Impact of the Internet on Transactions

IBM

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Management Summary

The move towards Internet-based business models has forced a re-evaluation of much of the IT infrastructure currently in place in organisations. Of all the issues surrounding the new business trading milieu, in Butler Group's opinion one stands out as being the prime driver for the need to examine – and where necessary replace – current systems; this is the sheer volume of transactions that will be generated in this new environment.

To a certain extent, simply to talk of an explosion in transactions is to understate the true nature of the problems that will face organisations in the future. However, the starting point for the required examination of systems has to deal with the question of volume, and then move to matters that are more complex.

To concentrate solely on volume will lead to problems in the future. Any implemented solution for handling larger volumes that does not also address the other issues will ultimately leave businesses exposed to being able to handle large volumes of transactions, but in a manner that does not reflect true business needs and processes.

Therefore, any solution – or perhaps more accurately solution provider - has to be able to demonstrate an understanding of all the issues that surround the new transactional model. In Butler Group's opinion, there are very few vendors who have the technology backed up by the service infrastructure to help businesses turn concept into reality, and one of these few is IBM.

This should not be taken as meaning that there is no place in the market for point solutions, or that the only correct way forward is a single vendor solution. What it does mean is that enabling technology has to be able to operate in highly complex environments and a high degree of interoperability and openness has to be inherent within implemented systems.

Transaction Types and Numbers

Most organisations have infrastructures that handle the 'nitty-gritty' of current transactions; regardless of the initial point of contact, or primary interface. Thus, for instance, banks and other financial institutions will currently process transactions electronically, even though the majority of the primary points of contact come from a counter-based human interface. The move to replace these human interfaces with electronic ones will not have - at this base level - any appreciable effect, apart from the need to engineer a suitable interface and tie it into back-end processing systems.

It should be recognised that creating new interfaces does not *per se* increase the number of transactions in the traditional sense. Due to the newness of this whole market, there is no evidence that Web-enabling an e-commerce system will increase trade. Rather it is seen as providing another channel – giving consumers and customers the choice as to how they do business. While early adopters of such systems will gain market share by providing this new channel, their competitors will soon have played the game of catch-up and market share will start to even out driven by more traditional marketing techniques.

Therefore, it could be considered that in this model, there will be little increase in the number of overall transactions across a given industry or vertical market sector. Certain organisations will see an increase for a given period of time, and some of that increase will stick, but most certainly not all. This raises the concern that early adopters will create large infrastructures capable of handling the huge volumes of new transactions that are coming their way, but eventually these systems will be under-occupied as the market settles down.

This may seem to be a negative point of view, and contrary to the stated view that the number of transactions will increase. It is, however, not intended to be a negative; it has been raised to extend the range of thinking beyond the current view of what composes a transaction, and what transactions are likely to be spawned from opening up systems to the Internet.

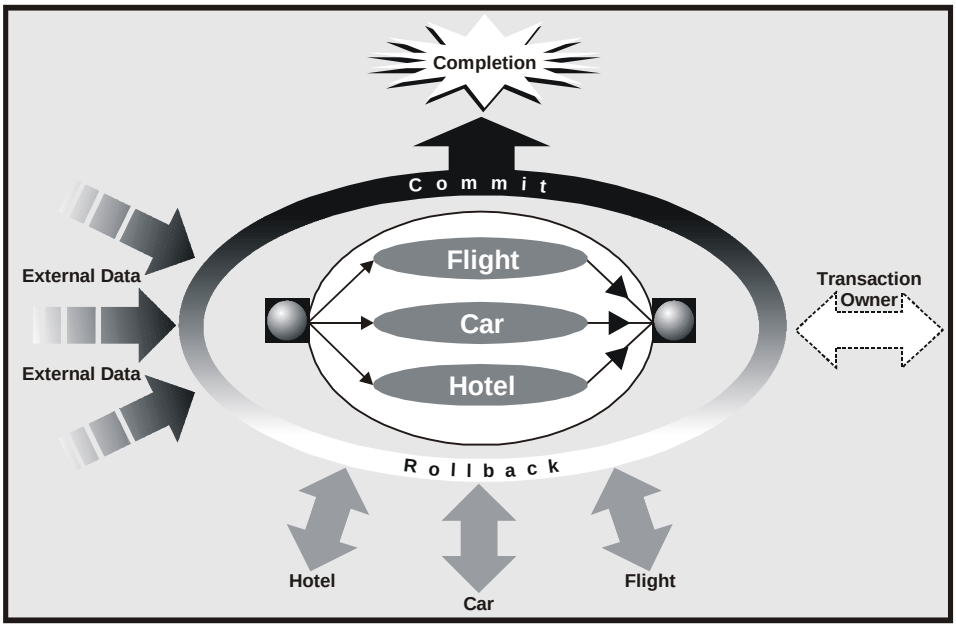
Currently, a transaction is most often thought of as a fulfilment of a specific business requirement; such as a request for a bank balance, or the placing of an order. It is the fact that the real business requirement – as far as the business itself is concerned - commences at the initial point of contact. There has been much discussion of Customer Relationship Management (CRM) over recent times, and how such elements as personalisation and content management will enhance the user experience. These elements can only be brought to market fruition by treating every part of the process as a transaction.

Currently, back-end transactions are tightly confined within old operating paradigms. They exist within a process flow model that suited concepts such as batch processing. It is decoupling this structure that is one element that will create an explosion of transactions, by creating new transaction types.

Further to this decoupling - and central to it - is the length of time that transactions will exist. Again, the old model was for Atomic Consistent Isolated Durable (ACID) transactions. Tightly controlled, easily managed (relative to what was to follow), and understandable. In the context of a discussion on transactional types, it is relevant to consider exactly what an ACID transaction entails. It is concerned with an indivisible unit of work or an all-or-nothing process that maintains a consistent state. It works in isolation divorced from any other transaction and the effect of the transaction will remain after being committed even if the system fails.

More and more, ACID transactions do not serve the purpose of customer expectations. Modern transactions need to be long running; they have to serve an extended purpose, and they need to operate within a highly complex distributed environment. It is the ACID transaction as a specific entity that has reached a ceiling; the long-running transaction is the one that will cause the problems; especially those that have to run across a distributed network – as most will.

Long-running transactions are those that most closely mirror the expectations of the customer, especially in terms of Internet-based access. To take a simple example, a travel Web site may provide the facility for booking an airline flight, an hotel, and a hire car.



In the past, each of these would have been considered as a separate transaction, but they are tied together in terms of the customer needing all three before a commitment is made. It can be readily seen how this differs in all points from an ACID transaction. It is not a single indivisible unit of work; state will be dependent upon different parts of the transaction; it is not isolated from other transactions; and it needs to have the ability to be rolled back in total if one part of the transaction is not attainable.

A final point that separates the new transactional model from the old, is the move towards real-time transactions. This relates back to batch processing, which no longer is adequate to provide the Quality Of Service (QOS) expected. It can clearly be seen that the major issue here is not purely an exercise in numbers; it is about the change in transaction types.

This change in transaction types brings into play the need to create solutions that interoperate between diverse applications without necessarily being able to predefine which applications will have to have this ability for interoperability. This is all part of the requirement to create seamless and transparent integration across all elements of the IT and business infrastructure, which leads back to the need to ensure that implemented solutions are not tied into any form of proprietary system.

