

# Present Status and Future Deployment of Remote Maintenance

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## Abstract

Trends in the usage of open system architectures and increasing system complications have been making it more difficult than hitherto to identify which device is faulty, the location of the problem and whether it is due to a hardware or software malfunction. Meanwhile, in order to enable stable system operation, it is essential to administer/manage the entire system and this is only possible by managing the configuration, performance and resource information of the system. This paper introduces the remote functions packaged in NEC products that have been designed to meet the above needs. The present status and future deployment of remote maintenance utilizing the TRS (Total Remote Support) infrastructure is also discussed.

## Keywords

remote maintenance, automatic alert, remote diagnostics, internet, operational monitoring, ITIL

## 1. Introduction

At NEC Corporation and NEC Fielding, Ltd., we have been deploying remote maintenance of hardware from servers (Express5800) to supercomputers to ensure stable operation of customer IT systems.

However, an increase in the number of computers employing open systems and also complicated systems has resulted in composite monitoring of information including OS and application running situations, configuration information, performance information, consumables/life expiration information and resource information in order to ensure stable operation of the systems. This paper introduces the present status and anticipated future deployment of remote maintenance that is essential for the stable operation and operational cost reduction of customer IT systems.

## 2. The Present Status of Remote Maintenance

Nowadays, if the service provision from a customer's IT system is stopped due to a problem the customer's business incurs immeasurable effects and will inevitably lose the confidence of the market. However, a huge expenditure on labor and costs is required for permanent monitoring of the normal operations of computer devices composing an IT system.

If "remote maintenance" is introduced, the normality of

computer devices is monitored for 24 hours a day and 365 days a year, thereby replacing the need for customer personnel and preventive maintenance is applied at the moment that a sign of trouble is detected. Critical system issues can thus be prevented before they occur.

### (1) History and Functions of Remote Maintenance

The provision of remote maintenance functions for NEC products began with the mainframe (ACOS) released in 1974. Since that time, the target models have expanded from supercomputers to servers, POSs and printers and maintenance functions have also been expanded for each computer device ( Fig. 1 ).

### (2) Remote Maintenance Functions Packaged in NEC Products

The system that was developed by NEC and NEC Fielding for implementing remote maintenance is called ALIVE (An

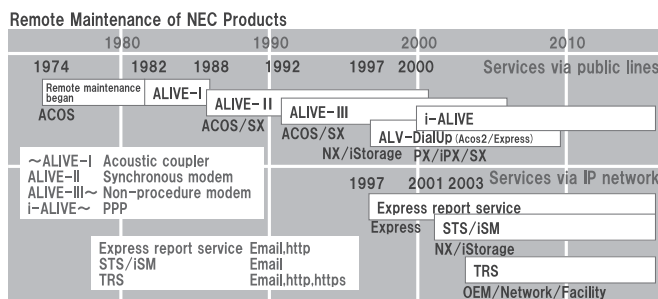


Fig. 1 History of remote maintenance of NEC products.

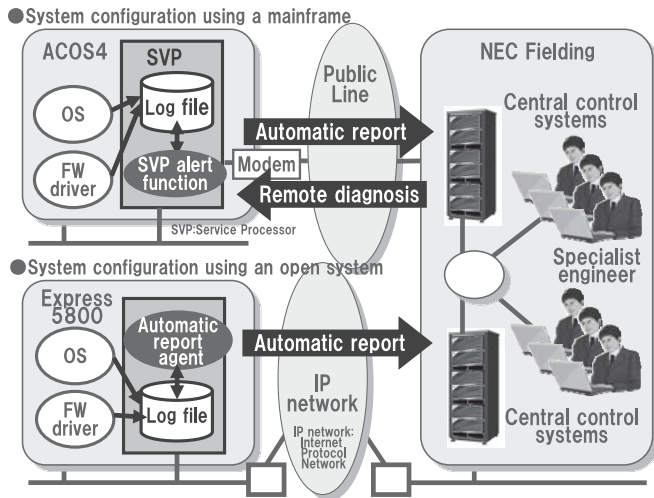


Fig. 2 Structure of ALIVE.

online versatile maintenance system), which is composed of the following two functions.

