Embedded Device Platform for Ubiquitous Era: "Visual Application Platform"

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Demand increases for applications that incorporate video processing functions to exchange images between devices as the "Advent of the Ubiquitous Era" is at hand. It is believed that in the near future we will enter an era when many devices need to have video communication capabilities.

The Visual Application Platform (hereinafter referred to as "VAP") is an embedded device platform for the purpose of developing products with video processing, audio processing, communication processing and other such functions. Digital Signal Processor (hereinafter referred to as "DSP") manufactured by Texas Instruments (hereinafter referred to as "TI") shall be the core for video and audio processing, which, combined with a base consisting of a common platform composed of hardware and software IP (Intellectual Property), will offer a platform suitable for various applications.

Oki Information Systems Company Limited (hereinafter referred to as "OIS") participates as a third party vendor for Texas Instruments Japan Limited (hereinafter referred to as "TI Japan"), who are rapidly providing platforms for video communication applications suitable for the market needs (or social needs), in collaboration with several other companies represented in the third party networks of TI Japan and TI.

It will be possible for our customers to shorten the development time or reduce development costs by using VAP. Here we introduce the VAP that OIS develops, builds and advocates as the embedded device platform for the ubiquitous era.

Summary of VAP

VAP is a platform used for the purpose of developing products with video processing, audio processing, communication processing and other such functions. A summary description is provided below.

(1) Flexible structure

VAP is composed of three layers: "Common Platform Layer", "Product Platform Layer" and "Application Layer" as shown in Figure 1.

The "Common Platform Layer" is composed of proven hardware and software IP. Individual hardware and software IPs are considered to be functional modules in the VAP.

An IP required for each target market or product line is selected for the "Product Platform Layer" from the

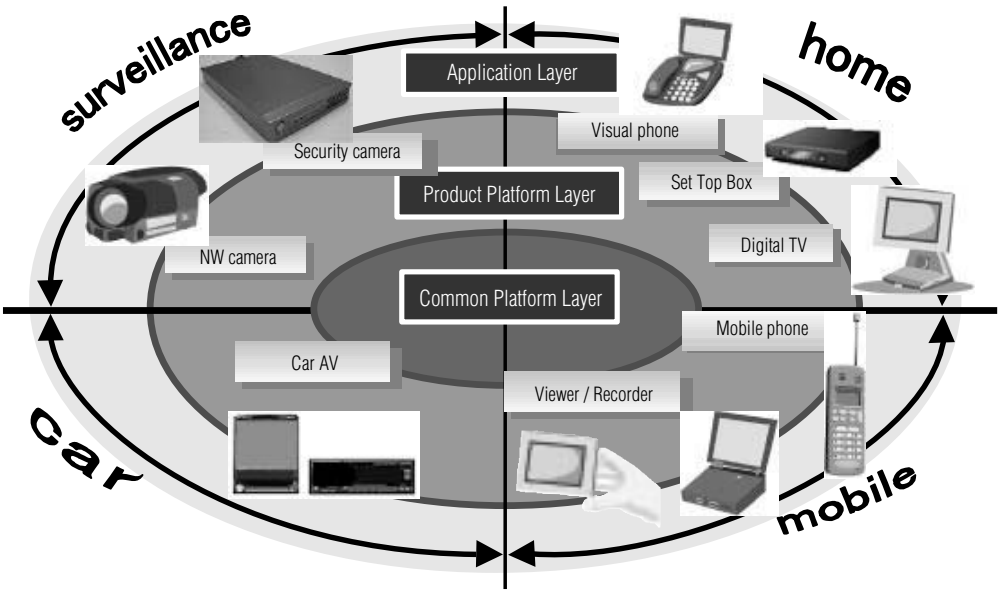

Fig. 1 Three-layered architecture and the markets attracting concerted efforts for VAP.

"Common Platform Layer" and from these a series of processes are built and offered to customers.

The "Application Layer" is a layer that handles the applications of customers. Customers can acquire a differentiation with their products by embedding their proprietary applications onto the "Product Platform".

The most significant characteristic of the VAP is its ability to contribute towards the realization of superior "Time to Market" quality for customers by providing a reference design that results from the building of a platform, which satisfies functions and performances required of targeted products by organically combining proven, common IP.

(2) Focused Market

Concerted efforts are being channeled to four markets including surveillance and security, home installed terminals, mobile terminals for personal use and vehicle-mounted AV terminals. Various product platforms, such as network cameras, monitoring cameras, visual phones, personal viewers and car-mounted AV terminals, have been built as product platforms in response to these market demands.

(3) Partnership with TI

A technology that can realize the real-time compression and decompression of video/ audio will be a significant factor for video communication applications. Since there are a lot of repeating sums for product calculations in the processing of compression and decompression algorithms for video/ audio the use of a DSP that can process sums for product calculations in parallel proves to be more advantageous in comparison with general-purpose processors.

The DSP manufactured by TI has been adopted as the core processor for the processing of video/ audio in VAP. Since April 2000, OIS has participated in the network of third party vendors of TI Japan, establishing a strong partnership with them. The ability to utilize this cooperative relationship is one of the factors that make it possible for OIS to provide a timely response to the market needs.

Common Platform

The common platform of VAP consists of the hardware IP and the software IP. A description of the common platform is provided below.

(1) Hardware IP

Various types of hardware IP, such as DSP evaluation board, FPGA code and so on, are available for the hardware of VAP as shown in Figure 2, , which makes it possible to select a suitable hardware for any application. Proven hardware IP is provided to customers as a hardware reference, which allows customers to develop hardware for their targeted products within a short period of time.

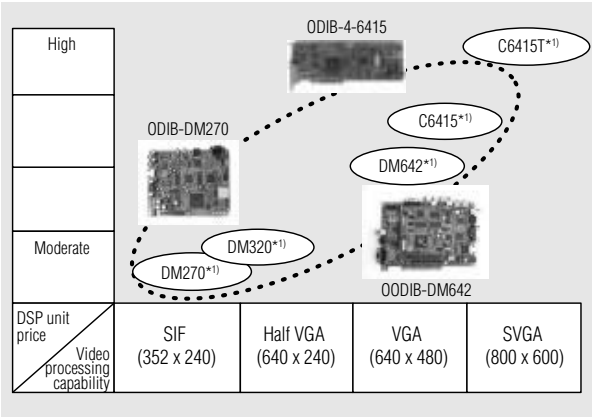

Fig. 2 TI DSP evaluation board provided by VAP.

(2) Software IP

The software of VAP consists of a number of parts including "Codec Parts" consisting of an audio/video CODEC IP, "Visual Extension Parts" consisting of an IP for additional video processing, "Network Parts" consisting of a protocol IP for communications, such as TCP/IP and "Maintenance Parts" consisting of middleware for maintenance, as shown in Figure 3.

The necessary parts or IPs from among the parts available can be selected to suit the requirements of each customer's product. Since the individual software IP of VAP is designed so that it does not depend on the real-time operating system (hereinafter referred to as "RTOS"), it can be loaded on equipment without concern over the influence of a customer's RTOS, such as μITRON*2) or Linus*3).

Further, parts other than "Codec Parts" and "Visual Extension Parts" are designed to ensure that they do not depend on processors either. It is therefore, not only possible to accommodate systems with hardware configurations that involve only DSP but also those that have both general-purpose processors and DSP in a flexible manner configured as a part of the system.

Further, the available software IPs are not only OIS proprietary IPs but also supplemented by those provided by TI Japan and several alliance partner companies in the TI Third Party Network.

Product platforms and case examples

Product platforms are composed through selections and combinations of IPs required for the final product selected from IPs that are available for common platforms. The software that organically links individual IPs and operates them in an efficient manner is referred to as a "framework" of VAP. The way an IP is used may vary from one application to another even if an identical IP is used. This is the portion where product know-how comes into play. A framework is prepared for each product line, such as network cameras or visual phones.

*1) C6415T, C6415, DM642, DM320 and DM270 are the names of products manufactured by Texas Instruments.
*2) μITRON is an abbreviation of Micro Industrial TRON.
*3) Linux is a trademark or registered trademark of Linus Torvalds in the United States and other countries.

