Enabling the Killer Application

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The Killer Application

For years industry experts have speculated about the one application that will truly propel next-generation wireless systems into mass-market acceptance. High-speed Internet, real-time video, interactive gaming—all are applications that will greatly enhance the end-user's experience, and certainly, they are all compelling reasons to move beyond today's voice-centric equipment. However, to correctly identify the *one* "killer app" one must understand a host of issues that are of great concern to end users, equipment manufacturers and service providers. Each of these players brings a unique set of issues and requirements into play. The killer app must be cost effective for service providers to implement, affordable, compelling and in attractive form factors for consumers, and it must give wireless device manufacturers a strong business case for providing the new systems. Only when an application meets the requirements of device manufacturers and operators by providing good value to the consumer will it meet the criteria for a "killer app".

For these reasons, it is probably more helpful to think of "killer app" as an ever-evolving continuum of different applications—all with certain characteristics that make them inherently valuable. One characteristic that will most certainly be an attribute of every new "killer app" is that it will be centered on communication. Just as the wired Internet has given users a richer and more effective way to communicate, tomorrow's "killer wireless app" will be the one that improves how users interact with the world around them by leveraging wireless technology's inherent advantage—mobility.

Today, voice is the killer app for a very good reason; it is the single most common and effective communication method. It will continue to be. At the same time, new categories of compelling communications applications are quickly emerging as advances in infrastructure and end equipment technology make them feasible. A few years ago, SMS was considered the next killer application. Then, the category grew to include wireless e-mail, and now the next killer app is moving to e-mail with rich media, such as video and audio clips. In the future, full-time streaming audio and video will certainly may become the next targeted application, but certainly not the last.

In the meantime, however, it is important to focus on a few fundamental factors required to move the market along the continuum of killer apps.

Wireless Device Manufacturers
Since equipment manufacturers are motivated by customer demand, the killer app will have definite characteristics that make their products more attractive to consumers. Device manufacturers-defined killer apps will:

- Efficiently utilize the power, screen and user input capabilities of the end-user device, so as to allow maximum usability, while building upon current technology and products.
- Provide compelling reasons for consumers to upgrade their equipment, in some cases by buying new devices and in others by paying for new services that will either reside on the network or be downloadable to their existing client device.

Service Providers
Service providers bear enormous cost in providing new infrastructure to meet the demand for new bandwidth-hungry wireless applications. Once again, killer applications will have unique characteristics that allow service providers to remain profitable, maximize infrastructure use and meet demand for new services. They will:

- Use limited (or optimal) network resources, making them cost effective and profitable to deliver the new services
- Allow them to utilize existing infrastructure and continually introduce more compelling, applications-based services that will enhance their position as market leaders.

End Users
In the end, consumers will determine the success of killer applications. In short, the successful application must enhance the end-user's ability to cost-effectively communicate in a form that fits the consumer's lifestyle needs. From an end-user perspective, the killer app will be:

- One that is compelling, in some way adding value to their life, either through entertainment, through time and/or location specific information or by better connecting them to other people.
- One that is available in similar form factors as today's voice-centric phones, one that provides comparable battery life and one that is available at a price that makes using it more desirable than a voice conversation.

Choosing a Technology Platform to Satisfy Everyone's Needs
Clearly, the next killer application's success is rooted in its ability to consistently and effectively meet the needs of end users, device manufacturers and service providers. As discussed earlier, the killer application is not one single application destination. Rather, there will be a host of continually evolving killer applications whose success will be determined by their ability to meet constantly changing market requirements.

Service providers are not only faced with huge financial outlays for purchasing wireless spectrum. They must also pay an equal or greater amount for building out the wireless data infrastructure to support 2.5G and 3G services. Some service providers have reported that as much as a ten-fold increase in the number of cell sites will be needed to support 3G speeds

when compared to current 2G-voice service. The combined cost of spectrum and system build-out has led some providers to explore arrangements where competing operators would share infrastructure.

A related capacity issue is how to balance the need for delivering higher throughput to end-users and the overall quality of service. Delivering the 3G standard of 384 Kbps requires a single GSM user to have access to one full RF channel (i.e. eight time slots). Considering then the current wired Internet business model of a single flat-fee for unlimited access to most services, the operator is left with the question of how to effectively price services and how to dole out the "limited" capacity available, particularly in the early days of roll out.

How will the relatively open market of the Internet space, with its wired infrastructure, powerful desktops and limitless power (i.e. the ubiquitous wall plug) give way to an untethered, capacity-constrained, but ultimately convenient hand-held device-based wireless Internet? The resulting need to control what services are offered over the 3G infrastructure, in order to provide reasonable return on investment, then runs up against the demand for unique, compelling services that grow more powerful and compelling as demanded by the end-users.

The challenges and the opportunities are myriad. As a result, it is of paramount importance for device manufacturers, service providers and ultimately consumers to choose wireless technology that is powerful, flexible and scalable enough to evolve with changing perceptions about what the killer application is.

Some of the characteristics a successful wireless technology platform most possess include:

- Applications processing technology: Processing cores, including DSPs, CPUs and flexible combinations of these computing engines. The technology must simultaneously support high-end applications enabled by 3G infrastructures, while providing the long battery life consumers now expect.
- Communication processing technology: Powerful baseband communications processing engines and modem technology must support the complete range of 2.5G and 3G wireless standards and the increased data rates
- RF and analog technology: Successful next-generation wireless platforms will feature a complete set of highly integrated RF and analog building blocks supporting all 2.5G and 3G standards. These block must provide a low-cost, low-power radio architecture
- Communications and applications peripherals: Peripheral building blocks to enable the entire spectrum of handset functionality, including serial, USB, Bluetooth™, Flash storage, stereo music codecs, LCD controllers, etc…
- Open programming environment: A common set of software APIs and powerful development tools, allowing application developers to write software that will be supported by a range of chipset and handset architectures.

The OMAP™ Platform – Meeting the Needs of Next-Generation Wireless Platforms

The OMAP platform from Texas Instruments is rapidly gaining momentum as the technology of choice for powering 2.5G and 3G wireless platforms. TI's OMAP architecture enables the industry's highest performance with as little as a quarter of the power consumption for 2.5G and 3G wireless devices. It also provides software developers easy access to real-time DSP functionality.

Open Architecture

Because of its open architecture, the OMAP platform encourages software developers to create new applications or add functionality. It also encourages reuse because its standardized interface allows device manufacturers to move application software easily from one platform to another. Reusing existing software and adding innovations from outside developers help device manufacturers get to market quickly with differentiated features.

The OMAP architecture provides manufacturers with a choice of devices providing either TI's enhanced RISC processing or a combination of DSP and RISC processing. This provides optimum flexibility to accommodate advanced applications while preserving battery life. The open architecture makes it easy for third-party developers to create wireless multimedia applications not yet even imagined. With TI's network of more than 350 third-party companies developing hardware and software products for the TMS320™ digital signal processor (DSP) family device manufacturers can speed time-to-market with an array of algorithms and smart media engines already available.

For both device manufacturers and software developers, the OMAP architecture provides a powerful springboard for creating end-user devices that support next-generation wireless systems and applications.

Wireless Device Manufacturers

The OMAP platform is based on TI's enhanced ARM processor and TI's high performance and low power DSP technology. As a result it provides a powerful method for developing 2.5G and 3G wireless devices that will run the gamut of next-generation wireless applications, including interim killer applications such as e-mail with rich audio and video. As infrastructure proliferates and consumer demand calls for even more advanced applications, the OMAP platform has the inherent processing performance and low-power roadmap to address multimedia-rich applications such as streaming video, video conferencing and high-fidelity audio.

Developers

For future-generation wireless applications, developers will take two forms—Application Developers and Media Engine Developers. The OMAP architecture gives both types of developers a powerful platform for meeting current and future killer applications requirements. The OMAP architecture includes an open software infrastructure that allows applications to be developed that will run on OMAP as well as other platforms, with DSP acceleration provided by the OMAP Media Engine. This infrastructure also supports quick integration of custom DSP media engines that can be accessed through standard APIs.

Application Developers

An OMAP Application Developer writes high-level applications for handheld wireless devices. Some types of wireless applications that can utilize the OMAP platform include mixed media messaging, video conferencing, Internet audio, mobile commerce, location-based services, security, gaming and speech. The OMAP platform is operating system (OS) independent, allowing a broad audience of developers to port their applications to the OMAP platform. Standard APIs for popular operating systems will be available, making access to the performance of the OMAP processor transparent to the developer. Application Developers can leverage Media Engine Developers to take advantage of the video, audio, speech and security DSP algorithms running on the OMAP platform without needing any DSP programming

knowledge. The Media Engines will allow tremendous differentiation of applications for the wireless market through increased performance and added functionality.

OMAP Media Engine Developers
An OMAP Media Engine Developer writes software that gives the application developer access to the power of the DSP through standardized APIs. These software engines differentiate applications with enhanced multimedia functionality, including streaming video and audio, security, speech and location-based services. OMAP Media Engines allow optimization for high-end, multimedia-enhanced devices, leveraging TI's DSP-based OMAP1510 processor. By taking advantage of TI's more than ten years of wireless expertise and a network of developers, OMAP Media Engines boost consumers overall wireless application experience, whether used for a corporate productivity application or interactive game.

Additionally, developers will have the ability to enhance applications by effortlessly integrating a library of OMAP media engines and hardware peripherals to add multimedia, speech recognition, security or gaming functionality by calling a single application programming interface (API).

TI is working with OS vendors to create tools that allow developers to easily write code for the OMAP architecture. In addition, TI offers Code Composer Studio™ Integrated Development Environment DSP, which is a premier DSP development environment offering unprecedented host and target connectivity with an easy-to-use graphical interface. TI is combining its extensive DSP development expertise with the expertise of the OS vendors to produce robust, easy-to-use tools for Media Engine Developers.

