High Performance Infrastructure Foundation for Electronic Commerce

Brian Goff, M.Eng., MBA

Introduction

Today, it's common knowledge that the Internet has revolutionized commerce. Traditional brick-and-mortar businesses are complementing their operations with an Internet presence. Since the Internet provides an affordable and secure way to link people and computers together, numerous innovative enterprises, virtual companies, markets and trading communities have flourished.

Systems architects and developers are now being challenged by many new technologies that the Internet has given rise to. Professionals are subjected to new challenges due to the following reasons –

- Realization of newer and more demanding requirements as traditional bricks-and-mortar companies transform themselves to take advantage of the Web
- Complexities and frustration of new implementations and applications.

- Beginning of the emergence of standards (both committee defined and defacto), lack of which creates a plethora of interoperability problems (examples include XML, SOAP, and RosettaNet), and the presence of which demand in-depth understanding.
- Slew of products released every day claiming piece-meal solutions.

This paper reviews the requirements to build an *infrastructure foundation* to enable a scaleable, manageable and secure Electronic Commerce application. It also describes a solution to build such a foundation that meets current requirements while accommodating anticipated developments in technology and business. The discussion draws upon **GOFF Tech Consulting's** experience and on-going practice in designing, implementing and maintaining client-server technology, distributed open-systems and internet-enabled solutions.

Foundation Infrastructure

Requirements for an "infrastructure foundation"

The architectural points that need to be satisfied in an Electronic Commerce application include:

- Mission-criticalness
- Transactional integrity
- Reliability
- Security
- Very high performance

- Scalability
- Integration with existing open systems
- Integration with legacy systems
- Manageability
- Support for global, inter-department and inter-organizational topologies
- Accommodation of future technological and business standards and developments.

All the points cited above must be addressed by the entire eCommerce application, however, they cannot all be satisfied by a database such as Oracle; a language such as Java; standards such as IIOP; or a platform such as NT/2000 by themselves.

An *infrastructure foundation* has to be architected, designed and built to offer these features. The *foundation* may be designed with one or more products, but it has to satisfy the following, along with all of the above-mentioned features:

- Fully integrated solution
- Multi-platform and
- Wide industry support.
- Flexible
- Usable
- Reliable
- Functional
- Proven in the field

Reuse of client-server foundations –

Managed Multi-Tier Client-Server Architecture

Through the evolution of hosted, client-server, and Internet-enabled architectures, **GOFF Tech Consulting** has developed essential experience in incorporating proper software engineering techniques into the full development process, as well as in the software product itself. Judicious application of a methodology the supports the entire software life cycle is an important element in managing the many risks inherent in solutions design, including the risks of improper design, failing to address critical functionality, ease of maintainability, and cost overrun. We have evolved from two-tier, three-tier, multi-tier / n-tier to managed multi-tier architectures. Each of these architectures is enabled by the selection of a set of products (including Microsoft .Net, Java, etc.) Solutions based on each of the above architectures have limitations as well as distinct advantages.

The journey of client-server architectures has taken us to the *managed multi-tier (MMT) client-server architecture,* which retains all of the significant advantages of the previous architectures and solves many limitations elegantly. The salient feature of *MMT* architecture is the introduction of a *manager,* or a *Transaction Process (TP) Performance Monitor* as a component in the *middleware.* A TP monitor provides the architectural framework to build large-scale distributed applications.

TPC benchmarks are standard benchmarks used by competing product vendors. Vendors often quote these benchmarks in order to position their products with respect to the competition. To utilize the resources optimally and achieve the highest performance (for

the lowest cost) possible for a given configuration, all of the TPC configurations use TP monitor-based *managed multi-tier architectures.*

The TPC-C class of the TPC benchmarks represents solutions for OLTP problems such as business applications with users submitting well-defined queries and waiting for response on-line. Electronic Commerce applications, in general, fall into the category of OLTP, and are not too different.

One of the best ways to look at the advent of the Web is to perceive the Web as an extension of the repertoire of supported front-end mechanisms over a public network to an established client-server architecture / solution. Applications built using a managed multi-tier architecture, where a TP monitor is used as the middleware, are well positioned to extend the front-end to back-end connection mechanism to the Web.

A Foundation Infrastructure – example

Let us consider an *eCommerce foundation infrastructure* that can be built with reliable and proven products. Let us consider two of the leading TP monitors, The TUXEDO System and TIBCO's Rendevous, both of which are endorsed by the major vendors in the Transaction Processing Council and together comprise a major segment of the market. Sun published the best TPCC benchmark so far, 30,000 transactions per minute. Sun accomplished this benchmark using Oracle as the database and TUXEDO as the TP monitor.

TUXEDO and TIBCO can be used to build or integrate large-scale applications running on different versions of UNIX, AS400, Windows NT or a mainframe. They are MOM's offering queuing and load balancing to optimize resource utilization. These products, and others like them, support asynchronous, event-subscribe, synchronous, broadcast, conversational and guaranteed communication methods for complete flexibility. Each can support true distributed transactions across different databases. Lastly, each offers extensive application management features to manage large applications within and across organizations.

The features that are of extreme importance for eCommerce include:

- Extensions that enable developers to write Java applets that can talk securely to the backend applications with complete transaction control, on a different network connection, without any limitations of HTTP (like TUXEDO JOLT).
- Link-level encryption - all communication over a network can be encrypted, enabled by an administrative feature, without the involvement of developers.
- Domains - administrative features that can help build virtual enterprises within and across organizations.

Other MOM solutions are available from vendors such as IBM (MQ Series), and Microsoft (MSMQ). MOM capabilities can even be found in Java language extensions (JMS). All of these solutions approach the problems discussed in this report in a similar fashion

and all are capable of achieving dramatic improvements in scalability, reliability and throughput.

Conclusion

Electronic Commerce challenges and considerations are at the high end of OLTP specter. It is of paramount importance to select a *strong infrastructure foundation* using well-known products and proven architectures. *TP Performance-based managed multi-tier architecture* can provide this required foundation and enable you to match your platform's flexibility, reliability and security with your business' growth. TP monitors embody the best features of several products and can play a great role in simplifying Electronic Commerce solutions, reducing costs and increasing profitability.