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Established - 1932

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22nd September 2016

TO
THE CONTROLLER OF PATENTS
THE PATENT OFFICE
KOLKATA

RE: Indian Patent Application No. 836/KOL/15
of 31.7.15 In the name of SIEMENS AKTIENGESELLSCHAFT

Dear Sir,

In connection with the abovementioned Patent Application, we send you herewith the following:

1. Formal Application Form 1.

Kindly take the same on record.


Yours faithfully,



.....
OF L.S. DAVAR & CO.
Applicant's Agent


Encl: as marked above

/hb

FORM 1 THE PATENTS ACT, 1970 (39 of 1970) & THE PATENTS (AMENDMENT) RULES, 2006 APPLICATION FOR GRANT OF PATENT (See Sections 7, 54, 135 and rule 20(1))		(FOR OFFICE USE ONLY) Application No.: Filing Date: Amount of Fee Paid: CBR No.: Signature:		
1. APPLICANTS				
Name	Nationality	Address		
Siemens Aktiengesellschaft	Germany	Wittelsbacherplatz 2, 80333 München, Germany		
2. INVENTORS				
Name	Nationality	Address		
BAGEWADI; MANJUNATH	IN	Basav Nagar, Hukeri,, 591309 Belgaum, India		
Karanth; Rohit Kota	IN	#304, Ramky Utsav, New BEL road, RMV 2nd stage, 560094 Bangalore, India		
MITRA; ABHISHEK	IN	404, Koshambi Enclave, Nabin Mitra Road, Burdwaan Compund,, 834001 Ranchi, India		
SUREKA; ASHISH	IN	54-B, Sainik Farms, 110062 New Delhi, India		
Singh; Himanshu Kumar	IN	407/A3, Mallaprabha Block, National Games Village, Koramangala, 560047 Bangalore, India		
3. TITLE OF THE INVENTION: A decision support platform for guiding a bug triager for resolver recommendation				
4. ADDRESS FOR CORRESPONDENCE OF AUTHORISED PATENT AGENT IN INDIA			Telephone No.: (00 91) 33 2287-3996	
L.S.Davar & Co., 32, Radha Madhab Dutta Garden Lane, 700 010 Calcutta			Fax No.: (00 91) 33 2287-6292	
			Mobile No.:	
			E-mail: lsdavar@cal2.vsnl.net.in	
5. PRIORITY PARTICULARS OF THE APPLICATION(S) FILED IN CONVENTION COUNTRY				
Country	Application No.	Filing Date	Name of the Applicant	Title of the Invention
6. PARTICULARS FOR FILING PATENT COOPERATION TREATY (PCT) NATIONAL PHASE APPLICATION				
International application number		International filing date as allotted by the receiving office		
7. PARTICULARS FOR FILING DIVISIONAL APPLICATION				
Original (first) application number		Date of filing of Original (first) application		
NA				
8. PARTICULARS FOR FILING PATENT OF ADDITION				
Main application/Patent Number		Date of filing of main application		
NA				
9. DECLARATIONS:				
(i) Declaration by the inventor(s)				
I/We, the above named inventor(s) is/are the true & first inventor(s) for this invention and declare that the applicant(s) herein is/our my/our assignee or legal representative.				
(b) Signature(s):		_____		
(c) Name(s):		MANJUNATH BAGEWADI		

FORM 1 THE PATENTS ACT, 1970 (39 of 1970) & THE PATENTS (AMENDMENT) RULES, 2006 APPLICATION FOR GRANT OF PATENT (See Sections 7, 54, 135 and rule 20(1))		(FOR OFFICE USE ONLY) Application No.: Filing Date: Amount of Fee Paid: CBR No.: Signature:	
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Siemens Aktiengesellschaft	Germany	Wittelsbacherplatz 2, 80333 München, Germany	
2. INVENTORS			
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Karanth; Rohit Kota	IN	#304, Ramky Utsav, New BEL road, RMV 2nd stage, 560094 Bangalore, India	
MITRA; ABHISHEK	IN	404, Koshambi Enclave, Nabin Mitra Road, Burdwaan Compund,, 834001 Ranchi, India	
SUREKA; ASHISH	IN	54-B, Sainik Farms, 110062 New Delhi, India	
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		Mobile No.:	
		E-mail: lsdavar@cal2.vsnl.net.in	
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7. PARTICULARS FOR FILING DIVISIONAL APPLICATION			
Original (first) application number		Date of filing of Original (first) application	
		NA	
8. PARTICULARS FOR FILING PATENT OF ADDITION			
Main application/Patent Number		Date of filing of main application	
		NA	
9. DECLARATIONS:			
(i) Declaration by the inventor(s)			
I/We, the above named inventor(s) is/are the true & first inventor(s) for this invention and declare that the applicant(s) herein is/our my/our assignee or legal representative.			
(b) Signature(s):			
(c) Name(s):		MANJUNATH BAGEWADI	

(b) Signature(s):	
(c) Name(s):	Rohit Kota Karanth
(b) Signature(s):	_____
(c) Name(s):	ABHISHEK MITRA
(b) Signature(s):	_____
(c) Name(s):	ASHISH SUREKA
(b) Signature(s):	
(c) Name(s):	Himanshu Kumar Singh
<p>(ii) Declaration by the applicant(s) in the convention country</p> <p>I/We, the applicant(s) in the convention country declare that the applicant(s) herein is/are my/our assignee or legal representative.</p> <p style="text-align: center;">NA</p>	
<p>(iii) Declaration by the applicant(s)</p> <p>We, the applicants hereby declare(s) that:</p> <ul style="list-style-type: none"> • We are in possession of the above-mentioned invention. • The complete specification relating to the invention is filed with this application. • The invention as disclosed specification uses the biological material from India and the necessary permission from the competent authority shall be submitted by me/us before the grant of patent to me/us. • There is no lawful ground of objection to the grant of Patent to me/us. • I am/We are the assignee or legal representative of true and first inventors. • The application or each of the applications, particulars of which are given in Para 5 was the first application in convention country/countries in respect of my/our invention. • I/We claim the priority from the above mentioned application(s) filed in convention country/countries and state that no application for protection in respect of the invention had been made in a convention country before that date by me/us or by any person from which I/We derive the title. • My/Our application in India is based on international application under Patent Cooperation Treaty (PCT) as mentioned in Para-6. • The application is divided out of my/our application particulars of which are given in Para – 7 and pray that this application may be treated as deemed to have been filed on under Section 16 of the Act. • The said invention is an improvement in or modification of the invention particulars of which are given in Para – 8. 	

(b) Signature(s):	_____
(c) Name(s):	Rohit Kota Karanth
(b) Signature(s):	
(c) Name(s):	ABHISHEK MITRA
(b) Signature(s):	_____
(c) Name(s):	ASHISH SUREKA
(b) Signature(s):	_____
(c) Name(s):	Himanshu Kumar Singh
(ii) Declaration by the applicant(s) in the convention country	
I/We, the applicant(s) in the convention country declare that the applicant(s) herein is/are my/our assignee or legal representative.	
NA	
(iii) Declaration by the applicant(s)	
We, the applicants hereby declare(s) that:	
<ul style="list-style-type: none"> • We are in possession of the above-mentioned invention. • The complete specification relating to the invention is filed with this application. • The invention as disclosed specification uses the biological material from India and the necessary permission from the competent authority shall be submitted by me/us before the grant of patent to me/us. • There is no lawful ground of objection to the grant of Patent to me/us. • I am/We are the assignee or legal representative of true and first inventors. • The application or each of the applications, particulars of which are given in Para 5 was the first application in convention country/countries in respect of my/our invention. • I/We claim the priority from the above mentioned application(s) filed in convention country/countries and state that no application for protection in respect of the invention had been made in a convention country before that date by me/us or by any person from which I/We derive the title. • My/Our application in India is based on international application under Patent Cooperation Treaty (PCT) as mentioned in Para-6. • The application is divided out of my/our application particulars of which are given in Para – 7 and pray that this application may be treated as deemed to have been filed on under Section 16 of the Act. • The said invention is an improvement in or modification of the invention particulars of which are given in Para – 8. 	

