A Novel Certification Process for Component-Based Life Cycle Model

Sandeep Chopra[1], M.K. Sharma[2], Lata Nautiyal[3]

[1]MCA ,Research Scholar ,Uttrakhand Technical University, Dehradun, India , 248001
[2]MCA , Amarapali Institute, Haldwani, India , 263139
[3]MCA , Graphic Era University, Dehradun, India , 248002

tosandeepchopra2016@gmail.com, 9897884345

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Abstract— Reusing the module or component of software is one of the most prime objective while developing a software system. To design computer program from the bottom or scratch is extremely expensive and time consuming so most of the giant companies in the field of computers are using pre- existing software components. CBSE i.e component based software engineering depends on the concept of combining different- components, providing interfaces and integrating all the modules or components. The concept of certification helps us to believe that a component is up to the mark and it follows a particular quality standard which is the reliability of a particular component. Through this novel certification model we are introducing a new mechanism that helps to select the component from the repository which increases the reliability of a component.

Keywords— Component testing, Component reliability, Component certification, Quality assurance, Component Selection, Repository

I. INTRODUCTION

The primary objective of developing software is to achieve customer satisfaction with in a stipulated time and cost. Making software from the scratch is very complex and time consuming process. Conventional approach is very tedious and expensive so another concept is COTS (Commercial off-the shelf)in   component based software engineering(CBSE).Using the concept of commercial off-the shelf one can select the component from repository , modify them because these modules are generated by many programmers using different programming languages and   providing interface so that it can connect with another component to form the computer system[1,2].By using module based software engineering one can use existing components, combine them and develop a new software system. Though it looks easy but it requires a lot of skills [3,4]. Designing the software system from the existing components requires several challenges which are not in traditional software engineering. To select the right development path one has to categorize the customer requirement into static or dynamic requirement [5]. This process is most important for developing the desirable software.. Now a day's companies are using this component based development technique to get the better result in terms of cost, reliability and quality of the computer system.

II. COMPONENT CERTIFICATION AND ITS PROCEDURE

Module or Component of a software system can be defined as a group of interfaces and method properties. It can be mathematically expressed as,
C = [If , Mp] where C denotes component, If denotes interfaces i.e I ={ If1, If2, If3,…….. Im} and Mp denotes functional properties i.e Mp = { Mp1, Mp2, Mp3, ………… Mpm}.
A component is a collection of more than one sub-system [6, 7]. The main objective is to develop a software system according to the customer requirement. To achieve this, a designer can use these pre-existing components. Some of the components are common in most of the software products and they are called "patterns". These patterns are very helpful in searching the components in component library. Selection of components can be done by number of ways.
i) Repository   ii) Update or Modify   iii) New   iv) Outsource

Certification of a component is the method of checking its value attached with it and tells the credibility and authenticity of a module in such a manner that it can be tested by third party rigorously. After getting certification of a component, it can be stored in a repository and is qualified for reuse in various software system[8,9]. However, the job of certifying is not simple. It involves a lot of skills as in software engineering one can evaluate the component in many different ways. Literature regarding certification is not sufficient. A lot of research is going on in this field.

There are so many hurdles which are   faced in certifying a component [10]

(i)   No standard procedure
(ii)   Certification cost is high
(iii) Duration of certification component i.e warranty
time

To achieve better quality component one can acquire reliability and compatibility with other module of a system [11, 12].

Using some software tools and techniques by third party or an independent body one can certify a module or component which assures credibility of that component. Certification is a method that indicates quality, reliability and security of a software system[13,14].To calculate the quality of a software module one can have some specific CQM i.e "Component Quality Model". Component quality is based on some entities, characteristics, attributes and the relationship among the entities that compose the model [14].Software quality management activities are performed in accordance with the plans, standards and methods by using unstructured weighting technique [15].

After analyzing different models of CBSE [16], we propose a novel model for module or component certification. With the help of this model a component can be selected or rejected.

III.   PROPOSED NOVEL APPROACH FOR COMPONENT CERTIFICATION

Component certification consists of conventional, semi conventional, unconventional assurance techniques with safety policies, code review and testing, integrating the components and references to support the literature. So there are many types of certificates and this certification process can have different mechanism.

