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The Quest for Mobility: Designing Enterprise Application Framework for M-Business Practices

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ABSTRACT

With the advent of the “road warrior,” a growing part of the workforce is mobile and using all sorts of mobile devices to stay in touch and transact business. As the global economy shifts toward the mobile economy, enterprises need to be progressively more flexible and globalize. Mobile businesses open up new opportunities for innovative enterprises and give them new means of communications with customers and employees. In a changing business landscape, mobile business addresses new customer channels and integration challenges. The current transformation is simply the movement of e-business to a mobile environment. It is still a developing concept as are the business models that support it. The usefulness of the mobile channels will be largely driven by new enterprise applications that enhance the overall customer values. This paper provides a broad discussion on the movement of mobile integration strategies. Several issues will be addressed, such as value chain, the data access of mobile computing, m-business application framework, and the future development of mobile computing. All of these efforts attempt to provide an overview and schematics for the integration of modern e-business application strategies into future m-business practices. This paper will show that any proposed system or strategy must recognize the primary value and mechanism of how people “work,” and technological solutions must be devised in order to facilitate people who conduct business. With mobile technologies, enterprise applications will go beyond the four walls of organizations to a workforce on the move.

1. THE PARADIGM SHIFT

The challenge of global marketplace and new emerging technologies are the driving forces for enterprise to optimize their business strategies and operations frequently. Customer preferences and needs change constantly, resulting in pressingly intense competitions. Time sensitive real-time transaction is becoming the common denominator for successful businesses. Information also needed to be available to anyone from anywhere at anytime. There are challenges along the path of business evolutions, however, the innovated enterprises seize every opportunity to reinvent themselves in order to fit into the global spectrum of business. The Internet is bringing profound impact to the business world and has enabled a new way of conducting commerce. To compete in the emerging digital economy, enterprise need to change their business models, rethink the way they work and forge new relationships with their trading partners and customers.

Today, mobile businesses open up new opportunities for innovated enterprises and give them new means of communications with inside/outside stakeholders. In a changing business landscape, mobile business addresses new customer channels and integration challenges. The e-business comes a long way from hype to mature. The mobile solutions will build on the top of the existing e-business investments. The m-business is facilitated by the integration of the Internet, e-business, and the wireless world where customers can go online with any device at anytime from anywhere. Enterprises focus on

how to use mobile technology to provide customers with rich service experiences and greater satisfactions. This is a more real picture about business, because business opportunities occur in anywhere at anytime. To embrace this big vision, a new value chain is emerging which focuses on the mobile devices, access methodology, and enterprise contents. Mobile applications are beginning to play a central role in enabling real-time supply chain. Enterprise must design a mobile application framework for both customers and their suppliers. The usefulness of the mobile channels will be largely driven by new enterprise applications that enhance the overall customer values. Seeing m-business processes in terms of a net value added chain is a good approach for visualizing current and future competitive advantages. The creation of these values depends on the enterprise’s ability to coordinate and link those internal/external activities efficiently.

2. THE WIRELESS LANDSCAPE

The m-business is facilitated by the integration of the Internet, e-business, and the wireless world where people can go online with any device at anytime from anywhere [1]. All mobile workforce demands mobile computing and access to e-commerce resources regardless of the medium used to gain access. However, to create multi-channel and multi-technology solutions in a fast-moving and technologically indefinite mobile environment is difficult and extremely risky. A number of mobile devices, closed networks, disparate carrier/server systems, protocols, and solutions characterize today’s

wireless landscape. Currently, accessing the web through a wireless device is different than accessing the web through wired connections. The fastest way to access the Internet on the move is through the IEEE 802.11b (Wi-Fi) standard. Overall, 802.11 (Wi-Fi) in its various forms (a, b, e and g) has emerged as the winner in wireless LAN technology [2]. However, the problem with wireless LAN-based access is that the access points or base stations have a very short range, which means they're restricted to a few "hotspots," such as hotels, conference centers, and airport. The situation gets more complex when the wireless LAN is mobile.

2.1 The Wireless-to-Wired Network Infrastructure

The development of the cellular network not only enabled the advancement of mobile communications but

also provided the playgrounds for mobile commerce. The term cellular comes from the honeycomb shape of an area into which a covered region is divided. Cells are base stations transmitting over small geographic areas. A frequency spectrum is divided into blocks of frequencies and those blocks are assigned to the cells. As a mobile unit passes from one cell site to the next, the call is handed off from one transceiver to another. When the service area grows with more users, the approach is to split an area into smaller ones. In this way, the urban centers can be split into as many areas as necessary to provide service in heavy traffic regions. Therefore, less expensive cells are then deployed to cover the remote rural areas. The base station (BS) host several telecommunication equipment at the transmit/receive antenna's base, the center of a cell.

