AS2—Meeting the Challenges of B2B Commerce

How to Use the AS2 Protocol for Transporting Data Securely and Reliably Across the Internet

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A GXS Thought Leadership White Paper

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Executive Summary

The availability of and ease of access to the Internet presents a huge opportunity for companies to be able to connect more easily and cheaply to both existing and new B2B partners—if they can find ways to share data securely over this very public network. A B2B communications standard introduced in 2002, AS2 is addressing this need, bringing the traditional benefits of electronic data interchange (EDI) to smaller companies with limited budgets and slashing the costs of online transactions for large companies.

AS2 works by providing an "envelope" for the data, allowing it to be sent over the Internet (or another TCP/IP-based network) using the HTTP protocol, which powers the World Wide Web. The receiving organization's server then listens out for messages addressed to it. Like a call to a phone with no answering machine, the message will be missed if your server is not available to take the call; so, many organizations decide to use a service provider such as GXS to provide AS2 connectivity. Of course, this approach also means you benefit from GXS' shared infrastructure, skills and security.

AS2 can handle any kind of document but is ideally suited to the kind of transactions that have traditionally made up the bulk of EDI exchanges. Just as with EDI document exchanges before the availability of the Internet, you can extract data from internal systems and use a translator to transform it into the appropriate standard before dispatching it. You can then process the data you send and receive in the same way.

There are two key differences between traditional EDI document exchanges and those EDI document exchanges using AS2 for transmission over the Internet, however. The first is that AS2 operates only over networks running the TCP/IP protocol. The second is that the receiving computer must be connected to the Internet at the time the document is sent. Together, these factors mean that if you decide to develop an AS2 capability in-house rather than work through a service provider, both you and your trading partners must use AS2 and both of you must be communicating over TCP/IPbased networks such as the Internet.

Before you can begin using AS2, you need to make a number of choices—in conjunction with your trading partners—about how you will transact online. This paper takes you through these decisions and shows how to get online with AS2 effectively.

Whether you are introducing AS2 at the request of a trading partner or rolling AS2 out to your own trading part-ners, GXS can help you with these steps. GXS offers a number of solutions and our clients are already benefiting from AS2 on a global basis. AS2 has become one of the key standards for B2B commerce, and GXS has helped make this happen by assisting many customers in their implementation of this powerful protocol.

Why AS2? The Business Case

At a minimum, B2B commerce requires:
- Partners to use common data formats (these days, typically EDI or XML)
- Common network connectivity, so that a network path exists between trading partners
- Secure document delivery, so that only the intended recipient receives the message
- Secure document transmission, so that no one can read the document in transit
- Non-repudiation, so that the recipient can be sure that a document was actually sent by the claimed sender
- Reliable document status, so that a sender knows exactly what has happened to a document

Ideally, a B2B commerce system would also offer:
- The ability to manage partner relationships, control who information is shared with, and what kind of information can be shared with different types of partners
- The ability to convert data into a form acceptable to the recipient
- The ability to send data using a range of protocols (such as secure FTP, FTP over VPN, and so on) and to make use of different carrier services, such as traditional value-added networks or other third-party integration service providers.

Some parts of this challenge—for example, common formats and functional acknowledgement—have been solved through the development of a range of data standards, such as ANSI, EDIFACT and forms of XML aimed at the B2B commerce environment, such as cXML and OAG BODs. Connectivity through the ever-evolving choice of protocols was traditionally achieved using a mix of private and shared value-added networks, adding to the complexity of the communication process, especially where smaller organizations were involved. The rapid growth of the Internet to the point of near universal connectivity is now allowing trading part-ners to carve out the pathways between them more easily—but at the expense of other requirements such as security, privacy and manageability.

An Internet standard created by the EDI over the Internet (EDIINT) task force of the Internet Engineering Task Force (IETF)—the body that develops the standards used on the Internet—addresses these concerns. Called AS2 (which stands for Applicability Statement 2), it was created to allow the secure and reliable transmission of documents over the Internet using the HTTP protocol.

In simple terms, if you can "surf the web", you have the basic infrastructure needed to send AS2-compliant documents and to exchange documents with other organizations also running AS2-compliant software—without needing to know anything about the specifics of their systems. If your organization can host a website 24x7, you have the basic infrastructure for receiving documents from partners via AS2—again without needing to know any technical specifics about their platforms.

Companies may question the need for yet another online standard—but there are good reasons why they should consider AS2. First, AS2 has been designed for both business

messaging and the Internet, meaning it works particularly well for the exchange of business documents. Unlike traditional data oriented protocols like FTP (which remains the leading TCP/IP-based protocol for B2B, eclipsing even AS2), it addresses issues such as document encryption and signatures, and offers receipts. And unlike other e-commerce specific standards, like ebXML or RosettaNet, it allows companies to continue to use existing internal processes, demanding changes only to the mechanisms actually used to exchange documents with partners. Although large enterprises will continue to make significant investments in e-commerce to handle high volumes of transactions, smaller partners with lower transaction volumes will now be able to afford the same features through relatively inexpensive software or outsourcing services. This should significantly increase the number of trading partners exchanging information electronically.

Second, AS2 may offer some cost savings over more traditional approaches to data exchange when both partners are using AS2 and when very high volumes of data need to be exchanged or when companies are migrating from legacy direct connects—although implementing it and managing the AS2 environment ongoing will still involve software, hardware and professional service fees.

This paper explains how AS2 works, what role it can play in your e-commerce operations and the issues you may face when implementing it.

How AS2 Works

The AS2 standard defines an envelope for data that enables it to be sent over the Internet using the HTTP protocol. AS2 can handle any kind of document but is ideally suited to the kind of transactions that have traditionally made up the bulk of EDI exchanges. Just as with EDI, you can extract data from internal systems and use a translator to transform it into the appropriate standard before dispatching it. You can then process the data you send and receive in the same way (for example, sending acknowledgement that a message has been received).

TRADITIONAL B2B IMPLEMENTATION

Partner "A" — Line of Business App → EDI/XML Translator → Comms Gateway

Partner "B" — Comms Gateway → EDI/XML Translator → Line of Business App
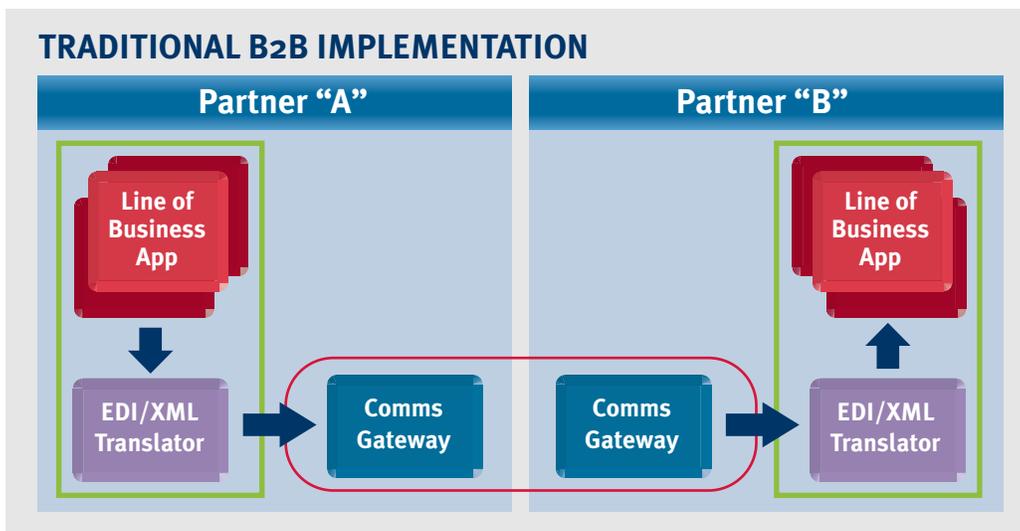
Figure 1: "Traditional" B2B Implementation (simplified)

In the above picture depicting a simplified traditional B2B program, only the area within the red oval—the communications gateways—is affected by the AS2 implementation. The areas outlined in green may continue to work in the same way. The limited change required is part of the reason AS2 has been adopted so quickly by many organizations.

There are two key differences between traditional EDI and AS2, however. The first is that AS2 operates only over networks running the TCP/IP protocol—which actually makes it ideal for situations in which you do not have a private network in place with trading partners and want to work through a public network like the Internet. However, it does mean that—as with the introduction of any new standard—you will probably need to continue to support transactions flowing over networks that are not Internet-based, using protocols that are not AS2, for some time to come.

The second difference is that the receiving computer must be connected to the Internet at the time the document is sent. It is like a phone with no answering machine: if you do not answer it, you miss the call. You need to have a server constantly listening for inbound documents and inbound HTTP connections, just as a web server does.

While many people use web browsers to access content on the Internet, very few of us actually run web servers offering content to the general public. Most businesses turn to dedicated service providers to host their websites, taking advantage of the cost benefits of shared infrastructure, the skills offered by the service provider's team and the higher levels of security which service providers are able to develop as a result of their expertise and ability to spread costs over multiple clients.

Together, these factors mean that if you decide to develop an AS2 capability in-house rather than work through a service provider, both you and your trading partners must use AS2 and both of you must be communicating over TCP/IP-based networks such as the Internet.

One option for implementing AS2 is to outsource your e-commerce connectivity to a service provider. The service provider will typically support all the protocols used by trading partners and will also implement new protocols, such as AS3 or AS4, as they are developed. Your organization can send all its messages to the service provider using a single protocol (whether that's AS2, FTP or something else) and leave it up to the service provider to handle the translation needed to deliver it to trading partners using the standards they prefer.

Alternatively, you may choose to use a hybrid approach in which you connect directly via AS2 with those trading partners for whom that make sense and also use AS2 as your connectivity method to a service provider. It will then be up to your service provider to handle connectivity to other kinds of networks and translation to other protocols as needed by the rest of your trading partners. This greatly simplifies your internal operations for several reasons:

1) your company has only a single protocol to manage
2) it enables you to leverage the value-added services of a service provider, including helping to get your trading partners online and providing ongoing support, and
3) it positions you to easily react to constant change that takes place in the IT industry and thus avoid the complexity and management headaches associated with those changes.

AS2—Meeting the Challenges of B2B Commerce

When using the Internet it is important that AS2 messaging provides security and reliability, and it does. In many cases, the AS2 standard builds on previous standards in these areas. For example, the use of digital certificates ensures that documents are delivered only to the intended recipient, that they are secured in transit, and that the sender can be verified. The AS2 standard works with some of the strongest encryption and signature algorithms available commercially, giving you the confidence that your documents will remain secure.

In addition, you need to secure your system from malicious attacks and ensure you are only exchanging data with known partners. These are network security issues not addressed by the AS2 standard. This can be resolved by using routers to isolate the AS2 server and control the traffic reaching it, or through implementation of one of the many firewall solutions available in the market.

Assuring reliable document status—so that documents don't "get lost in the system"—typically requires tracking the progress of the document in four ways. Three of these apply to any standard that automates the exchange of documents (see Figure 2):

- The communication status confirms that data was received at a network level (for example, that all 256 bytes expected were actually transferred)

- The functional acknowledgement confirms that a valid message was received by the e-commerce application (for instance, that the EDI envelope was opened and contained a valid or structurally correct document); and

- The business acknowledgement confirms the content of the message and that it has been dealt with in an appropriate way (for example, a purchase order acknowledgement agrees to fulfill the orders made in a purchase order)

The AS2 standard adds a fourth kind of status—the MDN, or message disposition notification (see Figure 2). Because AS2 places a message in an envelope to enable it to be sent over HTTP, you need to know that the message was successfully extracted from that envelope. In fact, the AS2 envelope may contain another envelope (ANSI EDI, for instance) with the actual document inside that.
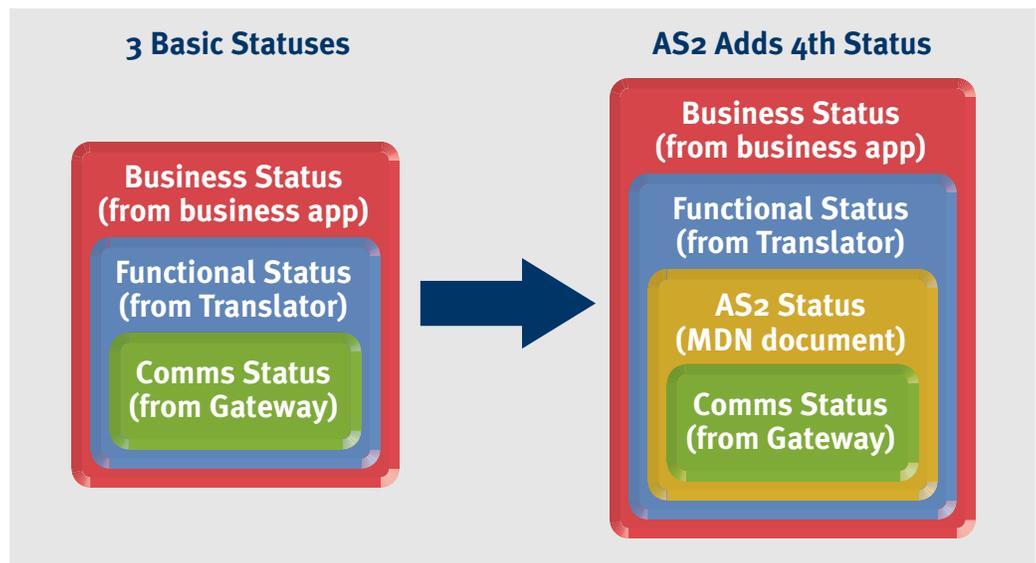
Figure 2: Document Status Tracking

AS2 software will generally manage both communication status and envelope extraction status, while AS2 services providers will also usually deal with functional status. The way in which you monitor business status will depend on your own business processes and the software you are using internally to manage those processes.

Introducing AS2 to Your Business—Implementing the Technical Solution

Before you can begin sharing documents using AS2, you need to make a number of decisions—some internal and some in conjunction with your trading partners.

1. **Firewall Security**

First, it is important to realize that running AS2 software means you are allowing receipt of transactions or documents from the Internet. You need to consider how to secure this "doorway" against malicious attacks. The most common approach is the use of a firewall, which looks at incoming transactions and filters them according to the rules you define. Two ways you might configure your firewall are:

- Allow each trading partner to send AS2 on a specific "port", or network address. The firewall can be configured to accept transactions for that port only from specific sources (such as the IP address of a particular trading partner). This is a very safe approach but considerably increases the overhead involved in setting up a new partner

- Use a DMZ (or de-militarized zone): all AS2 traffic comes in on a port through the firewall, but the computer running AS2 can only talk to other computers in your organization through a further firewall. This configuration eliminates the need to set up a separate security solution for each trading partner, but makes up for the lower security of letting any traffic into the computer running AS2 by isolating it from other computers

2. Digital Certificates

The next step is to decide how to manage the digital certificates you will be using. You can either generate your own certificates or use one of the Certificate Authorities (CAs), such as Verisign and Entrust, to manage the process for you. As well as handling the routine administration of certificates, the checks run by CAs provide additional assurance to trading partners that the holder of a certificate is who they claim to be. On top of that, CAs can "revoke" a certificate before it expires if it is "compromised" and will advise you to change your certificate if they suspect it has been compromised. CA certificates also contain an expiration date that will prompt the CA to verify the identity of your trading partner on a regular basis, increasing the security of the system still further. Clearly, you will need to pay an annual fee for the CA's services.

The alternative to using a CA is to get everyone to "self-generate" certificates, allowing them to set their own expiration dates. This simplifies the management headache but does reduce the security of the system, since no organization is "policing" the system and confirming that a certificate does belong to the person it appears to come from. Moreover, if you have many trading partners, adding and updating certificates can become a significant burden. The self-generated certificate model is currently more common in B2B as many B2B software applications include a certificate self-generation capability.

If your trading partners set the rules, you may need to support both models, with some partners asking you to use a certificate from a CA, while others will accept self-generated certificates.

Whichever route you choose, you must be careful not to lose access to your private key (by forgetting your own password, for instance), since neither a CA nor a system that self-generates certificates can retrieve it. In these circumstances, you will need to generate a new certificate and distribute it to all your trading partners, and you or your partners may need to re-send some documents if they were sent using the old key.

3. HTTP Protocol

A third decision is whether or not to use the secure HTTP protocol. If you are already using digital certificates to sign your messages through encryption, this is probably not necessary, since layering encryption does not usually strengthen security, while it increases the overhead of transmission. Secure HTTP can be used if the content is not already encrypted, but GXS recommends encrypting all content using digital certificates as a matter of course, since this allows you and your trading partners to confirm that content has really been sent by the organization named on the document, as well as ensuring confidentiality by preventing data from being intercepted in transit.

4. Receipts

A more complex decision is which of the five options for handling receipts (known as message disposition notification or MDN) you should use. The choices are:
- **No receipt:** this is a poor choice, since it generates no audit trail
- **Plain receipt:** returned immediately to signify that a message has been received, but not signed by the recipient

- **Signed receipt:** returned immediately and signed. This provides the strongest audit trail, since it not only confirms that the message was received but also that the receiver was probably the intended recipient, since they had access to the private key of the intended recipient
- **Asynchronous plain receipt:** the same format as the plain receipt but sent later rather than immediately
- **Asynchronous signed receipt:** the same format as the signed receipt but, again, sent later rather than immediately

The document the sender sends specifies the form of receipt you must send back, so you need to make sure your software can support all five options. You can make this choice yourself when sending documents—although your trading partners may ask you to request a particular form of receipt to ensure their own audit trail meets their needs. The form of receipt needs to be specified for each partner when you set up your AS2 software.

5. Encryption Algorithm

The next step is to decide on an encryption algorithm from those supported by your AS2 software. Options include, but are not limited to: no encryption, triple DES, RC2 40, and RC2 128. Algorithms using 128 bit keys (Triple DES and RC2 128) are much stronger and therefore more secure. Of course, it's essential that the software used by your trading partner can support the algorithm you intend to use, so you need to confirm which algorithms your partners can handle before you begin live trading. AS2 indicates the encryption method in the message headers, making it easy for your software to determine which decryption algorithm to apply.

6. Signature Algorithm

A final choice is the signature algorithm to be used. AS2 offers options: no signature, SHA-1 and MD5. Again, using signatures will make the process more secure since they make it much easier to prove that the person it appears to come from really sent a message. The AS2 standard recommends using SHA-1 but you should also support MD5 in case any of your trading partners are using it.

Of course, you also need to have reached agreement about the content of the document you are sending, by developing implementation guides for EDI messages or creating schemas for XML documents. For example, you and your partner need to know that you are sending an invoice, that the first data item is the invoice number and is so many characters long, that the second data item is the date, that the third data item is the sender's supplier number and so on.

Once you have made these choices, you need to configure them into your AS2 software (see box). The best AS2 solutions will allow you to set each option on a partner-by-partner basis in the trading partner's profile, which will also include the address (a web URL) of their AS2 server. In addition, you will need to load your partner's certificate into your AS2 software to give you access to their public key, used for encrypting the messages you send to them and for validating messages they send to you.

The final step before you attempt live trading is to verify that both partners have configured their systems correctly by sending a test document. Of course, you will need to reload your partner's certificate and retest the configuration each time a partner's certificate expires.

Introducing AS2 to Your Business — Managing Relationships

Getting the technology in place is only one aspect of the task of introducing AS2. You also need to manage the relationships you have with your trading partners in four ways:

- Making yourself available to receive AS2 messages when your trading partners want to send you messages
- Keeping track of expiring certificates
- Detecting problems when sending to partners; and
- Detecting security issues.

If you decide to run your own AS2 solution and connect directly to your partners—rather than working through a service provider—you will effectively become a VAN provider with one client. As well as making sure your AS2 software is connected and ready to receive at all times—if you are not online and ready to receive, your partners' attempts to send to you will fail—you will be responsible for back-ups and disaster recovery procedures.

You will also need to track the expiration dates on your partners' certificates and contact partners before their certificate expires to arrange for a new certificate to be sent to ensure that the smooth flow of documents is not interrupted. Obviously you should also make sure you provide your trading partners with the new version of your certificate before the old one expires.

A daily task will be to handle those occasions when messages fail, whether because of issues in your own AS2 solution, in your partners' AS2 solutions or in the networks that connect them. Most failures will be the result of temporary connection glitches and won't result in major disruption as long as you keep on top of spotting and fixing them. The final ongoing requirement will be to ensure that your solution is as robust as possible. One regular task will be to install any security patches for your AS2 software as soon as they are released. The second will be to check the AS2 software logs for suspicious activity to try to determine if someone is "probing" your system.

If you do decide to run your AS2 solution in house, you should look for software that makes these activities as easy and quick as possible. GXS estimates that taking into account software licenses, hardware procurement, purchase of trading partner-specific templates, keeping a permanent Internet connection and employing staff with the necessary skills, will cost a small company with low transaction volumes around $10,000-$30,000 in the first year to set up an AS2 solution in-house. In addition, ongoing annual costs of $5,000-$15,000 a year will be required to maintain it and add further trading partners. A large company with high transaction volumes, which would involve a more complex software solution and greater staffing requirements, would need to spend $130,000+ in the first year to implement a solution and $100,000 to $1 million a year thereafter.

WHEN ESTABLISHING AN AS2 RELATIONSHIP, EACH PARTNER NEEDS TO:

1. Decide whether to put the AS2 solution behind a firewall or in a "DMZ" isolated from their own systems

2. Install AS2 software

3. Get a certificate (the public/private key) from company a third-party provider or generate your own certificate

4. Agree whether to use HTTP or HTTPS (SSL-secured HTTP) as the transmission protocol

5. Agree on a "receipt policy"

6. Determine the encryption algorithm to be used

7. Determine the signature algorithm to be used

8. Configure your AS2 software with information about your trading partner:
   a. URL for sending documents
   b. Identity of partner
   c. Signing method
   d. Encryption method
   e. Receipt method
   f. Whether compression will be used

9. Load the partner's certificate (public key) into your software

10. Send a test document to confirm both systems have been configured correctly

Working through a service provider will allow you to offload most of the management hassle of running an AS2 solution—and will also reduce your operating costs. GXS estimates that for a company sending 300 documents a month it will typically cost less than $2000 a year to use the GXS AS2 Outsourcing Service, saving 50 percent or more when compared with the cost of running an AS2 service in-house and when the total cost of ownership is taken into account.

Getting Started with AS2

At GXS our AS2 volumes have continued to grow significantly each year. We believe AS2 is one of the key standards for B2B commerce and that companies should be eagerly embracing this low-cost approach to online trading. Moreover, AS2 implementation lends itself to an incremental approach that builds on your current infrastructure, allowing you to manage both costs and risks, so it's easy to begin testing how it might benefit your business.

If you are introducing AS2 at the request of a trading partner, you may be able to use your existing e-commerce infrastructure to handle it. If you use an EDI service provider, ask them about AS2. If you run your own software, check if the supplier offers an AS2 communications module (the Drummond Group provides a list of AS2-certified vendors at http://www.drummondgroup.com) or can recommend a third-party supplier whose software can be easily added to your existing setup.

If you have decided to roll this out to your own trading partners, it is probably a good idea to use your existing B2B broker software as a base. Most of the vendors who provide B2B brokers offer add-on modules for AS2 and you will be able to take advantage of other features offered by the broker software—such as logging, monitoring and connections to translation software—in addition to the basic AS2 protocol support.

Whatever your AS2 strategy and regardless of your company size or position in the supply chain, GXS can help. If you want a hosted service, GXS offers a number of solutions, with or without translation services, to suit everyone from small and medium-sized enterprises up to tier one suppliers and major purchasers. If you want to run your own AS2 solution, we can provide consultancy, implementation services and a variety of software components and connectivity services to allow you to build a system that meets your needs (see box on next page).

Summary

AS2 offers many benefits for organizations needing to exchange documents online: flexibility to share many different types of data; secure transmission of documents over the Internet, to which even the smallest trading partners can gain easy access; confidence that documents can be read only by the intended recipients or actually come from the claimed senders; and a very favorable cost when compared to other forms of electronic data interchange. Because of these benefits, we believe that AS2 has become one of the key standards for B2B commerce.

GXS Offers a Range of AS2 Solutions to Meet Your Business Needs:

AS2 Outsourcing Service—If you are responding to a request from a key trading partner for AS2-based trading, our AS2 Outsourcing Service can get you up and running quickly. You need no AS2 software, hardware, firewalls, certificates or special skills: GXS does all the work, including setup and testing with your trading partner and certificate management. We can also offer optional translation services.

AS2 Software Options—If you want to implement AS2 yourself and need AS2 communications software, GXS provides the BizManager® family of products, each of which supports a full suite of Internet-based communications protocols, including AS2. Each option offers a comprehensive B2B communications gateway for messaging, mapping, transformation, tracking and auditing your B2B transactions. Built to leverage the Internet and designed to incorporate and simplify industry standards, BizManager ensures the uninterrupted flow of information and direct, secure transport of all types of data and documents.

You can select a BizManager option to suit your needs depending on the number of trading partners with whom you'll need to connect, your operating system, and the specific functionality you require:

- **BizLink™—**Supporting a comprehensive list of file transfer and messaging protocols, BizLink is a powerful communications gateway solution that simplifies trading partner community management. BizLink can be implemented for high availability and scales to any trading volumes via distributed installation on multiple physical or virtual servers.

- **BizConnect™—**a Java-based solution designed for small- to medium-sized organizations, BizConnect is available on Windows and Linux platforms and provides secure connectivity with up to 25 trading partners. An embedded database is included to simplify implementation in a small footprint, turnkey solution.

- **BizManager400™—**Built for the IBM System i platform, BizManager400 is a native Java-based solution for data exchange, bringing the all the capabilities of BizManager and a browser-based user interface to the IBM System i.

- **SecureLink™—**a component that resides in the DMZ and works with BizManager to provide a single, secure gateway for all inbound and outbound data, isolating and guarding your systems from exposure to outside vulnerabilities.

AS2 Connectivity—If you have already selected an AS2 software solution, we can help you standardize on AS2 for all your communications. Where appropriate, you can connect to trading partners directly over the Internet. You can use the same AS2 software to connect to the GXS service, which will in turn connect to the rest of your partners according to their requirements. This enables you to reap the rewards of AS2 with your entire community and to simultaneously benefit from the GXS service, including trading partner management, transaction management, backup and recovery, translation services, access to tens of thousands of trading partners and more.

AS2 Contingency Service—If you connect to GXS via AS2, the AS2 Contingency Service provides an alternative connectivity method for sending and receiving critical business documents in the event of AS2 or Internet problems. You define the conditions under which the contingency mode is to be automatically invoked and you will be automatically notified of document arrival in your contingency mailbox.

ABOUT GXS

GXS is a leading B2B integration services provider and operates the world's largest integration cloud, GXS Trading Grid®. Our software and services help more than 550,000 businesses, including 22 of the top 25 supply chains, extend their partner networks, automate receiving processes, manage electronic payments, and improve supply chain visibility. GXS Managed Services, our unique approach to improving B2B integration operations, combines GXS Trading Grid® with our process orchestration services and global team to manage a company's multi-enterprise processes. Based in Gaithersburg, Maryland, GXS has direct operations in 20 countries, employing more than 2,800 professionals. To learn more, see http://www.gxs.com, read our blog at http://www.gxsblogs.com and follow us on Twitter at http://twitter.com/gxs. You can also access our public filings with the Securities and Exchange Commission at http://www.sec.gov/edgar.shtml.

However, getting started with AS2 involves a series of decisions and technical steps both within your own organization and in conjunction with your trading partners. GXS has the experience, knowledge and infrastructure to help you roll out an AS2 solution quickly and easily and we can provide long-term hosting services to take away the management headache of running AS2. GXS customers are already using our AS2 services to strengthen their relationships with trading partners while cutting the cost of transactions. Come and talk to us about how your business can join them in making the most of this exciting new standard.

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