Nettech White Paper:

Mobile Middleware:
The Next Frontier in Enterprise Application Integration

By, Tamara Kanoc, Director of Marketing,
Nettech Systems, Inc.

Nettech Systems, Inc.
600 Alexander Road
Princeton, NJ 08540
Tel: 609-734-0300
Fax: 609-734-0346
Web: www.NettechRF.com

I. Introduction

The role of this white paper is to introduce an emerging enterprise software category, mobile middleware. Mobile middleware refers to the software that is used by software vendors and corporate IT groups to add mobile connectivity to their applications. While mobile middleware has been used for years by many vertical market application developers, there are now forces at work that make mobile middleware a critical element in all aspects of the enterprise software market.

II. Understanding the Enterprise Software Market

Before we can fully appreciate the vital role that mobile middleware plays in the enterprise software market, we must first gain an understanding of that market and the growing use of middleware to integrate enterprise applications.

Enterprise Software consists of operating systems, network software, application development software, middleware, databases/warehouses and enterprise applications. Enterprise applications are those that are used within large corporate "enterprises" to track resources, perform services, manage customer data and communicate internally and externally. Applications generally categorized as "Enterprise Applications" include:

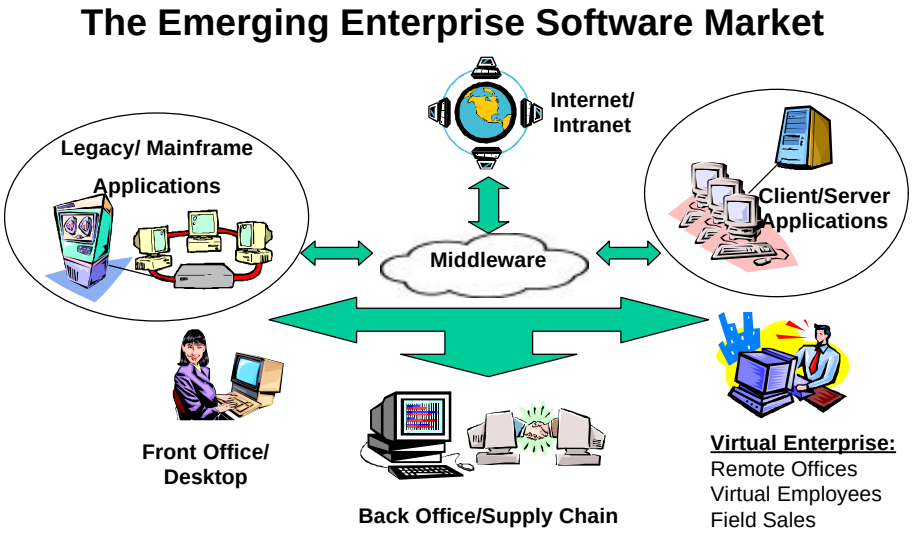
Enterprise Applications:

Front Office	Supply Chain/Back Office	Desktop
• Sales Force Automation (SFA)	• Enterprise Resource Planning (ERP)	• Email
• Customer Relationship Management (CRM)	• Manufacturing	• Internet/Intranet
• Customer Care/Call Center	• Financial/Accounting	• Calendar
• Legacy/custom applications	• Human Resources	• Productivity Applications (word processor, spreadsheet, graphics, etc.)
	• Legacy/Custom applications	•

Enterprise Software, already the largest software market segment, has grown rapidly over the last few years and will continue to explode over the next few years as companies look to improve communication and integrate applications. The drivers behind the growth of the Enterprise Software market are listed below.

Enterprise Software Growth Drivers:

1. ***The Internet.*** The Internet is quickly emerging as a mission-critical platform for enterprise applications. The growth of the internet has enabled companies to add services and perform tasks that were previously cost-prohibitive. Examples include: linking to customers, suppliers and business partners, achieving personalized communication with customers, connecting employees worldwide, etc. Internet technology will continue to blossom as organizations web-enable their enterprise resources to achieve greater efficiencies and offer new services.
2. ***Integration between Applications.*** To run effectively, many organizations are seeking to consolidate or integrate applications to create a greater knowledge base and improve efficiencies. However, since moving large organizations to completely new systems is expensive, time consuming and risky, many corporations seek to leverage their existing systems while adding on new technologies. This creates an environment where heterogeneous "islands of technology" co-exist. Much of the growth in the enterprise software market is a result of enterprises seeking to integrate applications together or migrate them to newer platforms.
3. ***Continuous Drive for Competitive Advantage and Productivity Increases.*** Business is conducted at an ever-increasing pace. Over the past few years, many organizations have implemented technologies that allow them to improve efficiency and productivity to be able to move more quickly to meet the demands of business and remain competitive. Over the next few years, we will see businesses looking to use technology to differentiate themselves and offer new value-added services to boost revenues. As mentioned earlier, the internet will play a critical role in this venture, as well as many other integration and enabling technologies.

