eXtensible Markup Language

Introduction

This white paper is part of a series of E-Commerce resources from Harbinger on emerging E-Commerce trends and technologies. In addition to providing an introduction to eXtensible Markup Language (XML) as an emerging technology, this paper also outlines major XML-based standards, areas of deployment, solution scenarios and Harbinger's plans for adopting XML to enable Internet-centric E-Commerce solutions.

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I. Executive Summary

eXtensible Markup Language (XML) is a "next-generation" language that allows users to define information about data structures and content inside a document, in a standard way. XML offers some of the strengths of Electronic Data Interchange (EDI) and HyperText Markup Language (HTML), as it allows data to be processed by machines as well as being read by humans. It also allows for the exchange and validation of data structures interactively.

Some of the other characteristics that make XML a promising technology for enabling E-Commerce solutions include:

- ***Internet-centric*** – The Internet-centric nature of XML allows it to be read by Web browsers, referenced inside documents and used for Web-based search and retrieval.
- ***Business Applications Flexibility*** – Communities and/or vendors can define their own XML-based vocabularies that meet their specific business needs. This makes it possible for XML to be used across a diverse set of business applications, industries and communities of interest networks (COINs).
- ***Proliferation of XML-based Standards*** – Several industry organizations and vendors are in the process of creating standards that accommodate their business requirements and that are backward compatible to existing standards such as EDI.
- ***Industry Awareness and Availability of Resources*** – Attention from several industries and institutions is leading to the creation of a large pool of resources that are familiar with XML.
- ***Improved Integration Paradigm*** – Distribution of XML-based data definitions, schemas and/or implementation conventions over the Internet promises to lower the barriers to application-to-application E-Commerce.

Driven by these characteristics, there is now strong momentum for XML to be a "next-generation" language for E-Commerce. Leading vendors such as Harbinger have started deploying XML-based solutions. It should be noted, however, that XML is still a relatively new technology and is in the "early adopter" stage of its evolution. It is also important to note that XML, like any other emerging technology, is not a panacea for all of the issues associated with the exchange of data within, and between, organizations. However, XML does hold the promise to provide software vendors, service providers and businesses a modern foundation that addresses some of the limitations of older technologies.

The exploitation of XML and other new Internet-centric technologies to deliver high value E-Commerce solutions is one of the key elements of Harbinger's strategy. We believe that XML is going to continue its dramatic growth and acceptance as a mainstream standard for E-Commerce, so we are building XML support into our existing products as well as future ones.

XML-based data conversion and integration will enhance Harbinger's ability to deploy Internet Protocol (IP)-centric E-Commerce solutions, and will contribute to the continued growth of business-to-business E-Commerce. Adopting promising new technologies such as XML is a key element of our mission to provide IP-centric E-Commerce solutions.

II. Introduction to XML

XML provides businesses and service providers unprecedented flexibility when exchanging data between machines as well as humans. By combining the strengths of several existing technologies, XML allows for data to be exchanged with, or without, human intervention. For example, using XML a business can:

- Define a document such as a purchase order (PO) with a valid data structure.
- Display the XML PO to employees through a browser or any other "XML Parser."
- Integrate the XML document with internal applications such as an electronic catalog.
- Communicate the XML PO directly to trading partner(s) or to an intermediary who can interpret the document without any prior knowledge of the data structure.

Business-to-business global data exchange standards were first established more than a decade ago by the American National Standards Institute (ANSI X12) and by the United Nations (EDIFACT). These standards have evolved as a result of the changing requirements of business-to-business E-Commerce. However, the emergence of the Internet has fueled the need for technologies that allow for real-time application-to-application, Web-to-application and Web-to-Web document flow and integration. XML fulfills these requirements for real-time, IP-centric solutions, as it provides businesses a flexible, extensible and dynamic environment for integrated, interoperable data exchange.

Internet-centric

Keeping in mind the evolution of the Internet and its effect on data exchange, the World Wide Web Consortium (W3C) developed XML. The Internet-centric nature of XML provides users several capabilities:

- XML is easily viewable by humans. XML viewing can be achieved by converting XML for applications that can display HTML, or by using modern applications that can interpret XML directly.

  This XML-based capability can allow E-Commerce to be extended beyond large companies to small- and medium-sized businesses. By deploying XML-based Web E-Commerce solutions, trading communities can increase the penetration of E-Commerce.

- HTTP communications and security infrastructure can be used to exchange XML. All Internet Web browsers, and most communications systems, support HTTP, so communicating XML to users with Internet access involves minimal additional effort.
- Search and retrieval of XML documents is faster and more efficient than searching through HTML, as XML is easier to arrange into an indexed repository. Most major database vendors such as Oracle, Informix and IBM are planning to use XML for data storage.

eXtensible Markup Language (XML) – a language developed by the W3C for visual presentation of data that can also facilitate the exchange of data between applications and/or humans.

Document Type Definition (DTD) – XML-based vocabulary(ies) that can be industry-, application- or business-specific.

XML Schemas – provide structure definition and validation capabilities in addition to those provided by DTDs.

eXtensible Link Language (XLL) – extends the power and sophistication of linking available in HTML.

eXtensible Query Language (XQL) – facilitates the searching of XML documents.

XML/EDI – a concept that combines XML and EDI for organizations which are deploying EDI programs that also leverage XML.

Shared by Different Business Applications and Communities

XML provides available communities and/or vendors the flexibility of developing their own XML-based vocabularies that meet the implementation needs of an application or a community. These XML-based vocabularies called Document Type Definitions (DTDs) can be stored and distributed via the Internet. XML Schemas also facilitate the development of industry or business specific vocabularies.

