Adobe®
Building XML Forms with PDF

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March 11, 2003

Overall Presentation Goal

Understand the reasons for implementing XML form applications and the Adobe technologies and products that are part of the solution

Learning Objectives

- **As a result of this presentation, you will:**
  - Understand the business reasons for XML Forms
  - Be familiar with current government initiatives
  - Understand the process flow involved in implementing a solution
  - Learn about Adobe technology for XML
  - Learn about Adobe products which can be used to implement an XML Forms solution

Agenda

- **Business Case for XML Forms Solutions**
- **The Role of Forms**
- **Representative Form Example**
- **Government & Adobe Architectures**
- **Demo (Acrobat 6 and XML Forms)**
- **Adobe Forms Technology**
  - Why XML Forms and PDF
  - Evolution of Adobe Technology for Forms
  - Customer Requirements for XML
  - Adobe Products and Solutions

Business Case for Forms Solutions

Citizen Centricity and Forms

"Citizen centricity is supposed to be a driving force for the eGov Strategy, and from the perspective of the citizen 'transactions' are 'forms'."

— Owen Ambur, DOI, Co-Chair XML WG, 12/19/02

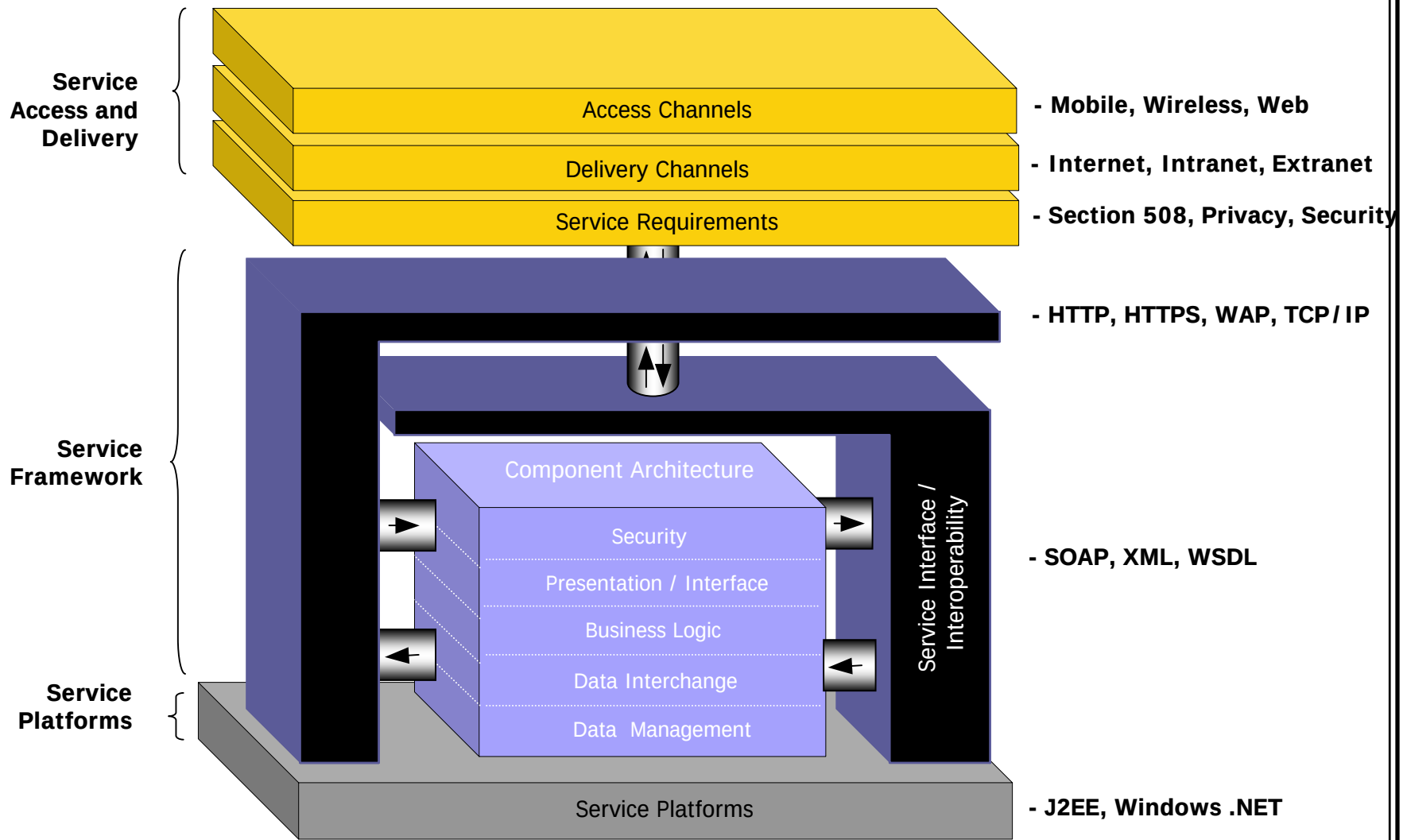
Market Imperatives:
Factors You Should Care About

- Improve constituent services
- Streamlining internal efficiencies
- Standards based
- Security
- Accessibility
- Back end integration
- Fraud and Abuse Prevention/Reduction
- Communicate, Collaborate, Interoperate

E-Government Initiatives (24)
A subset

- **Internal Efficiency & Effectiveness**
  - Recruitment One-Stop, Integrated HR, e-Clearance, e-Payroll, e-Travel, e-Records Mgmt., etc.
- **Government to Citizen**
  - Recreation One-Stop, Eligibility Assistance Online, Online Access to Loans, USA Services, EZ Tax Filing, etc.
- **Government to Business**
  - Online Rulemaking Mgmt., Expanding Electronic Tax Products for Businesses, One-Stop business Compliance Info, etc.
- **Government to Government**
  - e-Grants, Disaster Assistance, e-Vital, (etc.)

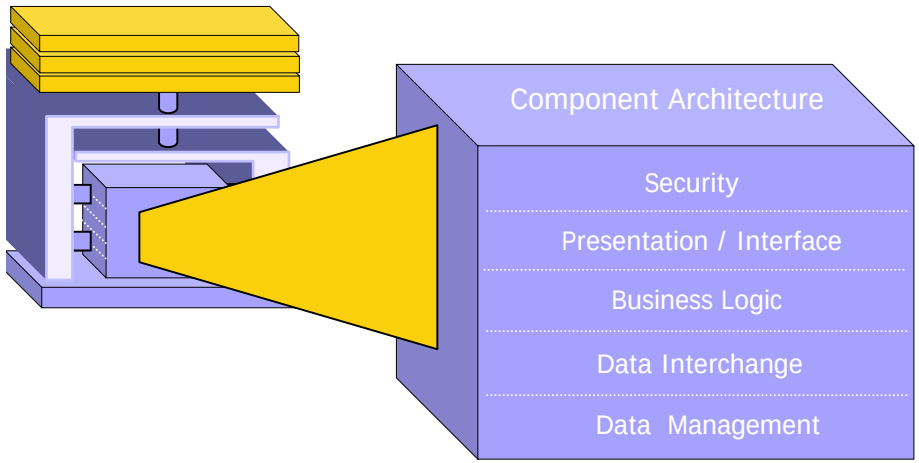
Draft Government Federal Enterprise Architecture Technical Reference Model



* Graphic from Bob Haycock's FEA Presentation, XML 2002 Conference name xml02/baltimore

PDF and Acrobat Relationship with FEA Component Architecture

Adobe



Security

- X.509 PDF ACROBAT
- NIST / FIPS 186
- Secure Socket Layers (SSL) ACROBAT

Presentation / Interface

- HTML, SVG ACROBAT
- JSP, ASP, ASP.Net
- DTHML, CSS, XHTML ACROBAT
- XSL-FO ACROBAT
- PDF PDF ACROBAT
- XML Forms PDF ACROBAT

Data Management

- XBRL, JOLAP, OLAP ACROBAT
- JDBC, ODBC ACROBAT
- ADO, ADO.Net ACROBAT
- SOAP

Data Interchange

- XML PDF ACROBAT
- ebXML
- RDF, XMP, DC PDF ACROBAT
- WS-I
- XSLT ACROBAT

Business Logic

- Java/J2EE (EJB) ACROBAT
- C, C++, JavaScript PDF ACROBAT
- COM/COM+, C# ACROBAT
- Visual Basic ACROBAT

* Graphic from Bob Haycock's FEA Presentation, XML 2002 Conference name xml02/baltimore

XML is the Foundation of the Technology Stack

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	Company/User Variants or Unique Schemas						
Industry Segments	Manu facture	Health	Insure	Finance	Finance Educ.	Publish	HR
Vertical Vocabu-laries	Rosetta Net	HL7	ACORD	MISMO XBRL	XMP RIXML SCORM	NewsML OEBF	HR-XML
Industry Initiatives	SOAP WSDL	ebXML	XML/ EDI	UBL	RDF	SVG SMIL	XHTML
Core XML	DTD, XSD, XPATH, XSLT, DSIG…						
	XML 1.1						

http://www.oasis-open.org/committees/ciq/Press/xml%20standards.pdf

* http://xml.coverpages.org/ and http://www.xml.org/

Roles of Forms and Phases of Forms Solution Implementation

Roles and Requirements of Electronic Forms in Government & Industry

Adobe

- **An interface to the constituent**
  - At no cost to the constituent
  - Available on any device and OS
  - Off-line and on-line
- **A data capture mechanism**
- **An integration vehicle to back end systems**
- **The human interaction point with a process**
  - Route for commentary, approvals, signatures, etc.

Government Agency Form Use

- **For many Government agencies**
  - Forms are the primary method of data interaction
  - Forms are one of the official interfaces to the agency
- **GSA Forms Site**
  - Centralized store for many government forms
- **Individual Agency Forms Repositories**