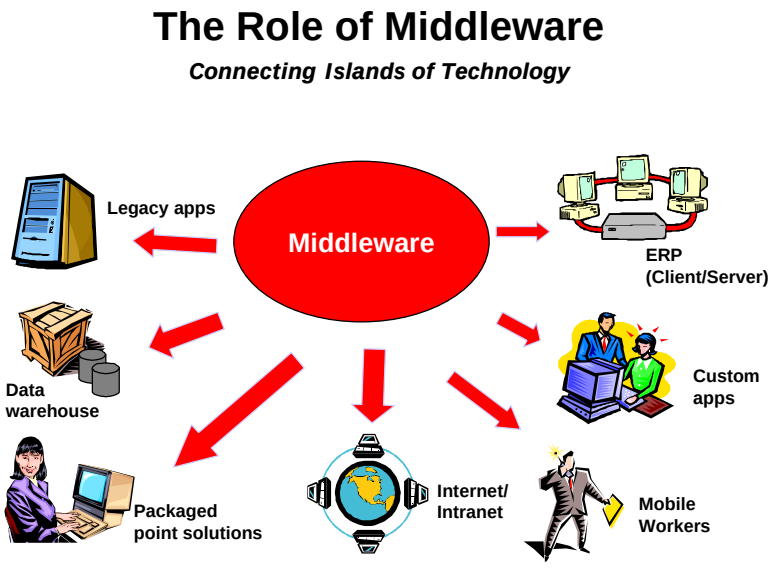


III. The Role of Middleware

The term middleware encompasses many different types of software, most of which operate "behind the scenes." Middleware, which is sometimes referred to as the "glue that holds components together" is really an enabling technology that ties together applications, rather than the solution itself. Middleware is traditionally defined as:

An enabling layer of software that resides between the business application and the networked layer of heterogeneous (diverse) platforms and protocols. It decouples the business applications from any dependencies on the plumbing layer, which consists of heterogeneous operating systems, hardware platforms and communication protocols. (Source: International Systems Group)

Middleware is an important part of the enterprise software market because it is used to "tie together" the various "islands of technology." (See diagram below) Middleware enables enterprises to leverage their legacy systems, while at the same time introducing new technologies. Middleware provides a unifying layer between these disparate systems.



Middleware Categories:

1. ***Data-Access Middleware.*** Software used by applications to access data from disparate data stores. Example: Intersolv's DataDirect.

2. ***Message-Oriented Middleware.*** Includes software that allows two or more disparate applications to exchange data or messages to ease application integration. Example: IBM's MQ Series.

3. ***Transaction Processing.*** Middleware that handles high transaction processing requirements in a distributed environment. Example: BEA System's Tuxedo.

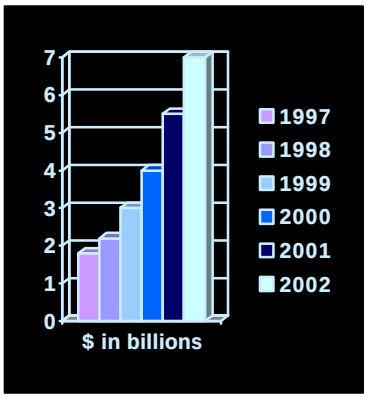
4. ***Desktop-Access Middleware.*** Middleware that allows a GUI front end on a legacy program. Examples: terminal emulation products, legacy to HTML converters, etc.

5. ***Object Middleware.*** Sometimes referred to as object request brokers, object middleware is essentially high abstraction, reusable software components (objects) that facilitate integration within the enterprise. Example: CORBA.

We are now seeing the emergence of a new middleware category – ***mobile middleware***. This will be examined in depth in the following sections.