(b) Signature(s):	_____
(c) Name(s):	Rohit Kota Karanth
(b) Signature(s):	_____
(c) Name(s):	ABHISHEK MITRA
(b) Signature(s):	<u>Ashish Sureka</u>
(c) Name(s):	ASHISH SUREKA
(b) Signature(s):	_____
(c) Name(s):	Himanshu Kumar Singh
(ii) Declaration by the applicant(s) in the convention country	
I/We, the applicant(s) in the convention country declare that the applicant(s) herein is/are my/our assignee or legal representative.	
NA	
(iii) Declaration by the applicant(s)	
We, the applicants hereby declare(s) that:	
<ul style="list-style-type: none"> • We are in possession of the above-mentioned invention. • The complete specification relating to the invention is filed with this application. • The invention as disclosed specification uses the biological material from India and the necessary permission from the competent authority shall be submitted by me/us before the grant of patent to me/us. • There is no lawful ground of objection to the grant of Patent to me/us. • I am/We are the assignee or legal representative of true and first inventors. • The application or each of the applications, particulars of which are given in Para 5 was the first application in convention country/countries in respect of my/our invention. • I/We claim the priority from the above mentioned application(s) filed in convention country/countries and state that no application for protection in respect of the invention had been made in a convention country before that date by me/us or by any person from which I/We derive the title. • My/Our application in India is based on international application under Patent Cooperation Treaty (PCT) as mentioned in Para-6. • The application is divided out of my/our application particulars of which are given in Para – 7 and pray that this application may be treated as deemed to have been filed on under Section 16 of the Act. • The said invention is an improvement in or modification of the invention particulars of which are given in Para – 8. 	

10. FOLLOWING ARE THE ATTACHEMENTS WITH THE APPLICATION:

- ~~(a)~~ Complete Specification
- ~~(b)~~ Complete Specification (in confirmation with the international application)/as amended before the International Preliminary Examination Authority (IPEA), as applicable (2 copies)
No. of pages 22 No. of claims 19
- ~~(c)~~ Drawings (in confirmation with the international application/as amended before the International Preliminary Examination Authority (IPEA), as applicable (2 copies) No. of sheets **7**
- (d) Priority documents
- (e) Translation of priority documents/Specification/International Search Report
- ~~(f)~~ Statement and undertaking on Form 3.
- ~~(g)~~ Power of Authority **(GWA)**
- (h) Declaration of inventorship on Form 5.
- (i) Sequence listing in electronic form
- (j) _____

Fee Rs. **22,400/-**

We hereby declare that to the best of our knowledge, information and belief the fact and matters stated herein are correct and We request that a patent may be granted to me/us for the said invention.

Dated **31st day of July, 2015**

Siemens Aktiengesellschaft

Signature 
NAME: Klinger Renner
Both Authorised Officers

To, The Controller of Patent
The Patent Office at New Delhi, Mumbai, Chennai, Kolkata.

Pac

STAMP AFFIXED BY
21/8/14
STAMP
KOLKATA COLLECTORATE



GENERAL POWER OF ATTORNEY

We, **SIEMENS AKTIENGESELLSCHAFT**, of Wittelsbacherplatz 2, 80333 München, Germany, a German Company, are desirous and hereby appoint our Attorneys for the purposes hereinafter mentioned:

NOW THESE PRESENT WITNESS THAT WE THE SAID

SIEMENS AKTIENGESELLSCHAFT

heraby nominate **G. S. DAVAR, P.S. DAVAR, P.D. GUPTA, MRS. S. BANERJEE, MRS. I. BANERJEE, MS. NANDINI GHOSH, MS. SOMA RANI MISHRA, and MS. MONA SAINI** of the firm **L.S. DAVAR & CO., 32 Radha Madhab Dutta Garden Lane, Kolkata - 700 010, India, and 5/1, Kalkaji Extension, New Delhi - 110 019, India, jointly and severally, to be true and lawful Attorney or Attorneys for us in our name and as our act and deed.**

1. To take all appropriate steps and necessary actions for and on our behalf under the Patents (Amendments) Act, 2005 and the Patents (Amendment) Rules, 2006, and/or any other corresponding or allied Acts or Laws which may be for the time being in force in the Union of India.

2. To file applications for the registration and/or grant of Patents, prosecute said applications, maintenance thereof by payment of requisite fees and to protect them from time to time in the appropriate manner including Oppositions, Restorations, Cancellation proceedings before the Controller of Patents, as may be necessary or expedient to preserve our rights and interests.

....2/-

3. To file appeals, review, revision, applications, petitions for injunctions, claim damages, costs and take all such proceedings in the District Court, High Courts and the Supreme Court of India and/or before other authorities, Tribunals or authorised officers as our Attorney/Attorneys.

4. For the purposes aforesaid to sign all Plaints, Petitions, Vakalatnamas, Power of Attorney, Applications and other documents as may be desirable in the opinion of said Attorney/Attorneys including appointing Solicitors and/or Counsels for taking actions for and on our behalf.

5. Generally to execute any deed or sign any document which may be required and to do any other act, matter or think which our said Attorney or Attorneys shall consider necessary or expedient for carrying out any of the purposes or acts hereby authorised in the manner and as fully and effectually in all respects as we ourselves could do.

6. We hereby ratify everything which our said Attorney or Attorneys or any substitute or agent appointed under these presents have already lawfully done or purport to have been done under these presents.

7. This power shall be valid till such time it is revoked by us.

IN WITNESS WHEREOF, those presents have been created by us

Dated this ...06... (date) day ofAugust..... (month) 2014.

→
CERTIFIED TO BE TRUE COPY OF
THE GENERAL POWER OF ATTORNEY
FILED AT THE PATENT OFFICE ON 20.08.2014
IN CONNECTION WITH INDIAN PATENT
APPLICATION NO. 1435/KOLNP/2009
OF 17.04.2009

SIEMENS AKTIENGESELLSCHAFT
Milzarek *Zirkel*
.....
(Signature with Name, Designation & Official Seal)
Milzarek Zirkel
Both Authorized Officers

Form 3

THE PATENTS ACT, 1970
(39 of 1970)

&

The Patents Rules, 2003

STATEMENT AND UNDERTAKING UNDER SECTION 8

1. Name, address and nationality of the applicant.

I/We

**SIEMENS AKTIENGESELLSCHAFT
Wittelsbacherplatz 2 80333 München
Germany, a German Company**

hereby declare:

2. Name, address and nationality of the person.

(i) that I/We have not made any application for the same / substantially the same invention outside India

OR

(ii) that I/We who have this application no.
Dated Alone/jointly with 2.....N.A
made for the same/substantially same invention, applications(s) for patent in the other countries, the particulars of which are given below:

<u>Name of the Country .</u>	<u>Date of application.</u>	<u>Application No.</u>	<u>Status of the application</u>	<u>Patent number</u>	<u>Date of Patent</u>
NA	NA	NA	NA		

3. Name and address of the assignee.

(ii) that the rights in the application(s) has/have been assigned to

that I/We undertake that upto the date of acceptance of the complete specification by the controller. I/We would keep the controller informed in writing details regarding Corresponding applications for patents filed outside India within three months from the date of filing of such application.