- 1) Automatic alert report function, with which the computer device detects its own troubles and reports to the central control system.
- 2) Remote diagnosis function, by which the central control system diagnoses the condition of computer devices remotely.

Mainframes (ACOS4), large storages (iStorage) and certain servers perform automatic alert report and remote diagnosis by means of the function called SVP (Service Processor) and public line networks as shown in Fig. 2. The automatic alert reported data is encrypted and a special protocol is used for communication with the central control system. In consideration of the security, the remote diagnosis function employs the callback method with which the central control system diagnoses the log stored in the SVP. With servers such as the NX7000/7700 and Express5800 or compact storages (iStorage), alerts are made via an IP network including the Internet and by using the mail protocol or HTTP (Hyper Text Transfer Protocol). Some products attach an error log to the alert.

### (3) Formation for Remote Maintenance

With regard to the current remote maintenance procedures, when a failure occurs with a computer device in a customer IT system, an alert is sent automatically to NEC Fielding. At NEC Fielding, specialists are permanently monitoring alerts. When an alert is received, it is analyzed using a case database in order to identify the cause and treatment

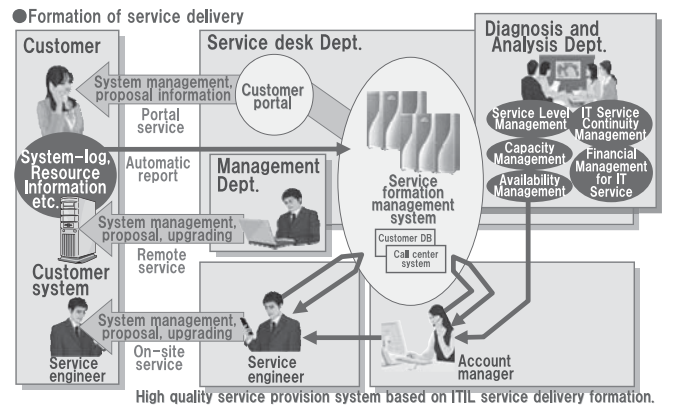
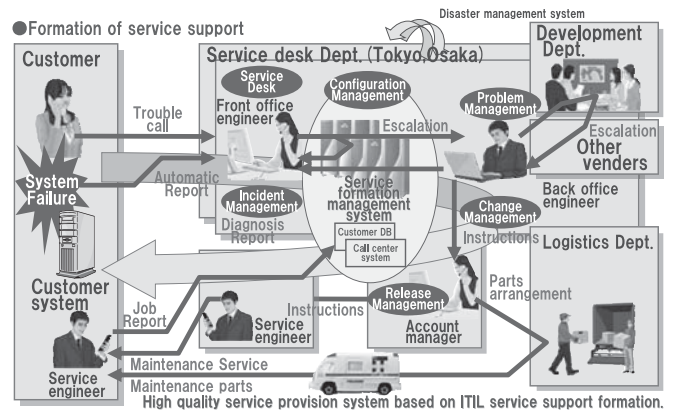


Fig. 3 Formation for remote maintenance.

of the trouble. Instructions are then sent to the maintenance station in charge of the customer. In a case for which a judgment is not possible exclusively via automatic alert reported data, remote diagnosis of the customer system are conducted in order to acquire information required for cause identification as well as to check the system status. Upon reception of the treatment method instructions, the service engineer proceeds to servicing in order to quickly recover the customer system. Fig. 3 shows the flow of the remote maintenance procedures.

## 3. Remote Maintenance Support Infrastructures

### (1) Issues of Remote Maintenance

Recent advances in applications of IT to customer businesses have made their systems more complicated than formerly. As a result remote maintenance needs to solve the

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following issues.

### 1) Need for the Service Management of the Entire IT System

To improve the availability of customer business services running on their IT systems it is necessary to manage the entire IT system providing the services, including the hardware, software and network.

