



White Paper

# Implementing Electronic Forms: Overview for Technical Managers

by PureEdge Solutions Inc.

Practical ideas and tips on e-forms benefits, project management, functionality, features, workflow, security, installation and more.

Written primarily for project managers,  
systems architects and IT managers.

## Why Electronic Forms?

### **The Benefits of Electronic Forms**

An electronic form can be much more than an accurate reproduction of an equivalent paper form. E-forms offer improvements over paper that enhance the user experience and dramatically improve organizational efficiency. While it may be possible to achieve the same result with a more generic technology, such as VB or Java, dedicated e-forms software allows system developers to achieve these goals faster and with less effort.

### **The Benefits of PureEdge e-Forms**

Through a rich end-user interface and powerful integration capabilities, PureEdge E-Forms create seamless, flexible and sophisticated e-business systems. At the core of PureEdge technology is Extensible Forms Definition Language (XFDL), an open “document-centric” XML language developed by PureEdge to meet all the technical, business and legal requirements of on-line contract formation.

## Features of PureEdge E-Forms

### **A Complete XML Document**

PureEdge E-Forms are complete documents, with no separate files for data and graphics. This makes them easy to use offline, route to coworkers and to archive. PureEdge technologies use XFDL, an XML language, as their native documents format, so you can utilize the many XML features and tools included in your existing systems. In contrast to the proprietary formats of other e-forms, XFDL is an open standard, so you will always be able to access your e-business records.

### **Digital Signatures**

PureEdge continues to be a leading implementer of digital signature technology that is both simple to use and extremely flexible. Developers have full control in defining exactly which sections of the document are signed, and who can do the signing. More importantly, the PureEdge document model ensures that all of the crucial elements – data, presentation, and logic – are included in the digital signature.

### **A Consistent Electronic Representation of Your Documents**

Accurately reproducing a paper document in HTML has always been problematic. Newer additions to HTML, such as CSS, have improved the situation, but there are

still problems. An XFDL document rendered by the PureEdge Viewer will always have the same appearance, on any screen and if the document is printed.

### **Easily Integrated E-Forms**

Your organization has likely already invested in web server and database software. You may have also acquired software to help with document management, workflow, or PKI (Public Key Infrastructure) and digital signatures.

PureEdge e-Forms are simple to integrate into almost any existing software environment. For the most part, there is very little overlap in the functionality that PureEdge provides, and that provided by other packages. The investment in PureEdge technology is complementary, rather than contradictory, to investments you have already made.

In order that third-party tools may easily manage them, PureEdge has carefully designed XFDL documents to be compact, self-contained, and standardized.

### **Powerful Functionality**

XFDL is a unique language. It combines document description capabilities with the computational power of a spreadsheet. Once you understand the syntax, establishing relationships between elements in your document is a simple exercise.

Creating a truly “dynamic” document is possible. You can set up a PureEdge e-Form to add sections, or even entire pages, “on the fly” as dictated by user interaction.

If bandwidth is a concern for your project, PureEdge has features that may help. Developers can set-up documents so that they transmit in compressed format. Further, they can define exactly which portions of the document they want submitted.

If your business process requires features unavailable in PureEdge E-Forms, your developers can easily extend PureEdge client-side software with their own C/C++ or Java modules.

## **A “Document-Centric” Approach**

From the start, XFDL was designed to reproduce the beneficial aspects of paper documents. So while XFDL documents offer all the advantages of electronic documents, there is also a straightforward transition from paper.

With this in mind, it pays to invest the time required to fully understand the business processes you are automating, especially if you are modernizing a long-standing paper process.

The traditional approach to systems design often focused on data and not on documents. Data was captured through a user interface and mapped to database fields.

The problem with this approach is that legal, regulatory and contractual matters most often apply to documents taken as a whole. The legality is lost forever if the data is extracted without retaining all other aspects of the document. XFDL was designed so that the entire document would have permanency. XFDL moves from the “data-centric” to a “document-centric” model.

