M2M Cloud Computing for Realization of Inter-Business Solutions

KIMURA Satoshi, HOSHI Kaichi

Abstract

The increasing diversification and complexity of customer needs in today's business environment has led to the study of Inter-Business Solutions that integrate different business fields in various industry sectors. As the use of open sources and cloud computing becomes more prevalent, integration of different systems and services is becoming easier. In this environment, M2M Cloud Computing can be considered as one of the crucial IT infrastructures for achieving Inter-Business Solutions, and beyond to Cross-Industry Solutions. This paper introduces our observations regarding the current spread of M2M services in accordance with the needs of customers and society in general, as well as the challenges that we face in order to realize Inter-Business Solutions through M2M Cloud Computing.

Keywords

M2M cloud computing, inter-business solutions, cross-industry solutions
information distribution infrastructure

1. Introduction

As customer needs become increasingly diversified and complex, a closed system that delivers value only among specific business fields, is becoming insufficient. And as the use of open sources and cloud computing becomes more prevalent, Inter-Business Solutions that span different business fields are being considered, going beyond the scope of that is currently occurring in the finance and distribution businesses, etc.

One important factor in achieving Inter-Business Solutions is the necessity of an "information distribution infrastructure" serving as the common axis when attempting to integrate different business fields. CONNEXIVE M2M Cloud Computing (hereinafter called M2M Cloud Computing) will be the foundation for realizing various Cloud Services. These are achieved by collecting, consolidating, processing and sharing data acquired from enormous amounts of wide-ranging devices (e.g. sensors, information terminals, machines, facility equipment, etc.) that are linked to the Center via network. Sharing data among different business fields results in the "information" that serves as the common axis to facilitate the integration of those different business fields. As of late, M2M Cloud Computing has gained recognition as one of the crucial IT infrastructures for achieving Inter-Business Solutions.

The second chapter of this paper deals with the demands of customers and society in regards to M2M Cloud Computing, and the third chapter discusses current M2M service examples and future possibilities for M2M Cloud Computing in Inter-Business Solutions. In the fourth and last chapter, we talk about the challenges involved with achieving Inter-Business Solutions through M2M Cloud Computing.

2. Business Environment Surrounding M2M Cloud Computing

In addition to environmental issues (such as CO_2 reduction), the earthquake and tsunami disaster in northeastern Japan cause much interest in Energy Management System (EMS), and various undertakings have begun. The demands for EMS have broadened from the being valued as an independent system (e.g. energy saving as a single system) to being valued as part of a region comprised of various systems (energy optimization on a regional basis). In other words, Inter-Business Solutions are being contemplated with "energy" as the common axis.

Not limited to the example of EMS, in various business fields, systems are being studied from the standpoints of both conventional style "individual optimization" which emphasi-

zes the independence and uniqueness of systems, and "total optimization" which offers cooperation and unity based on the idea of open systems linked by a common axis.

M2M Cloud Computing needs to play a pivotal role as a hub for data and as the information distribution infrastructure for integrating various different business fields and systems. By playing this role, M2M Cloud Computing will be able to offer both "individual optimization" and "total optimization". The following requirements need to be considered in the acquisition, consolidation, processing and sharing of data with M2M Cloud Computing.

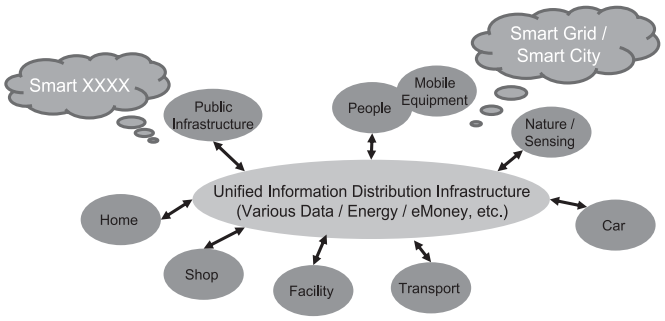

Fig. 1 Information distribution infrastructure image.

(1) Data acquisition and consolidation
Device (terminal) interface standardization, Real-time data acquisition, Security management, Reliability management, etc.

(2) Data processing
Large volume data processing, Analysis, Prediction and Prevention, etc.

(3) Data sharing
Database management, Application interface standardization, etc.

Fig. 1 , by linking various things and realizing a unified information distribution infrastructure for different types of data, energy, and eMoney, it is expected that new worlds of "Smart XXXX" will develop much in that way that Smart Grids and Smart Cities developed with "energy" as their common axis.

3. M2M Service Examples

Current M2M services can be divided into major categories as shown in **Fig. 2** .

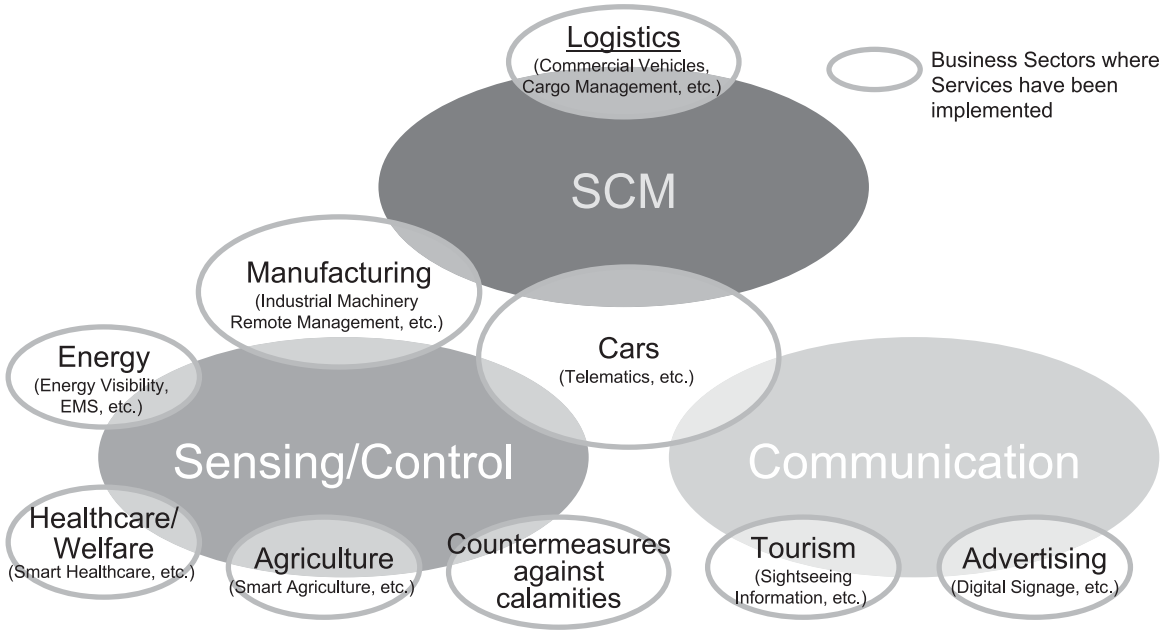

Fig. 2 M2M service breakdown (example).

(1) SCM (Supply Chain Management)
Equipment running and maintenance management services as part of a manufacturer’s SCM system, as represented by Manufacturing (Industrial Machinery Remote Management, etc.).
(2) Sensing/Control
Equipment monitoring and operation services, etc., as represented by Energy (Energy Visibility, EMS, etc.) and Agriculture (Smart Agriculture, etc.).
(3) Communication
Information provision services, etc. as represented by Advertising (Digital Signage, etc.).

As Fig. 2 shows, in addition to various businesses implementing M2M services, there is also an increase in cases where services combining SCM, sensing/control and communication are implemented, such car-related M2M services.

Based on the example of the car, we will offer specific explanations regarding M2M services. As part of telematics services, currently the car (on board unit) and Center communicate wirelessly via 3G network, etc., and are providing the following services.

(1) SCM
Vehicle remote maintenance (fault diagnosis, software update), Vehicle operation management, etc.
(2) Sensing/Control
Vehicle data management, EV battery data management, Remote security (car theft prevention) etc.
(3) Communication
Provision of traffic information and various multimedia services, etc.

