

# A NEW PROGRAM PLATFORM OF SMARTPHONE

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**Abstract.** With the coming of 3rd Generation, the conception of web service has become the main characteristic. We build up a new program architecture and platform. Through the CAR platform, we build up an general architecture faces to the future usage and realize a embedded system of smartphone.

## 1 Introduction

With the development of telecommunications, the operating system has expanded from special to general step by step. The application services have expanded from personal computer to web services. The project designs lead to AOP more and more. The explorer application model and the web security begin to face a more wide space.

## 2 Characteristic of dominant embedded system

Currently, the main operating system of smartphone includes Symbian, MS Smartphone, PalmOS and Linux etc. For the support of several companies, Symbian has occupied leading place. MS Smartphone operating system has good compatibility with other Microsoft OS and it has power strength in multimedia service. PalmOS and Linux begin to enter the smartphone operating system now

Besides the system from above, the main development platforms for smartphone include JAVA, BREW and DOT NET, but they all have some shortcomings. For example, the performance of mobile devices deal with j2me is lower, the service applications software are scarce and it dose not has a consummate dispense and tally mechanism. BREW is aim at CDMA platform and it collects high patent expense. So the applications on BREW are less than on JAVA. The platform of Microsoft is too ideal and can not realize in a short time.

From above all, the characteristic of BREW and J2ME is all related applications will be packed and loaded, the local client will analyze or run it. With the development of

3G, the data operation on net will beach from quantity to complexity, the importance of “download on demand” and “rolling download” will appear.

### **3 Elastos**

Elastos is based on the component and middleware. It integrates the agile kernel, CAR(Component Assembly Runtime) technique, Elastos program model, smartphone development platform and program explorer. And it has become a full design faced to the enterprise and smartphone industry series. It embodies the web service conception, accords to the future web applications and SOA(Service-Oriented Architecture) and gives the full support of the next wireless communication. It provides a high efficiency development platform bases on the “client/middleware/server” structure to the smartphone software development platform.

#### **3.1 Introduction**

The aim of Elastos is to provide the full support for embedded device and web service development in the future. In the architecture, it is a fully face to the component and middleware operating system. It provides the running environment for component, opening software bus and agile kernel. It actualizes “click to run” through program explorer, “zero maintenance” and “instant startup”. Users need not to setup any driver, the system realizes truly plug and play. The object code of different companies can realize seamless linking, the program runs on different platform will become true. The mobile calculate, grid and other jumped-up technique will receive powerful support.

#### **3.2 Architecture And Predominance**

The design idea of Elastos—the embedded RT system--of smartphone will fully incarnate the component program technology orients web service.

The architecture of Elastos includes several main part are shown as below:

1. OS architecture: Agile Kernel
2. CAR component technique: the program model and criterion orient component
3. Elastos component platform: the running environment for CAR component
4. Elastos OS: base on the component technique, the next OS provide component application
5. Elastos integrated environment: orient the component program for software development

The characteristics of Elastos aim at the embedded device in the internet period and provide more available development face to web service. In the architecture, it is a net OS completeness orients the component and middleware. The kernel is CAR component technology. CAR is an object-oriented program model. It modifies a group of rules for calling among components which make the binary components realize self-describe and dynamic linking when the programs are running. CAR has well compatible with COM. Also it expurgates some rules in COM and forbids users to define unself-describe interface. Through consummating component and interface self-describe, Elastos expands and predigests COM. So it can support web service availability.

### **3.3 Innovations**

Elastos supports components binary compatible and dynamic update and realizes the application explorer model of needn't install, download for demand and click for running. Also it has self-antivirus mechanism.

## **4 Achievement**

### **4.1 Facing to Internet Application, Implementing Component and Middleware Architecture**

OS must provide high performance and ought to provide more stabilization and security. The traditional OS architecture with monolithic kernel and micro-kernel can not satisfy both of them. But Elastos will carry out the CAR antilogy, users can decide some system components such as file, graphics and driver system to run in kernel mode or user mode by demand. So it has characteristic of "agile kernel", settled the problem above from theory to practice.

