

UPS Management System

「SAN GUARD IV」

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1. Introduction

Computers that support our information society are backed up by the uninterruptible power system ("UPS"). It is, however, necessary to let the computer system shut down and preserve the data when long duration power failure is occurred. We first developed a UPS management system, "SAN GUARD I," which transmits a shutdown signal in order to cope with such a situation.

We followed this with the development of "SAN GUARD II" which provided a scheduled operation function as it became necessary for the UPS to have automatic operation functions, especially when they were used as servers.

Furthermore, as the network system grew larger in size using a large number of UPS, it became necessary to centrally control such UPS. To satisfy these demands, "SAN GUARD III" provided an integrated control function for utilizing the network.

However, the advancement of the network system in recent years is tremendous. Corporations are fast implementing the Internet into their network systems and increasingly want to be able to remotely control their UPS from Web browser screens. There are also demands for the means for the efficient operation of the system to cope with the accelerating scale expansion of networking activities.

In view of this situation, we have developed a new UPS management system "SAN GUARD IV," which has greatly reinforced the network-oriented functions over the existing systems.

We are going to describe the system configuration, advantageous features, and internal configuration of "SAN GUARD IV" in this paper.

2. System Configuration

"SAN GUARD IV" is composed of a LAN interface card ("LAN I/F P") to be mounted in UPS and UPS management software to be installed in the computer. The system configuration is shown in [Fig. 1](#) below.

As shown in Fig. 1, UPS 1 supplies power to Computer 1 and 2 while UPS 2 supplies power Computer 3. These UPS are power supply for computers when the power supply source is disrupted or power failure is occurred. The Computer for UPS management is a computer intended to centrally control UPS 1 and 2 and is capable of monitoring and setting up UPS 1 and 2.

While UPS and computers previously exchanged information by means of serial communication, "SAN GUARD IV" exchanges all information with computers through a LAN.

3. Advantageous Features

3.1 UPS Management Using Web Browsers

UPS management can be remotely performed using Web browsers (Java applet) via the Internet because the LAN I/F P have a Web server function. This function has made it possible to remotely carry out the UPS management. It means that the UPS management can be conducted from anywhere in the network system.

An example of the screen setting of the Web browser is shown in [Fig. 2](#).

3.2 Cluster System Application

The system configuration of "SAN GUARD^{IV}" as applied to a cluster system is shown in [Fig. 3](#).

A cluster system is a system comprising two computers conducting the same processing so that the operation can be maintained by one of the two computers even if the other computer fails in its operation. It is, therefore, essential that UPS and each computer should be able to communicate with each other directly. "SAN GUARD^{IV}" has become applicable to the cluster system by satisfying the condition of communicating with each other through a LAN.

3.3 Applicability to Computers Running on UNIX OS

"SAN GUARD^{IV}" stored in the LAN I/F P has UPS management data (e.g. the time limit to check for power failures, shutdown delay time, UPS stop delay time, etc.), that was previously held in the computers, stored in the computers. Thus "SAN GUARD^{IV}" does not need any UPS management software to execute on the UNIX OS even if the subject computer runs on UNIX OS. "SAN GUARD^{IV}" can control the computer by logging onto UNIX from the LAN I/F P through a LAN using TELNET. It can also run on various UNIX systems and the new LINUX by merely modifying the settings.

It is no longer necessary to develop a UNIX compatible UPS management software for each UNIX program prepared by a different supplier as before. You can freely upgrade your software for additional functions.

Even in the case as shown in Fig. 1 where computers running on different OS such as Windows NT and UNIX are used in a system, you can efficiently supply power from a single UPS.

3.4 Compliance to a Variety of Network Protocols

"SAN GUARD^{IV}" supports a variety of protocols as shown below to make it compatible to various network environments in order to lighten burdens imposed on the network administrator.

- DHCP (Dynamic Host Configuration Protocol)
A protocol to facilitate the IP address management
- DNS (Domain Name Service)
A protocol to control UPS and other hardware by name.
- SMTP (Simple Mail Transfer Protocol)
A protocol to handle E-mail communication in the case of error or operation
- SNMP (Simple Network Management Protocol)
A protocol to execute UPS management using a general purpose SNMP manager.

