Web Technologies and Programming Languages Used in Production Systems Management

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Abstract: - The development of the Internet has led to new approaches to production systems management, which replaced the classic “four-wall” organisation to concepts that preceded that of Computer Integrated Manufacturing (CIM) such as: the virtual, extended, fractal etc. enterprise. Processes may occur disparately, anywhere in the world, on the entire life cycle of a particular product, beginning with its initial stage, that of demand and continuing with that of conception, design, manufacturing, sale, decommissioning, etc. All of these are possible by a correct and concrete use of information technology in an Intra(Inter)net.

Key-Words: - Systems management, web technologies

1 Introduction
One of the major problems software developers often encounter is that of organising, storing, as well as retrieving useful information in a huge volume of documents (specifications, source code).

Nevertheless, this increase in the amount of information has naturally entailed technologies which are able to deal with it. These are generically called WEB 2.0.

2 What is web 2.0?
Web 2.0 may [2] be considered a marketing concept. Though it may be a harsh, even “ragged” utterance, it is definitely true. Web 2.0 was the name of a conference held in 2004 and organised by O’Reilly Media and MediaLive International. The term’s function was to draw attention to the “revival” of the WWW. The participants to the conference failed to produce a definition of the term but they came up with several examples:

- Encyclopaedia Britannica is web 1.0 – Wikipedia is web 2.0;
- DoubleClick is web 1.0 is web 1.0 – Google AdSense is web 2.0;
- Ofota is web 1.0 – Flikr is web 2.0.

The main idea is that the web is turning from an application-to-application data transmission tunnel into the very platform that runs the application.

Today, after one year and a half since the development of the Web 2.0 concept a huge number of applications are running in the browser. Thus, Gmail or Zimbra are strong competition to Outlook or Mozilla Thunderbird. Writely is a substitute to Word that brings forward the idea of collaboration; its online application has helped SalesForce become the king of CRMS; Basecamp has the best project management software, and Bloglines is an outstanding desktop RSS feeder.

Web 2.0 is based on Web 1.0 or WWW, which was established by CERN, i.e. “Conseil Europeen pour la Recherche Nucleaire”, (the European Particle Physics Laboratory) in 1989, thanks to physicists Tim Berners-Lee, Robert Caillau, and their team; the main purpose was to provide quick access to technical information in computer manuals, in a standardized way.

The main advantages the Web generally offers fall into the following categories:

- device independence
- software independence
- scalability
- its multimedia features.

One of the main and most successful Web components is the logical description of documents by means of languages based on metalanguages such as SGML (Standard Generalised Markup Language), which is chiefly HTML and more recently XML.

3 XML
XML (eXtensible Markup Language) – a new mark up language – a subset of SGML, used for structuring different types of information by means of a free set of instructions.

XML can be used nowadays in all applications that require data structuring–ranging from geoinformational systems transmitting a huge volume of data to software designed for personal computers.
XML may be the solution to numerous problems related to structured data creation and processing the present-day information world has to deal with.

First, this technology may be useful for developers of complex data systems with a large number of applications, dealing with differently structured data flows. In this case, XML documents play the role of a universal format for the data exchange between different software components.

XML [1] is a basic standard for the new RDF (Resource Description Framework) description language, which makes many Web tasks easier: searching information necessary for the control process dependent on the contents of network resources, creating electronic libraries, etc.

Because in XML data can be freely described, it is used for presenting specialised data such as chemical, mathematical, physical formulae, medical prescriptions, etc.

XML documents may be used as intermediary data format for cross linked systems. As a rule, the interaction between application and databases servers depends on a concrete SGBD and on the SQL dialect, used for accessing the data.

The information in XML documents can be changed, transferred to the customer’s computer and partly renewed. Xlink and Xpointer specifications allow referencing to particular elements of XML documents, in the dependence and on their inclusion and attributes.

Style sheets (XSL) allow XML documents to be displayed independently.

XML is used as an environment for describing other languages’ grammar and for controlling the document structuring correctness. Thus, XML itself does not contain the necessary structuring tag, but it defines the order in which these are created; the tags set can be quickly expanded.

The XML document creation process is very simple and requires only HTML skills and a good knowledge of what one wants to accomplish by using the XML as a mark-up language. Thus, it becomes possible to define one’s own tags, which facilitate effective definition of the data the documents contain. The author of the document creates its structure, makes the necessary connections between elements by using the needed instructions; the resulting mark-up will enable the user to search and analyse the document.

XML allows the user to control data correctness and hierarchic relationships within the document and to develop a single standard for document structure. This means that XML can be very useful for creating complex data systems, in which data exchange between applications working in the same system is very important. By creating the data exchange mechanism structure since the beginning, several problems are solved, such as those related to the incompatibility between the components of the data formatting system.

Fundamentally, the emergence of the XML meta-language among other Web data formats ends the dispute related to the ways of structuring documents in order to meet the original view of those who created the Web [Berners-Lee, 1999]. At the present moment, XML is the only complex data annotation method and the only one that offers support for developing resource-management Web applications. The semantic Web is a higher level of the current Web which relies on XML as data representation method.

4 The Semantic Web

Due to its features, the semantic Web is an essential component in the development of the project being discussed, namely [2], [8]:

- Languages that structure connections between resources;
- Resource classifying and structuring.

The semantic Web uses the following technologies (“concepts” seems a more accurate term):

- RDF – Resource Description Framework;
- OWL – Web Ontology Language.

A. Web services

The accessibility issue is the first one that the members of a development team should first deal with in order to make sure a particular application, i.e. the project being discussed here, operates properly. Thus, a secure (processed or unprocessed) data transfer system is required, as well as a processing system and a user interface. However, although the Web supports some of these desiderates, there is also a major problem:

- most processing must be done at a server level, because html’s only function is to mark up the text so that it can be displayed;
- client processing is limited (at the level of JavaScript).

Considering these drawbacks, web services in conjunction with a client that can be based on a set of different technologies (JavaScript, XML, HTML) or a stand-alone one (e.g., .net application) may be a reliable solution.

Chronologically speaking, the first applications designed and developed were: Microsoft Distributed Component Object Model (DCOM), Object Management Group's Internet Inter-ORB Protocol.
(IIOP) and Common Object Request Broker Architecture (CORBA) [5], [6]. These systems provide a complex and consistent environment for, especially, creating symmetrical applications.

Limits appear when one attempts to develop complex web services. The Internet cannot guarantee the existence of the same object model at both communication ends (all the three systems use different object models).

Moreover, one cannot specify what server (or client) runs at the other communication end.

The consequence: we need an open standard that will meet everybody’s current requirements and needs.

The solution: widely use the current Internet standards (HTTP, XML).

Advantages [9]:
- HTTP is unanimously recognised as the most viable file transfer protocol (in mark-up format);
- the other client/server applications (excluding HTTP) may be prevented from working normally by firewalls;
- XML [due to its standardisation] offers a Document Object Model [DOM] independent from the language or platform used during implementation.

However, there is a problem; HTTP is generally used for transferring files, which are mainly public files, and thus they require no encryption. Web servers use SOAP which supplies the HTTP with new headers and improves the XML, in order to make it suitable for complex application-to-application systems on the Internet [3], [4].

B. SOAP (Simple Object Access Protocol)
This technology is defined to use HTTP and XML and it is used to access platform-independent services, objects and servers.

A major advantage is the fact that by using HTTP, which is firewall-friendly, extant servers require no reconfiguration; this is not possible when working with other similar protocols. When using XML as main transfer method, the platform plays a very important role in communication.

5 The Project’s Purpose
The main objective of this project is to give a hand to software developers who have to deal with hundreds of different documents (specifications, diagrams), and thus are currently facing an impossible task. This project embodies WEB 2.0 technologies and its main aim is to find the best way to imbed them so as to make them user-friendly and not only programmer-friendly. The main operations are presented below.

A. Project Management
This operation includes project registration. The project registration contains information such as: the date of registration, deadline, as well as other information referring to the users who have accessed the project, visualisation rights, and modifications.

B. Operational Management Tasks
This category refers to operations related to the management of project development stages. A model, which can successfully be applied to various projects, has already been developed for this stage. The stages that are defined within this category are:

I. Data collection and analysis
- Preliminary architecture
- Requirements
- Internal documentation
- GUI storyboard
- Use cases
II. Envisioning
- Preliminary architecture
- Project documents, structure, project plan
III. Project start
All stages above (which can be also referred to as tasks) are structured in such a way that they allow building a structure for each version. One often goes back to a certain specification, addition, modification.

In this model, one is able to make a copy of the specifications on a certain date, which can be of real help for back-up and status report.

C. The Management of Functional Tasks
This category provides the use of an application as file server (a sort of CVS, i.e. Concurrent Versioning System) structured on versions and moreover it provides (by the data input method) a connection between operational tasks. This connection is in fact the core of the project. It opens up new analysis possibilities for the application that is being developed by this system.

D. Analysis
It includes reports referring to the dependencies between modules, which are based on the connections between operational and functional tasks. This connection is made by using RDF and RDFS.

6 Conclusion
WEB 2.0, semantic WEB creates the perfect environment for developing distributed applications
and provides the foundation for developing well-built applications. XML is the basis of all these developments and we might presently regard it as the father of WEB 2.0.

Such an approach implies the following advantages:
- Maximum client flexibility
- Look and Feel easily attainable due to (XHTML, CSS, AJAX-ATLAS)
- Workload on the server
- Firewall friendly

References: