

# Special Article on Operation System

## Operation System Development Trends in DoCoMo

### — Towards Efficient Operation of Networks and Improvement of Service Quality —

Mobile telecommunications networks are becoming increasingly large scale and complicated along with the rapid market penetration of mobile phones and the diversification of services. In light of these rapid changes, the OPS (Operation System) is becoming increasingly important in terms of ensuring efficient network operation, and improving the quality of telecommunications, as well the services provided to customers.

Meanwhile, there is heightened interest in the direction of OPS in research on IMT-2000 (International Mobile Telecommunications-2000) aiming for global mobile multimedia telecommunications.

This paper explains the current status and challenges regarding OPS within DoCoMo, and our basic thinking, architecture, and process for OPS enhancement.

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## 1. Introduction

The rapid market penetrations of mobile phones and increase in traffic have necessitated a massive deployment of network elements. Service enhancements, such as the introduction of packet telecommunications and i-mode, have also resulted in the use of various types of network elements. Furthermore, IMT-2000 is due to begin operation in Spring 2001. Further enhancement and improvement of performance of the OPS (Operation System) will be required to meet of these network elements.

This paper explains DoCoMo's basic thinking, architecture, and process for OPS enhancement in light of the current status and challenges regarding OPS within the company.

## 2. Current Status of DoCoMo OPS

### 2.1 Characteristics of Current OPS

After DoCoMo was established as a new company in 1992, it launched the general OPS for mobile telecommunications, as a system for centralized supervision in response to the requirements of regional companies, in order to further increase operation efficiency and improve the services provided to customers.

An overview of the system configuration of the OPS is shown in Figure 1. The characteristics of the OPS are as follows :

- (1) Use of data forwarding network and servers for device management made centralized supervision and control of NE (Network Elements) possible over a wide area.
- (2) Use of a common platform with common protocols and screen displays for OPE (Operation Equipment) and management servers made it possible to operate all NEs with one OPE.
- (3) Centralized display of major alarms of NE, and real-time supervision of traffic conditions of transit circuits through the monitoring of common channel signaling were developed as network management capabilities, making it possible to monitor the traffic conditions of the network.

### 2.2 Issues pertaining to the current OPS

Various issues pertaining to the current OPS have arisen with the increase in telecommunications elements accompanying the rapid growth in the number of customers and the deployment of new elements for packet telecommunications, etc.

The issues that have arisen in terms of operations include the following :

- ① Fault isolation is time consuming since the alarms between devices are inadequately coordinated.