3.5 Improved Operations

By grouping and stratifying System management tool is a number of UPS subject to control, you can set them up or control in a group. Facilitate the set-up and control of a number of UPS in this way, and you can lighten the burden imposed on the network administrator of a large scale system. An example of the main screen is shown in [Fig. 4](#).

Parts marked 1 and 2 on the tree in the left hand frame on the screen are UPS and parts marked 3 lists UPS groups. By selecting 2F West on the tree, for instance, you can set up all UPS (e.g. those marked 1) in the group in one process.

4. UPS Management System Inner Configuration

4.1 Function Summary

Shown in Table 1 are the basic "SAN GUARD" functions.

Table 1 Basic SAN GUARD functions

Functions	SAN GUARD II	SAN GUARD III	SAN GUARD IV
Automatic shutdown	◇	◇	◇
UPS automatic shutoff	◇	◇	◇
Integrated control	◇	◇	◇
User's command execution	◇	◇	◇
Status display	◇	◇	◇
History control	◇	◇	◇
Schedule setting	◇	◇	◇
SNMP compliance	-	◇	◇
Web browser compliance	-	-	◇
Cluster compliance	-	-	◇
E-mail transmission	-	-	◇
DHCP, DNS compliance	-	-	◇

4.2 LAN Interface Card

LAN I/F P is identical in shape to the serial interface and SNMP cards developed by Sanyo Denki as optional cards for the small capacity UPS "ASC." Mount either a Serial Interface card or SNMP card when using "SAN GUARD III," and mount the LAN I/F P in "ASC" when using "SAN GUARD IV." S112, a RISC chip with a high throughput capacity, is used for the CPU to realize functions using the LAN I/F P.

These functions were previously provided by the management software. Furthermore, multitask processing is executed by running on a realtime OS which eliminates the need for developing a dedicated application program.

Flash ROM is used for memory to enable updating the program. The possibility of remotely updating the program through the network helps to reduce the need of frequent maintenance services. The system can also quickly process the implementation of new standards related to networks and efficiently respond to users' demands for new functions.

4.3 UPS Management Software

The UPS management software is composed of a system management tool and a service program. Their configuration is shown in [Fig. 5](#):

4.3.1 System Management Tool

The system management tool is a program used for setting up various conditions for UPS management. It executes HMI including the display of monitoring and log data.

The program is configured in components by utilizing Active X and other technologies for the ease of development and the provision of flexibility to efficiently respond to future updating and to cope with emergency situations.

4.3.2 Service Program

The service program starts running in the background as soon as Window NT starts up to collect such data as the state of the UPS and measured values and record them in the log file.

It will also receive event data unsynchronously transmitted from the UPS to monitor the state of the UPS and to control the computer.

5. System Behavior

The behavior of the "SAN GUARD^{IV}" is explained below using [Fig. 6](#) for reference.

According to the Fig 6. diagram, information from 1 to 7 is transmitted and received among the UPS, computers 1 and 2, and the computer for UPS management for display and control purposes. Information contained in 1 to 7 is as follows:

1. A variety of controls such as shut down, etc. are always run from the LAN I/F P by using TELNET protocol.
2. UPS events such as a power failure or low voltage of battery are notified to the service program ("SAN GUARD^{IV}" protocol).
3. The system management tool defines relevant conditions such as the power failure delay time, scheduled operation time of UPS (LAN I/F P) and, at the same time, obtains UPS status ("SAN GUARD^{IV}" protocol).
4. The system management tool defines various conditions related to Computer 2 by using the system management tool and, at the same time, records events generated from Computer 2 in the log (DCOM).
5. Distributes trouble notices by E-mail (SMTP).
6. It defines various UPS conditions by using a Web browser (Java applet) and, at the same time, obtains UPS state data (HTTP and "SAN GUARD^{IV}" protocol).
7. The SNMP manager runs control and obtains data. Trouble notices are sent from UPS to the SNMP manager (SNMP).

6. Conclusion

The network system is progressing from day to day, increasing the importance of UPS which backs up the power supply of the system. In developing "SAN GUARD^{IV}," we have concentrated our efforts in order to make the system flexible and compliant with the ever advancing network system.

The tremendous speed of the growth of the network system, however, constantly surpasses our expectations and as a manufacturer aiming at developing UPS truly compatible to the network we must always pursue the subject and be certain what sort of UPS management system we should be able to offer.

We will keep on functionally improving our management system on the basis of "SAN GUARD^{IV}" and aim at offering effectively usable UPS management systems.

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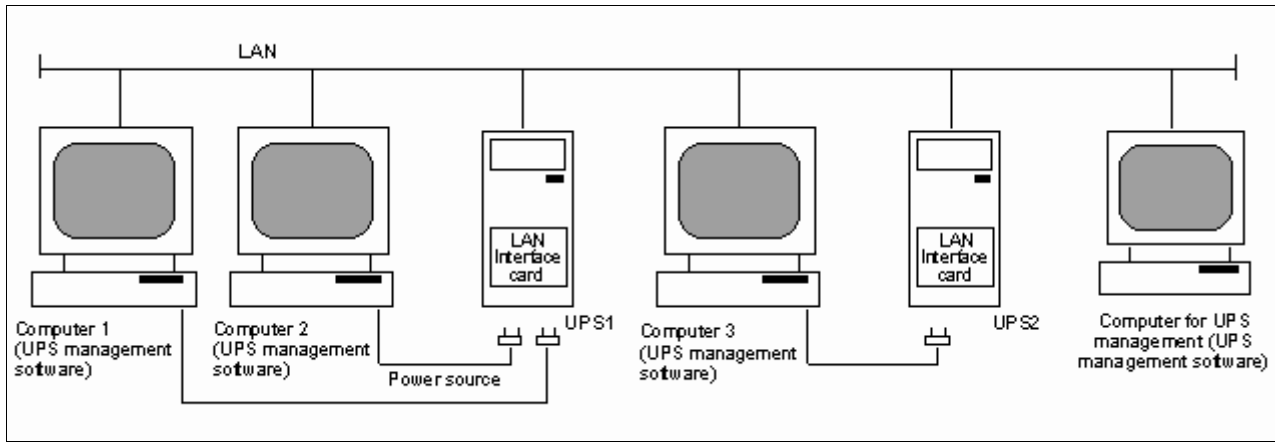


fig. 1 System configuration

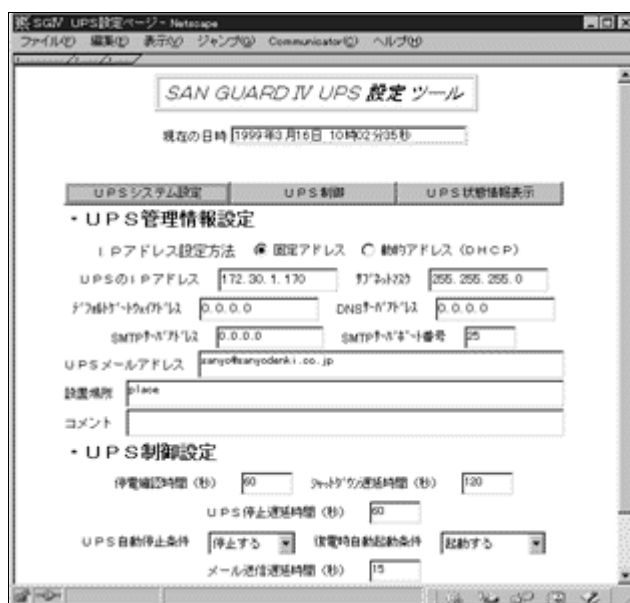


fig. 2 Example of a web browser screen

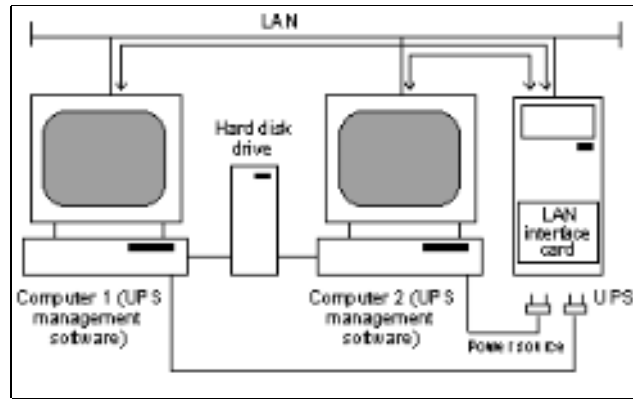


fig. 3 Applicaton to a cluster system

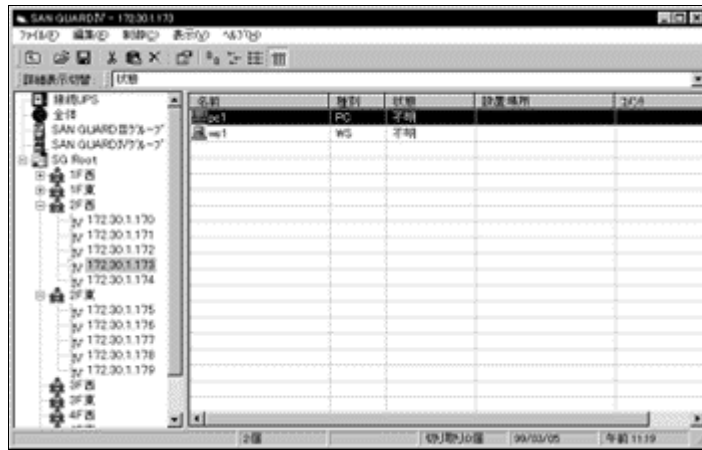


fig. 4 Example of a main screen

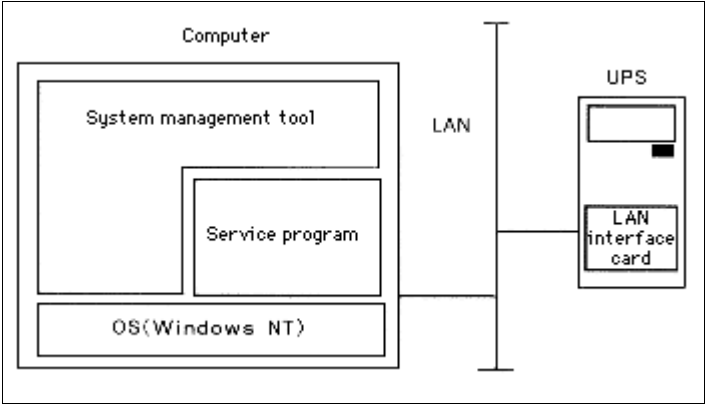


fig. 5 UPS managemant software configuration

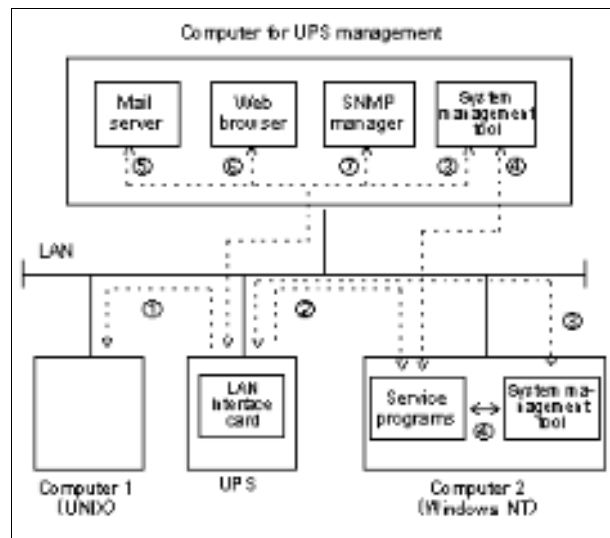


fig. 6 Operation description diagram