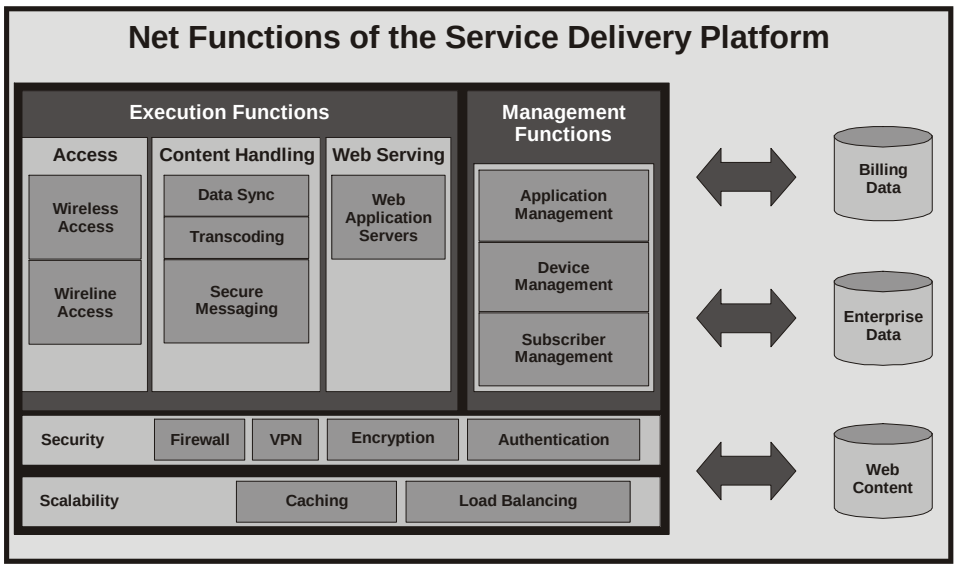
In respect of transaction numbers, and how the Internet will impact on these, consideration has to be given to the way that businesses will use, or should use, available information. A Web site visit generates information – a fact not necessarily generally accepted unless a transaction (in the old sense of the word) is forthcoming. Again, an example will demonstrate the meaning. Take an electronic store; by monitoring visitor behaviour, detail insight can be gained on the effectiveness of different areas of the site. This will typically be carried out by capturing and analysing patterns against some central data store. Every one of these captures and every analysis query is another transaction to be handled by the system. Thus, transactions spawn transactions. Responding to the analysis undertaken will also spawn further transactions. This is why it is so important to consider transactions in terms of both the old business model and the new.

Transactions have historically been thought of in terms of I/O impact on databases. While this consideration still exists, the thinking needs to be extended as to how transactions will impact on whole systems, from the point of view of the technical infrastructure, the way that business is transacted, and the use of information.

Pervasive Computing

The era of pervasive computing is upon us in no uncertain terms. The desktop is not dead, but just as transaction types are being extended, so are the different types of access. To take the example of the mobile phone – although pervasive computing extends far beyond this – as both a point of retrieval of information and as an interactive device, it has already been seen that the issues extend far beyond the merely technical. With pervasive devices, content management becomes an overriding factor; not just the reengineering of content for presentation, but the actual detail of what is to be presented.

What is true for the presentation layer, also holds good for the transactional layer. Account has to be taken of the interaction ability of the various devices that will be in use – not everything comes with a standard 'QWERTY' keyboard. The transactional functionality that underpins the modern computer infrastructure will need to be completely accessible and transparent to all these devices.



The challenge to vendors of pervasive computing solutions is not just to ensure that the transactional systems can be accessed by the new devices – either with straight interconnectivity or by a translation layer – but that the systems can handle the increase in volume. When it comes to pervasive computing, the one fact that will stand out is that transactions will increase – taking the notion that every access generates a transaction, or that every process is also a transaction.

It is a fact that increasing the availability of systems through mobile devices will increase the number of transactions that these systems will have to handle. It is a simple case of if it is there, then people will use it. Take as an example the ability created by mobile devices to access airline information. Without mobile devices it would be impossible to check on the status of flights while travelling to the airport; now that information is available through a mobile phone, it would be contrary to human nature to expect that it would not be used.

Integration Issues

As with the talk of the transaction explosion, there are other issues that tend to be talked about in general terms; without complete understanding of what these mean both in technology and business terms. Prime in this area is integration, or to give it its current flavour Enterprise Application Integration (EAI).

Integration can be considered from increasingly complex viewpoints; starting from the interfacing of various applications for the purpose of getting them to communicate. At the top end of the integration chain is the ability to not only tie in all current applications, transactional flows, and business processes; but to also create a framework that allows new elements of all these types to be added or taken away without affecting the total business process.

The infrastructure that needs to exist within the modern organisation has to be totally flexible, and when it comes to customer interfacing, it needs to have the ability to be completely transparent across the whole of the extended supply chain.

The vast majority of current transactional systems are implemented at the traditional supply chain model; this is internal processes. The extended supply chain, and by extension the transactions that make it work, needs to have both external ends of the traditional business internal supply chain – the supplier and the ultimate consumer – integrated into one complete system.

In simplistic terms, a customer order should be processed seamlessly through the receiving organisation, right down to the supplier of raw materials. Although at first sight this might appear to be a single linear process – and consequently relatively easy to manage – the reality is vastly different.

