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# HIGH PERFORMANCE AND APPLIANCE APPROACHES FOR XML

## *XML AND WEB SERVICES AT WIRE SPEED*

ZapThink, LLC • 11 Willow Street, Suite 200 • Waltham, MA 02453 • info@zapthink.com • www.zapthink.com

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## *XML AND WEB SERVICES AT WIRE SPEED*

November 2004

*Analyst: Ronald Schmelzer*

**Abstract**

Increasingly organizations are seeking to find solutions that can transparently monitor XML traffic on the network and apply business rules or corporate IT policies such as security, routing, performance, management, transformation, and end-point connection provisioning without adversely impacting network performance or burdening their already over-stretched IT departments.

Because XML traffic is content-oriented, rather than protocol-oriented, solutions responsible for securing XML traffic must make decisions based upon the content of the messages, rather than the protocols that underlie those messages. However, XML is a huge bandwidth, processor, and storage hog. XML processing tasks such as XSL transformation, schema validation, XPath-based classification, XML security, and intelligent routing are inherently processing-intensive, placing a significant burden on server infrastructure that may not be optimized to perform these tasks.

As a result, there is a need for approaches that seek to provide the content-level functionality required of today's XML and Web Services solutions but also provide the high level of performance needed to effectively run these solutions in production. The result of this need is the evolution of XML appliances, specialized chip-based solutions, and optimized software approaches that aim to ensure XML-related functionality without performance degradation. This report follows the evolution of the XML appliance markets, and the emergence of new classes of solutions dealing with processing XML-based content at wire speed.

### ✦ Market Overview

- New approaches are needed to deal with XML-based messages being exchanged on the network that are exceeding the capabilities of the general purpose hardware and software that is now being applied to the problem.

### ✦ Future Trends

- XML traffic is expected to increase from under 15% of all network traffic on the network in 2004 to just under 48% of all LAN network traffic by 2008.
- The total XML performance optimization market will reach $1.2 billion by 2010.

### ✦ Decision Points

- The effective processing of Very Large Messages (messages that exceed the capabilities of general-purpose processors) is an issue that threatens the long-term viability of SOA implementations.

# Table of Contents



## I. Report Scope

*As network traffic based on XML increases, IT data center administrators and developers are quickly realizing that the operational inefficiencies of XML are bogging down their general-purpose hardware and software.*

XML and Web Services are increasingly making an impact on enterprise networks. The interoperability benefits of XML, the significant integration cost savings that Web Services provide, and the business agility that Service-Oriented Architecture (SOA) promises are gaining significant currency in today's enterprises. At the same time, enterprises are looking to add more layers of functionality, and thus complexity, to the XML traffic on the network. Simple point-to-point XML-based exchange in free-text format is no longer sufficient to realize the benefits that XML promises. Companies are increasingly desiring an set of requirements for XML-aware network processing such as routing, transformation, compression, caching, security, and management tasks.

However, this rapid adoption of XML-based infrastructure has a significant downside. As network traffic based on XML increases, IT data center administrators and developers are quickly realizing that the operational inefficiencies of XML are bogging down their general-purpose hardware and software. The addition of more advanced security, reliability, and process capabilities puts an overwhelming burden on existing network infrastructure that is already stretched to the limit handling basic XML processing tasks.

Network traffic increases due to both the increasing quantity and size of messages, both XML and non-XML based, will tax existing corporate IT infrastructure to its limit. Network administrators will increasingly devote general-purpose application servers, network equipment, and messaging infrastructure to simple message parsing, handling, and routing functions, while precious few resources will be left to execute the core business logic so important to companies.

As a result, companies need new approaches to deal with messages on the network that stress the capabilities of the general purpose hardware and software that now deals with the problem. To make matters worse, XML traffic is content-oriented, rather than protocol-oriented. As a result, devices responsible for performing any operation on XML traffic must make decisions based upon the content of the messages, rather than the protocols that underlie those messages. How can efficient content-level message processing be distributed to all the nodes in a corporate network? How can dumb networks that aren't processing XML at the content-level be made more intelligent through the ability to process data and metadata it formerly ignored?

ZapThink last wrote about the class of solutions focused squarely on solving XML processing issues on the network in mid-2002. At the time, we identified a category of solution called *XML Proxies*, which we defined as follows:

> *XML proxies are intelligent, XML-aware intermediaries that can process XML on specialized hardware, software, or hosted network solutions. XML proxies are hardware or software solutions that actively listen for XML traffic on the network and either pass it along unmodified or perform some action on the XML content.*

Since that time, the market has evolved significantly. In particular, what was once a monolithic market consisting of a handful of vendors focusing on all of the aspects of XML-based processing has now matured to a larger set of vendors specializing in different areas of XML processing and optimization. In particular, the landscape of solutions has evolved into a set of distinct markets focusing on security, transformation, routing, and content processing optimization. Each of these markets have a distinct set of hardware and software vendors that compete within their area, but rarely across multiple market segments. This

*What was once a monolithic market consisting of a handful of vendors focusing on all of the aspects of XML-based processing has now matured to a larger set of vendors specializing in different areas of XML processing and optimization.*

report will identify how these markets have evolved, the range of technical solutions, the key players in that market, and emerging customer needs driving market growth.

This report will also re-examine the growth of XML traffic on the network and explore emerging customer purchasing behaviors, ranging from growing desire to purchase dedicated network appliances to an emerging market for embeddable and OEM-able technologies that chip manufacturers and software vendors provide. Finally, the report will address one of the critical roadblocks to widespread adoption of the technologies mentioned in this report: the lack of understanding by developers, architects, and network administrators about the best way to handle the exploding quantity of XML traffic on their network.

## II. The Growth of XML Traffic

The market for XML appliances and performance optimization is actually a *second-order* market. In a second-order market, growth in demand for a set of products is dependent on the growth of another market to establish the necessary customer base before a new market demand can build. In this case, the growth in demand for XML appliances and high-performance solutions first depends on the adoption of XML for significant tasks, followed by the realization that these first order solutions aren't meeting evolving needs. Specifically, companies seek to implement security, performance, transformation, and routing solutions once they already have implemented a business-critical solution that utilizes XML or Web Services, or when they have already made plans to build those mission-critical solutions.

**Decision Point**

*ZapThink believes that over the course of 2003-2004, those primary markets for XML and Web Services have reached the point of maturation, and as such, the markets for XML appliances and high-performance solutions should experience significant growth in 2005.*

As such, one can expect the markets for XML appliances and high-performance solutions to become significant only when other markets for XML solutions have matured to some extent. ZapThink believes that over the course of 2003-2004, those primary markets for XML and Web Services have reached the point of maturation, and as such, the markets for XML appliances and high-performance solutions should experience significant growth in 2005.

However, the growth of these primary markets isn't enough to guarantee demand for second-order markets. Companies require another impetus to search for solutions to optimize performance, or provide security, transformation, or routing capabilities in a hardware appliance form factor. The impetus in this case is the inefficiency of XML as a communications format and the insecurity and unreliability of XML and underlying protocols for communication. For example, it is precisely the need for security, combined with the inefficiency of XML that has given rise to the growth of the security XML appliance market.

Why is XML inefficient? Text-based, metadata-laden XML is intended for both machine processing and human readability. The combination of these two purposes results in message sizes that are easily 10 to 50 times larger than corresponding messages written in purpose-built, binary protocols. XML conversant endpoints must perform each of the following steps to conduct a simple point-to-point exchange:

- Receive
- Decrypt
- Validate
- Parse
- Transform to Object Representation
- Perform Business Logic

- Serialize
- Canonicalize
- Sign
- Encrypt
- Transmit

*Basic XML tasks such as canonicalization represented over 93% of the total processing time for processing of simple documents like an XML-Signature document (a typical XML document.*

Each endpoint must execute these steps on a per-message basis, imposing a significant load on processing machines. Research has shown that basic XML tasks such as canonicalization represented over 93% of the total processing time for processing of simple documents like an XML-Signature document (a typical XML document).

In addition, the problem with XML traffic is that it is content-oriented, rather than protocol-oriented. A device responsible for performing any operation on XML traffic must make decisions based upon the content of the messages, rather than the protocols that underlie those messages. As a result, there is an increased requirement for improving performance of such critical tasks as content-based security, policy enforcement, malformed message protection, authorization and authentication, encryption and decryption, and schema validation.

Add to these processing requirements the need for additional parsing and validation steps for XML schema, the growing number and complexity of security, reliability, and process headers, the need for partial-message security, XPath and XQuery processing of documents, message compression and decompression, business logic validity checking, and message integrity validation and a bandwidth, processing, and storage nightmare results that grows in cost and complexity over time. Clearly, general-purpose processors, off-the-shelf software parsers and validation engines, general application servers, and non-optimized security solutions are not sufficient to meet the burgeoning XML processing challenge.

**Decision Point**

*ZapThink expects XML traffic on the network to grow from around 15% in 2004 to just under 48% by 2008.*

### 2.1. The Growth of XML Traffic on the Network

In addition to increased processor load, as XML usage expands in the network, inefficient XML traffic will increasingly consume network bandwidth . At some point, IT administrators will demand more effective use of network resources. ZapThink research shows that the average quantity and size of these metadata-laden messages will continue to increase over time. Developers and specifications bodies continue to overburden the messaging systems with additional layers of headers and metadata meant to abstract underlying infrastructure.