### **4.2 Research a New Kernel Architecture, Importing Domain Conception**

In the traditional OS, the communication among components in the one process has the lowest protect level and the highest performance. On the contrary, it has the highest protect level and the lowest performance. The performance and the security can not make the best of both sides. So we import the domain controlling mechanism in the shared address space into the process, the different domain in one process will share the same address space. Through this way, it raises the security of the communication in domain with less fall of performance.

In our design, it has two types of domain: user domain and super domain. The next one is shared by each process and it has higher purview than the first one. The super

domain can access the memory of user domain and it does not true on opposition. Only the components with higher purview can be loaded in to the super domain. The super domain provides the maximal support for the high performance component such as driver and process controller etc. Of course, these conceptions are sightless to the users and makes well preparation for the future.

#### **4.3 Saving Energy Controlling**

Elastos fully uses the management function of CPU and circuit board and develops power controlling module which provides multi-level controlling mode. It can use the APM to lead CPU into dormancy or shutdown when the devices are idlesse, to control circuit clock and to wake up device by external event such as keyboard etc. The OS allow users define suspend point, wake up mode and which chip to suspend etc.

The most chips use CMOS technique, the cost expresses as such equation:

$$P = 1/2 \times a \times C \times V^2 \times f$$

a: activity coefficient, we can set up I/O make it lowering the frequency to reduce the cost

C: capacitance, can not be controlled

V: voltage, we can depress the voltage according to the running situation

F: clock frequency, we can depress the frequency dynamic when there are less device

#### **4.4 BSP Support**

Elastos provide various BSP for embedded development. According to the developable board, Elastos provides the unified interface to implement register initialization, interrupt management, clock controlling and memory address mapping. Also it provides several startup mechanism.

#### **4.5 Working Pattern of Elastos Calculate According to Need**

Calculate according to need is one of the characteristic in the movable calculate. Web service rules define the details of realizing service and the alternation among them. The traditional OS base on C/S module will become past in the future. The calculation on demand will take the place of it. Elastos is just based on middleware and provide a design for distributing system. The SOA architecture treats the functions as services and sends them to users. On the other hand, we can put the URL and source code tighter through code and self-describe information like web explorer. So we can realize the “click for running”, “download on demand” and “rolling download” through the explorer. Users need not pay any attention to the location of programs.

CAR program platform request every CAR component has its unique name. Besides the string name, it has another name of 128 binaries. It is generated by an application and will be refrained.

#### **4.6 Security Authentication**

In order to safeguard the developers' benefit, Elastos security subsystem provides a series guarantee. The developer must build a communication with our organization which is build up by another authority department. Only the software with the certificate awarded by those departments can be running in Elastos platform. Also the certificate has its own period of validity.

Elastos security subsystem mainly uses PKI architecture and realizes certificate management, user authentication, safe transmission and source code encrypt in binary.

The encryption software are based on MD, RSA, SHA and IDEA etc. Those guarantee the security of the subsystem.

### **5 Summarize**

Elastos is created by our own technique, it safeguards our country communication system and national security. The industrialization will drive the software realizing celerity and continuance development through middleware technique. The middleware is benefit to form software factory, increase productivity and constitute our own technique standard.

### **References**

1. Chen Rong; software platform of mobile and industrialized (2004.8)
2. Koretide comp. BeiJing; the development of embedded mobile system based on Linux and industrialized (2004.8)
3. Stanley-Marbell, P.; Ifode, L.; Scylla: a smart virtual machine for mobile embedded systems Mobile Computing Systems and Applications, 2000 Third IEEE Workshop on. , 7-8 Dec. 2000 Pages:41 - 50
4. P Panigrahi T, D.; Panigrahi, D.; Chiasserini, C.; Dey, S.; Rao, R.; Raghunathan, A.; Lahiri, K.; Battery life estimation of mobile embedded systems; VLSI Design, 2001. Fourteenth International Conference on , 3-7 Jan. 2001 Pages:57 - 63