Issues in Developing an XML Forms Solution

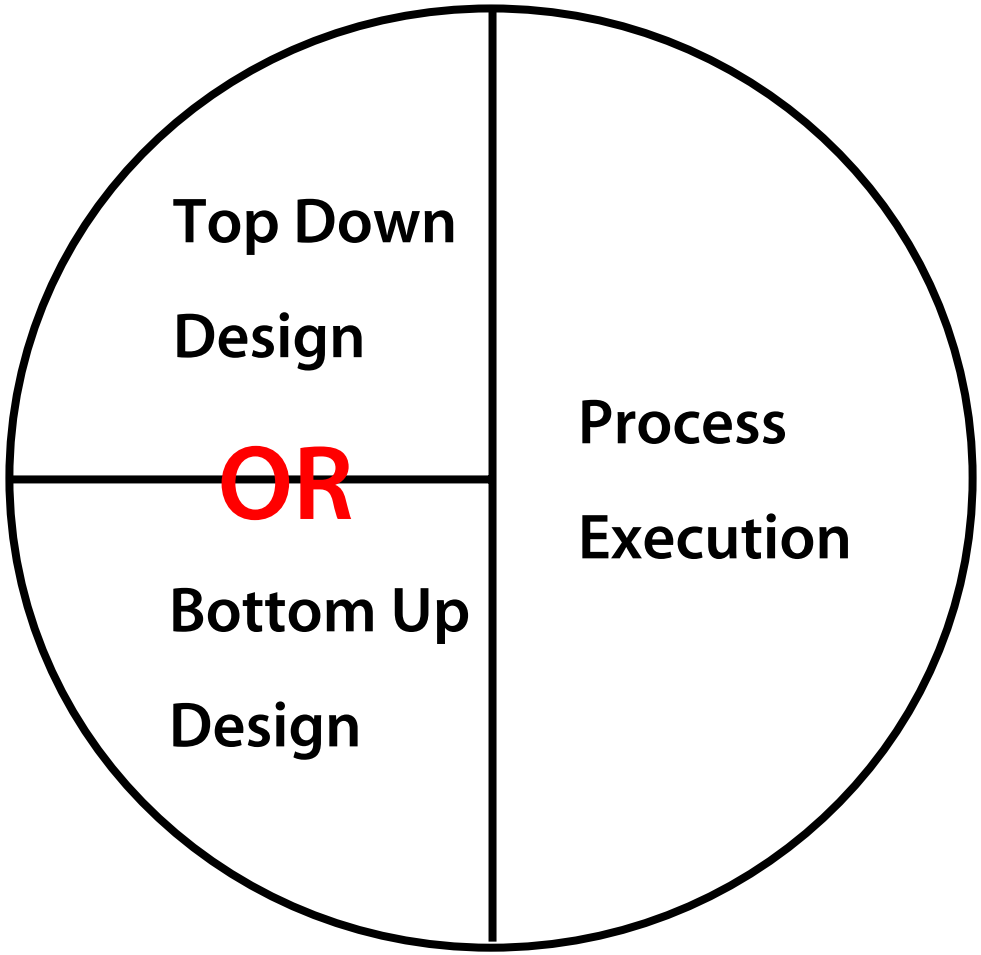
Adobe

- **How to define elements that capture the data represented in the forms**
- **How to define schemas that use the elements**
- **How to reduce duplicate efforts**
  - identify common elements and schemas
  - Develop a DRM (Data and Information Reference Model)

Phases of Developing an XML Forms Solution

Adobe

Design Time



Run Time

Design Time (Top Down)

- **Identify Business Process**
- **Identify Data Involved in Business Process**
- **Derive Data Elements and Schemas**
- **Register Elements and Schemas**
- **Where Does Data Come From?**
  - Collected via an e-Form?
- **Associate Form Elements to Schema Elements**
  - Create Form Template
- **Register Form Template and store in Repository**

Design Time (Bottoms Up)

- **Start with a Paper Form**
- **Create an Electronic Version of the Form (PDF)**
- **Create a Fillable Form (PDF)**
  - Add live fields to PDF
  - User enters data into PDF form
- **Add embedded logic to Fillable Form (PDF)**
  - Validate and format data as it is entered
- **Add element and schema definitions (PDF w/ XML)**
- **Automate Form data (pre-fill, extraction)**
  - PDF XML Forms
  - Form Designer, Form Server, Document Server w/Reader Extensions

Run Time

- User Searches Registry/Repository for Appropriate Form Template
- Download e-Form
- Fill out Form
- Return Form
- Submit Form Data
- Archive Form
- Send Form and/or Data to Next Step in Process
  - DB, Web Service, Another Form

Registries, Forms, and Schemas

"... Registering the data elements ... and the XML schemas that are implicit in our existing forms is the fastest and best way to facilitate specification of the DRM [Data and Information Reference Model] and ... to reconcile needless redundancies and inconsistencies."

— Owen Ambur, DOI, Co-Chair XML WG, 12/19/02

U.S. Government Registry Examples

- US Navy
  - http://navycals.dt.navy.mil/dtdfosi/repository.html
- US Army
  - http://www.asrl.com
- EPA
  - http://www.epa.gov/edr/
- Justice Standards Registry
  - http://it.ojp.gov/jsr
- NIST
  - http://www.itl.nist.gov/div897/docs/electronic_commerce_registry.html
- Registry Implementations Are Based on Use of Open Source Implementation of OASIS ebXML Registry/Repository specification
  - http://ebxmlrr.sourceforge.net

Form Example

E-grants

eGrants Pilot Example

- **eGrants Forms**
  - http://www.whitehouse.gov/omb/grants/grants_forms.html
- **Specific investigation of form SF424**
- **Output XML according to e-Grants "core elements"**
  - http://grants.gov/docs/CoreDataElements.pdf
- **Define Elements and Schema**
- **Create Interactive Form**

Form SF424

Adobe Acrobat - [sf424-egrants.pdf]

File Edit Document Tools View Window Help

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Bookmarks Thumbnails Comments Signatures

APPLICATION FOR FEDERAL ASSISTANCE

OMB Approval No. 0348-0043

1. TYPE OF SUBMISSION: Application ☐ Construction ☐ Non-Construction; Preapplication ☐ Construction ☐ Non-Construction		2. DATE SUBMITTED January 29, 2003	Applicant Identifier
		3. DATE RECEIVED BY STATE	State Application Identifier
		4. DATE RECEIVED BY FEDERAL AGENCY	Federal Identifier

5. APPLICANT INFORMATION

Legal Name:	Organizational Unit:
Address *(give city, county, State, and zip code):*	Name and telephone number of person to be contacted on matters involving this application *(give area code)*

6. EMPLOYER IDENTIFICATION NUMBER *(EIN):*

☐☐ — ☐☐☐☐☐☐☐

7. TYPE OF APPLICANT: *(enter appropriate letter in box)* ☐

A. State
B. County
C. Municipal
D. Township
E. Interstate
F. Intermunicipal
G. Special District
H. Independent School Dist.
I. State Controlled Institution of Higher Learning
J. Private University
K. Indian Tribe
L. Individual
M. Profit Organization
N. Other (Specify) _____

8. TYPE OF APPLICATION:

☐ New ☐ Continuation ☐ Revision

If Revision, enter appropriate letter(s) in box(es) ☐ ☐

A. Increase Award B. Decrease Award C. Increase Duration
D. Decrease Duration Other *(specify):*

_____

9. NAME OF FEDERAL AGENCY:

10. CATALOG OF FEDERAL DOMESTIC ASSISTANCE NUMBER:

☐☐ — ☐☐☐

11. DESCRIPTIVE TITLE OF APPLICANT'S PROJECT:

1 of 2 8.5 x 11 in

Core Data Elements

Adobe Acrobat - [CoreDataElements.pdf]

File Edit Document Tools View Window Help

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Bookmarks Thumbnails Comments Signatures

