DISTRIBUTED SYSTEMS AND NUMERIC CALCULATION

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Abstract

Many software applications are considered as being failures, due to the fact that they cannot deal with certain issues. Thus the application and the investment are not justified. This situation is named implementation trap [1]. The resolution of a false problem can damage the whole project: it can be abandoned, so one can lose time and money. The architecture offers different but complementary points of view over the soft.

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Introduction

The process of projecting architecture is described through the following steps: the problem understanding, the identification of the projection elements and the relations among them, the evaluation of the architecture, the transformation of the architecture. The architectural perspective of the software developing cycle is centered on the application or system projection and on the way the project leads to its application. This is named architecture based on software construction. (Sewell M, Sewell L., 2002). The domain analysis is one of the most important activities when realizing a software architecture. A good analysis of the domain can significantly contribute to the success of the software applications. As a rule, the programmer is focused on the computer science.

The source code represents an abstraction of the machine instructions and the data types structured in the terms of a programming language grammar. Two programs written in different programming languages, but compiled on the same hardware platform will use the same machine instruction (Albin S.T., 2003).

Java and C programming languages offer different concepts. C affords the type of structure data, which is vaguely defined by the user and Java affords a type

of classes which is strongly defined. It is possible to obtain the same machine code and types of data when one compiles a Java and C program. Java is compiled in byte code and interpreted by the virtual Java machine which, in its turn is compiled for a specific hardware platform.

Literature review

A problem can occur in any other field, not necessarily in informatics. It can be a physics, engineering or even a life problem. Regardless of the field of the problem, a pattern is created. It can be a discreet or a continuous one. In order to resolve it, we can use one of the two methods: analytical or numerical, depending on the type of the problem. After the completion of the first three stages, there is the implementing stage, which involves the application in a programming language as C/C++/Java/Python and the usage through a parallel calculation. In the end, we meet the visualization, the interpretation and the experimentation of the solution.

The graphic representation of the solving stages is shown below:

PROBLEM	PATTERN	METHOD	IMPLEMENTATION
– Physics – Engineering – Life	– Discreet – Continuous	– Analytic – Numerical	– C/ C++/ Java/ Python – Parallel calculation
THEME – Vizualization – Interpretation – Experimentation			

Fig. 1. *The graphic representation of a problem resolving stages*

If we examine the classical process of information, such as the process of automation with the help of the computers, we find the solution for the informatics request. Each and every case was preceded by a period of procedures formulating. These were precise and not ambiguous. They represented the base for the algorithm concept. The procedure must be applied to the data.

Therefore, the digital technologies are based on charges identified through data and algorithms. A consequence is the fact that they require a good training about the contents, mostly for that derived from two fields: the tasks field and the informatics field.

The additional knowledge in data, algorithms and programs executed with data algorithms accumulated in the Computer Science must be added to the Applied Informatics.

It is crucially important to choose the adequate program for the success of the program use.

Theoretical background

Once the application realized, it must be connected through a web service. From now on, it is not only an individual application anymore, it can also communicate with other ones.

The Web services revolutionize the way one application communicates with other application, offering a universal format of data which can be easily adapted or transformed. Based on XML, the Web services can communicate with different platforms and operating systems, regardless of the used programming language (Lawler Jones P., Howell-Barber H., 2008).

Every Web service is a code sequence which deals with a specific set of tasks. The Web services are independent, they can be linked in order to create a new group.

At present, the technology of the Web applications is known. It is known the fact that the Web application technology is realized by exchanging data and information via Internet. The exchange is based on the protocols through the portal servers.

The Web services eliminate many barriers in communicating the information, but there are also several problems. The elimination of the differences between the used technology, the protocols and the information structure represents the solution to these problems.

The distributed object technologies allow the ruling objects on a computer be accessed by applications or objects belonging to other systems.

The importance of the distributed systems is assured by the software components. The developer of such an application must combine efficiently the role of the software components, the used technology and the chosen architectural model with the initial and later requirements of the user.

There are many practical considerations (Bass Clements P., Kazman R., 1998) as concern the projection of the distributed components, because there are significant differences between the unfolding of a local code sequence and the one of a remote code sequence.

The web service for numerical computation

The purpose of the present study is the analysis of the surplus introduced by the Web service interface and the exposure manner in a simpler way of the facilities it offers.

For my study I use the Numerical Library in Java for Scientists and Engineers. I do not implement again the codes used in it, I am only using the already implemented ones.

