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B2B Interaction Management: The Last Mile for the Digital Economy

ActionPoint Provides the Human Interface to XML Business Objects

Executive Summary

Highlights:

- **B2B eCommerce is growing at a phenomenal rate, from around $100 Billion in 1999 to over $2 Trillion by 2004.**
    - **Originally driven by single-supplier extranets and single-buyer eProcurement networks, the market has entered a new phase, "B2B eCommerce 2.0," based on net markets connecting multiple buyers to multiple suppliers. In the race to build net markets, high-profile dot-com startups will be challenged by Global 1000 companies with strong existing business relationships.**
    - **The market for B2B eCommerce software will quintuple in the next four years to $8 Billion. (Source: IDC Internet Commerce Applications market report 4/00)**
- **B2B eCommerce 2.0 is characterized by complex business processes, including RFIs/RFQs, complex product configuration, competitive bidding, contract negotiation, and credit financing.**
    - **Net markets rely on XML Process Management software to automate these complex processes by encapsulating transaction data as XML business objects and routing them using business rules. But this software is optimized for application-to-application communications, and ignores the human interface to these objects at "action points" of the system: configuring products, generating RFQs, applying for credit, etc. A new complementary infrastructure component for XML Interaction Management is needed to build engaging net markets quickly and easily. This is what the ActionPoint Interaction Management System provides.**
- **ActionPoint streamlines the human interaction with XML business objects at all action points of the eCommerce business process.**
    - **ActionPoint Dialog Server simplifies web interactions by putting the "brains in the browser," creating engaging dynamic dialogs at all action points without slow server round trips. These dialogs guide the user while providing fast response and conformance with business rules. It also dramatically reduces the time and effort required to launch and maintain a net market, by creating an auditable XML Schema-based management framework for data and business rules, and visual tools to link them to web content.**
    - **ActionPoint Enterprise Server delivers formatted and validated transaction data to enterprise systems, and can archive web transaction documents just like paper and fax transactions today.**
    - **Input*Accel* transforms today's paper and fax transactions into eCommerce-ready content. Leveraging workflow and business rules on the ActionPoint Enterprise Server, it provides a common front door for web and paper transactions.**

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The B2B eCommerce Revolution

The number one issue facing business managers today is harnessing the power of the internet. Within the space of two years, consumer-oriented eCommerce has already revolutionized the marketing, sales, and distribution of goods and services ranging from books and CDs to air travel and stock trading. The internet's unique capabilities – low-cost one-to-one marketing, information aggregation and instant delivery, 24x7 self-service, and ubiquitous global reach – are rewriting the rules in nearly every segment of commerce. Now it is clear that to thrive in the 21st century, *every* business must become an e-business.

Business-to-business transactions are the next wave of internet commerce shaping the new digital economy. Market estimates (Figure 1) put the value of B2B eCommerce at $2 Trillion or more by 2004, dwarfing B2C. B2B involves a multitude of transactions all along the supply chain, each of which potentially represents a distinct market. By increasing efficiency through automation and information transparency, B2B eCommerce dramatically lowers transaction costs for both buyers and sellers.

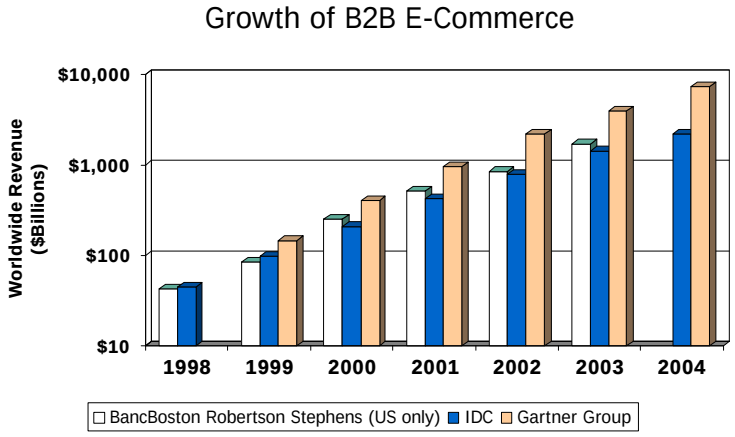

Figure 1. The growth of B2B eCommerce will be driven by net markets linking multiple buyers and sellers.

B2B eCommerce represents a quantum jump in complexity from the typical business-to-consumer transaction. The products are more complex, ranging from industrial equipment to automotive and aircraft parts to specialty materials, and require expertise to specify and configure properly. More importantly, the business process itself is far more complex, involving multiple stages of requests for information (RFIs), requests for quote (RFQs), competitive bidding, contract negotiation, purchase orders, and financing (Figure 2)[1]. In financial services, it might require personalized assembly of presentation packages and contracts from a centralized information repository.

In fact, some complex consumer-facing processes, such as mortgage lending and insurance underwriting, are beginning to shift to eCommerce as well, and

[1] For a good discussion, see "XML on the Front End," *The Gilbane Report*, April 2000.

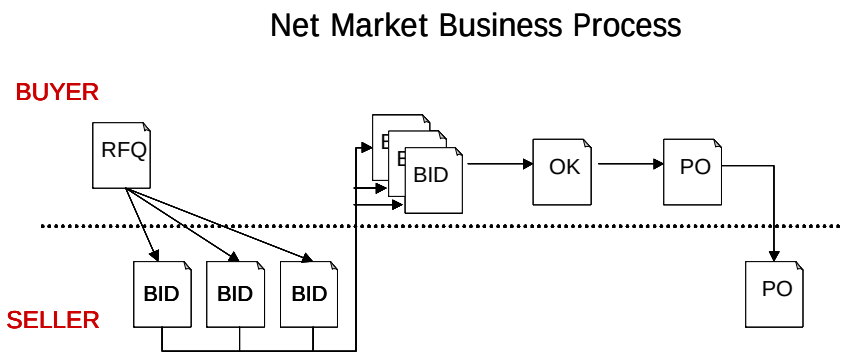

Figure 2. Net market processes are complex, involving multiple interactions within and between buyer and seller companies.

share many of the same characteristics as B2B processes. Moving all these complex processes to the automated self-service environment on the web promises to replace today's slow, manual interactions conducted via fax, phone, and paper with instantaneous electronic interactions, using intelligence and process management built into the eCommerce system itself. But it's not easy.

Net Markets and B2B eCommerce 2.0

Moreover, today's B2B eCommerce is a far cry from what is yet to come. Up to now, it has consisted of extranets built by brand leaders like Cisco and Dell that reduce the cost of sales while enhancing customer relationship management, and eProcurement networks established by powerful buyer organizations to reduce purchasing costs by promoting competition and efficiency in the supply chain. But according to IDC[2], these models of one-sided eCommerce will account for less than half of what it projects to be a $2.2 Trillion B2B eCommerce market by 2004. The majority of that market, 56 percent, will come from a segment that barely exists today but is projected to grow at over 300% annually for the next five years. The new segment represents eCommerce controlled not by a single dominant seller or buyer organization, but by a third party creating a virtual community linking many buyers to many sellers. These so-called *net markets* enhance the financial return for both buyer and seller by expanding eCommerce to a wider marketplace and by reducing inefficiencies in supply and demand chains. IDC calls the new era represented by the rise of net markets "B2B eCommerce 2.0."

Net markets are specialized, typically representing either a single vertical industry or horizontal set of products, and their number is expected to grow by orders of magnitude in the next two years. While pure born-on-the-web net market makers like Ventro (formerly Chemdex), Healtheon, or VerticalNet are the best known today, the biggest players in the net market game may well be the established powers of the traditional brick-and-mortar economy. These include not only powerful suppliers (extranet hosts today) and buyers (eProcurement-oriented), but also middlemen from the brick-and-mortar economy – particularly Global 1000 financial services organizations – who can leverage their size and wealth of existing industry relationships to

[2] Richard Villars, "B2B eCommerce 2.0," IDC telebriefing 3/23/00.

counter the agility of the new dot-coms. For example, MasterCard International recently created a net market for its small business cardholders, and Bank of America entered into an agreement with Ariba to co-develop a net market for B of A's two million business customers. Erstwhile competitors of the brick-and-mortar economy are even teaming up to form their own net markets, such as the Big 3 automakers, or a group of fourteen energy and petrochemical giants, or members of the Star Alliance international network of airlines.

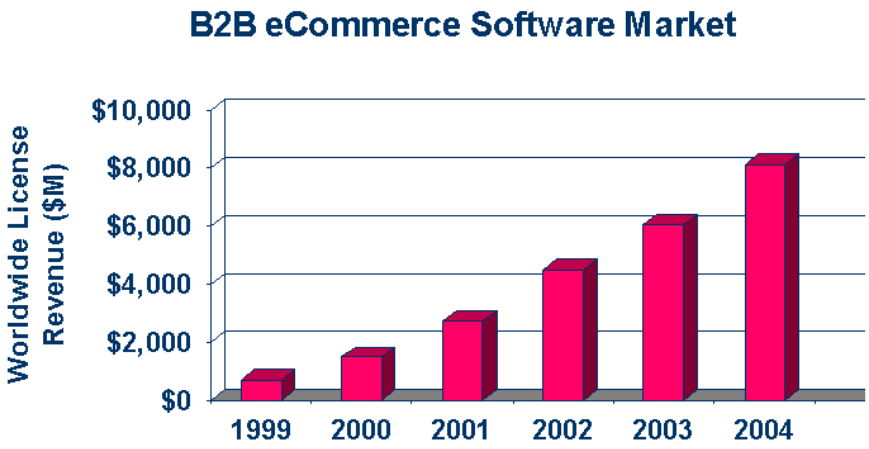

Figure 3. The market for B2B eCommerce software will quintuple in the next four years. Source: IDC Internet Commerce Applications market report, April 2000

