

CENTUM CS DEVICE MANAGEMENT TOOL BASED ON FOUNDATION™ FIELDBUS

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This paper describes one of our most recent developments, the CENTUM CS Fieldbus Device Management Tool software. This software runs on a personal computer in the instrument room. It accesses field devices via the FOUNDATION™ fieldbus, in order to display status information and messages and enable parameters to be displayed and set. Remote access to field devices from the instrument room can greatly simplify their maintenance.

INTRODUCTION

The phenomenon of the current era, coined the information age, involves a global trend toward digital technology and open architecture. Field devices are no exception to this trend. The next-generation field communication system succeeding 4-20 mA analog instrumentation and smart instrumentation, such as BRAIN and HART, has finally arrived and begun practical application. The system being referred to is the FOUNDATION™ fieldbus (hereinafter simply referred to as the fieldbus) – a bidirectional digital communication system. The architecture of the CENTUM CS already supports fieldbus, thus we have developed the Device Management Tool that is compatible with the fieldbus standard. This paper introduces the functions of the Fieldbus Device Management Tool.

In Section 2 of this paper, we will discuss how to deal with field devices in the fieldbus age (i.e., a broad survey of expectations regarding the maintenance of field devices). In Section 3 and thereafter, we will discuss the functions of the newly developed tool.

MAINTENANCE OF FIELD DEVICES

In this section, we will 1) explain the various field device information that is available; 2) outline the range of field devices supported by the Fieldbus Device Management Tool; and 3)

describe what kind of maintenance for field devices (in a broad sense) is expected in the future.

1. Information on Field Devices

The following items of information relating to field devices are available.

- A. Online information (process information)
 - Realtime data (instantaneous-value data)
 - Time-series data (trend data)
 - Event history (historical messages)
 - Information on device engineering
- B. Information on a field device's life cycle (maintenance information)
 - History of manufacture and shipment
 - History of inspection, malfunction and repair, and information provided by inspectors
 - History of operation and calibration
 - Inspection and replacement (purchase) plan
- C. Plant information
 - Information on device installation (systems and environment)
 - Control information (relationship with the process and control loop)
- D. Reference information
 - Information based on manuals (device specifications)
 - Parts and inventory information and production plans
 - Problem reports (manufacturer and user)

2. Role of the Device Management Tool

Field devices include analog devices, smart communication

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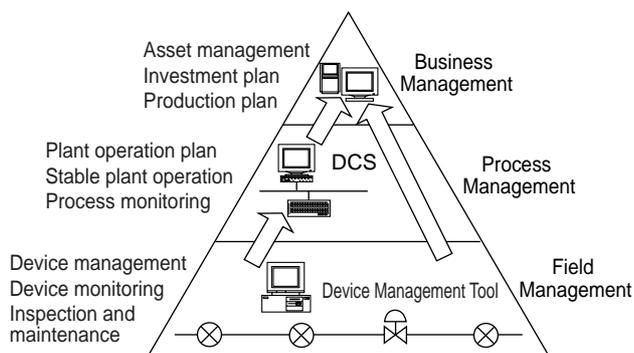


Figure 1 Hierarchical Structure of Plant Management

devices such as the BRAIN- and HART-based instruments, and field devices capable of FOUNDATION™ Fieldbus communication, which all coexist in the same plant.

The Device Management Tool is concerned with the latter of these. From the information items of fieldbus-enabled devices discussed in Subsection 1, the Device Management Tool is designed to deal with 'online information.'

There are also tools, such as the Maintenance Support System⁽¹⁾, for handling maintenance and reference information. In addition, there is a realm of asset management that covers all plant equipment, from electric devices such as motors, to programmable logic controllers and general office equipment, regardless of whether or not they are field devices. Figure 1 shows the hierarchical structure of plant management.

3. Expectations for Device Management, Maintenance Support and Asset Management

The user demand for field device management is based on a desire to increase the overall efficiency of not only device monitoring and inspection but also maintenance support and asset management with the aim of reducing maintenance costs over the plant's life cycle.

An outline of how each of these objectives is to be achieved is given below.

- A. Increase in the efficiency of equipment operation
 - Device monitoring in a central monitoring room and office
 - Reduction in equipment downtime as a result of device and equipment diagnosis
- B. Increase in the efficiency of maintenance work
 - Support of maintenance planning
 - Availability of information for maintenance work and assistance of the work
 - Reduction in the burden of on-site work by means of online functions (namely, work relating to inspection, calibration, adjustment, and so on)
 - Automation of recording of maintenance work (communication and report making)
- C. Increase in the efficiency of management work
 - Mechanization of purchase and management work
 - Support of equipment maintenance planning

FUNCTIONAL CONFIGURATION

This section discusses the functional configuration of the CENTUM CS Fieldbus Device Management Tool.

1. Intended Application

The Device Management Tool is designed to run on a PC connected to the CENTUM CS Enet/Ethernet. Figure 2 shows the configuration of the CENTUM CS fieldbus system.