The transfer from an interface with the user in the command line to an interface based on the Web services represents a great advantage because it allows the combination and the usage of some procedures (routines), previously defined. The knowledge and the learning of the numerical computation methods are practical, efficient and elegant. The realization of a Web service will significantly contribute to this process (Hong T. Lau, 2004)

There is a series of functions within the realized numerical computation. They can be appealed by other functions belonging to other groups, named Basic. The table contains only the basic functions.

Table 1

The representation of the common functions

Function Name	Basic1	Basic 2	Basic 3	Basic 4	Basic 5	Basic 6	Basic 7
Rnk1min			**Rnk1min**		**Rnk1min**		
Praxis	**Praxis**		**Praxis**				
Marquardt	**Marquardt**		**Marquardt**				
Gssnewton	**Gssnewton**		**Gssnewton**				
Multistep	**Multistep**		**Multistep**				
Ark	**Ark**		**Ark**				
Efrk	**Efrk**		**Efrk**				
Efsirk	**Efsirk**		**Efsirk**				
Liniger1vs	**Liniger1vs**		**Liniger1vs**				
Liniger 2	**Liniger 2**		**Liniger 2**				
Gms	**Gms**		**Gms**				
Impex	**Impex**		**Impex**				
Peide	**Peide**		**Peide**				
Minmaxpol	**Minmaxpol**	**Minmaxpol**				**Minmaxpol**	

By using these functions I obtained a series of tests, following different possible scenarios for problem solving. The experimental results are presented in the table below.

Table 2

The obtained time when testing

	WS 2x2	Con 2x2	WS 3x3	Con 3x3	WS 4x4	Con 4x4	WS 5x5	Con 5x5	WS 6x6	Con 6x6	WS 7x7	Con 7x7	WS 8x8	Con 8x8	WS 9x9	Con 9x9
Suma 1	124	31760	155	63933	293	104647	317	118323	642	179817	1445	243078	96	286256	-	-
Suma 2	87	32082	122	60776	137	99928	146	112502	188	179686	1517	324743	3160	286083	-	-
Suma 3	89	29685	117	64181	103	100201	135	114665	213	171903	217	379526	263	371584	-	-
Scadere 1	56	31719	116	63946	128	100474	138	117425	190	180489	210	366958	259	280512	-	-
Scadere 2	55	32245	173	56843	791	100124	905	114534	1013	179535	1390	364693	2512	285700	-	-
Produs	63	31372	167	55817	173	99639	247	116339	426	192731	504	356460	8477	399901	-	-
Divizare	62	31922	173	62806	118	91329	1420	119942	200	183242	1668	360198	428	416070	-	-
Transpusa 1	4	28385	69	48881	91	87872	124	118044	168	180539	5777	352467	2646	405871	-	-
Transpusa 2	50	29611	68	62897	105	91625	1494	114164	2137	183603	3280	467799	4870	510209	-	-
Determinantul	31	156	124	286	515	3922	6508	4567	24233	23344	76555	255284	967344	826578	-	-
Inversul	286	34208	468	52574	5670	91807	18393	132468	151344	315996	1048074	2301332	8829661	10053879	-	-
Media	50	5362	61	5016	77	8467	124	11956	9	11921	140	19830	157	124004	-	-
Matricea medie	45	6134	57	10812	66	11434	83	11423	794	19435	116	19838	132	34184	-	-
Covariansa	75	29850	139	56160	166	87511	1064	112456	432	172651	1210	380630	698	439619	-	-

*) The time is expressed in microseconds

*) WS – Web Service

*) Con – Executed in a console

Due to the calculation of the inverse, the time for execution beginning with 9x9 is longer than 30 seconds.

The advantages of the functions usage:

✓ the possibility of resolving ample problems, which do not go in the user‘s computer memory;

✓ the identification of the common costs;

✓ the reduction of the costs;

✓ the reduction of the time response.

The client can get involved in the problem description.

Conclusions

In this paper I presented a general view on the architectures based on services and their present state in the informational and research fields. I also specified the role of the Web services and their benefits, but also the problems in realizing the Web services. I also carefully presented some concepts connected to the architecture of the distributed systems. The idea I want to develop is that of attaining some Web services, by using numerical computation methods. The applications are created on the Eclipse platform and made with the help of the book *Numerical Library in Java for Scientists and Engineers*. They begin with elementary structures and build up to some more complicated ones.

By grouping them and creating services for each of them, I realized that many functions appeal to other functions and thus, I created a table where I put only the functions which appear one time. I created a proper service for each function and I followed the response time. I noticed that this time differs depending on the complexity of the function.

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