ZapThink expects XML traffic on the network to greatly increase over the next few years, from under 15% of all network traffic on the network in 2004 to just under

48% of all LAN network traffic by 2008. Figure II-I and Table II-1 below show the expansion of network traffic over the next few years:

**Figure II-I: Traffic by Payload Type**

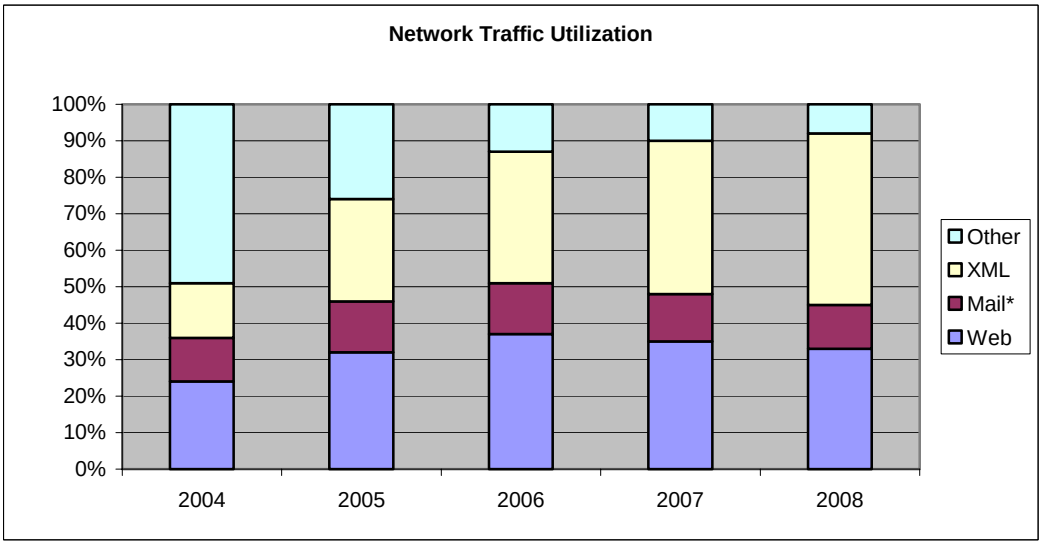





**Table II-1: Traffic by Payload Type**

| | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 |
|---|---|---|---|---|---|---|---|
| Web | 11% | 18% | 24% | 32% | 37% | 35% | 33% |
| Mail* | 8% | 10% | 12% | 14% | 14% | 13% | 12% |
| XML | 2% | 4% | 15% | 28% | 36% | 42% | 47% |
| Other | 79% | 68% | 49% | 26% | 13% | 10% | 8% |

(* by Mail we mean SMTP, POP, and IMAP traffic for mail that is not HTTP-based)

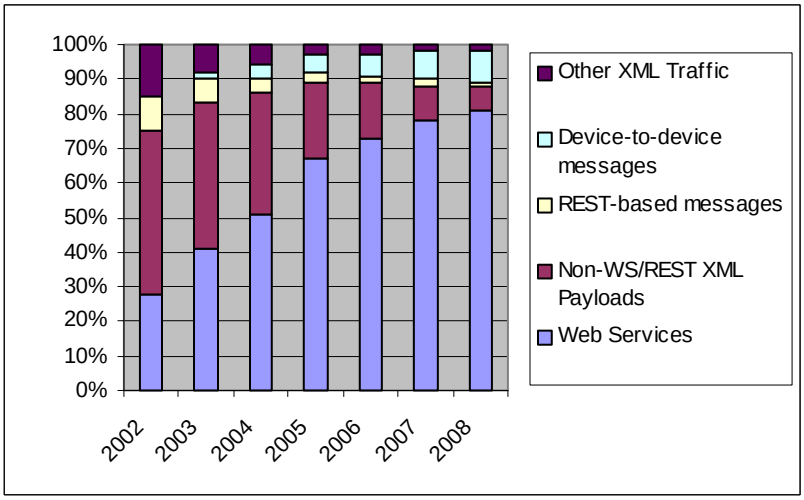
## 2.2. Classifying XML Workloads

While close to 50% of all network traffic by 2008 will be XML-based, the purpose and type of XML traffic can vary widely. For example, some XML-based traffic is for Web Services for system-to-system communication mainly behind the corporate firewall to simplify integration, while other traffic might be XML payloads destined for outside the corporate network. In general, ZapThink sees the following major XML workload types as being prevalent on the network for the next 3-5 years:

- XML Web Services messages (SOAP-based)
- Representational State Transfer (REST)-based Web Services interchanges (non-SOAP based) – REST is a more simplistic way of implementing XML-based system-to-system exchanges that doesn't mandate security, management, process, or other overhead, but is implemented in a mostly synchronous fashion.
- XML document formats (such as ACORD messages, etc.) not transmitted via Web Services or REST-based mechanisms.
- XML-based device-to-device interchanges

ZapThink has attempted to categorize the various potential uses for XML that may be present on the corporate network and their growth from 2002 through 2008 as follows:

**Figure II-II: Makeup of XML Traffic on the Corporate Network**






*ZapThink expects Web Services traffic to dominate XML traffic on the network by end of 2005.*

**Table II-2: Makeup of XML Traffic on the Corporate Network**

| | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 |
|---|---|---|---|---|---|---|---|
| Web Services | 28% | 41% | 51% | 67% | 73% | 78% | 81% |
| REST-based messages | 10% | 7% | 4% | 3% | 2% | 2% | 1% |
| Non-Web Services or REST XML Payloads | 47% | 42% | 35% | 22% | 16% | 10% | 7% |
| Device-to-device | 0% | 2% | 4% | 5% | 6% | 8% | 9% |
| Other XML Traffic | 15% | 8% | 6% | 3% | 3% | 2% | 2% |

Given the above predictions and estimates for future traffic on the corporate LAN, successfully addressing the challenge of managing the efficiency of Web Services traffic in particular will be key to assuring the viability of XML as a robust and reliable protocol on the network.

### *2.2.1. Exacerbating Poor XML Performance: Very Large Messages and Inefficient Practices*

Decision Point

*Before sending out XML documents on the wire, developers should seek to maximize performance by minimizing unnecessary redundancy.*

Since XML technologies are still an emerging practice for most businesses, some companies are applying poor development practices that result in a variety of inefficient implementations that make the problem of processing XML worse on the network. A first step that companies should take to improve XML performance would be to simply eliminate these poor practices and replace them with more effective methods. Such practices include:

- *Frequently repeated XML* – The inefficiencies of XML rapidly stack up when developers build XML documents that contain frequently repeated element and tag sets. Before sending out XML documents on the wire, developers should seek to maximize performance by minimizing unnecessary redundancy.

- *Synchronous or fine-grained invocation styles resulting in frequent back-and-forth exchanges* – Another common development mistake is making too much use of back-and-forth communication between communicating nodes. Shifts to asynchronous, coarse-grained modes of document exchange will significantly improve performance over fine-grained, synchronous modes of exchange.
- *Overly chatty protocols* – Some proposed specifications, such as WS-Discovery, mandate that systems announce their presence using an XML document format. Such traffic should be limited to only one-time use, since overly chatty systems will quickly clog a network.
- *Overly-frequent validation checking* – While many developers have inappropriately shunned use of XML validity checking altogether (see Section 2.2.2), still others check the validity of their XML documents too frequently, causing their XML performance to drop.
- *Communication overload resulting from non-communication between message processing functions* – More difficult to solve is the problem of XML documents, such as SOAP messages, being laden with security, management, process, reliability, and other header information. While each processing task may be individually handled efficiently, there is not enough sharing of information and resources between each processing task, resulting in efficiency when a document is parsed, unencrypted, signed, and validated once per operation.
- *Overuse of common parsing technology* – XML parsing technology has significantly improved since the early SAX and DOM days. Today, new technologies and approaches exist for parsing XML documents ranging from new XML "Pull" Parsers (such as XPP3) to chip-based, binary stream, and optimized software implementations. Developers should investigate these new approaches and set behind these other inefficient approaches.

*Shifts to asynchronous, coarse-grained modes of document exchange will significantly improve performance over fine-grained, synchronous modes of exchange.*

However, in some cases, the high impact of XML on the network simply can't be avoided because the XML payload itself is very large. Businesses typically exchange these *Very Large Messages* (VLM), rather than consuming them within the corporate network. They typically represent business documents critical for business-to-business interchange. Generally speaking, a message can be considered to be "Very Large" if it is roughly 10 megabytes in size or if it contains highly repeated XML elements and very deep levels of nesting. Over time, as XML infrastructure is increasingly optimized, what will be considered to be "very large" will also shift over time. By the year 2008, a very large message will be 1 Gigabyte in size or larger.

**Decision Point**

*The increased prevalence of Very Large Messages on the network is an issue that threatens the viability of SOA implementations.*

The increased prevalence of VLM on the network is an issue that threatens the viability of SOA implementations, since the efficiency of networks is threatened when payloads consisting of very large messages are transmitted from one Service to another. Clearly, hardware and software approaches must be implemented to mitigate the threat posed by very large messages on the network – by either processing them with very high degree of efficiency or by limiting their presence on the network.

### *2.2.2. Why Users are Breaking XML to Improve Performance*

While XML's verbosity may be acceptable for situations with moderate transaction volumes, XML's processing overhead, storage requirements, and bandwidth consumption become quite problematic when either transaction volumes are high or message sizes are large. As a result, many companies are

resorting to potentially dangerous tactics for squeezing every last drop of performance out of XML. Three common tactics include compressing XML, ignoring XML validity, and changing the parsing rules for XML.

One obvious approach to optimizing XML is to compress it. Since XML is a text-based format, using common binary compression formats like gzip can squeeze over 90% of the volume out of XML data files. However, the problem with compression is that both ends of the communication pipeline must understand the compression format and be able to uncompress the document on the fly without introducing extra latency. As such, while compression might solve a network bandwidth issue, it actually worsens processing at individual nodes.

*While compression might solve a network bandwidth issue, it actually worsens processing at individual nodes.*

A straightforward alternative to using binary compression formats is to simply avoid long element names. Many developers have resorted to the tactic of referring to their XML elements as simply "<g>" or "<bx1>". While such short tags are definitely an improvement over tags like "<SOAPInspectionSecurityHandler>", the resulting XML is for all practical purposes no longer human readable, and results in XML document formats that are not truly interoperable.

Simply skipping the processing step of validating XML documents is another approach to improving XML performance. In fact, ZapThink's research has shown that few businesses use XML validation of any type (either DTD or W3C XML Schema) as part of runtime XML-based business processes. Instead, developers will check their XML for validity only during the test or design phases of an implementation, and then simply trust that the documents are remain valid thereafter. After all, checking for a document's validity does not remove the need to check its validity at the application level anyway. Since validity checking slows down XML parsers, it's often the first thing to go when optimizing XML performance.

There is no doubt that standard XML is an inefficient data representation format, and the increasing layers of complexity that Web Services add to the core XML language further exacerbate the problem. Nevertheless, ZapThink sees that the many of the above trends for optimizing XML performance are a tremendous step backwards for interoperability and standards-based computing. At what point does a compressed, stripped-down, non-validating "XML-like" format leave the standards behind and represent a proprietary data format?.

### 2.3. Potential New Solution: Binary XML?

One way to improve XML performance is to utilize binary, rather than text-based, means for serializing and transmitting XML information. Since the development of the XML infoset, alternate representations of XML besides text are possible. A binary representation of XML is more than simply compressing the XML format into a binary form. To resolve the limitations of all-or-nothing compression and its processing overhead, the W3C has begun the development an alternate, binary encoding of XML that promises to significantly alter the processing, bandwidth, and storage penalties that currently plague XML. This encoding uses binary, rather than text-based, means for serializing and transmitting XML information. This binary representation of XML is far more sophisticated than simply compressing the XML format into a binary form. The binary XML approach takes advantage of XML language grammar to simultaneously compress, validate, and optimize the processing of XML documents.

**Decision Point**

*The binary XML approach takes advantage of XML language grammar to simultaneously compress, validate, and optimize the processing of XML documents.*

In this natively binary format, it's possible to transmit whole XML documents or stream them incrementally, without sacrificing performance speed. At the same time, the encoding software validates the documents as a side effect of the binary encoding mechanism. In effect, the binary XML format is a "pre-parsed"

version of an XML document that an endpoint can readily consume, without any additional decompression or validation. The endpoint can also consume just the part of the message it needs, without needing to consume or parse the entire message. As a result, endpoints can process binary-encoded documents many times faster than the equivalent text-encoded XML files, and considerably faster than any other XML compression scheme.