4. To be signed by the
Applicant or his authorized
Registered patent agent.

Dated this **31st** day of **JULY 2015**

Signature

**OF L. S. DAVAR & CO.
APPLICANTS' AGENT**

5. Name of the natural
person who has signed.

To
The Controller of Patents,
The Patent Office
at KOLKATA

FIG 3

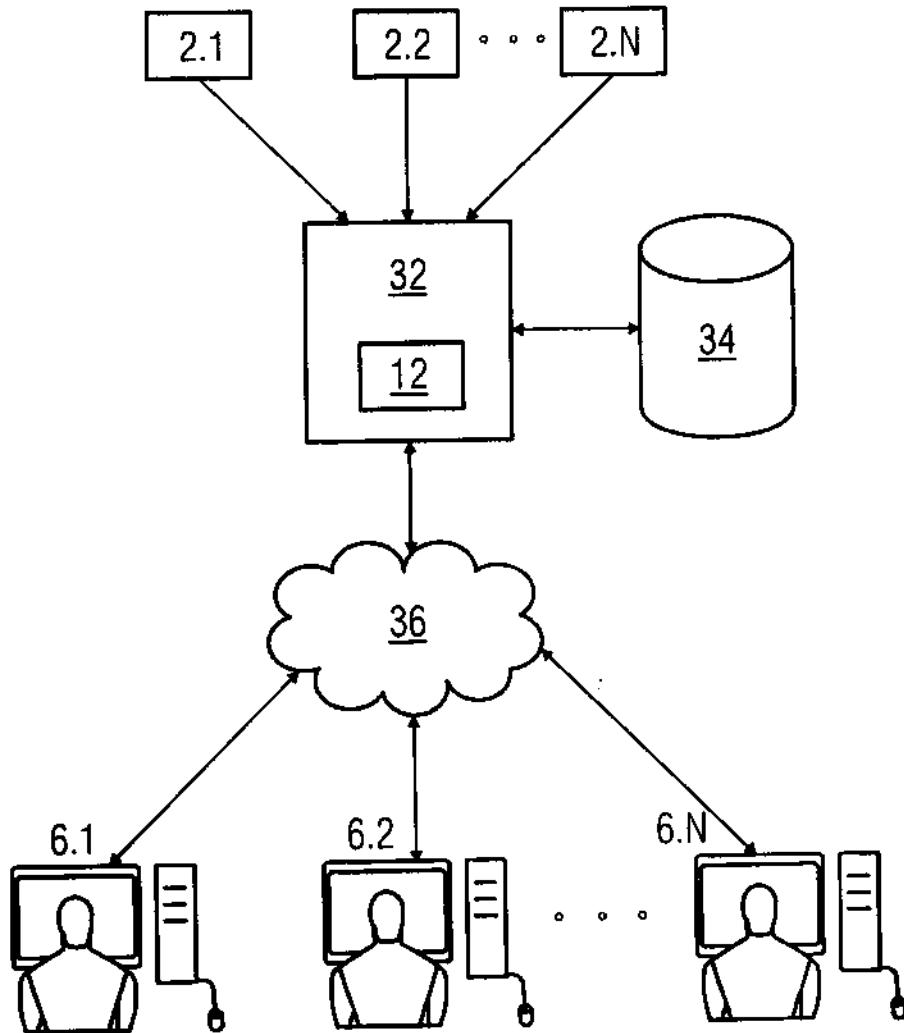


FIG 1

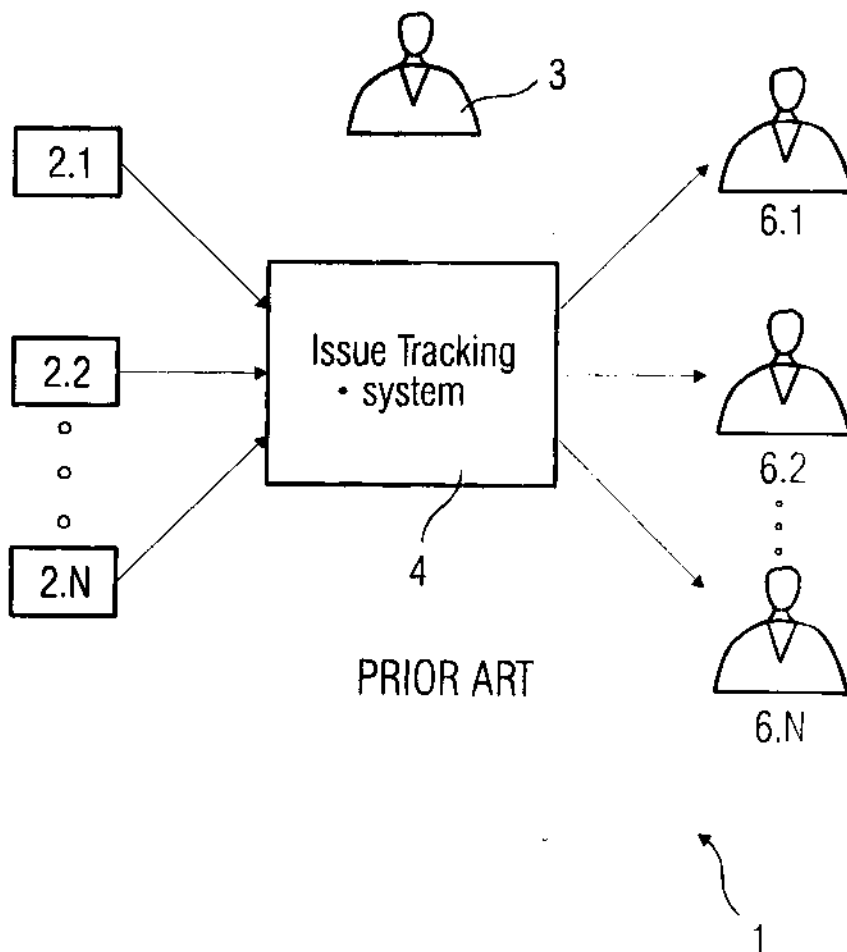
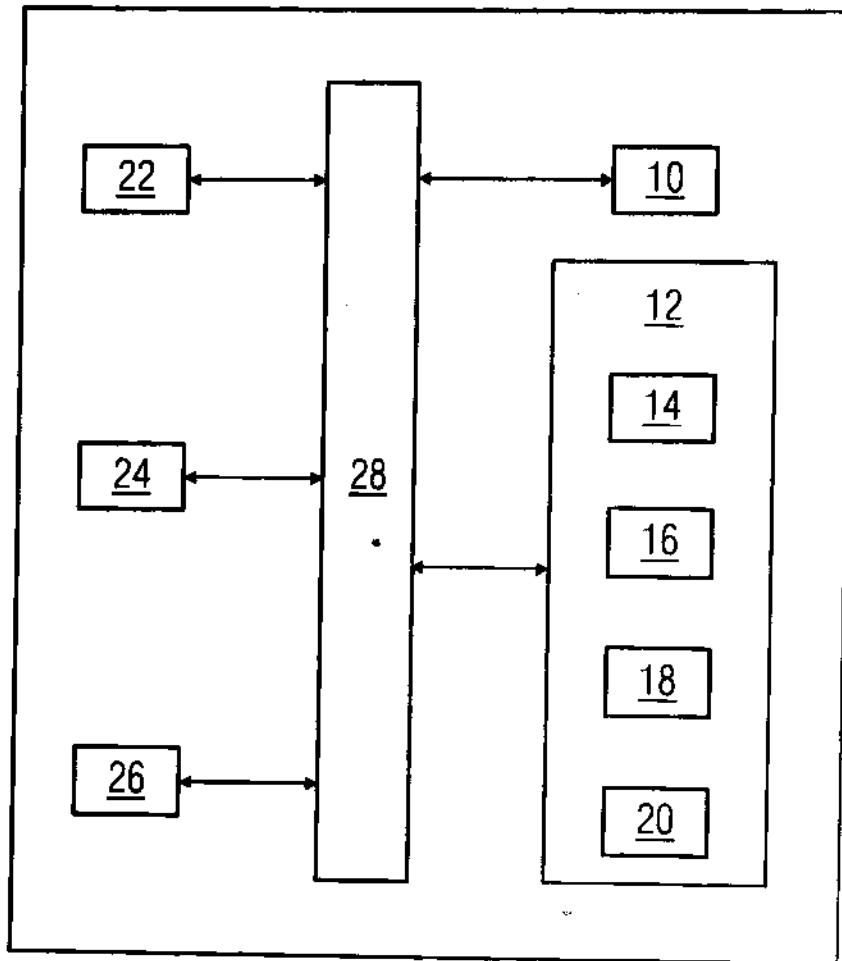


FIG 2



8

FIG 3

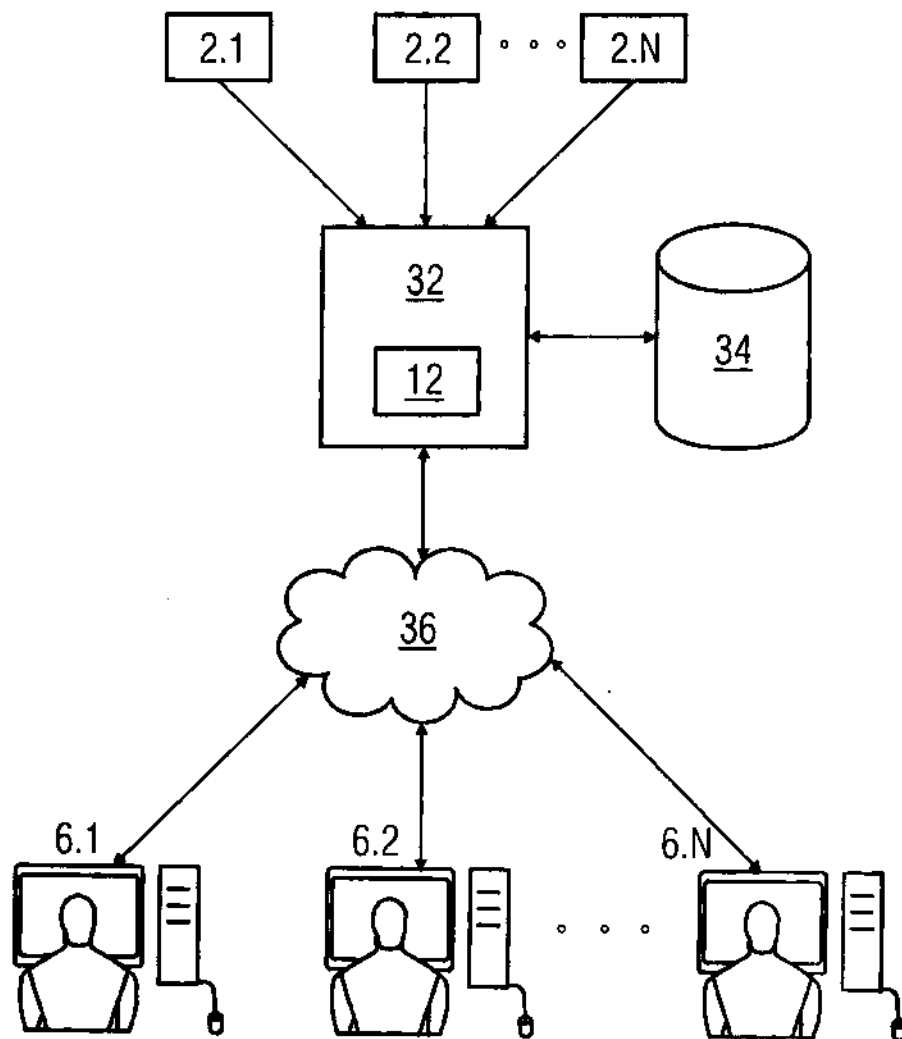
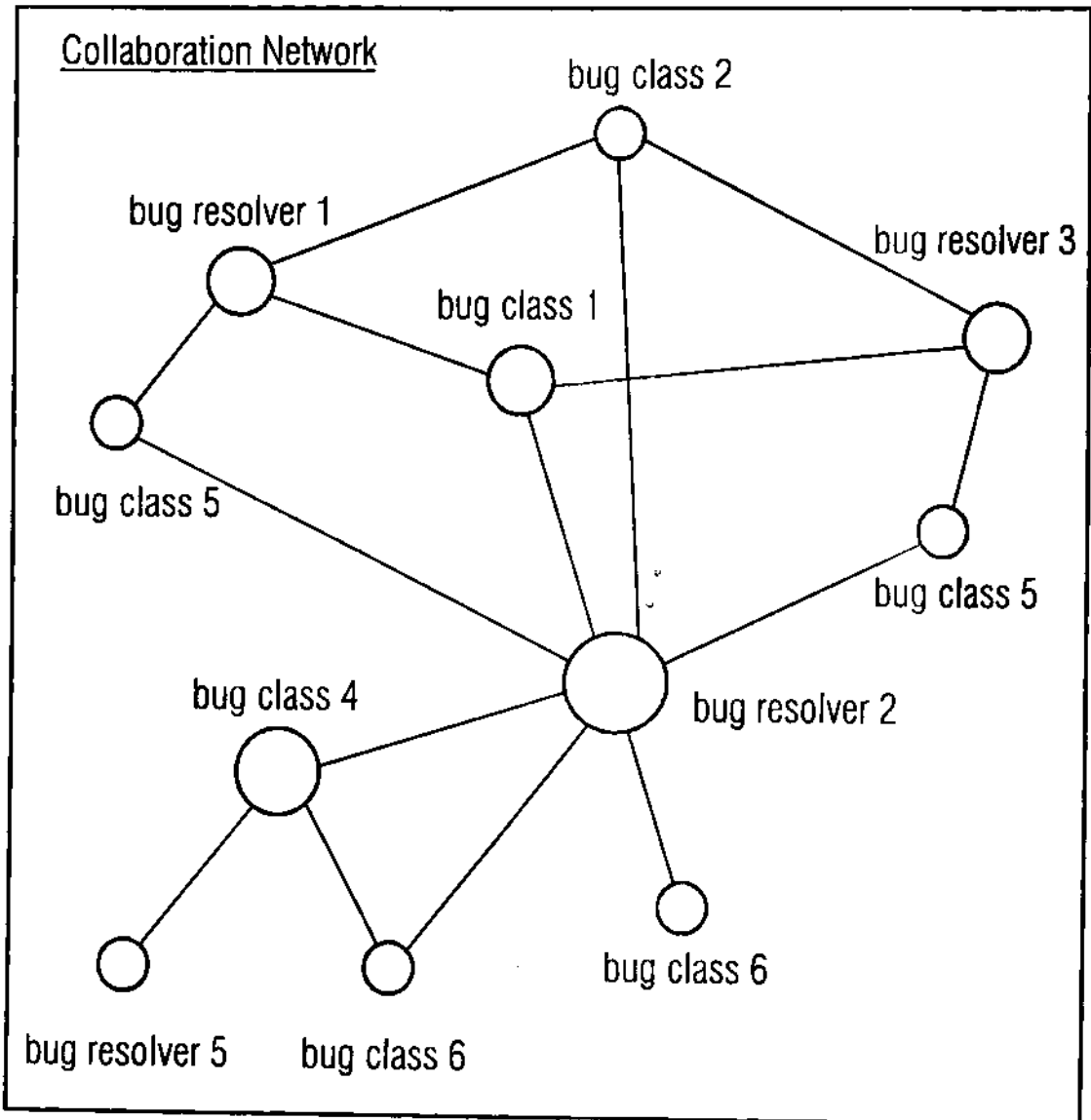


