

applications. More specifically, this invention relates to developing a wireless application gateway to enable wireless access of customized data from multiple remote enterprise systems.

In today's world, most enterprises deploy several applications for executing their business processes. An enterprise may deploy, for example, a supply chain management (SCM) application for managing its inventories and it may also deploy a Customer Relationship Management (CRM) application for managing relationships with its customers. Some well-known examples of applications used for SCM and CRM include those developed and sold by SAP of Germany, Siebel Systems of San Mateo, Calif., USA and Oracle Corporation of Redwood City, USA.

Typically, these large enterprise applications and systems reside on an Information Technology platform and use Operating systems such as Windows 2000, Microsoft NT, Linux, etc. Furthermore, these applications and their corresponding data may reside in various database systems at different sites or different locations (within or even outside the enterprise). For example, an enterprise that deploys an SCM application may have a production facility in China, a sales office in France, and its headquarters in the USA. The employees, contractors, dealers, suppliers, and even customers of such an enterprise usually need to exchange information (from their respective locations).

To address this issue of information exchange over geographically distant locations, enterprises use wired networks to connect their systems (as well as employees, clients and others) to the Internet or enterprise intranets. These local and wide area networks allow the connected parties to access data and execute applications, as desired. Although a wired connection solves the problem of accessing the enterprise Information Technology resources to a great extent, this solution is clearly limited, as mobile users cannot use it. For example, this solution will not help a salesperson-who is traveling to a customer site and who may want to access information about a product (that his/her company may be currently selling or is in the process of developing).

Emerging wireless technologies overcome the abovementioned drawback to a certain extent since they allow the user to access enterprise Information Technology resources through mobile devices (such as Personal Digital Assistants (PDAs), Palm tops, mobile phones, and handheld scanners). Currently, wireless services are based on different wireless technologies such as General Packet Radio Services (GPRS), Cellular Digital Packet Data (CDPD), Code Division Multiple Access (CDMA) and Global System of Mobile communication (GSM) and are primarily used for accessing general portal information; general portal information is simply "common information" that can be accessed by any user (for his/her personal use). Examples of such information include stocks quotes, the weather report and sports scores. While accessing and presenting such general portal information, a minimal amount of personalization and processing is required.

Of course, incorporating the heretofore-mentioned technologies and devices for accessing an enterprise's business information `anywhere` and `anytime` provides many advantages to the enterprise. These advantages include lower sales costs, improvements in productivity and shortening of supply chain and customer response cycle times. However, there are four sets of issues that need to be addressed in order to properly integrate wireless systems with enterprise backend systems. These issues are related to (a) processing and customizing the information to be presented to the user, (b) integrating different mobile devices having different screen sizes and other resources, (c) handling a number of wireless technologies (e.g. CDPD, GSM, GPRS, and CDMA) and taking care of issues related to security and Quality of service (QoS) for each of these technologies, and (d) seamlessly integrating a multitude of interfaces within the enterprise system and the wireless system for the proper functioning of the entire system. Since these four sets of issues are fairly important and complex, they are described in detail in the following paragraphs.

The first set of issues arises while integrating the wireless system with the enterprise backend systems. There are four main complexities that need to be handled while integrating these systems. First, the business information from an enterprise needs to be processed and customized for each individual user who is accessing the business information. Second, the business information may have access and security issues associated with it for individual users. (For example, the president of Human Resources may have different access rights than a warehouse manager.) Such issues also need to be addressed while integrating the wireless systems with the backend systems. Third, enterprise information has to be often retrieved from multiple backend systems before transmitting it to the mobile devices. (For example, an enterprise may use

Area Network (WWAN). In such a case, in addition to considering the type of mobile device, the wireless network connection is also considered while developing the WAG solution. For instance, the amount of data to be transferred to WLAN connected mobile devices may be specifically programmed using MDC 306. Also, mobile devices may access the WLAN using wireless access points located at different locations in the enterprise. These access points may use any standard communication protocol, such as Bluetooth, HomeRF, IEEE 802.11, etc.

As WLAN offers higher bandwidth for data transfer, a higher amount of data may be transferred to mobile devices that are connected to System 100 using the WLAN. Thus, a mobile device, which receives the list of electrical engineers in set of, say, three engineers per list, through WWAN, receives the list in set of, say, ten engineers per list.

In case a mobile device uses a WLAN to access the enterprise backend system, then the security of the network is determined by the enterprise security protocol. In such a case, System 100 access is independent of the security protocol being used. Thus, System 100 will work on any protocol.

In another alternative embodiment, the transfer of information between the System 100 and a mobile device may be a batch transfer, i.e. information is not transferred at real time. Instead, it is transferred in batches, either at pre-defined times or on the basis of network availability. A batch transfer may be carried out if the client device is a thick client with memory and processing capabilities. In such a case, a user of the mobile device may conduct all the transactions offline. Whenever, the mobile device connects to a wireless network (in order to connect System 100), all offline transactions done by the user are uploaded into System 100. Similarly, all the data that needs to be downloaded to the thick mobile client is downloaded from System 100 to the mobile device (when the mobile device is connected). In this embodiment, System 100 may be provided with "batch agents" that are executed in order to enable batch transfer; information related to the transaction, such as time stamp information may be stored by the use of these "batch agents".

ADVANTAGES

The invention provides a graphical development toolkit for development of a WAG solution without any programming. Using the wizards and GUIs provided by the development toolkit, a developer can develop WAG solution simply by selecting options through "point and click" configuration. The developer can be a business analyst having no programming knowledge. The graphical development toolkit also prevents the developer from making mistakes as are common while writing code.

The invention provides wireless access not only to databases but also to complex business applications of the enterprise.

The invention also allows the user to work with the business components of different enterprise backend systems without knowing about the intricacies of these business components.

The invention allows a WAG solution to be deployed quickly (in a matter of two to four weeks) and seamlessly.

Using the invention, WAG solutions can be built for all levels of the enterprise using the data gathered at the time of development. The WAG solution provides transparency of data where each level in the enterprise is presented with the data based on its profile. Thus, a production manager can access data related to production processes whereas a director can access a summary about status of different processes in the enterprise.

The invention also provides code transparency to enable code reuse by using code corresponding to a WAG solution for another WAG solution.

While the preferred embodiments of the invention have been illustrated and described, it will be clear that the invention is not limited to these embodiments only. Numerous modifications, changes, variations, substitutions and equivalents will be apparent to those skilled in the art without departing from the spirit and scope of the invention as described in the claims.

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