Another advantage of binary XML is the ability to handle data types in their native format. For example, the binary encoding represents floating point numbers so that the endpoint need not translate between strings and integers, for example, and thus impinge on processing time. As a result of the pre-parsing and binary representation, binary XML promises performance improvements several orders of magnitude over their text-based brethren.

*The greatest challenge of any binary encoding is that all points on the communication path need to be able to not only tolerate the format, but be able to process it.*

Binary XML, however, is not without its downside. The greatest challenge of any binary encoding is that all points on the communication path need to be able to not only tolerate the format, but be able to process it. While proponents often talk about how end-points can easily be configured to deal with binary XML, they often neglect the fact that intermediaries between the communicating parties often must be able to inspect and make decisions on that traffic. As a result, binary XML's global acceptance hinges upon all security, process, management, and transformation systems or devices being able to understand and process the binary XML format. Furthermore, binary XML raises the specter of potential compatibility and vendor lock-in concerns. For example, the format chosen to represent numerical data, such as integers, floating point numbers, or arrays, must be platform independent, so that different consuming platforms are able to take advantage of the performance boost that such native formatting offers – a tall order in today's complex, heterogeneous IT environment.

It is also not clear if solving the parsing and transmission problems of XML will truly result in significant overall performance increase. In many situations, XML processing represents only a small part of the overall processing load for a given XML message. Binary XML does not address the processing costs that result from security look-ups, semantic mapping, transformation, and other complex processing tasks, suggesting that binary XML might not be worth the trouble, since the processing bottleneck may be elsewhere. Furthermore, there are ways to upgrade the text-based XML format itself to give it some of the benefits of binary XML. Providing indexes in XML documents can speed up the parsing of a document, and it is possible to include a binary index for search as well as provide for more lenient DOM processing that may reduce the processing required for very large documents.

☆ Vendor Focus

**ExpWay**

One company, **Expway** is pioneering the use of Binary XML with their BinXML product – a generic SDK that provides processing, compression, and validation technology based on binary XML that promises significant performance enhancements – as long as all parties utilize binary XML as their means to communicate and process XML documents. In production with multimedia applications, they have seen performance increases of over 1000% over traditional software approaches, and compression of XML documents up to 200 times.

## III. Vendor Landscape

In ZapThink's last Foundation Report on this market in 2002, we classified the market as the "XML Proxy" space, which included both hardware appliances and software solutions that we predicted would provide a set of functionality that intermediaries can perform on inbound XML documents prior to being forwarded to end point destinations. At the time, we saw that this new category of solution

would converge on a set of value-added tasks for handling all XML-related activities including message routing, security, performance enhancement, transformation, and monitoring and management. In that report, we stated:

> As enterprises use XML Proxies as XML-aware intermediaries to monitor, manage, and modify XML and Web Services traffic on the network, there will be a demand for these solutions to handle an increasing set of functionality. At some point in the future, it won't be feasible to implement separate solutions for corporate-wide XML security, management, routing, transformation, and performance enhancement … After all, if the device is handling all XML traffic on the network, adding an increased set of value-added features is a natural step.

*The term "XML Proxy" failed to garner any marketing traction, and the markets formerly identified as a single purchasing behavior are in fact splitting into specific problem domains.*

However, the market has considerably matured and evolved in a different direction than as stated above. The term "XML Proxy" failed to garner any marketing traction, and the markets formerly identified as a single purchasing behavior are in fact splitting into specific problem domains, solving security, performance, routing, and messaging functionality in a variety of form factors. While a wide variety of companies are providing solutions that span the various markets for security, integration, reliability, and performance, customers have yet to settle on a buying behavior that seeks all these capabilities from a single vendor – rather, customers have separate line-items on their budgets to solve various problems and seek solutions that are either focused in a particular market, like security, or can solve multiple parts of their budgetary needs.

This section first identifies the various form factor approaches for solving high performance XML issues and then identifies the various solutions in each of the problem domains for processing XML with high efficiency.

## 3.1. Examining Form Factors for High Performance XML Processing

Before delving into the details of the specific domain areas that emerging high-performance XML solutions address, this report will first examine the various different form factors that current vendors in the market provide. As of Q4 2004, ZapThink sees five main approaches for optimized XML processing: network appliances, blade form factors, PCI-cards, specialized chip-sets, and optimized software solutions. Each approach is detailed below.

### 3.1.1. *Hardware Appliances and Blade Form-Factors*

Decision Point

*Hardware solutions remain a good option for IT data center administrators looking to manage corporate-wide XML and Web Services traffic.*

While there are many different approaches to providing high performance XML solutions, the hardware solution remains a good option for IT data center administrators looking to manage corporate-wide XML and Web Services traffic. The hardware form factor, whether specialized chipsets and custom-developed firmware, or specialized, pre-configured software on more general-purpose hardware platforms, offers some significant benefits to customers looking to improve the performance of their XML solutions. Many hardware platform vendors are able to offer substantially higher performance over purely software-based solutions, and also offer security-hardened environments that prevent tampering as well as simplified administration. Hardware solutions also free application developers from being responsible for protecting their applications from every possible type of attack by offloading those responsibilities onto a centralized device, and focus them on the primary responsibility of building application logic.

IT personnel can configure hardware appliances so that they are ready to install by simply plugging the equipment into their corporate network with minimal additional configuration. As a result, IT shops can control their installation and maintenance costs and complexity, making sure that they have properly

configured certain security, routing, transformation, and management features prior to installation.

Three primary form factors exist for hardware-based solutions to XML processing needs. One of the first to market is the rack-mountable network appliance that can fit within the existing network topology set by data center administrators. Vendors such as **Actional** (formerly **Westbridge Technology**), **Cast Iron Systems**, **Conformative Systems, DataPower, Digital Evolution, F5 Networks, Forum Systems, Layer 7 Technologies, NetContinuum, Reactivity, Sarvega, Solace Systems,** and **Teros** produce rack-mountable network appliance form factor systems that solve a variety of XML-based processing challenges. This report will discuss each solution in the problem domain sections (Sections 3.2 through3.5)below.

Another hardware form factor rapidly gaining acceptance is the blade form factor, increasingly used in emerging virtualized environments for high-performance computing. A blade server is actually a group of individual, general-purpose, commodity servers pulled together into a single appliance called a chassis that provides the group of servers with a common set of infrastructure like power supplies, cooling fans, and networking capabilities. Blade computing seeks to reduce IT complexity and administration costs by simplifying the management of groups of servers, speed deployment by allowing the swapping of individual servers at very low cost and with significant ease, conserving space and power by consolidating servers into small form-factor chassis, and providing for significant agility by allowing the provisioning of servers at runtime.

A blade server consists of general-purpose computing hardware adapted with specialized software to perform specific processing tasks, instead of purpose-built hardware like network appliances. For this reason, companies that are looking to solve XML performance issues are increasingly looking to the blade form factor to deploy their solutions. In particular, the embeddable software approach enables companies to deploy their solution on a flexible, as-needed basis to available blade servers as XML performance requirement demands change.

The advantages of the blade form factor is that it doesn't require any changes to network topology and can make use of the management and runtime infrastructure of existing blade systems. Some disadvantages of the approach include the fact that chassis are far from standardized, requiring technology vendors to carefully select their partners, and a requirement to involve the data center administrator in the purchasing process. **Sarvega** has partnered with a few companies to release a blade form factor version of their product, and **DataPower** has produced an OEM-able version of their offering in a blade form factor called XG4.

Also gaining increasing prevalence among XML processing vendors is the PCI card form factor. Meant to be fit into existing server systems, PCI-card form factor devices can improve a wide variety of XML processing tasks ranging from XML parsing to security, routing, management, and transformation in small packages that can be inserted into an individual server. A number of companies including **Forum Systems, Tarari,** and **Xambala** have released PCI versions of their applications. The advantage of a PCI solution is that it can participate at any location in a corporate network and individuals not associated with the data center can install and maintain it. However, a frequent challenge that these solutions present is that they aren't necessarily plug-and-play and may need to be explicitly coded for in order for their capabilities to be leveraged.

In identifying these solutions, ZapThink has also noticed that the expectation for the total cost of ownership (TCO) for each of the above solutions varies heavily by

✯ Vendor Focus

**Actional**
**Cast Iron Systems**
**Conformative Sys.**
**DataPower**
**Digital Evolution**
**F5 Networks**
**Forum Systems**
**Layer 7 Tech.**
**NetContinuum**
**Reactivity**
**Sarvega**
**Solace Systems**
**Teros**

*Another hardware form factor rapidly gaining acceptance is the blade form factor, increasingly used in emerging virtualized environments for high-performance computing.*

✯ Vendor Focus

**DataPower**
**Forum Systems**
**Sarvega**
**Tarari**
**Xambala**

price point. Typically the network appliance form factors are the most expensive, with current price points from $15,000 to $100,000 per appliance in small volumes. Blade form factors seem to be half those price points and PCI-card form factors even lower priced, with prices dropping down to $5,000 or less for individual PCI-card versions. Part of the reason for this difference in pricing is the perceived volume in which these solutions are sold, with expectations that hundreds of PCI cards, dozens of blades, and handfuls of network appliances can be sold per customer.

### 3.1.2. Emerging Chip-based solutions

*An emerging set of vendors are producing specific chipsets for handling XML processing requirements.*

In addition to the network appliance, blade, and PCI-card form factors, an emerging set of vendors are producing specific chipsets for handling XML processing requirements. Those chips are either produced as Field-Programmable Gate Array (FPGA) units that have a high per-unit cost but allow for faster time-to-market or as application-specific integrated circuits (ASICs) that can be produced at high volumes at low cost but have a higher capital investment and longer and more costly development cycles. Regardless of the approach used to develop and produce the technology, companies are aiming these chips at the emerging market for third-party software and hardware vendors looking to embed high-performance XML processing capabilities in their systems by utilizing specialized capabilities of a chip rather than over-burdening their generic CPU.

Two vendors are specifically focusing on the OEM market for their chips: **Tarari** and **Xambala,** both of which are producing chips focused on solving the content processing challenge with a specific emphasis on XML parsing and querying operations such as XPath. In addition, hardware vendors like **Conformative Systems**, **DataPower,** and **Solace Systems** have built their own chipsets to optimize their hardware appliance, and some of those vendors have made plans to OEM their chips to other vendors on a selected basis.

☆ Vendor Focus

**Conformative Sys.**
**DataPower**
**Solace Systems**
**Tarari**
**Xambala**

ZapThink believes that the opportunity for OEM and embedded applications of specialized XML processing chipsets will significantly increase in 2005 as larger, incumbent network vendors, emerging startup vendors, and software vendors seek to maximize the performance of their solutions by leveraging specializing processing capabilities.

