



Grails application in entrepreneurship

Katarina Mitrović¹, Danijela Milošević¹, Nenad Stefanović¹ and
Marjan Milošević¹

¹ Faculty of Technical Sciences Čačak, University of Kragujevac, Serbia

e-mail katarina.mitrovic@ftn.kg.ac.rs, danijela.milosevic@ftn.kg.ac.rs, nenads@kg.ac.rs,
marjan.milosevic@ftn.kg.ac.rs

Abstract: *The subject of this paper is the development of applications in the field of entrepreneurship using the Grails framework. This study describes some of the most important Grails features and its architecture. The demonstration application, which was created for the needs of this papers, is based on Grails framework and it is developed for the company's Sales subsystem. The goal of this work is analyzing the use of Grails framework in the field of entrepreneurship and providing an overview of the results of the analysis, as well as the advantages and disadvantages that have been proved during the research. Also, in this paper the overall impression of whether Grails meets the software requirements set by today's complex business environment or not is presented.*

Keywords: *Grails; Entrepreneurship; Framework*

1. INTRODUCTION

An aspect of life that is mostly changed with the invention of computers is the business aspect. Computers have made it possible to accelerate business processes and provide space for the expansion and development of business. Most of the administrative tasks that were once performed manually can now be performed through a computer program. The creation and processing of data and documents, accounting programs, programs for calculation of salaries, programs for virtual meetings and sending e-documents, ERP software, and e-commerce applications, are just some of the computer programs with whom a big part of any enterprise business can be covered.

In order to meet increasingly extensive and complex requirements of companies in the software sense, combining multiple programming languages is necessary. Beside the basic functionalities required by users, providing of fast, secure and flexible software is necessary. The team of programmers that created the program for the company must be available to maintain and upgrade the software, in case of errors, system crashes or expanding user requirements. It is very important to perform a thorough evaluation of all criteria in the selection of appropriate programming languages and frameworks for application development.

Most of the frameworks combine multiple programming languages, where each functionality is developed with most adequate language. Many well-designed application benefits can be achieved by choosing the right framework, because a variety of mechanisms for creating sustainable, concise and secure applications are integrated in frameworks.

In past few years, several authors presented their research of Grails application development in entrepreneurship. The paper [1] summarizes the advantages of Grails framework in developing the enterprise-level application by utilizing current Java resources. The paper [2] studies and designs Office Automation System based on Grails. The authors in [3] discuss domain oriented development of enterprise web application, and also a procedure of domain oriented development using Grails is showed in detail. The work from Szymajda and Zabierowski in [4] demonstrates how to use Grails and Groovy languages in creating schedule manager. Also, the paper [5] presents a comparison of Web frameworks, including Grails, in order to establish the best practices for Web development. The authors in [9] analyse the development of plugin for RDFa semantic information exposing using Grails. The paper [10] describes the experience of implementing Grails in textual analysis software building. The authors of paper [11] explore Grails implementation in area of web-based 3D collaborative virtual environment for distance learning. The work [12] presents a rich internet application for remote visualization and collaborative annotation of digital slides in histology and cytology developed in Grails and concludes that proposed web software is generally applicable and its methodological choices open the door for large-scale distributed and collaborative image annotation and exploitation projects. The research [13] proves that Grails can be used in area of distributed system with service resource oriented architecture development. The authors in [15] studies an enterprise framework for computational chemistry based on Grails framework.

In this paper, Grails framework will be discussed. In the next section, the basic features and architecture of Grails frameworks are described. In the third section, the demonstration application is described. In the fourth section, the use of Grails frameworks in the field of entrepreneurship is analyzed and an overview of the results of the analysis are provided. At the end of this research, the overall impression of whether Grails meet the requirements set by today's complex business environment or not, is presented.

2. ABOUT THE GRAILS FRAMEWORK

Grails framework is an open source web framework based on Groovy and Java programming languages. It was designed to combine the advantages of existing Java technologies under a simple interface [6].

The Grails framework architecture is shown in Fig. 1. Grails implements *MVC* architecture and is based on *Java virtual machine*. It combines multiple technologies such as Spring, Sitemash, Hibernate and Quartz. Programming code in Grails can be written either in Java or Groovy programming language.

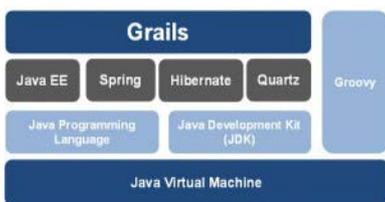


Figure 1 – Grails architecture [7]

Grails framework integrates an important rule - "*convention over configuration*", meaning that all of the configuration files are already set in Grails and that developers can immediately start developing the application, which significantly shortens the time needed for development. Convention over configuration in Grails is achieved with the tools that perform automated configuration - Tomcat and HSQLDB.

Some of the dominant technologies applied in Grails are *GORM* (technique for mapping created on the model of Hibernate ORM), *RAD* model for quick application development,

embedded domain-specific languages (*DSL*), asynchronous programming, run-time and compile-time metaprogramming etc.

Grails frameworks became very popular in short time and some of the worlds most famous companies which uses this framework for its business improvement are Netflix, BestBuy, Cisco, Google, IBM, LinkedIn, MasterCard, MTV, Commerzbank, NCI, Nestle, Oracle, Sony, UBS, Vodafone and many others.

The following section describes an explorative application developed in Grails for company's sales process.

3. DEVELOPMENT OF SALES MODULE APPLICATION IN GRAILS

3.1. Bussiness Aspect

Enterprise business consists of a complex and extensive set of processes, such as procurement, sales, production, marketing, finance, human resources, etc. When the enterprise business software is developing, for each subsystem should be created matching module, such as: marketing module, sales module, production module, etc.

In this paper, explorative example is implemented for the Sales module, based on the following example. Client sends request for an offer to the Sales Department, which contains information about products that are necessary for the client. Based on this request, the offer/pro forma invoice is created, which includes information about the characteristics of the required products and conditions of sale. The offer is submitted to the client. Afterwards, the sales order is created by client and sent to factory. Upon that, the request for the production of ordered products is created and sent to the Production Department. After completion of the production, products with product receipt are delivered to warehouse. Then, the warehouse creates consignment note in four copies. These documents are sent to the client together with products, whose signature confirms that the products are delivered. One copy of the consignment note is created for the buyer, while the remaining three are for warehouse, Bookkeeping and Sales Department.

In exploratory application one simple (entry, modification and deletion of products) and one complex (entry, modification and deletion of orders) use case that occurs in previously described Sales module are implemented.

3.2. Technical Aspect

The demonstration application is developed in NetBeans development environment using Grails framework. Two main programming languages are used for the implementation of exploratory web application - Java and Groovy. Besides, two more important languages were used - HTML programming language for the presentation layer and the SQL programming language for constructing database queries. One of the application's functionality is implemented as REST service in Maven, with the Grails at the client side.

A deployment diagram of demonstration

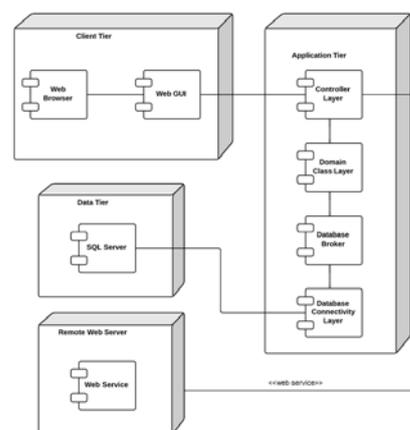


Figure 2 – Deployment Diagram

application is shown in Fig. 2, where application software, hardware and architecture can be seen. The application implements a three-tier architecture, consisting of a client, application and database tier. Database tier is implemented in SQL Server and associated with the application in the Grails database connectivity layer. Database connectivity layer is connected to the database broker, which has access to the domain classes. Domain class layer is connected to the presentation layer through the controller layer. Presentation layer consists of a user interface that can be accessed to with a web browser. The application uses the remote service, implemented in Maven.

3.3. User Aspect

Grails user interface is a dynamic web interface, which is developed with HTML, CSS, JavaScript and other programming languages. Grails can provide very easy and fast integration with Bootstrap, which results in rich user interface with modern and accessible content, with minimal programming effort.

The home page (Fig. 3) contains a menu with implemented functionalities - input, editing and deleting of products or orders.

After the implementation and descriptions of explorative Grails application, the performance analysis can be made, which is described in next section.

4. RESULT ANALYSIS

Grails is the framework that combines multiple programming languages, i.e. it requires the use of different programming languages, depending on the part of the application that is being implemented. HTML, CSS, and similar languages are used in the presentation layer of application, Groovy is used in the logic layer, and SQL query language is used for communication with the database. For Grails applications development, knowledge of at least three programming languages in different domains is necessary, which means that it requires at least basic knowledge of polyglot programming. Also, Grails offers the possibility of combining other programming languages, because even though the Groovy programming language is inseparable part of Grails framework, Grails can execute the code written in another programming languages. Grails can have plug-ins, with which interoperability with other programming languages like Clojure, Scala and Ruby can be achieved. These plugins represents the Java implementation of the aforementioned programming languages on the Java virtual machine. In controllers, domain classes and the broker database, Groovy and Java programming languages can be combined, in order to obtain maximum benefit from both languages.

Grails framework provides a great flexibility in writing code, and different programming language features can be combined within it. The quality of implemented functionalities



Figure 3 – Explorative application home page

can be significantly raised without time or other losses if programming languages are properly used, ie. used in those parts of the application where they reach the best performance. Thus, as one of the biggest advantages of Grails, the possibility of **creating polyglot applications** with maximum performance and minimum investments and losses can be indicated.

Entrepreneurship is a very extensive and serious area that requires constant **system maintenance and improvement**. In this sense, Grails can be very convenient, but some disadvantages may occur. Grails code is very concise, simple, clear, flexible, scalable and each folder has a precise purpose, so new programmer can easily understand existing application and make adjustments which client needs. However, if the developer applied a large number of programming languages for creating Grails application, it is necessary that the developers who maintain the application also have knowledge of all these languages.

As another Grails advantage, mentioning of "**convention over configuration**" is crucial. This principle allows developers to immediately start with development, which significantly shortens development time and accelerates application programmer productivity.

Grails framework represents the **synthesis of some of the best technologies** in the world of programming. Grails integrates their advantages and eliminates their defects, which is why high quality and performance applications can be developed. Grails applications are easy to use from the perspective of developers and users. Configuration is not required, scalability and reusability are at the highest level, development time is shortened, and a modern and easy-to-use web-based application is provided.

Grails is very flexible in terms of the **additional technologies integration**. In order to maximize use of its potential it is necessary to learn a new programming language - Groovy and to know additional programming languages and technologies, as well as the possibilities of their integration. Some of the technologies, which are built into Grails, cannot be changed, so, for example, Grails does not support any ORM technology except GORM technology that is embedded [8].

Using only **Groovy programming language** in Grails application layer development can result with simple and short code, but the possibility of pattern applying is reduced to a minimum. Some Groovy functionality has its downside - *def* data type is difficult to maintain, when creating multi-threaded applications some problems may occur with GORM functionality, etc [8].

Grails has a **large and constantly active community**, so developers who choose this framework for application development can get online tutorials and answers to questions anytime.

After a detailed analysis of Grails application development in the field of entrepreneurship, overall conclusion and suitability assessment of Grails application in the mentioned area can be made.

5. CONCLUSION

This paper aims to present a new technology, which can be applied in complex enterprise software solutions. The exemplary web application and obtained results showed that Grails framework is modern and comprehensive framework offering flexible and fast applications. From this study, we can conclude that Grails is highly suitable for use in large and complex

business environments. This paper proves that Grails applications are very convenient for developing programmers, maintenance team, target users, and for the enterprise as a whole. Features such as improved maintainance, convention over configuration, additional technology integration etc, characterize Grails as a popular framework, which have spread across software community in just several years and found its place in large number of business applications. After analyses of Grails framework made in this paper, it can be concluded that Grails could be hard to master, because it integrates many technologies, but once learned, it offers developers a comprehensive tool that can solve complex problems and deliver automatization of business processes. At the same time, end users get simple and elegant software that meets their higher needs.

REFERENCES

- [1] Bosi, C. (2009). *Developing Web Application Based on Grails Framework*. Computer Applications and Software, Issue 8
- [2] Weiqiao, Z., Qihua, J. & Ming, L. (2013). *Research and Implementation on Office Automation System Based on Grails*. Railway Computer Application
- [3] Hao, Z. & Guang-Xin, W. (2009). *Discussion of Domain Oriented Web Application Development Based on Grails*. Microcomputer Application
- [4] Szymajda, D. & Zabierowski, W. (2011). *Schedules Manager as an Example of Grails and Groovy Language Use*. Polyana-Svalyava, CADSM
- [5] Mora-Murguía, L.P., Alor-Hernandez, G., Olivares-Zepahua, B. A., Reyes-Hernandez, L. A. & Chavez-Trejo, A. M. (2014). *Best Practices fro Web Development using Grails and Django*. Mexico City, Technological Trends in Computing, IPN
- [6] Groovy and Grails Understanding – Part 2, <http://techmytalk.com/2013/04/14/groovy-grails-understanding-part2/>, [online] april 2016.
- [7] Groovy and Grails Application Development, <http://people10.com/blog/groovy-and-grails-application-development-2/>, [online] march 2016.
- [8] Pros and Cons using Grails, <http://clearobjects.blogspot.rs/2012/09/grails-pros-and-cons-pros-rapid.html>, [online] april 2016.
- [9] Pereira, M. & Martins, J. A. (2012). *aRDF: A plugin to expose RDFa semantic information using Grails*. EATIS, 6th Euro American Conference
- [10] Heiden, S. (2010). *The TXM Platform: Building Open-Source Textual Analysis Software Compatible with the TEI Encoding Scheme*, 24th Pacific Asia Conference on Language, Information and Computation
- [11] Settapat, S., Ohkura, M. & Achalakul, T. (2009). *A web-based 3D collaborative virtual environment for distance learning*. ICCAS-SICE
- [12] Marée, R., Stévens, B., Rollus, L., Rocks, N., Lopez, X. M., Salmon, I., Cataldo, D. & Wehenkel, L. (2012). *A rich internet application for remote visualization and collaborative annotation of digital slides in histology and cytology*. Italy, 11th European Congress on Telepathology and 5th International Congress on Virtual Microscopy
- [13] Hermawan, H. & Sarno, R. (2012). *Developing Distributed System With Service Resource Oriented Architecture*. TELKOMNIKA, Vol.10, No.2
- [14] Waller, M.P., Dresselhaus, T. & Yang, J. (2013). *JACOB: An enterprise framework for computational chemistry*. Journal of Computational Chemistry, Vol. 34, Issue 16