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**Huawei's Leadership Role in IMS standards development and  
in its own proprietary Softswitch**

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## ABSTRACT

**Purpose:** The purpose of this paper is to provide a case study of Huawei's leadership role in the IMS (IP Multimedia Subsystem) international standards effort while it developed its own proprietary Softswitch solution. This strategy of leading the standards bodies, developing proprietary standards, and being the low-cost provider is helping Huawei to become the number one telecom company in the world.

**Design:** For this case study we interviewed over 20 industry experts, both outside of Huawei and within, and utilized web resources. The big challenge we faced was the nebulous name "IMS" which combined technical standards with a vision for the future of the telecommunications.

**Findings:** It is a common assumption that China is a copier of technology and not one of the world's leaders in terms of technical innovation. China's Huawei Technologies Company Ltd. (Huáwēi Jíshù Youxiàn Gōngsī) is rapidly becoming one of the world's largest telecom manufacturers and one of the key innovators in the telecom field. For example, Huawei is the world's largest supplier of softswitch products, the software-based solution that is the backbone for VoIP switching and is also being used in mixed PSTN and VoIP networks. Huawei also plays a leading role in the standards committees for developing Next Generation Network (NGN) solutions and in 2008 Huawei had 300 engineers working on international standard committee bodies. One of the core technologies of NGN is a group of standards grouped together under the title of IMS (IP Multimedia Subsystem) that makes possible multimedia solutions across a wide number of platforms: cell phone (both GSM and CDMA), landlines, and television. Ultimately, most carriers have continued to invest in the old TDM (Time Division Multiplexing) technology and have not stepped up to either IMS or proprietary technology. Huawei's foray into IMS demonstrated that though it is a low-cost provider, it can be counted on to provide a pathway to the most advanced telecommunication capabilities if the customer decides they need them.

**Social Implications:** China is now a leader in the development of global telecommunications standards.

**Value of Paper:** The originality in this paper is our thesis that Huawei's ability to be at the forefront of standards while being the low cost provider is critical to Huawei's ability to become the number one telecommunications manufacturer in the world.

## Keywords

China, Huawei, NGN, IMS, Softswitch

## INTRODUCTION

Huawei Technologies Company Ltd. had revenues of US\$ 21.5 billion in 2009, a 17.5% increase over 2008 (Mast, 2010). Huawei is the world's largest supplier of softswitch, the software based solution for switching within and between Voice over Internet Protocol (VoIP) and Public Stitched Telephone Networks (PSTN) networks (In-Stat, 2007).

China Mobile, the largest VoIP network in the world, is built on Huawei's Softswitch. Based on this installed base, Huawei has been ranked for the past ten years as having more individual subscribers around the world supported by its Softswitch than by the softswitch of any other manufacturer.

China Mobile's Softswitch architecture is being migrated to a switching fabric based on Internet Protocol Multi-Media Subsystem (IMS). On May 24<sup>th</sup>, 2010, Huawei announced that it had won 60% of China Mobile's new IMS deployment (Huawei, 2010a). The project covers 31 provinces and has the capacity to provide advanced services to 14 million subscribers.

## NGN AND IMS

Huawei is a leader in the development of a new regime of telecommunications standards that fall under the rubric of NGN (Next Generation Networks). Huawei actively participated in 123 international standardization organizations involved in NGN including ITU, 3GPP, 3GPP2, OMA, ETSI and IETF (Huawei, 2010b). It often plays a leadership role in these organizations and chairs many of their working groups.

At the core of NGN is a group of standards known as IMS (IP Multimedia Subsystem). The goal of IMS is to provide a switching system for multimedia that can support quality of service to applications regardless of the platform (PSTN, Television, wireless, or others). The IMS standards, driven primarily by 3GPP, represent an immense amount of work to develop standards that allow any telecommunications platform to communicate with any other platform (3GPP, 2008). IMS has been one of the hottest buzz words in telecommunications over the past five years as it is envisioned as the basis for a wide range of applications that the telecommunications carriers can sell in addition to raw bandwidth. These applications include presence, chat, push to talk, and others. Unfortunately for the telecommunications carriers, companies like Skype have been able to provide low-cost alternatives to these services by building intelligence at the edge of telecommunications infrastructure. The IMS standards efforts have also been stymied by the difficulty of writing application standards that work over IMS because of the complexity of writing standards that all stakeholders at this level can buy into.

