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SER316 - Assignment 7 – Refactoring/Metrics

Task 1:

Size

1. Total lines of code in the project (LOC) = 22539
2. HTMLEditor.java, Total LOC = 2144
3. Set is the method Metrics used the determine LOC. The method set() is dependent to other methods to perform is task.

Cohesion

1. LCOM2 – In a method-attribute graph is a directed edge connects a method node to an attribute node if the method references the attribute.
   LCOM2 = 1 – e/(n * a)
   Where, n = # of methods, a = # of attributes, e = # of edges.
2. The total shows Local class in Local.java have 0 Lack of Cohesion therefore it has the highest cohesion.

Complexity

1. 2.241 is the mean cyclomatic complexity in the main package.
2. Class HTMLEditor have the worst cyclomatic complexity with average of 5.762.
3.

Package Level Coupling

1. Afferent and Efferent coupling. A class afferent coupling is a measure of how many other classes use the specific class. An efferent coupling is a measure of how many different classes used by the specific class.
2. main.java.memoranda.util package have the highest afferent coupling with a total of 57.
3. main.java.memoranda.ui package have the highest efferent coupling with a total of 49.

Worst Quality
   The class with the worst quality is NoteListImpl. It has a high CC but most of 2.485 but most of all it has the highest nested-block dept of 1.5 but its constructor is > 2.3. The nested block dept issue makes it very hard to read or trace when there are bugs to figure out. Maintainability is most difficult for this code.

Task 2: Eclipse Refactoring

1.

| | | | Problems ⊠ | @ Javadoc | Declaration | Coverage | Checkstyle violations | Bug Info | Bug Explorer | | | |

25 errors, 1,461 warnings, 0 others (Filter matched 125 of 1486 items)

Description   Resource

Metrics - src - Normalized Distance (avg/max per packageFragment) ⊠

Metric	Total	Mean	Std. Dev.	Maximum	Resource causing Maximum
> McCabe Cyclomatic Complexity (avg/max per method)		2.241	2.851	42	/SER316-Spring-2018-Metrics/src/main/java/memoranda/ui/htmleditor/HTMLEditor.java
> Number of Parameters (avg/max per method)		0.928	1.097	9	/SER316-Spring-2018-Metrics/src/main/java/memoranda/ui/htmleditor/HTMLEditor.java
> Nested Block Depth (avg/max per method)		1.39	0.955	8	/SER316-Spring-2018-Metrics/src/main/java/memoranda/NoteListImpl.java
> Afferent Coupling (avg/max per packageFragment)		19.3...	19.653	57	/SER316-Spring-2018-Metrics/src/main/java/memoranda/util
> Efferent Coupling (avg/max per packageFragment)		11.4...	15.276	49	/SER316-Spring-2018-Metrics/src/main/java/memoranda/ui
> Instability (avg/max per packageFragment)		0.36	0.247	0.778	/SER316-Spring-2018-Metrics/src/main/java/memoranda/ui
> Abstractness (avg/max per packageFragment)		0.111	0.137	0.333	/SER316-Spring-2018-Metrics/src/main/java/memoranda/date
> Normalized Distance (avg/max per packageFragment)		0.529	0.237	1	/SER316-Spring-2018-Metrics/src/main/java/memoranda/ui/htmleditor/util
> Depth of Inheritance Tree (avg/max per method)		2.652	1.934	6	/SER316-Spring-2018-Metrics/src/main/java/memoranda/ui/AppFrame.java
> Weighted methods per Class (avg/max per type)	3254	14.1...	25.54	242	/SER316-Spring-2018-Metrics/src/main/java/memoranda/ui/htmleditor/HTMLEditor.java
> Number of Children (avg/max per type)	60	0.261	1.405	16	/SER316-Spring-2018-Metrics/src/main/java/memoranda/ui/htmleditor/HTMLEditor.java
> Number of Overridden Methods (avg/max per type)	59	0.257	0.691	4	/SER316-Spring-2018-Metrics/src/main/java/memoranda/ui/table/TableMap.java
> Lack of Cohesion of Methods (avg/max per type)		0.262	0.398	1.2	/SER316-Spring-2018-Metrics/src/main/java/memoranda/ui/htmleditor/CharTablePanel.java
> Number of Attributes (avg/max per type)	1326	5.765	14.118	101	/SER316-Spring-2018-Metrics/src/main/java/memoranda/ui/htmleditor/HTMLEditor.java
> Number of Static Attributes (avg/max per type)	136	0.591	1.793	12	/SER316-Spring-2018-Metrics/src/main/java/memoranda/Task.java
> Number of Methods (avg/max per type)	1269	5.517	6.833	42	/SER316-Spring-2018-Metrics/src/main/java/memoranda/ui/htmleditor/HTMLEditor.java
> Number of Static Methods (avg/max per type)	183	0.796	2.51	17	/SER316-Spring-2018-Metrics/src/main/java/memoranda/EventsManager.java
> Specialization Index (avg/max per type)		0.15	0.487	5	/SER316-Spring-2018-Metrics/src/main/java/memoranda/ui/ProjectsTablePanel.java
> Number of Classes (avg/max per packageFragment)	230	25.5...	29.833	92	/SER316-Spring-2018-Metrics/src/main/java/memoranda/ui
> Number of Interfaces (avg/max per packageFragment)	16	1.778	3.292	11	/SER316-Spring-2018-Metrics/src/main/java/memoranda
Number of Packages	9				
> Total Lines of Code	22539				
> Method Lines of Code (avg/max per method)	15637	10.7...	28.219	346	/SER316-Spring-2018-Metrics/src/main/java/memoranda/ui/PreferencesDialog.java