The actual term 'supply chain' has been used to denote and emphasise the linkage between different elements or parts of the total process. While this serves a useful purpose in that respect, it does have the negative effect of hiding the fact that there are multiple points of external process interactions at many points of the chain.

Just as the supply chain is inherently complex, so the transactions that drive the business processes are equally complex. Upon consideration of these issues, it can readily be seen that this 'business' of integration is no small affair; nor is it addressable by implementing point solutions.

When one considers the range that this integration covers, and the disparate systems, applications, data sources, etc. that need to work together seamlessly, it becomes apparent that any provider of a solution has to have experience in all parts of the supply chain, and has to be able to provide products/services that will make the conceptual need for an extended supply chain a workable reality.

A further consideration has to be made in respect of managing transactions; not at the technology level, but at the business process flow layer. The flexibility that has been identified as a requirement for the technology infrastructure also needs to be reflected in the overlying Workflow. Transactions do not exist in isolation away from the mainstream of providing customer satisfaction. Effective management of transactions is also of great import. It is not enough to map out an ideal transactional routing, and to make provision for measurable externalities; what is required for the new age of e-business is the ability to have systems that respond to non-measurable externalities – the exceptions that (in this case) do not prove the rule.

While it might be a cliché that 'your competitor is only a click away', it does not make it any less true. The customers – whichever end of the extended supply chain they sit – demand seamless transactions; it has what the new age of computing has promised them, and it is up to companies such as IBM to deliver on that promise.

IBM as a Solution Provider

Without doubt, IBM is one of very few organisations that is able to develop total solutions for the new world of e-commerce and e-business. With products ranging from mainframes and servers; one of the world's leading databases in DB2 Universal DataBase (UDB); through messaging with MQSeries (which also includes Workflow and Integration engines); application development, deployment, and integration with WebSphere; right up to desktop machines.

Having this range of products is only part of the story. There would be no support from Butler Group for any company – no matter how large – who could supply this total solution set if it meant tying the purchasing organisation into proprietary systems. Although the reality of standards is a little bit overblown – inasmuch as there are often more standards for one issue than there are different suppliers – the support of accepted standards is paramount in considering a total solution. IBM is fully committed to Enterprise Java Beans (EJBs), and eXtensible Markup Language (XML). These standards will become central to the dual issues of creating and deploying flexible transaction-based applications, and integrating heterogeneous systems in a loosely coupled manner.

Vision – and the ability and resource availability to drive that vision to a logical conclusion – is another element that needs to come under consideration. Specifically in this instance, one would be looking at the movement in the pervasive computing arena. IBM has implemented mobile commerce solutions that give a clear indication of its standing in this field.

Overall, Butler Group believes that IBM has the relevant products, as well as the vision and resolve to help organisations move towards viable e-commerce and e-business transactional-based solutions; whether the interface is the desktop, a Web browser, or the new wireless devices.

CASE STUDY – SWISSAIR

IBM has developed an application that allows selected Swissair customers in the Zurich area to check-in by using their mobile phones. After check-in, the phone's screen will relay information that would normally be printed onto a boarding pass, such as departure time, seat number, and boarding gate. Once check-in has been made by mobile phone, any change in details will be automatically sent to the mobile phone.

IBM is providing both the hardware and software for this solution, and also the transcoding technology that translates information from Web format to a format adaptable on a smaller form factor, such as handheld devices. While IBM has already provided solutions for the real-time delivery of flight information for other airlines onto wireless devices, Swissair is the first airline to extend this to include interactive check-in. This extends the mobile phone from an information interface to part of the transactional processing system.

CASE STUDY – HANDELSBANKEN

Sweden's Handelsbanken is the largest bank in the Nordic region. It competes in a market place where 60 per cent of the population carry a mobile phone, and where the overall penetration of mobile information devices is the highest in the world.

Handelsbanken's aim was to enhance customer relationships, and provide the bank with new levels of customer information and interaction. This interactive service would allow customers to access up to the minute banking information – including the latest stock market and interest rate data. Due to the nature of the market in which it was operating, the only effective solution was considered to be one based on mobile phones.

Handelsbanken chose IBM to provide this pervasive computing solution because of its ability to offer not only hardware and software, but also an infrastructure model that could hold the bank's pervasive computing architecture together.