The Interaction Management Problem

"Today, up to 95% of users that start a transaction on the Web fail to complete it, largely out of frustration. This results in millions of dollars of lost business."

Shane Hughes, Pyxis Consulting, leading eCommerce integrator in financial services

While the rush to build the infrastructure for B2B eCommerce 2.0 goes on at a frantic pace, it remains a fact that in 1999 just a minuscule 1.1 percent of B2B commerce is conducted online[3], and most of that uses private network EDI, not the public internet[4]. Even companies conducting B2B commerce on the internet use traditional channels (paper, fax, phone) for at least part of the transaction. AMR Research[5] reports that of 600 net markets surveyed, only 10 conduct the entire transaction on the web.

So how do we get from here to that bright shining future? Software to build the new B2B infrastructure is already a hot commodity, including scalable *process management* systems that can organize the B2B transaction data defined by each net market into standardized *business objects*, and intelligently route and manipulate those objects with high performance, reliability, transaction integrity, and conformance to business rules, connecting a myriad of potential buyers and sellers.

However, these tools and infrastructure have been optimized for computer-to-computer interaction only. The missing piece is connecting that infrastructure and its standardized business objects to the people that must

[3] Goldman Sachs Investment Research, "B2B: 2B or Not 2B?" 11/12/99
[4] Boston Consulting Group, cited by Stacy Lawrence, *The Industry Standard*, 2/21/00.
[5] AMR Research, cited in *InformationWeek Daily* 4/3/00

interact with them. Each place people interact with complex eCommerce processes defines an *action point* of the system. Action points include:

- Configuring complex products
- Generating requests for quotes, proposals or information
- Evaluating and responding to bids
- Applying for lease or credit lines
- Creating purchase orders
- Securing logistics services
- Applying for a mortgage loan, credit card or life insurance

In most B2B eCommerce solutions today, action points are a problem, for users and developers:

1. In the net market application, information is collected from users through static forms, typically online replicas of existing paper forms. Filling them out online is confusing and fraught with errors, any one of which can force the user to start all over again. Certain fields do not pertain at all to the user and should be ignored, while others are mandatory for the particular transaction being executed. Modeled after standard paper forms, these web interactions fail to take advantage of the medium's ability to dynamically guide the user. Ideally, users should only be prompted for input required based on previous responses, instead of "if the answer to question 3 is Yes and you are a current customer, skip to box 23B, otherwise…" In many cases, the format for information collection should not look like a form at all, but perhaps a wizard or tabbed dialog.
2. Data entry at action points is unnecessarily tedious for users. They have to repeatedly key in boilerplate contact information, as well as data already "known" by the system, such as contracted pricing, discount schedules, etc. The system should be able to prefill that information.
3. Validation and user feedback at action points are annoyingly slow. Are the entered part numbers correct? Are they in stock? Is the total within my credit limit? Have I entered everything needed to complete the order? Typically, a user doesn't find out until hitting Submit, waiting several seconds, changing some data, and trying again. Most of the time, the system should be able to validate user input and provide feedback in real time as each data element is entered, without waiting for a server round trip.
4. Developers must handcraft every action point in custom code, integrating each bit of data and business logic with its representation in a web browser, typically using HTML and Javascript. To set up a net market, this task must be repeated for each member – buyer and seller. The effort required is prodigious, resulting in both a clumsy human interface for the user and costly, protracted site development for the net market.

What's needed is software that enables rapid, maintainable implementation of rich, user-friendly action points throughout the net market application. By

hooking up the eCommerce system to the people that need to use it, this software, which we call *interaction management*, represents the last mile of B2B eCommerce.

The ActionPoint™ Interaction Management System from ActionPoint, Inc. is the first software designed to let net markets create intelligent, browser-based dialogs connecting users with the eCommerce system at every action point of the process. There are a number of software vendors who provide single-purpose tools and applications for product configuration, eMarketing, and eCRM, but only ActionPoint has developed a general-purpose facility that can be applied across *all* action points.

