ISSN (Online) : 2278-1021
ISSN (Print) : 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering
Vol. 3, Issue 3, March 2014

# A Review of Methods for Developing Business Rules Engine

**Sachin Chaware [1], Aarti Karandikar [2]**

Student M.Tech, Department of Computer Science and Engineering, Shri Ramdeobaba College of Engineering and Management, Nagpur, India[1]

Assistant Professor, Department of Computer Science and Engineering, Shri Ramdeobaba College of Engineering and Management, Nagpur, India[2]

**Abstract**: It has been widely recognized that many future database applications including communications, manufacturing and engineering processes will require some kind of fact based reasoning. Fact based systems often spend a large fraction of their execution time matching rule patterns with data. A business rules engine enables an organization to increase its agility and speed to adapt to business process execution. This paper presents a systematic literature review of different methods for developing business rules engine for the fact based systems. First, we provide a pattern matching algorithm Rete Network which is used in OPS5, which efficiently identify the applicable rules. The second method is YES/MVS real time expert systems which extends the Rete algorithm and also extends the use of expert systems techniques to continuous, real time, interactive control applications. The third method is YES/OPS system which advances the Rete algorithm. The fourth method is Set-Oriented Constructs which forwards the Rete Rule Bases to Database Systems. The fifth method is LEAPS which produces the fastest executables of OPS5 rule sets. The sixth method is BPRE Rule Matching Algorithm which is constraint-based rule matching algorithm. On the basis of review of different methods presented here will be very useful to develop a business rules engine for fact based systems. It is believed that this review and classification scheme proposed in the paper would serve as a guide for both researches and practitioners in the further studies.

**Keywords**: business rules, business information systems, business processes, business rule engine

## I. INTRODUCTION

Today's dynamic business environment presents many new business process management challenges. The number of business rules in a typical information system can range from several hundred to several thousands and the number of computer and process controls for reasons of data compliance, quality control and internal audit can similarly reach into the thousands. Facing the complexity of business processes and rules user find it difficult to understand the underlying logic of the business. They are not able to analyse and make appropriate decisions in a timely fashion when business process issues arise. In recent years business rules engines (BRE) have become a key component in almost every major enterprise class projects. The increased importance of projects using BRE has been recognized throughout the industry. Business rules engines have not only have become a more powerful, scalable and robust technology, which is capable to process an extremely high number of complex rules per minute, per hour, and even per second; but whole BRE platform is evolved. The BRE platform is a complex environment with the special tools for development, analysis and design as well as numerous enhancements, making the process of performing encountering of business rules very efficient. Business Rules Engine (BRE) provides an automated rule application of processes on which inference such as backward and forward chaining is enabled. As the recent study on modernizing information systems, less than 30% of software source code contains business logic, while the remaining code supports infrastructure-related activities. It follows that, if the large part of software changes are due to the need to adopt its functionality to the changed business requirements, then facilitating comprehension of software with automated business knowledge extraction methods may significantly reduce the cost of software maintenance and evolution. This hypothesis has been investigated by many researches during the past several decades resulting in numerous methods for development of business rule engine for fact based systems.

This article reviews about the current state of BRE-based development and their specific needs. This paper presents a systematic literature review in order to: summarize the state-of-the-art in this research field, identify any gaps in current research and explore possible directions for the further research, provide a framework in order to appropriately position new research activities in the field of business process management. Corporations utilize a business process management system (BPMS) to support the execution of business process through the automated coordination of activities and resources according to the defined model of the business process.

## II. PRODUCTION RULE SYSTEMS

When working with a BRE the main entity is a rule. A rule is a set of conditions and associated actions which performed when the conditions met satisfaction. A rule is written in the form of an "If" and "else" statements, which might have preconditions that are other rules which must have to be executed or matched for the further processing of application should be in the same ruleset. Same rule set

and Precondition rules allow the reuse of rules and reduce repetition of framing conditions across rules. While rules that are fired need to have at least one condition and action. Below are other BRE entities which should be accounted for during rules implementation.

A rule set is a logical collection of business rules. A rule set is used to supports the grouping of business rules that governs a specific function. Such as all rules related to discounts could be grouped under one "discount-rules" ruleset.

In some products, there is representation for rule is "if/then" knowledge. During the process of rules encountering, the taxonomy of the rules should be developed. Such rules classification will determine the next tasks in the rules analysis, implementation and the processes related to building the business rule model - where discover, detail, analyse, group the business rules are performed according to the established classification of the identified rules to the developed taxonomy.

## III. DIFFERENT METHODS

This section discusses the different methods which are used for developing business rule engines in the fact based systems.

[1]C. L. Forgy invented the Rete pattern matching algorithm which uses OPS5 to reduce the computation required to check for conditions that are satisfied. Forgy mentioned in paper that the Rete network has been introduced to avoid iterating over working memory. To evaluate the conditions of the various rules and monitor changes in the database is efficient way in the paper. The method used in Rete is language OPS5 which uses the algorithm steps-first evaluate the LHSs of the productions to determine which are satisfied given the current contents of working memory. Second step is select one production with a satisfied LHS; if no productions have satisfied LHSs, halt the interpreter. Third is perform the actions in the RHS of the selected production and then go back to first step. Thus, The Rete Match Algorithm is a method for comparing a set of patterns to a set of objects in order to determine all the possible matches.

[2] J.H. Griesmer, S.J. Hong, M. Karnaugh, J.K. Kastner, M.I. Schor developed the YES/MVS system (Yorktown Expert System for MVS operators) which is a real time expert system that exerts interactive control over an operating system as an aid to computer operators. The OPS5 production system developed by C. L. Forgy [1] was chosen as their primary tool. This system improved the speed of execution of OPS5 by compiling the right hand side (RHS) or consequent part of a rule and fast communication.

[3] Marshall 1. Schor, Timothy P. Daly, Ho Soo Lee, Beth R. Tibbitts, developed the central algorithm which achieves significant improvement in efficiency and rule clarity. This paper changes the rete operation, and change how the rules are (re-)triggered. This system has efficiency of space and time, especially for large production systems.

[4] DN Gordin , Alexander J. Pasik presented the Set-oriented constructs for forward chaining fact based systems. This paper extends Rete while making as few changes to the Rete network structure as possible. This paper presents the S-node algorithm which is concisely and efficiently specified ,which increases likelihood of OPS-like languages being used as the rule language for relational database systems.

[5] Don Batory invented the LEAPS Algorithm which is a state-of-the-art production system compiler that produces the fastest sequential executables of OPS5 rule sets. The system outperforms the OPS5 interpreters.

[6] Wayne Huang and Edward A. Stohr developed BPRE Rule Matching Algorithm which uses a constraint-based rule matching algorithm without using the database trigger facility. This is efficient in a production environment and easy to use and understand.

Thus systematic literature review is summarize the state-of-the-art in this research field, identify any gaps in current research and explore possible directions for the further research, provide a framework in order to appropriately position new research activities in the field of business process management.

## IV. CONCLUSION

A conclusion section based on the analysis discussed in this paper, there is some demonstrated value in the addition of the following tasks and methods to projects with the business rules engines:

- Make analysis of taxonomy of business rules a required part of the business rules analysis, enabled by the current and future state of the development of BRE technology, impacts the whole process of how these rules are captured and implemented.
- There is no unified approach for capturing business rules and their conversion to a form which is optimal for the BRE. This step is one of the key challenges and areas of risk for these types of projects
- In case of enterprise level project with BRE as one module, the rules are applied against methods and attributes of the classes imported to the BRE from the overall class diagram of project, making it a required design artifact for project.
- Use case points based estimate is a convenient way of estimating the effort for any project with well defined use cases and BRE in particular.

For a project with BRE, it is proposed that this type of estimation is extended by introducing of the effective complexity of the use cases through the formula connecting complexity of the use case itself to the complexity of the associated business rules.

## ACKNOWLEDGMENT

We would like to thank anonymous reviewers for providing sound guidance and suggestions for early versions of this paper.

## REFERENCES

[1] Charles L. Forgy, Rete: A Fast Algorithm for the Many Pattern/Many Object Pattern Match Problem ,Artificial Intelligence, 1982.

[2] J.H. Griesmer, S.J. Hong, M. Karnaugh, J.K. Kastner, M.I. Schor, YEWMVS: A Continuous Real Time Expert System, IBM ,1984.

[3] Marshall 1. Schor, Timothy P. Daly, Ho Soo Lee, Beth R. Tibbitts, Advances in rete pattern matching,IBM,1986.

[4] DN Gordin , Alexander J. Pasik, Set-Oriented Constructs: From Rete Rule Bases to Database Systems, Artificial Intelligence, 1991.

[5] Don Batory, The LEAPS Algorithms, Technical Report 94-28, Department of Computer Sciences, University of Texas at Austin, 1994.

[6] Wayne Huang and Edward A. Stohr , Design and Implementation of a Business Process Rules Engine, Center for Technology Management Research, 2007.

[7] Ross, R.G., Principle of the Business Rule Approach. 2003: Addison-Wesley.

[8] Chisholm, M., How to Build a Business Rules Engine. 2004: Morgan Kaufmann.

[9] Huang, W., Business Process Rules Management: Challenges and Solutions, Stevens Institute of Technology, 2007.