The resulting service is based on the Wireless Access Protocol (WAP), the open industry standard for mobile Internet services. Handelsbanken's service will be delivered via Nokia's and Ericsson's WAP-enabled smart phones.

IBM developed the solution in around two months, and integrated it into the bank's systems in two weeks; an achievement that was credited to IBM's end-to-end pervasive computing model.

Market Position/Strategy

IBM is ideally placed to take advantage of the explosion in e-business and e-commerce transactions, given its history in providing top-end solutions. From the hardware standpoint, IBM already has a large range of products from the S/390 and the RS/6000 downwards. Many of these platforms are already in use within large organisations, and the addition of WebSphere and MQSeries for those organisations not already using these technologies, will enable a quick start to be made.

From the pervasive computing angle, the proven ability to implement solutions (as shown in the case studies above) will be a strong marketing factor. While this is a relatively new technology area, the uptake in understanding the business benefits that will be made available by moving transactions outside of the strictures of internal systems has been dynamic. Led by specific industries, such as banking and finance, it will not be long before other market segments see the possibilities inherent in the new delivery mechanisms as interfaces to transactional processes. Ally this to the understanding that customers' expectations as regards QOS are increasing almost daily, and the market will help to make itself.

Single vendor solutions have had something of a roller-coaster ride in the past few years. The need to implement quick – and sometimes dirty solutions – bolstered the best-of-breed scenario. IBM – along with other major vendors – has taken huge conceptual market segments, such as Customer Relationship Management (CRM), and built total solutions that have addressed the problems of integration. Now that single vendor is no longer seen as proprietary vendor, the market is opening up for the total solution implementer to make a comeback.

Technical Products

Apart from the availability of numerous platforms to create the hardware/firmware infrastructure, there are two main offerings from IBM that are central to the ideal of transactional processing. These are the MQSeries messaging base along with the MQSeries Integrator and Workflow product, and the WebSphere application server. The MQSeries base provides an asynchronous messaging framework, and the WebSphere application server provides synchronous Web access to transactional systems.

WebSphere is currently in version 3, and the depth of functionality within this product has taken the basic Web application server product to new heights of usability in the world of e-business, giving open access to multiple applications.

Both products have a large degree of platform/language independence, which is vital to organisations as they not only need to connect to multiple systems within their specific organisations, but as integration becomes more and more an issue of cross-organisational support.

MQSeries

An MQSeries application is a program or set of programs that can exist and be running on different platforms. The MQSeries applications are written using the Message Queue Interface (MQI). This common programme interface allows applications developed on one platform to be transferred to any other supported platform.

For true enterprise business-critical messaging to work, certain elements must be assured. Firstly, the delivery of the message has to be guaranteed. Secondly, messaging must support transactional integrity with full commit procedures. This is enabled as a complete message. Thus if one message spawns four other messages and one of those can not be committed, then the full process is rolled back up to and including the original message. This is controlled by creating related work units that contain the messages.

These work units can be coordinated with other work, such as database updates. This coordination ensures that data held within a message is constantly synchronised with data held in the database.

MQSeries supports the publish/subscribe paradigm along with other messaging models. If a publish/subscribe function is required, then publish/subscribe brokers must be implemented on the MQSeries platform. The publish/subscribe functions mean that MQSeries applications can publish messages without a prior requirement to know the target names – the subject of the message is identified, and passed to special MQSeries publish/subscribe nodes. Similarly, MQSeries applications can register subject requirement to an MQSeries publish/subscribe node, and receive all messages that contain that subject content. The other major messaging models supported are:

- Request-Response
- Decompose-Recompose
- Fire-and-Forget
- Data-Replication

MQSeries Integrator

Integration is hampered by the need to build multiple interfaces between applications, many of which will require data transformation, translation, and routing techniques. If this were not enough of a problem, the need for organisations to react quickly to change, also means a requirement that interfaces will have to be constantly updated.

MQSeries Integrator solves the problem of the point-to-point links that need to be created every time a new application is introduced into the infrastructure, or business rules change that require different data routing. MQSeries Integrator acts a central hub for data transformation and routing, thus eliminating the complexity that comes with hard-wiring new application interfaces.

There is no suggestion that there is not the need to create new interfaces for every new point of contact, but without a central hub solution, as provided by MQSeries Integrator, the new interfaces grow exponentially for every added point of contact.

