

Collaborative Mobile Gaming

Enabling socially interactive, participatory, media-rich gaming experiences.

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Dr. Venu Vasudevan leads Motorola's research and development of platform technologies for mobile and pervasive computing. Venu's lab – the Pervasive Platforms and Architectures Lab (PPAL), part of the Applications Research Center of Excellence within Motorola Technology - currently has active projects in wireless Internet and Java technologies, multi-modal architectures, wireless peer-to-peer platforms, wireless sensor networks and distributed wireless caching architectures. Previously, Venu has been (in reverse chronological order) a Fellow of Technical Staff at Motorola Labs, a researcher at a "virtual" company funded largely under DARPA's program on Collaborative Agent-Based Systems, and the Database and Network Management architect at Motorola's Iridium project.

Abstract

It is anticipated that the future of wireless service revenues will be increasingly dependent on leveraging the personalization and entertainment functions of mobile phones. As a new segment within the wireless entertainment market, mobile games are growing rapidly and are projected to reach 60 million consumers by 2009.² Correspondingly, Motorola has devoted an increased amount of research activity into the gaming segment. Motorola's gaming research focuses on collaborative mobile gaming experiences that blend content and communications to enable socially engaging services, such as enriching the social interaction of a user with their social group and expanding the user's social group through shared experiences. This paper reviews the core assumptions that shape Motorola's mobile gaming research program, the links between experiential and architectural innovation, and the specific research initiatives that Motorola believes will help define the future of collaborative mobile gaming.

Introduction

Quickly becoming "communication's Swiss Army Knife," mobile devices have enjoyed breakthrough application developments that have increased consumers' demand for, and access to, mobile entertainment and communication. As a popular mobile phone feature, wireless gaming alone is forecasted to experience spectacular annual market growth; capturing 166 million game downloads annually by 2009.² Driving the segment's growth will be collaborative, multi-player gaming that leverages real-time communication as an integral part of the game experience. These socially interactive games will create new types of communities, and will sustain them through extended experiences that can be seamlessly linked across sessions, devices and even networks.

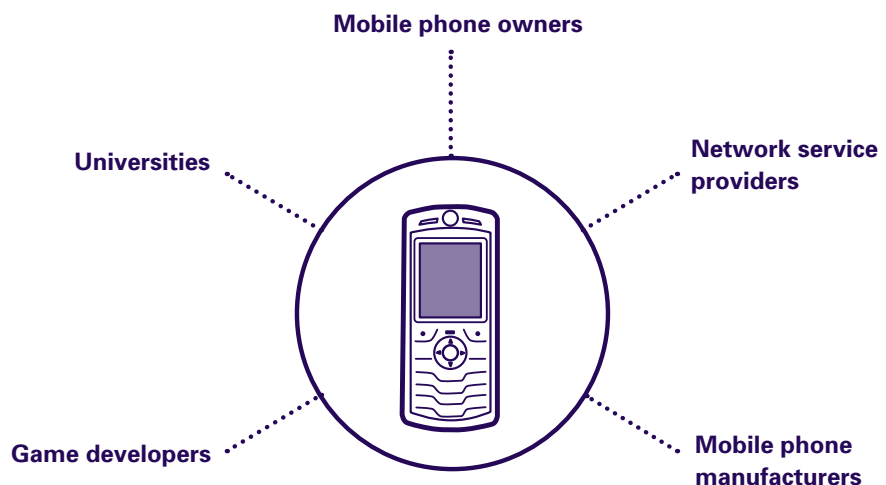
LUCRATIVE GROWTH POTENTIAL

- U.S. gamers spend 57% more on their device than non-gamers.¹
- 22% of mobile gamers have higher monthly wireless bills than non-gamers.¹
- Revenue from one-time game purchases and monthly gaming subscriptions are expected to reach \$1.6 billion by 2009.²
- Already today, one in three cell phone gamers find it important that the games have a community aspect to them.³
- Community and multiplayer games are expected to reach approximately 40% of the gaming market by 2009.²

Communication and Common Interest Will Transform Mobile Gaming

The creative resources that are now being brought to bear on mobile game development reflect two important features of this market space: the massive scope of the economic opportunity and the breadth of commercial and consumer communities with an interest in its expansion.

- Mobile phone owners constitute a huge market with a demonstrated appetite for compelling games. According to the 2005 Ziff-Davis Media survey “Digital Gaming in America”, 86 percent of all video gamers own cell phones, and 42 percent have purchased additional games for their phones.
- Network service providers may be the primary beneficiaries of a significant expansion of the mobile gaming space, as collaborative games will create new occasions for communication, drive service consumption, increase revenue and reduce customer churn.
- Mobile phone manufacturers expect collaborative gaming to help drive higher-margin handset sales, as more sophisticated games begin to leverage new platform features, such as cameras, GPS navigation, RFID sensors, optical scanners and multi-band RF capability.
- Game developers are attracted to mobile platforms as a more affordable and lower-risk alternative to console and PC targets. Collaborative games will expand the mobile game audience, market and revenue potential.
- University computer science departments around the world are building game development programs, many of which have become hotbeds of mobile game innovation.



The development of mobile platform technologies and collaborative gaming content will be driven by the converging interests of many participant communities.

¹ The NPD Group: Mobile Games: Who's Playing, 2005

² IDC, Market Analysis: U.S. Wireless Gaming 2005-2009

³ PEW Internet, Project Data Memo: Cell phone use; April 2006. http://www.pewinternet.org/pdfs/PIP_Cell_phone_study.pdf

Creating a Platform for Mobile Gaming Innovation

Fulfilling the expectations of these diverse stakeholders presents the wireless industry with significant challenges in standards definition, platform architecture design, and ecosystem development. Significant investigation will be required to:

- Identify the core technologies required to enable a collaborative mobile gaming platform
- Define a mobile software architecture that can be tuned and optimized for gaming applications
- Create new game concepts that leverage the communication capabilities and peripheral platform capabilities of advanced mobile devices
- Plot a staged strategy that identifies near- and long-term goals for technology rollout and market development

To address these fundamental questions, Motorola Labs recently launched a research project, codenamed PlayAnywhere, within the Application Research Center's Pervasive Platform Architecture Lab. The project's goal: to define a shared technology vision that will help the industry realize the experiential and economic potential of collaborative mobile gaming.

Vision for Collaborative Mobile Gaming

Project PlayAnywhere research is focused on exploring new types of gaming experiences that fully exploit the unique mobility and communication functionality of the wireless phone platform, and on extending that platform's hardware and software architecture in ways that enable innovative gaming concepts. Our investigations are guided by a set of beliefs about specific ways in which collaborative mobile gaming will differ from the existing casual games.

It will integrate communication as an organic part of the gaming experience. Participants in a team-format combat game might use push-to-talk (PTT) radio to coordinate with teammates. People playing a scavenger-hunt or geo-caching type game might be required to take a digital photo of a search item or location and email it to other players as proof of achievement.

It will integrate commerce into the mobile gaming experience. Users will be able to purchase game software, licenses, and game assets both real and digital, all through the handset itself.

It will integrate additional networking technologies – WLAN, Bluetooth, etc – to enable ad hoc, proximity-based, P2P interaction in addition to conventional WWAN connectivity. A user sitting in an airport lounge may use his phone handset to access the local Wi-Fi network, locate other gamers in the immediate area, and initiate an impromptu session.

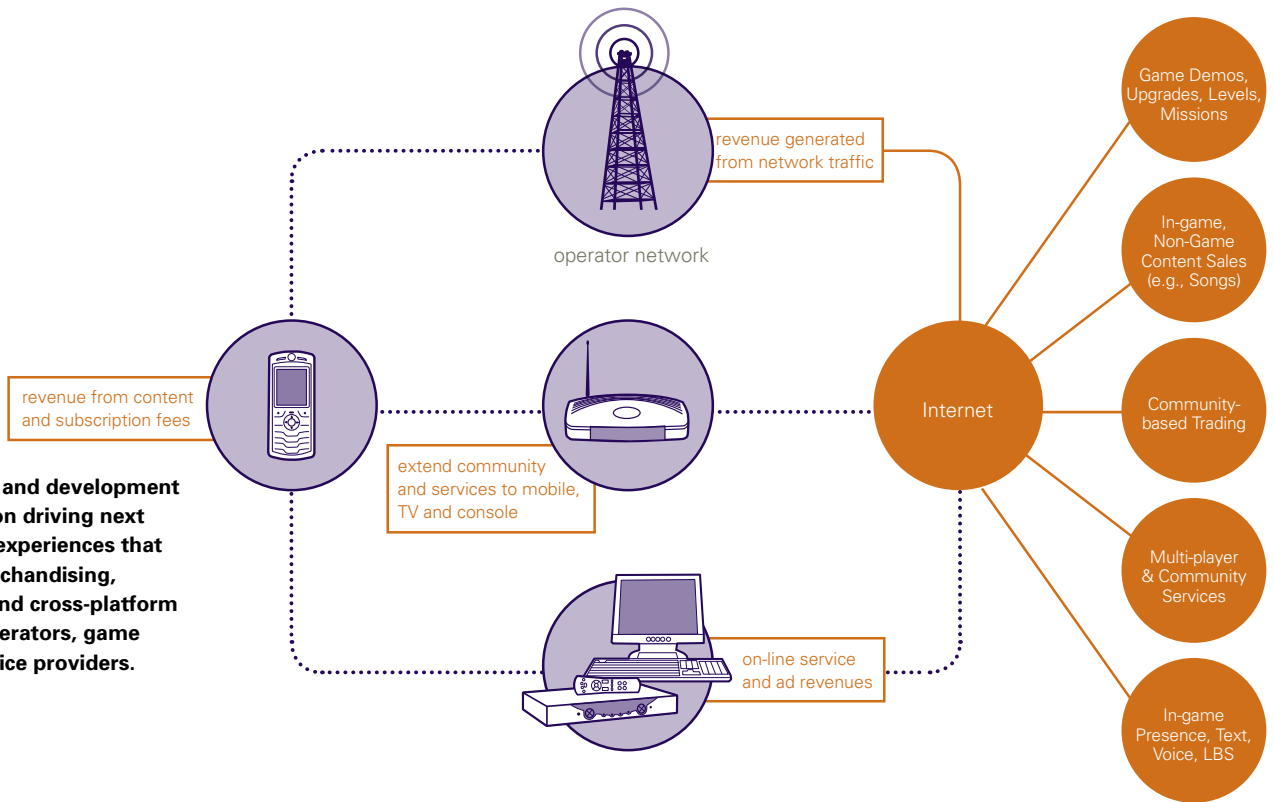
It will make gaming experiences extensible and seamless over time and across devices, so that a session begun on a mobile phone may be continued on a TV, gaming console or PC. Intelligence in the network will provide state maintenance and session management, and will provide an infrastructure for other potentially revenue-producing services.

It will utilize new interfaces. Speech recognition, for instance, might be used as an alternative or a supplement to keypad inputs for game control.

It will integrate location – sensing and presence technologies to help gamers connect and interact with like-minded enthusiasts. An address book may incorporate presence in the same way that IM buddy lists do today, allowing users to see at a glance which of their favorite opponents are available for a game session.

It will exploit new handset features – cameras, GPS and RFID sensors – to connect the digital and physical worlds and enable new experiences.

Motorola's research and development efforts are focused on driving next generation gaming experiences that can incorporate merchandising, shared experience and cross-platform opportunities for operators, game developers and service providers.



A Staged Development Strategy

Motorola's game development agenda is shaped by three guiding principles that will allow Motorola technologies to support a staged progression of novel game experiences over short and longer term time spans. Motorola's intent is not to enter the mobile gaming market as a provider of gaming content. Our goal is to identify compelling new experiences that will expand the existing market space by attracting both developers and users to an extended and more profitable Motorola technology platform.

This includes driving three vectors of change in the gaming experience and the technologies that support it.

Mobilize – We will create mobile extensions of popular console and PC experiences that enable hybrid modes of play, and player communities that simultaneously include both tethered and mobile participants.

Accessorize – We will enable the creation of compelling new gaming experiences that spur the development of new accessories and revenue streams.

Futurize – We will enable the creation of innovative experiences that are dependent on feature-rich handsets and advanced network concepts.

Each of these guiding principles is driving architectural innovations that, in turn, enable new genres of gaming experiences that more fully exploit the potential of a mobile communications platform.

The mobile phone as console extension – One possible development trajectory is for the mobile phone to enter the online multi-player gaming space as a communication adjunct of the console. Motorola is investigating possible applications that involve the phonebook acting as a registry for dynamic gaming, as a retrieval tool for auxiliary information, as a network link to other hardware resources, or as an Internet gateway.

PIONEERING MOBILE DEVICE TECHNOLOGY

Much of this new functionality will be created by the extension and recombination of existing technologies, many of which originated at Motorola Labs. Examples of Motorola innovation and technology leadership include:

Web technologies for voice services – In 2000, Motorola co-founded the VoiceXML Forum with AT&T, Lucent and IBM, and co-authored the VXML specification, which in turn provided the foundation for W3C's Speech Interface Framework.

Location-based services for mobile devices – Motorola's VIAMOTO suite of location applications turn data capable cell phones into powerful navigation systems and local information guides.

Integrating sensors and wireless communication – Motorola's neuRFon (named for a combination of "neuron" and "RF") integrates very small sensors with low-power radios and new protocols to support ad-hoc, multi-hop communication. Much of the neuRFon technology was incorporated in the IEEE 802.15.4 standard and in the ZigBee specification.

Portable payment and personal data solution – MotoWallet is an incubation-stage solution that utilizes Near Field Communications, biometric identification and secure onboard storage to provide an integrated platform for mobile commerce, credentials, access, password and personal data storage, and authentication within a universally available hand-held device.

Location-based game concepts – Because mobility is the default feature of all mobile devices Motorola is evaluating new game concepts that link communication and location, such as geo-caching and treasure hunts. These have obvious applications as promotional vehicles, and can leverage platform accessories such as GPS that are already becoming popular.

Games based on sensor extensions to the mobile platform – Motorola is also exploring ways in which the addition of new sensors to the handset platform may enable new types of gaming experiences. One example is a mobile version of the arcade game "Dance Dance Revolution" in which motion sensors attached to the player's legs provide the inputs conventionally acquired through a floor pad. Play prompts are delivered through the handset screen instead of a console monitor.

Games that leverage rich-media capabilities – Motorola is also taking a longer-range look at gaming concepts that will require more sophisticated media processing capabilities than are currently available in mobile phone platforms. Among the features and functions under investigation is the use of animated avatars or synthetic actors to provide novel and distinctive interfaces capable of subtle emotional communication with conservative network bandwidth requirements.

Strategic partnerships that design game-friendly platforms – Motorola is leveraging strategic partnerships with game developers to create new mobile-phone platforms that complement future game software and visa versa. By partnering with designers early in the process, it will ensure a high level of quality and volume of games that will be marketable to future mobile devices. The partnership can also lead in the development of handsets and accessories for new games that require different hardware and software functionalities.

Architectural Initiatives at Motorola Labs

To enable the new types of compelling mobile game experiences described above, investigators at Motorola Labs are evaluating numerous possibilities for extending handset and network architectures to provide significant new capabilities. Examples include:

Distributed Multi-Modal (DMM) Architecture – To improve the performance of mobile applications with multi-modal interfaces, Motorola is developing new architectures that separate and distribute the component functions of speech processing and voice services. By performing all signal processing locally on the client device, and employing VXML communication with network-based services, DSR delivers high speech recognition performance with reduced latency and bandwidth requirements.

Ad-hoc P2P Networking – The Acapella platform is a Java ME middleware suite developed at Motorola Labs to let mobile applications discover and interact with nearby peer devices using an 802.11 (Wi-Fi) RF signal instead of the cellular wide-area network. In gaming applications Acapella may enable ad-hoc, proximity-based P2P gaming sessions, temporary viral extension of software rights and other useful capabilities that add significant flexibility to the gaming experience.

Push-to-X – Motorola is adapting its Push-to-Talk over Cellular (PoC) technology to provide a wide range of communication services that may extend and enrich the mobile gaming experience. P2X may provide a voice communications overlay to game play; enable file exchange or photo delivery all over a half duplex channel.

API Definition – Extending the handset platform means extending the APIs that are available to applications running on the device. Motorola engineers are currently identifying a series of high-priority game concepts as a first step in identifying the new APIs that will be required to enable play on a mobile phone handset.

Engaging the University Community

Motorola is also reaching out to involve computer science departments at leading universities in the work of defining new collaborative gaming experiences and the mobile platform architectures required to deliver them. Motorola is working with key faculty members at USC, Georgia Tech, and the Royal Institute of Technology (KTH) Stockholm to develop curricula focused on key gaming challenges

Our collaboration with USC will create a new course in mobile game design leveraging multi-modal and location-aware technologies. Georgia Tech will focus on augmented reality games and gaming-oriented wearables. KTH Stockholm will target sensor integration and SIP-based architectures for multi-player games.

These relationships play a unique role in Motorola's gaming development program, providing a fresh source of innovation and insight, an opportunity to assess emerging talent, and the opportunity to connect with industry leaders in gaming content creation such as Electronic Arts, who are also involved with many of the same institutions.

Conclusion

Motorola believes that mobile gaming is evolving to provide a collaborative experience that will seamlessly connect player communities across sessions, devices and networks. We believe this development is strongly propelled by the converging interests of consumers, content developers, device manufacturers, and network service providers with gaming creating important new opportunities for all industry participants. Motorola Labs' new PlayAnywhere research project is a combination of internal investigations and external collaborations designed to define a shared technology vision that will help the industry fully exploit the immense potential that exists at the intersection of collaborative gaming and mobile communications.



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