FIG 4

Bug Resolver Shortlist				
Shortlist	Bug Resolver name	Field	Expeirence	No of bugs resolved
1				
2				
3				
4				
5				

40

FIG 5



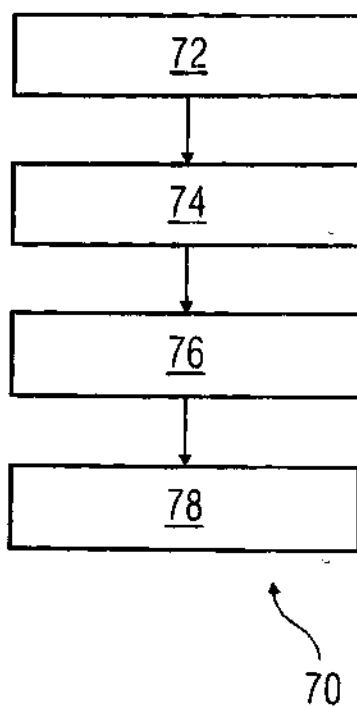
50

FIG 6

Rank	Name	Confidence Score	Current Work Load
1	Bug Resolver 6	4.3	6
2	Bug Resolver 8	5.2	10
3	Bug Resolver 1	5.6	15
4	Bug Resolver 2	1.4	2
○	○	○	○
○	○	○	○
○	○	○	○

60

FIG 7



FORM - 2

THE PATENTS ACT, 1970

(39 OF 1970)

&

The Patents Rules, 2003

PROVISIONAL/COMPLETE

SPECIFICATION

(See section 10 and rule 13)

1. Title of the Invention : **METHOD OF RECOMMENDING A BUG RESOLVER
FOR SOLVING A SOFTWARE BUG AND A SYSTEM
THEREOF**

2. Applicant(s)

Name, Nationality & Address :

**SIEMENS AKTIENGESELLSCHAFT
Wittelsbacherplatz 2 80333 München
Germany, a German Company**

3. Preamble to the description :

~~PROVISIONAL :—The following specification describes the Invention.~~

COMPLETE : The following specification particularly describes the invention and the manner in which is to be performed.

Description

METHOD OF RECOMMENDING A BUG RESOLVER FOR SOLVING A SOFTWARE
5 BUG AND A SYSTEM THEREOF

This invention relates to a method and system for efficient
software bug assignment. The method and system involves
analyzing textual information and bug resolver profile for
10 assigning the software bug to a bug resolver.

Bug assignment or triaging is normally performed by
determining a bug resolver for a particular software bug
reported in the Issue tracking system (ITS). Bug assignment
15 is an important step in software development as it determines
the delivery time and quality of the software developed. Bug
assignment is a key issue in both Open Source Software (OSS)
and closed or Proprietary Source Software (CPSS). Currently,
identification and assignment of bug resolver for a software
20 bug is performed manually by holding meetings with a panel of
the members (triagers) of the software development team. This
method may be result in software bugs being incorrectly
assigned to bug resolver. The panel members may not consider
all the relevant factors while assigning the bug to a bug
25 resolver. This will result in the delay in bug resolution and
deteriorates the quality of the software code.

Bug resolver assignment is a non-trivial knowledge intensive
task in a large and complex software development project. The
30 bugs may be received in large numbers frequently and the
triagers may be under pressure for assigning the bugs for
resolution. In such situations, it may happen that a certain
type of software bug is assigned to the bug resolver whose
expertise lies in solving another type of software bug.

Further, even if the bug resolver has the required expertise the big resolver may be occupied with other tasks (work-load issue) or may not be fixing similar types of bugs in the recent past. Such incorrect bug assignments result in
5 unwarranted delays and poor quality software code. Therefore, there is need for assistance in recommending an appropriate bug resolver for solving a software bug.

Accordingly, it is an object of the invention for providing a
10 decision support platform for assigning bug resolvers with software bugs. It is also an object of the invention to provide recommendations, with confidence scores, of bug resolvers for a particular type of software bug.

15 The object of the invention is achieved by providing a method of recommending a bug resolver for resolving a software bug, the method comprising a processor, a memory associated with the processor, wherein the memory includes one or more machine readable instructions configured for classifying a
20 software bug into one or more classes based on a bug report. The software bug may be classified into a programming domain based on the keywords present in the bug report. Further, the bug report may be classified based on the comments and threaded discussions in an issue tracking system. The method
25 further includes generating a list of bug resolvers for assigning the software bug by analyzing at least one bug resolver profile in comparison with the class of the software bug. The method further comprises recommending a bug resolver for solving the software bug based on one or more predefined
30 conditions. The bug resolvers shortlisted in the previous steps are considered for solving the software bug. There may be pre-defined conditions for assigning the software bug to the bug resolver. The predefined conditions may be based on

attributes such as a level of work experience, workload and number of bugs resolved.

5 In an embodiment, the method further comprises ranking the bug resolvers based on the class of the bug and at least one attribute of the bug resolver profile. The bug resolver profile comprises attributes such as field of expertise, work experience and number of bugs resolved. The bug resolver profile is updated periodically or manually by the respective
10 bug resolvers.

In another embodiment, classifying the software bug into one or more classes comprises performing textual analysis of the bug report. The bug report may comprise a brief description
15 of the software bug to be resolved. The text of the brief description is analyzed and keywords indicating the class of the software bug are extracted.

In an aspect of the invention, generating a list of bug
20 resolvers comprises correlating the class of the software bug with the bug resolver profile, wherein the bug resolver profile comprises attributes such as a field of expertise, number of bugs resolved, experience in bug resolving, severity of bugs resolved, types of bugs resolved and a
25 number of open bugs assigned to the resolver.

In another aspect, recommending a bug resolver for solving the software bug comprises assigning the bug to a bug
resolver based on one or more predefined conditions, wherein
30 the predefined conditions are based on work experience, current workload and number of bugs resolved. For example, a predefined condition may be to assign a software bug to the most experienced bug resolver with the least workload.

In yet another aspect, assigning a bug resolver for solving the software bug comprises assigning the bug to a highest ranked bug resolver.

5 In still yet another aspect, assigning a bug resolver for solving the software bug comprises generating a confidence score for justifying the assignment of the software bug to a bug resolver. The confidence score is based on the class of the software bug and the attributes of the bug resolver
10 profile. In this case, the confidence score may be generated by comparing all the bug resolver profiles against a particular software bug.

In yet another aspect, the confidence score is generated
15 based on the class of the software bug and one or more attributes of the bug resolver profile.

In order to solve the objective, a system for recommending a bug resolver for solving a software bug is disclosed. The
20 system comprises a processor and a memory coupled with the processor, wherein the memory comprises bug classification module configured to classify the software bugs into one or more classes based on a software bug report. The memory further comprises a shortlisting module configured to
25 generate a list of bug resolvers for assigning the software bug by analyzing at least one bug resolver profile in comparison with the class of the software bug. The memory also comprises a bug assignment module configured for assigning a bug resolver for solving the software bug based
30 on one or more predefined conditions. The predefined conditions may be based on the class of the bug and the attributes of the bug resolver profile.

In an embodiment, the system comprises a ranking module configured to rank the bug resolvers based on the class of the bug and the bug resolver profile. The bug resolvers may be ranked based on the bug resolver profiles as compared with
5 the class of the software bug.

In another embodiment, the bug classification module classifies the bug into one or more classes by performing textual analysis on a software bug report. The system may
10 perform the textual analysis of the software bug report to extract certain keywords for determining a class of the software bug.

In yet another embodiment, the short listing module is
15 configured to correlate one or more attributes of the bug resolver profile with the class of the bug to shortlist the bug resolvers.

In still yet another embodiment, the short listing module
20 generates a collaboration network based on the class of the software bug and the attributes of the bug resolver profile. The nodes of the collaboration network are generated based on the bug resolver profile.

25 In yet another embodiment, the bug assignment module generates a confidence score based on the class of the software bug and the attributes of the bug resolver profile. The confidence score also be based on the attributes such as

30 In still yet another embodiment, the bug assignment module is configured to assign the software bug to a bug resolver with the highest ranking. The bug assignment module automatically assigns the software bug to a highest ranked bug resolver without any human interference.

In a variation, the predefined condition for assigning the software bug comprises conditions based on the experience, workload and number of software bugs resolved by the bug resolver.

In another variation, the attributes of the bug resolver profile includes field of expertise, number of bugs resolved, workload and experience.

In yet another variation, the shortlisting module employs machine learning algorithms for generating the collaboration network and list of bug resolvers for solving the software bug and the collaboration network.

The above mentioned and other features of the invention will now be addressed with reference to the accompanying drawings of the present invention. The illustrated embodiments are intended to illustrate, but not limit the invention.

The present invention is further described hereinafter with reference to illustrated embodiments shown in the accompanying drawings, in which:

FIG 1 illustrates an exemplary block diagram of assigning samples to bug resolvers in accordance with prior art;

FIG 2 illustrates an exemplary device for recommending bug resolvers for solving software bugs in accordance with an embodiment;

- FIG 3 illustrates an exemplary block diagram for assigning software bugs to bug resolvers in accordance with an embodiment;
- 5 FIG 4 illustrates an exemplary interface displaying the shortlisted bug resolvers for solving a software bug, in accordance with an embodiment; and
- 10 FIG 5 illustrates an exemplary collaboration network determined by the shortlisting module in accordance with an embodiment;
- FIG 6 illustrates a exemplary interface displaying
15 the ranking of the bug resolvers as determined by a ranking module, in accordance with an embodiment; and
- FIG 7 illustrates exemplary method steps involved in
20 assigning software bugs to bug resolvers in accordance with an embodiment.

Various embodiments are described with reference to the drawings, wherein like reference numerals are used to refer
25 like elements throughout. In the following description, for the purpose of explanation, numerous specific details are set forth in order to provide thorough understanding of one or more embodiments. It may be evident that such embodiments may be practiced without these specific details.

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FIG 1 illustrates an exemplary block diagram 1 of assigning samples to bug resolvers in accordance with prior art. As shown in FIG 1, the bug resolution environment according to the prior art includes bug reports 2.1-2.N, an issue tracking

system (ITS) 4, a triager 3 and one or more bug resolvers 6.1-6.N. In an exemplary scenario, the software bugs reports 2.1-2.N are logged into the ITS as and when the bugs are encountered in a software application. A triager periodically
5 review the ITS and assigns the bugs to one or more bug resolvers 6.1-6.N. The manual assignment may lead to incorrect assignment of the bugs to the bug resolver resulting in the delay in bug resolution and quality of the software. Further, some attributes such as experience,
10 workload and field of expertise may not be considered while assigning bugs to the bug resolvers. There is a need for a more informed assignment of software bugs to the bug resolvers rather than manual assignment.

15 FIG 2 illustrates an exemplary device for assigning software bugs to bug resolvers in accordance with an embodiment. The device 8 includes a processor 10, a memory 12, a storage unit 22, Input/Output (I/O) unit 24, a communication module 26 and a communication bus 28 for connecting all the aforementioned
20 components. The processor 10, as used herein, means any type of computational circuit, such as, but not limited to, a microprocessor, a microcontroller, a complex instruction set computing microprocessor, a reduced instruction set computing microprocessor, a very long instruction word microprocessor,
25 an explicitly parallel instruction computing microprocessor, a graphics processor, a digital signal processor, or any other type of processing circuit. The processor 10 may also include embedded controllers, such as generic or programmable logic devices or arrays, application specific integrated
30 circuits, single-chip computers, and the like.

The memory 12 may be volatile memory and non-volatile memory. A variety of computer-readable storage media may be stored in and accessed from the memory 12. The memory 12 may include

any suitable elements for storing data and machine-readable instructions, such as read only memory, random access memory, erasable programmable read-only memory, electrically erasable programmable read only memory, hard drive, removable media drive for handling compact disks, digital video disks, diskettes, magnetic tape cartridges, memory cards, and the like. As depicted, the memory 12 includes one or more modules for assigning the software bugs to the bug resolvers based on the class of the bug and attributes of a bug resolver profile. The memory 12 includes a bug classification module 14 configured to classify the software bugs into one or more classes. The bug classification module 14 performs textual analysis on the bug report for classifying the bug report. For example, the bug may be classified into classes of software languages such as Java, C#, C and .NET. Further, the memory 12 includes a shortlisting module 16 configured to generate a list of bug resolvers for assigning the software bug by analyzing at least one bug resolver profile in comparison with the class of the software bug. The bug resolver profile may include information such as experience, field of expertise, number of bugs resolved and current workload. Additionally, the shortlisting module 16 may generate a collaboration network involving the software bugs and the bug resolvers aiding in effective bug assignments. The shortlisting module 16 further generates a confidence score for each bug assignment recommendation that is made. The memory 12 includes a bug assignment module 18 configured for assigning a bug resolver for solving the software bug based on one or more predefined conditions. The memory 12 further includes a ranking module 20 which may rank the best suited bug resolver for a particular software bug in question.

The storage unit 22 may be a non-transitory storage medium configured for storing files and databases. For example, the storage unit 22 includes bug resolver profiles which may be updated periodically. It can be noted that the storage unit
5 22 may be located at a remote location and may be accessed via a network connection.

The input/output unit 24 includes a display unit which may include an LED monitor, an LCD monitor, a CRT monitor, a
10 touch screen display, an OLED display and the like. The display means is configured to display interactive user interfaces for assigning bugs to bug resolvers. Further, the display unit is capable to accepting one or more inputs such as a keystroke, a mouse click, a gesture input and a touch
15 input.

The input/output devices 24 may include keyboard, keypad, touch sensitive display screen, mouse and the like. The input/output devices 24 enable a user to interact with the device
20 8 for providing inputs for assigning software bugs to bug resolvers. Further, various graphical interfaces are displayed to the triager in the process of assigning bugs to the bug resolvers.

25 The device 8 further includes a communication module 26 for communicating with the components of the automation environment. The communication module 26 may include a Wi-Fi transceiver, a network interface card (NIC) and the like.

30 FIG 3 illustrates an exemplary block diagram 30 for assigning software bugs to bug resolvers in accordance with an embodiment. The block diagram 30 includes one or more bug reports 2.1-2.N, a server 32 which includes the functionalities of device 8, a bug resolver profile database

34, a network 36 and one or more bug resolvers 6.1-6.N. In an exemplary scenario, the bug reports 2.1-2.N is reported from various sites where a software application is being tested. The server 32 is a computing device which includes the capabilities of the device 8, which was described in detail based on FIG 2. The server 32 has access to the database 34 which hosts the bug resolver profiles of one or more bug resolvers 6.1-6.N. Further, the server 32 is connected to the workstations of the bug resolvers 6.1-6.N through the network 36. In an exemplary scenario, one or more bug reports are logged with the server 32. The server 32 includes the modules for assigning the software bugs to the bug resolvers based on the class of the bug and attributes of a bug resolver profile. The server 32 includes a bug classification module 14 configured to classify the software bugs into one or more classes. The bug classification module 14 performs textual analysis on the bug report for classifying the bug report. Further, learning methods such as random forests and probabilistic classification models such as Naive Bayes classifiers may be used to classify the bug reports into classes. The Further, the server 32 includes a shortlisting module 16 configured to generate a list of bug resolvers for assigning the software bug by analyzing at least one bug resolver profile in comparison with the class of the software bug. The server 32 has access to the bug resolver profiles stored in the database 34. The bug resolver profile may include information such as experience, field of expertise, number of bugs resolved and current workload. Additionally, the shortlisting module 16 may generate a collaboration network involving the software bugs and the bug resolvers aiding in effective bug assignments. The server 32 includes a bug assignment module 18 configured for assigning a bug resolver for solving the software bug based on one or more predefined conditions. The server 32 further includes a

ranking module 20 which may rank the best suited bug resolver for a particular software bug in question. The ranking module 20 ranks the bug resolvers based on a confidence score. The ranking module 20 generates a confidence score for each bug assignment recommendation that is made. The server 32 may notify the bug resolvers 6.1-6.N of the software bugs they have been assigned along with information such as confidence score and collaboration network.