### 3.1.3. Software Approaches for improving XML performance

Decision Point

*Hardware solutions aren't the only approaches to improving XML performance on the network.*

While hardware in its many forms offers compelling solutions for optimized XML processing, such solutions aren't the only approaches to improving XML performance on the network. Clearly, one of the first approaches companies should take is to reevaluate the usage of generic parsing and processing technologies from their vendor suppliers. Rather than code their own security, transformation, routing, or parsing routines, companies should seek more optimized software solutions in those cases when a hardware approach is not viable or cost-effective, such as on end-point processing nodes, sometimes-connected devices, mainframes, and other systems.

☆ Vendor Focus

**Actional**
**Expway**
**Forum Systems**
**RogueWave**
**Sarvega**

In these cases, a variety of software-based approaches are emerging for more optimized handling of XML performance. **Quovadx**, through its **RogueWave** division, is offering an optimized solution set for XML processing. Likewise, binary XML solutions offered by companies like **Expway** offer an alternate approach for efficient handling of XML in software.

In addition, companies like **Forum Systems**, **Sarvega**, and **Actional** offer software-only versions of their products that are highly optimized for specific XML processing, security, and management tasks. In particular, **Sarvega**'s strategy is

notable since they offer a completely OEM-able version of XESOS, their hardened-software system for XML processing. Such solutions can be viable when hardware alternatives are not appropriate, or when customers are looking for the flexibility of installation that software solutions provice. In addition, while **Reactivity** offers only a hardware appliance, they have based their solution on software optimizations and intelligent processing of XML more so than specific hardware or chipset improvements, although they do leverage the **Tarari** solution for even greater performance enhancement.

### 3.2. High Performance XML Security

Security involves a particular set of XML operations that tax network bandwidth and server processors to their limits. While it's clear that companies want the capabilities of content-level message inspection, per-message authentication and validation, and policy-based Service execution, they aren't capable of dealing with the load that these requirements impose on their IT infrastructure. As such, a variety of optimized XML appliance and hardened software solutions exist that not only provide security capabilities but do so at the performance level that enterprises require.

*Optimized XML appliance and hardened software solutions exist that not only provide security capabilities but do so at the performance level that enterprises require.*

Companies increasingly realize that security is one of the fundamental issues they must resolve if they plan to implement a SOA. Fundamentally, those security issues center on authorization and authentication, in addition to guaranteeing the reliability and confidentiality of messages as they crisscross on the corporate network and move between companies. Luckily, a wide range of vendors provide functionality that adequately covers many of the needs of these users. In essence, by the end of 2004, much of the functionality and performance that Web Services and SOA Security vendors offer will converge on the accepted set of security capabilities companies require to implement a robust SOA. Vendors such as **Actional**, **DataPower, Forum Systems, Layer 7 Technologies, Reactivity,** and **Sarvega** focus their security offerings on providing authentication, authorization, message confidentiality, and intrusion detection for XML and Web Services traffic.

**Vendor Focus**

**Actional**
**DataPower**
**Forum Systems**
**Layer 7 Tech.**
**Reactivity**
**Sarvega**

**Decision Point**

*As systems become more distributed and abstracted through Web Services-based SOAs and other means, it becomes increasingly difficult for a company to gain adequate visibility into their vulnerabilities.*

In addition to solutions that secure access to the programmatic interfaces and ensuring the confidentiality of interactions between systems, there remains a significant challenge in securing the data that application and the interfaces themselves transmit. What is to stop a malicious intruder from gaining access to a system through legitimate means and then sending dangerous or unauthorized data to the interface? As systems become more distributed and abstracted through Web Services-based SOAs and other means, it becomes increasingly difficult for a company to gain adequate visibility into their vulnerabilities.

In addition, companies must safeguard the data that moves between systems. In the case of Web Services, this payload information might be insurance claims, electronic patient records, or simply acknowledgements of transactions received. Whatever the size, companies must safeguard these payloads from illegitimate transactions and improper usage. Finally, all this security activity must happen in a way that doesn't slow down the overall performance of the network.

**Vendor Focus**

**NetContinuum**
**Teros**

Companies like **Teros** and **NetContinuum** focus specifically on securing the data in the payload from malicious or unintentional attacks such as SQL injection, malformed XML messages, schema poisoning, coercive parsing, XML denial-of-service attacks, inappropriate transmission of private or confidential information, oversized payloads, replay attacks, and other security vulnerabilities associated with the payload of the messages.

Currently, a wide range of products exist that not only provide security capabilities, but do so in an appliance, blade, PCI, or chip form factor in order to

meet performance and hardened-security requirements. Table III-1below outlines currently available products and key characteristics:

**Table III-1: Hardware Form Factor XML Security Offerings**

| Network Appliance | Blade | PCI | Chip / Embeddable Hardware |
|---|---|---|---|
| Actional XA Series<br>DataPower XS40<br>F5 Networks TrafficShield<br>Forum Sentry / XWall<br>Layer 7 SecureSpan Gateway<br>NetContinuum NC-1000<br>Reactivity Gateway & Manager<br>Sarvega XML Guardian<br>Teros Web Services Sec. Gateway | Sarvega XESOS | Forum Sentry / XWall | DataPower XG4 |

*It has become clear that performance-related transformation issues play second fiddle to security concerns.*

### 3.3. Integration and Transformation at Wire-Speed

When ZapThink first wrote about the XML Proxy market in 2002, many of the vendors focused their attention primarily on the challenge of transforming content from one representation, such as XML, to another, such as HTML. At the time, these vendors believed that transformation would be the largest and most immediate addressable market, while other markets would mature over time. In the past two years, however, it has become clear that performance-related transformation issues play second fiddle to security concerns.

More importantly, it's clear that applications that focus in other domains of XML processing, such as security or messaging, also provide core capabilities for wire-speed transformation in their appliance. For example, **Reactivity** and **Forum Systems** appliances both provide core capabilities for XML transformation, even though their solutions haven't been purpose-built for this task. As such, it became clear that transformation, in and of itself, didn't represent a separate market, per se, but rather an emerging need.

☆ Vendor Focus

**Forum Systems**
**Reactivity**

Regardless, a number of vendors have built products specifically tailored for optimized XML transformation, and as such built an early market presence with their products. These network devices specialize in transforming XML documents using XSLT and XPath, accepting messages over the network through SOAP or just HTTP, transforming the data and then routing it to a new destination. The user can pre-configure the destination or determine it on-the-fly based on the content of the message. The devices can also be set up as XSL co-processors for use with internal applications, and can also traverse protocol boundaries--accepting XML requests in one protocol format (say, HTTP) and outputting it in another (say, SMTP and FTP). For example, an XML proxy can deliver an inbound SOAP packet delivered over HTTP to an endpoint using EDI over FTP.

☆ Vendor Focus

**Cisco**
**Conformative Sys.**
**DataPower**
**Sarvega**

**DataPower** was first to market with their XA35 appliance and targeted the early markets for dynamic XML-to-anything conversion. **Sarvega** was on their heels with their Speedway product, and **Conformative Systems** is relatively new to market with their <CXSi> appliance, an ASIC-based network appliance that applies parallel-processing or "supercomputer" techniques to the parsing, validation and transformation of XML data using XSLT. **Cisco** has also tentatively entered the space with their CTE 1400 content transformation engine aimed at taking HTML and delivering the data to non-desktop devices. This 1U appliance takes in XML and HTML and outputs XHTML, Web Unified Modeling Language (WUML), compact HTML (cHTML), and Handheld Device Markup Language

(HDML). While arbitrary XML formats and more general XML processing isn't supported in the product (preventing it from being a true XML appliance *per se*), it is Cisco's first step in the content-aware networking market and can signal increased competition from the company in the near future.

An additional, and emerging, problem domain high-performance appliance form factors solve are a set of devices that provide integration capabilities traditional provided by integration middleware such as EAI and MOM approaches. These devices, sometimes called "Integration Brokers in a Box" provide application adapters, data transformation, and business process orchestration. One of the first vendors to announce such a product is **Cast Iron Systems**, with its Application Router 1000 product. Released in 2004 is **DataPower**'s XI50 appliance that provides common message transformation, integration and routing functions in a network device.

Rather than selling on the basis of their features, the integration-focused XML appliances are primarily focused on performance and total cost of ownership. Therefore, companies looking to evaluate these solutions should center on their performance in their particular scenario and their cost savings vs. general-purpose processing technology and approaches.

**Table III-2: Hardware Form-Factor XML Integration and Transformation Focused Offerings**

| Network Appliance | Blade | Chip / Embeddable Hardware |
|---|---|---|
| **Cast Iron Systems Application Router 1000**<br>**Cisco CTE 1400**<br>**Conformative Systems <CXSi>**<br>**DataPower XA35**<br>**DataPower XI50**<br>**Sarvega Speedway** | **Sarvega XESOS** | **DataPower XG4** |

### 3.4. Context-aware Routing: Facilitating XML-based Messaging

A more recent trend among XML appliance vendors is the development of capabilities to meet a range of high performance, wire speed routing and messaging infrastructure needs. At its most basic level, *routing* is simply the intelligent movement of a document or message from one location on the network to another location that may or may not be in the corporate network. In the general network context, routing usually is based on information such as IP packet headers, URLs, or other information that doesn't have anything to do with the actual content of the message. However, XML routing depends upon deeper inspection of the content itself to determine the most suitable recipient of those messages, as well as the headers of the messages.

Companies like **F5** have been successful in offering high-speed processing of content-rich messages, and have added XML to their cadre of capabilities. In addition, a number of the security or integration-focused XML appliance vendors have also added elements of context-based routing to their products, providing for an element of messaging in their solutions.

More interestingly is the need to deliver messages in a reliable manner. In this vein, the routing capabilities that some of the vendors provide, especially **Sarvega**'s XML Context Router and **Solace Systems**' XCR 1300 perform more like reliable messaging infrastructure and asynchronous message queues than simple point-to-point routing. In effect, these products enable companies to

☆ Vendor Focus

**Cast Iron Systems**
**DataPower**

Decision Point

*Companies looking to evaluate hardware integration solutions should center on their performance for their specific needs.*

☆ Vendor Focus

**F5 Networks**
**Sarvega**
**Solace Systems**

*XML routing depends upon deeper inspection of the content itself to determine the most suitable recipient of those messages, as well as the headers of the messages.*

implement loosely coupled, asynchronous Web Services messaging through the deployment of hardware solutions, rather than through the deployment of technologies such as emerging Enterprise Service Bus or MOM-based infrastructures. They provide a network of interconnected devices in a mesh that in effect provides an XML routing infrastructure.

These tools provide message reliability and quality-of-service (QoS) delivery for content. Sarvega, in particular, offers XPath-based routing and publish/subscribe-based messaging that allows endpoints to subscribe to particular message topics and receive messages based on events and notifications. These products can also provide seamless integration with existing messaging middleware such as IBM WebSphere MQ, TIBCO buses, or JMS-based applications. However, what makes these products unique is that they can also extend the messaging infrastructure outside the walls of the company, touching external parties in a reliable, cost-effective, and high-performance manner.