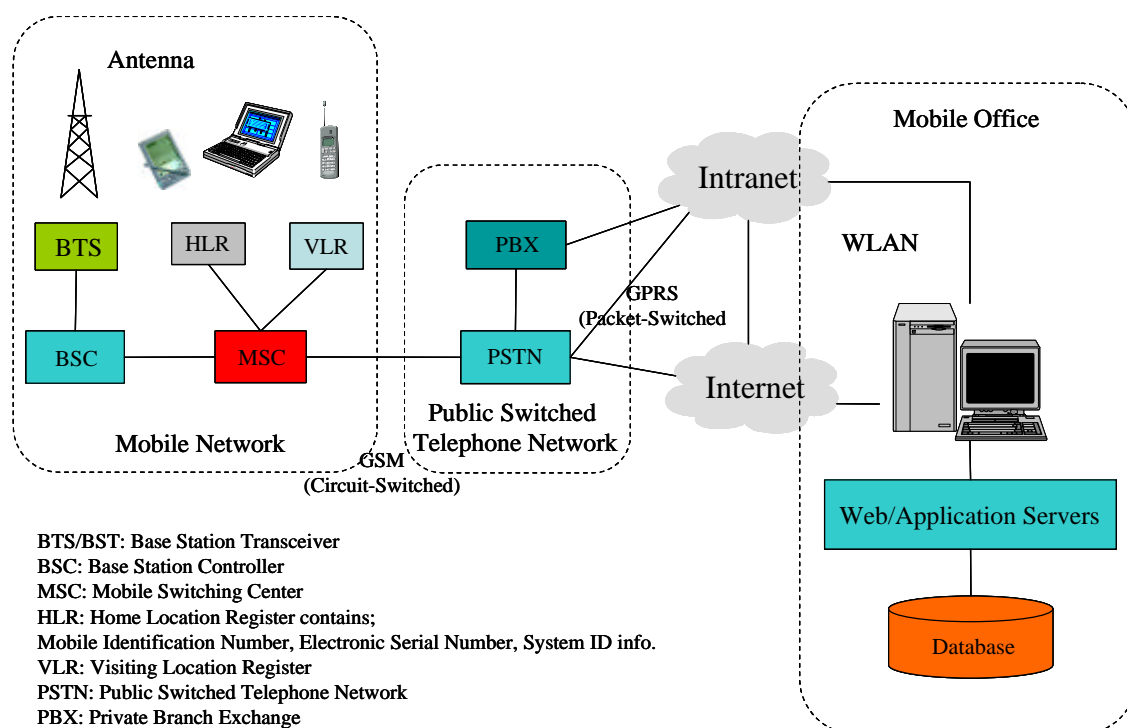


Figure 1 The Wireless-Wired Landscape

The base station in Figure 1 consists of two major electronic units known as the base station transceiver (BST) and the base station controller (BSC). The BSTs are full-duplex transmitter and receiver units (transceivers) that signal to the mobile units and receive signals from them. The BST serves one cell in the cellular network and contains one or more transceivers. The BSC controls the transmission and reception of signals of the BST and switches calls between the BST and mobile units. The BS is also responsible for administration, call processing, maintenance, handoff, and audio signal compression and decompression as directed by the mobile switching center (MSC). Each BS is controlled by the MSC. The BS is connected to the MSC using voice trunks and data links. The MSC serves

as a central coordinator and controller for the cellular system and is also an interface between the wireless and wired infrastructure. The MSC is connected to the Public Switched Telephone Network (PSTN) using voice trunks and data links. The MSC can be considered the same as a landline-switching center in the central office (CO) with the enhanced capability to track each mobile unit. A system identification number (SID) is used to identify whether a person is roaming or in the home (home SID) area. If a person makes a call within the home area, then the MSC serving the call is considered the home MSC. If the person is roaming outside the home area, then the MSC serving the call is known as the serving MSC. In that case, the SID of the MSC is known as serving SID.

In addition, there are Home Location Register (HLR) and Visiting Location Register (VLR) databases owned and maintained by the service providers that keep track of subscriber's information. In this way, the mobile users can get on the Internet using technologies, such as Wideband Code Division Multiple Access (WCDMA), which is usually referred to as 3G.