MQSeries Integrator has four parts that provide its functionality:

1. MQSeries messaging software that provides the messaging service.
2. A formatter that gives dynamic transformation of messages to meet the various requirements of different applications.
3. A rules-based system that contains the business logic that decides the transformation required and the routing.
4. Application libraries that give a fast start approach by providing interfaces for popular application software.

Support is provided for applications that are supported by MQSeries messaging. The rules and format definitions are stored in a rules database, which gives the manageability necessary for complex business logic. Message transformation is carried out by parsing the individual fields within a message, and then creating an output format, depending on the requirements of the receiving application.

Because the formatter is table-driven, users do not need to describe the conversion process, they only need to describe the input and output message layouts. This is carried out using a GUI that runs on Windows NT. The advantages of this approach are numerous:

- There is a shallow learning curve involved in the use of the formatter, due to the fact that the user works from a GUI screen, and has to describe the message rather than the actual conversion process.
- Each input or output message only has to be described once. Conversion paths to new formats do not have to be described.
- The formatter does not use embedded compilers, which means that MQSeries Integrator is extremely portable.

Business rules can be applied to messages that have been broken down into their constituent fields. These rules evaluate the contents of the fields and then provide an action based upon that content and the associated rules. Messages in a new format can be created, or messages can be put into a new queue or several queues.

While MQSeries messaging software provides the deliverable layer, MQSeries Integrator is the toolset that provides the true usability of the system. Despite the unarguable mathematics that show that a central integration hub solution is the only viable way forward to total business application integration, this only really becomes workable if this is attached to a toolset that eases the process of transformation.

MQSeries Workflow

Whereas MQSeries Integrator can be seen as providing a technical empowerment-interface to messaging, so MQSeries Workflow is the solution that provides true vertical and horizontal integration of the technical and human infrastructure.

Using MQSeries Workflow, organisations can design, refine, control, and document their business processes. It has a GUI that allows these processes to be represented visually.

Three processes exist within the MQSeries Workflow model:

1. An actual business process along with related activities to fulfil that process.
2. The organisation of people to fulfil the process.
3. The technical resource required.

MQSeries Workflow contains a modelling tool that can conceptually exist as a separate entity, can work with other modelling tools, but ties into the other MQSeries products from a technical standpoint due to its transactional process execution coordination.

MQSeries Workflow can be used to build enterprise-level applications, utilising existing software solutions to create an operating infrastructure based upon existing technology and human resource.

Butler Group believes that IBM has extended MQSeries messaging and queuing software beyond the norm for this type of application. It has created an environment that will spread across all aspects of the enterprise.

WebSphere Application Server

The WebSphere Application Server is an integral part of a whole family of WebSphere products. Together these products create a complete Web application platform that can be used to develop, deploy, and manage Web applications.

As the question of scalability is such a key element in the whole discussion on transactional throughput, it is worthy of note that the WebSphere Application Server is available in three editions, so it can be implemented at varying levels of business size and usage. Migration between the different versions is seamless, and has no negative impact on the transactions running through the system.

True e-business demands a deployment environment that supports transactions that can be originated from remote sites, and while there are many ways of creating such an environment from scratch, few businesses have the resource to re-engineer to this extent. Therefore, any solution must also have the ability to integrate and communicate with multiple infrastructures.

The WebSphere Application Server has an internally implemented Enterprise JavaBean (EJB) Server that supports the integration of existing infrastructure and also allows Web access to transactional systems. The model used by WebSphere is a classic 3-tier architecture; clients access a logical middle tier where EJB components can be deployed independent of the clients at the front end.

This architecture provides a deployment environment for client-specific data (session beans) and transactional system data (entity beans). This also gives distributed transaction persistence support using server-side JavaBeans.

