FA Integrated Solution: e-F@ctory and the Integrated Platform

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1. Introduction

Production plants in fields such as the semiconductor, liquid crystal, and auto industries need to be able to produce variable volumes of diverse products, respond quickly to shorter product cycles, and raise production efficiency.

Mitsubishi Electric has evolved the concept of e-F@ctory for optimizing the entire plant facilities as illustrated in Fig. 1 and has introduced MES interface products that link the host information system and production sites for enhanced visualization of the production sites. This report describes the integrated platform that links the production sites in line with the information linkage technology mentioned above.

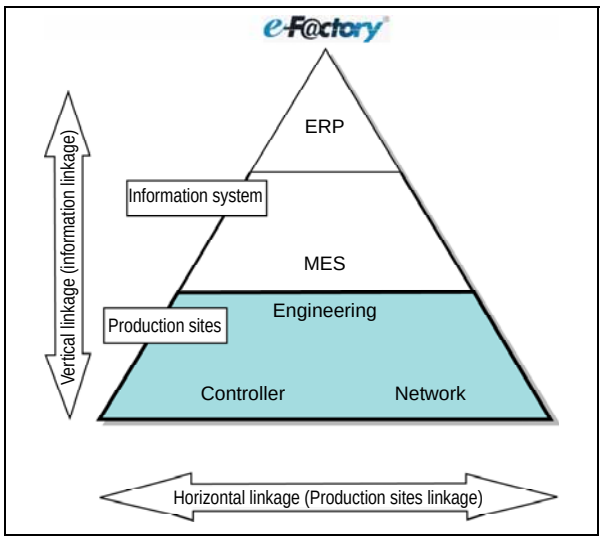

Fig. 1 e-F@ctory and the integrated platform

2. Linkage between Production Sites: the Integrated Platform

Production sites are facing tough demands for higher productivity yet lower development cost arising from the construction or modification of production lines, production-line start-up cost, and maintenance and operation cost. To achieve these cost reductions, it is necessary to reinforce the linkage between the FA components incorporated in the production sites. We have developed and released the integrated platform, which is based on a new concept for reinforced linkage. The integrated platform is composed of the controller platform, the engineering platform, and the network function.

3. Controllers for the Integrated Platform

Controllers designed for the integrated platform of controllers offer improved performance of the bus between CPUs, CPUs themselves, and the network used in conventional MELSEC-Q series products.

Figure 2 shows the controllers newly developed for the integrated platform.

(1) Multiple CPU high-speed base unit
(2) High-speed programmable controller
(3) High-speed motion controller
(4) Numerical controller (CNC) for the production line
(5) Robot controller
(6) Controller network unit (MELSECNET/G)

3.1 Controller platform

The controller platform has the following two features.

(1) High-speed data transmission between multiple CPUs

The multiple CPU high-speed bus shown in Fig. 3 features a transmission speed that is 8 times that of the bus used in the conventional MELSEC-Q series. The bus can be used with any of about 100 units (such as I/O, intelligent functions, and network functions) of the conventional MELSEC-Q series without changing their specifications.

(2) Data transmission synchronized with the operation cycle of the motion controller

With the multiple CPU high-speed data transmission synchronized with the operation cycle of the motion controller, optimum data transmission between CPUs is achieved for enhanced overall performance of the control system (for example, a system consisting of the programmable controller CPU and the motion controller CPU). This applies to the CNC for the production line and the robot controller.

