Abstract: Our main goal is the interrelation amongst the new metadata paradigm - the XML family - and the Workflow Process Automation, and its integration and interaction with database legacy systems. We intend to answer two fundamental subjects: the granularity of XML documents that support the framework, and the cross-reference capacity with other files or databases in a system, being both supported by XML databases. We used TEXTML Server as a back end system for intermediating and recovering information from binary and XML files. In our case study, we implemented a multimedia and heterogeneous distributed system based on Web Services. The main idea in the proposal of the framework was separate the process logic from the application components. For that, we used workflow process management techniques and XML Web Services to the process logic. For the application components we built XML Schemas to generated XML files, indexes for TEXTML Server and XSL files that will be used to format data for each system front-end like PDA’s, third generation mobile phones (GPRS, UMTS) and personal computers. We are testing a workflow process automation prototype (based on WfMC reference model) to be used in our case study: the information management system of legislative data of the portuguese parliament. All this was embedded in the new Microsoft’s platform for software components: the .NET Framework.

Key-Words: E-Parliament, XML, Workflow Systems, WPA, TEXTML Server, Web-Services, .NET Framework

1 Introduction

Through the proposal of a generic framework called FloWPASS – Framework to Workflow Process Automation Systems – we intend to analyze the workflow processes and metadata of the Portuguese Parliament to infer the benefits that can be extracted and, also, to implement a multimedia system based on this framework.

Concepts related with WPA – Workflow Process Automation, e-commerce and XML – eXtensible Markup Language can be found in [1], [2] and [3], but we didn’t find a solution based on open patterns using XML Web Services and XML databases.

In [1], the XML Nets are proposed, a new type of high level Petri Nets to support interorganization business processes. In [2], a XML architecture is discussed for distributed workflow management whose key is called XML Mediator. It is based on XSQL of Oracle and uses XML messages over HTTP to change data between the workflow and the business object servers and, on the other hand, between the workflow and the customers’ activities. And [3] describes an infrastructure composed by dynamic agents based on Java for the e-commerce automation. XML is the message format chosen for the communication among that agents.

We found in [4] and [5] related works that use XML to make the business logic independent from the mechanisms that support them. [4] disusses the integration of the documents inside of an organization and it’s based on Ultimus Workflow solution ([6]). [5] describes an architecture to supports interorganization workflows through XML messages and it is based on the open pattern Wf-XML specified in the Interface 4 of Reference Model of WfMC – Workflow Management Coalition.

In the next sections we discuss about the three main pillars of our work: the WPA, the technologies XML and the .NET Framework. After, we explore the case study.
2 Workflow Process Automation

Our study is fundamentally based in WPA that can be defined as a sequence of structured tasks (or semi-structured) executed in series or in parallel for two or more individuals to obtain a common goal.

When we began the investigation of concepts, myths and solutions of current workflow systems we saw that the majority of existing solutions in the industry (Diamond, icXpert Solution Suite, HighView Workflow, W4 Architecture and Ultimus Workflow [6] ) confuse the essence of WPA with other concepts like cooperative and collaborative work, process digitization, integration of the applications inside a company, re-engineering or even with the own operating system.

We investigated some proposed models for standardization of WPA and we chose the Workflow Reference Model [7] of the group WfMC as this model more readily adapted to generic solutions.

Thus we discarded others standardization proposals like the complex proposal of OMG, the limited proposal of BPMI – Business Process Management Initiative [8] and the SWAP – Simple Workflow Access Protocol [9][KAI99] of IETF Working Group, that, in fact, didn't become a pattern although it has its merits.

3 XML Family

We used XSL – Extensible Stylesheet Language files and XSLT to do style sheets of the information based on XML documents. An XSL file should be created necessarily for the corresponding format of the XML elements that you want to show in a specific front-end.

The XSL files generated in our framework will be used in the communication with mobile devices front-ends, including PDA’s [10], the third generation of mobile phones, and, also, with browsers of laptops and/or desktops computers.

3.1 Search Engines

We analyzed some intermediary systems for the recovery of information in XML files. Specifically, we looked at the following solutions: Sgrep, XYZFind, eXist and TEXTML Server [11]; the Kweelt [12], an academic proposal from the University of Pennsylvania; and we also discussed some solutions with the REDIS Group of the University of Vigo.

We chose TEXTML Server as a back-end system to store, index and look for information in a great number of XML documents. We highlighted the main reasons: quite efficient query language, safe support for commercial applications and 100% XML database.

4 Software Components Models

Recently, Microsoft® launched a new product unto the market for visual development called Visual Studio.NET™ that includes, among others, an architecture for Web applications – ASP.NET [13] – much better than previous ASP and new resources for Visual Basic, creating the VB.NET [14].

We began the research on ASP.NET and VB.NET for the prototype implementation of the workflow system based on XML, with database managed by TEXTML Server.

Thus, we could use the new integrated concepts, such as XML Web Services and .NET Framework [15] (platform independence, debugging, security services, inheritance, garbage collection, etc).

