cloud AI service

Toshiba has been supplying "Communication AI RECAIUS," which combines various media intelligence technologies for audio and visual utilization services (namely, media and knowledge processing, including speech recognition, text-to-speech, and intelligent dialogue and image recognition), since October 2015. In 2016, we launched services for communication support, fieldwork support, monitoring, and security.

"RECAIUS Speech Translator" is a software-as-a-service (SaaS) solution that combines speech recognition, speech translation, and text-to-speech to support the improvement of services for foreign visitors to Japan. The dictionaries of RECAIUS can be customized to add new knowledge according to the field of application or intended use.

"RECAIUS Field Voice" is an SaaS solution that uses speech recognition to facilitate the creation of reports required for fieldwork.

"RECAIUS Human Finder" is a platform-as-a-service (PaaS) solution that incorporates image recognition technology. It is expected to be used for entry/exit control and other applications in the security field or for marketing using digital signage. RECAIUS Human Finder analyzes the current situation based on the attributes and behaviors of people in a camera image and predicts their future actions. It has three main functions: customer attribute analysis, crowd density analysis, and situation analysis.

We will further upgrade Communication AI RECAIUS to make it possible to constantly update its dictionaries and problem-solving knowledge bases during interactive use so that it can be utilized in a wider range of applications.

AI: artificial intelligence

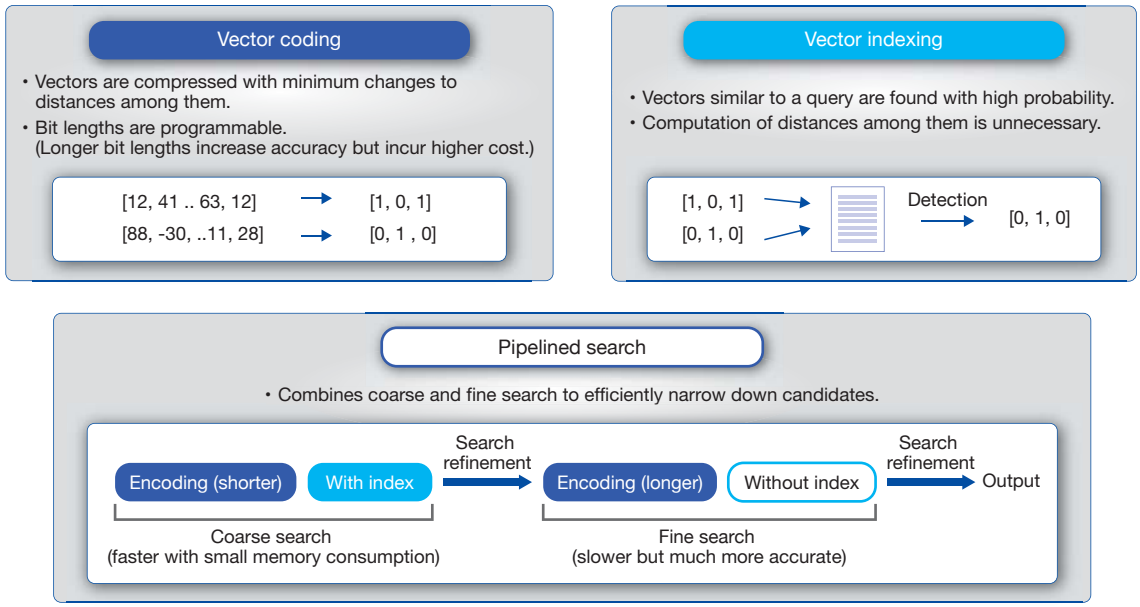
Examples of UI displays of RECAIUS Speech Translator and RECAIUS Field Voice SaaS services

Customer attribute analysis function

Crowd density analysis function

Overview of RECAIUS Human Finder PaaS service

Large-Scale High-Speed Vector Matching Technique



Components of ultrafast data matching techniques

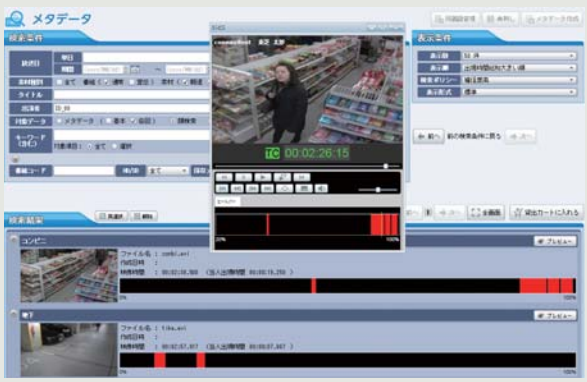
Toshiba has successfully developed a data processing technique for high-speed matching of big data and large-scale media data. This technique represents faces, sales data, and other types of data as high-dimensional vectors and creates indexes for them in advance to speed up subsequent matching. We have demonstrated that this technique can find a specific person from a face image dataset of 10 million people in 8.31 ms, which is more than 50 times faster than its predecessors.