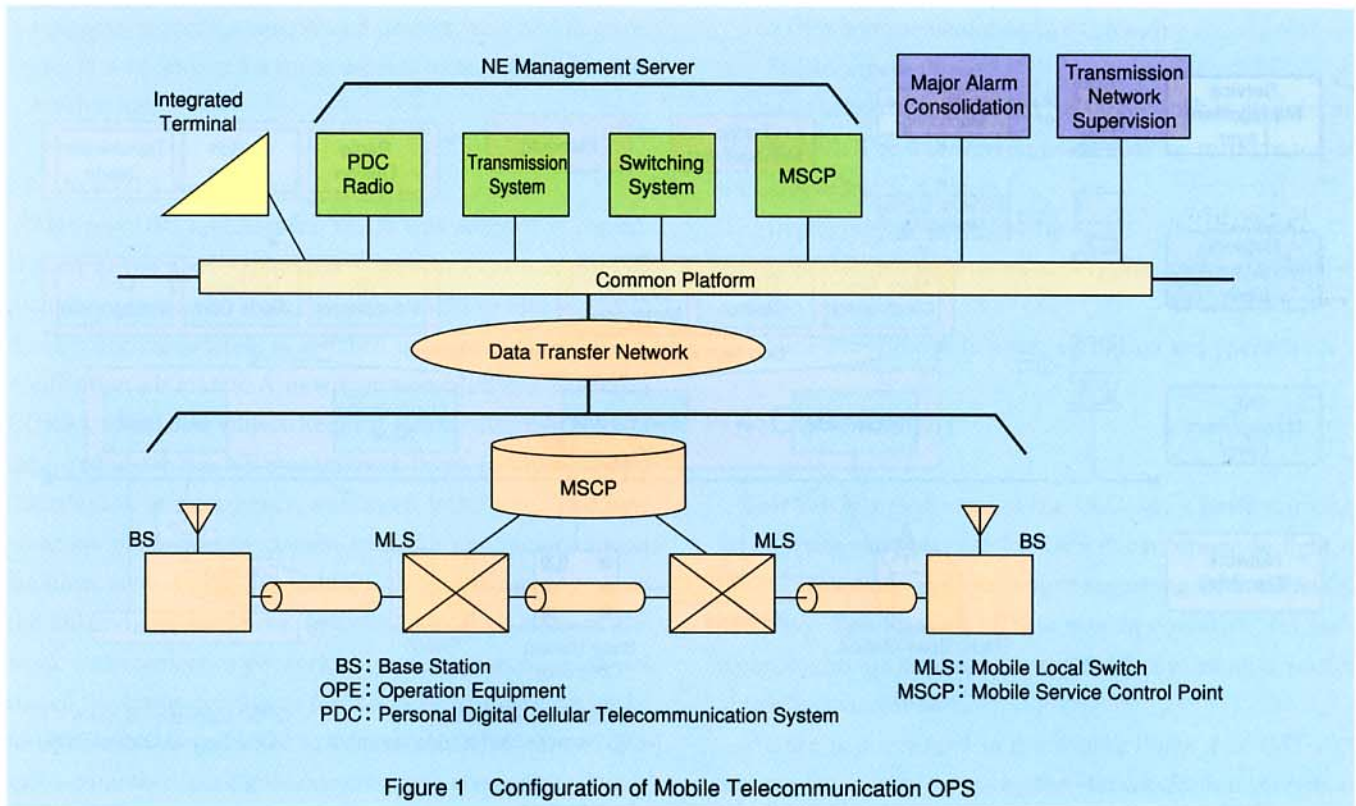


Figure 1 Configuration of Mobile Telecommunication OPS

- ② Congestion can not be effectively restricted and controlled since the monitoring of the total traffic conditions of both the radio and core networks is inadequate.
- ③ Double entry and double management of some data occur since the OPS and element design systems are constructed separately.

The system that was developed eight years ago is now encountering the following two problems : ① The platform is reaching its performance limit as the network scale increase ; and ② the utilization of effective middleware has been difficult which has hampered the efficiency of development and maintenance.

### 3. Enhancement of the OPS

#### 3.1 Our Thinking with regard to Enhancement

Table 1 lists the desired enhancements of the OPS. In order to enhance its services and accommodate the rapid increase in subscribers, DoCoMo is deploying NMLS (New Mobile Local Switch) and NMSCP (New Mobile Service Control Point) compatible with its PDC (Personal Digital Cellular Telecommunication System), as well as expanding its PDC Packet facilities. Furthermore, since the IMT-2000 network is due to be deployed in Spring 2001, it is preferable that the enhancement of the OPS be carried out in conjunction with these development activities. The following matters

Table 1 Desired Enhancements for Current OPS

Operations	Fault Management	Shortening of time required to isolate faults Enhance supervision of service status
	Performance Management	Real-time congestion control based on traffic data Notification of service status to customer support
	Configuration Management	Shortening of provisioning operations (Flow-through of site construction and retrofitting work)
System		Improved performance and capability of the platform

need to be considered with regard to OPS enhancement :

- (1) DoCoMo is using multiple vendors for its main telecommunication elements in order to reduce costs and increase reliability. The OPS must be configured to handle a multi-vendor environment.
- (2) Total centralized management of both the existing and new networks is desirable.

A new platform that is compatible with the current OPS needs to be adopted.

- (3) The TMF (Tele Management Forum) and other bodies are in the process of developing models for business processes and adopting a framework for telecommunication platforms. And now there is remarkable technological