The fourth-generation (4G) cellular services intend to provide mobile data rates of 100Mbps or more. This 4G is an entirely packet-switched network that all network elements are digital with higher bandwidths to provide multimedia services at lower cost. In 4G mobile IP, each cell phone is assigned a permanent "home" IP address, along with a "care-of" address that represents its actual location. When a computer somewhere on the Internet wants to communicate with the cell phone, it first sends a packet to the phone's home address. A directory server on the home network forwards this to the care-of address via a tunnel, as in regular mobile IP. The directory server also sends a message to the computer informing it of the correct care-of address, so future packets can be sent directly. This should enable TCP sessions and HTTP downloads to keep going as users move between different types of networks. The ultimate 4G would be full on-demand capability, Wi-Fi to WAN roaming, and have it as a true IP network. Currently, the Japanese government required all of Japan's ISPs to support IPv6 by 2006, to coincide with the launch of 4G. Countries in Europe and Asia are considering similar regulatory action. NTT DoCoMo (provides i-mode service) also hopes that true mobile broadband will enable them to replace fixed access entirely, and they plan to have a 4G system operational by 2006.

3. DEFINING MOBILE MARKET VALUE

Whenever a technological innovation is introduced, it brings both new business opportunities and new challenges to enterprises. As the global economy shifts toward the mobile economy, enterprises need to be progressively more flexible and globalize. The mobile business strategies will focus on what "value" might be created for the enterprises in the marketplace.

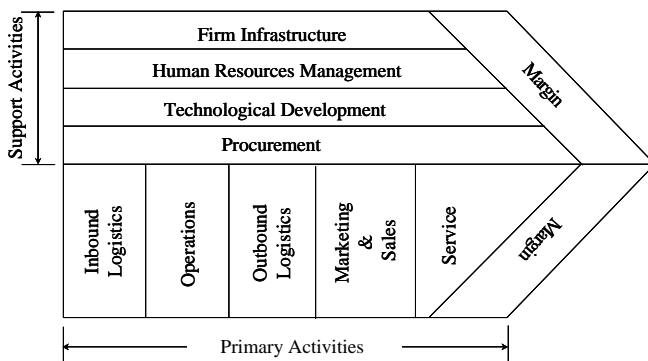


Figure 2 Porter's Value Chain

To gain competitiveness and create values, the enterprise should target on redesigning their core business processes in response to key competitive factors. These competitive factors can be derived from the Porter's value chain [3]. The value chain divides the organization into a set of generic functional areas, which can be further divided into a series of value activities. In the value chain, there are two distinct types of functional area: primary and support (Figure 2). Primary activities are concerned with the direct flow of production (such as inbound logistics, operations, outbound logistics, marketing, sales, and service), whereas support activities (firm infrastructure, human resource management, technology, and procurement) support the primary activities and each other. Starting with its generic value chain categories, a firm can subdivide into discrete activities, categorizing those activities that contribute best to its competitive advantage. Porter's version of supply chain management is called a value chain because it focuses on value. The value is measured by the amount customers are willing to pay for an organization's product or service. Primary and support activities are called value activities, and an enterprise will be profitable as long as it creates more value than the cost of performing its value activities [4]. In this way, a value chain is defined and a better organizational structure and business process can be created around those value activities that can most improve an organization's competitive advantage [5].

Porter also recognized linkages outside the enterprise, as they relate to the customer's perception of value. This provides the possibility that one value chain could be linked to another value chain, because one business partner could be the other's customer. This interconnected value chain system can act as a supply chain that encompasses the modern business world, and participating organizations can readily extend their technologies to their partners. The "extended enterprise" aspect enables supply chain integration, more effective outsourcing, and self-service solutions for both internal and external stakeholders [5]. The usefulness of the mobile channels will be largely driven by new enterprise applications that enhance the overall customer values. A business that creates m-business applications can benefit from the first-to-market advantage. As the wireless Internet continues to expand, first-to-market organizations will have already secured a customer base. It can be foreseen that the m-business market value will be astronomical.

4. THE M-BUSINESS SERVICE BLUEPRINT

As mentioned before, seeing m-business processes in terms of a net value added chain is also an approach for visualizing current and identifying future competitive advantages. In short, the creation of these values depends on the enterprise's ability to link and coordinate these internal/external activities efficiently [3]. This

interconnected value chain system can act like a supply chain that encompass the modern business world, and participating organizations can readily extend their technologies to their partners. The m-business supply chain practices are just like e-business supply chain practices with the exception of mobility. This is a more real picture about business, because business opportunities occur in anywhere at anytime.

