

Migration Strategy for the MICREX-NX

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1. Introduction

Fuji Electric first developed a distributed control system (DCS) for application to plant systems in 1975, and since that time, has applied DCSs to iron and steel works and waste disposal plants in the private sector, and then to various plant systems in the public sector, such as water treatment facilities. Fuji Electric is presently supplying its 4th generation DCS, the MICREX-AX, to the market. The Japanese DCS market shows signs of leveling-off, however, and Fuji Electric is aiming to expand its process automation system (PAS) business with the introduction of its MICREX-NX, equipped with a new platform architecture suitable for application to new markets such as food and pharmaceuticals, as well as to overseas markets and the conventional fields of iron and steel works, waste disposal, and water treatment. Figure 1 shows the changes over time in the MICREX systems developed by Fuji Electric.

In the future, most of the MICREX-PIII and other systems delivered by Fuji Electric will be due for replacement. However, replacement of a plant all at once will be financially difficult as customer budgets have decreased, and this work must proceed with consideration to minimizing the total cost of ownership (TOC).

Fuji Electric provides its customers with a means to improve manufacturing capability with the advanced capabilities of the MICREX-NX. Customers can replace their existing systems with the MICREX-

NX sequentially, while inheriting some legacy hardware and software, and thereby prolonging the service life of their existing systems.

This paper describes the process for migrating to the MICREX-NX from an existing MICREX system, while minimizing engineering labor and cost, and efficiently inheriting assets of the existing system.

2. Scenarios for Migration from Existing Systems

Scenarios for migrating from a customer's existing MICREX system to the MICREX-NX system in order to prolong the life of the existing system and to increase manufacturing capability are described below and illustrated in Fig. 2.

(1) Partial replacement of HMI only

Because the human machine interface (HMI) system uses general-use components such as a CRT and hard disk, the HMI part will be the first to have its production discontinued. Consequently, in this scenario, the existing HMI will be replaced with the latest HMI version, and replacement of later-stage controllers will also be considered.

(2) Partial replacement, but retaining existing PIO

Due to such reasons as wiring complications or a decrease in plant investment, the existing PIO part will be retained, but the controller and HMI replaced.

(3) Plant replacement and expansion

To replace an aged plant and improve manufacturing capability, the controller, including the PIO, and the HMI will be replaced all at once, or the plant