XML Schemas and/or DTDs can meet the needs of several different categories of applications because of the flexibility available in developing vocabularies to address the needs of varying implementation conventions. For example, an EDI/XML agent, workflow agent, Web browser, search engine and/or ERP application can all process an XML-based purchase order. In addition to being shared by different business applications, XML can also be adopted by a cross-section of trading communities engaging in E-Commerce. Using XML, communities can implement conventions specific to their business needs, but can still exchange documents that are interoperable with minimal additional effort.

It is important to note that even though several classes of applications can share XML, most XML-based transactions need to be converted to conform to business-specific requirements, as XML-based vocabularies can vary. It is extremely important for users of XML to consider deploying "XML translation" systems that can convert XML to commonly used E-Commerce formats such as EDI, flat-file, etc. Businesses require different data types; meeting the needs of a wide range of customers and suppliers is essential when deploying E-Commerce.

Industry Awareness and Availability of Resources

XML is receiving attention from several industries including publishing, telecommunication, automotive, electronics and banking for several areas of deployment including E-Commerce, electronic Catalog Data Management, enterprise application integration and documentation. As a result of this widespread awareness about the potential of XML, many XML-based software tools, such as parsers and document editors, are available today. There are also several resources for information on XML on the Internet, and training on XML is widely available. This is all resulting in an increase in the pool of resources available for deploying XML-based solutions, thereby enhancing the likelihood of the widespread adoption of XML.

Improved Integration Paradigm

The data that defines an XML document (DTDs or Schemas) can be sent with an XML document or can be referenced in an XML document. This capability allows for the creation of XML-based repositories on the Internet that can be made available to a worldwide audience. This improved paradigm of distributing "data definitions" and/or "implementation conventions" over the Internet promises to lower the barrier to businesses engaging in integrated application-to-application E-Commerce. In addition to this opportunity, by using XML, businesses can also reduce the number of "maps" they need to create and maintain since the document definition is available from the document itself.

XML, like any other emerging technology, is not a panacea for all of the issues associated with the exchange of data within and between organizations, however, XML provides software vendors, service providers and businesses a modern foundation that addresses some of the limitations of legacy technologies.

III. Increased Momentum and Activity

There is strong momentum for XML to be an important "next-generation" language for E-Commerce. Leading vendors such as Harbinger are building XML support into software and network offerings, and several companies have started deploying XML-based solutions. While it may take some time for XML-based standards and technologies to mature, XML appears to be destined to be an important part of the technology enabling E-Commerce.

Industry and Application-specific Standards

Several industry organizations and businesses are in the process of conducting pilot programs and creating XML-based vocabularies that accommodate their business requirements. Some of the major initiatives currently underway include:

RosettaNet – This consortium of companies is developing a dictionary of XML-based definitions and a framework to define products and other components of business transactions exchanged by the Computer Electronics industry. In addition to building definitions, RosettaNet is also defining document exchange processes to increase the penetration of E-Commerce in the IT industry.

RosettaNet has been successful in developing momentum in the last few months with the emergence of XML. Members of the RosettaNet managing board now include major industry players such as Cisco Systems, Compaq, Hewlett-Packard Company, IBM and NEC Technologies.

Automotive – The automotive industry has traditionally been an "early-adopter" of E-Commerce technologies. Several major automotive industry players, such as the Automotive Industry Action Group (AIAG) General Motors (GM) and DaimlerChrysler, have stated their intent to adopt XML for E-Commerce.

GM is currently working on several XML pilot projects in a cross-section of areas including E-Commerce, finance and the OnStar satellite system. GM is using XML technology to assess the viability of using XML to exchange data between GM's legacy systems and XML-enabled clients such as Web browsers. DaimlerChrysler is also actively considering the use of XML for E-Commerce, and has created DTDs for the automotive industry to promote XML-based data exchange.

Voice XML – AT&T, Motorola, Lucent and several other telecommunications giants are sponsoring Voice XML (vXML) to drive the adoption of voice-enabled applications. vXML is expected to make it easier to develop Web applications that incorporate voice access.[1]

Open Financial Exchange (OFX) – In early 1997 CheckFree, Intuit and Microsoft founded Open Finanical Exchange to develop data standards that facilitate the electronic exchange of data between financial institutions, businesses and consumers over networks. Several banks, financial institutions and other organizations have since implemented XML-based OFX.

Channel Definition Format (CDF) – allows publishers to setup a Web channel.

Open Trading Protocol (OTP) – facilitates placing orders and making payments using the Internet.

Resource Definition Format (RDF) – provides a standard or interoperability between applications that exchange data in a Web-based environment.

Chemical Markup Language (CML) – is a standard for the exchange of chemical information over the Internet and other networks.

eCo Framework – is an initiative by CommerceNet to ensure compatibilty between E-Commerce environments and XML-based standards.

Weather Observation Markup Format (OMF) – facilitates the on-line exchange and presentation of weather related information.

Java Speech Markup Language (JSML) – is being developed to improve the quality of speech.

XML/EDI – The XML/EDI group is developing recommendations that combine XML and EDI for organizations that have existing EDI programs and that also want to leverage XML. The XML/EDI effort uses XML while leveraging the existing EDI knowledge base and infrastructure. XML/EDI aims to be backward compatible with existing EDI standards to provide a migration path for EDI users and is expected to experience rapid growth in the next few years. The Gartner Group estimates that by year-end 2003 XML/EDI will account for 30 percent of EDI transactions, with a further 30 percent supported via XML/EDI-to-EDI gateways. The remaining 40 percent will be supported via traditional EDI.[2]

Commerce XML – Several companies involved in Operating Resource Management (ORM) software and services are sponsoring Commerce XML (cXML) to facilitate the exchange of content and transactions over the Internet. cXML is a set of "lightweight" XML DTDs that have been formed in line with the requirements and vocabulary of the ORM business process.[3]

Initiatives by Software and Services Providers

Several major providers such as IBM, Microsoft and Harbinger are developing XML-based technologies and integrating support for XML in their products and services.

IBM – is promoting XML standards, products and services under the following initiatives:

- ***Tools*** – IBM is developing various tools to fuel the adoption of XML. Some IBM software tools that already incorporate XML include XML for Java parser and VisualAge TeamConnection.
- ***System and Network Management*** – The Tivoli Network Management Suite supports XML as an acceptable data format.
- ***Data Management*** – Support for XML in the IBM database (DB2)is underway. XML support in DB2 was first made available in the form of an extender for handling XML-tagged data to provide better text-searching capabilities.

Microsoft – is integrating XML into its major product initiatives. Microsoft is planning and executing several XML related initiatives including[4]:

- ***BizTalk E-Commerce framework***[5] – to incorporate XML in Microsoft software and in the software of solutions providers such as Harbinger that are a part of the BizTalk initiative.
- ***Extensible Style Language (XSL) support*** – allows developers to apply style sheets to XML data and display the data in a way that can be easily customized.
- ***Server-side XML*** – allows XML to be used as a standard means of passing data between multiple distributed application servers.
- ***XML document object model (DOM)*** – a standard object application-programming interface that gives developers programmatic control of XML, document management and conversion. The Microsoft XML implementation supports the World Wide Web Consortium (W3C) XML Document Object Model(DOM) recommendation and is accessible from the Visual Basic development system, C++ and other languages[6].

Harbinger – We have embraced XML as a fundamental component to deploy E-Commerce solutions. We are in the process of "XML enabling" our existing offerings to combine solutions that incorporate EDI and emerging technologies such as XML. For example, we are enabling our application-to-application portal, harbinger.net[SM], to process XML documents and to provide XML-based conversion and integration capabilities in Third Quarter 1999. In addition to providing these "on-network" capabilities, we are also enabling our translation products to interface with XML-based applications. We plan to offer customers EDI-to-XML, XML-to-database and XML-to-EDI conversion and integration capabilities by First Quarter 2000.

In addition to enabling our current products, we have also launched a division called Harbinger Labs that is focused on creating a suite of "next-generation"

software products that bridge new and existing E-Commerce technologies. Harbinger Labs' software products will provide businesses with real-time data conversion and integration capabilities that are optimized for deploying IP-centric E-Commerce solutions.

Harbinger is actively pursuing the use of XML for E-Commerce solutions since lowering the barriers to entry to E-Commerce, and adopting promising new technologies are key elements of our mission to provide IP-Centric E-Commerce solutions.

IV. Harbinger's Plans for XML

We have embraced XML as a fundamental component to enable E-Commerce solutions and are in the process of "XML enabling" our existing offerings to deploy solutions that incorporate EDI, as well as XML. We plan to offer customers XML-based conversion and integration capabilities through harbinger.net and as an integral part of our software products.

harbinger.net℠

harbinger.net is the world's first IP portal for application-to-application E-Commerce that supports real-time transactions, open network and application interfaces, self-serve customer care facilities and E-Commerce content for industry professionals.

We are in the process of enhancing harbinger.net to process XML documents and to provide "on-network" XML-based conversion and integration capabilities. The first "on-network" offerings will become available by the end of Third Quarter 1999. In addition to providing XML-based conversion services, harbinger.net will be enhanced to be the leading repository of XML-based standards and document definitions, as XML-based standards are finalized and published for implementation. These capabilities available via harbinger.net will allow businesses to leverage XML-based technologies for E-Commerce and will facilitate the exchange of business transactions, regardless of document format.

Harbinger TrustedLink™

TrustedLink is Harbinger's premier translation, integration and communications software suite. TrustedLink is easy to use and offers exceptional processing performance, true platform independence across all major platforms, advanced application integration capabilities, and comprehensive communications options.

TrustedLink currently converts application data formats to and from EDI standard messaging formats and also supports numerous non-standard data definitions for EDI and non-EDI translation. TrustedLink is being enhanced to provide EDI-to-XML and XML-to-EDI conversion and integration capabilities to exchange XML with trading partners.

By the end of Third Quarter 1999, an XML-based facility will be available to directly read and write disparate databases and feed the data to the TrustedLink UNIX Edition and NT Server Edition translators. Using TrustedLink software, businesses will be able to exchange any of the commonly used data formats with their trading partners.

Harbinger Knowbility™

Harbinger Knowbility content management services and software help businesses build and maintain accurate data within E-Commerce applications such as Operating Resource Management (ORM) catalogs. Since most major business applications and databases start storing data in XML format, it will be easier for businesses to send data to customers in XML format. In addition to facilitating the aggregation of data from applications, XML also enables the collection of data from Web sites.

Harbinger Knowbility products and services will simplify the deployment of ORM solutions by collecting and converting XML into the desired format for a catalog application, thereby facilitating the rapid deployment of ORM solutions.

Harbinger is already working with leading providers of operating-resources solutions providers such as Ariba to accelerate the acceptance of the cXML standard for E-Commerce. Harbinger Knowbility is also leveraging XML today for data aggregation, retrieval and management.

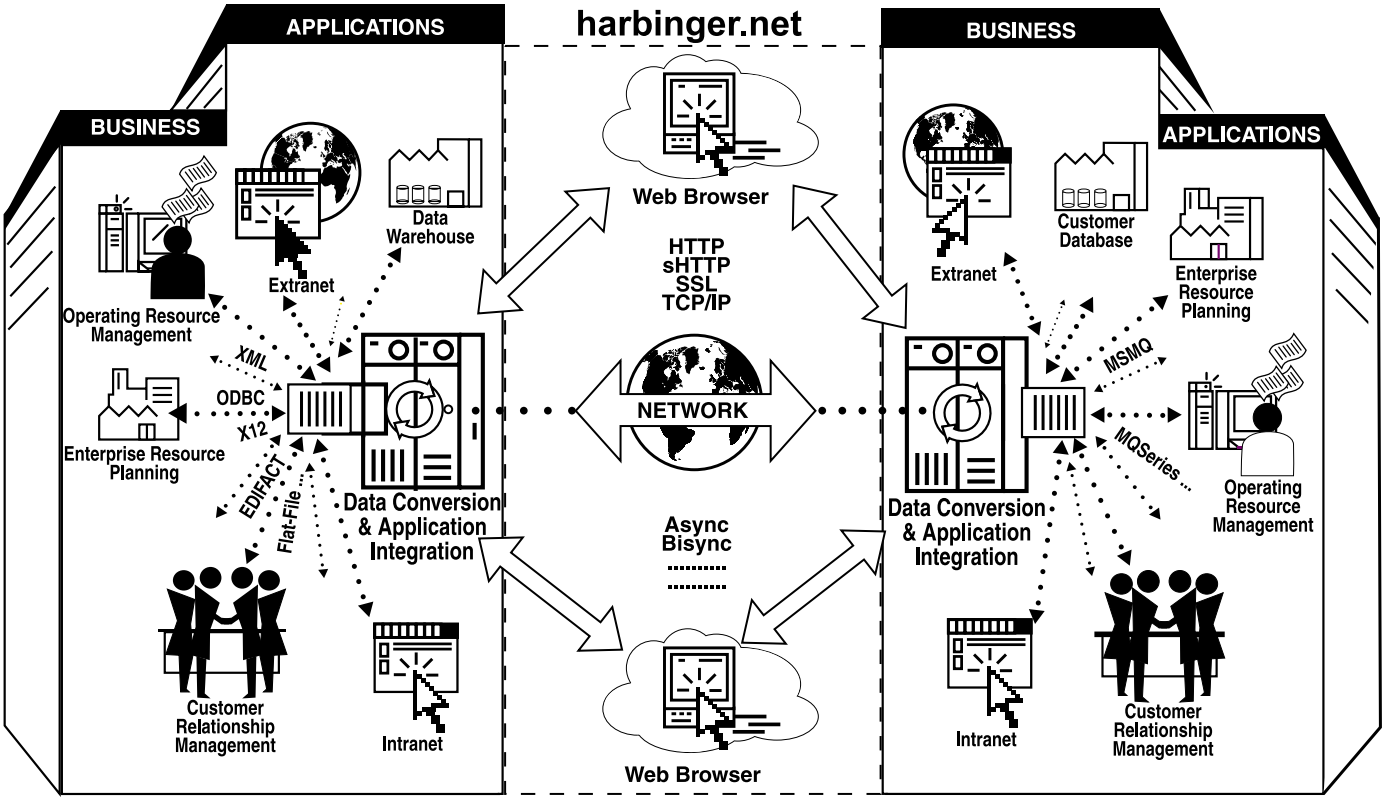
Harbinger Express

Harbinger Express is a forms-based Internet solution that helps tear down the barriers to expanding E-Commerce by using the Internet and Web-based technologies. With Harbinger Express, trading partners can exchange business documents economically using only a Web browser or an easy-to-use desktop application and an Internet connection. All EDI translation is handled on the Server. Harbinger Express will also benefit from the emergence of XML, as it will convert EDI and non-EDI data to XML for viewing by trading partners on the Internet. Using XML will allow Harbinger Express to integrate easily with business applications that are XML-enabled as XML-based integration will reduce the level of effort required to deploy a Harbinger Express solution.

Harbinger Labs

Harbinger Labs is focused on the delivery of new technologies for Internet-centric E-Commerce. To achieve this goal, Harbinger Labs is creating a suite of sophisticated, scalable and powerful software products that bridge new and existing E-Commerce technologies. Our Labs products, due to market in 2000, are being designed from the ground up as real-time, Web-oriented E-Commerce enablers.

Harbinger Labs is focused on incorporating the latest standards and technologies into our upcoming products. The exploitation of XML and the fulfillment of its promise of leveling the playing field for all segments of the E-Commerce market are key elements of our product strategy for Harbinger Labs.



E-Commerce beyond 2000

V. Areas of Deployment

XML alone cannot meet all the needs of an Enterprise deploying Internet and/or E-Commerce solutions, however, XML combined with other technologies can facilitate "next-generation" solutions for strategic advantage.

Most businesses need to integrate Enterprise Resource Planning (ERP) applications, databases or other systems to enable E-Commerce solutions. Several major application and database vendors are in the process of accepting XML directly into their systems – for such systems, businesses can use XML for enabling E-Commerce as well as Enterprise application integration, and can benefit from significant economies of scale. It is important to note that the XML defined by one business may, or may not meet the needs of another business, so most solutions will require some level of "XML Translation" to enable a diverse set of applications and/or trading partners *(see **Figure 1**– "Areas of Deployment")*.

