

Introduction of platformOVIA – A Semiconductor Solution Platform

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Abstract

The platformOVIA is a semiconductor solution that systematizes LSIs optimized for mobile devices, digital AV devices and automotive information systems with the OS or middleware, which is the basic component of a system's configuration. It features standardization of the multimedia processing interface to enable the most advanced IP available in the IT industry and pre-integration to enhance the product development capabilities of users. platformOVIA represents the key strategy for NEC Electronics Corporation to expand its ASSP (Application-Specific Standard Products) business.

Keywords

semiconductor solution, platform, multimedia, software structure, multimedia interface, partner program

1. Introduction – Changes in Lifestyles –

High-performance computers (small operation processors) are now used to support many aspects of our everyday lives. The performance of the LSI for use in mobile devices such as cellular phones and in digital home appliances has improved so much that multimedia contents such as HD (High Definition) image data can now be easily enjoyed. The advancement of such technologies has made it possible for us to access multimedia information without being concerned about restrictions in time and space. This facility is now available at home, outdoors or even in rapidly moving transportation. Freedom in our daily lives has thus been enhanced more than ever.

2. Problems at Software Development Sites

On the other hand, the requirements of higher performances and the greater variety of functions of the latest digital devices have increased the development scale to a level that begins to threaten the development capabilities of the manufacturers. For example, the labor needed to produce a cellular phone with One-Seg digital TV reception capability, or a TV for receiving land line digital broadcasting as well as satellite HDTV broadcasting, is several times greater than was previously required. In addition, if a manufacturer wants to deploy its products worldwide, development is required for the same number of times as the number of standards that apply in the various regions. Also, if a network connection function is used, testing in compliance with the standard is essential, so the test labor in-

involved will now be several times greater than before. Since the promotion of functional improvements among equipment manufacturers is expected to continue in the future, the developmental labor requirement is also expected to increase continually.

3. Changes in the Roles of Semiconductor Manufacturers and Equipment Manufacturers

With regard to the product planning role of equipment manufacturers, this tends to direct changes in our lifestyles. Proposals related to lifestyle planning have increased the importance of such a role, as may be seen in the case of the iPod. In the field of digital home appliances such as digital TVs, the competition is becoming severe by the involvement of Chinese manufacturers in addition to the Japanese and South Korean manufacturers in a high cost competitive environment. As a result, all equipment manufacturers are promoting the enhancement of production efficiencies by introducing improvements to their production systems as well as making every effort to improve their development efficiencies. This policy is aimed at cost reduction and to ensure effective planning/development capabilities.

Recent progress in integration has made system LSIs capable of handling functions at the level of relatively large-scale subsystems. This has caused the trend among the equipment manufacturers to outsource the development of standardized subsystems to semiconductor manufacturers as reference designs for middleware. The equipment manufacturers expect that this trend will allow them to focus their development plans on

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proposals for new lifestyles for users, thus aiming at assuring a highly competitive environment for their products.

As a result, the role of the semiconductor manufacturers has changed from that of simple suppliers of LSIs to involvement in the SI business for integrating peripheral devices and large-scale software into systems and supplying them to the customers.

4. Platform Strategy of NEC Electronics

At NEC Electronics, we are promoting platformOVIA business in order to deal with the market change situation as described above. This business is intended to offer semiconductor solutions composed of application-specific system LSIs and high-function OS and function modules (MW) running on the LSI for the three fields of cellular phones, digital AV devices and automotive information system. Its features are as follows.

(1) Unification of Software Structure

The software structure is unified to improve the development efficiency and to divert use of assets. The interface is defined so as to ensure that software is independent from the LSIs. Focus is particularly on multimedia processing for which high accuracy and high performance is necessary.

(2) Lineup of Pre-Integrated Middleware (Expansion of Immediately Applicable Middleware)

The middleware products for implementing a wide range of semiconductor solutions business for the field of mobile devices, digital AV devices and automotive information systems are available for our partners.

(3) Provision of an Optimum LSI for Each System

A wide range of system LSIs developed with characteristics optimized for each application are available in order to offer semiconductor solutions that match the needs of the device manufacturers.

5. Unification of Software Structure

Turning the software created in the past into assets and diverting these into new applications is necessary for improving software development efficiency. Nevertheless, this policy has not advanced smoothly with embedded systems, and one of the causes of this is that the software architectures are not integrated. If the structure is not decided, the software design cannot go well because the ideas for example of the types of functions will vary according to the software. For platformOVIA,

we have divided software into hierarchies including the driver layer for controlling the OS and hardware and the middleware layer for implementing certain support functions.

6. OViA Media Framework and Multimedia Interface

After the unification of the software structure, what we have done next for platformOVIA was to implement the systemization of the multimedia type processing and defined the multimedia interfaces that are easy to use with applications (see **Table**). Multimedia processing is greatly dependent on the LSI performance, and it may be implemented either by using dedicated hardware or by software of a DSP or a CPU. In the past, this characteristic has made it necessary to alter multimedia processing according to the hardware performance.

However, except for Windows, there are few interfaces that can be the standard for multimedia processing software. This situation has forced some designers to utilize various structures. An example of such a structure is the one that allows the application to control the hardware directly. Such a system can of course improve the performance, but it is doubtful if it can be diverted for different hardware. Also, for some architectures a driver layer is inserted that is independent of the hardware, and some have advanced even further by causing the software to become independent of the hardware at a certain level in order to increase its abstractness. Platforms are located for all of these cases, but software is not naturally incapable of diverting use among these platforms.

At NEC Electronics, we have newly developed the OViA Media Framework (OMF), which can receive commands from a multimedia interface and allows applications to implement multimedia functions irrespective of the hardware (**Fig. 1**).

The OMF is composed of the software module for multimedia processing and the multimedia interface as described above. The module architecture features the Media Compo-

Table List of OMF multimedia interface functions.

Editing	Processing Outline
Omfinit	OMF initialization and CCtrl/MC setups.
OmfUninit	OMF termination and CCtrl/MC closures.
OmfCreateChain	MCC creation.
OmfReleaseChain	MCC release.
OmfControlChain	MCC execution control.
OmfGetMessage	OMF message acquisition.
OmfFreeMessage	OMF message freeing.
OmfGetVersion	OMF version information acquisition.

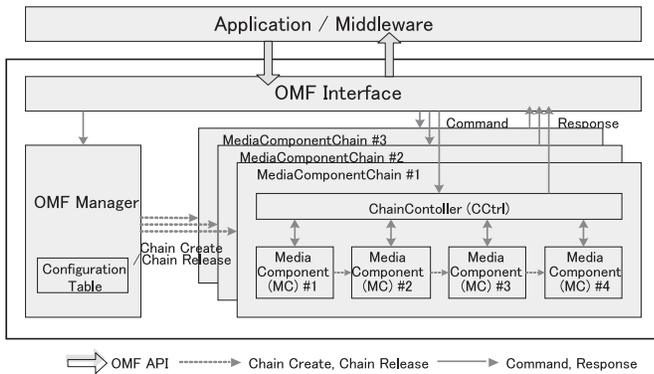


Fig. 1 Basic configuration of the OMF software module.

nents (MCs) that are the minimum configuration modules divided into each multimedia function such as compression and extension, and the Chain Controller that is designed to exploit the full performance of the hardware by controlling the groups of MCs (Chain) combined for implementing the multimedia functions. The MCs include the Media Controller for executing the CODEC signal processing and the Media Engine that controls the Media Controller.

The OMF does not use a single MC to execute a multimedia function such as MPEG4 video playback. This is because, if the modules required for implementing the functions are

packed in a single MC and when implementation of another multimedia function is required later, the use of the module in the MC cannot be diverted to this function, so the same module must be newly developed. By assigning the minimum configuration unit to each MC, the OMF improves the diverted use capability in the implementation of other multimedia functions.

The application executes multimedia processing by controlling the Chain Controller. This makes it possible to achieve high-performance multimedia functions by simply controlling the chains, irrespective of the hardware used (Fig. 2).

The OMF is an open architecture so that a variety of multimedia functions can be easily implemented.

7. Range of Pre-Integrated Middleware Implemented as Partner Programs (Expansion of Middleware Range)

Even with embedded systems, it is no longer realistic to build a system without using middleware. In order to implement functions that can meet the various market needs as early as possible, it is necessary to select and combine the optimum middleware from a wide range of options. But this strategy is always accompanied with certain risks from the viewpoint of the equipment manufacturers because it is difficult to verify in

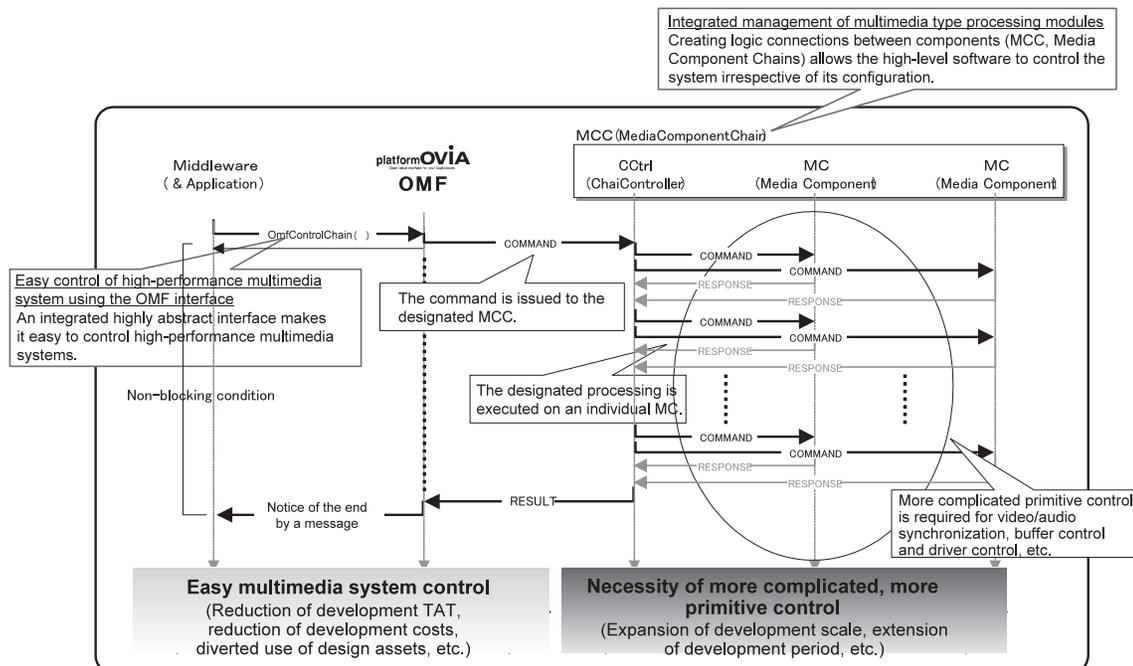


Fig. 2 Image of the OMF control sequence.

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advance whether or not the chosen middleware vendor product will work properly on the selected platform. The platform-OViA avoids such a risk by establishing a middleware approval mechanism. NEC Electronics are thus able to confirm the operation of each product from a middleware partner by checking that it works properly on the platformOVIA before delivering it to the equipment manufacturer. This procedure allows the customer to benefit from a high quality solution.

In addition to verification of single middleware products, we also enhance our solutions in favor of equipment manufacturers by incorporating system integration work in our solutions, by combining more than one middleware product and by actually packaging them in the system to be delivered to the customer. There is another risk for the equipment manufacturers, which is the necessity of managing supplies from multiple vendors. When introducing middleware from various vendors, the equipment manufacturer should usually apply administrative tasks including the drafting of agreements with each vendor.

The platformOVIA solves this risk by preparing a mechanism in which NEC Electronics also delivers the middleware products from its partners. This allows the equipment manufacturers to integrate their contacts and therefore reduce the labor input.

8. Provision of Optimum LSI for Each System

As a market matures its sectors are diversified, thereby making it necessary to finely implement functions and performances for each product sector. For example, when playing back a movie, 7 frames/second is adequate for low-end models to playback with the QVGA standard but 30 frames/second is required for high-end models. However, even when the equipment manufacturers wish to use the optimum system LSI for each sector, this has been very hard to achieve in the traditional environment due to the need for the software development to be started from scratch every time that a new LSI is employed.

Meanwhile, as described above, the platformOVIA environment enables the diverted use of software, including the complicated multimedia section, so that an LSI with optimum cost efficiency can be used for each segment. Thus, equipment manufacturers do not need to re-create an application for every LSI change but can deal with the development of a wide range of products in a short time by the diverted use of existing software.

9. Organization Systematics of platformOVIA

Our products based on platformOVIA include the system LSIs represented by the EMMA Series for digital AV devices, the MP Series of application chips for mobile devices, and the semiconductor solutions composed of software running on the system LSIs. The semiconductor solutions actually provided for equipment manufacturers take the following forms.

(1) Basic Package

This is composed of the high-function OS that is the foundation of the platformOVIA, a device driver that can exploit the full performance of the LSI, the OViA Media Framework and the development board. Three kinds of basic packages are available for the LSIs; for cellular phones, digital AV devices and automotive information systems.

(2) Middleware

A menu of the middleware products of our partners.

(3) System Integration Services

A menu of services including porting to each customer system and middleware integration.

(4) Development Environment

(5) Support & Maintenance Services

10. Business Deployment in Collaboration with NEC Corp.

NEC has always been the key player in the field of networking since its inception when C&C (Computers & Communications) was the slogan, and its role is still unchanged in the age of NGN. At NEC Electronics, we expect that NEC Corporation will provide us with their newly developed networking and information system technologies. We believe that collaboration with NEC Corporation will ensure a more powerful development of platformOVIA business and we hope to see a further enhancement of this kind of collaboration in the future.

11. Conclusion – Future Efforts for the Provision of Easier-To-Use System LSIs –

At NEC Electronics, we completed the development of the basic OMF architecture in 2006. The results were disclosed to our middleware partners in order to enable the initiation of middleware development and we also offered proposals to the

equipment manufacturers. We have already succeeded in having some customers recognize the effectiveness of platform-OViA, as seen with a portable media player released in the spring of 2007 incorporating the platformOViA product together with the MP-201 (application processor). The platformOViA model is the result of rebuilding the system LSIs, particularly ASSPs, from the perspective of the equipment manufacturers and by studying an easier way to deliver easy-to-use ASSPs. As the leading partner in SI business it is our intension to offer a large number of solutions to benefit our customers and the device manufacturers. In this way we aim to support the businesses of our customers.

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