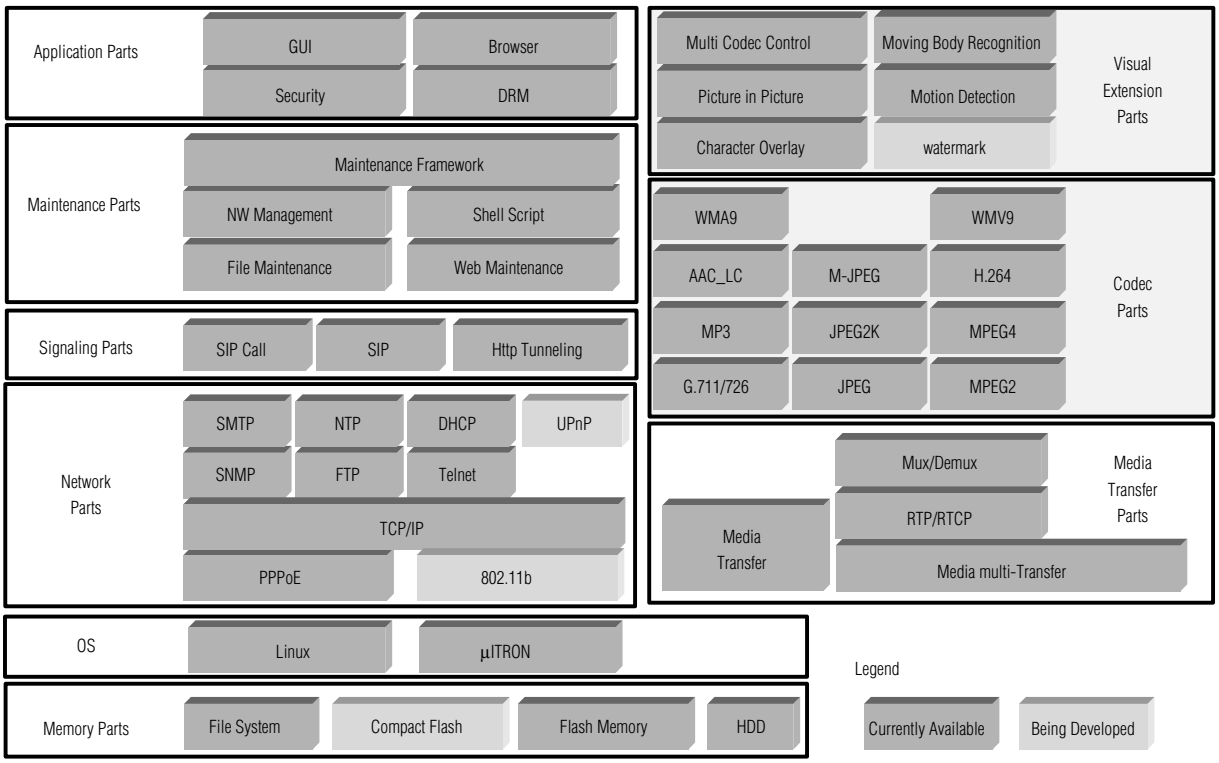

Fig. 3 An example of VAP software IP.

The product platform is considered to be a platform that includes a framework.

Case examples of systems that use the product platforms of VAP are shown below.

(1) Network Camera Platform

Figure 4 represents a platform for a network camera used to monitor day care centers and parking lots on a video-on-demand basis. The image from the camera can be viewed on a web browser, such as Internet Explorer, on a personal computer.

Video communication functions necessary for the network camera are realized with VAP by combining a number of basic parts.

Further, it is possible to build a platform for a security camera intended for crime prevention purposes by enhancing this platform with the loading of motion detection IP or motion recognition IP of the "Visual Extension Parts" to convert the framework of the camera into one of a security camera.

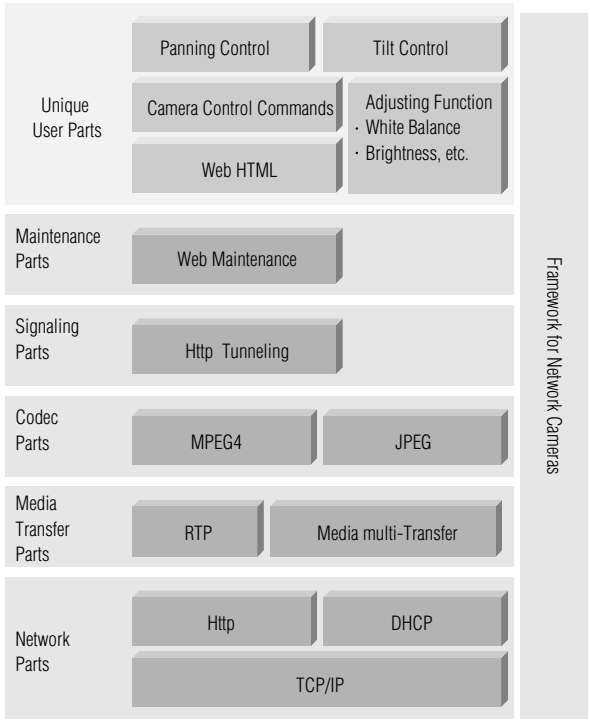

Fig. 4 Network camera platform

(2) Visual Phone Platform

Telephones have evolved from conventional fixed

telephones to IP phones provided by VoIP services. Among such IP phones there are now terminal devices with videophone functions that provide video.