FIG 4 illustrates an exemplary interface 40 displaying the shortlisted bug resolvers for solving a software bug, in accordance with an embodiment. The shortlisting module 16 is configured to determine a list of bug resolvers who are most suited for solving a software bug of a particular class. The shortlisting module 16 generates a table as shown in FIG 4 which includes the names of the bug resolvers and the other details of the bug resolver profile. The shortlisting module 16 is configured to correlate the class of the software bug with the attributes of the bug resolver profile in order to shortlist the bug resolvers for solving the software bug. In FIG 4, an exemplary interface is as displayed by the device 8 is shown. In the interface, the shortlisted bug resolver names are displayed along with the field of expertise, experience in bug resolving and number of bugs resolved. It may be apparent to a person skilled in the art that the interface may include additional attributes of the bug resolver profile as required.

FIG 5 illustrates an exemplary collaboration network 50 determined by the shortlisting module, in accordance with an embodiment. The shortlisting module 16 may generate a collaboration network 50 involving the software bugs and the bug resolvers aiding in effective bug assignments. The shortlisting module 16 may generate the collaboration network

by using one or more machine learning toolkits such as WEKA. A learning model is built using the machine learning toolkit which can be used to generate the collaboration network. Further, the collaboration network may indicate information such as prior work experience, current workload, number of bugs resolved. Further, the collaboration network may be determined project wise to extract information regarding the kind of bugs resolved by the bug resolvers. The collaboration network may be determined by extracting information from the lifecycle of the software bug. As shown in FIG 5, the collaboration network may include one or more nodes which represent a bug resolver and a class of the software bug. It can be observed in FIG 5 that the size of the nodes is varying. The variation in the size of the nodes is due to at least one of an occurrence of the bug class and collaboration frequency of the bug resolver with the particular bug class. For example, we can observe that the bug resolver 2 (bug res 2) is associated with bug classes 1, 2, 4, 5 and 6. Therefore, the node of bug resolver 2 is bigger compared to other bug resolvers. Further, it can be observed that the node of bug class 4 is bigger when compared to other bug classes. The bigger size of the node indicates that the bug class 4 occurs more frequently compared to the other bug classes. Therefore, a probability of the bug resolution for a particular class of bug can be inferred from the collaboration network 50.

FIG 6 illustrates an exemplary interface 60 displaying the ranking of the bug resolvers as determined by a ranking module 20, in accordance with an embodiment. Further, the collaboration network 50 may be used for generating a confidence score for a particular assignment a software bug to a bug resolver. The ranking module 20 is configured to compute the confidence score 64 from a weighted equation

involving attributes of the bug resolver profile and the node size of the collaboration network 50. Further, the ranking module 20 generates a list of bug resolvers ranked according to the confidence score 64. For example, the ranking module 5 20 may generate the interface as shown in FIG 6. The interface 60 includes names of the bug resolvers, confidence scores 64 and current work load 66. In an exemplary scenario, the software bug may be assigned manually to a bug resolver based on the ranked list. In this case, the current workload 10 of the bug resolver is considered while assigning the software bug. In another example, the highest ranked bug resolver may be assigned with the code without any manual intervention. It may be apparent to a person skilled in the art that the graphical user interfaces may be designed using 15 D3.JS, JavaScript, Java Servlets and the like.

In an alternative embodiment, the ranking module 20 is configured to rank the bug resolvers based on the confidence scores. Thereafter, a triager may manually assign the 20 software bugs to appropriate bug resolvers with the help of the confidence score.

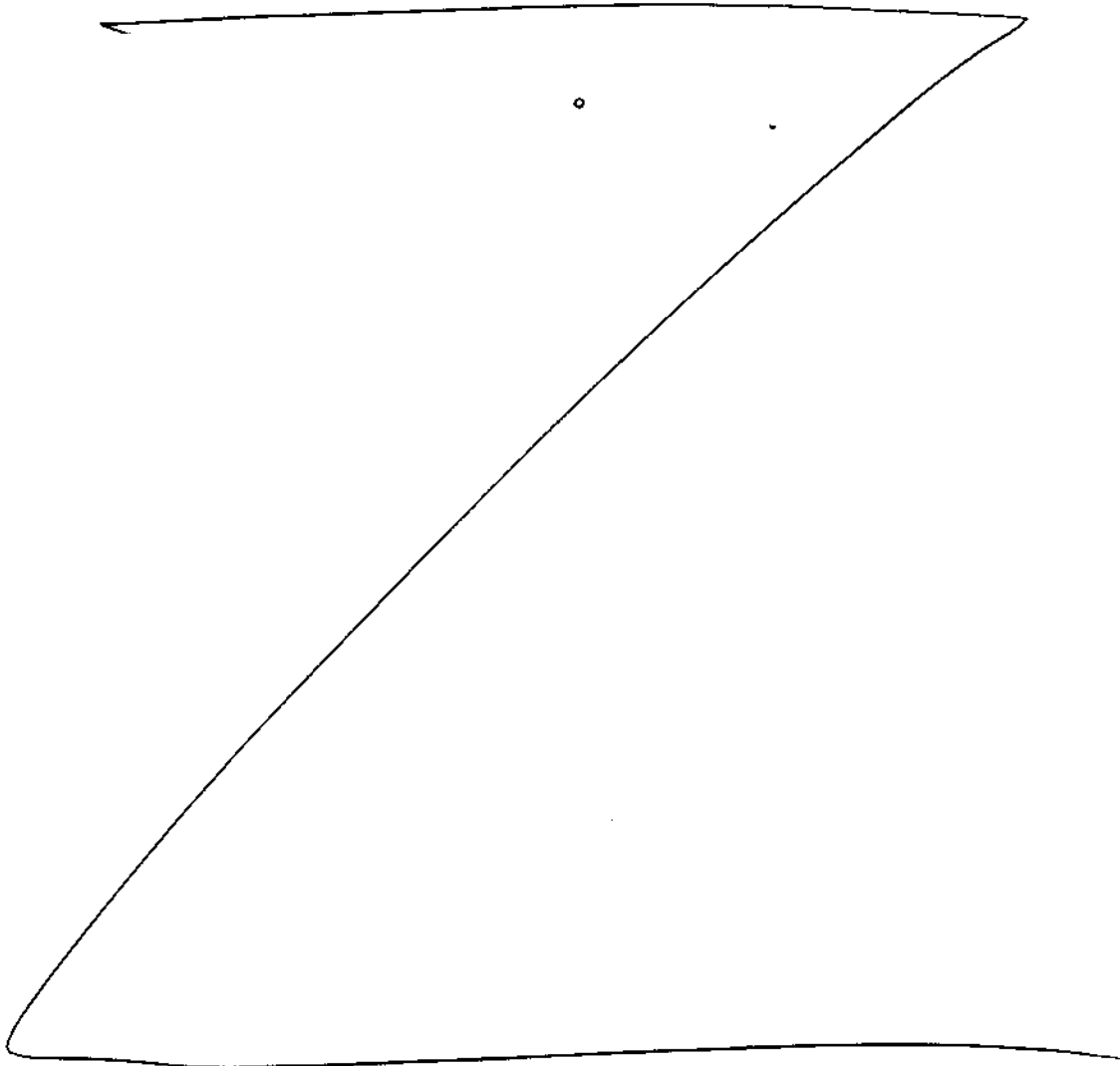
FIG 7 illustrates exemplary method steps 70 involved in assigning software bugs to bug resolvers in accordance with 25 an embodiment. At step 72, a software bug is classified into one or more classes based on a bug report. Textual analysis is performed on the bug report in order to classify the software bug into one or more classes. At step 74, a list of bug resolvers for assigning the software bug is generated by 30 analyzing at least one bug resolver profile in comparison with the class of the software bug. The bug resolver profile is correlated with the class of the software bug in order to shortlist the bug resolvers preferred for resolving the software bug. Further, a collaboration network is generated