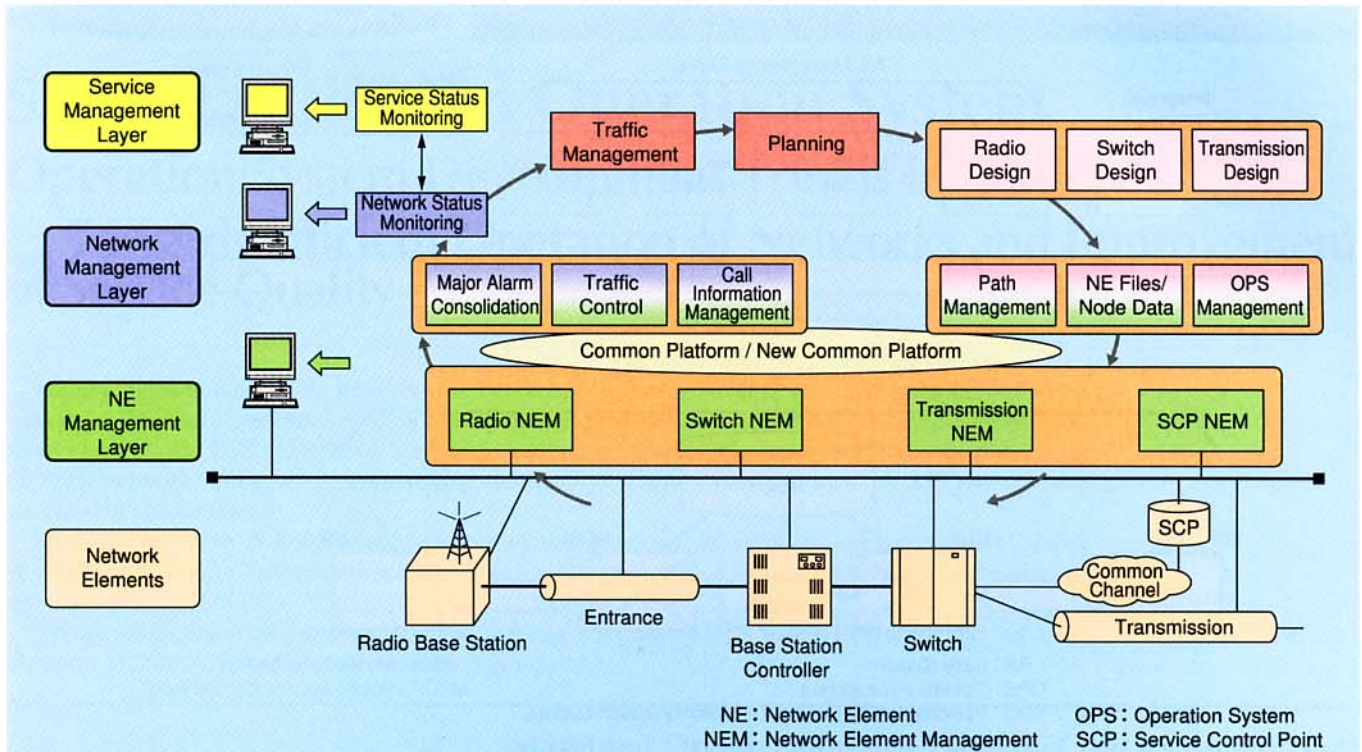


Figure 2 New OPS Architecture

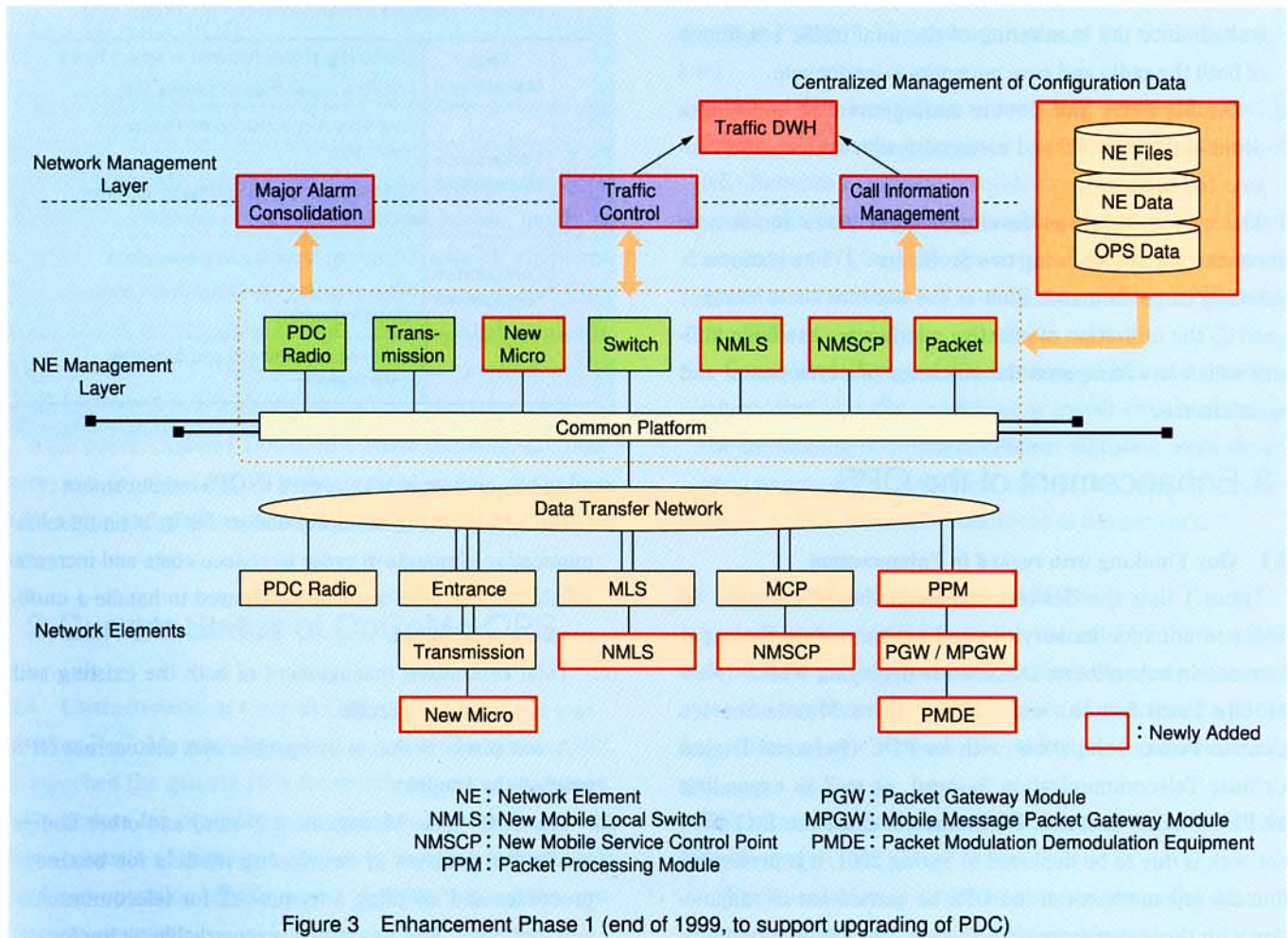


Figure 3 Enhancement Phase 1 (end of 1999, to support upgrading of PDC)

progress regarding distributed objects, and middleware, etc. It is necessary for these aspects to be reflected in the mechanism.

### 3.2 New OPS Architecture

The new OPS architecture, which was adopted in consideration of the above issues, is shown in Figure 2. An NE management server, under which a multi-vendor environment is accommodated, is installed to manage the telecommunication elements. A new common platform based on CORBA (Common Object Request Broker Architecture) is deployed above the NE management layer, providing a data distribution infrastructure with open interfaces. The new common platform can coexist with the previous common platform, allowing the general OPE to centrally manage both the old and new networks. In order to achieve efficient network management, a network supervision capability allows the all the traffic conditions for the radio and core networks to be monitored, and a traffic control capability allows NE's to be controlled during device failure or congestion. A data warehouse for centralized management of network traffic is established to achieve consolidated management and to allow flow-through in day to day quality management operations, as well as in equipment planning and equipment design.

### 3.3 Process of Enhancement

The enhancement of the new OPS is to be divided into two stages in terms of timing for the deployment of telecommunication equipment.

#### (1) Enhancement Phase 1

This is an enhancement in line with upgrading of the PDC and PDC packet networks. The management capabilities given below are to be deployed by the end of 1999. An overview of the system configuration at this phase is given in Figure 3.