Accompanying the recent progress of practical applications for machine learning, the amount of data used for analysis has been increasing at a rate faster than expected. It has therefore become essential to speed up the calculation process.

Our newly developed large-scale high-speed vector matching technique combines three components to achieve both accuracy and high speed: vector coding to compress vectors with minimum changes to the distances between any pair of vectors, vector indexing to find vectors most similar to a query vector from the registered vectors without calculating distances, and pipelined search to perform a coarse search and a fine search stepwise. Vector indexing is our unique method and provides a significant increase in speed.

In October 2016, we released “GridDB Vector Edition,” a distributed database application incorporating the new technique. We will further enhance and promote the application of this database to various solutions and services, including pattern mining, media recognition, and big data analysis.

Wide area surveillance



Person identification

Examples of application to pattern mining using video data

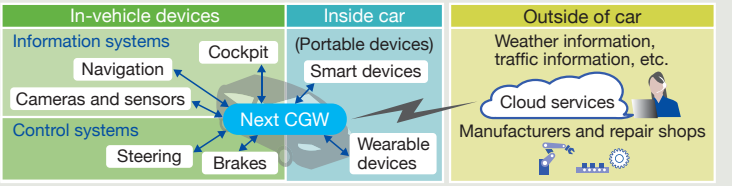
"Next CGW" Automotive Gateway Platform for Next-Generation Telematics

Toshiba has developed the "Next CGW" software platform for automotive IoT data to realize next-generation telematics services.

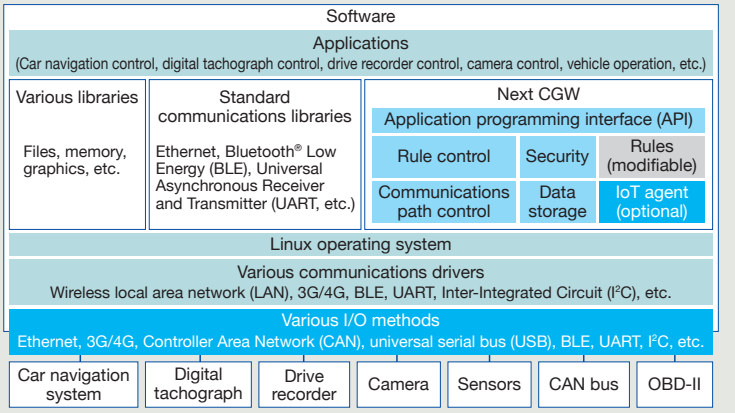
In recent years, connected car(*) and autonomous driving technologies have rapidly progressed. Automatic control technology has also been utilized in the fields of construction and agricultural machinery. Since these applications incorporate various sensors and devices, the volume of data generated has significantly expanded. This, in turn, has increased the complexity of data processing, slowed communication speeds, and increased power consumption. It is therefore necessary to realize cloud-based communications that provide enhanced levels of security and safety.

The newly developed software platform makes it possible to build value-added automotive IoT systems.

(*) Cars equipped with information and communication technology (ICT) devices capable of collecting various data via networks, including data on vehicles and road conditions gathered by sensors



Fields of application of Next CGW software platform for on-vehicle devices



3G/4G: third-generation/fourth generation I/O: input/output
OBD-II: on-board diagnostics version II

Architecture of Next CGW

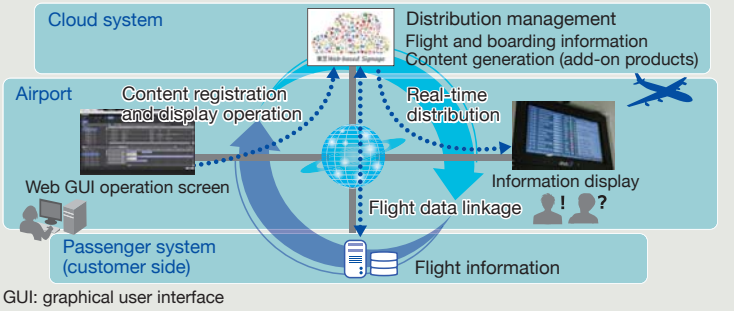
"Canary" General Guidance Information Display System to Guide Airline Passengers to Boarding Gates

The "Canary" digital signage system of All Nippon Airways Co., Ltd. (ANA) plays a major role in its airport services by providing flight and other information to passengers. Toshiba has delivered and installed 300 units of the Canary system at 34 airports that serve ANA's domestic flights.

UX design techniques were utilized in designing this digital signage system in order to display information on flights, aircraft changes, boarding gate changes, and other matters in an intelligible manner. In addition, we employed visual guidance based on ergonomic and universal design principles to improve visibility so that people affected by color blindness can also see the information they need.