7/26/2002

Grant Application Core Data Elements for First Release Version

Application Information									
LN	**194 Data Element Name**	**SF424 Name**	**Description**	**Core****	**SF424**	**Data Type***	**Length**	**Required**	**Duplicates**
1	Construction Application Indicator	Type of Submission	Indicates the application includes one or more construction projects.	C	1	AN	45	No	No
2	Application Date	Date Submitted	The date the application was submitted.	C	2a	Date	8	Yes	No
3	Applicant's Application Identification	Applicant Identifier	The grant applicant's unique identifier for the application.	C	2b	AN	30	Yes	No
4	Date Received by State/Other Reviewer	Date received by State	Date received by state or other reviewer	C	3a	Date	8	No	No
5	Reviewing Organization Application Number	State Application Identifier	The application number assigned by a reviewing organization taking action prior to the submission of the application to a Federal Agency.	C	3b	AN	30	No	No
6	Date Received by Federal Agancy	Date Received by Federal Agancy	Date Received by Federal Agancy	C	4a	Date	8	No	No
7	Federal Agency Application Number	Federal Identifier	Federal ID Number	C	4b	AN	30	No	No
8	Application Type	Type of Application	Type of application being submitted. 6A – Accomplishment Based Renewal 6C – Competitive Renewal 6N – Non-competitive Renewal 6R – Resubmission S4 – New Application TS – Application Transfer	C	8	Code	2	Yes	No
9	Application Purpose		The purpose of application being submitted. 00 – Original	C	8	Code	2	Yes	No

1 of 22 11 x 8.5 in

eGrants Sample Schema

```
<?xml version="1.0"?>
<xsd:schema targetNamespace="http://www.grants.gov/schema"
xmlns:egrants="http://www.grants.gov/schema"
xmlns:xsd="http://www.w3.org/2001/XMLSchema">
        <xsd:element name="SF424" type="egrants:_SF424"/>
        <xsd:complexType name="_SF424">
          <xsd:sequence>
            <xsd:element name="SubmissionType" minOccurs="0">
                <xsd:simpleType>
                  <xsd:restriction base="xsd:string">
                        <xsd:enumeration value="A"/>
                        <xsd:enumeration value="P"/>
                  </xsd:restriction>
                </xsd:simpleType>
             </xsd:element>
```

Sources of XML elements and schemas Types of User Defined XML

- **Horizontal Schemas (UBL)**
- **Vertical Industry Standard Schemas**
  - Healthcare (HL7, HIPPA)
  - Travel (OTA)
  - Insurance (ACORD)
  - Manufacturing (NEMI/IPC, RosettaNet)
- **Internal Organization Specific Schemas**
  - Document Templates/Reports
  - Dashboards/Tables
  - Spreadsheets/Databases
  - Enterprise, BU, Workgroup Data Models/Dictionairies

Demo
XML PDF Forms

Demo: Adobe XML Forms Technology

- **Example of XML schema for a government form**
- **Elements of form associated to form fields**
- **User fills out form**
- **XML Data extraction**
  - On the back end
  - Submitted via a web service

Adobe

Adobe Architectures for Implementing XML Solutions

XML Architecture Core Elements

Adobe

XML Data Interoperability

Intelligent Routing and Integration

- Integrate with enterprise application through Web Services
- Native support for interchange with arbitrary XML

XML Template Definition

Business Logic

- **Ability to merge and extract XML data**
- **Ability to create business logic based on XML**
- **Ability to inter-operate with industry standards, e.g. ebXML**
- **Support for schema based data element validations**

Presentation

- **Presentation expressed in XML**
- **Ability to abstract presentation for multi-channel rendering (PDF, HTML, Print)**
- **Support for XML based Digital Signatures**