The problems which are generally faced in this field are that many organizations fail to acquire component of their need from the repository. Repository is a pool of various components. One can select the component according to the need but the issue arises whether that component is certified or not. As we are aware that component certification is not an easy job. Most of the companies are ignoring this process due to lack of fund and the involvement of human labor in it. So it depicts that certification is a very important phase which should not be ignored. Without certification a component or a module is of no use at all. The method of certification is drawn in figure1 and described in the paragraph underneath.
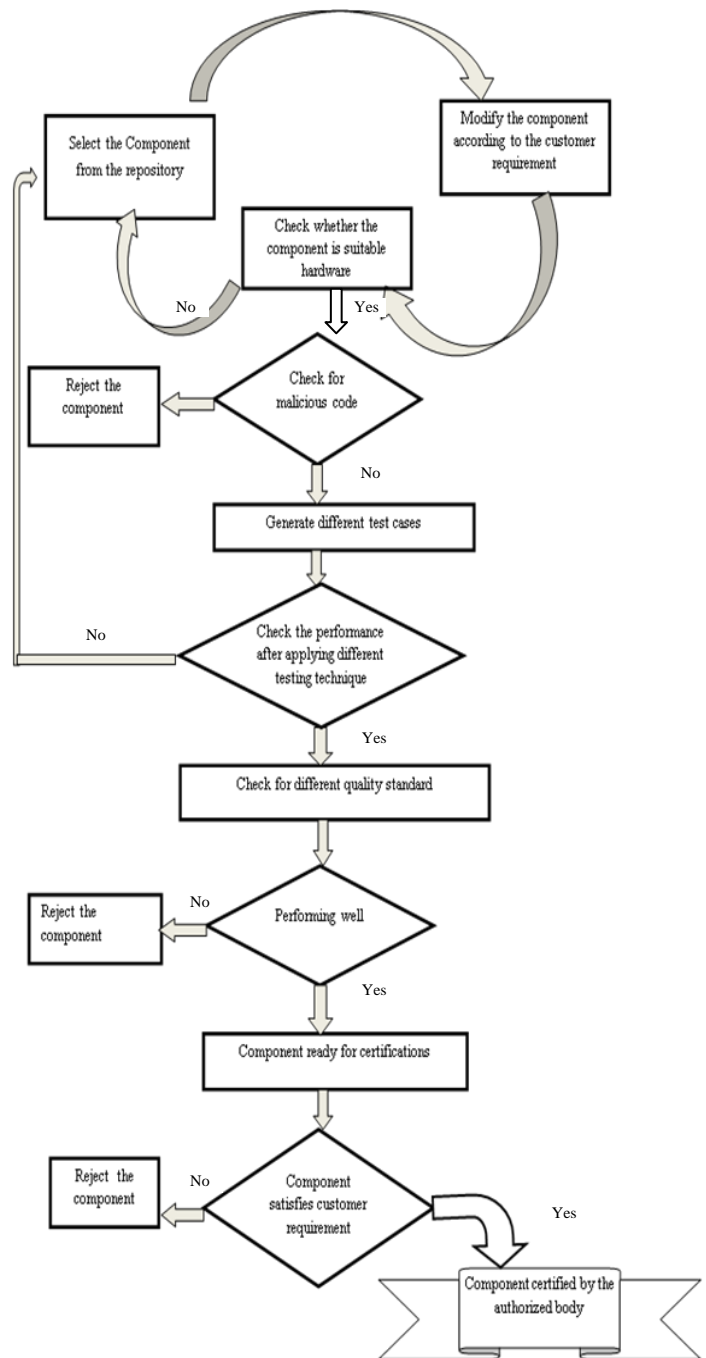

Fig-1   Method of Certification of a component

III.(I) COMPONENT SELECTION , CHECKING THE COMPATIBILITY WITH HARDWARE/SOFTWARE AND PERFORMING DIFFERENT TESTING TECHNIQUE

On the basis of attributes, functionality one has to select software component from the repository and check whether it meets the specific requirement or not .But if **it** does not the component is modified or updated. After that one has to check whether the component is compatible with the underlying hardware and software. If the answer is no then the new component is selected from the pool of components i.e repository and this process continues until we find a suitable module. Now the most important phase which is introduced in this model is that it has undergone for checking the malicious code such as trojan horse or worms. If there is any suspicious program in the module we should straight away reject that component because this can hamper the entire process. But if there is no hidden code in a module then one can develop the different test cases and apply different testing strategies. Broadly software testing can be categorized into two parts i.e White Box Testing and Black Box Testing. Before this a unit testing is applied on a component that validates the individual unit of a source code whether it works properly or not. It is also known as component testing. After successful execution of unit testing one has to implement white box and black box testing .When one checks the internal structure of a program it's known as white box testing and without going or looking into the internal structure if someone test the program it's known as black box testing. To ensure non conformances i.e 'any incident not expected in the test methods" one has to check regression testing. Software testing verifies that a module or component meets its requirement. This process of testing continues until the tester is satisfied that this component is up to the mark. This process is shown in figure 2.