4. EventEmpl.java _elem renamed to _element using refactor->rename. Compiles and run OK.
5. Prefixed all interface class names with "I".
6. Verified program compiles and run.
7.

Metrics - SER316-Spring-2018-Metrics - McCabe Cyclomatic Complexity (avg/max per method) ⊠

Metric	Total	Mean	Std. Dev.	Maximum	Resource causing Maximum	Method
McCabe Cyclomatic Complexity (avg/max per method)		2.241	2.851	42	/SER316-Spring-2018-Metrics/src/main/java/memoranda/ui/htmleditor/HTMLEditor.java	setTablePr
> Number of Parameters (avg/max per method)		0.928	1.097	9	/SER316-Spring-2018-Metrics/src/main/java/memoranda/ui/htmleditor/HTMLEditor.java	setImageP
> Nested Block Depth (avg/max per method)		1.39	0.955	8	/SER316-Spring-2018-Metrics/src/main/java/memoranda/NoteListImpl.java	getNotesF
> Afferent Coupling (avg/max per packageFragment)		21.6	20.011	57	/SER316-Spring-2018-Metrics/src/main/java/memoranda/util	
> Efferent Coupling (avg/max per packageFragment)		10.6	14.263	49	/SER316-Spring-2018-Metrics/src/main/java/memoranda/ui	
> Instability (avg/max per packageFragment)		0.335	0.243	0.778	/SER316-Spring-2018-Metrics/src/main/java/memoranda/ui	
> Abstractness (avg/max per packageFragment)		0.172	0.301	1	/SER316-Spring-2018-Metrics/src/main/java/memoranda/interfaces	
> Normalized Distance (avg/max per packageFragment)		0.522	0.251	1	/SER316-Spring-2018-Metrics/src/main/java/memoranda/ui/htmleditor/util	
> Depth of Inheritance Tree (avg/max per type)		2.652	1.934	6	/SER316-Spring-2018-Metrics/src/main/java/memoranda/ui/AppFrame.java	
> Weighted methods per Class (avg/max per type)	3254	14.1...	25.54	242	/SER316-Spring-2018-Metrics/src/main/java/memoranda/ui/htmleditor/HTMLEditor.java	
> Number of Children (avg/max per type)	60	0.261	1.405	16	/SER316-Spring-2018-Metrics/src/main/java/memoranda/ui/htmleditor/HTMLEditor.java	
> Number of Overridden Methods (avg/max per type)	59	0.257	0.691	4	/SER316-Spring-2018-Metrics/src/main/java/memoranda/ui/table/TableMap.java	
> Lack of Cohesion of Methods (avg/max per type)		0.262	0.398	1.2	/SER316-Spring-2018-Metrics/src/main/java/memoranda/ui/htmleditor/CharTablePanel.java	
> Number of Attributes (avg/max per type)	1326	5.765	14.118	101	/SER316-Spring-2018-Metrics/src/main/java/memoranda/ui/htmleditor/HTMLEditor.java	
> Number of Static Attributes (avg/max per type)	136	0.591	1.793	12	/SER316-Spring-2018-Metrics/src/main/java/memoranda/interfaces/ITask.java	
> Number of Methods (avg/max per type)	1269	5.517	6.833	42	/SER316-Spring-2018-Metrics/src/main/java/memoranda/ui/htmleditor/HTMLEditor.java	
> Number of Static Methods (avg/max per type)	183	0.796	2.51	17	/SER316-Spring-2018-Metrics/src/main/java/memoranda/EventsManager.java	
> Specialization Index (avg/max per type)		0.15	0.487	5	/SER316-Spring-2018-Metrics/src/main/java/memoranda/ui/ProjectsTablePanel.java	
> Number of Classes (avg/max per packageFragment)	230	23	28.174	92	/SER316-Spring-2018-Metrics/src/main/java/memoranda/ui	
> Number of Interfaces (avg/max per packageFragment)	16	1.6	3.169	11	/SER316-Spring-2018-Metrics/src/main/java/memoranda/interfaces	
> Number of Packages	10					
> Total Lines of Code	22586					
> Method Lines of Code (avg/max per method)	15637	10.7...	28.219	346	/SER316-Spring-2018-Metrics/src/main/java/memoranda/ui/PreferencesDialog.java	jblnit

8. Comparison of metrics after Task #5 (lexical design pattern update). There were several changes or improvement in the metrics. Coupling metrics, both efferent and afferent were improved. Lexical pattern is used by compiler algorithm for internal code structure, with better lexical order, compiler become more efficient.

Task 3: Code Smells and Refactor

1. Code Smell with in a class. I selected History.java.
   Code smell issues – Duplicated logic for determining size, position and history elements. This is effectively a data clumps in methods add(), rollback() and rollforward().Missing Javadoc comments to all methods. A key reason for updating method add() was it has code block to set its size when this redundant, adding an item to the list will increase its size() by 1. Although, variable p was maintained in order to prevent breaking other method removeProjectHistory(); the logic for add(), rollback and rollforward were simplified that achieves exactly their intentions.

2. Code Smells within classes.
   EventDialog class – Feature envy, too many event handlers that does not do anything. ExitConfirmationDialog class – Improper capitalization "CANCELLED", updated to cancelled (updated reference in appFrame.java). No Javadoc comments completely. Also had many event handlers that does not do anything. Added a simple print notification for future update.

3.

Metric	Total	Mean	Std. Dev.	Maximum	Resource causing Maximum
> McCabe Cyclomatic Complexity (avg/max per method)		2.24	2.85	42	/SER316-Spring-2018-Metrics/src/main/java/memoranda/ui/htmleditor/HTMLEditor.ja
> Number of Parameters (avg/max per method)		0.928	1.097	9	/SER316-Spring-2018-Metrics/src/main/java/memoranda/ui/htmleditor/HTMLEditor.ja
> Nested Block Depth (avg/max per method)		1.39	0.955	8	/SER316-Spring-2018-Metrics/src/main/java/memoranda/NoteListImpl.java
> Afferent Coupling (avg/max per packageFragment)		19.909	20.349	57	/SER316-Spring-2018-Metrics/src/main/java/memoranda/util
> Efferent Coupling (avg/max per packageFragment)		9.727	13.877	49	/SER316-Spring-2018-Metrics/src/main/java/memoranda/ui
> Instability (avg/max per packageFragment)		0.395	0.3	1	/SER316-Spring-2018-Metrics/src/test
> Abstractness (avg/max per packageFragment)		0.157	0.291	1	/SER316-Spring-2018-Metrics/src/main/java/memoranda/interfaces
> Normalized Distance (avg/max per packageFragment)		0.475	0.283	1	/SER316-Spring-2018-Metrics/src/main/java/memoranda/ui/htmleditor/util
> Depth of Inheritance Tree (avg/max per type)		2.645	1.933	6	/SER316-Spring-2018-Metrics/src/main/java/memoranda/ui/AppFrame.java
> Weighted methods per Class (avg/max per type)	3255	14.091	25.499	242	/SER316-Spring-2018-Metrics/src/main/java/memoranda/ui/htmleditor/HTMLEditor.ja
> Number of Children (avg/max per type)	60	0.26	1.403	16	/SER316-Spring-2018-Metrics/src/main/java/memoranda/ui/htmleditor/HTMLEditor.ja
> Number of Overridden Methods (avg/max per type)	59	0.255	0.69	4	/SER316-Spring-2018-Metrics/src/main/java/memoranda/ui/table/TableMap.java
> Lack of Cohesion of Methods (avg/max per type)		0.261	0.397	1.2	/SER316-Spring-2018-Metrics/src/main/java/memoranda/ui/htmleditor/CharTablePane
> Number of Attributes (avg/max per type)	1329	5.753	14.088	101	/SER316-Spring-2018-Metrics/src/main/java/memoranda/ui/htmleditor/HTMLEditor.ja
> Number of Static Attributes (avg/max per type)	137	0.593	1.79	12	/SER316-Spring-2018-Metrics/src/main/java/memoranda/interfaces/ITask.java
> Number of Methods (avg/max per type)	1270	5.498	6.824	42	/SER316-Spring-2018-Metrics/src/main/java/memoranda/ui/htmleditor/HTMLEditor.ja
> Number of Static Methods (avg/max per type)	183	0.792	2.505	17	/SER316-Spring-2018-Metrics/src/main/java/memoranda/EventsManager.java
> Specialization Index (avg/max per type)		0.149	0.486	5	/SER316-Spring-2018-Metrics/src/main/java/memoranda/ui/ProjectsTablePanel.java
> Number of Classes (avg/max per packageFragment)	231	21	27.598	92	/SER316-Spring-2018-Metrics/src/main/java/memoranda/ui
> Number of Interfaces (avg/max per packageFragment)	16	1.455	3.056	11	/SER316-Spring-2018-Metrics/src/main/java/memoranda/interfaces
Number of Packages	11				
> Total Lines of Code	22617				
> Method Lines of Code (avg/max per method)	15649	10.77	28.21	346	/SER316-Spring-2018-Metrics/src/main/java/memoranda/ui/PreferencesDialog.java

4. There were minimal or insignificant update in metrics although some improvement in afferent coupling from Task3-1 update.

   I also worked on NoteListImpl class to reduce the complexity of the very complex and if then hell but reverted changes due to time constraint of delivering a non-working code. I hope to fix in github when this homework is checked.