Adobe XML Forms Technology

Anatomy of a PDF & XML Document

Document contains logic, signatures and validation

PDF

Presentation

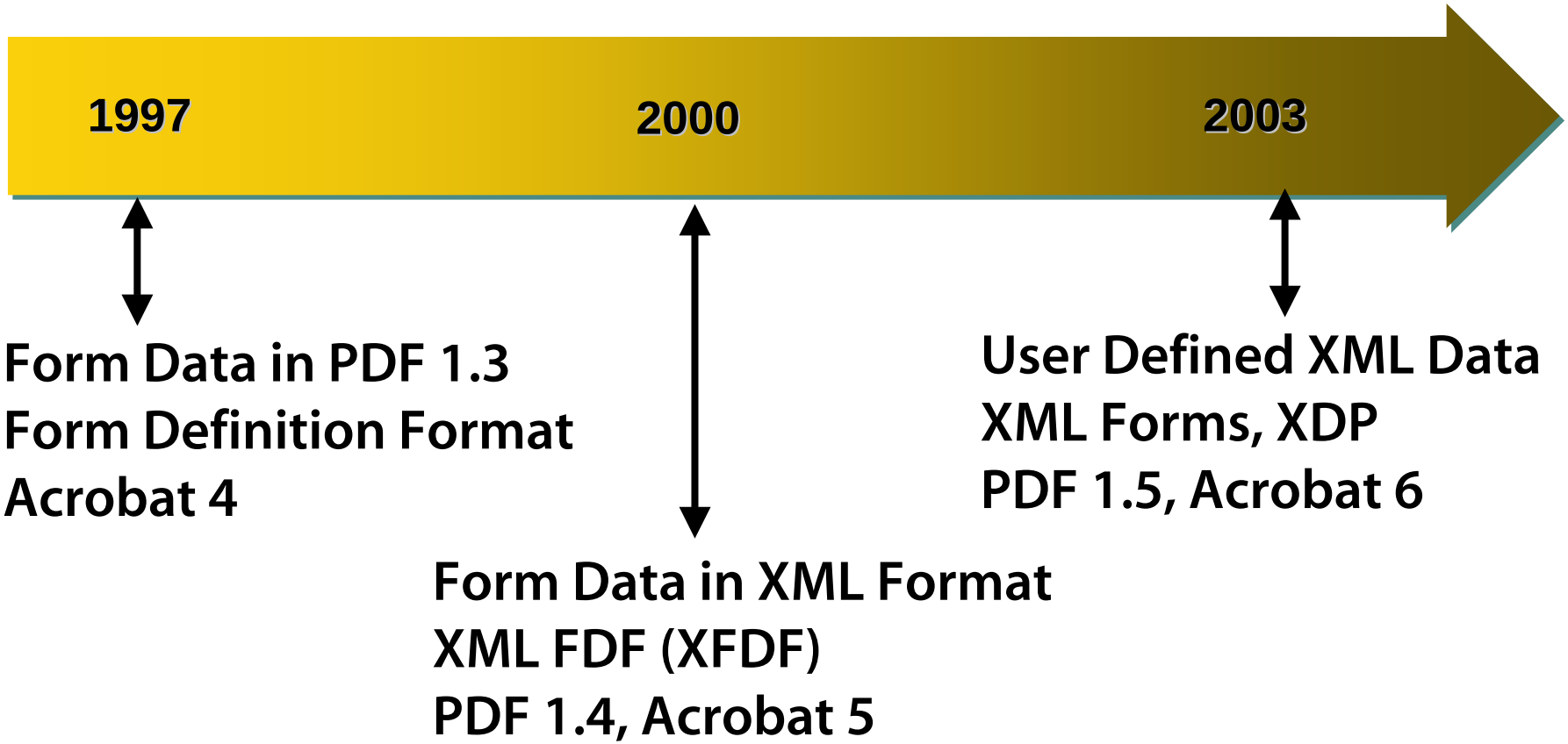
Business Logic

Transportable Data

Associated data can be transported via XML

Evolution of Adobe Forms Technology

Providing Form Solutions for Years



Customer Requirements for XML

- **User-defined XML**
- Use of Industry Standards
  - Tools (like Parsers)
- Integrate PDF into existing XML workflows
  - XML & PDF together
- Web Service Interoperability

User-defined XML

```
<?xml version="1.0" encoding="UTF-8"?>
<Purchase>
<LINE_ITEM>
<DESCRIPTION>Widget #1</DESCRIPTION>
<QUANTITY>10</QUANTITY>
<UNIT_PRICE>33.33</UNIT_PRICE>
<EXTENDED_PRICE>333.30</EXTENDED_PRICE>
</LINE_ITEM>
…
<SUBTOTAL>509.30000000</SUBTOTAL>
<TAX>36.92000000</TAX>
<TOTAL>546.22000000</TOTAL>
<ORDER_DATE>03/03/2003</ORDER_DATE>
<REQUISITION_NO>01-02-03</REQUISITION_NO>
</Purchase>
```

Purchase Order

Order Date: March 3, 2003 Requisition No: PO:01-02-03

Vendor Name and Address	Ship To

Description	Quantity	Unit Price	Extended Price
Widget #1	10	33.33	$333.30
Widget #2	4	44.00	$176.00
	0	0.00	$0.00
	0	0.00	$0.00
	0	0.00	$0.00

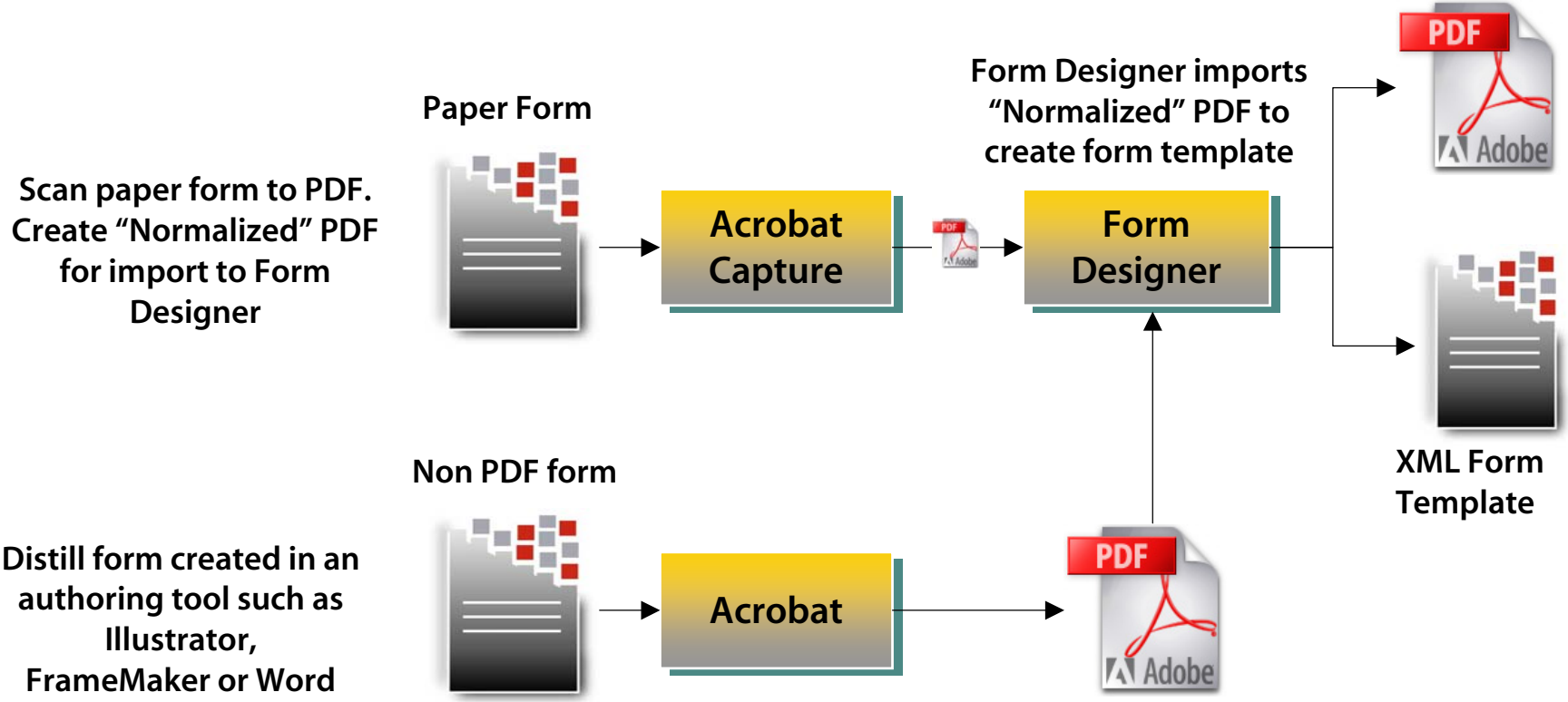
Next Previous

Subtotal	509.30
Tax @ 7.25%	36.92
Total	546.22

Allow Arbitrary XML Forms Data

- **User-defined XML as forms data**
- **XML-based form definition template**
- **Embedded calculations and business logic in form through JavaScript**
- **XML Data mapping and transformation**
  - Simple and automatic or very complex (XPATH, XSLT)
- **Adobe Forms Designer**
  - Creates forms layout
  - Specify behavior
  - Specify XML data mapping