What’s more, as seen in the “Next Generation Energy and Social System Demonstration Project” being promoted by the Japanese Ministry of Economy, Trade and Industry (at Yokohama City in Kanagawa Prefecture, and Toyota City in Aichi Prefecture) since 2010, we are witnessing the spread of car services being provided as part of a social system. This includes providing value through integration with various systems surrounding the car when we consider the actual activity pattern of cars and their users, in addition to more traditional services geared around enhancing the value of the individual car as a mode of transportation. To be specific, as **Fig. 3** shows, the various system surround the car are integrating through

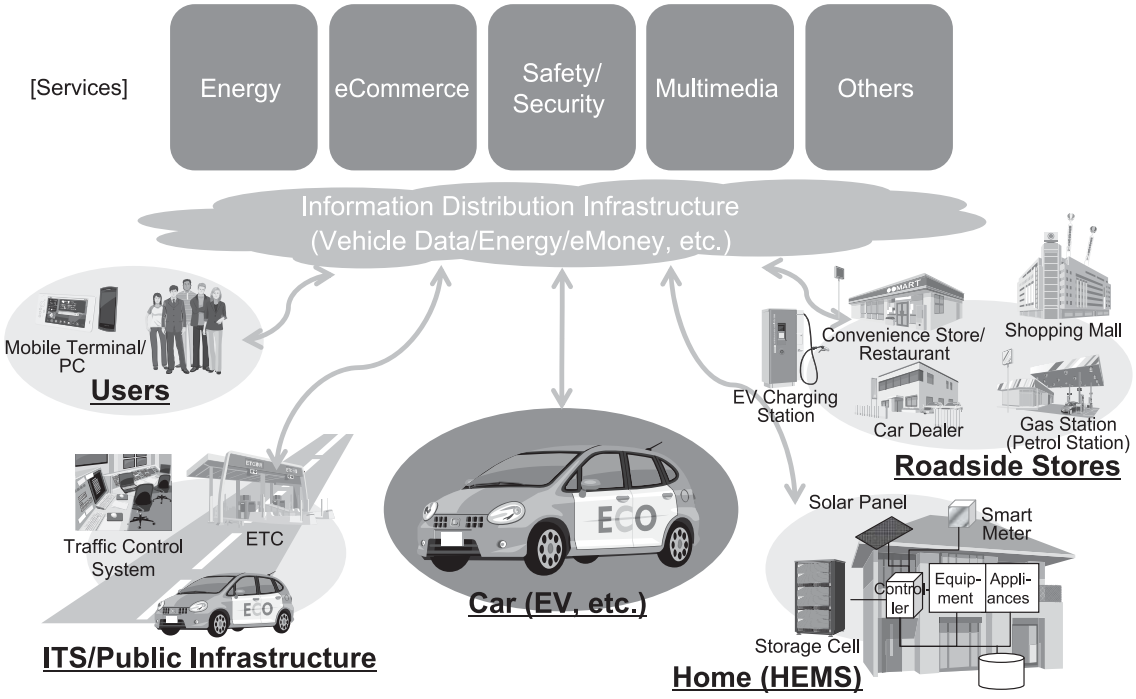

Fig. 3 Cars and systems surrounding them (example).

information distribution infrastructures, and are providing various forms of value by sharing a common axis (such as energy, ecommerce, safety/security, or multimedia).

- **Energy**

  Integration of Electric Vehicles (EV) and homes in terms of energy (electricity) (such as capacitor management using EV and HEMS (Home Energy Management System)).

- **eCommerce**

  Integration of cars and roadside stores through information provision services (such as ad distribution of roadside stores to on board unit, electronic payment for purchases).

- **Safety/Security**

  Integration of cars and traffic information, safe driving support and disaster information via ITS (Intelligent Transport Systems) and public infrastructures. (such as disaster information service to car navigation system)

- **Multimedia**

  Integration of cars and multimedia services using mobile terminals and PCs (such as data sharing by connecting a digital audio player or smartphone to the on board display unit).