### 2) Need for Configuration Information Management

A case in which the configuration is changed during operations makes accurate countermeasures impossible. In order to shorten the recovery time and to effectively manage the configuration information by preventing such a problem necessitates long hours until full recovery is completed.

### 3) Need for Performance Information Management

In order to implement customer business services running on an IT system at an optimum cost it is necessary to manage the capacity and performance for optimum operations without either insufficiency or excess of resources.

### 4) Need for Consumables/Shelf Life Expiration Information Management

Issues regarding the insufficient management of consumables and shelf life-expired articles are increasing and it is essential that they are managed with a well-scheduled maintenance program.

### (2) Construction of Remote Support Infrastructures

To solve the above issues, we have introduced the TRS (Total Remote Support) Infrastructure concept and arranged our development operations accordingly. The “TRS Infrastructure” is the generic appellation of the remote support infrastructures based on “Remote GateWay.” This is a system capable of monitoring/information collection of operational status, etc. of the customer’s system, the communication infrastructure connecting the customer’s IT environment to NEC Fielding and “Center GateWay,” which is the central control system for managing/analyzing collected data and distributing the results to the operations monitoring/management department.

#### 1) Remote GateWay

This system externally monitors and collects information from open system units that have difficulty in incorporating the RAS (Reliability, Availability and Serviceability) functions due to a reduction in price and increased universality. Fig. 4 shows the functions of Remote GateWay and Fig. 5 shows images of information collection. Remote GateWay has five main functions: The event reception function receives event information from the monitoring target devices and sends automatic alert reports to the

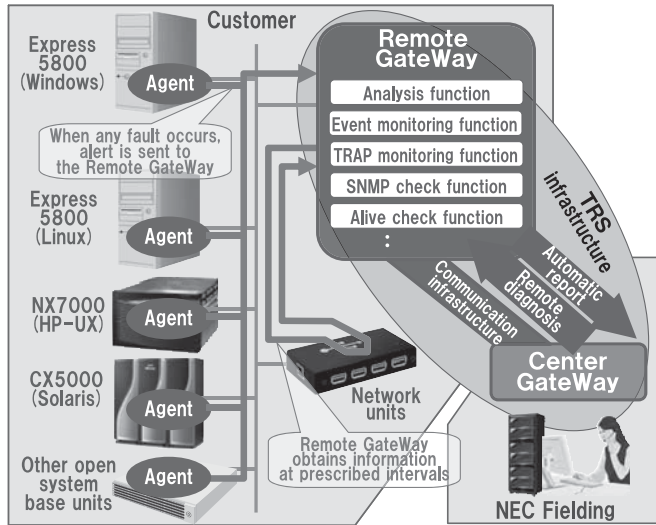


Fig. 4 Remote GateWay functions.

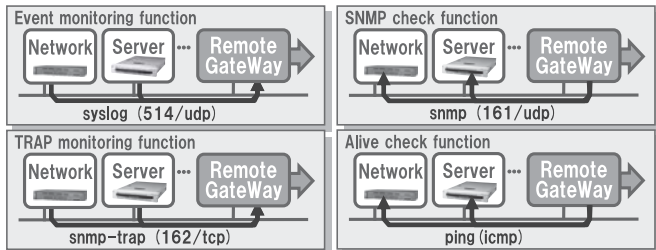


Fig. 5 Information collection of Remote GateWay.

Center GateWay according to the KDB (Knowledge Database) described for each device. The TRAP reception function monitors the TRAP packets output from the monitoring target devices and sends automatic alert reports according to the data in the KDB. The SNMP (Simple Network Management Protocol) check function obtains the performance and resource information at prescribed intervals based on the MIB (Management Information Base) information of the monitoring target devices based on the data in the KDB, and sends alerts if a threshold value is exceeded. The analysis function collects data based on the data in the KDB and analyzes the results. Finally, a live check function performs alive monitoring of target devices according to the parameters described in the KDB.