### **Forms Life Cycle**

With this “document-centric” approach, it helps to understand the life-cycle and value of the documents involved in the system you are building. Examples of good questions to ask during initial project development stages include:

- What is the purpose of this document? Who uses it? How long is it retained? Does it have the potential to be used in dispute resolution? Might we ever have to use it to defend our organization in court?
- Is the data collected in the document used in other ways? How do we currently communicate the data? Is there privileged information in the document? Who should have access to the privileged information?
- What level of security do we currently have in the process? Do we need to make the system more secure?
- Who designed the original form? Who processes submitted forms? Does the legal or compliance department need to approve any changes to the document?

Posing these questions early in the development process avoids unpleasant surprises near the end. The more questions asked, and the more targeted they are, the smaller the surprises will be.

### **The Limitations of Paper**

Take care not to replicate the limitations of paper-based systems. For example, there may be ways to address space limitations in an e-form that are not possible on paper.

If you are moving an existing paper process online, it may be possible to significantly simplify it. Separate but linked documents may be integrated into single, multi-page e-forms. Duplicated fields and information may be removed, or automatically pre-populated when known users first open a blank form. Dynamic, “wizard”-like interfaces can simplify the process of filling in a form. By taking advantage of the rich user interface and powerful integration capabilities of PureEdge E-Forms, e-business processes can be much more efficient than their paper equivalents.

## **Document Routing and Workflow**

All documents move from person to person. By their nature, they are a means of communication. The simplest movements are often referred to as document routing. More complicated movements, especially when the document is used to capture and track a unit of work, are often called workflow.

### **Routing and Workflow Technologies**

The simplest and most common method of document routing is via e-mail. If you need someone to complete a section of a document, you include the document as an attachment to an e-mail. Doing this with PureEdge E-Forms can be as simple as a mouse click. Each document is a single XFDL file, so users do not have to bundle disparate template, data and graphics files. And PureEdge E-Forms can contain e-mail buttons that will, when clicked, automatically create an e-mail message with the e-form already attached.

Routing via e-mail has disadvantages. There is no way to automatically track or monitor the movement of e-mail documents. The participants must be vigilant to ensure that a piece of work is not misplaced or forgotten. E-mail systems are often not very secure.

If the process is complicated, with many participants, and if there are many decision points in the routing scheme, the purchase of a third-party workflow package is recommended. Most of these packages will allow attachments to units of work, so integration is achieved simply by attaching the XFDL document.

PureEdge customers who don't want the expense of purchasing a third-party workflow package often construct a simplified workflow system themselves. Typically,

a database is used to monitor the status of the documents and the participants in the process. Documents are never sent by e-mail. Rather, notifications are sent by e-mail and these provide hyperlinks to the documents. User authentication can then be enforced and the documents can be communicated via secure SSL to prevent unauthorized access.

### **Issues in Routing and Workflow**

Regardless of the routing method used, there are issues that need to be addressed when the e-form moves from person to person. Inevitably, the appearance and behavior of the document will need to change as each person handles it.

For example, consider a mortgage application. The applicant will be required to fill in personal and financial information and sign. After submission, this section of the document should become locked, while another section of the document becomes active for the bank officer to indicate approval. Because XFDL computes are “state-based”, implementing this logic in a PureEdge E-Form is very easy.

It is very important to consider how the behavior of documents changes as they move from person to person. The system should be designed so that it is impossible to complete the wrong section of a document. Proper visual clues should be included to guide each user to appropriate sections of the document. All of this must be taken into consideration during the design and testing phases.

## **Features that Could Impact System Design**

### **Computes In XFDL**

XFDL is a “state-based” programming language. (A well known state-based computational model is a computer spreadsheet.) As with spreadsheets, XFDL documents are constantly being automatically re-evaluated to ensure all dependencies are kept current. Because of this, it is extremely easy in an XFDL document to map values. For example, if a person’s address is entered at the top of the first page, it would be very easy to have the address information automatically appear at other places in the document.

The impact on system design is that it is often simpler to consolidate multiple related forms into a single multi-page e-form, to save the complexity and programming time of obtaining related values through a database.

**Attachments**

PureEdge e-Forms allow other documents to be attached. These attached documents are actually encoded and embedded into the XFDL code. The result is that attached documents can be covered by the form's digital signatures. Once an attachment has been signed, it cannot be altered without "breaking" the signature. For this reason, PureEdge E-Forms often serve as signed "envelopes". Once signed, the documents in the envelope are safe from tampering. This is a valuable feature that ensures business integrity, regulatory rigor and legal validity.