Fig.1 Changes in Fuji Electric's MICREX systems

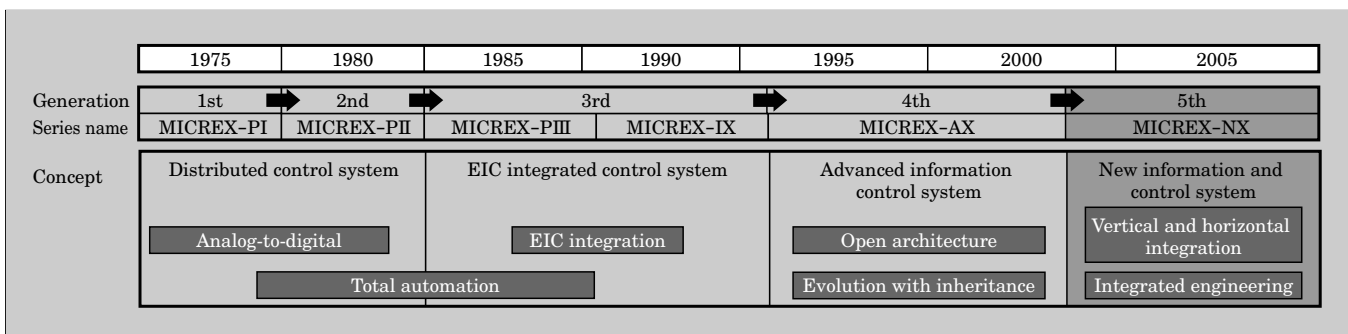
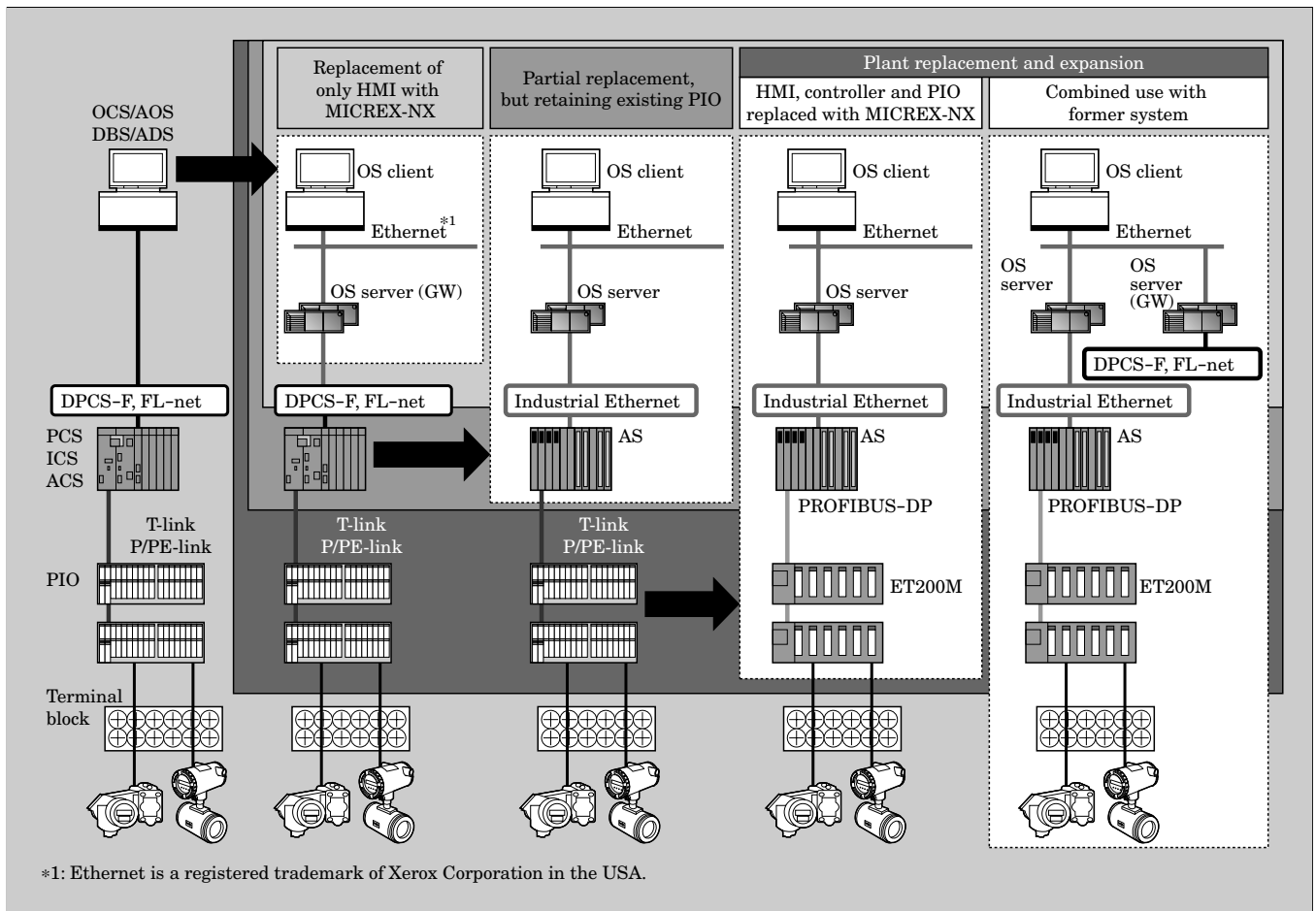


Fig.2 Migration scenarios



expanded.

3. Concept of the MICREX-NX Migration

The concept of the MICREX-NX migration is to provide a mechanism that enables partial replacement or expansion of an existing system by utilizing the customer's existing DCS assets to the maximum extent while allowing the customer to enjoy the advantages of the new MICREX-NX, such as the concept of plant hierarchy and the automatic associations generated among device modules in the controller and the HMI faceplate.

The method for migrating to the provided MICREX-NX to partially replace or expand a plant while inheriting legacy functions is described below. Figure 3 shows the overall migration process.

3.1 Easy connection of MICREX-NX to an existing system

The new MICREX-NX allows the partial replacement or expansion of an existing MICREX-PIII or later system (MICREX-PIII, MICREX-IX, and MICREX-AX). For this purpose, Fuji Electric provides a gateway (GW) and link device as components for connecting the existing system's control network and remote I/O network to the MICREX-NX.

(1) Gateway

The gateway connects Fuji Electric's DPCS-F and FL-net-compliant LAN backbone networks to the MICREX-NX's plant bus.

(2) Link device

The link device connects Fuji Electric's P-link and PE-link for connecting a remote I/O network or general-purpose programmable controller (PLC) of an existing system to the MICREX-NX's controller.

3.2 Inheritance of existing system functions

(1) Migration of HMI objects and database (DB) information

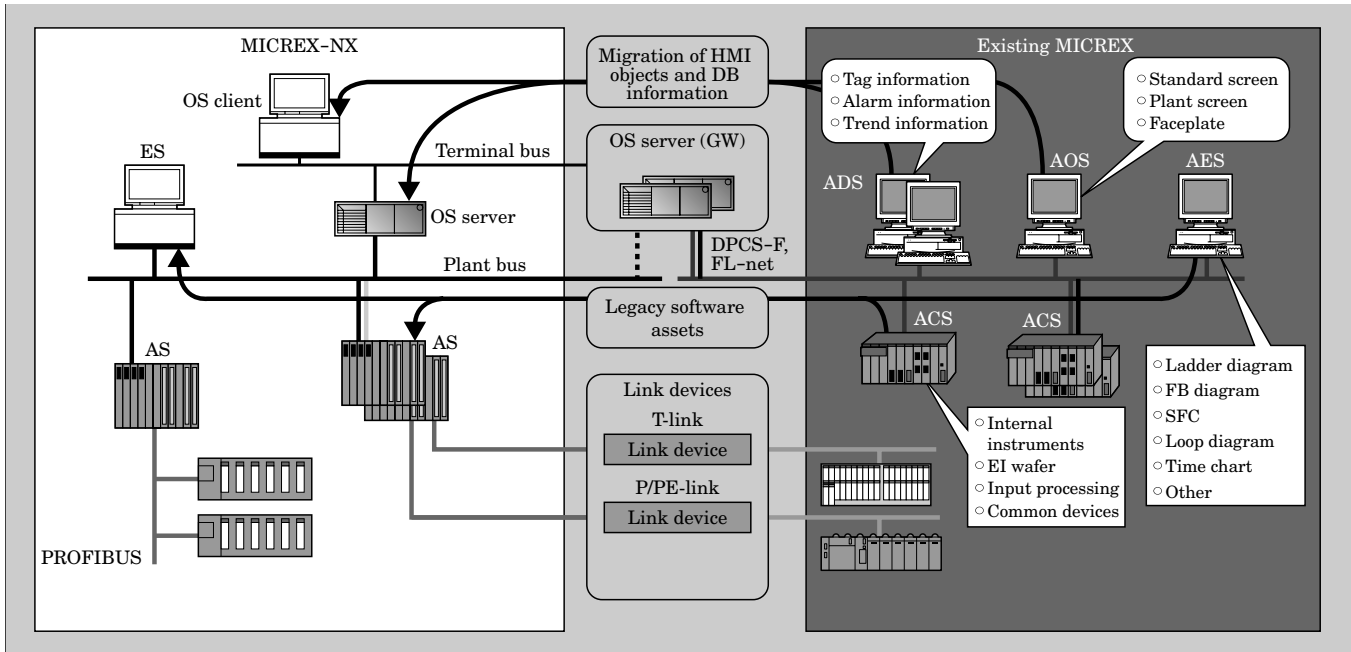
It is important that any changes to the customer's familiar display and operation of HMI objects, or any inconsistencies of the HMI objects and operation within the same control room are not conspicuous to the user.

So that the migration can be implemented smoothly, a faceplate and diagnostic screen that are the same as those of an existing MICREX system, and also a database conversion tool are available.

(2) Inheritance of controller software assets

An application program converter is provided with the new MICREX-NX. This converter converts controller application programs of the existing system, so that

Fig.3 Migration with MICREX-NX



replacement can be implemented smoothly without having to develop new application programs for the new MICREX-NX.

4. Migration Components

4.1 OS server (GW)

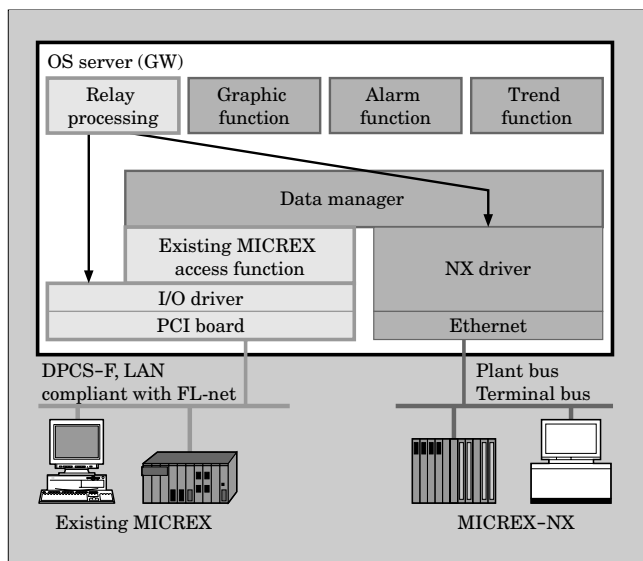
Fuji Electric has two control level networks, its original DPCS network and an FL-net-compliant LAN that was developed based on the FL-net JIS specifications. A gateway based on the standard operator station (OS) used with the MICREX-NX is provided in order to connect these control level networks to the plant bus that is the MICREX-NX network. In addition to the capability for performing data accesses from the OS client to the existing controller, this gateway also has the functionality described below.