## SOFTSWITCH<sup>1</sup>

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<sup>1</sup> In this document we use the capitalized "Softswitch" for Huawei's proprietary Softswitch offering and "softswitch" for generic solutions provided by all vendors.

Softswitch is a solution that replaces hardware telecommunications switchboards (such as ones based on SS7) with software based solutions that run on computers. As such, they take up much less space, are easily customizable and cost significantly less.

Softswitch is conceptualized as having a Call Agent and a Media Gateway (MG) (see Figure 1). The Softswitch Call Agent is responsible for signaling, call services, and routing. A Call Agent may control several different Media Gateways. Media Gateways can have interfaces for connecting different types of transport protocols such as IP (Internet Protocol) and the PSTN transport protocols. The Call Agent and Media Agent communicate via the IETF's SIP (Session Initiation Protocol) standard which is responsible for setting up and tearing down voice and video calls.

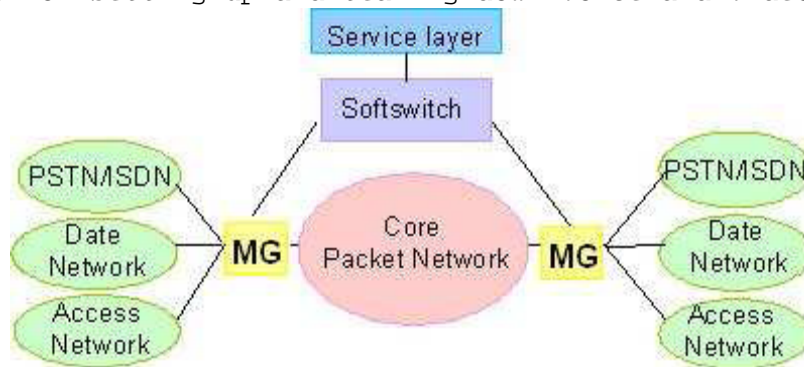


Figure 1 The position of Softswitch in the network (Huawei, 2001)

The Call Agent provides services that we are familiar with from POTS (Plain Old Telephone Service) such as dialing a number, causing a phone to ring, and providing a busy signal. With Softswitch, however, it is possible to customize a user's communication experience. For example, a user could decide to have his number ring to his landline, then to his secretary's landline, then to his mobile phone, and then to voice mail. Softswitch offers the opportunity to customize each user's experience, something that is not possible with a hard wired switch.

#### HUAWEI'S SOFTSWITCH SOLUTION

Huawei is also part of an effort to develop softswitch standards at the International Telecommunications Union (ITU). Figure 2 shows the role of the ITU's H.248 to set up calls between the media gateway and the media gateway controller. Huawei's Softswitch also supports ISUP which it uses to setup calls with the PSTN. H323 is also supported, which is a group of products that links audio video into the Softswitch.

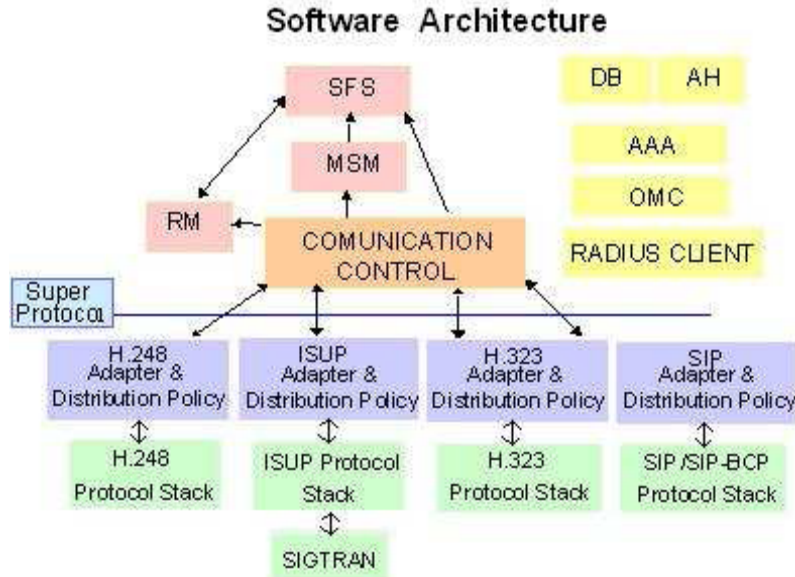


Figure 2 The architecture of a general Softswitch (Huawei, 2001)

The challenge of this standards effort is to keep pace with the rapid evolution of Softswitch as vendors of proprietary softswitch solutions rapidly innovate. Huawei, itself, has become known for providing, at a relatively low cost, customization of its Softswitch application to meet the needs of individual telecommunications providers. It should be noted that in Figure 2 between the international communications standards and the Communication Control, there is what is called a "Super Protocol." This "Super Protocol" is middleware that is proprietary to Huawei.