With the convergence of B2B, B2C, SCM, CRM, ERP, Business Intelligence, and real-time relationship management, the personalization of customer information is now possible. The IP convergence strategy will provide a solution that joins the two worlds of voice communications (telephony) and data traffic together. Technologies, such as interactive voice response (IVR), computer telephony integration (CTI), are beneficial to selling chain management. The fully interactive nature of the Internet changes everything in the world of self-service. The blending of Sales Force Automation (SFA) with customer self-service brings new business opportunities. Relevant information and intelligence support processes all can be aligned and implemented in real-time at anywhere. The application and technological framework of m-business to facilitate

these highly interactive communications will be illustrated in the following section. This framework extends existing business applications such as ERP, CRM, and mobile workforce applications to wireless devices.

5. THE M-BUSINESS SYSTEM ARCHITECTURE

In today's m-business, competing for mobility requires either aligning one's strategy to what the enterprise agility or developing mobile computing capabilities to support a desired supply chain strategy. Mobile business systems must to address the strategic visions of enterprise. A successful mobile business application framework for enterprises should link supply chain management, relationship management, and knowledge management to function in an adaptive way and continue to thrive in the m-business era. The design of a m-business system needs to focus on collaboration. In the m-business system architecture, several dedicated servers and databases are required, because enterprise must capture and retain in a central/distributed data repository the data and information that employees need (Figure 3).

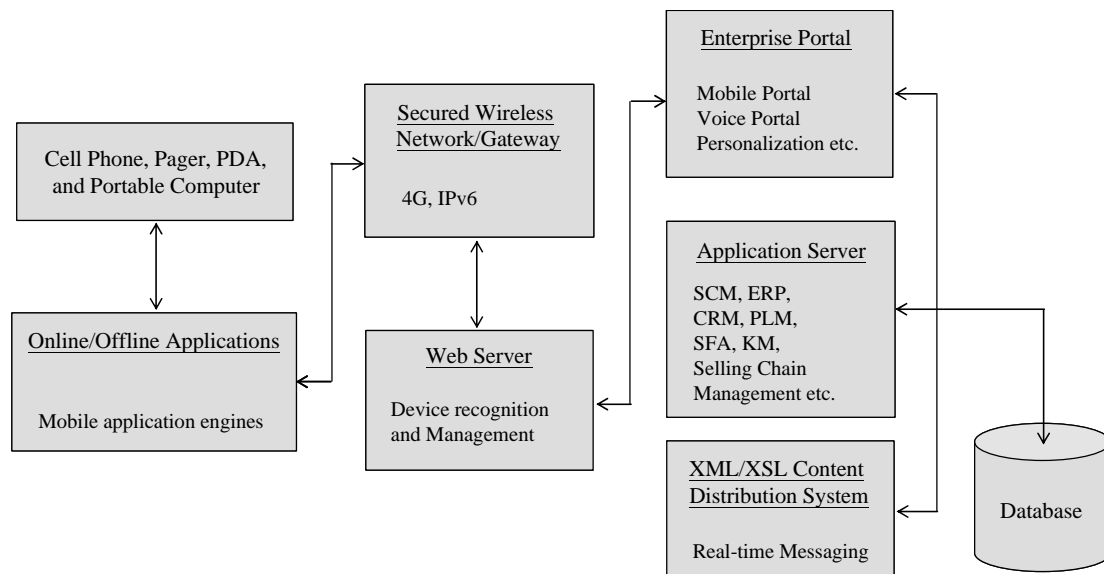


Figure 3 M-Business Application Framework

A selling chain management suite for customer care applications enables new kinds of interactions, new kinds of information, and comprehensive access to all customers and enterprise portals. This customer care can foster joint problem-solving, and convenient self-service. Given the information customers need in the purchasing process. The reasons to stress on 4G and include in this framework are (a) it has wider bandwidths, higher bit rates, (b) it support interactive multimedia services, teleconferencing, wireless Internet, etc., and (c) the global mobility and service portability. For knowledge

management issues, the architecture of IT in the knowledge management system is concerned with organizing and analyzing information in an enterprise's database so this knowledge can be readily available throughout an enterprise. A central/distributed data repository that provides/captures the data and information for employees and executive decision-making is also very important in a knowledge management system. The database system is the driver that consolidates and directs the overall resources of the supply chain to the most mission-critical business