- (1) Converts alarm information generated by an existing system to the MICREX-NX's message system format, and performs client OS notification, display and acknowledgement operations, and the like to integrate alarm information of an existing system with the MICREX-NX method
- (2) Notifies the OS client of existence information and diagnostic information from controllers in an existing system
- (3) Integrates the redundancy of an existing system with the MICREX-NX method

Figure 4 shows the basic architecture of an OS server (GW) that realizes the above-described functions.

As shown in this drawing, the OS server (GW) is equipped with a PCI interface card for physically connecting a DPCS-F conventional network or an FL-net-compliant LAN to the standard OS server of a

Fig.4 OS server (GW) functional structure



MICREX-NX. The data access operation of a standard-configuration MICREX-NX (such as a graphic system or trend system) is implemented via a data manager by an existing MICREX access function that converts the MICREX-NX information to a format for broadcast transmission or message transmission on the DPCS-F or FL-net-compliant LAN, or for file access (IJF access), in order to accesses actual data in the existing MICREX's controller.

4.2 Link device for T-link

Fuji Electric's original networks such as T-link, open PIO and optical FFI are available for use as remote I/O networks. The T-link, in particular, supports not only the I/O unit (IOU) that was used

widely with the MICREX-PIII, the I/O unit (IPU) which achieved many good results with the MICREX-IX, and MICREX-AX, as networks for connecting Fuji Electric's PIO, but also supports many varieties of PIOs. Examples are listed in Table 1.

A link device that links to the PROFIBUS-DP, which is the MICREX-NX's standard remote I/O interface, is available as a component for connecting the T-link to the MICREX-NX's controller. This link device enables an existing PIO and cable to be used directly to connect to the MICREX-NX. Moreover, use of the PROFIBUS-DP enables the advantageous configuration technique of the MICREX-NX and an integrated mode of engineering for implementing the notification of failures, diagnostic information and the like to the HMI, and also supports future system growth. (Refer to Fig. 5.)

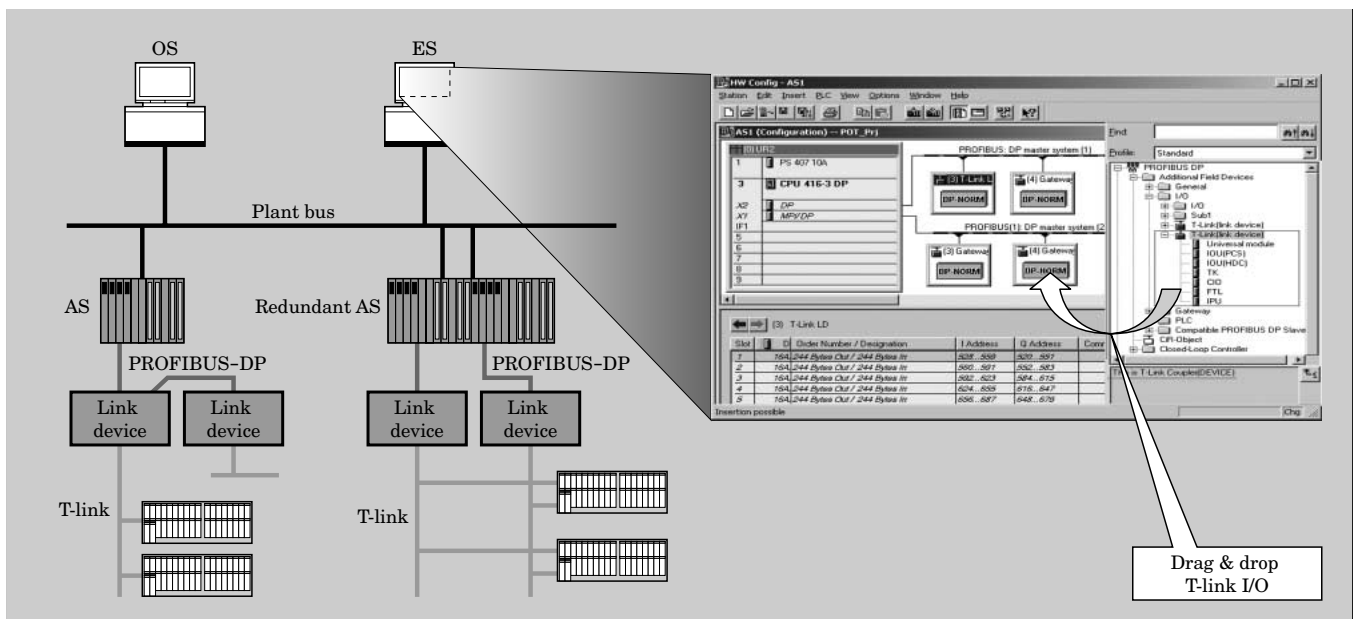
This link device, under the supervision of the PROFIBUS interface, refreshes PIO data for the T-link, and also integrates the following T-link functions.