XML, combined with other E-Commerce technologies can help businesses deploy application-to-application, application-to-Web and Web-to-Web E-Commerce solutions. XML facilitates such solutions as it allows businesses to:

- ***Define Data Structures*** – Using XML-based DTDs and/or XML Schemas, businesses can incorporate their implementation conventions in transactions. This allows businesses to add structure to documents exchanged. Businesses can use DTDs or the recently developed XML Schemas, which are also being adopted by businesses, to define a set of documents.
- ***Distribute Data Structures*** – Once a business or a community has created a set of DTDs that conform to their business requirements it can distribute the DTDs and implementation conventions via the Internet.
- ***Communicate Securely over the Internet*** – XML transactions can be sent via the Internet using HTTP or sHTTP to trading partners worldwide. If a business wants third-party services such as archiving, the transactions can also be routed via an E-Commerce portal such as harbinger.net.
- ***Validate Content*** – XML-based transactions are unique as they can carry data as well as information describing the structure of the data. This allows systems with XML-parsing capabilities to validate the content of a transaction spontaneously, and allows for XML to be used for structured data exchange over the Web.
- ***Display via a Browse***r – XML-parsing capabilities available in browsers can be used to display documents to end-users.
- ***Process for Application Integration*** – For trading partners integrating transactions, XML can be converted into an acceptable format by using an "XML Translator."

Reference Scenarios

XML-based technologies can be used to enable varying types of E-Commerce solutions. The following examples illustrate some of the capabilities of XML and the types of solutions that may be deployed using XML and other E-Commerce technologies:

- Reduce cost of goods to stem shrinking margins.
- Control purchasing costs.
- Improve customer loyalty.

Reduce Cost of Goods to Stem Shrinking Margins

In this example, a company manufactures rubber-based parts that are sold to automotive Original Equipment Manufacturers (OEMs) such as Ford, Chrysler or retailers such as The Home Depot, Lowe's and Pep Boys. The company sells directly to customers in USA and in Canada and through a network of distributors overseas. For the purposes of this example, the company will be called "American Rubber".

American Rubber needs to lower its costs of goods sold by engaging in E-Commerce with its customers and by enabling all its suppliers. American Rubber can lower its cost of goods by deploying a solution that will incorporate:

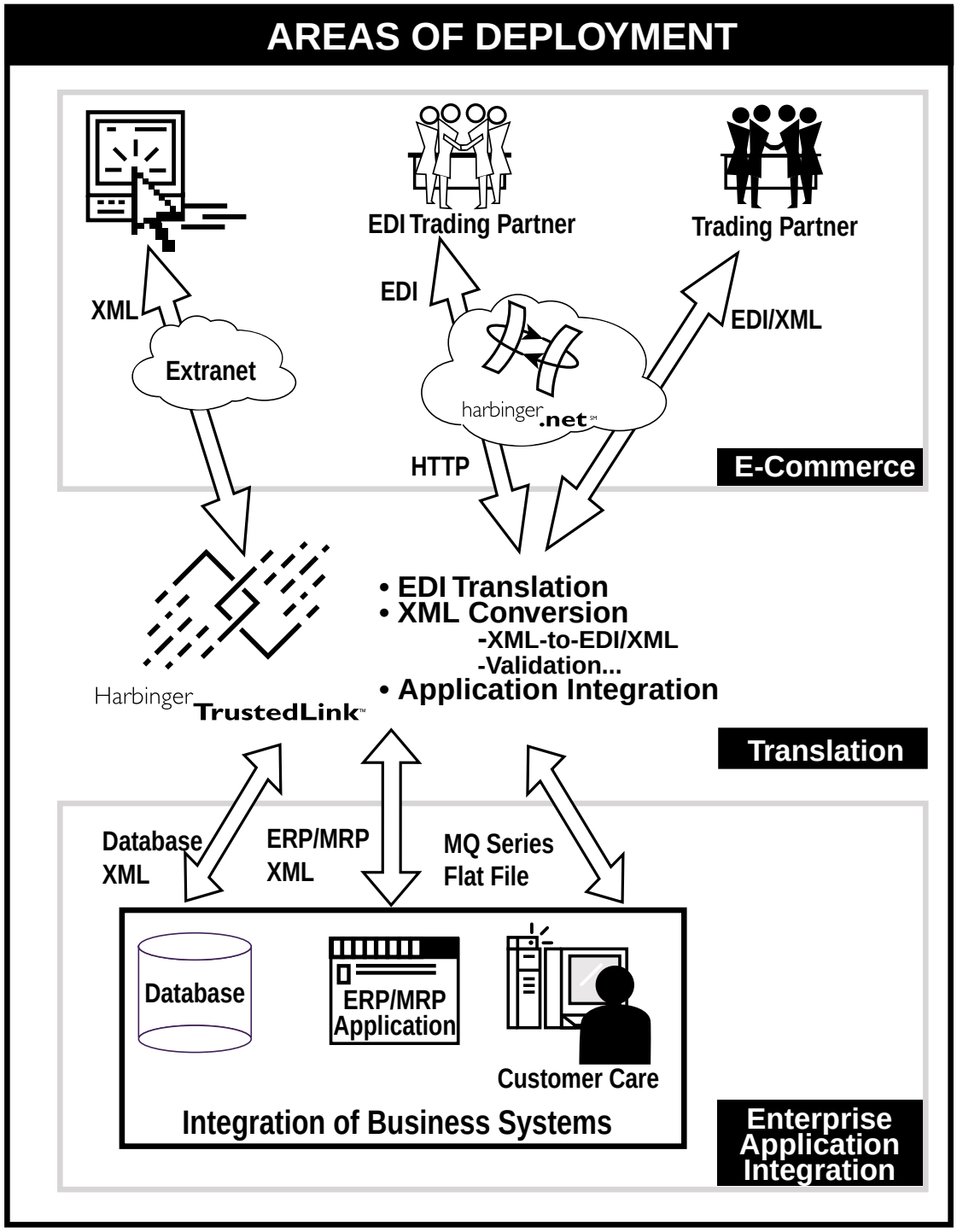


Figure 1 *– Deploying application-to-application, application-to-Web and Web-to-Web E-Commerce solutions is facilitated by technologies such as XML.*

- Real-time integration with MRP system, as transactions will need to be sent to its automotive OEM customers on a "real-time" basis.
- Exchange of EDIFACT documents with automotive customers via the automotive Network Exchange (ANX) using HTTP.
- Exchange of X12 documents with retailers via harbinger.net.
- Posting of XML documents to a Web site to allow small- to medium-sized suppliers to access purchase orders and other documents using a Web browser.
- Posting of XML documents to the American Rubber Intranet, so workers on the shipping dock can view, print and respond to documents using a Web browser.
- Real-time integration between the shipping docks and the automotive OEMs need advance shipping information from American Rubber before a shipment can be accepted.

American Rubber can deploy an E-Commerce solution that meets the needs of its diverse base of trading partner by spanning application-to-application, application-to-Web and Web-to-Web technologies. Using XML for real-time integration with the MRP system and the posting of documents to a Web site will allow American Rubber to rapidly deploy an E-Commerce solution that meets the needs of its small- to medium-sized trading partners. However, in addition to deploying XML-based technology, American Rubber also needs to exchange X12 and EDIFACT with its customers who are using EDI technologies. In such a scenario, American Rubber will need to deploy a solution that spans existing and emerging E-Commerce technologies (*see* ***Figure 2*** – *"Reduce Cost of Goods")*.

Control Purchasing Costs

In this example, an organization that provides business consulting services needs to streamline the purchase of operating resources such as pens, paper etc. The company, B Consulting, is spending more on purchasing than its competitors, which is resulting in lower profits per partner. B Consulting wants to lower purchasing costs by allowing employees to order supplies such as pens, pencils, staples, etc. via a Web-based catalog that will be available to its employees through the company Intranet.

Deploying an ORM solution will allow B Consulting purchasing to spend more time on negotiating with suppliers and will lower the total cost per transaction. The solution needs to include capabilities that allow for:

- Display of catalog to employees through a browser.
- Creation of a catalog with items, prices and business logic that is specific to the purchasing contracts between B Consulting and its suppliers.
- Regular updates from suppliers that include the latest product information such as price, models, colors and availability.
- Automation of the exchange of purchase orders, invoices, etc. between B Consulting and suppliers for the items ordered by employees.

An XML-based solution has several advantages for B Consulting, as using XML will:

- Allow suppliers to send their product data securely over the Internet, thereby facilitating the collection and update of catalog data.
- Minimize the amount of effort required to collect information before transmission since several databases and applications are planning to store data in XML.
- Facilitate the display of catalog data to employees through a browser or software suite such as Office 2000 over the company Intranet.
- Facilitate the automation of order back to suppliers through a Web site and/or other formats.

The first step in deploying the solution will involve creating the catalog specific to B Consulting prices, item descriptions, contacts, etc. This process usually involves the collection of data from suppliers in multiple formats that are "rationalized" to a standard format and loaded into the catalog system. XML is an ideal medium for the collection of data from suppliers