Web Services are the emerging pattern for distributing functionality over Internet. They are built over open patterns and protocols like HTTP, XML and SOAP – Simple Object Access Protocol (defined by W3C).

The functions that a Web Service makes available are defined by another pattern: the language WSDL – Web Services Description Language. These patterns allow the software components to communicate each other, in spite of the operating system in which they reside.

.NET Framework supplies types and services to support the creation and distribution of Web Services. For example, the namespace System.Web.Services supplies such types like WebService, a class to access the ASP.NET functionalities.

5 FloWPASS Architecture

We used the classic logical model of three layers (Data, Logic and Presentation) to define the architecture of the FloWPASS (see figure 1).

In the Data Layer are located the storage services and data indexes. We used TEXTML Server as the back-end system. They are necessary for integration and interaction of the Document Base with legacy files of data.

For example, in our case study we crossed referenced information with the digital library [16] of the Portuguese Parliamentary meetings [17]. These services didn’t modify the stored files, maintaining the integrity of the database.

The logic business services are located in the Logic Layer for the WPA. These services also include the rules and logic of the business that will generate specific ASP.NET forms.
5.1 FloWPASS’s Elements

XML technologies are significantly different from classic procedural programming languages both in structure, syntax and nature. XML application development is also a completely different process. XML application development begins with developing the content model using XML Schema or DTD’s [18].

The FloWPASS is composed by a interface API, a generic XML Schema and the XML Web Services, as follows:

5.1.1 TEXTML Server Client API

We discovered that TEXTML Server can provide us intelligent (dynamic) indexes that will facilitate the search and the necessary cross-references for a generic multimedia system. The documents are reconstituted from the repository, that also collaborates with the bi-directional integration among the base of XML data and the other types of binary files such as audio, video and images. For this we use the TEXTML Server Client API, designed by Ixiasoft [11].

5.1.2 Generic XML Schema

We investigated the WfMC metamodel and the XRL – eXchangeable Routing Language proposed in [19] and [20]. We decided to use the metadata outline of the XPDL – XML Process Definition Language [21] defined in the Workflow Process Definition Interface of Workflow Reference Model, see figure 2.

![Figure 2: WfMC Meta-Model](image)

We used, in that way, a DTD that contained generic information to model all the elements that compose the process of a typical workflow: Participants, Activities, Transitions, Applications and Important Data of Workflow. We created, thus, a generic XML Schema based on this DTD.
5.1.3 XML Web Services

We used XML Web Services to offer for the framework the functionality of a ubiquitous systems (anywhere, anytime, anymedia, anydevice syndrome and context-aware). Because each front-end needs a different view of the data and has a different hardware architecture, it can have guaranteed access to the system thanks to Web Services's interoperability.

6 Case Study: Portuguese Parliament

Starting from the generic XML Schema and based on Portuguese Parliamentary rules [22], we generated an XML document.

Each Activity of the Common Legislative Process is associated with an Activity Performer, its Description and other elements like the Restrictions to the Transitions (post-conditions and pre-conditions for its accomplishment), Simulation Data, Time Limits, etc., see figure 4.

![Figure 4: Main XML Elements of a Legislative Process](image)

This relates the infrastructure of the workflow with each process.xml document regarding the hundreds of processes that will be generated in a Legislative Session.

The workflow is also related with the Commission or Commissions assigned to the Portuguese Parliament President responsible for the path of those processes. Thus, we can infer cross-references in the Processes, its Activities, and its responsible Commissions.

A Process XML Schema (see figure 5) was created to generate XML documents of Portuguese Parliament Processes that will keep the referring data to each/any process type that can be appreciated.

![Figure 5: Portuguese Parliament Process XML Schema](image)

Emphasizing the multimedia characteristic of the proposed framework, each element of this XML Schema called DocumentoEscrito can be a binary file (audio, video, image, text) that are added and indexed dynamically in the TEXTML Server database.

![Figure 6: Debate Element in Comisions XML Schema](image)

That discussion helps to solve the first great objective of our research: the degree of granularity of the XML documents used for the definition of a WPA system.

7 Conclusion And Future Works

The effective interrelation between the XML family and the WPA facilitates a great variety of data queries in XML documents or any indexed binary file stored in a XML database, like the TEXTML Server Document Base.

The resolution of these subjects leads us to the key point of our research: the capacity of cross-reference in XML documents with other files or legacy databases. For the specific problem of our case study we will test this with the
We are in the final phase of the study of XPDL API, TEXTML Server Client API and the definition of the ASP.NET webforms. These elements are the main ones of the constitute the framework here proposed. At the moment we have not found any academic work that uses XML Web Services nor XML databases to implement solutions in WPA systems.

Our next step is the effective integration of the proposed framework with ubiquitous applications [23] and front-ends [24] of the new mobile world, mainly PDA’s and the third generation of mobile phones that already facilitate the use of MP3 audio files, images and video.

As a future work project, we intend to analyse the use of XML database versus relational database and describe the inherent aspects of the integration of heterogeneous systems based on XML Web Services.

References: