

Task 1

Size

- (1). The Total Lines of Code in the project is 22,539.
- (2). The largest code file is HTMLEditor.java and it's LOC is 2,144.
- (3). The tool used the noteChanged method. The method goes through every noteListener and changes it with the note parameter.

Cohesion

- (1). LCOM2 equals the percentage of methods that don't access a specific attribute averaged over all attributes in the class. The equation for LCOM2 is $LCOM2 = 1 - \frac{sum(mA)}{(m * a)}$, where m is the number of methods in the class, a is the number of attributes in the class, and mA is the number of methods that access an attribute.
- (2). TaskListImpl.java has the highest level of Cohesion because it has a good number of methods that has relationships with other methods. Most of the class has Functional Cohesion.

Complexity

- (1). The Cyclomatic Complexity is 16.
- (2). The EventsManager.java has the worst Cyclomatic Complexity on average which is 16.
- (3). I added a method getAttribute() to lower the complexity of the getEvent() method. The getAttribute() method is a helper method so that the getEvent() method doesn't have to do so much work. The complexity was lowered from a 5 to a 2.

Package-level Coupling

- (1). Afferent Coupling is the number of classes in other packages that depend upon classes with the package is an indicator of the package's responsibility. Efferent Coupling is the number of classes in other packages that the classes in the package depend upon is an indicator of the package's dependence on externalities. The difference between the two is that Afferent Coupling are the incoming dependencies and Efferent Coupling are the outgoing dependencies.
- (2). The package that has the worst Afferent Coupling is main.java.memoranda.util and it's value is 57.
- (3). The package that has the worst Efferent Coupling is main.java.memoranda.ui and it's value is 49.

Worst quality

The EventsManager.java class has the worst quality. It has the highest Cyclomatic Complexity, and the highest Number of Parameters. Since the class has a high complexity it is harder to understand compared to the other classes which would take a longer time for another developer to understand. Plus, with the high number of parameters it naturally increases the complexity of the code.

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Assignment 7

Task 2

(Step 1)

Before

The screenshot shows the Eclipse IDE interface. The Package Explorer on the left displays the project structure for 'SER316-Spring-2018'. The main editor window shows the 'EventsManager.java' file with a code snippet:

```
if (d == null)
    d.getElement().removeChild(getEvent(date, hh, mm).getContent());
```

 Below the code, a 'Metrics - SER316-Spring-2018' table is displayed, listing various code quality metrics and their values across different parts of the project.

Metric	Total	Mean	Std. Dev.	Maxim...	Resource causing Maximum	Method
> McCabe Cyclomatic Complexity (avg/max per	2.24	2.85	42	/SER316-Spring-2018/src/main/java/memoranda/ui/...	setTableProperties	
> Number of Parameters (avg/max per method)	0.93	1.098	9	/SER316-Spring-2018/src/main/java/memoranda/ui/...	setImageProperties	
> Nested Block Depth (avg/max per method)	1.39	0.955	8	/SER316-Spring-2018/src/main/java/memoranda/Not...	getNotesForPeriod	
> Afferent Coupling (avg/max per packageFragm	19.333	19.653	57	/SER316-Spring-2018/src/main/java/memoranda/ui/...		
> Effort Coupling (avg/max per packageFragm	11.444	15.276	49	/SER316-Spring-2018/src/main/java/memoranda/ui/...		
> Instability (avg/max per packageFragment)	0.36	0.247	0.778	/SER316-Spring-2018/src/main/java/memoranda/ui/...		
> Abstractness (avg/max per packageFragment)	0.111	0.137	0.333	/SER316-Spring-2018/src/main/java/memoranda/date		
> Normalized Distance (avg/max per packageFra	0.529	0.237	1	/SER316-Spring-2018/src/main/java/memoranda/ui/...		
> Depth of Inheritance Tree (avg/max per type)	2.652	1.934	6	/SER316-Spring-2018/src/main/java/memoranda/ui/...		
> Weighted methods per Class (avg/max per typ	3255	14.152	25.548	242	/SER316-Spring-2018/src/main/java/memoranda/ui/...	
> Number of Children (avg/max per type)	60	0.261	1.405	16	/SER316-Spring-2018/src/main/java/memoranda/ui/...	
> Number of Overridden Methods (avg/max per	59	0.257	0.691	4	/SER316-Spring-2018/src/main/java/memoranda/ui/...	
> Lack of Cohesion of Methods (avg/max per typ	0.262	0.398	1.2	/SER316-Spring-2018/src/main/java/memoranda/ui/...		
> Number of Attributes (avg/max per type)	1326	5.765	14.118	101	/SER316-Spring-2018/src/main/java/memoranda/ui/...	
> Number of Static Attributes (avg/max per type	136	0.591	1.793	12	/SER316-Spring-2018/src/main/java/memoranda/Tas...	
> Number of Methods (avg/max per type)	1269	5.517	6.833	42	/SER316-Spring-2018/src/main/java/memoranda/ui/...	
> Number of Static Methods (avg/max per type)	184	0.8	2.539	18	/SER316-Spring-2018/src/main/java/memoranda/Eve...	
> Specialization Index (avg/max per type)	0.15	0.487	5	/SER316-Spring-2018/src/main/java/memoranda/ui/...		
> Number of Classes (avg/max per packageFrag	230	25.556	29.833	92	/SER316-Spring-2018/src/main/java/memoranda/ui/...	
> Number of Interfaces (avg/max per packageFrag	16	1.778	3.292	11	/SER316-Spring-2018/src/main/java/memoranda/...	
> Number of Packages	9					
> Total Lines of Code	22542					
> Method Lines of Code (avg/max per method)	15638	10.763	28.21	346	/SER316-Spring-2018/src/main/java/memoranda/ui/...	jblnit

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Assignment 7

(Step 7)

After

The screenshot shows the Eclipse IDE with the 'Metrics - SER316-Spring-2018' view open. The table displays various code quality metrics for the 'main.java.memoranda.interfaces' package. The metrics are organized into columns: Metric, McCabe Cyclomatic Complexity (avg/max per method), Number of Parameters (avg/max per method), Nested Block Depth (avg/max per method), Afferent Coupling (avg/max per package/fragment), Effort Coupling (avg/max per package/fragment), Instability (avg/max per package/fragment), Abstractness (avg/max per package/fragment), Normalized Distance (avg/max per package/fragment), Depth of Inheritance Tree (avg/max per type), Weighted methods per Class (avg/max per type), Number of Children (avg/max per type), Number of Overridden Methods (avg/max per type), Lack of Cohesion of Methods (avg/max per type), Number of Attributes (avg/max per type), Number of Static Attributes (avg/max per type), Number of Methods (avg/max per type), Number of Static Methods (avg/max per type), Specialization Index (avg/max per type), Number of Classes (avg/max per package/fragment), Number of Interfaces (avg/max per package/fragment), Number of Packages, Total Lines of Code, and Method Lines of Code (avg/max per method). The table also includes a column for the resource causing the maximum value and a column for the method name.

Metric	M McCabe Cyclomatic Complexity (avg/max per method)	N Number of Parameters (avg/max per method)	N Nested Block Depth (avg/max per method)	A Afferent Coupling (avg/max per package/fragment)	E Effort Coupling (avg/max per package/fragment)	I Instability (avg/max per package/fragment)	A Abstractness (avg/max per package/fragment)	N Normalized Distance (avg/max per package/fragment)	D Depth of Inheritance Tree (avg/max per type)	W Weighted methods per Class (avg/max per type)	C Number of Children (avg/max per type)	O Number of Overridden Methods (avg/max per type)	L Lack of Cohesion of Methods (avg/max per type)	N Number of Attributes (avg/max per type)	S Number of Static Attributes (avg/max per type)	M Number of Methods (avg/max per type)	S Number of Static Methods (avg/max per type)	S Specialization Index (avg/max per type)	N Number of Classes (avg/max per package/fragment)	I Number of Interfaces (avg/max per package/fragment)	N Number of Packages	T Total Lines of Code	M Method Lines of Code (avg/max per method)	Resource causing Maximum	Method
> McCabe Cyclomatic Complexity (avg/max per method)	2.24	2.85	42	/SER316-Spring-2018/src/main/java/memoranda/ui/...																				setTableProperties	
> Number of Parameters (avg/max per method)	0.93	1.098	9	/SER316-Spring-2018/src/main/java/memoranda/ui/...																				setImageProperties	
> Nested Block Depth (avg/max per method)	1.39	0.955	8	/SER316-Spring-2018/src/main/java/memoranda/inte...																				getNotesForPeriod	
> Afferent Coupling (avg/max per package/fragment)	18.4	19.971	57	/SER316-Spring-2018/src/main/java/memoranda/ui/...																					
> Effort Coupling (avg/max per package/fragment)	10.3	14.22	49	/SER316-Spring-2018/src/main/java/memoranda/ui/...																					
> Instability (avg/max per package/fragment)	0.382	0.259	0.778	/SER316-Spring-2018/src/main/java/memoranda/ui/...																					
> Abstractness (avg/max per package/fragment)	0.11	0.151	0.379	/SER316-Spring-2018/src/main/java/memoranda/...																					
> Normalized Distance (avg/max per package/fragment)	0.508	0.233	1	/SER316-Spring-2018/src/main/java/memoranda/ui/...																					
> Depth of Inheritance Tree (avg/max per type)	2.652	1.934	6	/SER316-Spring-2018/src/main/java/memoranda/ui/...																					
> Weighted methods per Class (avg/max per type)	3255	14.152	25.548	242	/SER316-Spring-2018/src/main/java/memoranda/ui/...																				
> Number of Children (avg/max per type)	60	0.261	1.405	16	/SER316-Spring-2018/src/main/java/memoranda/ui/...																				
> Number of Overridden Methods (avg/max per type)	59	0.257	0.691	4	/SER316-Spring-2018/src/main/java/memoranda/ui/...																				
> Lack of Cohesion of Methods (avg/max per type)	0.262	0.398	1.2	/SER316-Spring-2018/src/main/java/memoranda/ui/...																					
> Number of Attributes (avg/max per type)	1326	5.765	14.118	101	/SER316-Spring-2018/src/main/java/memoranda/ui/...																				
> Number of Static Attributes (avg/max per type)	136	0.591	1.793	12	/SER316-Spring-2018/src/main/java/memoranda/Tas...																				
> Number of Methods (avg/max per type)	1269	5.517	6.833	42	/SER316-Spring-2018/src/main/java/memoranda/ui/...																				
> Number of Static Methods (avg/max per type)	184	0.8	2.539	18	/SER316-Spring-2018/src/main/java/memoranda/Eve...																				
> Specialization Index (avg/max per type)	0.15	0.487	5	/SER316-Spring-2018/src/main/java/memoranda/ui/...																					
> Number of Classes (avg/max per package/fragment)	230	23	28.174	92	/SER316-Spring-2018/src/main/java/memoranda/ui/...																				
> Number of Interfaces (avg/max per package/fragment)	16	1.6	3.169	11	/SER316-Spring-2018/src/main/java/memoranda/...																				
> Number of Packages	10																								
> Total Lines of Code	22560																								
> Method Lines of Code (avg/max per method)	15638	10.763	28.21	346	/SER316-Spring-2018/src/main/java/memoranda/ui/...																				jblhit

(Step 8)

The Afferent Coupling went down considerably because the package's responsibility got transferred to the new interface package so the overall responsibility of each package lowered in result.

Task 3

(Step 1)

I made the method 'getRepeatableEventsForDate' in the EventsManager.java class shorter because it was originally too long (Code Smell was long method). /SER316-Spring-2018/src/main/java/memoranda/EventsManager.java was the class being altered.

(Step 2)

I fixed the method 'createTask' in the ITaskListImpl.java class and in the TaskList.java class because there were too many parameters (Code Smell was too many parameters). /SER316-Spring-2018/src/main/java/memoranda/interfaces/ITaskListImpl.java and /SER316-Spring-2018/src/main/java/memoranda/TaskList.java were the classes being altered.

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Assignment 7

(Step 3)

(after)

The screenshot shows the Eclipse IDE interface. The Package Explorer on the left displays the project structure for 'SER316-Spring-2018'. The main editor area shows a Java file 'TaskPanel.java' with the following code:

```
CalendarDate sd = new CalendarDate((Date) dlg.startDate.getModel().getValue());
CalendarDate ed = new CalendarDate((Date) dlg.endDate.getModel().getValue());
```

Below the code, a 'Metrics - SER316-Spring-2018' table is displayed, showing various code quality metrics and their values across different packages.

Metric	Total	Mean	Std. Dev.	Maxim...	Resource causing Maximum	Method
> McCabe Cyclomatic Complexity (avg/max per	2,239	2.849	42	/SER316-Spring-2018/src/main/java/memoranda/ui/...	setTableProperties	
> Number of Parameters (avg/max per method)	0.93	1.098	9	/SER316-Spring-2018/src/main/java/memoranda/ui/...	setImageProperties	
> Nested Block Depth (avg/max per method)	1.39	0.955	8	/SER316-Spring-2018/src/main/java/memoranda/interf...	getNotesForPeriod	
> Affert Coupling (avg/max per package fragm...	18.4	19.971	57	/SER316-Spring-2018/src/main/java/memoranda/interf...		
> Effert Coupling (avg/max per package fragm...	10.3	14.22	49	/SER316-Spring-2018/src/main/java/memoranda/interf...		
> Instability (avg/max per package fragment)	0.382	0.259	0.778	/SER316-Spring-2018/src/main/java/memoranda/interf...		
> Abstractness (avg/max per package fragment)	0.11	0.151	0.379	/SER316-Spring-2018/src/main/java/memoranda/interf...		
> Normalized Distance (avg/max per package fra...	0.308	0.233	1	/SER316-Spring-2018/src/main/java/memoranda/interf...		
> Depth of Inheritance Tree (avg/max per type)	2.652	1.924	6	/SER316-Spring-2018/src/main/java/memoranda/interf...		
> Weighted methods per Class (avg/max per typ...	3253	14.143	25.537	242	/SER316-Spring-2018/src/main/java/memoranda/interf...	
> Number of Children (avg/max per type)	60	0.261	1.405	16	/SER316-Spring-2018/src/main/java/memoranda/interf...	
> Number of Overridden Methods (avg/max per	59	0.257	0.691	4	/SER316-Spring-2018/src/main/java/memoranda/interf...	
> Lack of Cohesion of Methods (avg/max per ty...	0.262	0.398	1.2	/SER316-Spring-2018/src/main/java/memoranda/interf...		
> Number of Attributes (avg/max per type)	1326	5.765	14.118	101	/SER316-Spring-2018/src/main/java/memoranda/interf...	
> Number of Static Attributes (avg/max per typ...	136	0.591	1.793	12	/SER316-Spring-2018/src/main/java/memoranda/interf...	
> Number of Methods (avg/max per type)	1269	5.517	6.833	42	/SER316-Spring-2018/src/main/java/memoranda/interf...	
> Number of Static Methods (avg/max per type)	184	0.8	2.539	18	/SER316-Spring-2018/src/main/java/memoranda/interf...	
> Specialization Index (avg/max per type)	0.15	0.487	5	/SER316-Spring-2018/src/main/java/memoranda/interf...		
> Number of Classes (avg/max per package frag...	230	23	28.174	92	/SER316-Spring-2018/src/main/java/memoranda/interf...	
> Number of Interfaces (avg/max per package fra...	16	1.6	3.169	11	/SER316-Spring-2018/src/main/java/memoranda/interf...	
> Number of Packages	10					
> Total Lines of Code	22553					
> Method Lines of Code (avg/max per method)	15630	10.757	28.207	346	/SER316-Spring-2018/src/main/java/memoranda/interf...	jbInit