Especially with cars, more dynamic information distribution can be achieved through real-time acquisition, consolidation, processing and sharing of data (vehicle sensor data, passenger data, etc.) from among the vast amount of vehicular data that exists. This embodies the possibility of realizing totally new Inter-Business Solutions in business fields that have not even been considered yet.

As seen with the car example, M2M Cloud Computing can play a role as the unified information distribution infrastructure for a number of common axis groups, to deliver various types of value through various common axis groups, by integrating different systems from different business fields. In other words, there are high expectations for it in the realization of Inter-Business Solutions.

4. Challenges for Achieving Inter–Business Solutions

In order the realize and expand our Inter-Business Solutions through M2M Cloud Computing, we will need to separately address the issues in the areas of "technology," "global standardization," and "market," then undergo a matching development process.

"Technological challenges" would include, in addition to the acquisition/consolidation/processing/sharing of data mentioned earlier, these issues: 1) accommodation of evolving ICT era; 2) accommodation of open sources; 3) establishment of a logical architecture that accommodates differentiation of competitive and non-competitive areas. Differentiation of permanent and variable (plug-in) functions should also be addressed as M2M Cloud Computing functionality. It is especially important for the third item, the establishment of logical architecture, which we standardize among the various different systems and business sectors when developing Inter-Business Systems.

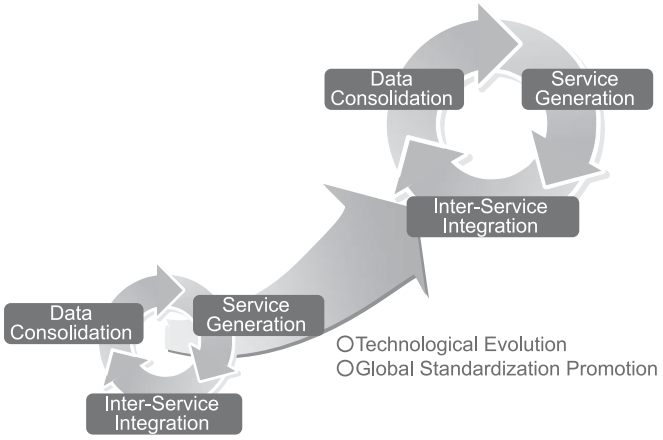

Fig. 4 Market development process.

For "global standardization," it is necessary to standardize device interfaces and application interfaces to facilitate the integration of devices and applications, in addition to the aforementioned architecture standardization.

As for "market," as a prerequisite to establishment of each service's business model, it will be necessary to: 1) consolidate data from mass acquisition; 2) generate new services from consolidated data; 3) form a "loop" of generating new services by using inter-service integration and establish business. As shown in **Fig. 4** , it is necessary to technologically evolve the market "loop," and further enlarge this "loop" using global standardization as the driving force.

5. Conclusion

In order to realize an M2M-based vertical business model from device (terminal) to service, M2M Cloud Computing accommodates: 1) a wide variety of device connectivity; 2) mass scalability as a foundation for networks and services; 3) expandable and flexible services that evolve with the times and

changes in service styles. It also has the potential of adapting to global and other wide-region businesses and services. M2M Cloud Computing, which plays an important role in the acquisition, consolidation, processing and sharing of data, is thought to be one of the most crucial IT infrastructures in realizing Inter-Business Solutions and leading to Cross-Industry Solutions by reinforcing the bonds between business fields.

Through M2M Cloud Computing, it will be possible to achieve a vertical style business in a wide range of fields and services, and to link them together laterally through their common axis. In the process of linking them together, through collaboration among different business fields, various types of “Smart XXXX” can be realized, evolving eventually into one of the core infrastructures that will support the Smart City.

Authors' Profiles

KIMURA Satoshi
Senior Manager
New Business Promotion Division
Sales Business Unit

HOSHI Kaichi
Chief Manager
New Business Promotion Division
Sales Business Unit

Information about the NEC Technical Journal

Thank you for reading the paper.
If you are interested in the NEC Technical Journal, you can also read other papers on our website.

Link to NEC Technical Journal website

Japanese

English

Vol.6 No.4 “Network of Things”

Vol.6 No.4
December, 2011

Special Issue TOP