**Client-Side Extensions**

The capabilities of XFDL and the PureEdge Viewer can be enhanced through the creation of custom extension modules using C/C++ or Java. An extension may read or write to the XFDL document from which it was called. Extensions can also access the local file system and communicate over the network.

The potential uses of extensions are limitless. One example is a financial services form where the user enters the date of a transaction and the currency type. An extension could automatically convert the digits to their text equivalent (e.g., "Twelve Thousand Dollars...") or retrieve the current exchange rate from an Internet service.

**Dynamic Forms – Changing XFDL On-the-Fly**

It is possible to have the underlying XFDL code change "on-the-fly" in response to user actions. For example, an XFDL form could be built that automatically generates additional "comments" pages as the user fills available space in a "comments" field. Items in an XFDL document can be added or removed as required to create a truly dynamic document. For developers, the incredible power of PureEdge e-Forms is revealed when they start creating C/C++ or Java extensions to tailor a form according to selections the user makes.

**Auto-Expanding Fields**

One of the classic problems in translating a paper form to an e-form is whether to allow scrolling in individual fields. It is commonplace in user interfaces to allow users to type more than will fit in the physical space presented by a field. Yet if you let a user type beyond the physical bounds of a field, only the visible portion will appear when the document is printed. Since it is often important to retain the ability to create a printed copy of a document, this is unacceptable.

PureEdge has developed a solution to this problem. Since XFDL is state-based computation language, every option can be determined as the result of a computation. This includes the width and height of a field. So, we can allow the user to type

beyond the physical size limit of a field, and when they tab out of the field, we can automatically adjust the height of the field to accommodate all of the content.

### **Relative Positioning**

XFDL allows for dependencies in physical locations and sizes of items. For example, it is very easy to specify that a field should always be located to the right of a particular label. In a static form design, this isn't as useful. But since PureEdge forms can be very dynamic, items can shift positions and sizes. A flexible, relative positioning scheme ensures that if one item moves or changes size, the items around it automatically shift and resize accordingly.

## **Security**

When considering an e-forms application, especially one that has the potential to include digital signatures, there are three important security considerations:

### **Authentication**

Authentication usually involves a user providing some proof of identity. This can be via input of a user name and password, or through more sophisticated means. PureEdge software allows you to extend the scope of authentication through the use of digital signatures. Long after the fact, you will still be able to verify the identity of a person who signed a document.

### **Non-Repudiation**

Non-repudiation implies that a party to an agreement will not be able to repudiate an aspect of the agreement at a later date.

The digital signature capabilities of PureEdge e-Forms have been designed to provide the highest level of assurance that neither the signing process, signed content, nor the identity of the signer can be disputed. Other products only allow you to sign the user's input. This model is flawed, because the signer would be able to dispute the content or presentation of the questions in the original e-form. It is absolutely essential that a digital signature captures all aspects of the agreement being signed, including data, presentation, and all logic embedded in the electronic document.

### **Privacy**

Often it is important that unauthorized persons not see the contents of your documents. Most e-mail flows over unsecured network lines and could potentially be intercepted and read. If you need the contents of your documents to be private, they should only be transmitted in encrypted form. The standard method for

accomplishing this over the Internet is by using SSL (Secure Socket Layers). PureEdge e-forms are fully compatible with SSL. If your organization requires additional levels of encryption, contact the PureEdge Service Department, who have a great deal of experience on projects with unique encryption requirements.

It is important to realize that no system is 100% secure. Your responsibility is to implement enough security that the amount of effort required to defeat the safeguards is too great to be attempted. Overall security is directly determined by the weakest link in your system. For example, there is no point in encrypting user submissions if you later use FTP to batch upload unencrypted data over unsecured lines.

## The PureEdge E-Forms Viewer

PureEdge E-Forms are viewed, filled, signed and submitted with ICS Viewer™, which can operate as either a stand-alone application or from within either Microsoft Internet Explorer or Netscape Navigator.

