

Impact of Mobile Internet on Smart Phone

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Abstract:

Along with the deployment of 3G networks and the launch of diversified mobile Internet services, network service modes and operation modes have greatly changed, and now the smart phone plays a key role. Accordingly, the key technologies for the smart phone, such as the application security management framework, application software authentication mechanism, interoperating capability and dynamic power management should be paid much attention to. The mobile phone vendors are gradually transforming into platform providers who will offer the support for services, including hardware, protocol stacks and storage, instead of providing specific services. Meanwhile, operators and Internet service providers will become the main body of service development.

When 3G concept was first introduced, people believed there might be some "killer" services that can match voice and short message services of 2G networks and tried to find them out. But unfortunately, such killer services do not exist. The feature of Internet, i.e. quick change, makes it difficult to launch basic but popular new Internet services. The tendency of Internet development is to continuously segment customer bases and provide each customer group with customized services.

Meanwhile, competition situation of telecom industry has changed fundamentally. First, the price war among telecom operators reduces the revenues of traditional telecom services, which are still going down. Second, new invaders, for instance, Internet service providers, begin to nibble telecom services. In particular, the newly emerging iPhone suggests a new profit sharing mode, which seriously threatens market positions of traditional telecom operators. In fact, the business model of the entire telecom industry is experiencing a

transform^[1-2].

To adapt themselves to such a transform, telecom operators, Internet service providers and device vendors at different positions and from different countries are adjusting their policies. In such a transform, smart phone plays a critical role.

1 Impact of Mobile Internet on Telecom

1.1 Features of Traditional Telecom Business Models

In 2G era, mobile services received rapid development: Telecom networks almost covered most areas, telecom services were well known and accepted and telecom operators got significant benefits therefrom. In general, traditional telecom business models have the following features:

- (1) There are only a few types of services, but these services are basic and each type has widespread customer demands and huge customer bases.
- (2) Most services are paid services, so benefit-making models are relatively stable.
- (3) The users are highly loyal to the operators. One reason is that a user's

phone number, which is provided by the operator, is bound to certain basic telecom services, which brings the user extra costs if the user wants to change the network.

(4) The services are highly exclusive. Services provided by different vendors or operators can not be compatible with each other.

(5) The competition is relatively orderly. Such traditional competition means as price war are often adopted. However, price war is limited by costs and regulations, so market situation changes slowly.

(6) Restricted by networks and terminals, each service often takes a long time to develop and deploy and the lifetime of the service is also very long.

Due to these features, traditional telecom markets develop on a steady basis, competition situation evolves slowly and the operators gain steady revenues, but meanwhile, the operators lack innovation motives.

1.2 Features of Internet Model

In the Internet field, game rules are quite different from those of traditional telecom industry. The features of Internet industry are as follows:

- (1) A blank field receives explosive

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development in several years, with various new technologies and concepts introduced one after another and new services being continuously launched. Internet companies increase dramatically and develop quickly.

(2) It attracts users with free basic services but charges uses for advertisements and value-added services. The three main benefit-making models of Internet companies are: Charging for advertisements, offering value-added services and selling part of their shares in the exchange market or even selling the company.

(3) The users' loyalty is very low. The users are likely to change from one service provider to another, so the competitive advantages of an Internet company may turn over quickly.

(4) Software and hardware involved in Internet are highly standardized and open, enabling a uniform open interface to develop.

(5) Competition is disorderly and fierce due to lacking necessary regulations.

(6) The winner gets the lion's share. The revenue difference between No.1 and No.2 is often computed by tens of times or even several hundred times. While in traditional telecom industry,

operators usually match each other.

Therefore, Internet companies are innovative and aggressive, while traditional telecom industry is relatively conservative.

1.3 Challenges Faced by Traditional Telecom Industry

The deployment of 3G networks makes mobile Internet come true. Confronted with aggressive attacks from Internet companies, the advantageous positions of traditional telecom operators are threatened. The attacks mainly come from the following aspects:

(1) The communication channel becomes cheaper and cheaper. As a result, the operators' revenues gradually reduce. Moreover, the price war among traditional operators accelerates the decrease of their revenues.

(2) The competition situation becomes more complex than before. In addition to traditional telecom operators, new participants join the competition, including Internet companies and content service providers.