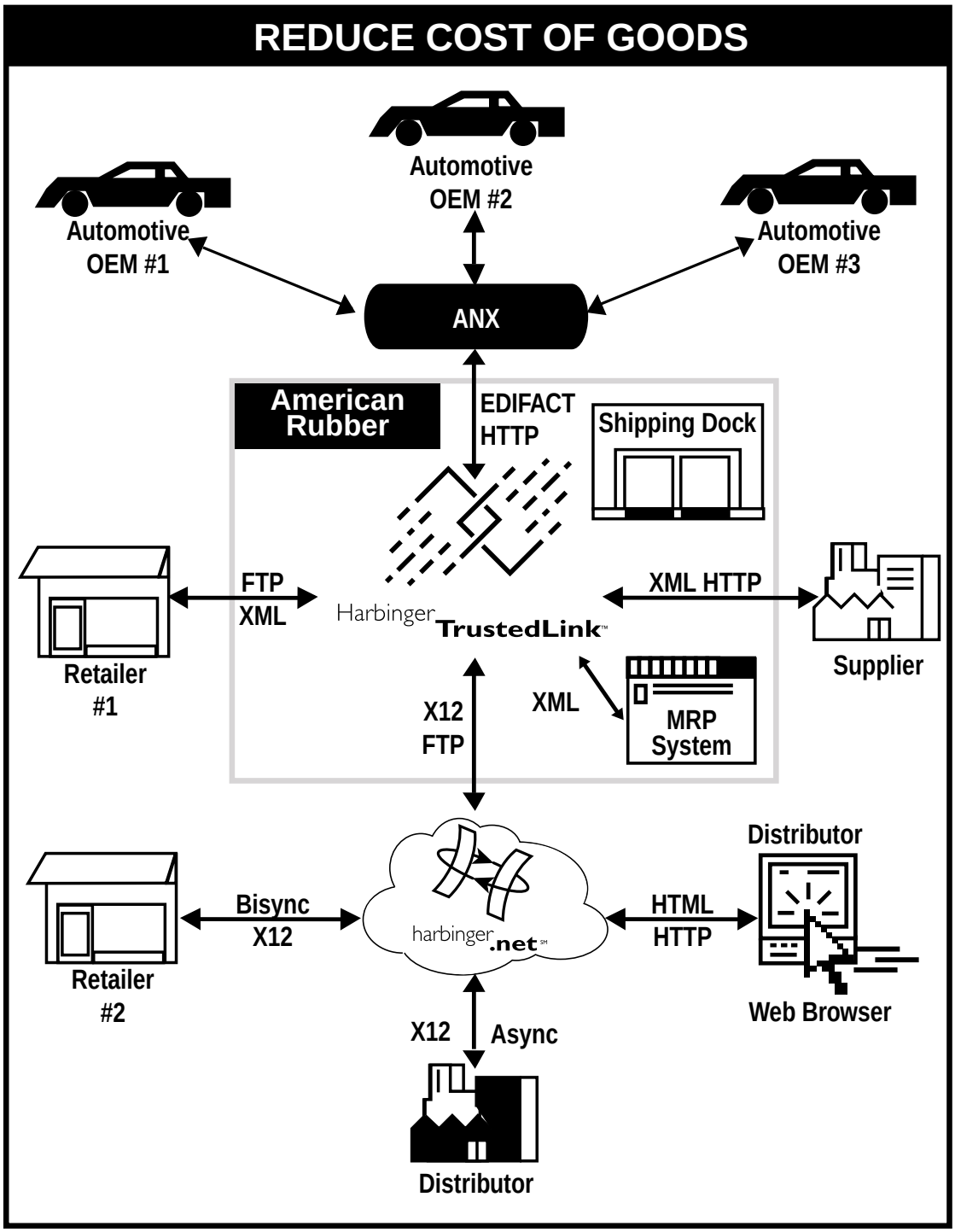


Figure 2 – Meeting the needs of a diverse base of trading partners can be accomplished by deploying existing and emerging E-Commerce technologies.

since it can be loaded into most databases, and it can be prepared for display with minimal additional effort by using XSL for display and formatting. While most suppliers may send their product data in XML, others may have their data in flat-file, or other formats, and all of these data formats usually need to be rationalized.

In addition to rationalization, this type of solution is most effective when the system is integrated with other application systems and when orders and other business documents can also be sent back to suppliers electronically. These data conversion and integration services can also be provisioned for such a solution via a system that can provide XML-to-flat-file, XML-to-EDI and other types of data conversion and integration. Such a solution can help any business make accurate purchases, eliminate maverick purchasing, cut transaction costs by eliminating time and money associated with paper-based and telephone-intensive processes, and reduce inventory costs and procurement cycle time (*See* ***Figure 3*** *– "Control Purchasing Costs"*).

Improve Customer Loyalty

In this example, the business is a Virtual Enterprise (VE), which sells non-prescription pharmaceuticals over the Internet at discounts over major drugstores. VE wants to improve customer loyalty by providing customers with tracking information on their purchases. VE expects this capability to result in improved customer loyalty and stimulate repeat purchasing, since VE's competitors do not offer tracking information on customer purchases. VE also wants to lower costs by automating orders and other transactions placed with its suppliers.

The solution needs to include capabilities that allow for:

- Integration with the Logistics System.
- Fast and accurate response to VE customers via a browser.
- Conversion from the Merchant System's "proprietary" flat-file format to X12 and EDIFACT per the Pharmaceutical Manufacturers' implementation conventions.
- HTTP and VAN communications

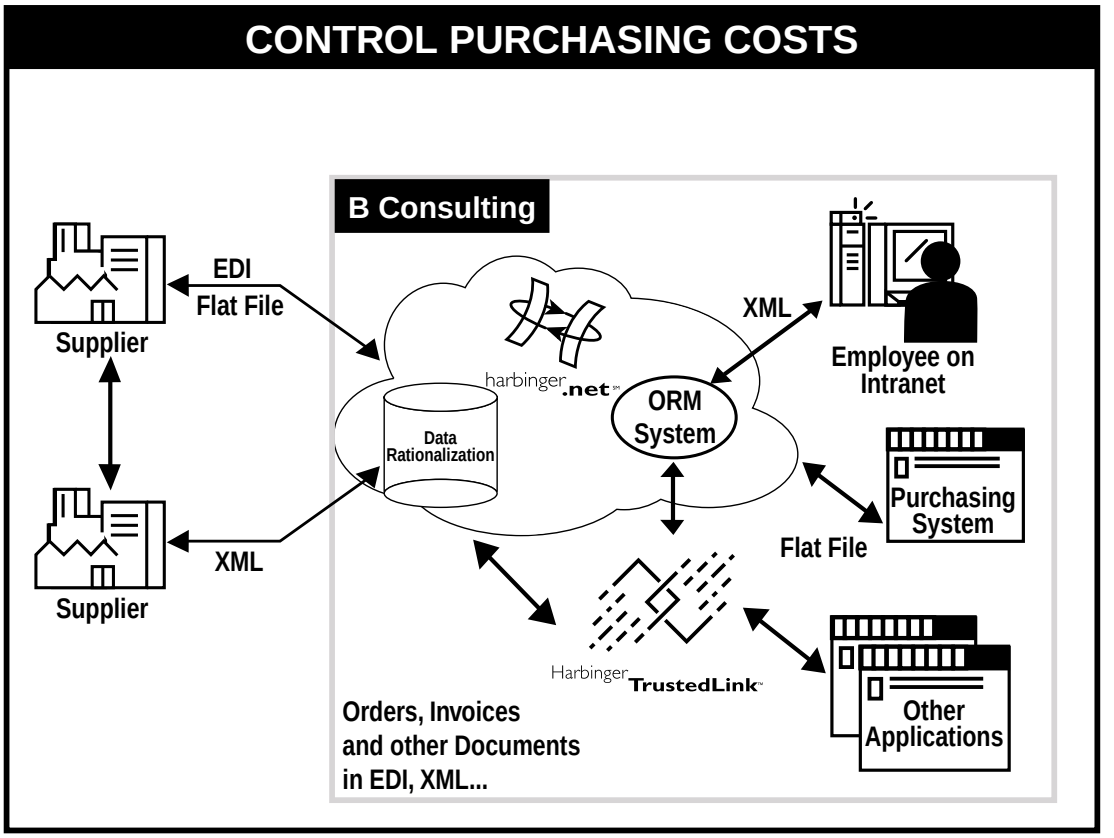


Figure 3 *– Eliminating manual processes can allow businesses to focus on "high-value" activities such as negotiating contracts.*

VE will deploy an E-Commerce solution that will be integrated with its systems to provide customers accurate and timely information on their purchases. This capability will differentiate VE from its competition and will result in increased revenue for VE. In addition to increasing revenue, such a solution will also allow VE to lower its cost of goods by automating purchases *(See **Figure 4** – "Improve Customer Loyalty")*.