A Human Interface to XML

With this background, let's look at the technical issues addressed by interaction management. The key technical difference between the new B2B infrastructure and the previous generation is the replacement of private data interchange standards with open, extensible ones based on XML. XML, or eXtensible Markup Language, is becoming the new universal standard for business data in B2B eCommerce. Within that language, each vertical industry has its own special vocabulary called an *XML Schema*. The schema defines the data elements – names, data types, and other attributes – so that they can be understood and processed by applications. For example, required data elements in a purchase order schema might include a PO number, bill-to address, ship-to address, description, amount, and payment terms. Data objects representing each business transaction take the form of *XML instance documents* – specific values for the data elements defined by the schema – as they are routed through the net market's business process.

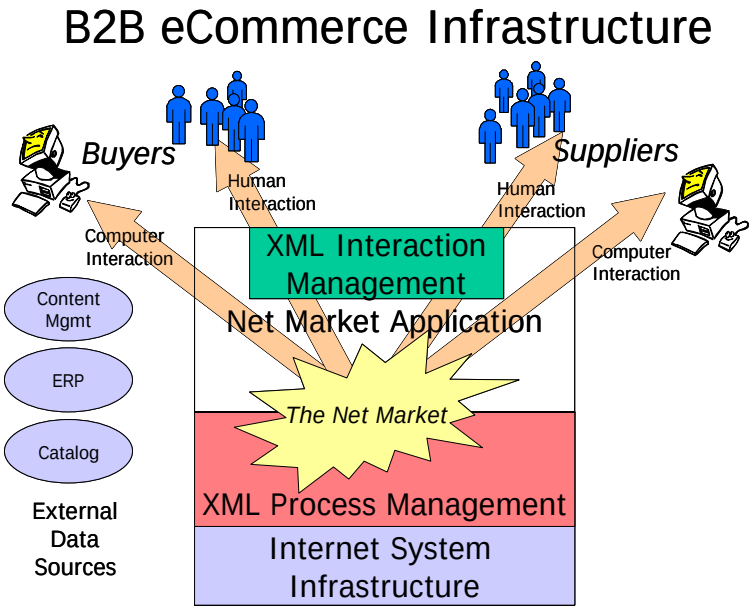

Figure 4. Interaction Management as a component of the XML infrastructure for B2B net markets

The automation of this process according to defined business rules is provided by XML Process Management software, a critical layer in the technology infrastructure for B2B commerce (Figure 4). Process automation

software from companies like webMethods, Vitria, and Bluestone provides a "smart XML pipe" that routes business objects through the specified workflow and exchanges XML data between line-of-business systems and the eCommerce application at the hub of the net market. Custom net market applications defining the functionality and workflow of the net market can be built using the process management tools directly or on top of application software from companies like Ariba and CommerceOne. ERP and legacy data systems, content management repositories like Documentum or Broadvision, and customer relationship management systems all represent external data sources that integrate with the B2B infrastructure.

Process management software routes the XML business objects between these systems automatically, application-to-application, according to the defined business process. However, it doesn't provide any help to users trying to populate, view, or manipulate the objects at action points, or to manage relationships among the data elements *within* an object. For example, it can connect a valid purchase order with the supplier's manufacturing, shipping, and accounting systems, but it doesn't tell the prospective buyer configuring the order that the minimum quantity for a particular part is 10,000 units, or that the combination of parts specified is invalid, or that the order cannot legally be shipped to the ship-to address. That's the role of interaction management software like ActionPoint, which fills a critical hole in the new B2B XML infrastructure.

The ActionPoint Interaction Management System

ActionPoint streamlines the human interaction with XML business objects, creating a richer and friendlier experience for the net market user while dramatically reducing the time and programming effort to launch and maintain a net market. It transforms static interactions into dynamic *action point dialogs*, real-time two-way interactions between a person and the eCommerce system that blend the presentation and collection of information to maximize user engagement.

- ActionPoint dialogs only ask questions that make sense in the context of previous responses. Users are never presented with irrelevant questions or prompted to "skip over" irrelevant form fields.
- ActionPoint dialogs prefill basic information already known to the system, saving time and reducing errors.
- The process management infrastructure only manages the workflow of the object as a whole and its relationships with the net market system. ActionPoint dialogs understand the rules and relationships between data elements *within* a business object, and can validate user data entry at the source. In many cases, this validation is provided in real-time inside the browser, without server round trips. For example, selections that are incompatible with other user responses are removed from dropdown selection lists. With ActionPoint, users can be guided to products or services that best fit their requirements, and prevented from attempting to create orders that will be rejected later by the system, such as invalid configurations or out-of-stock components that cannot be shipped by the user's specified delivery date.

"By enabling us to quickly build rich XML-based web interactions that integrate directly with backend e-business systems, ActionPoint will help net markets like ourselves with two of our biggest challenges: speeding time to market and delivering a dramatically better solution to our buyers and suppliers."

Lee Fife, CTO, Equilynx, a leading net market maker for the commercial marine industry

For the developer, ActionPoint significantly reduces the work of implementing net markets.

- ActionPoint lets developers link data and rules with HTML presentation elements through a simple drag-and-drop mechanism. All of the rules and relationships defined for the data element are automatically applied to the user interaction *without hard-coding*.
- ActionPoint provides a design framework that separates web presentation from business data and rules, allowing the XML data structure to be designed once and redeployed in many web pages and presentation formats, maintaining a central point of management and business audit.
- ActionPoint works with industry standard HTML design tools and web application servers, and is based on the latest XML Schema standards. It is designed to be complementary to and integrate with XML process management and web content management software.

ActionPoint offers a further benefit to business managers.

- It provides a common front door for "traditional action points" of the non-internet variety, including paper mail and fax, integrating paper-based transactions into an e-business process.
- ActionPoint also prepares internet transaction data records to be archived for regulatory compliance and customer service, just as their paper equivalents are today.

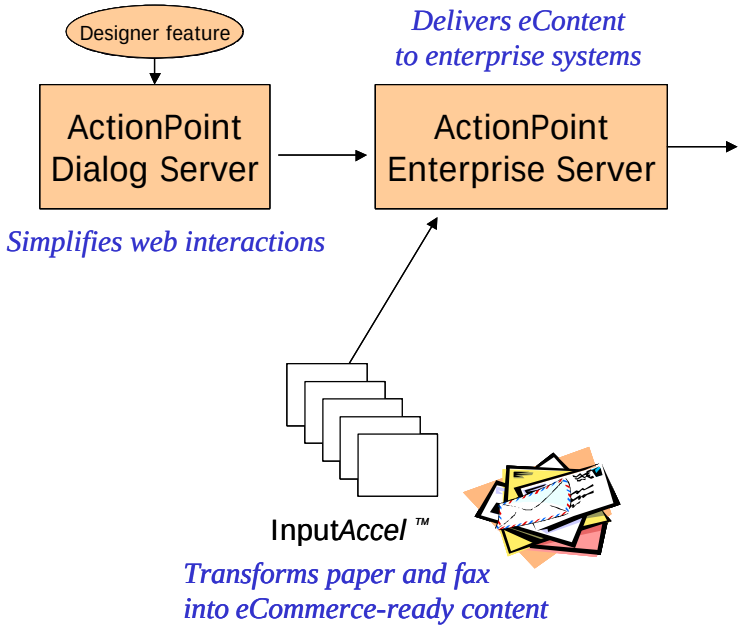

Figure 5. ActionPoint components include design tools, a web delivery engine, back office integration, and a common front door for paper and web transactions.

The ActionPoint Product Line

The ActionPoint product line (Figure 5) includes three families of products that: simplify complex web interactions, deliver eContent to enterprise systems, and transform paper and fax documents to eCommerce ready content.

The ActionPoint **Dialog Server** simplifies web interactions. Using its integrated Designer**,** a developer defines the XML data elements, their interrelationships and rules, and associates them with graphical elements of an HTML page. In an eCommerce application, when a user selects that page, the ActionPoint Dialog Server merges the XML and associated HTML, and automatically generates web pages in dynamic HTML and Javascript. These dynamically generated pages implement the action point behavior reflecting the defined relationships and rules. Much of this behavior is executed using intelligence built into the web page itself, providing validation and user guidance in real time, even before the user presses Submit.

After the user Submits the page, the ActionPoint **Enterprise Server** delivers the eContent to enterprise systems. It performs further validation checks and external data lookups, and formats the transaction data as required for XML process management software, back office workflow systems, document archives, and legacy data systems.

ActionPoint's **Input*Accel*** modules can integrate with Enterprise Server to transform paper and fax documents to eCommerce ready content. Input*Accel* provides image and data capture, the entry point for traditional, paper-based action points.

A More Technical Description

ActionPoint Designer

As an integrated feature of the Dialog Server, ActionPoint Designer (Figure 6) is used by developers to specify the data elements of the action point. Unlike other proprietary approaches, Designer uses XML Schema as its native format. In fact, ActionPoint is one of the first products available based on XSDL, expected to be the new XML Schema standard. An XML Schema specifies the data elements in an XML instance document based on it: the data types, valid ranges, whether they are mandatory, etc. As a starting point, Designer can import or replicate existing schemas based on DTDs (which are not written in XML, but are currently the most common schema format), XDR (also known as BizTalk schemas, under Microsoft's leadership), or on an existing example XML instance document.

