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SER316 – Assignment 7

Task 1

Size

1. In the main.java.memoranda package, there is 2187 total LOC
2. EventsManager.java > 329 LOC
3. LOC for this was determined by total number of non white space lines of code, including any lines that are comments, just braces and even package and import declarations. All empty spacing lines are excluded.

Cohesion

1. LCOM2 means a lower value indicates higher cohesion and a more well defined class implying simplicity and reusability. It is calculated by the following formula $LOCM2 = 1 - sum(mA)/(m * a)$ whereby:
   a. m = number of methods in a class
   b. a = number of member variables in class
   c. mA = number of methods that access a variable
2. In the main.java.memoranda package, the class with the highest cohesion is NoteListImpl.java at 0.108 on average and this is mostly because it has sub classes within that all add up to zero which help bring the average down. The main portion of NoteListImpl itself has a relatively lower cohesion at 0.542.

Complexity

1. The cyclomatic complexity in the main.java.memoranda package is on average 1.746
2. The EventsManager class has the worst complexity at 3.353 on average (16 just from one method)
3. Change the “getEvent” method in the EventsManager class and added an additional private method “getEventHelper” to reduce the complexity of “getEvent” from 5 to 4. This transitions some of the complexity to another method thus reducing the average for the whole class.

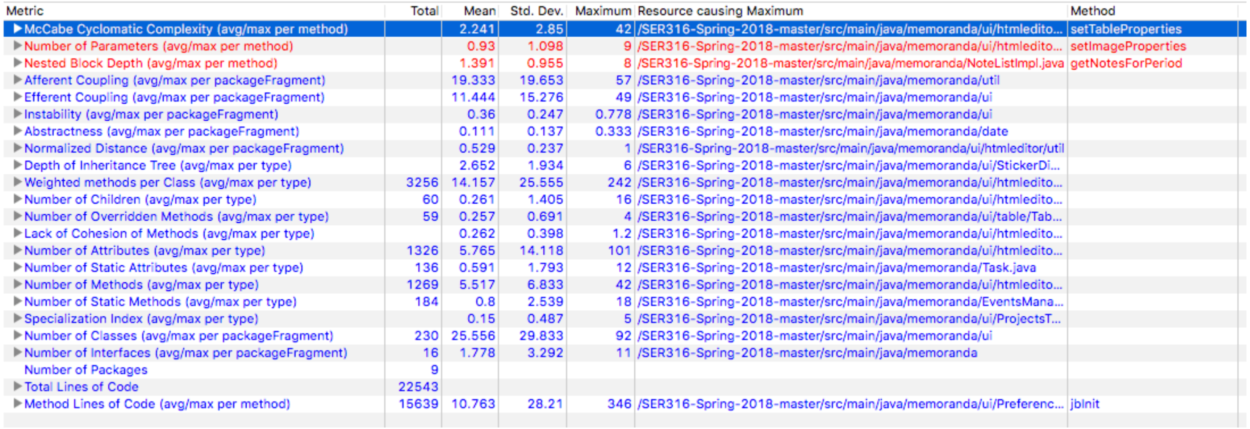
Package-level coupling

1. Afferent coupling refers to a particular packages importance to other packages i.e. package A is referenced by frequently by classes in other packages whereas efferent is the reverse wherein the number of classes in package A refer to classes in other packages.
2. Main.java.memoranda.util – 57
3. Main.java.memoranda.ui – 49

Worst quality

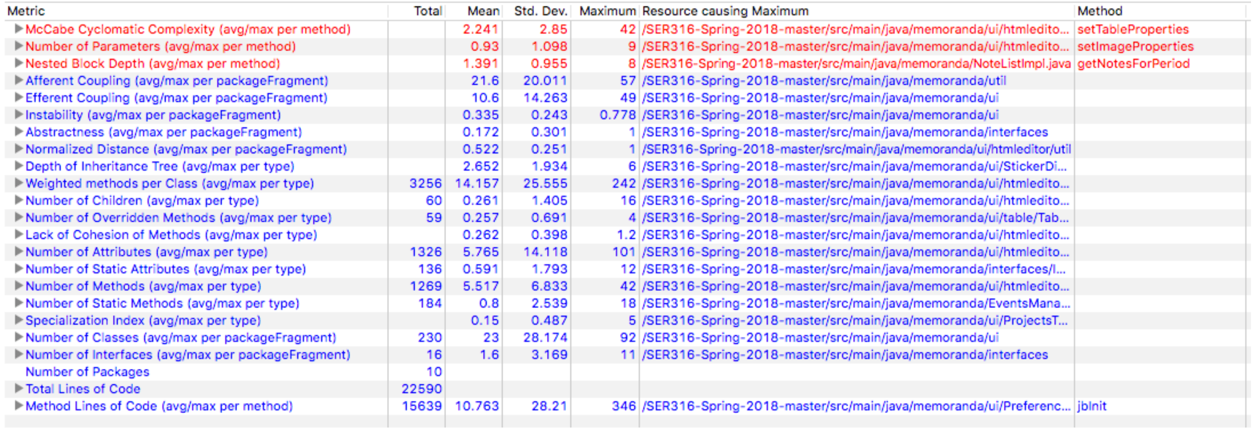
1. EventsManager has highest level of cyclomatic complexity. Having a large number of paths not only adds complexity to making updates but also increases the likelihood or unexpected conditions not being handled or missed during testing.

Task 2



Metric	Total	Mean	Std. Dev.	Maximum	Resource causing Maximum	Method
▶McCabe Cyclomatic Complexity (avg/max per method)		2.241	2.85	42	/SER316-Spring-2018-master/src/main/java/memoranda/ui/htmledito...	setTableProperties
▶Number of Parameters (avg/max per method)		0.93	1.098	9	/SER316-Spring-2018-master/src/main/java/memoranda/ui/htmledito...	setImageProperties
▶Nested Block Depth (avg/max per method)		1.391	0.955	8	/SER316-Spring-2018-master/src/main/java/memoranda/NoteListImpl.java	getNotesForPeriod
▶Afferent Coupling (avg/max per packageFragment)		19.333	19.653	57	/SER316-Spring-2018-master/src/main/java/memoranda/util	
▶Efferent Coupling (avg/max per packageFragment)		11.444	15.276	49	/SER316-Spring-2018-master/src/main/java/memoranda/ui	
▶Instability (avg/max per packageFragment)		0.36	0.247	0.778	/SER316-Spring-2018-master/src/main/java/memoranda/ui	
▶Abstractness (avg/max per packageFragment)		0.111	0.137	0.333	/SER316-Spring-2018-master/src/main/java/memoranda/date	
▶Normalized Distance (avg/max per packageFragment)		0.529	0.237	1	/SER316-Spring-2018-master/src/main/java/memoranda/ui/htmleditor/util	
▶Depth of Inheritance Tree (avg/max per type)		2.652	1.934	6	/SER316-Spring-2018-master/src/main/java/memoranda/ui/StickerDi...	
▶Weighted methods per Class (avg/max per type)	3256	14.157	25.555	242	/SER316-Spring-2018-master/src/main/java/memoranda/ui/htmledito...	
▶Number of Children (avg/max per type)	60	0.261	1.405	16	/SER316-Spring-2018-master/src/main/java/memoranda/ui/htmledito...	
▶Number of Overridden Methods (avg/max per type)	59	0.257	0.691	4	/SER316-Spring-2018-master/src/main/java/memoranda/ui/table/Tab...	
▶Lack of Cohesion of Methods (avg/max per type)		0.262	0.398	1.2	/SER316-Spring-2018-master/src/main/java/memoranda/ui/htmledito...	
▶Number of Attributes (avg/max per type)	1326	5.765	14.118	101	/SER316-Spring-2018-master/src/main/java/memoranda/ui/htmledito...	
▶Number of Static Attributes (avg/max per type)	136	0.591	1.793	12	/SER316-Spring-2018-master/src/main/java/memoranda/Task.java	
▶Number of Methods (avg/max per type)	1269	5.517	6.833	42	/SER316-Spring-2018-master/src/main/java/memoranda/ui/htmledito...	
▶Number of Static Methods (avg/max per type)	184	0.8	2.539	18	/SER316-Spring-2018-master/src/main/java/memoranda/EventsMana...	
▶Specialization Index (avg/max per type)		0.15	0.487	5	/SER316-Spring-2018-master/src/main/java/memoranda/ui/ProjectsT...	
▶Number of Classes (avg/max per packageFragment)	230	25.556	29.833	92	/SER316-Spring-2018-master/src/main/java/memoranda/ui	
▶Number of Interfaces (avg/max per packageFragment)	16	1.778	3.292	11	/SER316-Spring-2018-master/src/main/java/memoranda	
Number of Packages	9					
▶Total Lines of Code	22543					
▶Method Lines of Code (avg/max per method)	15639	10.763	28.21	346	/SER316-Spring-2018-master/src/main/java/memoranda/ui/Preferenc...	jbInit

After



Metric	Total	Mean	Std. Dev.	Maximum	Resource causing Maximum	Method
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▶Number of Parameters (avg/max per method)		0.93	1.098	9	/SER316-Spring-2018-master/src/main/java/memoranda/ui/htmledito...	setImageProperties
▶Nested Block Depth (avg/max per method)		1.391	0.955	8	/SER316-Spring-2018-master/src/main/java/memoranda/NoteListImpl.java	getNotesForPeriod
▶Afferent Coupling (avg/max per packageFragment)		21.6	20.011	57	/SER316-Spring-2018-master/src/main/java/memoranda/util	
▶Efferent Coupling (avg/max per packageFragment)		10.6	14.263	49	/SER316-Spring-2018-master/src/main/java/memoranda/ui	
▶Instability (avg/max per packageFragment)		0.335	0.243	0.778	/SER316-Spring-2018-master/src/main/java/memoranda/ui	
▶Abstractness (avg/max per packageFragment)		0.172	0.301	1	/SER316-Spring-2018-master/src/main/java/memoranda/interfaces	
▶Normalized Distance (avg/max per packageFragment)		0.522	0.251	1	/SER316-Spring-2018-master/src/main/java/memoranda/ui/htmleditor/util	
▶Depth of Inheritance Tree (avg/max per type)		2.652	1.934	6	/SER316-Spring-2018-master/src/main/java/memoranda/ui/StickerDi...	
▶Weighted methods per Class (avg/max per type)	3256	14.157	25.555	242	/SER316-Spring-2018-master/src/main/java/memoranda/ui/htmledito...	
▶Number of Children (avg/max per type)	60	0.261	1.405	16	/SER316-Spring-2018-master/src/main/java/memoranda/ui/htmledito...	
▶Number of Overridden Methods (avg/max per type)	59	0.257	0.691	4	/SER316-Spring-2018-master/src/main/java/memoranda/ui/table/Tab...	
▶Lack of Cohesion of Methods (avg/max per type)		0.262	0.398	1.2	/SER316-Spring-2018-master/src/main/java/memoranda/ui/htmledito...	
▶Number of Attributes (avg/max per type)	1326	5.765	14.118	101	/SER316-Spring-2018-master/src/main/java/memoranda/ui/htmledito...	
▶Number of Static Attributes (avg/max per type)	136	0.591	1.793	12	/SER316-Spring-2018-master/src/main/java/memoranda/interfaces/I...	
▶Number of Methods (avg/max per type)	1269	5.517	6.833	42	/SER316-Spring-2018-master/src/main/java/memoranda/ui/htmledito...	
▶Number of Static Methods (avg/max per type)	184	0.8	2.539	18	/SER316-Spring-2018-master/src/main/java/memoranda/EventsMana...	
▶Specialization Index (avg/max per type)		0.15	0.487	5	/SER316-Spring-2018-master/src/main/java/memoranda/ui/ProjectsT...	
▶Number of Classes (avg/max per packageFragment)	230	23	28.174	92	/SER316-Spring-2018-master/src/main/java/memoranda/ui	
▶Number of Interfaces (avg/max per packageFragment)	16	1.6	3.169	11	/SER316-Spring-2018-master/src/main/java/memoranda/interfaces	
Number of Packages	10					
▶Total Lines of Code	22590					
▶Method Lines of Code (avg/max per method)	15639	10.763	28.21	346	/SER316-Spring-2018-master/src/main/java/memoranda/ui/Preferenc...	jbInit

Two metrics that changed are the Afferent and Efferent coupling since the packaging of the interfaces has changed. Multiple classes and methods now refer to items in a different package (because of the move of the interfaces). I would say that it is marginally better just from a code organization standpoint. It's now easier to differentiate implementations vs interfaces by having package organization vs just class/file names.

Task 3

1. Refactored the "set" method and removed the "noteChanged" method within the CurrentNote class in main.java.memoranda. I updated those two methods because noteChanged is a private static method not used anywhere else within the class and it only contains a handful of lines. The "set" method is the only method of two called

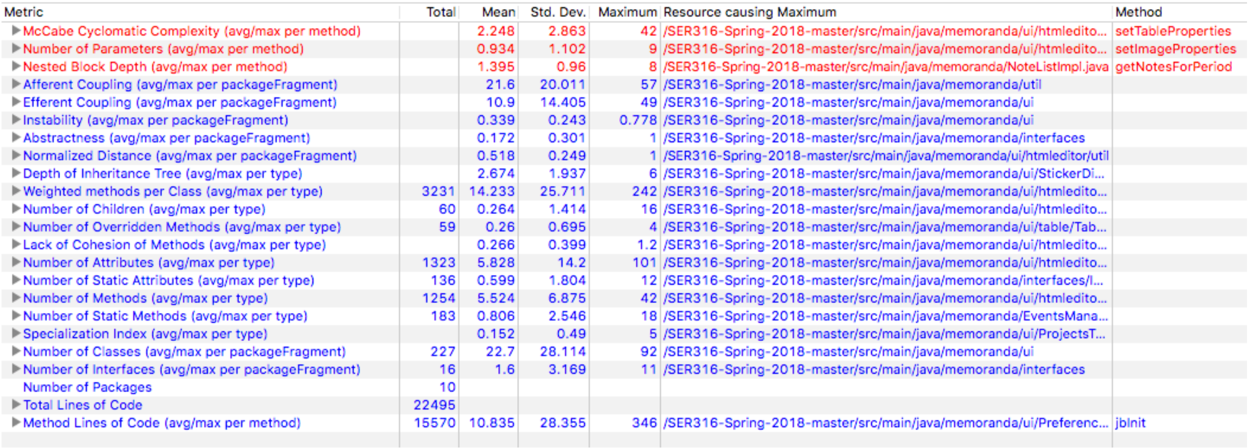
from outside the class and forcing that method to call another for a non complex operation unnecessarily adds to the complexity.

   a. I suppose the smell in this instance could be classified under “speculative generality” since it’s a single use method that really isn’t complex or long enough to warrant it being it’s own method. Maybe, eventually, if it were used outside the class or by other methods within the class then maybe it would deserve it’s own method but in this case it didn’t.

2. Created 3 new class files (Year, Month, and Day) that were previously sub classes in both the EventsManager and NotListImpl classes in the main.java.memoranda package and thus duplicate code. Day subclass in each were slightly different, consolidated them both to have just the one class that the other two classes could both use.

   a. I would classify this code smell as “Feature Envy”; two classes use virtually the same set of code but in the form of a sub class, why not make those classes standalone so that both of the higher level classes have access to them in a more functional way.

3. After



Metric	Total	Mean	Std. Dev.	Maximum	Resource causing Maximum	Method
▶ McCabe Cyclomatic Complexity (avg/max per method)		2.248	2.863	42	/SER316-Spring-2018-master/src/main/java/memoranda/ui/htmledito...	setTableProperties
▶ Number of Parameters (avg/max per method)		0.934	1.102	9	/SER316-Spring-2018-master/src/main/java/memoranda/ui/htmledito...	setImageProperties
▶ Nested Block Depth (avg/max per method)		1.395	0.96	8	/SER316-Spring-2018-master/src/main/java/memoranda/NoteListImpl.java	getNotesForPeriod
▶ Afferent Coupling (avg/max per packageFragment)		21.6	20.011	57	/SER316-Spring-2018-master/src/main/java/memoranda/util	
▶ Efferent Coupling (avg/max per packageFragment)		10.9	14.405	49	/SER316-Spring-2018-master/src/main/java/memoranda/ui	
▶ Instability (avg/max per packageFragment)		0.339	0.243	0.778	/SER316-Spring-2018-master/src/main/java/memoranda/ui	
▶ Abstractness (avg/max per packageFragment)		0.172	0.301	1	/SER316-Spring-2018-master/src/main/java/memoranda/interfaces	
▶ Normalized Distance (avg/max per packageFragment)		0.518	0.249	1	/SER316-Spring-2018-master/src/main/java/memoranda/ui/htmleditor/util	
▶ Depth of Inheritance Tree (avg/max per type)		2.674	1.937	6	/SER316-Spring-2018-master/src/main/java/memoranda/ui/StickerDi...	
▶ Weighted methods per Class (avg/max per type)	3231	14.233	25.711	242	/SER316-Spring-2018-master/src/main/java/memoranda/ui/htmledito...	
▶ Number of Children (avg/max per type)	60	0.264	1.414	16	/SER316-Spring-2018-master/src/main/java/memoranda/ui/htmledito...	
▶ Number of Overridden Methods (avg/max per type)	59	0.26	0.695	4	/SER316-Spring-2018-master/src/main/java/memoranda/ui/table/Tab...	
▶ Lack of Cohesion of Methods (avg/max per type)		0.266	0.399	1.2	/SER316-Spring-2018-master/src/main/java/memoranda/ui/htmledito...	
▶ Number of Attributes (avg/max per type)	1323	5.828	14.2	101	/SER316-Spring-2018-master/src/main/java/memoranda/ui/htmledito...	
▶ Number of Static Attributes (avg/max per type)	136	0.599	1.804	12	/SER316-Spring-2018-master/src/main/java/memoranda/interfaces/I...	
▶ Number of Methods (avg/max per type)	1254	5.524	6.875	42	/SER316-Spring-2018-master/src/main/java/memoranda/ui/htmledito...	
▶ Number of Static Methods (avg/max per type)	183	0.806	2.546	18	/SER316-Spring-2018-master/src/main/java/memoranda/EventsMana...	
▶ Specialization Index (avg/max per type)		0.152	0.49	5	/SER316-Spring-2018-master/src/main/java/memoranda/ui/ProjectsT...	
▶ Number of Classes (avg/max per packageFragment)	227	22.7	28.114	92	/SER316-Spring-2018-master/src/main/java/memoranda/ui	
▶ Number of Interfaces (avg/max per packageFragment)	16	1.6	3.169	11	/SER316-Spring-2018-master/src/main/java/memoranda/interfaces	
Number of Packages	10					
▶ Total Lines of Code	22495					
▶ Method Lines of Code (avg/max per method)	15570	10.835	28.355	346	/SER316-Spring-2018-master/src/main/java/memoranda/ui/Preferenc...	jbInit

4. The total LOC changed decreasing from 22590 to 22495 since the repeated code is now gone. The LCOM2 increased marginally from 0.262 to 0.266 as did the Cyclomatic Complexity from 2.241 to 2.248. I wouldn’t qualify the changes made as better or worse based on the metrics, but it did make the code more organized and easier to follow. References to Day/Month/Year can now be looked up under the umbrella of their own classes instead of in each instance having to refer to a different set of the same classes in two different files.