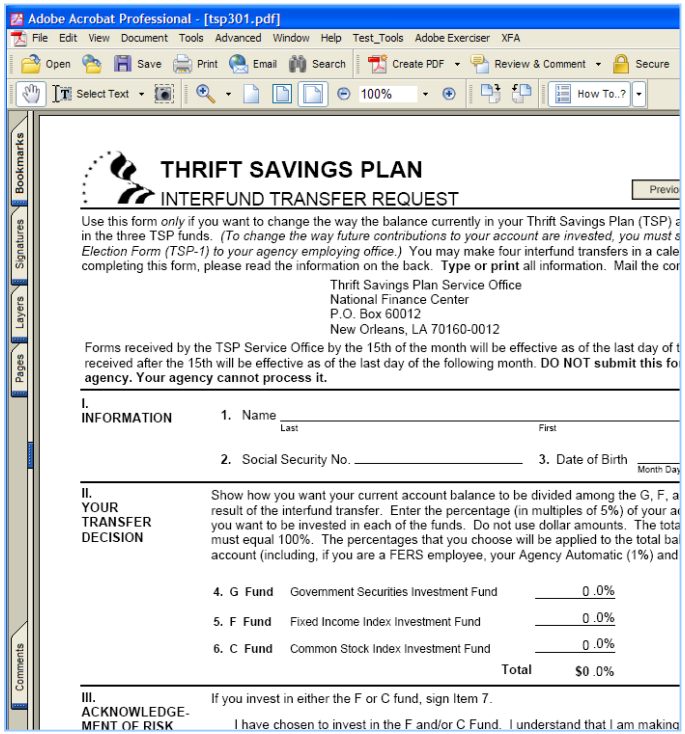
Adobe Form Designer 5.0
PDF Form Creation Method

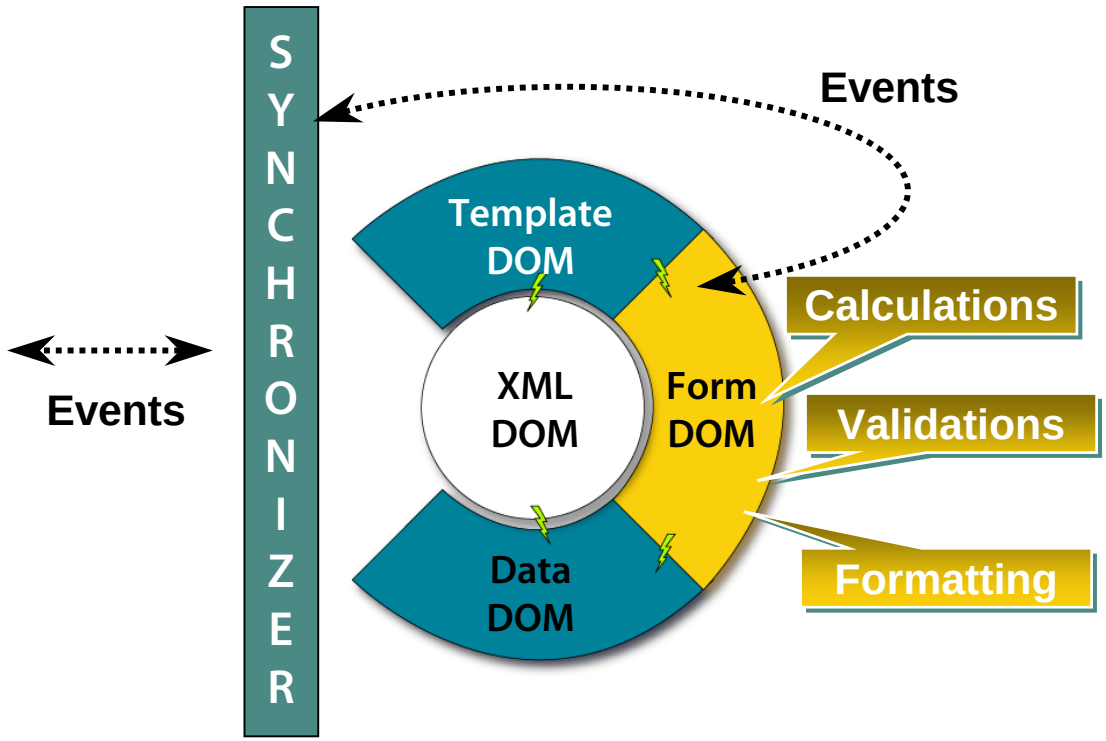


Acrobat & Adobe Reader
(Forms Client)

Adobe

Acrobat and Reader Forms Client (XML Forms Plug-In)