(3) The services become more and more complicate. For instance, service competition is more intensive, customer bases are further segmented, services increase more quickly, and launch

periods of new services are shorter.

(4) The loyalty of users decreases.

In the era of mobile Internet, the competition will focus on how to quickly deploy new services. In the past, services are basically pre-installed by phone vendors onto the phones. Consequently, it often takes quite a long time to develop, deploy and promote a new service. Besides, it is quite difficult to deploy a new service on the phones that are being used. In particular, the large number of existing phone users makes the promotion of new services troublesome. Obviously, they are all disadvantageous factors in future competition.

Service deployment on phones often takes three forms: Java (i.e. virtual), Web (i.e. browser) and downloading and installing executable codes (i.e. Native). The Java mode is not efficient; Web mode is only applicable to simple services because it is difficult to describe service logics; and most phones do not support code downloading and installation.

Therefore, smart phones play a critical or even determinant role in the deployment of future services. The smart phone platform and technical evolution path can be decisive factors in the future competition.

2 Impact of Mobile Internet on Smart Phones

2.1 Concept of Smart Phone

Although the concept of smart phone is well known, its meaning is not very clear. A generally recognized definition is that smart phone is a kind of high-end phone with powerful functions or adopting a smart operating system. The smart operating system itself is a vague concept. It often refers to Palm, Linux, Windows and Symbian.

The operating systems on smart phones are divided into two kinds: embedded and desktop.

The features of embedded operating systems include:

(1) Applications and the operating system are often compiled into one executable file.

(2) An application is a group of functions or a group of tasks invoked by

the operating system.

(3) Running an application means to directly run related functions, without uploading and relocating the application.

(4) Applications are in the same flat memory space as the operating system. That is to say, there is no difference between user mode and kernel mode.

The features of desktop operating systems include:

(1) Applications and the operating system are absolutely independent, from software compilation to release.

(2) Before an application is run, it has to be uploaded and relocated.

(3) Applications and the operating system run in their respective memory spaces, ensuring high-level security.

Smart operating system is more like a desktop operating system rather than traditional embedded operating system. A smart phone platform must satisfy the following conditions:

(1) Applications can be dynamically downloaded, installed and uninstalled.

(2) Applications are customized and can be dynamically configured.

(3) The platform supports multiple processes, applications own their independent memory spaces, several services can be delivered at the same time, and stopping of one application process will not lead to breakdown of the operating system.

(4) The platform can provide development packages for the third-parties to develop services.

Judged against the above criteria, many existing so-called smart phones are not smart at all^[5].

2.2 Evolution of Smart Phone Platforms

Smart phone platforms mainly develop along two routes, which reflect two technical approaches.

One route is to add some functions onto traditional embedded operating systems^[4] to enhance the traditional operating systems. The advantage of this approach is that it achieves the functions of smart phone with poor hardware performance, and at the same time, it does not reduce running efficiency. But with this approach, many changes have to be made in terms of scalability, generality and openness. Moreover, as services are diversified and high requirement is imposed on openness, the



potential of this route will be eventually exploited.

The other route is to cut down some unrelated functions from desktop operating systems^[5] so as to increase running efficiency and reduce the size. The benefit of this approach is it inherits all advantages of desktop operating systems and the interface expressions are rich. But its performance is unsatisfying. In its early versions, limited by hardware, the architecture of Communication Processor and Application Processor (CP + AP) had to be adopted. Now the architecture problem has been solved.

The above analysis shows that smart phone platforms had better evolve from desktop operating systems. To evaluate one smart platform, check its desktop system first. From this perspective, Windows-based smart platform is better than Linux-based platform whose desktop system is still a chaos.

2.3 Key Technologies for Future Smart Phone Platform

Here we will not discuss existing technologies for smart phone platform but focus on the future technologies. Future smart phone platforms have two core requirements: service deployment and User Interface (UI). Accordingly, their future technologies should involve the following aspects:

(1) Application security management framework: As application modules of

smart phones are installable and executable, improper applications will result in unpredictable consequences on network and data. Hence, a security management mechanism is necessary for these applications, including control over various resources. However, most of existing smart phone platforms has not such a mechanism^[6].