IV. The Driving Forces Behind Middleware

Middleware is one of the fastest growing segments in the enterprise software market. International Data Corporation, a Framingham, Mass.-based market research firm, expects the middleware market to grow from $1.7 billion in revenue today to ***$7 billion by 2002!***



This trend is expected to continue over the next five years as more corporations move to a distributed application environment where they have an even greater need to connect these "islands of technology."

<u>The key drivers behind the middleware market are:</u>

1. ***Integration with enterprise applications.*** As discussed earlier, many corporations still rely on legacy systems and mainframe databases. Middleware is the necessary link between these disparate "islands of technology". Middleware also provides the critical link between enterprise applications, such as Enterprise Resource Planning, Sales Force Automation and Customer Relationship Management applications, and a distributed workforce.
2. ***The Internet.*** As enterprises continue to deploy intranets and extranets, middleware will be required to facilitate access to legacy and other internal applications. Also, to realize the true value of the Internet, corporations will need to "web-enable" internal applications using middleware product.
3. ***Distributed computing.*** Computing no longer takes place just in the corporate data center. There are client/server environments, as well as distributing computing over the internet, intranets and extranets. There is also an evolving need to connect with suppliers and partner along the supply chain, many of whom have different hardware and software platforms.

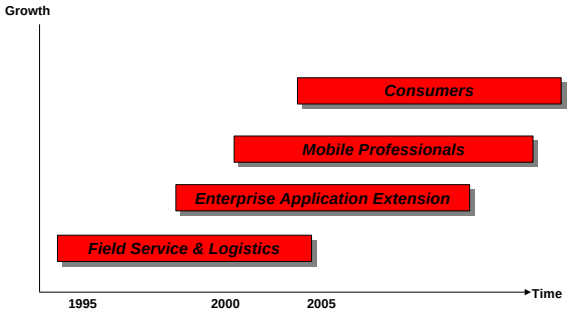
4. ***Mobile workers.*** A new, yet critically important, driver in the middleware market is the increasing number of mobile workers, as it introduces an entirely different category of middleware, mobile middleware, to the market.

V. The Growing Trend Toward Mobility

Today, more and more enterprise workers are "mobile," which means that their job requires them to be out of the office some percentage of time. GartnerGroup, a Stamford, Conn.-based research firm, estimates that 25.3 million of the 112.1 million-person U.S. workforce has a mobile job requirement. Furthermore, The Yankee Group, a Massachusetts-based research firm, estimates that the market for mobile communications will increase from 2.9 million users today to anywhere from 12.6 to 21.3 million users by 2002.

Today, a large percentage of mobile communications users are from vertical markets such as public safety, transportation and field service, where, historically, they have been able to demonstrate a very high return-on-investment through enormous increases in productivity and improvements in customer service. At this time, enterprises are contending with how to provide their increasingly mobile workforce with access to vital enterprise resources. Many are turning to mobile communications to achieve this goal. As the availability of mobile devices, applications and networks continues to grow and prices steadily decrease, we will see mobile professionals and then consumers also adopt mobile communication technologies.

Mobile Data Evolution



<u>Drivers Behind Enterprise Adoption of Mobile Communications:</u>
Enterprises are starting to add mobile connectivity to their mission-critical enterprise applications to meet the following business demands.

1. ***Increasingly mobile workforce.*** As mentioned previously, the number of mobile workers is growing rapidly each year. Yet, business demands that these workers have real-time or near real-time access to vital corporate resources.
2. ***Productivity demands.*** In today's competitive business environment, the need to cut costs and increase productivity reaches across all areas of the enterprise. Many organizations are finding that mobile communication technologies can allow them to reach more customers, more quickly.
3. ***Competitive pressure.*** Companies are continuously searching for ways to add value and differentiate themselves from their competitors. Adoption of

mobile communication technologies accomplishes this goal by allowing them to respond more quickly and service customers at the point of contact.

Enterprise developers are quickly discovering that mobile computing is another new computing paradigm requiring middleware to effectively connect it with their existing systems and overcome the challenges associated with mobility.