2. Overview of Functions

Figure 3 shows the various functions provided by the Device Management Tool.

3. Data Flow

Figure 4 shows the flow of data and the database structure.

The parameter data of various function blocks within the various field devices are processed through the ACF11 module, ICS and ACG using the fieldbus communication function, and then displayed in the relevant parameter windows.

The status of a field device is shown by acquiring the field device status data from the FCS. Messages from field devices are sent through the ACF11 module and FCS to the ICS for storage in its historical message file. Using the ICS's DDE server function, the Device Management Tool retrieves historical messages for display purposes.

4. Database

The system has the following communication databases.

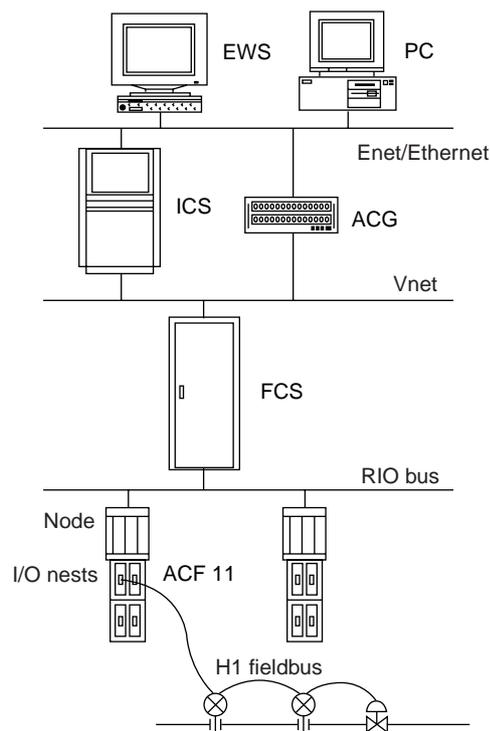


Figure 2 System Configuration

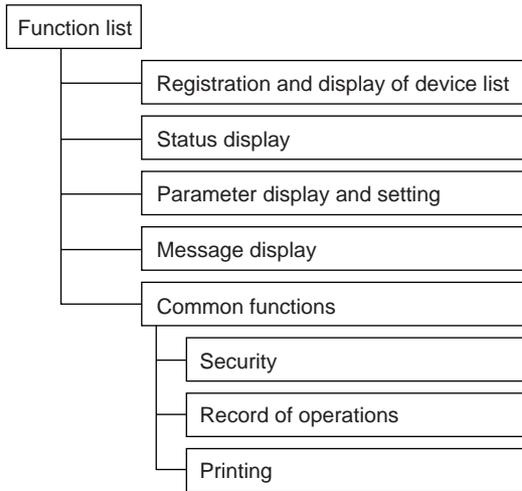


Figure 3 Function List

- Device list
Contains a list of user-defined devices and detailed information on the devices read from them via communication.
- Device database
Contains the information necessary to communicate with devices.

FUNCTIONS

1. Device List Registration

1.1 Items on the Device List

The following summarizes the items that are defined on the device list. Items specified as "non-omissible" are essential for

communication. All of the other items are auxiliary information and defined as necessary or not by the user.

- Device tag name (non-omissible)
A name given to a field device.
- Segment name (non-omissible)
A name that relates to the H1 fieldbus used.
- Address (non-omissible)
The address of a field device defined within the area of the H1 fieldbus.
- Device number (non-omissible)
The logical number of a field device defined within the area of the H1 fieldbus.
- Vendor name
- Model name
- Unit name
- Loop name
- User comment

The items from the device tag name to the model name (shown above) do not need to be entered if they are read from the host file set in the engineering tool.

1.2 Registration of Devices on the Device List

Devices are registered in the registration window. The registration window consists of a 'complete device list' registration window, which presents a list of registered devices, and an 'individual device list' registration window where data on devices are input.

1.3 Updating of a Device List (Reading of Device Information)

The field devices defined in the device list registration windows can be included in the coverage of various monitoring functions, such as parameter and status displays, by executing the