activities. As a result, an m-business supply chain solution must provide supports for the capture and communication of customer demand, as well as enable this demand to automatically trigger business events and initiate process workflow. Transcoding contents and developing enterprise applications to work across several mobile devices and browsers seem to be a complex problem. The key is to focus on the lowest common denominator: the XML (eXtensible Markup Language) and XSL(eXtensible Style sheet Language). The XML supports for developing mobile applications running on multiple devices and platforms [6]. Databases are also working with XML-structured data and tabular relational data. The ability to translate standard HTML/XML content into the various flavors of wireless content is based on the way that the XML/XSL standards operate. Because of these standards, XML is able to function as a meta language, flexible enough to recreate other markup languages and use them as subsets. Technologies such as Java Server Pages (JSP) and Active Server Pages (ASP) are also being extended to support multimode clients. Figure 4 and Figure 5 illustrate some examples of transcoding systems and applications. Enterprises that provide HTML to wireless transcoding solutions translate standard content into XML that reflects all of the information flow and logic of the transcoded content, and by browser detection determines for each mobile user which subset of XML to translate content into [7]. Thus we see that a robust and active transcoding system goes a long way toward reducing complexity and maintaining consistency throughout the enterprise across multiple clients. Effective m-business supply chain solution will need to deliver an accurate and common view of customer demand data as well as any subsequent events, plans, or other business data. This new supply chain framework will offer virtually unlimited business opportunities in the alignment of technologies and processes. A well-designed and well-integrated supply chain for m-business will improve upon existing cost-responsive processes, and have organizational agility in the event of change.

6. CONCLUSION

The emerging mobile technologies with Internet capabilities that connect numerous devices and information portals represent a new phase in enabling intelligent mobile workforces. Multi-channel and multi-technology strategies represent the next frontier. Mobile business addresses new customer channels and integration challenges. Being the central platform for mobile applications, the next generation Internet must provide an infrastructure that allows data transfer to be fast and more cost-efficient. The mobile Internet will open an important new channel for commerce. With mobile technologies, enterprise applications will go beyond the four walls of organizations to a workforce on the move. Employees will be able to access the company's mission-critical enterprise applications, such

as enterprise resource planning (ERP), customer relationship management (CRM), and supply chain management (SCM). This open enterprise is also extended to suppliers and trading partners so that when customers get in contact with the resources of an enterprise, they also touch upon the resources of the value chain. The usefulness of the mobile channel will be largely driven by these enterprise applications that enhance the overall customer values. With self-service applications in hand, customers will be able to touch the resource of an enterprise. It is the customers who drive the entire value chain (or supply chain), determining what is to be produced, when, and at what price. They will be able to interact with the entire business ecosystem and not just individual enterprise.

Content in XML can use XSL style sheets to dynamically render the content into:

- HTML for Desktop and PDA
- HDML or WML for mobile devices
- Specific XML for B-to-B

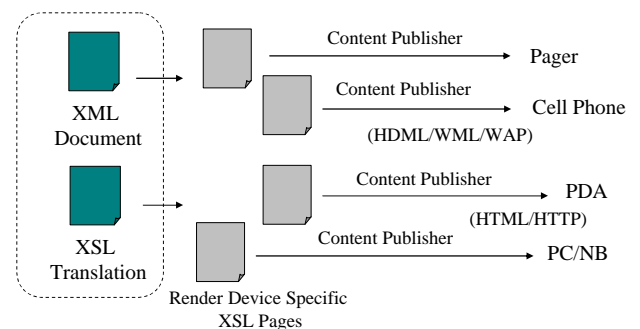


Figure 4 The Wireless-Wired Landscape

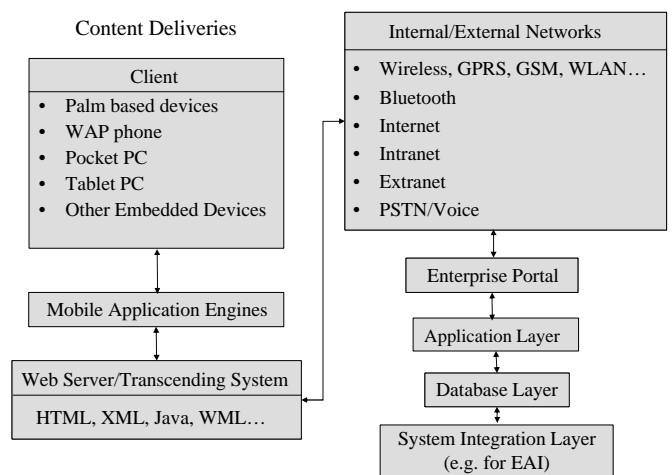


Figure 5 Content Delivery Schemes

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