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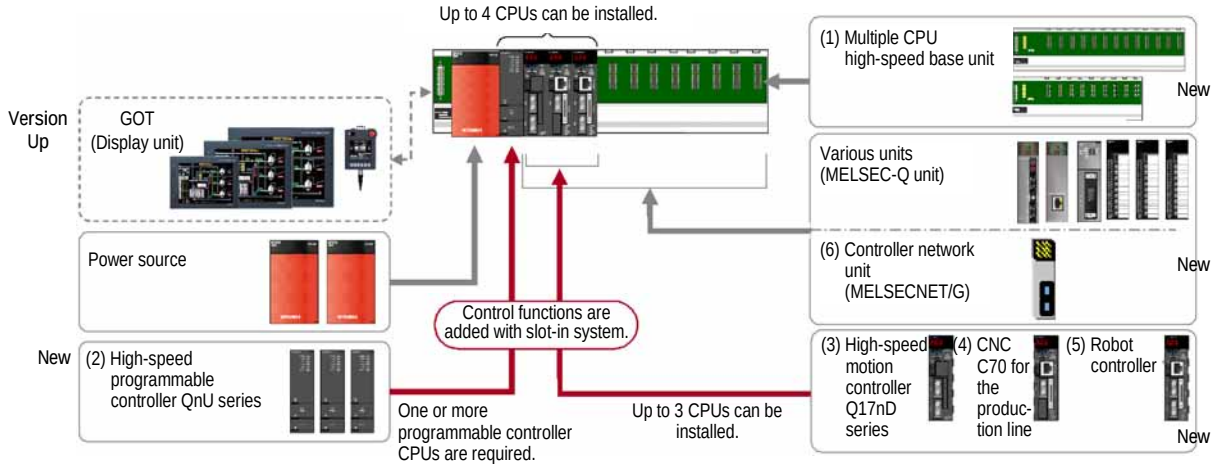

Fig. 2 Controllers newly developed for the integrated platform

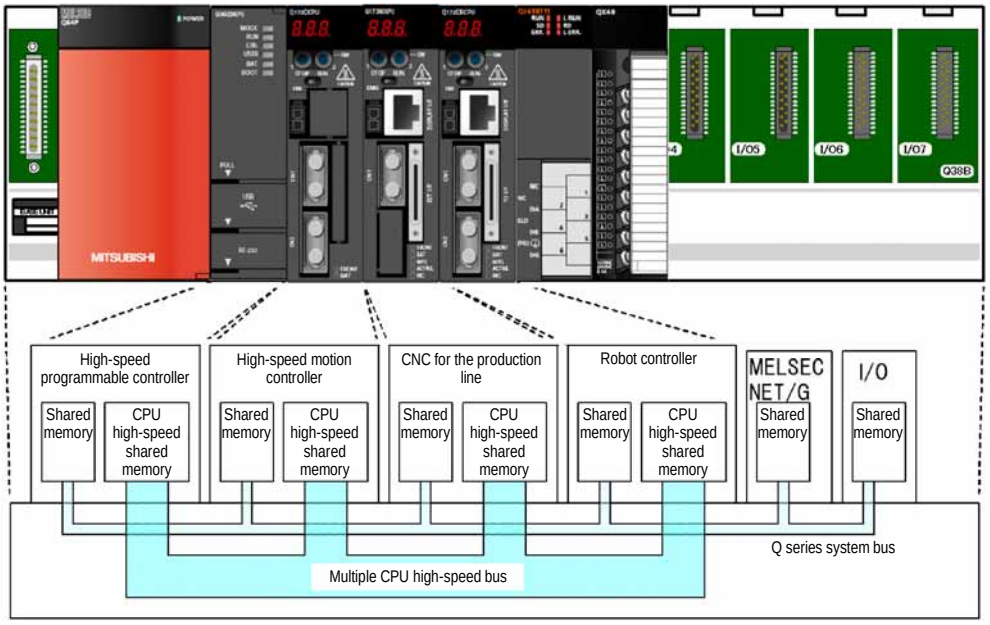

Fig. 3 Controller bus configuration

3.2 High-speed CPUs and controller network

To improve the performance of the entire control system, we have simultaneously released high-speed CPUs and the controller network for the integrated platform.

- The high-speed programmable controller QnU series features a high PCMIX value, an indicator of sequence control performance, which is approximately 6 times that of the conventional model due to faster basic instruction processing, floating-point operation, and memory access.
- The processing capacities of the high-speed motion controller Q17nDCPU and CNC for the production line have been approximately doubled compared with those of the conventional models as they are installed in newly developed hardware having new architectures.
- The controller network MELSECNET/G is equipped with communication technology conforming to the IEEE802.3Z (1000BASE-SX) Standard in the physical layer to increase the communication speed to 1 Gbps and the number of link registers to 8 times larger than that in MELSECNET/H.

4. Engineering Environment for the integrated platform

Engineering work for the conventional control system required software programming and debugging for each device. However, as control systems become increasingly complicated, it has become important to raise engineering efficiency by improving the linkage between software programs.

We are developing an engineering environment specifically for the integrated platform to improve the linkage between programs and so make engineering work more efficient.