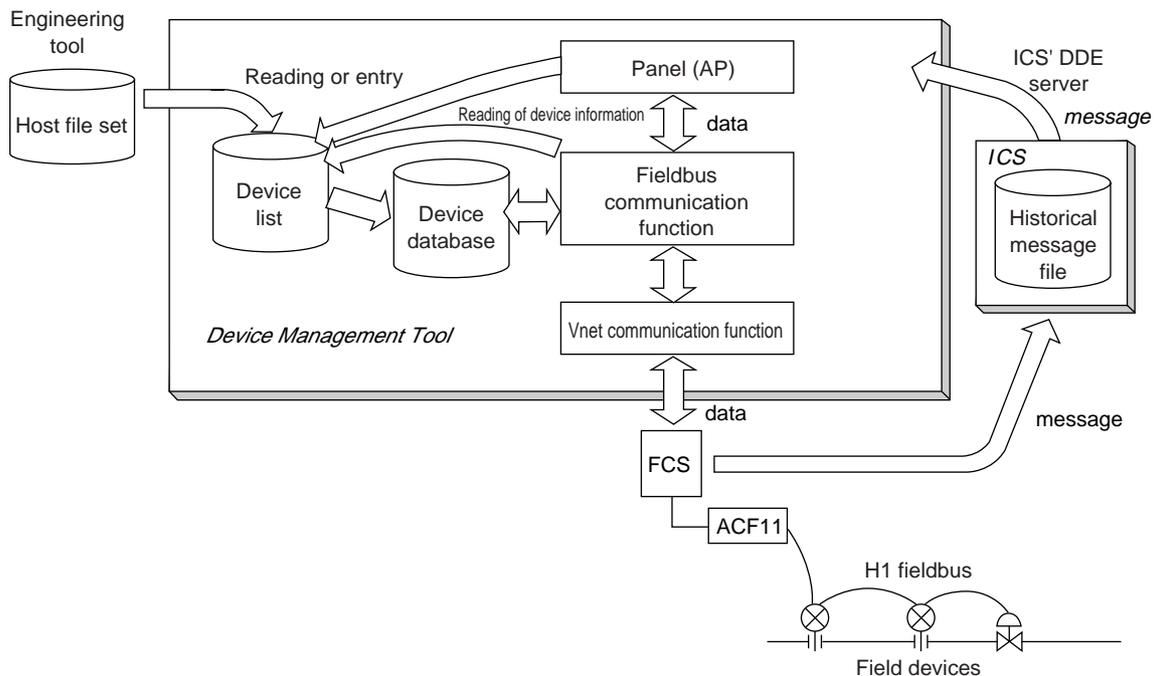


Figure 4 Data Flow and Database Structure



Figure 5 Status and Parameter Display Windows

menu bar command for updating the device lists. The detailed information (including block configuration and each parameter's index information) that is necessary to communicate with devices (or show parameters) can be read at the same time the device list is updated, allowing parameters to be shown as necessary. Another separate dialog box can be retrieved in order to read more detailed information on the devices. Information reading can be repeated as many times as necessary. The system is designed to minimize users' burden of selection and definition. Users simply have to read the information for each device in the form of master data. We believe this strategy will greatly help communication with multi-vendor field devices (i.e., those of other manufacturers).

2. Listing of Devices

The Device Management Tool lists details on the devices handled by the tool. The details can be shown in two window formats: a complete device list display or an individual device display.

2.1 Device List Table Display

The device list table display window is an all-in-one display of the details on devices handled by the Device Management Tool. In this window, users can search through the list by specifying a key word so as to list all of the devices of a specific vendor or the devices relating to a specific unit.

2.2 Device List on Individual Display

The individual device display window shows the details of a particular device included in the device list.

3. Status Window

The status window lists the statuses of devices handled by the Device Management Tool (i.e., the field devices connected to the CENTUM CS system). This window can be viewed in two formats: a segment-by-segment listing of the representative device statuses for all segments or a device-by-device display of the device statuses for a selected segment.

4. Parameter Display and Setting

The 'parameter display and setting' window is used to show and set the parameters for each function block of a device. These parameters can be shown either in the group corresponding to the VIEW object (an object prescribed in the FOUNDATION™ Fieldbus specifications that globally deals with the parameters of function blocks), or separately by individual selection. Figure 5 presents an example of the status window and the parameter display and setting window.

5. Message Displays

Messages given by devices are retrieved from the historical message file in the ICS (or PICS) for display on the screen. Taking advantage of the ICS's round-the-clock operation, users can view every single message relating to field devices.

6. Common Functions

6.1 Security

This function is used to register users who are authorized to log on to the Device Management Tool before they do so and to restrict the kinds of operation available on a user-by-user basis. The logon procedure may be omitted to make all kinds of operation possible.

6.2 Record of Operations

This function is designed to maintain a record of the operations used to set the parameters of a field device and keep a record of the log-on and log-off occurrences.

6.3 Printing

This function prints the contents of each window in a report form.

CONCLUDING REMARKS

This paper introduced the Device Management Tool that we developed as a means of engineering the CENTUM CS system in order to support the fieldbus standard. As discussed, there are a wide variety of devices in the field that must be supported in the future. These include not only fieldbus-enabled communication devices but smart communication devices as well. This tool is designed to cover those functions that are available online for the maintenance of field devices, but also acts as a framework for higher-order applications, such as maintenance support and asset management. In the future, we plan to develop other tools, such as maintenance support systems, that offer wide-ranging maintenance solutions based on the ETS concept. ◆

- * CENTUM is a registered trademark of Yokogawa Electric Corporation.
- * Windows NT is a trademark of Microsoft Corporation, USA.
- * HART is a registered trademark of Fisher-Rosemount Inc.

(1) The Maintenance Support System is a product of Yokogawa Engineering Service Corporation.