Decision Point

*Appliance-based routing products enable companies to implement loosely coupled, asynchronous Web Services messaging through the deployment of hardware solutions.*

**Table III-3: Hardware Form Factor XML Routing Offerings**

| Network Appliance |
|---|
| **F5 Networks Big-IP** |
| **Sarvega Context Router** |
| **Solace Systems XCR 3200** |

### 3.5. Non-Domain Specific Optimized XML Processing

As this report discussed earlier, some vendors are improving the performance of XML processing tasks without focusing on a specific application domain such as security, transformation, or routing. These vendors solve the core problems that bog down most processors when they encounter XML traffic on the network. In particular, the use of either specialized chipsets or software can significantly accelerate and optimize parsing, validation, document query, canonicalization, and compression steps by offloading those tasks from general purpose computing infrastructure.

Vendor Focus

**DataPower**
**Tarari**
**Xambala**

**Tarari** was first to market with their XML Content Processor, and built upon their early success with their Random Access XML (RAX) Content Processor product that focuses on optimizing XPath and other complex XML query and tree-operation tasks. **Xambala** released their Xambala Semantic Processor (XSP) 6000 and XPC 6000 in 2004, and **DataPower** announced an embeddable, OEM-able version of their XG4 technology as well.

Vendor Focus

**Expway**
**Quovadx**

On the software side, **Rogue Wave Software,** a division of **Quovadx**, has under development compelling software-based technology that aims to significantly enhance XML processing on general-purpose computing infrastructure on a wide variety of form factors. In addition, **Expway** has announced an offering based on Binary XML to significantly enhance processing of XML as well. Both software products work by replacing standard, off-the-shelf parsing and processing technology with their own technology and approaches.

*Software acceleration products work by replacing standard, off-the-shelf parsing and processing technology with their own technology and approaches.*

**Table III-4: Optimized XML Processing Form-Factors**

| PCI-Card / Chipset | Software |
|---|---|
| **DataPower XG4**<br>**Tarari XML & RAX Content Processors**<br>**Xambala XSP 6000 / XPC 6000** | **ExpWay BinXML**<br>**Rogue Wave** |

### 3.6. When will the Incumbents Enter?

As XML Proxy solutions become more visible in the corporate IT environment, it will be likely that the current incumbent Network Appliance vendor offerings from companies such as **Cisco, Nortel Networks, Intel, Juniper Networks, CacheFlow,** and **ArrowPoint** will make entrances in this market. In addition, ZapThink is seeing increased interest in high performance and appliance approaches to XML processing from security software vendors such as **KaVaDo** and **Sanctum**, who are adding the capability of securing, monitoring, and managing XML content such as Web Services operations with limited XML Proxy features to their software. It is expected that as these vendors provide appliance form factors for their solutions, their functionality will converge with the vendors featured in this report that provide high performance and appliance approaches for XML performance. Once they enter the space, we can expect to see increasing commoditization of appliance solutions, heightened merger and acquisition activity, and competitive pressure.

In the 2002 report, ZapThink discussed the inevitability of an "all-in-one" XML appliance that provided security, transformation, performance, routing, and management capabilities. While it seems that this vision is too broad and unfocused for emerging startup vendors, it's possible that only the incumbent network appliance vendors might be able to execute on this vision. It's quite likely that a vendor like **Cisco** might produce an XML appliance that provides all those benefits, since they might already have a significant number of assets deployed in a corporate network, and have taken a similar approach to technologies like Voice over IP (VoIP). In any case, ZapThink believes that the large, incumbent vendors will have significant impact on the market when, and if, they choose to enter.

### 3.7. Finding the Buyer

Companies have long realized the strategic value of their network for enabling their core applications and business processes. The network has evolved from a convenient means to connect a few important systems to being a critical infrastructure component on which the lifeblood of the organization runs. Yet, despite the important role that networks serve, the realms of application development and management and network operations and management have traditionally been separate and disconnected domains. Developers traditionally build applications for server-based applications, and network administrators are responsible for the maintenance and configuration of the network, but rarely vice-versa.

However, the wall between networks and applications is rapidly crumbling. The emergence of Web Services and SOA approaches that abstract the underlying implementation from consuming systems and provide location independence have increasingly spurred companies to realize that they can consider their network assets to be extensions of their previously software-only applications.

One of the side-effects of the movement to SOA is that the implementation of the Service is abstracted from the consumer of that Service. That means that a Service consumer wouldn't know whether their Service requests are being fulfilled by an application server, database, mainframe, human, or network appliance. As such, the formerly separate worlds of network administration and application development are increasingly becoming intertwined.

☆ Vendor Focus

**ArrowPoint**
**CacheFlow**
**Cisco**
**Intel**
**Juniper Networks**
**KaVaDo**
**Nortel Networks**
**Sanctum**

Decision Point

*Only the incumbent network appliance vendors might be able to execute on the vision of the "all-in-one" XML appliance.*

*The formerly separate worlds of network administration and application development are increasingly becoming intertwined.*

Furthermore, existing software infrastructure, such as application servers, databases, and messaging middleware, are becoming increasingly burdened with security, reliability, and integration tasks that bog down the systems to the point that they spend precious little time on the business logic that the application developer created. As a result, it's less clear who in the organization is responsible for buying such products. In particular, vendors might call upon application developers, enterprise architects, or network operations managers in the course of their sales efforts.

For software-based solutions, the answer might be a bit easier to find, since performance improvement through software is typically the responsibility of the developer, application integration project manager, or even the enterprise architect. But the feature-rich network appliances, chip sets, and PCI-card form factors pose a challenge since those solutions might be the domain of the network administrator, security administrator, application developer, enterprise architect, all, or none of the above.

**Decision Point**

*Companies who focus on the network administrator community will face the threat of significant competition from the network incumbents.*

XML and Web Services security and acceleration-focused appliances, Web Services routing, and even aspects of Web Services management applications are often tailored to solve the problems of the network operations and administration buyer. Network operations personnel care most about the health and well-being of the network. They often don't see XML and Web Services as a part of a distributed, agile computing infrastructure, but rather as a foreign, alien body that must be dealt with in a controlled manner.

Instead of being proponents of Web Services and SOA, network operations personnel are primarily disposed against these new technologies due to the threats they introduce to "their" network. When network operations users buy Web Services and SOA products, they do so out of FUD–fear, uncertainty, and doubt–that Web Services introduce, rather than the positive business changes that they represent. As a result, many companies selling such products can sell to this community, but these sales will tend to be tactically focused with little opportunity to sell to higher levels of the organization. In addition, network operations personnel are by definition risk-averse and tend to purchase from vendors they already trust. So, companies who focus on this community will face the threat of significant competition from the network incumbents, whenever they choose to enter the market because of the mindset of these buyers to select vendors they've already bought products from.

*By giving developers more control over network performance, and by giving network administrators more control over the applications that run on their networks, companies can expect to see significant impact on the efficiency and performance of their business.*

In addition, many of these new appliances are giving application developers programmatic control of the performance and operation of their network that they never have had before, as well as providing network administrators control over the most detailed parts of an application's operations across the network.

By giving developers more control over network performance, and by giving network administrators more control over the applications that run on their networks, companies can expect to see significant impact on the efficiency and performance of their business. Rather than building overcapacity into their IT infrastructure simply to enable their application server-based infrastructure to run, companies will increasingly look to network appliances to offer some of the capabilities that they had previously relegated to software-only applications. In particular, companies will call upon such appliances to provide security, reliability, messaging, and some forms of integration that intermingle the notions of business logic with transport and message delivery.

As developers and administrators realize the potency of these new hybrid network devices, they will flock to such Service-enabled solutions. The challenge these organizations face is not one of technology, but rather of changing the

mindset of applications developers and network administrators that might not be accustomed to thinking in the other's domain.

### 3.8. Market Segmentation and Vendor Differentiation

ZapThink sees that vendors are increasingly differentiating their products and messaging, and as such the below chart reflects the various products on the market, their specific problem domains, and their form factors as a recap of the above discussion:

**IMPORTANT NOTE TO READERS: The below chart is not a functionality matrix. Many of the vendors featured in this report have functionality that cross application domains. This chart is meant to illustrate which products have a specific focus on a given problem domain and attempts to classify their product by form-factor. Companies looking for a combination of features, such as security and routing, or transformation and security, should select vendors from both problem domain areas and compare functionality from this aggregated list.**

**Table III-5: Application Domain Focus and Form-Factors for Appliance and High-Performance XML Solutions**

| Application Domain | Network Appliance | Blade / OEM-able Software | PCI | Chip / Embeddable Hardware |
|---|---|---|---|---|
| XML / WS Security | Actional XA Series<br>DataPower XS40<br>Digital Evolution XML VPN<br>F5 Networks TrafficShield<br>Forum Sentry / XWall<br>Layer 7 SecureSpan Gateway<br>NetContinuum NC-1000<br>Reactivity Gateway & Manager<br>Sarvega XML Guardian<br>Teros WS Sec. Gateway | Forum XWall<br>Sarvega XESOS | Forum Sentry / XWall | DataPower XG4 |
| XML / WS-based Integration and Transformation | Cast Iron Systems Application Router 1000<br>Cisco CTE 1400<br>Conformative Systems <CXSi><br>DataPower XA35<br>DataPower XI50<br><br>Sarvega Speedway | Sarvega XESOS | | DataPower XG4 |
| XML / WS Messaging & Routing | F5 Networks Big-IP<br>Sarvega Context Router<br>Solace Systems XCR 3200 | Sarvega XESOS | | |
| General Purpose XML Acceleration | | ExpWay BinXML<br>Rogue Wave | Xambala XPC 6000<br>Tarari XML & RAX Content Processors | DataPower XG4<br>Tarari XML & RAX Content Processors<br>Xambala XSP 6000 |

The vendors that participate in these core application domains are currently in the process of defining their markets, their product strategies, and their core

customer value propositions. As a result, many vendors are adding functionality to their products that may appear to be functionality provided by a different market segment than where they might be focused. Such maneuvering tends to confuse the marketplace, as customers are not yet able to specify their needs by product category, but rather must publish requests for proposals (RFPs) that list the functionality they believe they will require. As a result, an increasing set of vendors from different markets are converging on the same set of functionality, thus blurring the lines between the various markets mentioned above.