(2) Security authentication mechanism for applications: From the perspectives of service operation control and security, the authentication mechanism is necessary, which can be implemented with such technologies as network authentication, local authentication and certificate. With the authentication mechanism, the operator can control the downloading of some service software or limit their running^[7].

(3) Advanced UI technology: With the launch of iPhone, colorful UI effects attract much attention, for instance, 2D/3D graphics transformation and animated effect. The key of special UI effects is algorithm. As the phone processor has limited processing capability, efficient algorithm is the bottleneck of UI. How to seamlessly integrate the UI algorithm with the platform is a critical problem, which needs dramatic improvements on the platform's UI mechanism. Simply adding special UI effects onto existing platforms is not enough and defective.

(4) Web engine-based service/UI framework and Web Widgets

technology^[8]. Traditionally, the browser is just one application of the phone, independent of the platform. In the future, the browser engine will be integrated into the platform and become one of its services. Browser engine-based service/UI framework will be one main trend; while Web widget technology facilitates the deployment of services.

(5) Interconnection with other devices: Smart phone should not be an isolated device. Its data transfer capability and interoperability with other devices, such as computers, digital cameras, set-top boxes and home gateways, will be more and more important. Especially for operators who deliver a full range of services, a series of standards may be worked out regarding smart phone's interconnection with other devices. Among them, Digital Living Network Alliance (DLNA) and Intelligent Grouping and Resource Sharing (IGRS) need special attention.

(6) Dynamic power management: The power consumption is a serious bottleneck of smart phone, while standby time is one important criterion for the users to select a phone. The intelligent dynamic power management technology with self-learning capability will be an important trend in the future.

(7) Hardware architecture: The architecture of AP+CP is born to be defective in size, power consumption and cost. In the future, the single-chip solution will dominate the market and the price will fall dramatically.

(8) Local data center: The core of the center is memory database technology.

2.4 Selection of Smart Phone Platform

Currently, there are many smart phone platforms in the market. The competition among these platforms is actually the competition for control over services. One platform means one business model. Future smart phone platforms can be divided into two kinds: one is the open platform of Internet force; and the other is the private platform of traditional telecom operators.

The open platform is now in a strong position. The most important feature of open platform is that services are open or deployed under the control of Internet companies, while telecom operators just provide communication channels.

Consequently, the operators only get limited profits from the services. Most of existing smart phone platforms belongs to this kind. However, private platforms of operators begin to be introduced, where the operators completely control the release of services and take dominant positions, while Internet companies are only partners. One interesting phenomenon is that most private platforms are based on Linux. No doubt, the competition between open platforms and private platforms will be fiercer and fiercer.

The platform selection of an operator depends on its position in the competition. For those operators who are in disadvantaged positions or are secondary ones, open platforms enable them to use lots of Internet resources to quickly develop and deploy services, thus exerting powerful impact on other operators in a short time. But the operators have to share benefits with Internet companies or even they gradually lose their leading positions and become channel providers. For the operators in dominant market positions, selecting closed platforms is more beneficial. In this way, they can control the deployment of services, thus getting stable service revenues. But the consolidation of leading position may risk the loss of users.

The phone vendors are gradually transforming into platform providers. They pay more attentions to phones' service support capabilities rather than specific services.

3 Conclusions

With the development of mobile Internet technologies, service deployment has become a critical factor of competition. As main carriers of service deployment, phones tend to be more and more intelligent. The low- and medium-end smart phones will become the mainstream.

The technologies of future smart phones focus on service deployment and UI. Meanwhile, the competition between open and private platforms, which represent different forces, will be certainly fiercer than ever. In the future competition, the determinant factor will be quick service deployment capability

and service stickiness.

The phone vendors are gradually transforming into platform providers, offering telecom operators with service support capabilities, including hardware, protocols and storage capability, instead of specific services. Telecom operators and Internet service providers are main bodies of service development. In the past, services are pre-installed on the phones in the factory; while in the future, a user can install services on the phone he buys according to his own demands; in the past, phone vendors sell all-purpose products, while in the future, phone vendors sell phone platforms.

The era of mobile Internet will surely experience a process of breakup and combination. The destiny of each participant in the industry chain depends on its own choice^[9-15].

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Biographies

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