Application of ColdFusion technology in large educational services

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Abstract

The development in Internet Technologies created new possibilities and prospects in education. With the idea of large educational service in secondary schools there arose the necessity of choosing the most suitable Internet Technology. The analysis of various technologies resulted in the choice of ColdFusion which proved to be the best for the realization of this project. ColdFusion technology displays several characteristics: the independence from widely used operating system platform, the possibility of implementation of many databases standards and combining many programming standards of Internet services. ColdFusion is supported by CFML language which permits quick generation of Java bytecode across language, implementation XML structures and organization of large structures of Internet services.

1. Introduction

The new project named "Virtual School" is going to be realized in ColdFusion architecture. The construction of the project consists of six basic parts: library, forum, knowledge tester, virtual lessons, certified courses and teachers' thematic Web Sides. The aim of the project is to create additional possibilities in education. Such elements as virtual lessons, tester and certified courses will introduce interactive forms of teaching. As a result it will create widely accessible service with the possibilities of e-learning. Pupils and teachers will be offered the opportunity of exchanging experiences, which is an important element of virtual education. Moreover, the possibilities of certifying skills will be created for teachers as well as pupils. Besides, the project will offer handicapped people the opportunity of individual education and preparation for secondary-school certificate. It will also introduce new standards in education broadening the methods of teaching compulsory subjects in secondary schools. The first secondary school curriculum to be realized by the project is "information management". After that, other subjects will be introduced.

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The beginning of the work on the project raised the question of the most suitable technology to realize it. After analyzing various server technologies, the Macromedia technology with the utilization of ColdFusion Server 6.1 MX was chosen.

2. The characteristic of ColdFusion Server 6.1 MX

ColdFusion Server MX 6.1, whose code name is 'Red Sky', was introduced by Macromedia in 2003. It is a new product which derives from the previous version 4.5.1. There are many changes in version 6.1 ColdFusion MX in comparison with the basic version. The new ColdFusion is faster and more effective. It uses reliable and tested technology J2EE.

One of the changes is the new installer. The process of modernization of the previous application versions written for versions 5 and 4.5 was improved in it. Therefore, it is more readable than the previous one. Moreover, the service of new operating systems: Windows .Net 2003 (IIS 6), Roads Hat Linux 8 and 9, SuSE 8, Solaris 9, AIX 4.3.3 and 5.1 and HP UX 11i was added [1].

The next significant change in version 6.1 is the new compiler. The basic version MX receives a document and it compiles it into Java code which is the same as the original CFML code. This code is exchanged into Java bytecode and really executed in JVM. This process is repeated whenever a change is introduced in a document. It is easy to notice that the process is very time-consuming. Also, the following reading of the document caused the "class" file reading from server cache. Version 6.1, however, compiles directly CFML code to Java bytecode. It accelerates considerably the process of ColdFusion documents processing. It also means that ColdFusion MX 6.1 does not have to record "class" files in cfclasses catalogue. The whole process of compilation and processing of the code can be held directly in the memory. Besides, version 6.1 serves both types of processing – with recording "class" files on the hard disc and without recording them. As a result, acceleration of the first document compilation is achieved. JVM 1.4 was exchanged into version 1.4.2. The new server also introduces an improved version of e-mail service. ColdFusion MX had single-thread service POP3 and SMTP. ColdFusion MX 6.1, however, introduces multi-thread service of these protocols. CFMX 6.1 administrative panel enables manual configuration of maximum quantity of threads. Tests proved that version 6.1 is able to send even one million letters an hour [1,2].

Another element which makes the e-mail service more effective is CFML language. CFMAIL markup became enriched by two new attributes – USERNAME and PASSWORD. It enables the service of SMTP servers which demand logging. The next large convenience in the service of e-mail is the possibility of defining several SMTP servers (well-known also as 'server fail-over'). If a server is inaccessible at the time of sending the mail, ColdFusion tries to send letters by a different server. Another improvement is the addition of

CFMAILPART markup. It makes it possible to separate textual content from HTML in one letter. This improvement concerns also CFPOP markup, which is able to serve e-mail of type text/plain and text/html. The service of HTTP protocol was improved – ColdFusion MX 6.1 serves version 1.1 of this protocol (GET, FAST, HEAD, PUT, DELETE, TRACE, OPTIONS). The new version also contains two very desirable improvements in CFC service (ColdFusion components): the possibility of defining the special range "super" inside CFC which has an access to hidden methods and safe placing CFC inside different ranges – CFC has the access to all ranges. The new ColdFusion version was enriched by the Wrap() function which gives the possibility of breaking lines in a text. This function will be useful when using CFMAIL markup. Many new functions have been added to COM service, the efficiency of CFCHART markup has been improved improvement to Flash remoting engine has been made, many SOAP solutions have been improved and the co-operation has been enlarged with .Net Web Services [1,2].