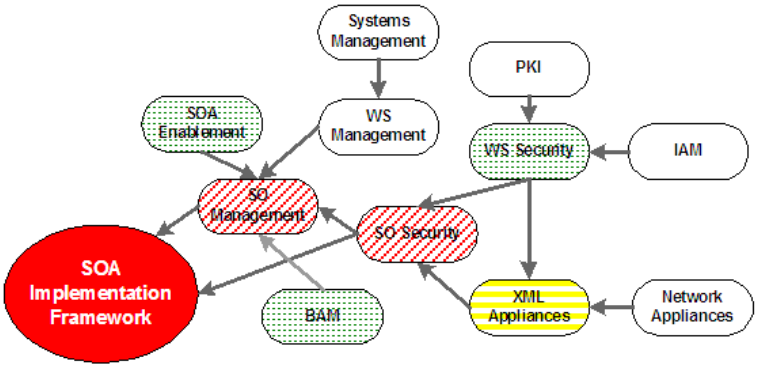
## IV. Market Trends

The core XML appliance and XML performance optimization market trends that ZapThink's analysis predicts for the remainder of the decade include:

- *Increased consolidation of XML / WS appliance vendors* – The Web Services and XML markets continue to be highly competitive and will increasingly force companies to consolidate their offerings as they seek to expand into related markets. In particular, the WS security and management markets are highly symbiotic, and increasingly XML appliance vendors with security offerings might choose to partner with, acquire, or merge with SOA management vendors. Likewise, the transformation appliances might become subsumed within integration markets. The below chart shows how some of that consolidation may happen as part of ZapThink's SOA Implementation Framework vision:

*The WS security and management markets are highly symbiotic, and increasingly XML appliance vendors with security offerings might choose to partner with, acquire, or merge with SOA management vendors*

**Figure IV-I: Convergence of Security and Management Capabilities for SOA Implementations**




- *Increased differentiation of XML and WS Appliance and High Performance Products* – Commensurate with the consolidation of the number of vendors in the space will be an increasing differentiation of products between vendors. 2003-2004 has already seen significant differentiation among the vendors as companies like **Forum Systems** and **Reactivity** increasingly focus on security while other companies like **DataPower** and **Sarvega** seek to broaden their offerings into related areas. ZapThink expects the market to both continue to differentiate into niches as well as consolidate with related markets.
- *Development of performance benchmarks and acceptable performance thresholds by enterprises* – While performance is the main topic at hand discussed in this report, customers require performance that meets

certain acceptable thresholds, mostly. A number of vendors have come out with performance claims about their products, but there yet has been established any industry-wide benchmark for XML processing performance. **Sarvega** has recently announced findings of a benchmark they have commissioned and are encouraging other vendors to join in that benchmark effort. In addition, **DataPower, Forum Systems,** and **Reactivity** have all had favorable ratings in recent magazine-based lab efforts and independent benchmark reviews. Companies looking at performance should evaluate each vendor's performance benchmarks and claims to see how they match up to their particular usage scenarios – at least until a generally available benchmark becomes accepted in the market. In any case, ZapThink sees that as the market matures and increasingly consolidates, demand for a general XML processing performance benchmark will increase.

Decision Point

*ZapThink sees that as the market matures and increasingly consolidates, demand for a general XML processing performance benchmark will increase.*

- *Increasing dominance of network appliance incumbents* – One of the biggest factors in the growth and maturation of the XML performance markets is the entry of significant products by network appliance incumbent vendors such as **Cisco, Juniper, Nortel Networks**, and others. Already **F5 Network's** entry into the market is causing some waves with their iControl, BIG-IP, and 3DNS products that have garnered significant market share. Once these vendors enter the market, ZapThink predicts significant increase in consolidation and more rapid uptake of products by buyers.

In order to provide a quantitative analysis of these trends, this report provides market predictions for the following appliance and optimization markets:

*Once incumbent network appliance vendors enter the market, ZapThink predicts significant increase in consolidation and more rapid uptake of products by buyers.*

- *XML Security Appliances* – Network appliances, embeddable hardware, and OEM-able software are actually three implementation approaches for the broader XML, Web Services, and Service-Oriented Security markets. In this report, ZapThink will show how the percentage of products sold in this market applies to each of the network appliance, embedded hardware, and OEM-able software approaches.
- *XML Integration and Transformation Appliances* – Just as in the case with security, XML appliances focusing on transformation and integration are part of the larger Service-Oriented Information Integration market, which is discussed in greater detail in ZapThink's *Service Orientation Market Trends* Foundation Report (ZTR-WS110). This report will show the percentage of solutions sold that are of an appliance nature in this larger market category.
- *XML Routing and Messaging Appliances* – Similarly, XML routing and messaging appliance and embedded solutions are a subset of the more general ESB marketplace. This report will show what percentage of ESB dollars are being allocated towards optimized XML appliance or embeddable solutions.
- *XML Performance Enhancement Software and Hardware* – The market for general-purpose XML optimization and performance enhancement is a unique and growing market. This report will indicate how the market is growing in end-user expenditure for these sorts of solutions.

Rather than predicting market size as a function of dollars spent by end-users, this report will focus on predicting the percentage of each market category that will be spent on XML appliance or embeddable high-performance solutions for the security, integration, and messaging markets. However, this report will

predict market sizing for the general-purpose XML performance optimization market.

### 4.1. Methodology

For estimates on market sizing where ZapThink calculates dollars spent by end-users, ZapThink bases its new entrant market numbers on an analysis of existing revenue figures provided by the new entrants in each market segment, adjusting for possible errors and uncertainty, including under- and over-reporting of revenues and best-guess estimates for companies not briefed for this report. Those numbers are then placed into the context of the overall changes affecting the XML, Web Services, and SO markets as the shift to SO takes place, as ZapThink covered in the *Service Orientation Market Trends* report (ZTR-WS110).

ZapThink then calculates a range of market sizing numbers for incumbent markets based on existing third-party research for each of these markets. We then multiply the low, high, and average incumbent market numbers by the percentage of the incumbent market predicted to be part of the emerging market by ZapThink's analysis of market trends. Therefore, it is also possible to input other third-party numbers in the place of the numbers in this report to obtain adjusted SO incumbent percentages based on third-party analyst research.

Based on these calculations, ZapThink is then able to estimate the total market size for each core SO market, which is the sum of the new entrant contribution and the incumbent SO portion to each core SO market. From those values we can then calculate the portion of each SO market that is due to the new entrants in that market.

Each subsection in this section contains the following information:

- A table with the raw data found in the graphs.
- A graph showing either the percentage of a total market spent on particular implementation approaches or the total revenue of new entrants as a part of the total market for the core SO market in question. This graph is in logarithmic form due to the relative size difference between total market and new entrant numbers.
- For sections detailing total market size as a function of end-user expenditure:

    - A graph showing the total SO market in question as a part of the total incumbent market, which includes both SO and non-SO components. This graph illustrates the trend of incumbents to Service-enable their existing software.
    - A line graph showing the high, low, and average market size numbers for the SO market in question. These ranges take into account the differing values of third-party incumbent predictions. The actual market size will be between the low and high numbers.
    - A percentage graph showing the percent of each incumbent market that is part of the total SO market in question. This graph also illustrates the trend of incumbents to Service-enable their existing software.
    - A percentage graph showing the percent of each SO market that is represented by new entrants.

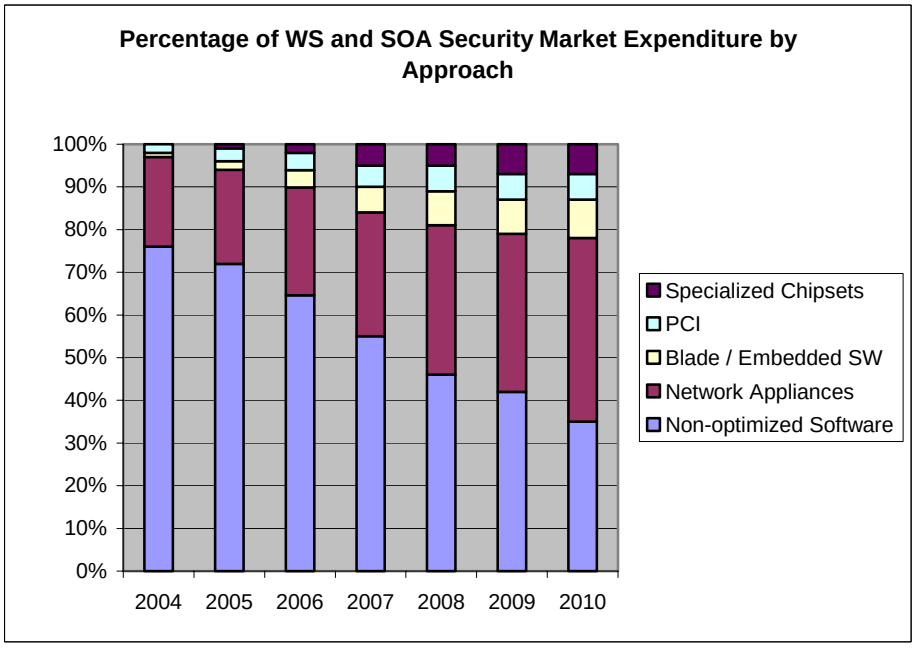
 

### 4.2. XML and Web Services Security

As mentioned earlier, the market for network appliances, PCI and blade form factor solutions, and embeddable chip or software approaches for XML and Web Services security is really a subset of the larger XML, Web Services, and SO Security market that ZapThink covered in its *Service Orientation Market Trends* Report (ZTR-WS110). For a discussion of the sizing of that more general market, please obtain a copy of that report.

This section will outline what percentage of solutions sold in that market will be of the appliance, blade, PCI, and chipset form factors, and how that percentage will grow over time. The below figure and table outline these general conclusions.

**Figure IV-II: Percentage of WS and SOA Security Expenditure by Approach**




Source: Copyright © 2004 ZapThink, LLC

*Non-optimized software solutions will remain as the most prominent approach for WS and SOA security until around 2010.*

**Table IV-1: % of WS and SOA Security Market Expenditure by Approach**

| | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|---|
| Non-optimized Software | 76% | 72% | 65% | 55% | 46% | 42% | 35% |
| Network Appliances | 21% | 22% | 25% | 29% | 35% | 37% | 43% |
| Blade / Embedded SW | 1% | 2% | 4% | 6% | 8% | 8% | 9% |
| PCI | 2% | 3% | 4% | 5% | 6% | 6% | 6% |
| Specialized Chipsets | 0% | 1% | 2% | 4% | 5% | 6% | 7% |

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Conclusions:

- Non-optimized software solutions will remain as the most prominent approach for WS and SOA security until around 2010, when Network Appliances will become the most predominant approach on the corporate network. Other approaches will maintain a significant subsegment of the market.

- It is important to note that chip-based solutions will become embedded by network appliance vendors, and as such, the combination of chip and network appliance approaches should be factored together.

### 4.3. XML and Web Services Transformation and Integration

As mentioned earlier, the market for network appliances, PCI and blade form factor solutions, and embeddable chip or software approaches for XML and Web Services transformation and integration is really a subset of the larger Service-Oriented Information Integration market that ZapThink covered in its *Service Orientation Market Trends* Report (ZTR-WS110). For a discussion of the sizing of that more general market, please obtain a copy of that report.