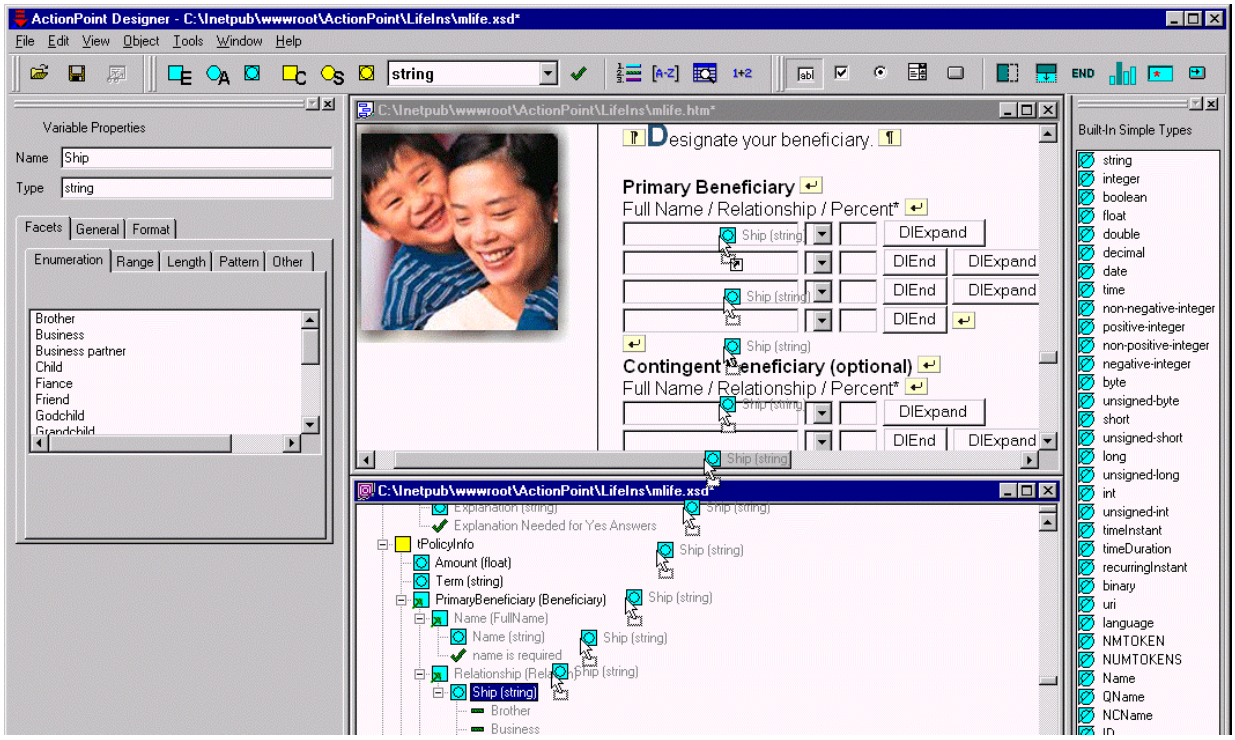

Figure 6. ActionPoint Designer links XML Schema data, extended with relationships and rules, to presentation content through a simple drag-and-drop operation.

The Designer extends standard XSDL by defining rules and inter-field relationships. For example, the bill-to and ship-to addresses must be in the same country, or the ZIP code and city/state must match. Implementing these rules as extensions to the base schema – allowed by XSDL – is key to action point implementation. There is a big difference in a business application between an XML instance document that simply conforms to the base schema – e.g., contains a "bill to" address, a "ship to" address, and a set

of line items with part number, quantity, and price – and one that is valid for processing by the business. ActionPoint can also create a human-readable report allowing a business analyst to review and audit all rules implemented by the developer.

The Designer then associates schema elements, which can be thought of as XML "variables," with HTML form elements, such as listboxes, checkboxes, radio buttons, or entire sections of a page. Designer includes a simple HTML editor for convenience, but it is assumed that most developers will use their favorite page editor to create presentation content. To link data with the content, the developer simply opens the HTML page in the Designer and drags the XML data element onto a form element on the page.

The Designer can direct the Dialog Server to look up data from an external database to populate a variable when a user in an eCommerce application accesses the page. For example, a list of available products can be mapped to a database query, automatically defining the dropdown list associated with the product selection field in a web form, or just as easily a set of radio buttons for product selection. When the data in the external table changes, the list served to the user changes automatically.

