A GQM APPROACH OF SOFTWARE ANALYSIS TO PREDICT MAINTAINABILITY

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Abstract—Software maintainability adaption of software to meet the new requirements of customers. Maintainability is the one of the main attributes that is used for determining how ease is a software product can be modified and maintained. A maintainable software means a software which can be used for correcting defects, improving the performance and enhancing other quality attributes. The reason for considering maintainability as significant factor is because more budget is required for software development in which the high priority is given to maintenance. Therefore, maintainability of the software plays a major role in overall software development. Now the present goal of our study is to extract the selected metrics in GOM framework of various Jedit versions concerned to the maintainability. A GQM framework is used in our empirical study which lists the goals, research questions for the metrics considered.

Keywords: Maintainability, GQM frameworks, Metrics, Tool IntelliJ IDEA, Metric Reloaded.

Introduction

Maintenance plays a vital role for overall development of software. Maintainability of software product refers to how ease a software product can be modified and maintained. Maintainability of the software is used to for maintaining the software to use for longer periods. Maintainability is the quality associated with the software product whereas maintenance is considered as a part of SDLC process [1]. In software development life cycle (SDLC) maintenance is given much priority

and it is a critical phase where several modifications are made in software product. The modifications include correcting the defects, Improving the performance. If the complexity of the software product increases there is a need to predict and measure maintainability of software as it reflects the costs, as much cost is included by maintenance [2]. Software maintainability is a significant external attribute for determining the quality of software. To know the external attributes, we should use internal attributes. It can be done by evaluating the internal attributes and analyzing their values. The values are the metrics that can be obtained for the selected software using the metric extraction tools like Jhawk, IntelliJ IDEA, stan, CKJM etc.

In this project as described, we have to evaluate systematically the metrics of the JEDIT which is a open source text editor for programmers. The metrics to be evaluated are selected by GQM based framework. This is an empirical study which means the research with evidence that includes direct and indirect observation or experience. For this study we select the 11 versions of Jedit mentioned in the project and a case study is made on the modules to determine how maintainability is affected. Therefore, we obtain the selected metrics to identify the values and to analyze metrics of various Jedit software system for code structure, size, complexity and understandability.

RESEARCH METHODOLOGIES

The methodologies of our research include study, metric extraction tools, Statistical measures and visualization methods.

I)Study:

The study selected for the empirical study is case study by which we can concentrate on a unit or a group of test cases by using both qualitative and quantitative analysis. case study is used for combining the various aspects to relate for evaluating the goal. There are various approaches to perform a case study. The reason for selecting the case study is because it is flexible and provides a clear insight of the of our study. The metrics are evaluated at package level of jedit in this study.

ii)Metric extraction tools:

we have used metrics reloaded plugin to obtain the metrics at package level of various jedit versions. It is an open software metric tool. It is used for code inspection that detect and correct anomalous code in our project. It can find various problems like locate dead codes, finding bugs, spell mistakes and overall code structure.

The reason for selecting metrics reloaded is because it is easily integrating with intellij IDEA. It is available free open source tool present in IntelliJ IDEA plugin and is easy to install.

Hence the tool is ease of use to obtain various metrics that are selected in our empirical study. The metrics obtained from the tool metrics reloaded plugin are suitable for case study considered for our empirical study. The metrics are LCOM, LOC, Ca, Ce, CBO, CLOC, WMC, Average cyclomatic complexity and comments ratio. The tool also provides us with several options to calculate such as martin packaging

metrics, complexity metrics, dependency metrics etc.

iii)Statistical measures and visualization methods:

In our project we have considered line graphs, bar graphs for the selected metrics of research questions in GQM tree. The graphs of internal attributes are used to measure the external attribute maintainability of software system under study. After measuring maintainability, it is used for identifying the modules that are poor to maintain. The bar graphs are made for V(G), CBO, LCOM, WMC, CLOC and Comment Ratio. The line graphs are made for metrics Ca, Ce and LOC. These graphs are used to analyze the maintainability of the versions. The modules that are difficult to maintain can be identified.

Goal question metric (GQM) tree

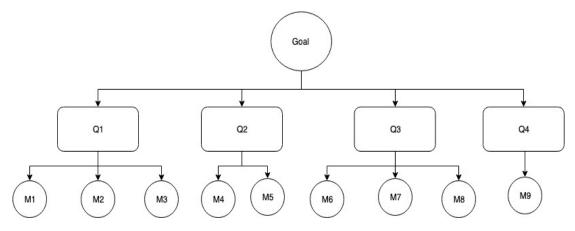
The overall goal of the study is to identify modules that are difficult to maintain.

Goal: To evaluate the maintainability of Jedit versions.

To identify the modules that are difficult to maintain.

Goal question metric (GQM) is an approach by which we can achieve our goal in a specific manner. It contains the questions formulated to achieve the goals. By answering the questions using suitable selected metrics our goals can be achieved. The following figure represents our project GQM tree as shown below:

GQM TREE



GQM Table

GOAL

To identify those jEdit modules that would be more difficult to maintain

QUE	ESTIONS
Q1	What are the Jedit modules that are
	frequently modified?
Q2	What are the Jedit modules that are
	having high complexity?
Q3	What are the Jedit modules that are
	highly coupled?
Q4	What are the Jedit modules that are
	with high cohesion?

MET	METRICS				
M1	Lines of Code (LOC)				
M2	Count Lines of Code (CLOC)				
M3	Comments Ratio (CR)				
M4	Average cyclomatic complexity				
	(V(G))				
M5	Weighted Methods per Class (WMC)				
M6	Coupling Between Objects (CBO)				
M7	Afferent Coupling (CA)				
M8	Efferent Coupling (CE)				
M9	Lack of Cohesion in Method (LCOM)				

Description of selected metrics

These metrics made us to answer the questions we did according to the GQM tree. The literature is written below:

LOC: lines of code shows that how many lines of source code is there in our code and namespace, class and methods in our code. It also can used to find out the size of code unit and the size of the project.

CLOC: cloc counts the blank lines, comment lines, and physical lines of source code in many programming languages. It has many features to make it easy to use.

WMC: weighted methods per class it is sum of CC of all methods in class. It shows us that high of WMC. It reflects effort and time in maintaining the code. [3]

CBO: Coupling between the objects. The dependency between the objects in class. The highest value indicates that the objects are highly critical for modifications and it increases the maintenance effort. [4]

Ca: Afferent coupling it measures the classes that depends on the classes inside of packages. It is propositional to modify so maintainability increasing is declined. [5]

Ce: Efferent coupling it measures the total number of classes inside the component which are depends on the classes outside of component. The other name of this is Outside Dependencies.

LCOM: Lack of Cohesion Between methods. It is used to measure the cohesion between the classes and methods. It is useful for to measure the extent of relation between methods. Low cohesion metrics is difficult to maintain and test the code. [5]

V(G): Average cyclomatic complexity is used to define the structural complexity of the code. It can be calculated by doing the average of number of distinct paths in flow of the program. If average cyclomatic complexity has higher value it will be less maintainable because of more code coverage.

Comment Ratio: It is the ratio that Calculates the ratio of lines of comment code to total lines of code for the project. Lines of whitespace are not counted for purposes of this metric.

Relating the metrics to internal attributes

The internal attributes are described below:

Understandability: It measures the coupling between the classes and methods. The high maintainability can be achieved by decreasing the coupling value. [6]

Complexity: The maintainability is directly proportional to complexity. If the complexity is increased the cost, effort and time also increases. It increases the cost of maintenance of the software. [7]

Size: It is used to estimate the code size in the project. It can be known by counting the lines of code (LOC) and CLOC. If greater the size it indicates more effort is needed for maintenance. The changes can be identified by counting the lines of code. [5]

Structure: cohesion metrics are used to define the structure. If the cohesion value is high, then it is easily maintainable. If the cohesion value is low, then it is difficult to maintain.

Selection of scales:

Quest	Enti	Attribute	Type	Metri
ions	ty	S	of Attri	cs
			bute	
Q.1 What are the Jedit modul es that are freque ntly modifi ed?	Pack ages	Size	Inter nal	LOC, COM_ RAT, CLOC
Q.2 What are Jedit modul es that are having high compl exity?	Pack ages	Complexi	Inter nal	V(G), WMC
Q.3 What are the Jedit modul es that are highly couple d?	Pack ages	Understa ndability	Inter nal	CBO, Ca, Ce
Q.4 What are the Jedit modul	Pack ages	Structure	Inter nal	LCO M

es that		
are		
with		
high cohesi		
cohesi		
on?		

The metrics LOC, CLOC, CBO, Ca, Ce, WMC, V(G) and LCOM are of absolute scale while comment ratio (COM_ RAT) is the only one which is a ratio scale type.

Related work:

In this project we have consider Jedit versions which is an open source software for this study. GQM framework is selected for this empirical study which consists of Goal, Question and metrics. GQM frame work is used to identify the attributes, entities and mapping the attributes with the suitable metrics. A case study is also done on the selected metrics using metric extraction tools. The tool we considered is IntelliJ IDEA with Metric Reloaded Plugin. The selected suitable metrics are extracted, and the graphs are obtained for various packages that are present in JEDIT versions.

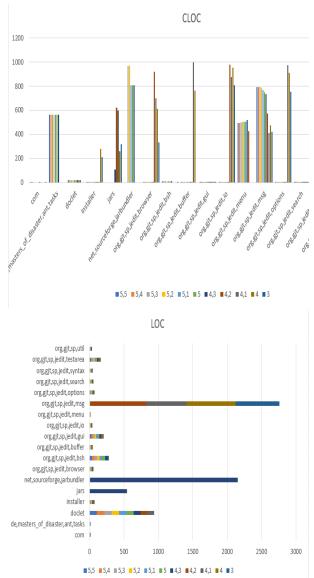
In the final part of the report the extracted metrics are analysed to know the maintainability of the packages present in Jedit versions. By this we identified the packages that are difficult to maintain.

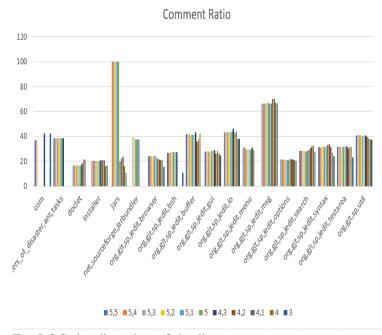
Results and analysis:

By analysing the metrics of the packages to the corresponding Jedit versions using IntelliJ IDEA with the Metrics Reloaded Plugin. We have answered the research questions of the GQM tree. As the all packages considered for all the Jedit versions. The metrics will decide the maintainability. By this we can identify the modules that are difficult to maintain. Therefore, the research questions are answered using the suitable metrics.

1. What are the Jedit modules that are frequently modified?

To identify the modules that are frequently modified. We have considered the metrics of Lines of code (LOC), Comment ratio (COM_RAT) and Comment lines of Code (CLOC) increasing the values of these metrics states that the modules are modified. The following figures represents the graphical results of the metric data. Shown below:





For LOC the distortion of the lines represents the modifications of the packages. For CLOC and Comment Ratio the changes in the bar values represents the modifications made for the selected packages.