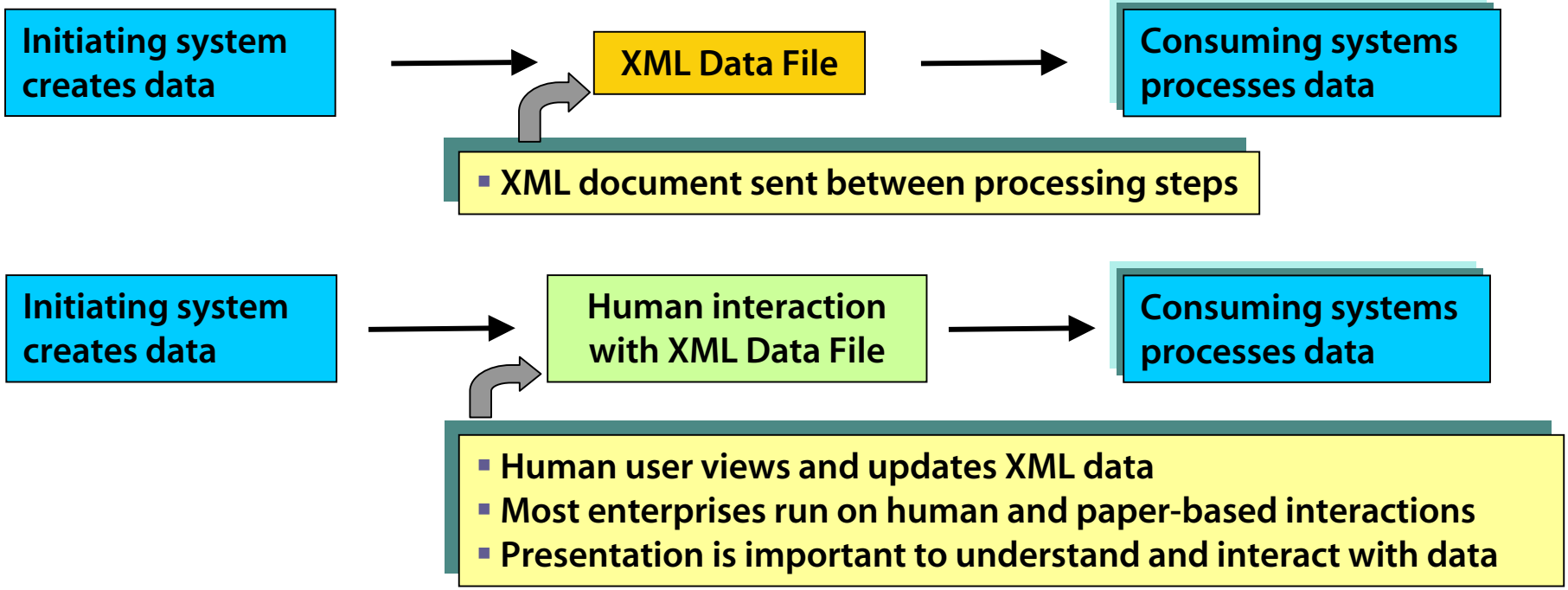
JavaScript APIs

- **Doc.submitForm**
  - "cSubmitAs“ param: FDF, XFDF, HTML, XDP, XML, PDF
- **Doc.exportXFAData**
  - "cPath" (string)
  - “bXDP" [optional, boolean]
  - “aPackets” (object)
- **Doc.importXFAData**
  - “cPath”

Customer Requirements for XML

- User-defined XML
- **Use of Industry Standards**
  - Tools (like Parsers)
- **Integrate PDF into existing XML workflows**
  - XML & PDF together
- Web Service Interoperability

XML Data Workflows



- PDF XML forms provides presentation and interaction
- PDF and Acrobat offer multiple representations and interfaces to fit the human interaction into the XML workflow

PDF XML forms

User Interface for XML Data

User-defined XML form data in user schema

PDF XML form Template defines field mapping and business logic

PDF Document

- User XML form data
- XML form Template
- Digital Signatures
- Security controls
- PDF form fields and page content

Form and document content have full fidelity and graphic richness of PDF.

Acrobat

- Save in PDF
- Submit XML data to server
- Export XML data
- Connect to Web Service

PDF XML forms - Key Points

- **The basics**
  - The XML data travels with the document as forms data
  - The document carries embedded calculations and business logic: intelligence and interaction
  - XML Data mapping to and from the form fields: Simple and automatic or very complex (XPATH, XSLT)
- **Standards**
  - Leverages W3C XML standards: XML, Namespaces, XSLT, XPath, XML Schema, XML Dig Signature
- **Paper processes move to XML and PDF-based processes**
  - PDF provides a simple first step in automating paper-based processes
  - Immediate ROI for customers
  - XML data provides interoperability with back-end systems
- **Uniform software architecture across client and server**

XML Data Package (XDP)

Using PDF in XML Workflows

User-defined XML form data; directly accessible in XML

PDF XML form Template; accessible in XML

Annotations

ADO DB & SOAP connection

XSLT on form data

User-defined XML

XML Document

- User XML form data
- XML form Template
- XML Digital Signatures
- Other XML data
- PDF Document (encoded in base64)

Form and document content have full fidelity and graphic richness of PDF.

Acrobat

- Save in PDF or XDP format
- Submit to server
- Export XML data
- Connect to Web Services

XML Data Package - Key Points

- **XDP *is* XML, so**
  - All standard XML tools work directly with XDP
  - PDF documents can be used in standard XML work flows
- **Use XDP format when:**
  - Documents and form data must travel in XML workflows
  - Form data to be manipulated with XML tools
  - Document is stored in XML repository
- **Use PDF format when:**
  - File size and transmission time are important
  - Documents are large
  - Document is packaged with supplementary data or images
- **Both formats are treated identically by Acrobat**

Customer Requirements for XML

- User-defined XML
- Use of Industry Standards
  - Tools (like Parsers)
- Integrate PDF into existing XML workflows
  - XML & PDF together
- **Web Service Interoperability**
  - SOAP, WSDL