VI. Conclusion

The application of XML and new Internet-centric technologies is one of the key elements of our product strategy for Harbinger as we believe that XML is going to continue its dramatic growth and acceptance as a mainstream standard for E-Commerce. Support for EDI, XML and any-to-any data conversion and integration will enhance Harbinger's ability to deploy IP-Centric E-Commerce solutions, and will contribute to the continued growth of business-to-business E-Commerce.

Sources

[1]AT&T, Lucent Technologies and Motorola Create VXML Forum; Companies Seek Open Standard to Promote Voice Access to Web Services, Press Release, March 1999.

[2]XML/EDI: Just the FAQs, C. Shih, Gartner Group Research Report, October 1998.

[3]Leading Companies Collaborate on Lightweight Standard for Business-to-Business E-Commerce Transactions, Press Release, February 1999.

[4]Microsoft to Deliver Advanced XML Support, Press Release, October 1998.

[5]The race to create XML for E-Commerce, CNET News, Wylie Wong, March 1999.

[6]Microsoft Press Release.

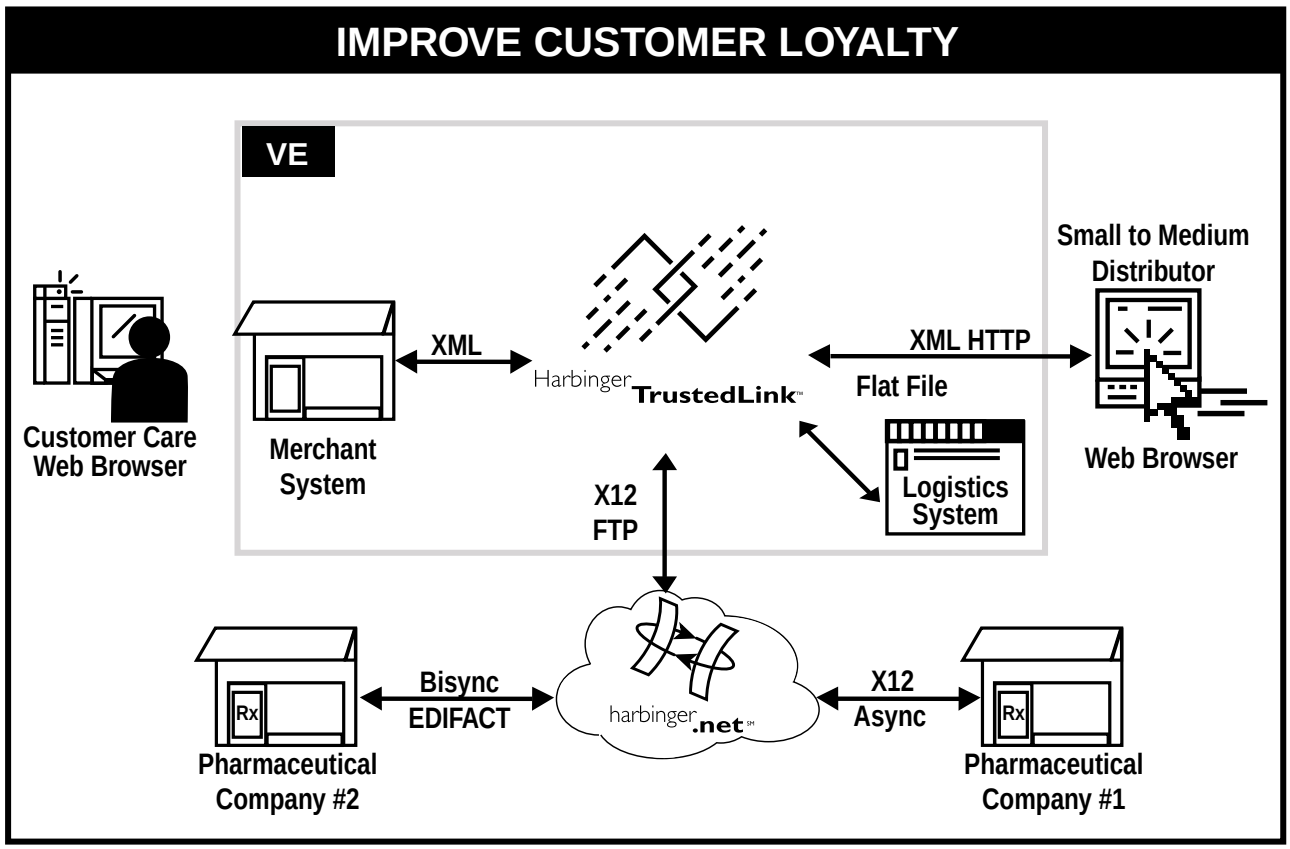


***Figure 4** – E-Commerce solutions that fulfill customer needs can be used for achieving sustainable competitive advantage.*

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