The "Toshiba Web-Based Signage" cloud service was adopted as the basis for the digital signage function. The Canary system provides enhanced operability for airport staff since it can be easily operated via a browser. This contributes to reduction of the workload of administrators at the 34 airports where it is installed.

Example of guidance information display at Haneda Airport Domestic Terminal 2



GUI: graphical user interface

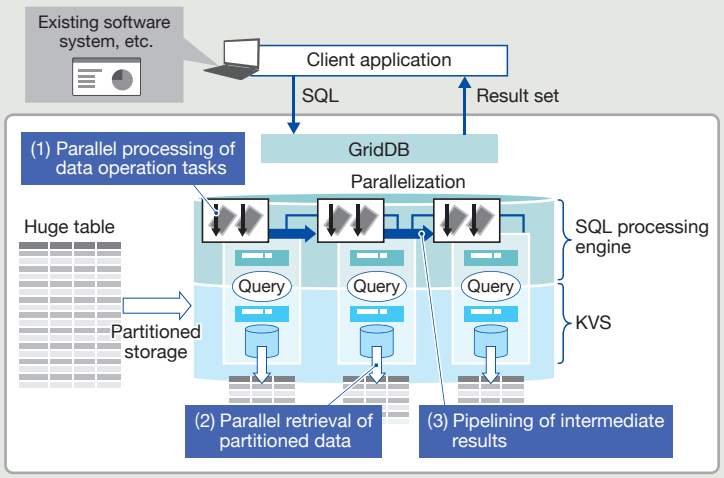
Overview of general guidance information display system incorporating Toshiba Web-Based Signage system

High-Performance SQL Processing Technology in GridDB Scale-Out Database

Toshiba provides the GridDB scale-out key-value store (KVS) database software as a means of coping with the ever-growing volume of IoT data.

In order to achieve a Structured Query Language (SQL) processing speed more than 10 times faster than that of the SQL processing mechanism of GridDB, we have developed a new distributed and parallel SQL processing mechanism. Features of the new SQL processing mechanism include three levels of parallelism layers, parallel processing of data operation tasks, parallel retrieval of partitioned data, and pipelining of intermediate results. Furthermore, its SQL processing is as fast as or faster than that of conventional major data warehouse (DWH) products.

This technology will make it easier to utilize IoT data compared with conventional database technologies because it seamlessly combines the speed advantage of KVS data management with the flexibility of SQL for complex database queries. We have incorporated this technology into GridDB Advanced Edition.



GridDB distributed and parallel SQL processing mechanism

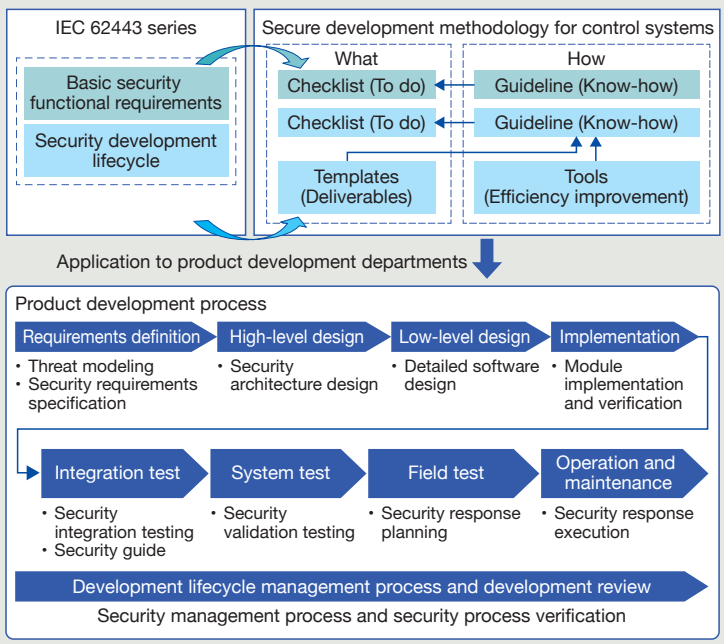
Secure Development Methodology for Control Systems Based on International Standards

For control systems supporting critical infrastructures, Toshiba has developed a secure development methodology covering their entire lifecycle. Engineers can use this development methodology to build security quality into systems and maintain the quality based on the International Electrotechnical Commission (IEC) 62443 series standards(*).

The newly developed methodology supports engineers in identifying security issues when deriving basic security functional requirements and preparing the documentation required by IEC 62443 throughout the development lifecycle. To fulfill these objectives, it incorporates a large number of explanations and examples into tools, templates, checklists, and guidelines. These features of the new methodology make it possible to improve the security of control systems and the efficiency of their global promotion.

(*) For the portions of the IEC 62443 series that are still under development, we consulted the ISASecure® standards that constitute the base documents for IEC 62443.

ISASecure® is a registered trademark of the ISA Security Compliance Institute.



Application of secure development methodology for control systems to product development process