Data elements can also be calculated values. In a net market, for example, discounts established by existing buyer-seller relationships can be looked up from an external database and applied directly in the action point. When the buyer fills out the order form, the appropriate discount is instantly applied by the associated calculation formula.

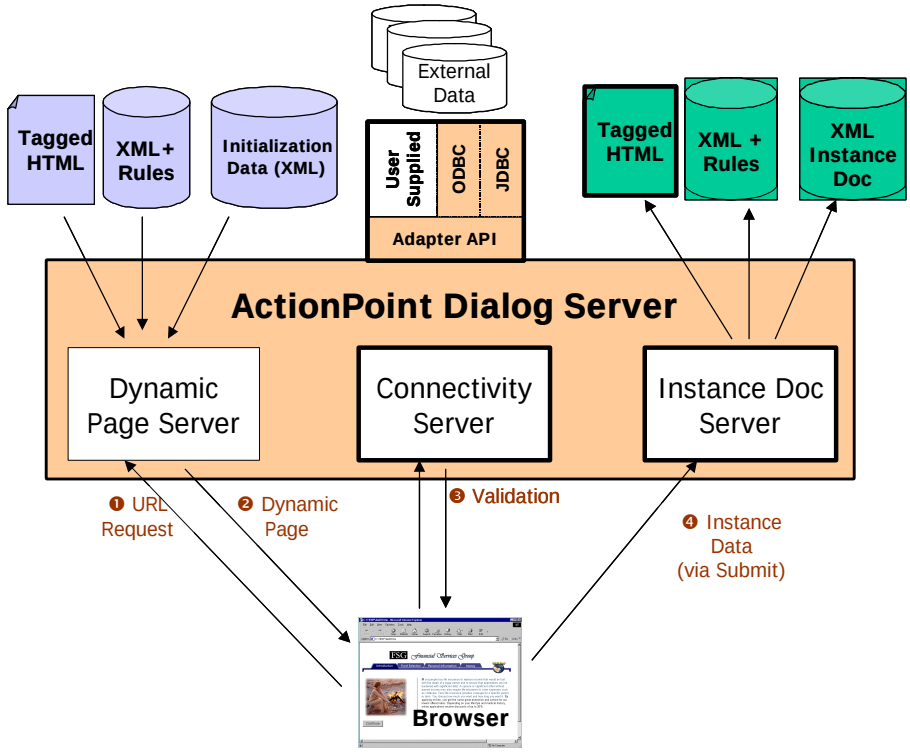

Figure 7. ActionPoint Dialog Server dynamically serves pages based on XML data, validates user input, and creates XML instance documents upon submit.

ActionPoint Dialog Server

To implement the action point behavior, the runtime component of the ActionPoint Dialog Server (Figure 7) first pulls HTML from the file system or from a content management repository, and merges it with its associated XML Schema files. It can also prefill the page with initialization data from database lookups. The resulting merged output is a set of dynamic HTML pages with embedded Javascript, cached and optionally compressed on the server to enhance performance. Each DHTML page can include an entire action point dialog, or large portion of it, allowing rules and relationships to be implemented instantaneously in the browser rather than waiting for a server round trip. This results in a visibly superior, more engaging user experience, and does not require plug-ins, downloaded Java applets, or ActiveX controls, which do not pass easily through corporate firewalls.

For example, Figure 8 illustrates configuration of a truck. Note that because the half-ton 2WD model has been selected, the option to select the 7.4L engine has been dimmed, as has the optional Auxiliary Battery. Hover text explains to the user the reason for each dimmed option. The unavailable options could just as easily have been suppressed from display entirely.

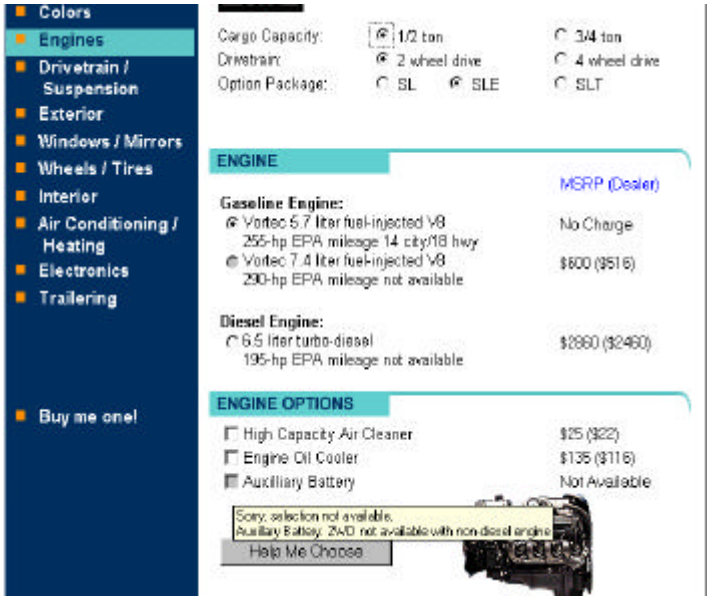

Figure 8. Business rules prevent users from selecting invalid combinations of options.