#### 2) Center GateWay

The Center GateWay features the various management functions required by the ITIL framework to manage the

complicated systems on a per-customer basis and to provide the remote support services cover for the operations domain. For the TRS Infrastructure we have adopted HTTP, HTTPS (HTTP Security) and SMTP (Simple Mail Transfer Protocol) as the communication protocols and have built remote support infrastructures that are highly secure, universal and extendible. The provision of remote services using these infrastructures enables integrated, simultaneous remote monitoring/management of customer system components. These include facility devices such as servers, storages, networks, power supplies and air conditioners and security products such as firewalls as well as middleware products and applications products.

### **(3) Features of Remote Support Infrastructures**

#### **1) Automatic Updating of Targets and Rules of Monitoring**

Remote GateWay notifies the Center GateWay of normal operation at constant intervals and at the same time confirms if there are commands to be executed on Remote GateWay itself. The commands automatically enable updating of monitoring target data (change of monitoring target devices) and acquisition/updating of monitoring knowledge DBs in monitoring the target devices. This feature enables dealing promptly with configuration changes and monitoring the item updating of customer IT systems.

#### **2) Management of Configuration Information**

Center GateWay is capable of extracting configuration information from the logs contained in periodical notifications received from Remote GateWay and other devices and managing the information by associating it with the customer information. This feature enables prompt and optimum failure treatment because the personnel in charge at a maintenance station or the support department can identify the latest configuration information of each customer in case any trouble occurs.

#### **3) Management of Performance Information**

The Center GateWay manages the CPU/memory/HDD utilization rates reported as performance information from each device and the response time of an arbitrary TCP port reported as performance information from the Remote GateWay as the time-series data of each customer. The Center GateWay generates graphs based on data for visualizing the daily system load and the performance saturation prediction. This feature enables optimum provisioning management of customer systems.

#### **4) Management of Consumables/Life Expiration Infor-**

#### **mation**

The Remote GateWay collects the consumables/life expiration information that is kept in the MIB of devices such as uninterrupted power supplies (UPS) and printers. It uses the SNMP and notifies the Center GateWay of the information. The Center GateWay identifies the models of the devices from the customer information and sends alerts for replacement of consumables/life-expired articles to the relevant personnel. This feature enables remote management of the consumables/life expiration information via the flow described above.

### **4. Services Utilizing the Remote Support Infrastructures**

At NEC Fielding, we deploy the “IT management service” and “operation monitoring service” utilizing the TRS Infrastructure for the remote monitoring/management of customer systems. These services are intended to remotely support the optimum operation of customer systems based on the ITIL concept. Utilization of the TRS infrastructure enables integrated monitoring of customer IT systems. It has the capability of identifying the degree of influence of an associated problem, the degree of the effect on customer services and the potential of identifying system bottlenecks. It is thereby enabled to maximize customer service continuity.

### **5. Conclusion**

Remote maintenance in the past has been focused on individual computer devices, but utilization of the TRS Infrastructure has expanded the target of management to the entire IT system including to the software, operations information and configuration information.

In the cloud computing environment and virtual systems that are expected to increase in the future, optimum resource allocation will be more important than ever for the normal operation of business applications.

In the future, we will enhance the remote maintenance function by means of the remote maintenance of computer device hardware and the management of configuration and performance information and of the TRS Infrastructures. The strengths of the NEC Group can thus also be manifested in the cloud computing environments and virtual systems. We believe that,

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thanks to resource optimization, our efforts will lead to the stable operation of customer IT systems as well as to reductions in the operating costs.

\*Windows is a registered trademark of the Microsoft Corporation in the USA and other countries.

\*Solaris is a registered trademark of the Microsoft Corporation in the USA and other countries.

### References

- 1) Ivor Macfarlane, Colin Rudd: "IT Service Management Pocket Guide," it SMF, ISBN 0-9524706-4-0 (2000)
- 2) Central Computer & Telecommunications Agency: "ITIL Service Support," CCTA, ISBN 0-11-330015-8 (2000)

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