The features of the engineering environment currently under development are introduced below.

4.1 Engineering platform

The engineering platform has the following three features.

(1) Integration of development environment

Such functions as programming, monitoring, and diagnosis, are called up from the System Configuration Management Tool shown in Fig. 4 to make it easy to design the control system and understand the work status. In addition, a function for sharing design information is provided.

(2) Sharing design information between development phases

The component devices of the control system are grouped so that, as shown in Fig. 4, the design information is shared between phases such as development, maintenance, and operation, thus boosting the efficiency of user-oriented activities.

4.2 Engineering common function

In the engineering environment for the integrated platform, effective functions are offered to each development phase. Typical functions are described below.

(1) System configuration management function

The system configuration management function allows the user to define the hardware configuration and network configuration graphically by using a mouse for editing and managing the system configuration charts as shown in Fig. 5. In addition, by operating the mouse on the system configuration chart, the user can call up various types of functions.

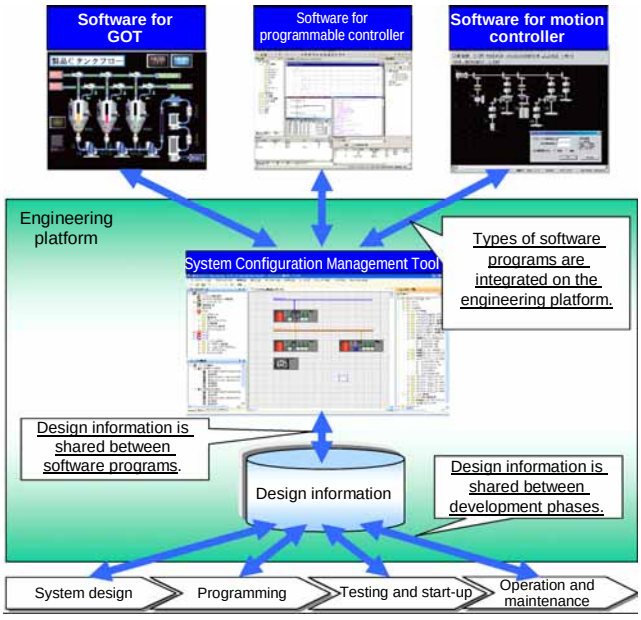

Fig. 4 Engineering environment for the integrated platform

(2) Label programming function

The label programming function allows the user to name devices (label definition) and program the labels to improve the readability of the program.

(3) System diagnosis function

The system diagnosis function allows the user to diagnose the entire system, including activation of the types of monitors on the programmable controllers and motion controllers in accordance with the system configuration chart.

(4) System back-up and restore function

The system back-up and restore function allows the user easily to read out and/or save the program parameters or other data stored in the component devices of the control system.

In addition, the user can write the program parameters or other data stored in the system together into a desired device, which helps to reduce maintenance time when replacing a device.

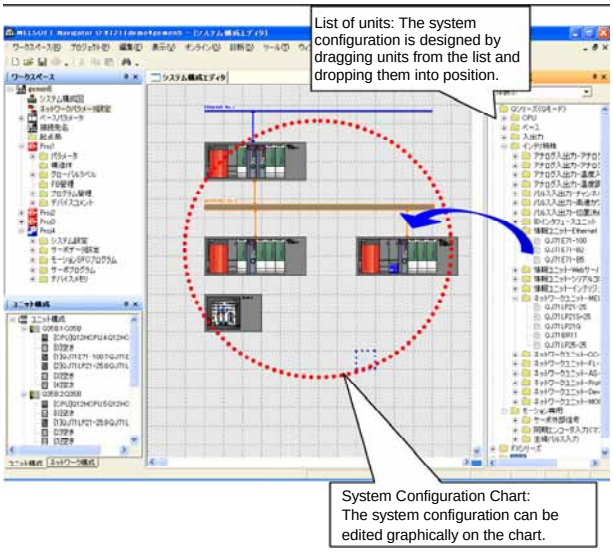

Fig. 5 System configuration management function

5. Conclusion

Following the information linkage at production sites, we discussed the integrated platform and related products for linking FA component products at production sites. We will improve the product range and performance of the common functions for the integrated platform to improve the controller and engineering environment. This will increase the productivity of production sites, reduce the engineering cost, and rationalize the development environment in innovative ways for users.