VI. Mobile Middleware: The Answer to Enterprise Mobility

Mobile middleware can be defined as an enabling layer of software that is used by application developers to connect their applications with disparate mobile (wireless and wireline) networks and operating systems. Mobile middleware is an extension of the middleware market, driven by enterprise adoption to mobile communications. Just as enterprise developers are turning to middleware to perform other tasks, they are turning to mobile middleware to extend their enterprise applications into the field.

When developing mobile applications, developers encounter many challenges unique to the mobile computing paradigm. Mobile middleware goes beyond the functionality of traditional middleware by overcoming mobility challenges, allowing enterprise developers to easily extend applications to mobile workers.

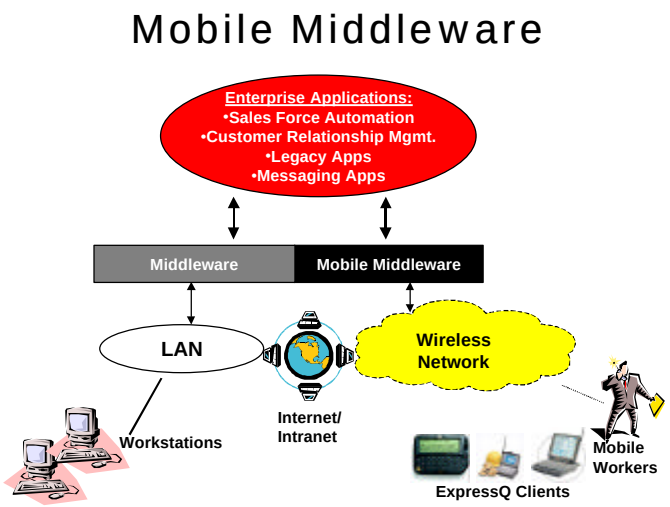
Mobility Challenges:

Since mobile computing, particularly wireless computing, is such a different paradigm than traditional LAN-based computing, developers encounter many unique challenges when developing and deploying a mobile application. These challenges include:

1. The wide variety of wireless and wireless networks available, many of which have non-standard, complex wireless protocols;
2. The variety of devices, which incorporate numerous mobile operating platforms, across which the application must run;
3. The need to communicate with roaming workers who move in and out of coverage, who switch between different devices/networks to meet different needs and who operate in a disconnected fashion;
4. The disparity between the LAN environment and the mobile environment which traditional protocols such as TCP/IP do not address including:
    - Narrower bandwidth than the LAN
    - Higher network latencies
    - Fluctuating coverage conditions
5. The difficulty involved in extending enterprise applications into the field including issues such as:
    - Security
    - Scalability

- Reliability
- Easy integration
- Multiple network and platform support

These challenges are being solved through the use of Mobile Middleware.



Mobile Middleware Benefits:

At the simplest level, mobile middleware allows software developers to easily add mobile connectivity to their application. Developers choose to use mobile middleware, rather than adding this mobile connectivity themselves because it:

- ***Speeds development and deployment cycles.*** By using an off-the-shelf middleware product, developers can quickly add mobile connectivity their application and spend their time concentrating on what they know best rather than trying to learn complex new protocols or figuring out how to solve mobility challenges.
- ***Reduces risk by offering a field proven solution.*** Mobile middleware is created by companies that understand the mobile environment and have spent years learning how to optimize communication for that environment.
- ***Allows them to write it once and run it anywhere.*** Most mobile middleware supports a wide range of networks and platforms with network and device-independent APIs, allowing developers to create their application once and run it over any network or device.
- ***Provides efficient and reliable communications.*** Most mobile middleware optimizes communication for the mobile environment lowering airtime expenses, increasing efficiency, extending battery life and improving the overall user experience.

Mobile middleware can also provide advanced mobility features such as guaranteed message delivery, push messaging, data security and the ability to roam between networks transparently.

Mobile Middleware Drivers:

There are a number of issues driving the demand for mobile middleware, including:

1. The increasing number of mobile workers.
2. The need to provide mobile workers with access to enterprise applications.
3. The large number of different wireless and wireline network protocols.
4. The variety of new devices on the market today.
5. The mobility challenges referenced above.

The quickly expanding mobile workforce, combined with the drivers listed above, clearly indicates that mobile middleware has emerged as a distinct and vital category in the enterprise software market.

For more information about mobile middleware, please refer to the Mobile Middleware White Paper published by Nettech Systems, Inc. This is available at www.NettechRF.com or by calling 609-734-0300 ext. 250.