- ① Deployment of a Network Element Management OPS supporting new nodes (NMLS, NMSCP) and PPM (Packet Processing Module), PGW (Packet Gateway Module), MPGW (Mobile Message Packet Gateway Module), and PMDE (Packet Modulation Demodulation Equipment) in response to upgrading of the PDC network infrastructure.
- ② Deployment of OPS for traffic-control and traffic-data management.
- ③ Deployment of an OPS supporting centralized management of file/node data for improved provisioning capability

and OPS management data flow-through.

#### (2) Enhancement Phase 2

The enhancement of the IMT-2000 network is planned for Spring 2001. The following upgrades will be made based on the achievements of Phase 1.

- ① Deployment of new platform.
- ② Improvement of network supervision and service supervision capabilities.
- ③ Data flow-through to planning, design and operation.

## 4. Conclusion

This report has discussed the DoCoMo's basic thinking, architecture, and process for OPS enhancement in light of the current status and challenges regarding OPS within the company. The Phase 1 OPS is now in operation. Its main technologies are explained in more detail in another section of this Special Article.

We are now engaged in developing Phase 2 of IMT-2000 and we are closely following the standardization process of 3GPP. We hope this will allow us to further improve the operation efficiency and service quality.

### References

- [1] Nishikawa, et al., "Construction of General OPS for Mobile Telecommunications," NTT Technical Journal, Vol.4, No.7, pp.77, 1992.
- [2] Nishikawa, et al., "Mobile Transit Network Traffic Operation System," NTT DoCoMo Technical Journal Japanese Version, Vol.2, No.2, pp.32-36, July.1994.