based on the correlation of the bug resolvers with the software bugs. The collaboration networks aids in the selection of a bug resolver for a particular class of bug. At step 76, the bug resolvers are ranked based on at least one
5 of class of the bug, the bug resolver profile, confidence score and the collaboration network. At step 78, a bug resolver for solving the software bug is assigned based on one or more predefined conditions. The predefined conditions may include a confidence score value, a level of workload and
10 a ranking of the bug resolver.

The method and system disclosed herein results in efficient assignment of software bugs to the bug resolvers. The bug resolvers are chosen by factoring in all the conditions such
15 as, but not limited to, experience, number of bugs resolved and current workload. Further, the method and system also generates a confidence score based on a collaboration network. The confidence score determines the best suited bug resolver for solving a particular software bug. Furthermore,
20 the bug resolvers for solving a software bug are ranked which makes the job of manual bug assignment well informed. Therefore, using the method and system disclosed the software bugs are assigned to the best suited bug resolver without any incorrect assignments. Employing the method and system in bug
25 assignment results in reduced bug resolving time and improves the overall software quality.

While the present invention has been described in detail with reference to certain embodiments, it should be appreciated
30 that the present invention is not limited to those embodiments. In view of the present disclosure, many modifications and variations would be present themselves, to those skilled in the art without departing from the scope of the various embodiments of the present invention, as

described herein. The scope of the present invention is, therefore, indicated by the following claims rather than by the foregoing description. All changes, modifications, and variations coming within the meaning and range of equivalency
5 of the claims are to be considered within their scope.



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We claim:

1. A method of recommending a bug resolver for solving a software bug, the method comprising:
5 a processor (10);
a memory (12) associated with the processor, wherein the memory includes one or more machine readable instructions configured for:
classifying a software bug into one or more classes (72)
10 based on a bug report;
generating a list of bug resolvers (74) for assigning the software bug by correlating at least one bug resolver profile with the class of the software bug; and
assigning a bug resolver for solving the software bug
15 (78) based on one or more predefined conditions.

2. The method in accordance with claim 1, classifying the bug report into one or more classes comprises performing textual analysis of the bug report.
20

3. The method in accordance with claim 1, wherein generating a list of bug resolvers comprises:
correlating the class of the bug with the bug resolver profile, wherein the bug resolver profile comprises
25 attributes such as a field of expertise, number of bugs resolved, experience in bug resolving, severity of bugs resolved, types of bugs resolved and a number of open bugs assigned to the resolver.

- 30 4. The method in accordance with claim 1, wherein generating a list of bug resolvers comprises:
generating a collaboration network based on the software bug class and the experience of the bug resolver.

5. The method in accordance with claim 1 further comprising ranking the bug resolvers based on class of the bug (76), the bug resolver profile, confidence score (64) and the collaboration network (50).
- 5
6. The method in accordance with claim 1, wherein assigning a bug resolver for solving the software bug comprises: assigning the bug to a bug resolver based on one or more predefined conditions, wherein the predefined conditions are based on, at least one of, work experience, current workload and number of bugs resolved.
- 10
7. The method in accordance with claim 1, wherein assigning a bug resolver for solving the software bug comprises: assigning the software bug to a highest ranked bug resolver.
- 15
8. The method in accordance with claim 1, wherein assigning a bug resolver for solving the software bug comprises: generating a confidence score (64) for justifying the assignment of the software bug to a bug resolver.
- 20
9. The method in accordance with claim 7, wherein the confidence score (64) is generated based on the class of the software bug and one or more attributes of the bug resolver profile.
- 25
10. A system for recommending a bug resolver (6.1-6.N) for solving a software bug, the system comprising:
- 30
- a processor (10);
- a memory (12) coupled with the processor (10), wherein the memory (12) comprises:

bug classification module (14) configured to classify the software bugs into one or more classes based on a bug report;

5 shortlisting module (16) configured to generate a list of bug resolvers for assigning the software bug by correlating at least one bug resolver profile with the class of the software bug; and

10 bug assignment module (18) configured for assigning a bug resolver for solving the software bug based on one or more predefined conditions.

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11. The system in accordance with claim 10, wherein the bug classification module (14) classifies the bug into one or more classes by performing textual analysis on the bug report.

12. The system in accordance with claim 10, wherein the short listing module (16) is configured to correlate one or more attributes of the bug resolver profile with the class of the bug to shortlist the bug resolvers.

13. The system in accordance with claim 10, wherein the short listing module (16) generates a collaboration network (50) based on the class of the software bug and the attributes of the bug resolver profile.

14. The system in accordance with claim 10, wherein the short listing module (18) generates a confidence score (64) based on the class of the software bug and the attributes of the bug resolver profile.

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15. The system in accordance with claim 10 further comprising, a ranking module (20) configured to rank the

bug resolvers based on the class of the bug, the bug resolver profile, confidence score (64) and the collaboration network (50).

- 5 16.The system in accordance with claim 10, wherein the bug assignment module (18) is configured to assign the software bug to a bug resolver based on at least one predefined condition.
- 10 17.The system in accordance with claim 10, wherein the predefined conditions for assigning the software bug comprises conditions based on the experience, severity of bugs resolved, types of bugs resolved, a number of open bugs assigned to the resolver and number of software bugs
15 resolved by the bug resolver.
- 18.The system in accordance with claim 10, wherein the attributes of the bug resolver profile includes field of
20 expertise, number of bugs resolved, workload and experience.
- 19.The system in accordance with claim 10, wherein the shortlisting module (16) employs machine learning algorithms for generating the list of bug resolvers and
25 the collaboration network.

Dated this 31st day of JULY 2015

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Abstract

METHOD OF RECOMMENDING A BUG RESOLVER FOR SOLVING A SOFTWARE
BUG AND A SYSTEM THEREOF

5

The invention relates to method and system for recommending a bug resolver (6.1-6.N) for solving a software bug. The method involves classifying the software bug into one or more classes based on a bug report (2.1-2.N). The software bug is classified based on the textual analysis of the bug report. Further, a list of bug resolvers (40) for assigning the software bug is generated by correlating at least one bug resolver profile with the class of the software bug. Further, a collaboration network (50) is generated by considering the attributes of the bug resolver profile and the class of the software bug. Furthermore, a confidence score (64) is computed and the bug resolvers are ranked based on the confidence score (64). Finally, the method involves assigning a bug resolver for solving the software bug based on one or more predefined conditions. The predefined conditions may involve at least one of a confidence score, a ranking, current workload of the bug resolver and the like.

25 FIGURE 3