

# Device Products Supporting M2M Services - Their Actual Applications

SUYAMA Takao, SUGAWARA Noburo, WATABE Tsutomu  
TAGUCHI Masayuki, KIZU Shuji, FURUNO Hiroyuki

## Abstract

The introduction and wireless implementation of M2M services offers four main advantages, these are; 1) saving of expenses; 2) improvement of work efficiencies, 3) reduction of CO<sub>2</sub> emissions and 4) creation of new services. This paper introduces the communication device products used in M2M services and discusses cases in which they are actually applied as well as some aspects of their future product planning.

## Keywords

M2M devices, PAU (PHS Access Unit), 3G communication unit, 3G adapter  
uM router, actual applications

## 1. Introduction

In collaboration with our customers, since the year 2000 NEC Magnus Communications has been accumulating much experience and expertise in the applications of PHS core technologies. These remote applications include: emergency call from elevator, gathering stock information of vending machines metering usages of gas, water and electricity and remote monitoring/periodical reporting of alarm information of in-premises facilities and office equipment, including their operational status and error logs.

In order to optimally meet the rapid growth of the M2M market, diverse communication technologies, diversifying services and use of IP, we are tackling the development of products and proposing solutions based on our accumulated resources.

Below, we describe our product lineup in the M2M device field and discuss actual examples of device applications as well as some aspects of product planning for the future.

## 2. PAU Products

The PAU (PHS Access Unit) products are able to reduce the running costs required for remote monitoring of industrial equipment significantly, by applying the PHS tele-metering service. These products also enable construction of effective remote monitoring systems in simplifying the installation work by the use of wireless communication.

The PAU series products are categorized as the analog PAU, equipped with a two-wire telephone interface, and the data PAU equipped with the RS-232C interface.

### 2.1 Features of the Analog PAUs

The analog PAUs (PAU-20 series) is a protocol converter for use with analog terminals in the PHS network ( **Photo 1** ).

Changing the connection of a terminal that has previously been connected to the telephone circuitry to the PAU enables wireless communications (voice calls, pseudo voice communications) via the PHS network.

The main features of this product are as follows:

- Waterproof type (The internal boards are damp-proof.)
- Two-wire interface
- Pseudo voice communications capability (data communication at 9,600 bps)



Photo 1 PAU-20 series.

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- No ring compatibility
- Outside antenna compatibility
- Built-in battery model: Operation for a certain period of time under power outage conditions
- Selection of public, private or transceiver modes

### 2.2 Features of the Data PAUs

The data PAU products (PAU-70 series) include two models, the equipment-embedded type module and the module incorporating the RS-232C compliant D-sub 9-pin interface (Photo 2).

These models are capable of wireless communications in the 32 kbps packet, 32/64 kbps PIAFS, transceiver and transceiver group modes, and their main features are as follows:

- Compact size and light weight suitable for embedding in equipment
- Low current drain (Battery drive compatibility)
- RS-232C compliance
- Outside antenna compatibility
- Contact input/output interface compatibility

#### (1)PIAFS communication

With PIAFS communication, origination and reception of calls are possible both at the center and terminals. Data communication via the PHS network is implemented by interconnection via TA with built-in PIAFS.

#### (2)Packet communication

With packet communication, only the call origination from terminals is possible. However, if the system is built using the WakeOn service provided by Willcom, Inc., the remote startup of terminals in the standby status can be controlled from the center.



Photo 2 Embedded type module (left) and D-Sub 9-pin type module (right).

#### (3)Direct communication between P2P terminals

Communications are possible free of charge using the private, transceiver or transceiver group mode. The standard communication range is 100 meters max., in the line of sight.

### 2.3 Actual Application of the PAU Series

#### (1)Emergency reporting/remote monitoring of elevators

The PAU series is used in emergency reporting in the case of close in due to a disaster or malfunction and in remote monitoring (Fig. 1).

The PAU series enables wireless communication without altering the existing center or the terminal equipment that was originally designed for wired telephone communications. This enables reductions in the installation costs and the payment of basic charges, and leads to a reduction in the running costs each month.

#### (2)Remote meter reading, remaining level management and gas cock opening/closing for LP gas systems

This system can read the meters etc. automatically from a remote location of LP gas supplies (Fig. 2).

Improvements in the meter reading job efficiency as well as for supply planning. This system can reduce the meter reading costs as well as CO<sub>2</sub> emissions.

In case of an emergency such as a gas leak, the gas cock can be closed or opened remotely in order to improve operational safety aspects.

#### (3)In-home nursing care call system

This system has been built for smooth operation of night-time-compatible visiting home care attendant services so that it is easy to use by aged persons and also that the person in charge of reception can apply any necessary measures instantly. The PAU modules are incorporated in the care call terminals (emergency report equipment) at the homes of users in order to eliminate telephone circuit installation work

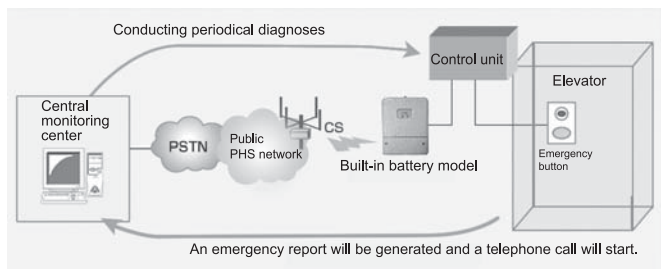


Fig. 1 Emergency reporting/remote monitoring system for elevators.

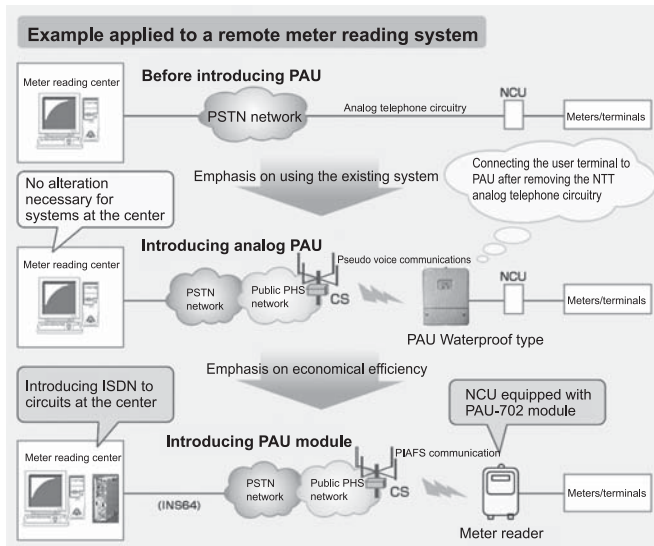


Fig. 2 Example of remote meter reading system configuration.

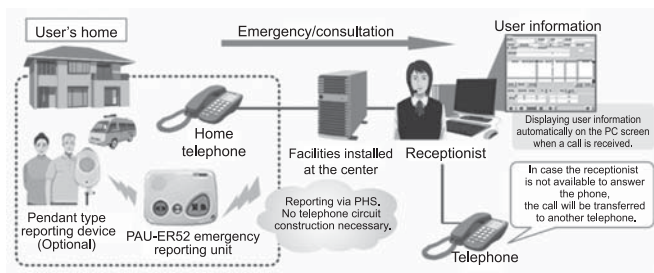


Fig. 3 Example of care call system configuration.

and to enable ease of system installation ( Fig. 3 ).

At present, we are commissioned to develop a new reception system compatible with the nursing care insurance system reform that was scheduled in FY2012. We are also developing new services to support the nursing care businesses of the future in collaboration with the relevant business carriers.

#### 2.4 An Estimation of Communication Cost Reduction

Assume that there is a system that pays a total phone cost including the basic circuit charge and communication fees of 2,800 yen per month (with 30 local calls lasting less than 1 minute placed daytime on weekdays per month). Using the PHS telemetry service the telephone equipment of this sys-

tem is replaced with the PAU module, the communication costs may then be reduced by 1,500 yen, because the total monthly payment becomes 1,300 yen (700-yen basic charge + 600-yen communication fees). The projected effects vary depending on the frequency of calls, the lengths of calls and the number of circuits.

### 3. 3G Products

We joined the 3G market in FY2009 in order to exploit our PAU series technology and operating expertise. We are introducing our products in response to the needs of the market and customer requests and as a dead zone countermeasure to serve locations that were not previously coverable.

#### 3.1 Trends in 3G Technology, Selection of Communication Modules

The 3G technology has recently been making rapid progress aiming at increasing Internet access speeds via cellular networks. Various services have already been started using the 3G data communication.

Communication modules compatible with the 3G network vary greatly between module vendors in functions, interfaces and sizes. Appropriate models should therefore be selected according to the specific applications purposes. We believe that new products as well as new markets can be pioneered by making full use of the technologies and functions of communication modules and by interfacing them with traditional technologies.

The trend toward standardization can be expected to gain pace in the future following the advancement of SIM free mobile phones.

#### 3.2 Functions and Features of the uM Router

The uM router available today is a dial-up router incorporating the FOMA Ubiquitous Module of NTT DoCoMo, Inc. ( Photo 3 ).

Its main features are as described below.

##### (1) Dial-up router equipped with three LAN ports

It can transfer packets with different destinations simultaneously and is therefore compatible with services holding communications with multiple servers. The auto IP address allocation and the port-level address conversion functions enable simultaneous communications of multiple terminals.

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### (2) Security measures

The packet filtering function shuts out attack packets including network crank packets.

### (3) Remote maintenance function

After installation of terminals, their communication destinations and settings can be changed and the software can be updated remotely. The maintenance center can deliver related information automatically to all of the uM routers, so that optimum after-sales maintenance is possible.

### 3.3 Actual Applications of uM Router

#### (1) E-money payment service for vending machines

We have implemented an e-money payment service for vending machines by combining the uM router with a multi-reader/writer and connecting them to a multi-service gateway center ( Fig. 4 ).