- (1) Diagnoses each PIO module connected to the T-

Table 1 List of I/O supported by T-link

System		MICREX-NX	MICREX-PIII		MICREX-IX MICREX-AX
			PCS-500	HDC-500	
I/O type	Single T	○	○	×	×
	IOU (PCS)	Redundant T	○	○	×
Single T		○	×	○	○
IOU (HDC)	Redundant T	○	×	○	×
	TK capsule	○	○	○	○
CIO	○	×	○	○	
FTL	○	×	○	○	
IPU (including FFI)	○	×	×	○	

Fig.5 T-link system configuration of MICREX-NX



- (2) Sets parameters and transmits/receives data for the communications module and other special modules controlled by application programs, and transmits messages for specified modules
- (3) Realizes redundant functions of the existing system in the new redundant architecture of the MICREX-NX

4.3 Link device for P/PE-link

Fuji Electric's P/PE-link has been used not only for the DCS controller, but also has been used in many projects as a simple network for connecting to Fuji Electric's general-purpose PLC. As shown in Fig. 6, a link device for connection to the MICREX-NX is also

Fig.6 P/PE link system configuration of MICREX-NX

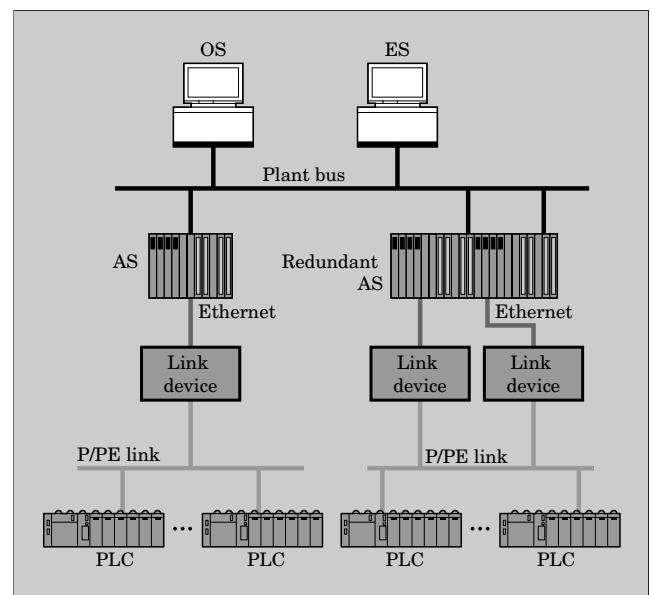
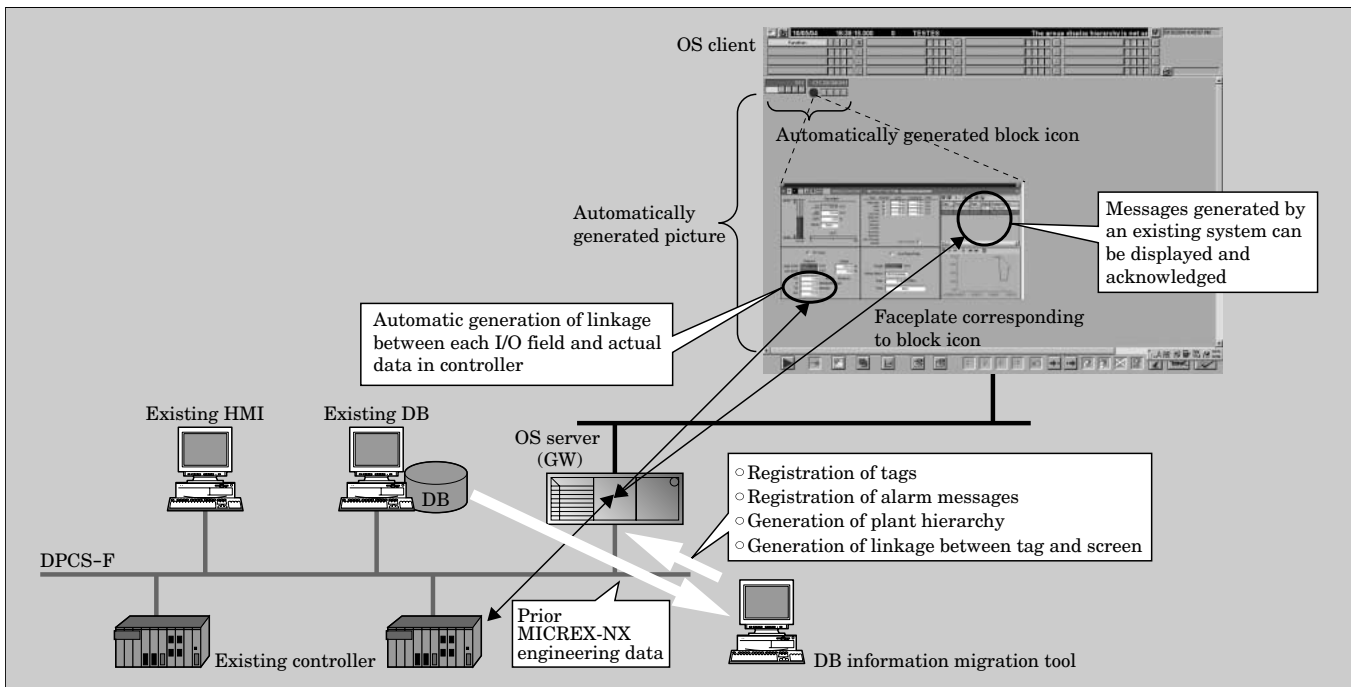


Fig.7 Engineering resulting from DB information migration tool



provided for this P/PE-link. The link device enables the handling of data between the general-purpose PLC of a MICREX-F or MICREX-SX connected to an existing system and the MICREX-NX's controller. Additionally, P/PE-link functions such as message transmission, redundancy and the like are integrated as standard features within the MICREX-NX architecture.

4.4 DB migration tool

So that the MICREX-NX system can use the same data names as previously to access data on an existing system, the engineering information (such as tag definitions and alarm message definitions) contained in the existing MICREX system must be loaded into the MICREX-NX environment. This task is accomplished by using the DB migration tool. (Refer to Fig. 7.)

The functions of the DB migration tool are listed below.

- (1) Registration of tags (user tags, module tags, system tags)