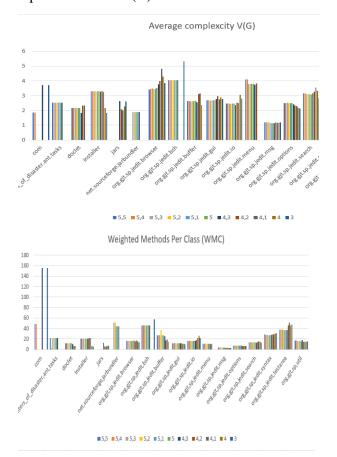
The results are given in table 1:

Module	Changes in				
	frequency level				
Com	Very Less				
de.master-of-	Very Less				
disaster.ant. tasks					
Docklet	High frequently				
Installer	Less frequently				
Jars	High frequently				
Net.sourceforge.	High frequently				
jarbundler					
Org.gjt.sp.	Less frequently				
jedit.browser					
Org.gjt.sp.jedit. bsh	High frequently				
Org.gjt.sp.jedit. buffer	Less frequently				
Org.gjt.sp.jedit. gui	High frequently				
Org.gjt.sp.jedit. io	Less frequently				
Org.gjt.sp.jedit. menu	Very less				
	frequently				
Org.gjt.sp.jedit. Msg	High frequently				
Org.gjt.sp.jedit. option	Less frequently				
Org.gjt.sp.jedit. search	Less frequently				
Org.gjt.sp.jedit. syntax	Less frequently				
Org.gjt.sp.jedit.	Less frequently				
textarea					
Org.gjt.sp.util	Very Less				
	frequently				

2. What are the Jedit modules that are having high complexity?

The Jedit modules that are having high complexity can be known using the selected suitable metrics average cyclomatic complexity V(G), WMC (Weighted methods per class). High complexity of the module requires more effort and cost to maintain. Higher the average cyclomatic complexity V(G) modifications of the code take large time. Similarly, higher the value of WMC it becomes difficult to maintain as the weighted methods per each class increases.

The following figures represents the graphical representation of V(G) and WMC



The results are given in table 2:

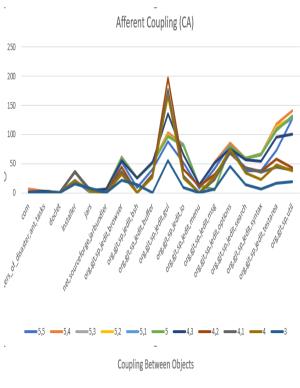
Module	Complexity rating level
Com	17
de.master-of-	14
disaster.ant. tasks	
Docklet	13
Installer	5
Jars	16

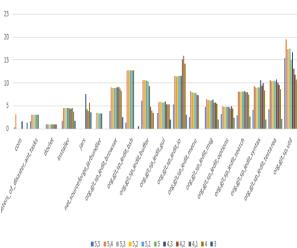
18
1
6
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9
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2
3
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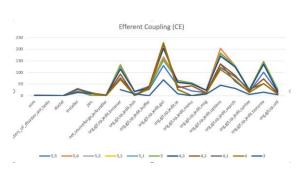
3. What are the Jedit modules that are highly coupled.

To identify the Jedit modules that are highly coupled we had considered the metrics CBO, Ca and Ce. If the coupling between objects (CBO) increases there will be more dependencies which reflect the decreasing maintainability. Similarly, increasing in the values of Afferent Coupling (Ca) and Efferent Coupling (Ce) decreases the maintainability.

The following figures represents the graphical representation of CBO, Ca and Ce







The results are given in table 3:

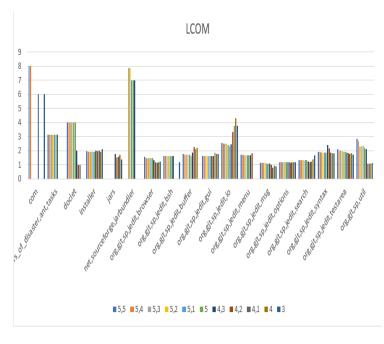
Module	Rating	
Com	18	
de.master-of-	15	
disaster.ant. tasks		
Docklet	17	

Installer	13
Jars	14
Net.sourceforge.	16
jarbundler	
Org.gjt.sp. jedit.browser	5
Org.gjt.sp.jedit. bsh	7
Org.gjt.sp.jedit. buffer	6
Org.gjt.sp.jedit. gui	11
Org.gjt.sp.jedit. io	2
Org.gjt.sp.jedit. menu	10
Org.gjt.sp.jedit. Msg	9
Org.gjt.sp.jedit. option	12
Org.gjt.sp.jedit. search	8
Org.gjt.sp.jedit. syntax	4
Org.gjt.sp.jedit. textarea	3
Org.gjt.sp.util	1

4. What are the Jedit modules that are with high cohesion?

To identify the modules that are having high cohesion. The selected metric is Lack of Cohesion Methods (LCOM). Cohesion metrics are used to define the internal attribute structure. It is used for measuring the extent of relation between the methods. If the cohesion value is high, then it is easily maintainable. While low cohesion results in less maintenance.

The following figure represents the graphical representation of LCOM shown below:



The results are given in table 4:

Module	Rating
Com	4
de.master-of-	5
disaster.ant. tasks	
Docklet	3
Installer	6
Jars	18
Net.sourceforge.	1
jarbundler	
Org.gjt.sp. jedit.browser	12
Org.gjt.sp.jedit. bsh	16
Org.gjt.sp.jedit. buffer	10
Org.gjt.sp.jedit. gui	11
Org.gjt.sp.jedit. io	2
Org.gjt.sp.jedit. menu	14
Org.gjt.sp.jedit. Msg	17
Org.gjt.sp.jedit. option	15
Org.gjt.sp.jedit. search	13
Org.gjt.sp.jedit. syntax	7
Org.gjt.sp.jedit. textarea	9
Org.gjt.sp.util	8

Reflections:

From this project we found the modules that are difficult to maintain using the GQM empirical study which consists of metric case study. There are five modules that are selected according to analysis of metrics from the research questions.

The modules are that are difficult to maintain are org.gjt.sp.jedit.browser, org.gjt.sp.jedit.bsh, org.gjt.sp.jedit.textera.

Conclusion

In this project the work we done is to know the modules that are difficult to maintain of the Jedit versions. The latest 11 versions of open software of Jedit are considered. For each of the version we had evaluated the metrics which we have selected. For this to obtain the metrics we had chosen the IntelliJ IDEA tool and Metric Reloaded Plugin. We framed the GQM which is known as Goal Question Metrics in that pattern we have done our work. To extend this work we can set up of more goals and analysis can be performed to the Jedit versions.

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Appendix

com	5,5 1,86	5,4 1,86	5,3	5,2 5	1 5				4	3.7		V(G)
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doclet	2,17			17 2				2,33	0	0	or	og gitt puti
installer	3,3	3,3	3,3	3,3 3,	9 3,29	3,21	8 3,3	3,24	2,17	1,82		orașit și ielit sortar
ars	0	0	0	-	0 0			_	2,26	2,59		ongglup jedt search
net.sourceforge.jarbundler	0			,88 1,8					0	0	D	oralizations
org gjt sp.jedit.browser	3,41			47 3/					4,28	3,85		orgatisa ieditmonu
org git sp jedit bsh	4,03			,03 4,0					0	5,31		oggtspjeltio
org git sp.jedit.buffer	2,62			£3 2,6					2,36	0		orgitpjeltele
orgajt sp jedit gui	2,68		-9-1	,69 2,6		-		2,73	2,88	2,76		orgetspiedths
orgajt spijedit io	2,47			,45 2,4				2,49	3,06	2,79		gglispjedi.braver auseforge.jarbunder
org gjt sp.jedit.menu	4,09	700	4.	78 3,			,		0	0	net.sc	acenge, promoer
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org.git.sp.jedit.options org.git.sp.jedit.search	3.16	3,16	up.	10 4 31 3					3,31	-941	i	of disaberantizatio
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org.git.sp.jedit.testarea	3,35			36 3					3.62	2.98		0 5 10 15 20 25 10 15 40 45
orgatsputil	2.87	-qu-		86 2				2,61	2.61	2,59		
- 40-4												#55 #54 #53 #52 #51 #5 #43 #42 #41 #4 #3
	5,5	5,4	5,3	5,2	5,1	5	43	4,2	4,1	4	3	
: com	0.25	3.25		0	0	0	1.67	0	0	0	1.33	000
de_masters_of_disaster,ant_tasks		3,23		3	3	3	3	0	0	0	1,33	
doclet	1	1	1	1	1	1	1	1	1	0	0	0/2.81.50.00
installer	1.76	4.51		4.51	4.51	4.58	4.39	4,44	4.5	3.79	1.75	APRINGATION A
jars	0	0		0	0	0	7,62	4,3	3,85	5,7	3,65	orgujt, pojedt, search
net,sourceforge,jarbundler	0	0		3,43	3,29	3,29	3,29	0	0	0	0	orgatispjeditoptons
orgajt,sp.jedit,browser	3.88	9.04	-91-	8,87	8,89	9,02	9	9.14	8.81	8.23	2,48	
orgat,spjedit,bsh	1.3	12.78		12.78	12,78	12.78	12,78	0	0	0	0.54	
O org.git,sp.jedit,buffer	6.17	10.61	10,57	10.57	10.52	10.32	9,33	4.81	3,94	3.5	0	org,gt.sp.jedt.gui
1 orggit,spjedit,gui	3,52	5,89	5,81	5,8	5,77	5,77	5,95	5,32	5,31	5,37	1,95	orgajtspjedi, buffer
2 orgajt,sp.jedit.jo	5,33	11,48	-1	11,37	11,48	11,56	11,5	15,08	15,89	14,2	3	nitition and the second
org.git,sp.jedit,menu	2,47	8,27		7,88	7,88	7,88	7,41	7,33	0	0	0	net, source for ge, jarbundler 💶
4 orggit,sp.jedit,msg	4,83	6,5	6,28	6,22	6,17	6,22	6,33	5,67	5,7	5,5	2	jas ==== installer ========
org.git,sp.jedit,options	3,23	4,88		4,8	4,82	4,84	4,82	4,41	4,89	4,37	2,38	installer
6 org.git,sp.jedit,search	2,9	8,1	8,12	8,12	8,12	8,16	8,23	7,97	7,96	7,4	2,7	
7 org.git,sp.jedit,syntax	4,14	9,33	9	8,95	9	9	10,62	9,36	9,93	8,3	2	
org.git,sp.jedit,testarea	4,25	10,57	10,41	10,41	10,52	10,34	10,76	10,09	9,5	8,68	2,13	0 20 40 60 80 100 120 140 160
9 orgajt,sp,util	15,43	19,5		17,3	17,44	15,03	16,68	13,08	11,8	10,8	9,57	
0												#32 #39 #39 #34 #31 #3 #45 #4£ #41 #4 #3
	5,5	5,4	5,3	5.2	5.1	5	4,3	42	4.1	4		3
com	8	8	- 1	0	0	0	6	0	0	0		6 LCOM
de,masters_of_disaster,ant,tasks	-	3,12		3,12	3,12	3,12	3,12	0	0	0		0
doclet	4	4	4	4	4	4	2	1	1	0		orggispudi orggispjeditestava
installer	1,97	1.89	1.89	1.89	1.89	1.92	2.03	1.97	2.03	1.89		
jars	0	0	0	0	0	0	1,75	1,52	1.58	1.7		c orgunits pledit, search
net,sourceforge,jarbundler	0	0		7.86	7	7	7	0	0	0		orggt,sp,jedt,sptons
org.git,sp.jedit,browser	1.58	1.49	1.49	1,49	1.49	1.47	134	1.17	1.11	1.19	1.2	orggtspjedtrosg
org.git.sp.jedit.bsh	1.64	1.62	1,62	1,62	1,62	1.62	1.62	0	0	0	-9-	o PRI/Minnistra
org.git,sp.jedit,buffer	1,78	1.74		17	1.7	1,64	1,88	2.24	2,12	2,19		orgajtspjedtgui
l orgajt,spjedit,gui	1.62	1.61	al	1,64	1,63	1,62	1.62	1,63	1.85	1,78		orggtsp.jedt,bufer
orgajt,spjeditjo	2.56	2,48	-1	2,48	2,41	23	2,46	3,31	3,78	43		
orgajt,spjedit,menu	1,73	1,73	-91.0	1,65	1,65	1.65	1.65	1,8	0	0		
orggit,spjedit,msg	1,11	1,11	1,11	1,11	1,05	1,05	1,06	1,0	0,8	0,92		1 jas ====
orgajt,spjedit,options	1,17	1,17		1,11	1,19	1,18	1,19	1.15	1.17	1,19		
orgajt,spjedit,search	1.33	1.33	-qea	1,33	1,33	1,33	1,23	1.16	1,25	1,36		
orggit,spjedit,syntax	1,93	1,9	-1	1,86	1,85	1,85	2.38	2,14	1,86	1.8	-9-	
orgigt,spjedit,testarea	2.11	2,03		1,98	1,00	1,00	1.85	1.83	1,77	1,79		
orgatisticalities	2,11	2,71	2,3	2.3	2.37	2.19	2.09	1.08	11	1,1		
orggyspun 1	4,00	4/1	4,5	4,5	4,51	4,13	2,03	1,165	I,I	1,1	1,1	■5,5 ■5,4 Ⅲ5,3 ■5,2 Ⅲ5,1 ■5 ■4,3 ■4,2 ■4,1 ■4 ■3
,					_				_	_		
	5,5	5,4	5,3	5,2	5,1	5	4,3	4,2	4,1	4	3	WMC
com	48,88	48,88	0	0	0	0	155,33	0	0		155,33	WWC
de,masters_of_disaster,ant,tasks	21,5	2,15	21,5	21,5	21,5	21,5	21,5	0	0	0	0	orgajico, vil
doclet	12	12	12	12	12	12	10	6	6	0	0	orgajt, pojedit testarea
installer	20,54	20,54	20,54	20,54	20,46	20,97	21,03	21,28	21,42	6,05	5,35	org.glt.sp.jedit.spntax
jars	0	0	0	0	0	0	12,62	5,73	5,81	6,7	7,71	orgatusjedi, search
net,sourceforge,jarbundler	0	0	51	51	44,29	44,29	44,29	0	0	0	0	orgajtspjelit,options orgajtspjelit,rog
org.git,sp.jedit,browser	16,29	15,85	15,94	15,85	15,85	16,22	16,8	15,77	17,44	15,5	14	orgajtspjedit,mens
org.git,sp.jedit,bsh	45,79	45,79	45,79	45,79	45,79	45,79	45,79	0	0	0	57,52	orgajtsp.jedt,io
org.git,sp.jedit,buffer	27,22	27,17	27,22	37,22	27,22	27,45	25,38	17,57	18,82	14,44	0	orgatisa jedi bylio
orggł,sp.jedł,gui	11,79	11,8	11,65	11,69	11,7	11,52	12,15	11,91	11,06	10,6	9,6	orgigtspjedtboffer orgigtspjedtboh
orgajt, sp.jedit, io	16,26	16,26	16,26	16,19	16,19	16,15	16,38	18,08	21,78	26,2	21,67	aggitspjedt,brouser
org.git,sp.jedit,menu	11,2	11,2	10,65	10,82	10,82	10,82	10,29	11,13	0	0	0	net,sourceforge,jarbundler
org.git,sp.jedit,msg	3,61	3,61	3,61	3,61	3,39	3,39	3,22	3,33	2,7	3	3	jars installer
org.git,sp.jedit,options	7,58	7,58	7,6	7,54	7,55	7,52	7,22	6,64	6,48	6,36	6,11	docist
org.git,sp.jedit,search	13,98	13,98	13,82	13,76	13,76	13,31	13,06	14,81	14,95	14,64	13,05 de	nyastes of disaterum, tasks
org,git,sp.jedit,syntax	28,52	28,38	28,14	27,52	27,48	27,48	28,19	29,14	28,64	30,4	30,64	COTI
org_git,sp.jedit,testarea	37,59	37,59	37,7	37,57	37,02	36,95	37	46,2	51,27	46,21	47,53	0 100 200 300 400 500
orgat,sputil	17,39	17,18	15.89	15,78	16,07	15,77	18.5	14,83	14,6	14,6	15,14	#55 #54 #53 #52 #51 #5 #43 #42 #41 #4 #3
orggr,sp,util												

	5,		5,3		5,1 5		4,2	4,1		3			Ca
com	12		0	167 1	0 (0	0		0			Cd .
de_masters_of_disaster,ant,tasks docket	1,3		2,67	2,67 2	0 (0	0			orgia		
installer	2		36	36	36 35		35	36	20 1		orgajt,sp.jedit,testa orgajt,sp.jedit,sm		
iars			0	0	0 (4,8		3,33 7,7	5	onglypjedt,sa	ech 💳	
net,sourceforge,jarbundler		0	6	6	6 6	5 6	0	0	0	0	orgatypjedt.opt urgatypjedt		
orggit,spjedit,browser	5	62	61	61	61 59	55	44	36	32 2	2	ogatspeitn		_
org.git,sp.jedit,bsh	8,5	25,83	25,83	25,83 25	5,83 25,83	25,83	0	0	0 1	4	bejqt,fg.gro	itjo 🚃	
orgajt,sp.jedit,buffer	4	52	52	52	51 50	53	32	29	26	0	orgatspjedt orgatspjedt,bu		
orggit,spjedit,gui	8	103	99,67	98,67 96	5,33 97,33	135,5	197	177	166 5	8	oggtspjedt		
orgajt,spjedit,io	5		83	81	82 80		40	29			og,gt,p,jedt,brov	1581	
org.git,sp.jedit,menu			13	13	13 13		12	0			nutriej, sgredsorues,	der II Jars II	
org.git,sp.jedit,msg	4		50	50	50 5		32	23		7		jio iler ===	_
orgajt,spiješit,options	8		80	80	80 79		68	69		5	śo		
orgajt,spjedit,search	3		59	59	59 59		43	43			rs_of_disaster,ant,to		
org_git,sp.jedit,syntax	3		67	66	66 66		36	35		7		om I	
orgajt,sp.jedit,testarea	7.		114		109 107		58	44		6		0 2	00 400 600 800 1000 1200 1400
orgajt,sp,util	12	7 141	128	128	128 132	2 100	43	39	38 1	9	■5,5 ■5,4 ■	5,3 15,2 1	5,1 m5 m43 m42 m41 m4 m3
		5,5	5,4	5,3	5,2	5,1	5	4,3	4,2	4,1	4	3	Ce
com		0	3	0	0	0	0	2	0	0	0	1	Ce
de,masters_of_disaster,ant,t	tasks	0,67	1,33	1,33	1,33	1,33	1,33	1,33	0	0	0	0	org.git.sp.util
doclet		0	0	0	0	0	0	0	0	0	0	0	org.git.sp.jedit,testarea
installer		19	30	30	30	30	29	30	29	28	16	14	org.git.sp.jedit.syntax
jars		0	0	0	0	0	0	11	12,4	10,4	8,67	10	org.git.sp.jedit,search org.git.sp.jedit,options
net,sourceforge,jarbundler		0	0	3	3	3	3	3	0	0	0		org.gi.sp.jedit,msg
org,gjt,sp,jedit,browser		77	134	130	130	130	127	115	93	77	70	26	org.git.sp.jedit,menu
org,gjt,sp,jedit,bsh		5,83	17,83	17,83	17,83	17,83	17,83	17,83	0	0	0	8	onggjt,sp.jedit,io
O org,gjt,sp,jedit,buffer		28	41	41	41	41	31	36	41	33	30	0	orggtspjedt,gul orggtspjedt,buffer
1 org.git,sp.jedit.gui		130	167	157	155	152	155,67	203	228	220	227	68	org,gjt,sp,jedit,bsh 🚥
2 org,gjt,sp,jedit,io		42	65	65	65	65	64	57	36	26	27	9	org.git.sp.jedit.browser
3 orgajt,sp.jedit,menu		21	50	55	55	55	55	51	42	0	0	0	net,sourceforge,jarbundler jars
org,git,sp,jedit,msg		14	23	23	23	23	23	23	13	10	13	7	jers installer
orgajt,sp.jedit,options		136	204	184	180	181	182	170	136	121	114	45	dociat
6 orgajt,sp.jedit,search		61	129	128	128	128	130	124	87	82	68		le,masters_of_disaster,ant,tasks
7 orgajt,sp.jedit,syntax		17	25	25	25	26	26	23	21	27	14	6	com)
B org.git,sp.jedit,testarea		101	147	146	146	146	146	135	72	52	52	15	0 500 1000 1500
9 org,git,sp,util		15	26	24	24	24	27	17	10	7	7	4	■5,5 ■5,4 ■5,3 ■5,2 ■5,1 ■5 ■4,3 ■4,2 ■4,1 ■4 ■3
0													
		5,5	5,4	5,3	5,2	5,1	5	4,3	4,2	4,1	4	3	CLOC
com		1,027	1,027	0	0	0	0	1,822	0	0	0	1,826	CLOC
de,masters_of_disaster,ant,ta	asks	563	563	563	563	563	563	563	0	0	0	0	orgajt,sq.util
doclet		18	18	18	18	18	18	18	21	21	0	0	org,gjt,sp,jedit,testarea
installer		1,449	1,449	1,449	1,449	1,446	1,446	1,537	1,47	1,482	278	210	org gjt.sp.jedit.syntax
jars		0	0	0	0	0	0	106,67	620	596	259	318	org_git_sp_jedit_search org_git_sp_jedit_options
net,sourceforge,jarbundler		0	0	967	967	809	809	809	0	0	0	0	orgajtus,jedt,msg
org,git,sp,jedit,browser		1,383	1,342	1,343	1,341	1,341	1,32	1,13	920	698	614	331	org.git.sp.jedit,menu
org,git,sp,jedit,bsh		10,144	10,144	10,142	10,143	10,143	10,143	10,143	0	0	0	2,096	org_g[t,sp.jedit_lo
org,git,sp,jedit,buffer		2,188	2,181	2,183	2,162	2,162	2,09	2,295	1,136	998	763	0	org,gjt,sp,jedit,gui i org,gjt,sp,jedit,bufler
org,git,sp,jedit,gui		6,822	6,79	6,61	6,613	6,598	6,624	6,039	3,402	3,177	2,843	1,411	orgitspjedt,bsh I
org.git,sp.jedit,io		1,99	1,989	1,99	1,987	1,982	1,985	1,879	981	876	953	806	org,gjt,sp.jedit,browser
org,git,sp,jedit,menu		496	496	500	503	503	503	520	428	0	0	0	net,sourceforge,jarbundler
org,git,sp,jedit,msg		792	792	792	788	768	747	735	575	412	475	423	jars installer
org,git,sp,jedit,options		1,714	1,703	1,575	1,53	1,53	1,529	1,429	1,146	975	912	753	dociet II
org,git,sp,jedit,search		1,681	1,681	1,665	1,658	1,658	1,648	1,592	1,285	1,262	1,157	721	de,masters of_disaster,ant,tasks
org.git,sp.jedit,syntax		1,612	1,583	1,573	1,541	1,541	1,541	1,278	1,115	972	570	573	com
org.git,sp.jedit,testarea		5,895	5,895	5,895	5,891	5,811	5,703	5,291	3,592	3,056	3,014	1,18	0 1000 2000 3000 4000 5000 6000 3
org.git,sp,util		1,789	1,786	1,575	1,574	1,608	1,812	1,452	631	517	495	393	■5,5 ■5,4 ■5,3 ■5,2 ■5,1 ■5 ■4,3 ■4,2 ■4,1 ■4 ■3
		5,5	5,4	5,3	5,2	5,1	5	4,3	4,2	4,1	4	3	
2 com		2,762	2,762	0	0	0	0	4,312	0	0	0	4,311	LOC
de,masters_of_disaster,ant,t	tasks	1,462	1,462	1,462	1,462	1,462	1,462	1,459	0	0	0	0	org.git.sp.util is
doclet		107	107	107	107	107	107	100	98	98	0	0	org.git.sq.iedit,testarea •••
installer		7,165	7,165	7,165	7,165	7,151	7,132	7,378	7,11	7,138		1,263	org,gjt,sp,jedit,syntax II
jars		0	0	0	0	0	0	535	2,785	2,513		2,905	org,gjt,sp,jedit,search
net,sourceforge,jarbundler		0	0	2,472	2,472	2,143	2,143	2143	0	0	0	0	org,git,sp,jedt,options org,git,sp,jedt,msg
org,git,sp,jedit,browser		5,774	5,594	5,614	5,602	5,614	5,53	5,172	4,272	3,352	2,96	2,131	org,gjt,sp,jedit,menu
org,gjt,sp,jedit,bsh		37,456	37,456	37,426		37,428	37,412	37,417	0	0		19,575	org.git.sp.jedit.jo
O org,gjt,sp,jedit,buffer		5,251	5,24	5,247	5,225	5,233	5,073	5,262	3,182	2,673		0	orgejtspjedtgui
1 org,gjt,sp,jedit,gui		24,454	24,283	23,689	23,554	23,229	23,316	20,986	13,019	11,256	10,914	5,716	org,git,p,jedit,buffer II org,git,p,jedit,buh
org,gjt,sp,jedit,io		4,583	4,582	4,585	4,552	4,556	4,54	4,076	2,299	1,988	-9	2,129	org.gjt,sp.jedit,browser
org.git,sp.jedit,menu		1,607	1,607	1,684	1,697	1,174	1,714	1,674	1,469	0		0	net,sourceforge,jarbundler
4 org,gjt,sp,jedit,msg		1,196	1,196	1,196	1,191	1,15	1,129	1,103	817	587		638	jars installer
org_git,sp.jedit,options		7,926	7,856	7,417	7,232	7,254	7,235	6,488	5,287	4,59	4,373	3,679	dodet
6 org,gjt,sp,jedit,search		5,967	5,967	5,91	5,883	5,893	5,783	5,482	4,185	3,912	3,525	2,595	
7 orgajt,sp.jedit,syntax		5,094	5,054	5,009	4,877	4,876	4,877	3,865	3,326	3,054	2,146	2,399	com
8 org.git,sp.jedit,testarea		18,681	18,681	18,729	18,704	18,439	18,4	16,373	11,669	9,703	9,491	5,152	0 500 1000 1500 2000 2500
9 org,git,sp,util		4,371	4,339	3,876	3,863	3,982	4,459	3,555	1,586	1,345	1,323	1,042	■5.5 ■5.4 ■5.3 ■5.2 ■5.1 ■5 ■4.3 ■4.2 ■4.1 ■4 ■3
0													#3,5 #3,4 #3,5 #3,2 #3,1 #3 #4,5 #4,2 #4,1 #4 #3
		5,5	5,4	5,3	5,2	5.1	5	4,3	4,2	4,1	4	3	
com		37.18	37.18	0	0	0	0	42.25	0	0	0	42.36	COM_RAT
de,masters_of_disaster,ant,ta	acks	38,51	38,51	38,51	38,51	38,51	38,51	38,59	0	0	0	0	
dociet	-	16,82	16,82	16.82	16,82	16,82	16.82	18	21,43	21,43	0	0	org.git.sp.util
installer		20,22	20,22	20,22	20,22	20,22	20,27	20,83	20,68	20,76	16,36	16,63	org_grusp.jedrusesarea org_grusp.jedrusyritax
		0	100	100	100	100	100	19,94	22,26	23,72	16,12	10,95	org.glt.sp.jedit.search
		0	0	39,12	39,12	37,75	37,75	37,75	0	0	0	0	org.git.sp.jedit.aptions
jars		23,95	23,99	23,92	23,94	23,89	23,87	21,85	21,54	20,82	20,74	15,53	org,gitsp,jedt,msg
jars net,sourceforge,jarbundler									0	0	0		org.git.sp.jedit.menu org.git.sp.jedit.jo
jars net,sourceforge,jarbundler org,gjt,sp,jedit,browser		27,08 41,67	27,08 41,62	27,1 41,6	27,1 41,38	27,1 41,31	27,1 41,2	27,11 43,61	35,7	37,34	42,37	10,71	org.gjt.sp.jedit.gui
jars net,sourceforge,jarbundler org,git,sp,jedit,browser org,git,sp,jedit,bsh				41,6 27,9	41,38 28,09	41,31 28,4	28,41	43,61	35,7 26.13	28,22	42,37 26,05	24,69	org.git.sp.jedit.buffer
jars net,sourceforge,jarbundler org,git,so,jedit,browser org,git,so,jedit,bsh org,git,so,jedit,buffer			27 nc	41,3		43.5	43.74	46,1	42.67	44.06	38.18	37,86	org.git.sp.jedit.bsh
jars net,sourceforge,jarbundler org,git,sp,jedit,browser org,git,sp,jedit,bsh org,git,sp,jedit,buffer org,git,sp,jedit,gui		27,9	27,95	42.4				40,1	74,07	T7,U0		31,60	org,gjt,sp,jedit,browser
jars net,sourceforge,jarbundler org,git,sp,jedit,browser org,git,sp,jedit,bsh org,git,sp,jedit,buffer org,git,sp,jedit,gui org,git,sp,jedit,gui		27,9 43,42	43,41	43,4	43,65	- agai	20.25	21.06	20 14	0	0	0	net, sourceforge, jarbundler
jars net,sourceforge,jarbundler org,git,so,jedit,browser org,git,so,jedit,brih org,git,so,jedit,buffer org,git,so,jedit,buif org,git,so,jedit,bui org,git,so,jedit,bui org,git,so,jedit,menu		27,9 43,42 30,86	43,41 30,86	29,69	29,64	29,35	29,35	31,06	29,14	70.10	0	66.2	net, source for ge, jurbundler jars
jars net,sourceforge,jarbundler org,git,so,jedt,browser org,git,so,jedt,brow org,git,so,jedt,buffer org,git,so,jedt,guffer org,git,so,jedt,go org,git,so,jedt,menu org,git,so,jedt,menu		27,9 43,42 30,86 66,22	43,41 30,86 66,22	29,69 66,22	29,64 66,16	29,35 66,78	66,16	66,64	70,38	70,19	67	66,3	jars installer
jars net,sourceforge,jarbundler orgajt,sp.jedt,browser orgajt,sp.jedt,bri orgajt,sp.jedt,bri orgajt,sp.jedt,pulfer orgajt,sp.jedt,joi orgajt,sp.jedt,joi orgajt,sp.jedt,menu orgajt,sp.jedt,menu orgajt,sp.jedt,mag orgajt,sp.jedt,ptions		27,9 43,42 30,86 66,22 21,63	43,41 30,86 66,22 21,68	29,69 66,22 21,24	29,64 66,16 21,16	29,35 66,78 21,09	66,16 21,13	66,64 22,03	70,38 21,68	70,19 21,24	67 20,86	66,3 20,47	jars installer dociet
jars net, sourceforge jarbundler orgajt, so jedt, browser orgajt, so jedt, browser orgajt, so jedt, boh orgajt, so jedt, boh orgajt, so jedt, boh orgajt, so jedt, boh orgajt, so jedt, menu orgajt, so jedt, menu orgajt, so jedt, menu orgajt, so jedt, potions orgajt, so jedt, potions orgajt, so jedt, pasch		27,9 43,42 30,86 66,22 21,63 28,17	43,41 30,86 66,22 21,68 28,17	29,69 66,22 21,24 28,17	29,64 66,16 21,16 28,18	29,35 66,78 21,09 28,14	66,16 21,13 28,5	66,64 22,03 29,04	70,38 21,68 30,7	70,19 21,24 32,26	67 20,86 32,82	66,3 20,47 27,78	jars installer
jars net, sourceforge, jarbundler org, git, so, jedit, browser org, git, so, jedit, browser org, git, so, jedit, buffer org, git, so, jedit, buffer org, git, so, jedit, j		27,9 43,42 30,86 66,22 21,63 28,17 31,65	43,41 30,86 66,22 21,68 28,17 31,32	29,69 66,22 21,24 28,17 31,4	29,64 66,16 21,16 28,18 31,6	29,35 66,78 21,09 28,14 31,6	66,16 21,13 28,5 31,6	66,64 22,03 29,04 33,07	70,38 21,68 30,7 33,52	70,19 21,24 32,26 31,83	67 20,86 32,82 26,56	66,3 20,47 27,78 23,88	jas installer dödet dösete, matters of disaster, ant taoks com
jars		27,9 43,42 30,86 66,22 21,63 28,17	43,41 30,86 66,22 21,68 28,17	29,69 66,22 21,24 28,17	29,64 66,16 21,16 28,18	29,35 66,78 21,09 28,14	66,16 21,13 28,5	66,64 22,03 29,04	70,38 21,68 30,7	70,19 21,24 32,26	67 20,86 32,82	66,3 20,47 27,78	jass installer dode fe, masters of disaster, and, tasks