III.(II) CHECKING THE QUALITY OF A COMPONENT

After successful completion of testing one should go for the quality of a component. One can say Quality assurance means "making sure quality is achieved". Quality such as

End user satisfaction = Requirement of the user + Expectations

"A good plan is useless, unless it is properly executed", so a quality of a module or component ensures that entire method of making a computer programming system is done in accordance with the proper planning. Software quality assurance (SQA) gives an assurance that software testing such as acceptance testing, is done in accordance with the method and plan. SQA reviews testing documentation for completeness and adherence to quality standards. By test monitoring, SQA assures software completeness and readiness of the component for delivery. The test procedures

tests the software requirements in accordance with test plan. Quality of a software component is based on these factors
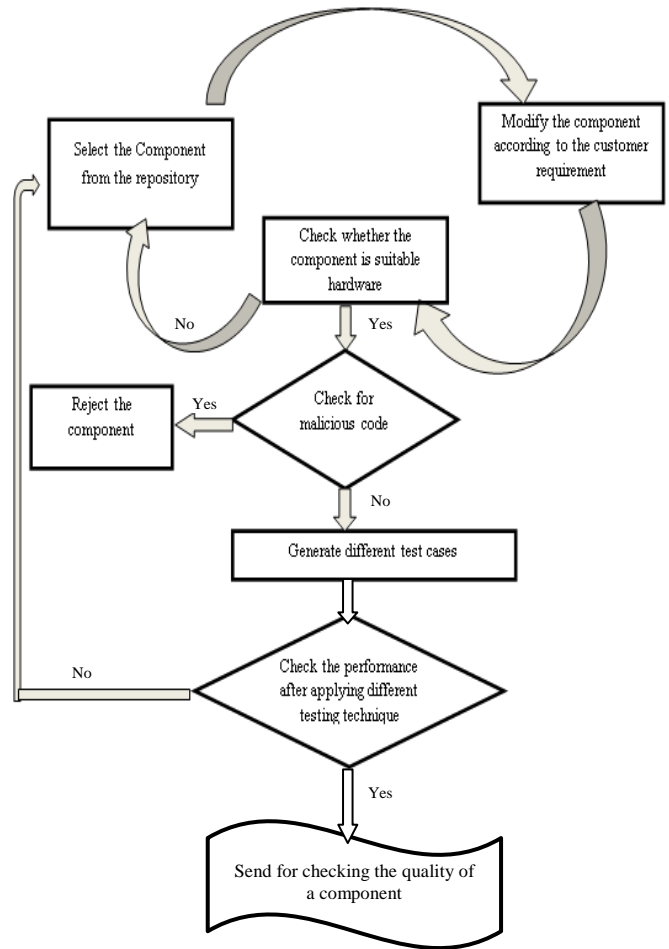

Fig-2   Component Compatibility with hardware and software

i)   It should be correct and understandable
ii)   It should be maintainable and testable
iii)   It should be transferable or portable
iv)   It should be verifiable and reliable
v)   It should be powerful or robust