ICS Viewer™ was developed with Internet commerce in mind, and as such is relatively small and is easy to install. Even so, within large organizations there is often a reluctance among system administrators to assume responsibility for installing and maintaining additional software, and at the same time end-users are often limited in what software they can install themselves. Approaches to overcome each of these problems are given below:

### **Options for Installing ICS Viewer™**

1. The easiest method of installation is to give the users a link to the PureEdge Viewer install program.
2. If you have a controlled user group, the best way to get the Viewer installed is to have your system administrator include it on the system build image.
3. If you want a fully automated install and update, consider using ICS Deployment Server™ (IDS). Whenever a new user visits your application's home page, a check will automatically be performed to see if they have the current ICS Viewer™. If they don't, a dialog box will appear, and with user consent, ICS Viewer™ will automatically be downloaded and installed without any input required from the user. IDS may be used to install other companies' software as well.

## Project Management Ideas

### **Assign An In-House PureEdge Specialist**

Ideally, pick at least one person to attend a PureEdge training session. All of the technical support questions to PureEdge should flow through him or her. If you can't send someone for training, it is still advantageous to assign a specialist. Encourage this person to maintain a file that documents all correspondence with PureEdge.

Having a single point of contact helps to simplify the relationship with PureEdge. Our technical support staff will have a greater familiarity with your specialist than would be possible if many people within your organization call for support. Communication will be more efficient, because it will be less likely that the same question will be asked more than once. Maintaining a PureEdge file is very important. With the high rate of staff turnover in IT, it is very likely that your specialist will move on at some point. Having an up-to-date file will greatly aid his or her replacement.

### **Schedule Regular Consultations with PureEdge Service Consultants**

This is particularly important during the early stages of project development.

Why? The cost of these consultations is going to be much less than the cost of fixing a design flaw. In addition, regular consultation helps to develop a familiarity for your project within PureEdge. As a result, responses to technical support queries will probably be faster and more targeted towards your project. It also improves the confidence of your project team to know that specialists have reviewed their design.

### **Use Prototypes**

It is particularly important to prototype if this is your first project using new software tools or technology. Prototyping should occur early in the development cycle and should attempt to represent the most important functionality.

Why? Your team's time estimates will be far more accurate once they have some familiarity with the software. By spending some hands-on time with the technology, your developers will discover many features that can be put to good use in your projects.

### **Add an Extra Development Server**

Your developers should have administrative access to a server. If they don't, acquire another server.

Why? During development, especially when trying to debug problems, relying upon system administrators to install components, access log files, restart, etc., can cost days or even weeks. This may sound like an exaggeration, but PureEdge has experienced this over and over again with many different organizations.

**Details Matter**

Ultimately, the success of your project will depend upon user acceptance. To illustrate this point, consider an e-form that has been designed with a white background for both the input fields and the page itself. A user presented with this page for the first time will have no idea how many fields there are to be filled, or how big the individual fields are. Simply assigning a background color for the page would have solved the problem. Visual clues that aid the user are invaluable, and encourage acceptance.

## *Appendix – An Introduction to XML*

The W3C (World Wide Web Consortium) defines XML as a “universal format for structured documents and data on the Web”. It is a “metalanguage”, used to describe other computer languages. Source code for XML documents resembles HTML, in that all XML documents use bracketed tags (“<” and “>”) to delimit data.

XML by itself is rather unspectacular. The power of XML comes from its ubiquity – many standard and specialized software tools exist to import, export and process XML, facilitating integration between systems and reducing overall development costs.

XML typically separates “data” and “presentation”. This makes it possible to present the same data in multiple applications across multiple platforms. An exception to this is Extensible Forms Definition Language (XFDL), which defines all features of an electronic form – its presentation, data and logic – to ensure that complete records of business documents can be created. Even so, data can be extracted and processed by XML-driven and legacy systems.

For more information on XML, visit the web site of the W3C (<http://www.w3c.org/>). You will find a good overview of XML at <http://www.w3.org/X>



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### About PureEdge

PureEdge Solutions is the leading provider of secure XML e-forms solutions for governments and regulated industries. The PureEdge Internet Commerce System™ (ICS) enables businesses to create, capture, process and archive secure XML e-forms, and integrate them seamlessly with infrastructure and legacy systems. By moving valuable business documents to the Web, PureEdge helps government and business organizations including the Securities & Exchange Commission (SEC), JPMorgan Chase, and the U.S. Department of Defense to save money and reduce paperwork, ensure their applications are secure, and extend their e-business systems to employees, customers and partners. For more information, visit [www.PureEdge.com](http://www.PureEdge.com) or call 1-888-517-2675.

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