Web Services Integration

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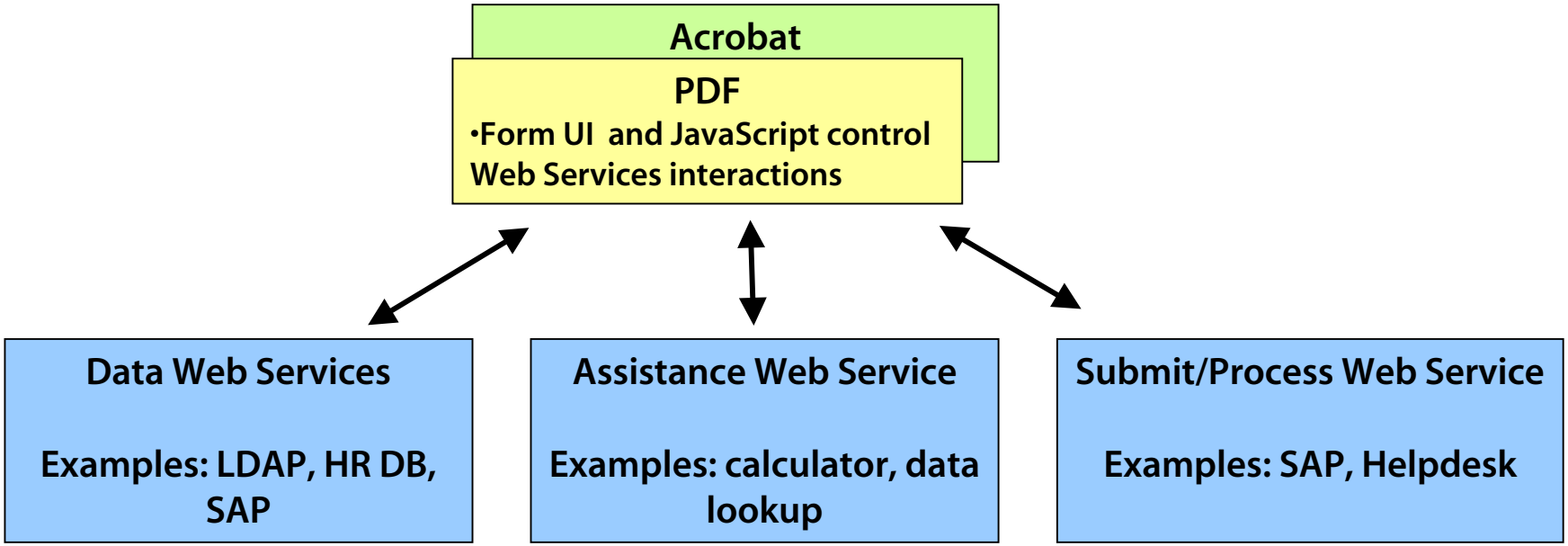

- SOAP interface to web services
- Forms include UI controls for interfacing with Web Services; created in Adobe Form Designer
- Full Acrobat and Reader support (Reader Extension)

SOAP support in Acrobat

- **Support a subset of SOAP spec 1.1 protocol**
- **Allows C/C++ and JavaScript clients**
  - Perform SOAP request-response transactions through HTTP
  - Convert SDL or WSDL service descriptions into convenience objects
  - Allow SOAP transactions occur synchronously and asynchronously
- **No UI**
- **SOAP interoperability**
  - http://www.xmethods.net/ilab/

SOAP Support

A Sample SOAP Request-Response Transaction

Adobe

```
// Call the SOAP Interop Test echoString method synchronously.
var e;
var endPoint = "http://kif:8080/axis-dev/services/echo?wsdl";
console.show();
try
{
	var response = SOAP.request(
	{
	    cURL: endPoint, // URL of endpoint
	    oRequest: {
	    "http://soapinterop.org/:echoString": // Method name
	    {
	                    inputString: "string to echo" // parameter inputString
	    }
	    },
	cAction: "http://soapinterop.org/" // SOAPAction header
	});
	// Get the return value
	var retVal =
	response["http://soapinterop.org/:echoStringResponse"]["return"];
	// Print the result to the console
	console.println("The string returned was " + retVal);
}
catch(e)
{
console.println("A Fault Occurred: " + e);
}
```

Summary

- **Government Processes are Automating**
- **Government Processes use Forms**
- **XML Forms drive process & data automation**
- **Adobe provides XML Forms Solutions**
  - User Defined XML
  - XML Data Integration (Import, Export)
  - High Visual Fidelity (Form Design & Approval)
  - Presentation & Data
  - Continuity with Paper-based systems
  - Web Services Integration (SOAP support)

Additional Resources

- http://partners.adobe.com/asn/developer/acrosdk/
- http://partners.adobe.com/asn/webseminars/
- http://partners.adobe.com/asn/developer/training/acrobat/
- http://www.w3.org/TR/soap12-part1/
- http://www.xmethods.net/ilab/
- http://www.w3.org/Signature/
- http://www.gsa.gov/Portal/content/offerings_content.jsp?contentOID=116369&contentType=1004&P=1&S=1

If You Only Remember One Thing . . .

Adobe provides standards based technology and products to implement XML Form Solutions TODAY with future enhancements on the way!

Adobe

Tools for the New Work™

Other slides

Adobe

Importance of Data *and* Presentation for Fraud and Abuse Prevention

Adobe

"The transmission of disembodied electrons into databases in which both the data as well as its presentation can be altered by those who are not parties to the 'transaction,' acting within the scope of their authorities, is simply not a responsible way to conduct business."

— Owen Ambur, DOI, Co-Chair, XML WG, 12/19/02

Meta-Data

What is Metadata?

- **Data about Data**
- **Similar to meta-tags in HTML pages, but using XML tags**
- **Allows you to describe what is in the document according to a classification system that is meaningful to your use of the document**
- **Many industry specific standards for meta-data**
  - Example: Publishing – Dublin Core standard
  - Author, Title, etc.
- **Create your own custom tags**

Metadata - What Our Customers Asked For

Open	Built on standards (XML, RDF)
Extensible	Supports custom schemas
Universal	Supports many file formats: JPEG, GIF, TIFF, EPS, PDF, HTML, XML, PNG, Photoshop…
International	Unicode, multilingual
Robust	Keep metadata with asset

XMP Metadata

- **XMP metadata support since PDF 1.4/Acrobat 5.0**
  - Stored global info about the document
  - Defined in catalog dictionary for document or any dictionary/stream cos object for components
  - Encoded as an XML formatted string using the W3C standard Resource Description Framework (RDF)
  - Intended to assist in cataloging and searching for document
- **Document metadata**
- **Component metadata**

What is new for Meta-data in Acrobat 6.0/PDF 1.5?

- Allows unencrypted plaintext metadata in encrypted document
- More flexible UI for adding, viewing and editing custom metadata fields
- Advanced > Document Metadata
- Directly get/set metadata properties through API

XMP Metadata

Extensibility with APIs and XMP Toolkit

- **Programmatic access, extraction, creation, processing of metadata through plug-in**
- **JavaScript APIs in Acrobat**
  - Access metadata

```
var r = new Report();
r.writeText(this.metadata);  // this is the Doc JS object
r.open("myMetadataReportFile");
r.save();
```

- **Acrobat SDK**
  - Four pairs of C APIs (PDDoc, CosDict, PDEContainer)
- **XMP Toolkit**
  - http://partners.adobe.com/asn/developer/xmp/main.html

Adobe®

Tools for the New Work™