One has to ensure that a component has to follow the standard quality method like   ISO-900 or SEI-CMM. If the quality checker is not satisfied with the quality of a particular component, it will be rejected . This process is shown in fig3
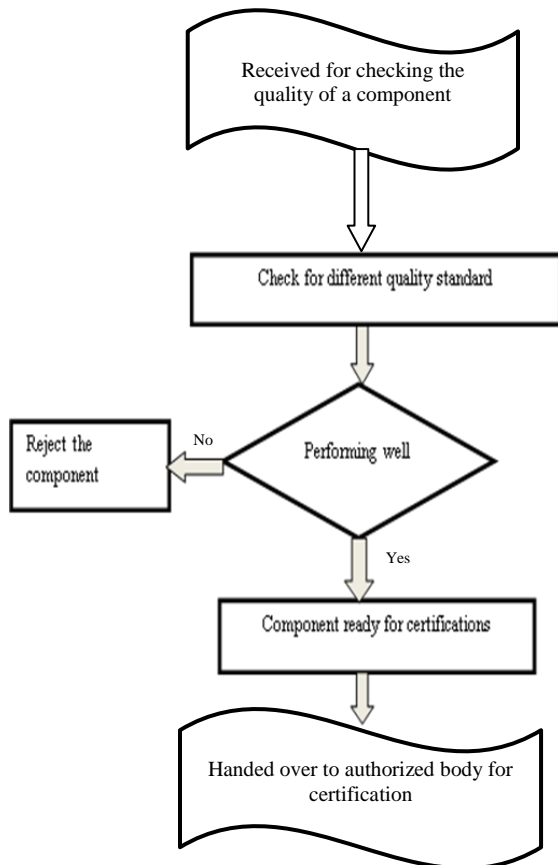
Fig-3   Checking the quality of a component

III.(III)   Component Certification

In this phase one have to give a component to the certification authority. The role of certification authority is to check whether the specified component,

i)   maintain high reliability
ii)   security of a component,
iii) fulfilled the customer requirement

If above said condition has fulfilled than component should be certified . Fig4 has shown the final submission process
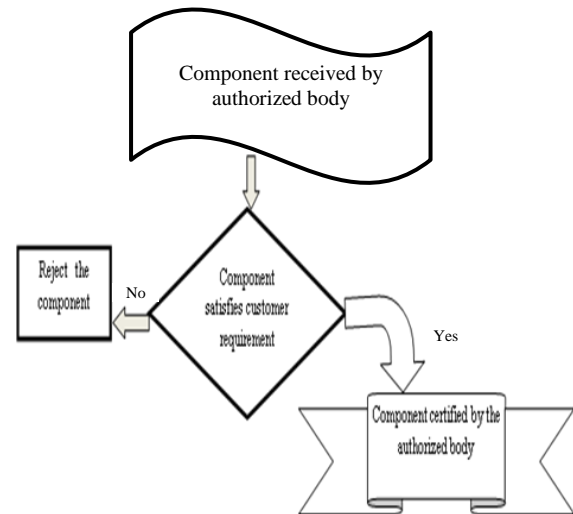

Fig-4   Component ready for Certification

IV.   CONCLUSION AND FUTURE SCOPE

Making a software system by using the concept of component based development is a new technique in the field of software engineering. By applying this process software companies can reduce their time and cost of building a computer system. Retrieving the component from the repository one should have trust on it that it has no malicious code. Through certification one can gain trust. In this paper we have proposed a novel certification process model for component to increase the level of trust which supports the quality assurance. There is a lot of future research scope in this field. The next step is to develop some certification tool which will calculate different quality parameters by using artificial intelligence, simulation, genetic algorithm or fuzzy logic. It will also provide necessary information such as time, effort which increases reliability.

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Authors Profile

Mr. Sandeep Chopra pursed Master of Computer Application(MCA) from G.B.Pant Engineering college (Pauri)in 2004. He has also done two more Master courses i.e MSc(Maths) and MTech(IT). He has cleared UGC-NET(twice), U-SET, GATE exam in the field of computer science. He is currently pursuing Ph.D. from Uttrakahand Technical University(Dehradun) and currently working as Assistant Professor in Department of Computer and Information and technology, University of SGRR since 2006. His main research work focuses on Component based software engineering.He has published 3 papers in international and 2 papers in national journals. He has 14 years of teaching experience and 2 years of research experience.

Dr. M.K.Sharma pursed Doctor of Philosophy PhD. He is currently Professor and Head inMCA Department of Amrapali Institute of technology,Haldwani. He has published more than 25 papers in national and international journals. He has 18 years of teaching experience and 7 years of research experience.

D*r. Lata Nautiyal* pursed Doctor of Philosophy PhD from Gurukul Kangri University in 2016.. She has also done three Master courses i.e MSc(CS), MCA and MTech(CS). She is currently working as Associate Professor in Department of Computer Application in Graphic Era University. Her main research work focuses on Component based software engineering.She has published 18 papers in international and 12 papers in national journals. She has 13 years of teaching experience and 6 years of research experience.