- (2) Registration of alarm messages
- (3) Generation of plant hierarchy (picture tree)
- (4) Generation of linkage between tags and block icons and between tags and faceplates

This DB migration tool can be used to download automatically the necessary engineering information from the existing system, thereby eliminating the need for one-by-one manual input. Also, when generating a screen on the OS client, tag names and faceplates corresponding to controller device modules on the existing MICREX system can be used, and by simply pasting the appropriate faceplate on the plant screen

(picture), linkage such as the display of device data, parameter settings from the screen, and the like can be realized.

4.5 Software converter

Controller applications for the third generation MICREX-PIII and later are created with an engineering tool called the FPROCES. Although there are some restrictions, a converter is available for migrating those applications to controller applications for the MICREX-NX. By using this software converter, application programs created with various representational systems such as ladder diagrams, FB diagrams, SFCs and loop diagrams that have been generated by FPROCES can be run as MICREX-NX programs.

5. Conclusion

The strategy for migrating an existing system to the MICREX-NX has been described.

Based on Fuji Electric's adopted motto of "evolution with inheritance," we have continued to advance new technology while inheriting the assets of our customers' existing systems. With the marketplace introduction of the MICREX-NX, Fuji Electric's new DCS, we believe that the capability for smooth migration will appeal to our customers, and that this capability will be a powerful advantage for our new information and control systems in the future.

With the MICREX-NX positioned as a new DCS platform, Fuji Electric intends to continue to provide systems capable of contributing to the profit of our customers.



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