#### (2) Authentication service for a quick charger and e-money payment service

The uM router is adopted as the communication unit of an authentication system for a rapid charger constructed by



Photo 3 uM router.

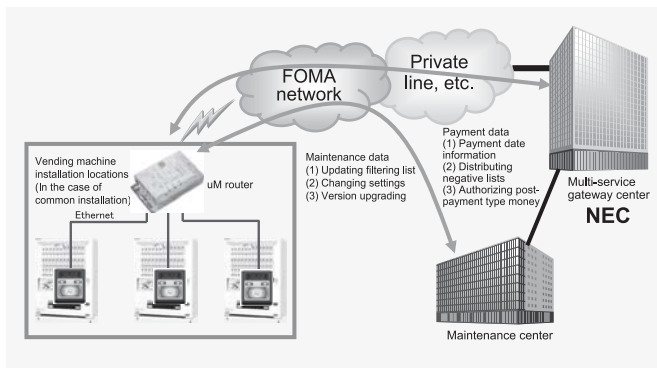


Fig. 4 Outline of e-money payment system for vending machines.

NEC Corporation in an experiment demonstrating electric vehicle infrastructures, as well as for electronic payment systems.

### 3.4 Product Plan for 3G Communication Units

Although the existing uM router supports only those communications based on LAN connections, the next-generation product will be equipped with various interfaces and functions so that it can be applied in more markets by making use of various communication module functions ( Photo 4 ).

#### (1) Standard equipment

- LAN interface (3 ports)
- RS-232C compliant D-Sub 9-pin interface
- Easy setting using the built-in setting GUI
- Enhanced router functions (VPN setting, multiple APN settings, etc.)
- Remote maintenance
- High-gain antenna

#### (2) Optional equipment

- Voice interface (Earphone/microphone jacks)
- USB interface (Connection of GPS, etc.)
- Wireless LAN (IEEE802.11 b/g)

We are also planning the release of a low-priced 3G adapter that is compatible exclusively with the RS-232C compliant D-Sub 9-pin interface.

### 3.5 Product Roadmap

As market needs for higher speeds and global compatibility are expected to increase in the future, we are planning to develop products that can meet customer requirements. These will include those incorporating HSDPA and GSM modules and those with gateway facilities for use in digital signage and xEMS (x Energy Management System (x: Building/Community./Factory/Home) ( Fig. 5 ).



Photo 4 uM router incorporating various interfaces and functions.

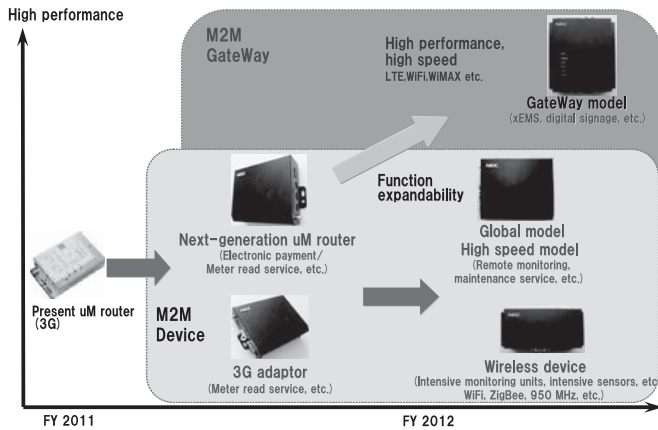


Fig. 5 Product roadmap.

**KIZU Shuji**

Manager  
2nd Sales Department  
NEC Magnus Communications, Ltd.

**FURUNO Hiroyuki**

Engineering Manager  
Engineering Department  
NEC Magnus Communications, Ltd.

**4. Conclusion**

Aiming at creating new businesses in the M2M market, we intend to enhance the lineup of M2M devices and we will also make proposals targeting even those areas outside the M2M device sector. This will be achieved by implementing proposals for optimum circuits as well as for the applications and M2M platform sectors.

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**Authors' Profiles**

**SUYAMA Takao**

Department Manager /2nd Sales Department  
2nd Sales Department  
NEC Magnus Communications, Ltd.

**SUGAWARA Noburo**

Manager  
2nd Sales Department  
NEC Magnus Communications, Ltd.

**WATABE Tsutomu**

Expert  
2nd Sales Department  
NEC Magnus Communications, Ltd.

**TAGUCHI Masayuki**

Engineering Manager  
Engineering Department  
NEC Magnus Communications, Ltd.

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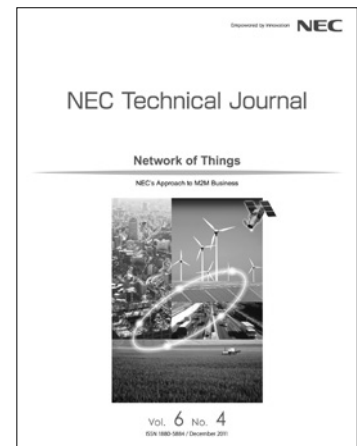
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**December, 2011**

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