INNOVATION AND CONTROL IN STANDARDS ARCHITECTURE

It is widely recognized that companies can, by having their APIs (Application Programming Interfaces), a defacto standard they can develop a significant competitive advantage over their rivals (Shapiro and Varian, 1999). For instance, NEC had a large advantage over Microsoft in Japan in the mid-1990s in terms of DOS-based applications. However, this advantage was neutralized by the introduction and acceptance of Microsoft Windows' APIs as a defacto standard in between applications and DOS (West and Dedrick, 2000). Since API's in the softswitch world are proprietary; the company which has its APIs adopted by third party application developers will have a huge competitive advantage.

SOFTSWITCH TO IMS PATHWAY

Huawei's marketing strategy is to provide a state-of-the-art softswitch solution to its customers with the understanding that there will be an upgrade path to IMS if and when it becomes a reality (Huawei, 2008c). In this scenario, Huawei's Softswitch will evolve into IMS's AGCF (Access Gateway Control Function) and MGCF (Media Gateway Control Function).

IMS, like softswitch, uses SIP to set up and tear down multimedia sessions. IMS also provides a mechanism for providing, and selling, quality of service. This is important if telecommunications providers want to provide users with the type of experience that they have come to expect from the PSTN and be able to charge them for this service.

In a world in which there is significant uncertainty about whether GSM, WCDMA, WiMax, Wifi will become the underlying communications technology, IMS holds the promise of making the underlying communications technology irrelevant to users. IMS will allow users to roam between different technologies without even a disconnect.

#### WILL HUAWEI'S SOFTSWITCH EVOLVE INTO IMS?

Though Huawei's marketing strategy is to promote IMS, its Softswitch provides many features that have not been standardized through 3GPP's IMS standard making. Because Huawei's cost of customizable programming is significantly less than that faced by Western companies such as Cisco, Alcatel-Lucent, Nokia, and Ericson, it can be predicted that Huawei will continue to be at the leading edge of softswitch/IMS evolution and customization.

#### WIKINOMICS AND HUAWEI?

Tapscott and Williams (2008) argue that over the past couple of years, companies that are succeeding are opening themselves up to rapid large-scale distributed innovation in which the boundaries between a company and its customers is disappearing. They point to IBM's, SAP, and Proctor and Gamble's willingness to allow outsiders access to core technologies. SAP, for example, has published API's (Advanced Programming Interfaces) to its best-selling ERP solutions.

Huawei also provides API's to its Softswitch technology to allow third parties to write applications that can run on top of Huawei's Softswitch solution. Companies have the potential to take advantage of this opportunity to carve out their own niche in the global telecommunications infrastructure by collaborating with Huawei. The question remains as to whether outside companies can out-innovate Huawei's own vast team of low-cost and highly talented programmers.

In the IMS space, Huawei has over 100 partners who have built applications on its IMS solution. As Huawei's IMS and Softswitch offerings converge, it will become apparent whether Huawei will embrace open systems or keep some of its innovation proprietary. This is not to imply that Huawei's IMS will not incorporate all relevant international standards.

Though most of the international carriers will not admit it, they have for cost cutting reasons chosen to stick with the old Time Division Multiplexing (TDM) networks and have not upgraded to Next Generation Networks (NGN). They have not been able to develop and market applications that cross from the cell phone to the old telephone system (PSTN). The PSTN is being left behind and IMS, the immense engineering effort that it has been, may be being left in the dustbin of history.