OMAP Developer Network
TI's OMAP platform and the OMAP Developer Network are designed for developers interested in creating differentiated wireless applications for the broadest possible market opportunity. Developers who create applications on TI's family of OMAP processors will benefit from access to today's leading wireless manufacturers including OMAP endorsers Nokia, Ericsson, Sony, Sendo and others. The OMAP Developer Network is a support structure that begins before the first line of code is written and lasts until the final day of development. The system, which greatly accelerates an OMAP developer's time-to-revenue, consists of support and services for both technical and business needs, such as:

- Technical support and training
- Development tools for both application and media engine developers
- Business development tools, including channel development, marketing and promotion, strategic relationships with other network members and investment advice

OMAP Platform Products
TI currently features two OMAP chipsets based on the OMAP1510 and the OMAP710 wireless processors. Both processors feature state-of-the-art performance, an open development environment and extensive development support for building next-generation wireless systems.

OMAP710
The OMAP710 smart phone/PDA applications processor enables the seamless convergence of voice telephony and wireless data. The device combines an ARM9 microprocessing core with a DSP-based GSM/GPRS modem subsystem, along with a wide range of general-purpose peripherals and dedicated multimedia application peripherals. With processing support for MPEG-4, MP3, JPEG and speech technologies like speech recognition, the OMAP710 combines the industry's most highly integrated wireless processing platform with best-in-class power and performance.

The OMAP710 is a feature-rich device that allows developers to customize products based on customer needs. The ARM9 core is an industry-leading RISC processor operating up to 132 MHz. The core provides the command and control functions, user interface and high-interrupt, computer-like applications. The ARM9 microprocessor core includes a memory management unit (MMU) for virtual-to-physical memory translation and task-to-task memory protection as well as 16-Kbytes instruction cache, an 8-Kbytes data cache and a 17-word write buffer. In addition, the core features 192 Kbytes of internal SRAM, providing a large memory space for on-chip data storage, such as frame buffer memory.

An integrated frame buffer and LCD controller allow a direct connection to a color LCD panel, reducing system component count and power consumption. The frame buffer can be allocated in the external SDRAM or internal SRAM. A dedicated channel on the ARM DMA unit is used to transfer data from the frame buffer to the LCD controller. The LCD controller can support 2/4/8/16 bits per pixel and a 240 x 360 display, internally and 640 x 480 and beyond displays using external SDRAM.

The OMAP710 acts as a USB client, allowing 12-Mbit per second data transfer between the OMAP710 and a USB host controller, such as a PC, for fast synchronization of critical data. The USB client controller supports the USB 1.1 standard with Tier 4 compliance

A multimedia card (MMC) interface on the OMAP710 allows for removable storage of multimedia data such as MP3 or WMA audio files, mapping data and personal information manager data like contact lists and agendas.

The OMAP710 combines the applications processing engine with a fully integrated GSM/GPRS modem. The DSP-based GSM/GPRS subsystem includes a complete Class 8 GPRS protocol stack to support communications on 2.5G wireless networks.

OMAP1510
TI's OMAP1510 processor was the industry's first to deliver the performance and power efficiency required for emerging 2.5G and 3G wireless applications. To provide the optimal balance of high performance and low power consumption, the OMAP architecture is based on a combination of TI's state-of-the-art TMS320C55x™ DSP core and high performance TI-enhanced ARM microcontroller. A RISC architecture, like a TI-enhanced ARM microcontroller, is well suited for control type code (Operating System, User Interface, OS applications). A DSP is

best suited for signal processing applications, such as MPEG4 video, speech recognition, and audio playback. The OMAP architecture combines two processors to gain maximum benefits from each.

The OMAP1510 Processor leverages all of the features of the OMAP platform and also offers a rich set of peripherals including LCD Control/Frame Buffer for 16 bit QVGA Display, USB Client & Host Control, MMC-SD Support, Bluetooth interface, USB, uWire, camera, and enhanced audio codec interface allow manufacturers to customize their products to meet their customers' needs.

Antenna-to-bits

In order for the next killer applications to be born, Handset Device Manufacturers, developers and systems providers must utilize more highly integrated wireless systems with more functionality and longer battery life. TI addresses these needs with a completely integrated system solution, including digital, analog, RF and software building blocks. By providing complete end-to-end system solutions, the OMAP platform supplies 2.5G and 3G wireless system designers the optimized cost and performance wireless users—and killer applications—will require.

Conclusion

The next killer wireless application will forever be “just around the corner”. Though the market may not yet be able to define it, each *next* killer application will come of age as market demand, infrastructure capabilities and end-system technology allow. Advanced platforms, such as TI’s OMAP architecture, provide a natural framework from which these advanced wireless applications will grow. High performance, low power operation, high levels of integration and an open development architecture are the foundation upon which killer applications will be built.