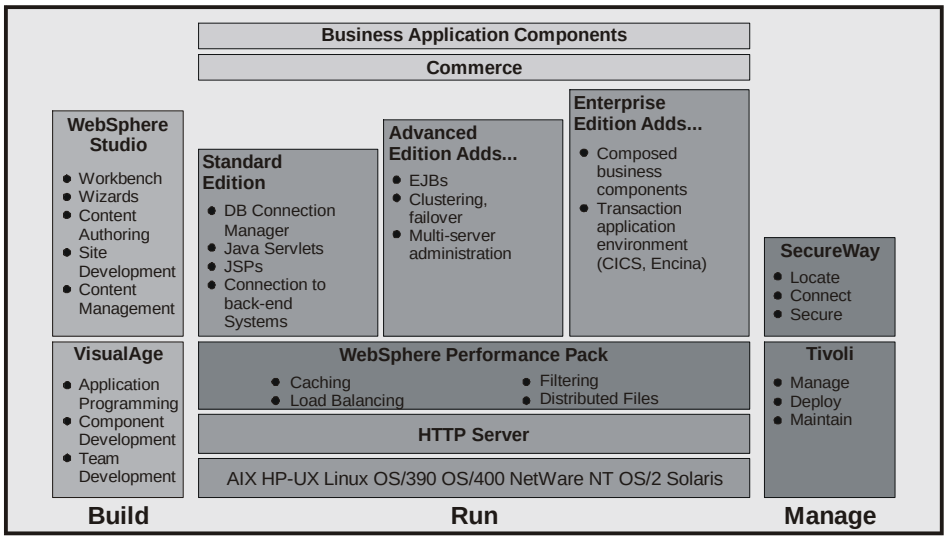
IBM's Application Framework for e-business focuses on thin-clients, and WebSphere clients can be of three distinct types. Firstly, standard HyperText Markup Language (HTML) Web browsers with support up to HTML4. The communication protocols supported between Web clients and Web servers are HyperText Transfer Protocol (HTTP) and HTTP Secure (HTTPS) that uses Secure sockets Layer (SSL). Web server support is for Apache (which is delivered with WebSphere and IBM extensions for enhanced performance and security), IBM's HTTP Server, Domino, Domino Go Web Server, Netscape Enterprise, or Microsoft IIS. WebSphere also supports cookies with an API for creation, updating, and access.

Secondly, WebSphere supports clients running eXtensible Markup Language (XML)-aware Java applications. It is possible to generate the XML interfaces by translating XML to HTML on the application server, or by using an XML-aware Java applet that can convert XML to HTML directly on the client.

The third type of thin-client supported is those running Java applets and applications. Applets communicate with WebSphere either through HTTP via the Web server, or directly to the Java servlets and EJBs running in WebSphere using Internet Inter-ORB Protocol (IIOP). For IIOP, there is a Common Object Request Broker Architecture (CORBA)-compliant Java-based ORB within WebSphere.

Away from the preferred IBM e-business framework of thin-clients, WebSphere can also be used with fat-clients that use IIOP or Internet Protocol (IP) sockets. There is also additional support away from the Java model for applications that use the Component Object Model (COM) from Microsoft.

From the technical details above on the near totality of the standards supported it can be seen that WebSphere is as near client independent as possible, and the use of industry standards will also ensure that the new client types that are being introduced in the area of mobile computing will not be isolated from the middle-tier, as the framework provided by WebSphere Application Server is open and adaptable to multiple new systems.



Conclusion

In order for organisations to create a model for e-business and e-commerce that is flexible and extensible, it is necessary that a full understanding of just where the increase in transactions will impact on current systems; it is not enough to simply state that transactions will increase; although they most certainly will. Once this understanding has been gained, then moves can be made to implement the infrastructure changes that will not become limiting in any specific time period.

Indicative of the need to have open solutions is the rise in pervasive computing. Systems that were implemented only a short time ago will now need to be amended to take advantage of new points of access. Those businesses that tied themselves into non-open solutions will pay the price in the coming years.

Butler Group believes that the quick-fix solutions that have been popular so far will not provide the level of service expected by the consumer. This service level expectation is fast growing, and for organisations to meet all the new demands, the transactional processes and integration solutions provided will be central to success or failure.

Whatever 'tag' one wants to put on the overall concept; be it CRM, the extended supply chain, or the value chain; the truth of the matter is that it is with the ability to create technology independent solutions that true success will lie. Any gaps or missing pieces of the puzzle could bring the whole machine grinding to a halt.

This then demands almost without consideration a vendor solution that can integrate across different platforms and one from a vendor that has expertise in all the relevant areas of transactional computing in the new age. IBM is ideally placed to provide the right foundation and a large number of the bricks for building transactional systems of the highest order. It also has solutions that follow open standards for those organisations that may want to enhance their offering into the market with some fancy ornamental stonework.

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