Through its connectivity server function (Figure 7), Dialog Server also supports mid-session asynchronous data access and validation, which means that if a selection list is based on external data, and that data changes after the dialog is served, the selection list seen by the user can be updated to reflect the new data.

When the user Submits the dialog, the Dialog Server creates an XML instance document, consistent with the schema, that can be passed to the ActionPoint Enterprise Server, or directly to the XML Process Management infrastructure, for processing by the net market application. In addition, the Enterprise Server can create a PDF form compliant with industry regulations and populate it with the instance data. Users of the net market application

can digitally sign the PDF, or print it out for their own records. ActionPoint thus separates the human interaction at the action point from the legal requirements for a transaction source record. It provides the former as an engaging dynamic dialog, the latter as a signed output document in a precisely specified format.

The ActionPoint Dialog Server will support both NT and Unix web servers and their associated web application server infrastructure. On Windows NT, the Dialog Server is integrated naturally with IIS or other servers as a COM object typically called by ASP pages. On Unix, the Dialog Server is a Java class library which can be integrated directly, or as a servlet or Enterprise Java Bean.

"Key to our success is reducing time to eMarkets. ActionPoint can get us there faster and improve the quality of our customers' online experiences, which helps keep Bank of America at the forefront of Internet banking."

Ed Porter, Sr. Vice President, Bank of America

ActionPoint Enterprise Server

The ActionPoint Enterprise Server is an optional system component for post-Submit processing and integration. It can create transaction confirmation documents and email them to customers, or it can perform lookups and validation based on external data, including legacy systems. If validation fails, its built-in workflow handles exception management. For example, it can notify the submitter via email with a URL link and instructions how to fix the problem, or route the item to an exception processing specialist for review, or automatically correct the problem according to a specified rule.

It can also convert the HTML presentation of an action point, including data submitted by the user, to TIFF or PDF format for archival purposes, supporting customer service, non-repudiation, and audit requirements. Many companies who routinely archive paper transaction documents for these purposes don't realize it is no less a requirement for e-business transactions. The inability to produce a disputed customer document can expose the company to a risk of huge financial losses in the paper world, and inevitably in the web world also.

InputAccel

Input*Accel* is a proven set of modules that scan paper forms and other transaction documents in very high volume, enhance the images, and extract and validate their data content, as configured by workflow and business rules on the ActionPoint Enterprise Server. It plays a critical role for most companies conducting B2B commerce today via paper and fax. Even born-on-the-web net markets should find it useful, given the volume of paper and fax still required to complete B2B eCommerce on 98% of those sites.

The Bottom Line

ActionPoint eliminates many of the barriers to building effective and engaging action points in net market applications:

- **Simplifies web interactions.** It puts the "brains in the browser" and provides dynamic presentation, the key to user engagement, without slow server round trips, preinstalled plug-ins, applets, or ActiveX downloads. It allows even complex products and services to be configured easily by users on the web, while maintaining conformance to business rules. It goes beyond configuration management to manage *all* the action points in a net market

application. Translation: lower abandon rate and maximum competitive advantage for net markets.

- **Delivers eContent to enterprise systems.** It automates the links between the action points and the XML process management infrastructure, mapping user input and external data to XML instance documents conforming to the schema.
- **Transforms paper and fax documents – action points of the traditional economy – into eCommerce-ready content**. ActionPoint's advantage in handling such transactions over the web is that the company is already handling them today in paper form with Input*Accel*. Many of ActionPoint's connections between the extracted customer data, backend transaction systems, and document repositories have been implemented by Input*Accel* customers for years, with proven scalability and reliability. ActionPoint thus offers a unique opportunity for paper-based companies to expand their business to the web and retain a common front door – common business rules, workflow, data connections, and document archive – for all transaction channels, as well as for startup net markets to handle the paper that still surrounds most B2B eCommerce.
- **Shortens the time to launch a net market.** In B2B eCommerce 2.0, the first mover has a tremendous advantage. ActionPoint dramatically reduces the time and effort required to launch and maintain a net market, by creating an auditable XML Schema-based management framework for data and business rules, and visual tools to link them to web content.

The bottom line is ActionPoint represents a new kind of XML infrastructure that provides the last mile for companies in all sectors racing to establish B2B net markets.

Bruce Silver