This section will outline what percentage of solutions sold in that market will be of the appliance, blade, PCI, and chipset form factors, and how that percentage will grow over time. The below figure and table outline these general conclusions.

**Figure IV-III: Percentage of Service-Oriented Integration Expenditure by Approach**

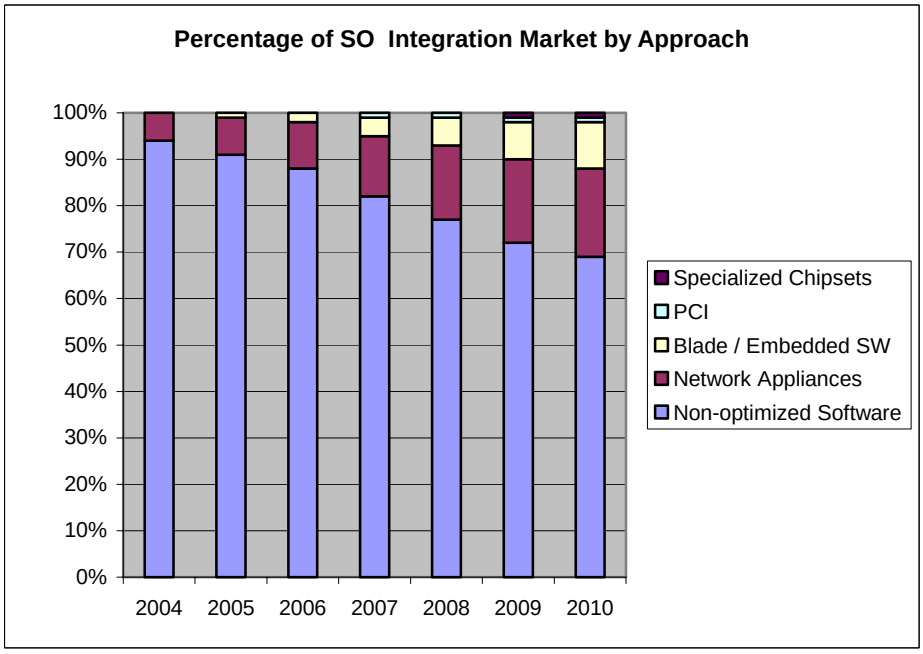





**Table IV-2: % of Service-Oriented Integration Expenditure by Approach**

| | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|---|
| Non-optimized Software | 94% | 91% | 88% | 82% | 77% | 72% | 69% |
| Network Appliances | 6% | 8% | 10% | 13% | 16% | 18% | 19% |
| Blade / Embedded SW | 0% | 1% | 2% | 4% | 6% | 8% | 10% |
| PCI | 0% | 0% | 0% | 1% | 1% | 1% | 1% |
| Specialized Chipsets | 0% | 0% | 0% | 0% | 0% | 1% | 1% |

*Embeddable software approaches that leverage blade technology will start to gain increasing acceptance starting in 2006.*

Conclusions:

- Software will remain the most dominant form of approach for SO integration through the rest of the decade.
- For integration-related problems, only network appliances that facilitate routine message or protocol transformation will gain increasing acceptance over the next few years.
- Also, embeddable software approaches that leverage blade technology will start to gain increasing acceptance starting in 2006.
- ZapThink doesn't expect any significant revenue to be associated with specialized chipsets or PCI form factors for integration-related tasks.

### 4.4. XML and Web Services Routing and Messaging

As mentioned above, the market for network appliances, PCI and blade form factor solutions, and embeddable chip or software approaches for XML and Web Services transformation and integration is really a subset of the larger Service-Oriented Information Integration market that ZapThink covered in its *Service Orientation Market Trends* Report (ZTR-WS110). For a discussion of the sizing of that more general market, please obtain a copy of that report.

This section will outline what percentage of solutions sold in that market will be of the appliance, blade, PCI, and chipset form factors, and how that percentage will grow over time. The below figure and table outline these general conclusions.

**Figure IV-IV: Percentage of XML and WS Messaging Expenditure by Approach**

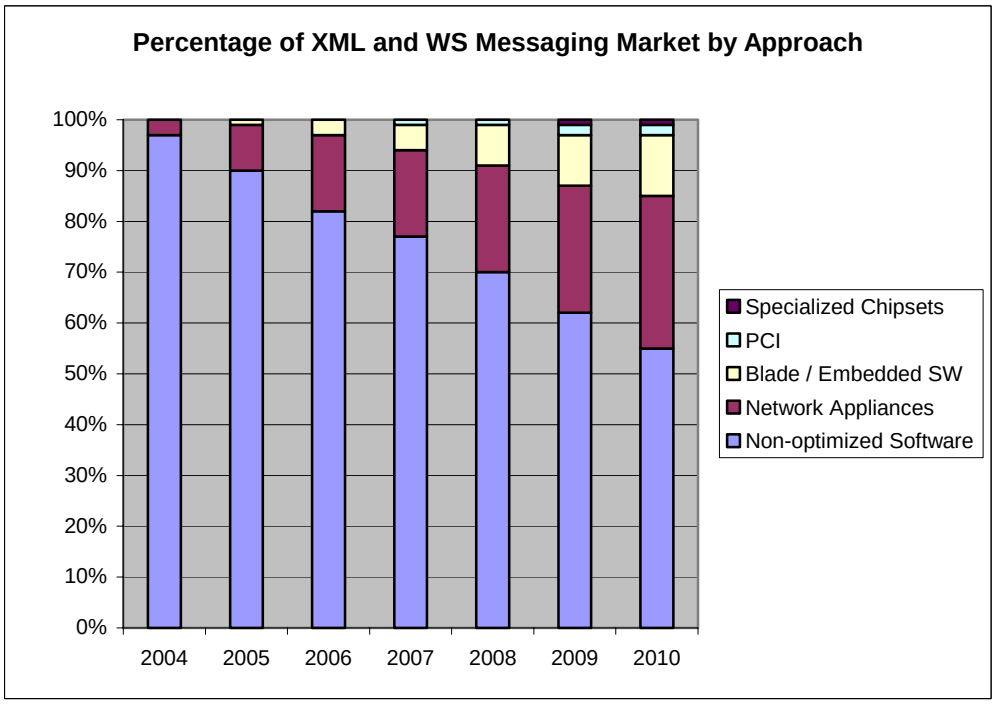


**Table IV-3: % of XML/WS Messaging Expenditure by Approach**

| | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|---|
| Non-optimized Software | 97% | 90% | 82% | 77% | 70% | 62% | 55% |
| Network Appliances | 3% | 9% | 15% | 17% | 21% | 25% | 30% |
| Blade / Embedded SW | 0% | 1% | 3% | 5% | 8% | 10% | 12% |
| PCI | 0% | 0% | 0% | 1% | 1% | 2% | 2% |
| Specialized Chipsets | 0% | 0% | 0% | 0% | 0% | 1% | 1% |



**Decision Point**

*Network appliances that provide ESB-like capabilities such as guaranteed message routing and reliability capabilities will gain increasing acceptance over the next few years.*

Conclusions:

- Software will remain the most dominant form of approach for XML and Web Services messaging through the rest of the decade.
- Network appliances that provide ESB-like capabilities such as guaranteed message routing and reliability capabilities will gain increasing acceptance over the next few years.
- Embeddable software approaches for ESB-like capabilities that leverage blade technology will start to gain increasing acceptance starting in 2006.
- ZapThink doesn't expect any significant revenue to be associated with specialized chipsets or PCI form factors for messaging-related tasks.

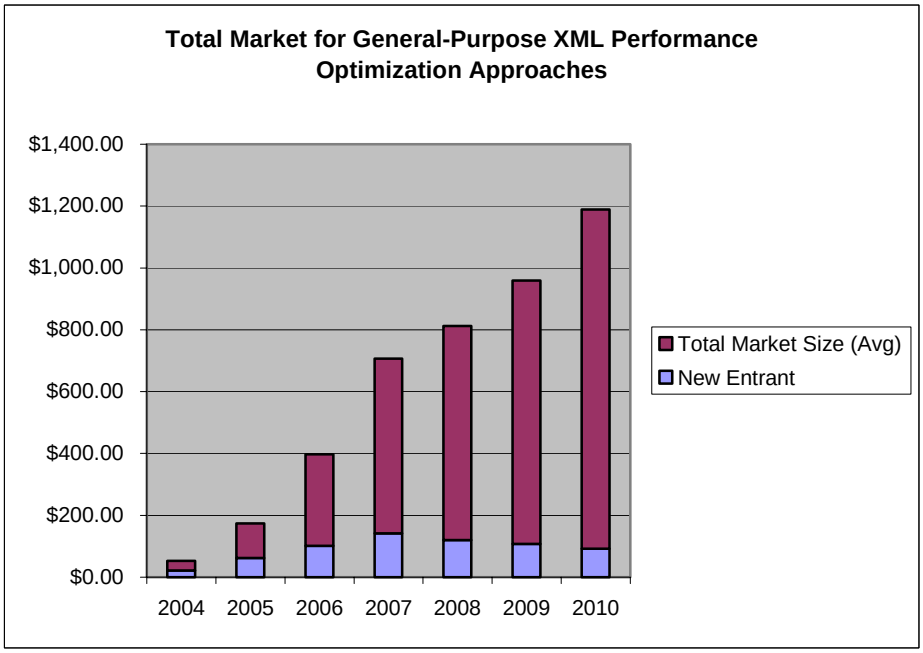
### 4.5. General-Purpose XML Performance Optimization

The market for general-purpose XML performance optimization is a market that has differentiated needs from the other markets mentioned above, and as such is subject to its own budgeting and purchasing process. As such, it is not a subset of any other market that ZapThink has covered to date. Therefore, ZapThink makes the following prediction about the growth and development of purchasing behavior for this market:

**Table IV-4: Total Market for General-Purpose XML Performance Optimization Approaches ($ Millions)**

| | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|---|
| New Entrant | $22.00 | $62.00 | $101.00 | $142.00 | $120.00 | $108.00 | $92.00 |
| % of Incumbent that is XML specific | 0.2% | 1.1% | 4.0% | 8% | 10% | 12% | 15% |
| Total Market Size (Low) | $28.23 | $99.69 | $251.77 | $473.69 | $576.07 | $710.01 | $919.76 |
| Total Market Size (Avg) | $30.37 | $111.74 | $296.60 | $565.10 | $692.12 | $850.81 | $1,096.79 |
| Total Market Size (High) | $32.50 | $123.79 | $341.43 | $656.52 | $808.17 | $991.61 | $1,273.83 |
| Incumbent Market Size (Avg) | $4,182.50 | $4,522.00 | $4,889.94 | $5,288.77 | $5,721.18 | $6,190.07 | $6,698.62 |
| % of Market that is New Entrant | 72% | 55% | 34% | 25% | 17% | 13% | 8% |

**Figure IV-V: Total Market for General-Purpose XML Performance Optimization Approaches ($ Millions)**




Source: Copyright © 2004 ZapThink, LLC

Decision Point

*Opportunities for new entrants will peak in 2006 at $142 million.*

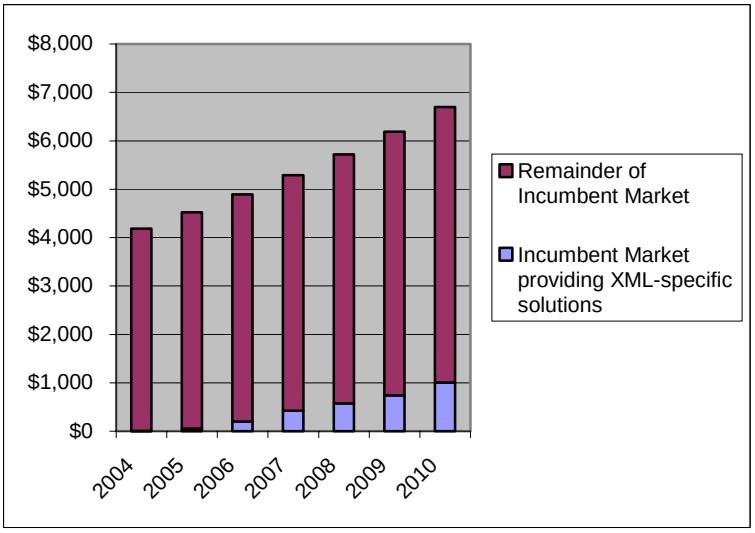
*The total XML performance optimization market will reach $1.2 billion by 2010.*

Key conclusions:

- The window of opportunity for new entrants in the XML performance enhancement market exists through 2007-2008, when the incumbent market will come to increasingly exert their presence on the space.
- Opportunities for new entrants will peak in 2006 at $142 million.
- The size of the new entrant market will go from approximately one order of magnitude to more than two orders of magnitude less than the total XML performance optimization market size.
- The total XML performance optimization market will reach $1.2 billion by 2010.

**Figure IV-VI: Total Market vs. Incumbent Market**






Key points to be drawn:

- The incumbent market will only see a small percentage of their revenues from XML performance optimization through the foreseeable future.
- The total network appliance market will continue to show growth during 2004-2010.

## V. Conclusions

Decision Point

*There remains significant opportunity for vendors to continue to innovate and push performance challenges of XML to the point where they are no longer seen as an impediment.*

The markets for high performance and appliance approaches for XML are starting to grow at a significant pace. Companies are tiring of the performance challenges they face when they seek to realize the significant benefits that XML provides to their firms. As companies seek to increasingly make use of secure, reliable, process-driven, and loosely coupled Service-oriented Architectures built on Web Services, they will quickly come to realize what sort of performance penalty imposed by the inefficient XML format. Only optimized approaches to handling XML–whether they be hardware, software, or a combination of both–will alleviate the problems companies face in utilizing this potent new technology.

As emerging startup and technology vendors continue to improve and sell their products, the market for optimized XML processing will continue to differentiate into different application domains, and each of these areas will continue to be faced with consolidation and pressure from the large incumbent vendors, should they enter the market. However, there remains significant opportunity for vendors to continue to innovate and push performance challenges of XML to the point where they are no longer seen as an impediment to a technology with significant promise to solve the lingering problems of IT.

### 5.1. Key notes

- *As network traffic based on XML increases, IT data center administrators and developers are quickly realizing that the operational inefficiencies of XML are bogging down their general-purpose hardware and software.*
- *What was once a monolithic market consisting of a handful of vendors focusing on all of the aspects of XML-based processing has now matured to a larger set of vendors specializing in different areas of XML processing and optimization.*
- *Basic XML tasks such as canonicalization represented over 93% of the total processing time for processing of simple documents like an XML-Signature document (a typical XML document.*
- *ZapThink expects Web Services traffic to dominate XML traffic on the network by end of 2005.*
- *Shifts to asynchronous, coarse-grained modes of document exchange will significantly improve performance over fine-grained, synchronous modes of exchange.*
- *While compression might solve a network bandwidth issue, it actually worsens processing at individual nodes.*
- *The greatest challenge of any binary encoding is that all points on the communication path need to be able to not only tolerate the format, but be able to process it*
- *The term "XML Proxy" failed to garner any marketing traction, and the markets formerly identified as a single purchasing behavior are in fact splitting into specific problem domains.*
- *Another hardware form factor rapidly gaining acceptance is the blade form factor, increasingly used in emerging virtualized environments for high-performance computing.*
- *An emerging set of vendors are producing specific chipsets for handling XML processing requirements.*
- *Optimized XML appliance and hardened software solutions exist that not only provide security capabilities but do so at the performance level that enterprises require.*
- *It has become clear that performance-related transformation issues play second fiddle to security concerns.*
- *XML routing depends upon deeper inspection of the content itself to determine the most suitable recipient of those messages, as well as the headers of the messages.*
- *Software acceleration products work by replacing standard, off-the-shelf parsing and processing technology with their own technology and approaches.*
- *The formerly separate worlds of network administration and application development are increasingly becoming intertwined.*
- *By giving developers more control over network performance, and by giving network administrators more control over the applications that*

*run on their networks, companies can expect to see significant impact on the efficiency and performance of their business.*

- *The WS security and management markets are highly symbiotic, and increasingly XML appliance vendors with security offerings might choose to partner with, acquire, or merge with SOA management vendors*
- *Once incumbent network appliance vendors enter the market, ZapThink predicts significant increase in consolidation and more rapid uptake of products by buyers.*
- *Non-optimized software solutions will remain as the most prominent approach for WS and SOA security until around 2010.*
- *embeddable software approaches that leverage blade technology will start to gain increasing acceptance starting in 2006.*
- *The total XML performance optimization market will reach $1.2 billion by 2010.*

### 5.2. Decision points

- *ZapThink believes that over the course of 2003-2004, those primary markets for XML and Web Services have reached the point of maturation, and as such, the markets for XML appliances and high-performance solutions should experience significant growth in 2005.*
- *ZapThink expects XML traffic on the network to grow from around 15% in 2004 to just under 48% by 2008.*
- *Before sending out XML documents on the wire, developers should seek to maximize performance by minimizing unnecessary redundancy.*
- *The increased prevalence of Very Large Messages on the network is an issue that threatens the viability of SOA implementations.*
- *The binary XML approach takes advantage of XML language grammar to simultaneously compress, validate, and optimize the processing of XML documents.*
- *Hardware solutions remain a good option for IT data center administrators looking to manage corporate-wide XML and Web Services traffic*
- *Hardware solutions aren't the only approaches to improving XML performance on the network.*
- *As systems become more distributed and abstracted through Web Services-based SOAs and other means, it becomes increasingly difficult for a company to gain adequate visibility into their vulnerabilities*
- *Companies looking to evaluate hardware integration solutions should center on their performance for their specific needs.*
- *Appliance-based routing products enable companies to implement loosely coupled, asynchronous Web Services messaging through the deployment of hardware solutions*
- *Only the incumbent network appliance vendors might be able to execute on the vision of the "all-in-one" XML appliance.*
- *Companies who focus on the network administrator community will face the threat of significant competition from the network incumbents.*

- *ZapThink sees that as the market matures and increasingly consolidates, demand for a general XML processing performance benchmark will increase.*
- *Network appliances that provide ESB-like capabilities such as guaranteed message routing and reliability capabilities will gain increasing acceptance over the next few years.*
- *Opportunities for new entrants will peak in 2006 at $142 million.*
- *There remains significant opportunity for vendors to continue to innovate and push performance challenges of XML to the point where they are no longer seen as an impediment.*

### 5.3. Figures



### 5.4. Tables



## Related Research

- Conformative Systems *ZapNote (ZTZN-1171)*
- DataPower *ZapNote (ZTZN-1159)*
- F5 Networks *ZapNote (ZTZN-1158)*
- Forum Systems *ZapNote (ZTZN-1170)*
- Reactivity *ZapNote (ZTZN-1161)*
- *Sarvega ZapNote (ZTZN-1165)*
- Teros *ZapNote (ZTZN-1152)*
- *Service-Oriented Integration* Report (ZTR-WS103)
- *XML and Web Services Security* Report (ZTR-WS104)
- *XML Proxies* Report (ZTR-DI101)
- *Testing Web Services* Report (ZTR-WS105)
- *Service-Oriented Management* Report (ZTR-WS106)
- *Service-Oriented Architecture: Tools and Best Practices* Report (ZTR-WS107)
- *Service-Oriented Process* Report (ZTR-WS108)
- *SOA Consulting* (ZTR-WS109)
- *XML in the Content Lifecycle* (ZTR-CL100)
- *XML Data Storage Technologies & Trends* (ZTR-ST101)
- *XML Data Store Multi-Client Study* (ZTR-ST102)

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## About ZapThink, LLC

ZapThink is an IT market intelligence firm that provides trusted advice and critical insight into XML, Web Services, and Service Orientation. We provide our target audience of IT vendors, service providers and end-users a clear roadmap for standards-based, loosely coupled distributed computing – a vision of IT meeting the needs of the agile business.

ZapThink's role is to help companies understand these IT products and services in the context of SOAs and the vision of Service Orientation. ZapThink provides market intelligence to IT vendors who offer XML and Web Services-based products to help them understand their competitive landscape and how to communicate their value proposition to their customers within the context of Service Orientation, and lay out their product roadmaps for the coming wave of Service Orientation. ZapThink also provides implementation intelligence to IT users who are seeking guidance and clarity into how to assemble the available products and services into a coherent roadmap to Service Orientation. Finally, ZapThink provides demand intelligence to IT vendors and service providers who must understand the needs of IT users as they follow the roadmap to Service Orientation.

ZapThink's senior analysts are widely regarded as the "go to analysts" for XML, Web Services, and SOAs by vendors, end-users, and the press. They are in great demand as speakers, and have presented at conferences and industry events around the world. They are among the most quoted industry analysts in the IT industry.

ZapThink was founded in October 2000 and is headquartered in Waltham, Massachusetts. Its customers include Global 1000 firms, public sector organizations around the world, and many emerging businesses. ZapThink Analysts have years of experience in IT as well as research and analysis. Its analysts have previously been with such firms as IDC and ChannelWave, and have sat on the working group committees for standards bodies such as RosettaNet, UDDI, CPExchange, ebXML, EIDX, and CompTIA.

Call, email, or visit the ZapThink Web site to learn more about how ZapThink can help you to better understand how XML and Web Services impact your business or organization.

**ZAPTHINK CONTACT:**
ZapThink, LLC
11 Willow Street, Suite 200
Waltham, MA 02453
Phone: +1 (781) 207 0203
Fax: +1 (786) 524 3186
info@zapthink.com

 

ZapThink, LLC • 11 Willow Street, Suite 200 • Waltham, MA 02453 • info@zapthink.com • www.zapthink.com