The next facility is the introduction of XML language service by ColdFusion. XML can be now used like other database sources. XSL can be used in the document transformations and the automatic serialization of data can be used in XML. Moreover, new drivers were added: DataDirect JDBC, DataDirect SequeLink 5.3 ODBC Agent, ODBC Server. Also, JDBC drivers were modernized. The new ColdFusion contains J-Integra 1.5.3. [3].

3. ColdFusion in UNIX and Windows systems

ColdFusion Server is not adapted to all of Windows and Unix architecture differences. The first of the differences is the fact, that Unix distinguishes size of given signs in the names of files. File named index.cfml is different from Index.cfml file. Both names show the same file in the Windows system.

The next difference between both systems is the way of mapping paths to files. The Windows system uses '\' sign to mapping paths, while Unix uses the opposite '/' sign. The lack of the drive signs in the Unix system is the next difference. ColdFusion in Unix is installed in the catalogue path: /opt/coldfusion – in system Windows in path: C:\CFusionMX [4].

If application which has to act independently of the operating system is required, an environment of application in which the differences between the systems will be considered should be created.

Example. Let us create a file Application.cfm (the name of this file has to be recorded exactly as it was given). The application variables, which will check the operating system on which application is started and for example will qualify the way of paths mapping, will be defined inside the file:

```
01 <cfif Server.OS.Name is "UNIX">
02 <!-- database Sybase or Oracle -->
03 <cfSet DBMS="SYBASE">
04<cfSet DSEPAR="/">
05 <cfElse>
06 <!-- database Access or MS SQL -->
07 <cfSet DBMS="MS_ACCESS">
08 <cfSet DSEPAR="\">
09 </cfif>
```

The list of Server variables and their possible values has been introduced [1]:
Server.ColdFusion.ProductName –
It sores the name of the product, for example ColdFusion Server,
Server.ColdFusion.ProductVersion –
The number of version of server is sored ColdFusion, for example. 6,0,0,58500,
Server.ColdFusion.ProductLevel –
It turns information about the version of server which becomes installed, for
example Professional,
Server.OS.Name –
It sores information about the operating system, on which server is installed, for
example Windows NT,
Server.OS.Version –
The information about version of operating system, on which server is working,
for example. 4.0,
Server.OS.BuildNumber –
It turns information about version of compilation of operating system, for
example 1381 or Generic.

4. Advantages of ColdFusion technology

The first advantage of ColdFusion technology is the fact that ColdFusion
Server 6.1 MX increases the effectiveness of applications and decreases the
charge of databases by multiple use of connections with databases in pauses
between the demands of the Web Pages reading. The important factor connected
with the service of databases is the acceleration of efficiency of asking questions
process with the simultaneous diminution of server charge by multiple use of the
results answer from databases.

Also, considering servers acting in clasters, it can be noticed that ColdFusion
technology permits the distribution of charges resulted from executing
applications between servers in clasters by the use of built-in functions of
equalizing servers charge (load balancing) [5].

The integration with equipment solutions for balancing the charge of servers
is also used with the purpose of obtaining the largest efficiency and accessibility.
High accessibility of Internet service is also possible thanks to automatic "fail

over" function and starting application on following servers acting in clasters. Moreover, the ColdFusion Server efficiency is assured for the client side. The data about sessions are kept in available database repository or cookies founded on the user's computer to assure the continuity of session in the case of starting application on another claster of server. ColdFusion Server avoids the loading of unmodified www sides.

The next advantage is the fact that Internet service efficiency has been improved by the development methods of inspection of the pages management which are kept in browser's cache. Also, the enlargement of efficiency together with the simultaneous diminution of server charge by repeated use of yield pages in cache memory has been improved with the purpose of rare storing changes on dynamic generated sides. In addition, the dynamic optimization of sides' codes has been introduced in 6.1 version of ColdFusion Server by the diminution of sides' volume and the enlargement of speed of their opening in browser by removing of the free lines, remaining after the code edition. Another important feature which decides about the work speed of this technology is the maximization of application reaction onto demands thanks to the delivery of sides during the process of their generating using the script tool of buffering and supervision of sending them [4]. Finally, Server ColdFusion supports in full CORBA and SOAP standards, connected with programming of dispersed application.

5. Implementation of databases in the CFML language in the ColdFusion technology

The CFML language is available in the two forms: CFML basic and CFScript script language. The CFML language is the markup language using the compiler of Java programming language which is implemented on the ColdFusion server. It possesses all features of object-oriented programming language and is independent of the operating system platform. The important feature is the side compilation only by side of Server (server-side applications).

The CFScript language belongs to the same group of languages as CFML, JavaScript or ActionScript which derive from the ECMAScript language. CFScript was introduced to ColdFusion in order to improve recording of long operation on variable and creation of its own functions. ColdFusion technology has a built-in implementation of databases service in various standards. However, the choice of proper implementation requires considering the operating system platform on which CF server is settled. Microsoft Access databases sources are not supported in ColdFusion installed in the Unix system, whereas SQL Server is not supported in ColdFusion which is earlier than version 4.5.1.

Additionally, in the Unix system the following options are not accessible:
– Crystal Reports (cfreport)

- COM/DCOM,
- Advanced Security (version 4.5.x and 5),
- Verity vspider (version 5 and MX),
- The undexing of Adobe Acrobat files (version 4.5.1-MX),
- The "cfgraph" graphs are inaccessible in the HP-UX systems (version 5),
- The markups Custom Tags have to be compiled by the use of GCC, Sun C++ or Unix C++ compiler.

The XML language is treated in a special way by technology CF. The XML object is treated by ColdFusion similarly to other types of data for example structures. It makes searching of XML object possible with the use of StructFind() function and StructKeyEsists() function. The functions whose main application is service of big arrays can be used additionally to analyze the XML object. Such an approach creates completely new possibilities. Parsing of XML in ColdFusion documents can be exemplified as follows:

Let's take the exemplary XML file whose name is uczen.xml:

```
01 <?xml version="1.0" encoding="UTF-8"?>
02 <Szkola>

03 <WSzkola>

04 <uczniowie typ="Liceum Profilowane">
05 <osoba id="1">Jan Kowalski</osoba>
06 <osoba id="2">Adam Nowak</osoba>
07 </uczniowie>
08 <uczniowie typ="Liseum Ogólnokształcące">
09 <osoba id="3">Marcin Wiśniewski</osoba>
10 <osoba id="4">Alina Nowacka</osoba>
11 </uczniowie>
12 <uczniowie typ="Technikum">
13 <osoba id="5">Anna Potocka</osoba>
14 </uczniowie>
15 <uczniowie typ="Policealne Studium Zawodowe">
16 <osoba id="6">Karolina Przybyszewska</osoba>
17 </uczniowie>

18 </WSzkola>

19 </Szkola>
```

The basic way of parsing the XML document with the use of CFML language can be done in the following way. The <cfset> markup assigns file uczen.xml (01). Next the XML file is read as a string of signs to KodXML variable (02). A very important step is the utilization of markup <cfset> to parse of XML

document onto XML object (03). The following step is the creation of the object which includes all XML data (04). In order to get the name of the school the name of markup must be received (05). If the number of pupils in Virtual School is to be checked, the following procedure must be used: (06)

```
01 <cfset plikXML = ExpandPath("uczen.xml")>
02 <cffile action="read" file="#plikXML#" variable="KodXML" charset="UTF-8">
03 <cfset DaneXML = XmlParse(KodXML)>
04 <cfset SzkolaDane = DaneXML.XmlRoot>
05 <cfset SzkolaNazwa = SzkolaDane.WSzkola.XmlName>
06 <cfset IloscUczniow = ArrayLen(SzkolaDane.WSzkola.XmlChildren)>
```

The data from uczen.xml file must be written in the browser's window:

```
07 <cfoutput>
08 Nazwa Szkoły : <strong>#SzkolaNazwa#</strong>.
09 <br>
10 Szkoła zapewnia <strong>#IloscUczniow#</strong> miejsca w Wirtualnej Szkole.
11 </cfoutput>
12 <br><br>

13 <strong>Typy szkół:</strong><br>
14 <cfoutput>
15 <cfloop from="1" to="#iloscUczniow#" index="a">
16 <cfset element = SzkolaDane.WSzkola.XmlChildren[a]>
17 <cfset stanowisko = element.XmlAttributes["typ"]>
18 Uczeń numer #a# : #stanowisko# <br>
19 </cfloop>
20 </cfoutput>
21 <br><br>
22 <strong>Który uczeń z jakiej szkoły?</strong>
23 <br><br>
24 <cfoutput>
25 <cfloop from="1" to="#iloscUczniow#" index="b">
26 <cfset element = SzkolaDane.WSzkola.XmlChildren[b]>
27 <cfset iloscOsob = ArrayLen(element.XmlChildren)>
28 <cfset stanowisko = element.XmlAttributes.typ>
29 Ze szkoły "#stanowisko#" są #iloscOsob# osoby:<br>
30 <cfloop from="1" to="#iloscOsob#" index="c">
31 <cfset kursant = element.XmlChildren[c]>
32 - #kursant.XmlText#<br>
33 </cfloop>
34  <br>
35 </cfloop>
36 </cfoutput>
```

As a result, the information about the pupils from "Virtual School" received from the XML document is shown on the service page.

XML is an extremely effective tool which permits fast access to data and quick opening in the Internet browser. The built-in functions of CFML language permit internal processing of XML objects.

6. Co-operation of ColdFusion Server with the architecture Macromedia Studio MX 2004

ColdFusion Server implements all the possible Macromedia technologies realized in Macromedia Studio MX 2004 software. The best way to create applications in various languages (Java, PHP, CFML etc.) is to use the Macromedia Dreamweaver editor which has the possibilities of managing large dispersed projects, as well as effective tools serving the optimization of application source code. Moreover, Dreamweaver editor serves the CFML language and permits the remote testing of www service on server. Another application, which gives wide possibilities, is Flash application. It serves to create animation and graphics of www advanced services.

In special uses of Flash application physical and mathematical processes can be modeled. The animation is written in the object-oriented ActionScript language. The Physical processes are modeled in accordance with laws of physics for example with the mechanics of movement. The mathematical processes can be shown in accordance with mathematical statements and functions. The example of using physical modeling is the model of cyclone imitating whirling movement. (Fig. 1a) The example of mathematical modeling is fractal dancer. (Fig. 1b) Modeling in ActionScript is the element which can be used in an interesting way during virtual lessons [6]. The Analysis Macromedia software proves that it provides both the technology as well as tools which permit quick creation of projects, as well as their optimization [6].
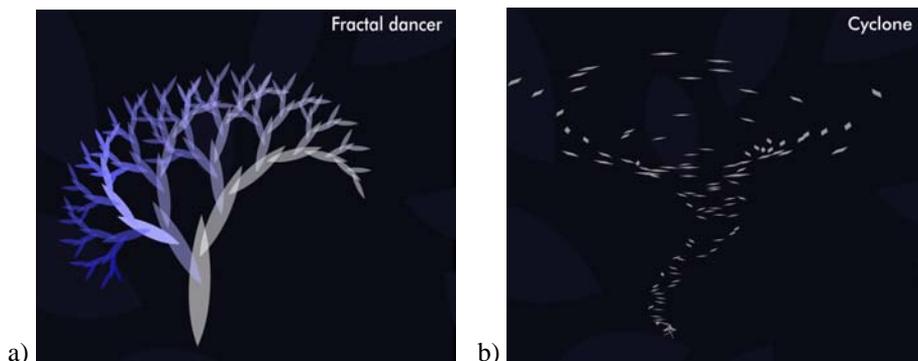

Fig. 1. The animation created in Macromedia Flash application: model of whirl – Cyclone (a) and fractal model – Fractal Dancer (b)

7. Conclusions

The "Virtual School" Project realized in the ColdFusion technology opens wide research areas: problems of databases, software engineering and e – learning. The analysis of ColdFusion technology proves that it is a very effective technology which combines the power of Java language with the possibilities of databases especially the built-in service of XML language. The important feature of this type of solutions is the high efficiency of Internet applications and a very high level of their optimization. Therefore, ColdFusion technology can be used to build a stable, save and effective educational service. The optimization of services based on CF technology is very advanced which assures fast and effective work of web application.

References

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