A platform for uploading video functions to telephones and fax machines is represented in Figure 5.

The Visual Phone's platform can be uploaded with an answering machine function equipped with a video feature by loading "Memory Parts" and "Visual Extension Parts". It will also be possible to highly develop value-added videophones that can attach messages left on answering machines and recorded video to emails and send them to users as part of the notifications sent to travel destinations (to a mobile phone, for example). Further, the SIP protocol stack, which is attracting a lot of attention as a function for ISP connections, can also be provided as software IP.

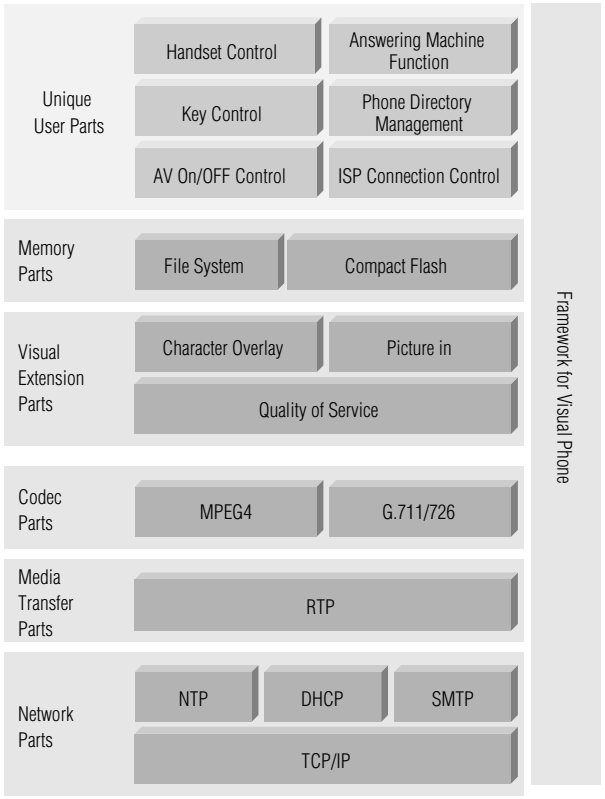

Fig. 5 Visual phone platform.

(3) Personal Viewer Platform

Figure 6 represents a platform for personal viewers. Music players incorporating a hard disk drive have become popular lately and this platform assumes such a music player product comes equipped with an audiovisual function for video. It is possible to build a platform for a mobile terminal that is equipped with a digital broadcast receiver function by loading the "Media Transfer Parts" and "Network Parts" to this personal viewer platform.

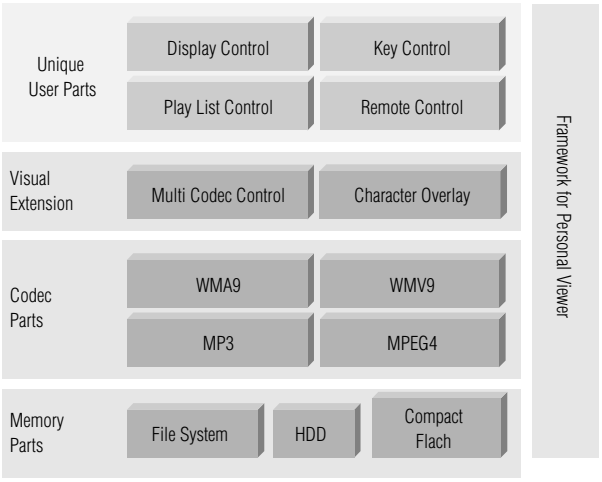

Fig. 6 Personal viewer platform.

Conclusion

At OIS we believe that the following two issues are "Keys" for the evolution of VAP:

1) Continue with efforts to substantiate IPs, keeping pace with market trends and technological evolution.
2) Build product platforms in a timely manner.

OIS plans to continue collaborating with TI Japan in order to substantiate a common platform in the future, responding to TI's roadmap for DSP. Furthermore, OIS will continue contributing toward our customers' realization of "Time-to-Market" improvement in software products by building product platforms that respond to market trends and by providing such platforms quickly to customers.

The evolution of VAP will benefit not only OIS, but we are confident that such efforts will bring about great business opportunities for our customers as well.

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