## WHAT IS DRIVING HUAWEI'S SUCCESS?

In 2010, the magazine Fast Company ranked Huawei as the 5<sup>th</sup> most innovative company in the world. They based this evaluation on the following factors:

Shenzhen-based Huawei Technologies shot past Alcatel-Lucent and Nokia Siemens in 2009 to become the world's No. 2 telecom-equipment provider, powered by quality and product upgrades on top of its long-standing low prices. In the past year, it has won a slew of lucrative, prestigious contracts -- Huawei recently beat out rivals Ericsson and Nokia Siemens for a deal to build Norway's pioneering 4G cell-phone network, one of the world's first -- and showed continued strength in the burgeoning Indian and Chinese markets. The sum of these deals was good enough to double Huawei's global market share to 20% and boost 2009 sales 17.5% to \$21.5 billion. (Lee, 2010)

Huawei is pouring massive amounts of resources into research and development (R&D). On its website, Huawei claims to have 43,000 employees (47% of its workforce) involved in R&D (Huawei, 2010b). It has a total of 42,543 patents and according to the World Intellectual Property Organization (WIPO), Huawei is ranked second in terms of patent applications under the WIPO International Patent Co-Operation Treaty (WIPO, 2010).

The cost structure that Huawei faces for R&D is very different from that of its Western rivals. Because Chinese universities have been graduating large numbers of engineers and PhDs, Huawei has traditionally paid wages that can be as low as one fifth of Western bundled wages. Though this is changing, Huawei has had the luxury of being able to get much more research done explore avenues more avenues, for the same amount of investment.

The low cost of talent, has made Huawei extremely competitive when it comes to customizing systems to the needs of its customers, something that is required given the need to integrate new systems into legacy equipment and the speed at which standards are evolving. Huawei is proud of how its R&D is customer focused and has embraced Integrated Product Development (Crow, 2002) the first principle of which is keeping the customer relationship integrated into the development process.

In 2008, the Chinese Ministry of Information Industries (MII) decided to migrate the four national carriers (China Mobile, China Telecom, China Unicom, and China Netcom) over to Voice over IP (VoIP) networks and to use this opportunity to speed the transfer of intellectual property to Chinese telecom manufacturers and to insure their growth (MII, 2009). China quickly had four of the largest VoIP networks in the world. China Mobile was strategically partnered by MII with Huawei. This relationship over the next couple years gave Huawei the opportunity to become one of the world's leaders in Softswitch and end-to-end IP networks.

At the same time, Huawei started carving out a niche building telecommunications systems in emerging markets. Its success can be attributed to a number of factors. It was both a low cost provider and well suited to bringing in new technologies that "leap frogged" the West's legacy



systems. In certain countries, the Chinese government supported these purchases through low cost loans and other agreements. Huawei proved adapt at working in countries that Western companies avoided because of the breakdown of civil society. In building its international operations it drew on the talents of Chinese Diaspora. For example, it would hire Chinese from Macau who spoke Portuguese to work in Portuguese speaking countries. In the same way, it built an international team that pulled expertise from throughout the telecommunications industry, many of non-Chinese ancestry. Huawei has hired many recent graduates and the average age of its employees is under thirty. These employees have grown up with technology and are comfortable with English and the West. Huawei now has relationships with 45 of the world's 50 biggest telecom companies and active relationships with most in Europe with a growing number in the US. Under the strong leadership of founder Ren Zhengfei, Huawei still has deep roots in Confucian culture, even as it has continually evolved to meet the needs of its customers around the world.

#### CONCLUSION

China's leadership has become convinced that participating on international standards committees is the way for China to achieve the high margins associated with American companies such as Microsoft, Qualcomm, and Cisco (Kennedy, Suttmeier and Su, 2008). Huawei is going down this lane, but at the same time it has learned from these companies how to develop a sustainable competitive advantage. By providing significantly lower cost hardware than its Western competitors and making it relatively easy to integrate its solution into existing systems, Huawei will continue to gain market share.<sup>2</sup>

There is no way that the IMS standards will be able to keep up with the pace of rapid innovation in the application layer of the telecommunications space. Innovation will automatically take place on the edge of the "Network."<sup>3</sup> However, there is a role for intelligence in the switching fabric of the network given the networks heterogeneity and the need for middleware. Huawei has the opportunity for providing this intelligence. If it is both the low-cost provider and the technology leader, no one will be able to stop Huawei from becoming the number one telecom company in the world.

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<sup>2</sup> Huawei has had difficulty penetrating the US market. Its 2008 effort to use the 3Com brand to open up the US market was stymied by the US Government which raised concerns about the national security implications of a Chinese company controlling 3Com.

<sup>3</sup> Skype for example does not use SIP and works on the edges of the "Network".



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