Task 1:

Size:

1) 22539 LOC
2) In the main.java.memoranda package, EventsManager.java is the longest, with 329 LOC
3) It counts physical LOC, excluding whitespace and comments (Method 1 in the slides)

Cohesion:

1) Henderson-Sellers defines Lack of Cohesion in Methods as follows. Let:

   M be the set of methods defined by the class

   F be the set of fields defined by the class

   r(f) be the number of methods that access field *f*, where *f* is a member of **F**

   <r> be the mean of *r(f)* over **F**.

   Then:

   $$\text{Lack of Cohesion in Methods} = \frac{\langle r \rangle - |\mathbf{M}|}{1 - |\mathbf{M}|}$$

   Found at: http://eclipse-metrics.sourceforge.net/descriptions/pages/cohesion/HendersonSellers.html

2) There are 21 classes that tie for the highest cohesion (all have 0 lack of cohesion). The reason these classes have the highest cohesion varies depending on the class. Several of the classes are interfaces which do not declare any class variables. Some of them declare only static variables and methods. Some of them are "normal" implementation classes, but are just very cohesive.

Complexity:

1) 1.746
2) Start.java has 3.5 cyclomatic complexity
3) I was able to reduce the complexity of Start.java to 2.66… by moving the launch of the app into a separate method that gets called from main

Package-level Coupling:

1) Afferent coupling is a number of classes from other packages that depend on classes in the measured package. Efferent coupling is a number of classes in other packages that classes in the analyzed package depend on.
2) Main.java.memoranda.util has an afferent coupling of 57
3) Main.java.memoranda.ui has an efferent coupling of 49

Worst Quality:

I think NoteListImpl.java is the worst quality class in the main.java.memoranda package. It ranks:

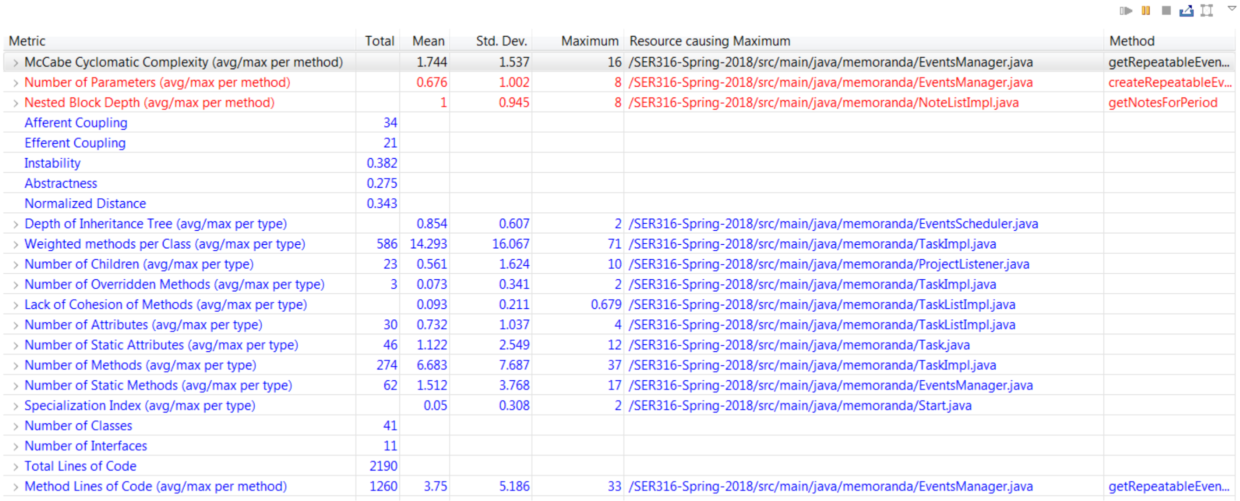
1st highest weighted methods per class

1st highest number of attributes

2nd highest Cyclomatic Complexity

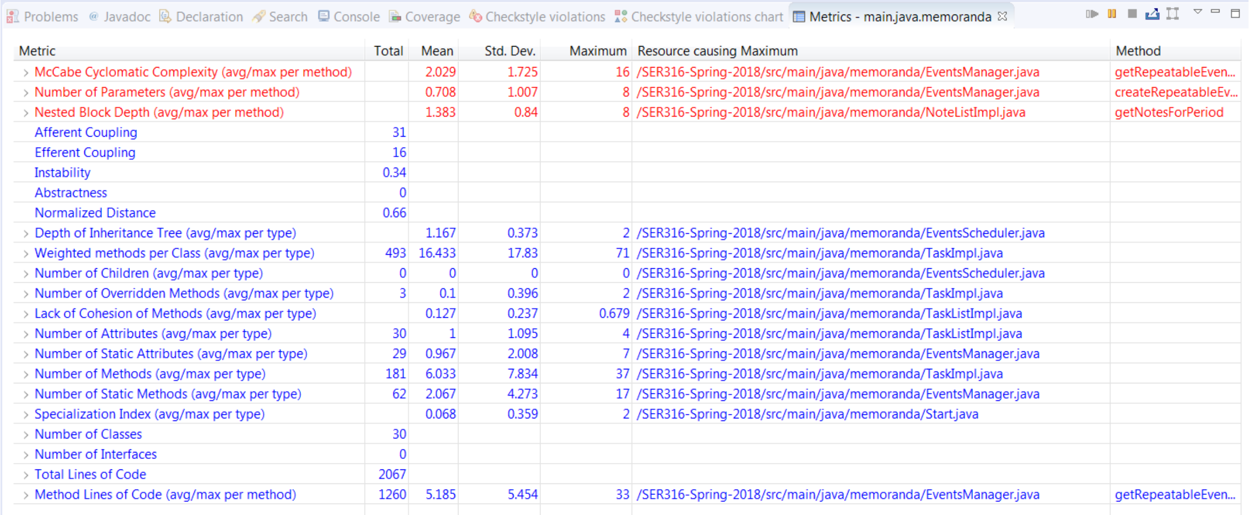
3rd highest nested block depth

Task 2:



Metric	Total	Mean	Std. Dev.	Maximum	Resource causing Maximum	Method
McCabe Cyclomatic Complexity (avg/max per method)		1.744	1.537	16	/SER316-Spring-2018/src/main/java/memoranda/EventsManager.java	getRepeatableEven...
Number of Parameters (avg/max per method)		0.676	1.002	8	/SER316-Spring-2018/src/main/java/memoranda/EventsManager.java	createRepeatableEv...
Nested Block Depth (avg/max per method)		1	0.945	8	/SER316-Spring-2018/src/main/java/memoranda/NoteListImpl.java	getNotesForPeriod
Afferent Coupling	34					
Efferent Coupling	21					
Instability	0.382					
Abstractness	0.275					
Normalized Distance	0.343					
Depth of Inheritance Tree (avg/max per type)		0.854	0.607	2	/SER316-Spring-2018/src/main/java/memoranda/EventsScheduler.java	
Weighted methods per Class (avg/max per type)	586	14.293	16.067	71	/SER316-Spring-2018/src/main/java/memoranda/TaskImpl.java	
Number of Children (avg/max per type)	23	0.561	1.624	10	/SER316-Spring-2018/src/main/java/memoranda/ProjectListener.java	
Number of Overridden Methods (avg/max per type)	3	0.073	0.341	2	/SER316-Spring-2018/src/main/java/memoranda/TaskImpl.java	
Lack of Cohesion of Methods (avg/max per type)		0.093	0.211	0.679	/SER316-Spring-2018/src/main/java/memoranda/TaskListImpl.java	
Number of Attributes (avg/max per type)	30	0.732	1.037	4	/SER316-Spring-2018/src/main/java/memoranda/TaskListImpl.java	
Number of Static Attributes (avg/max per type)	46	1.122	2.549	12	/SER316-Spring-2018/src/main/java/memoranda/Task.java	
Number of Methods (avg/max per type)	274	6.683	7.687	37	/SER316-Spring-2018/src/main/java/memoranda/TaskImpl.java	
Number of Static Methods (avg/max per type)	62	1.512	3.768	17	/SER316-Spring-2018/src/main/java/memoranda/EventsManager.java	
Specialization Index (avg/max per type)		0.05	0.308	2	/SER316-Spring-2018/src/main/java/memoranda/Start.java	
Number of Classes	41					
Number of Interfaces	11					
Total Lines of Code	2190					
Method Lines of Code (avg/max per method)	1260	3.75	5.186	33	/SER316-Spring-2018/src/main/java/memoranda/EventsManager.java	getRepeatableEven...

After:

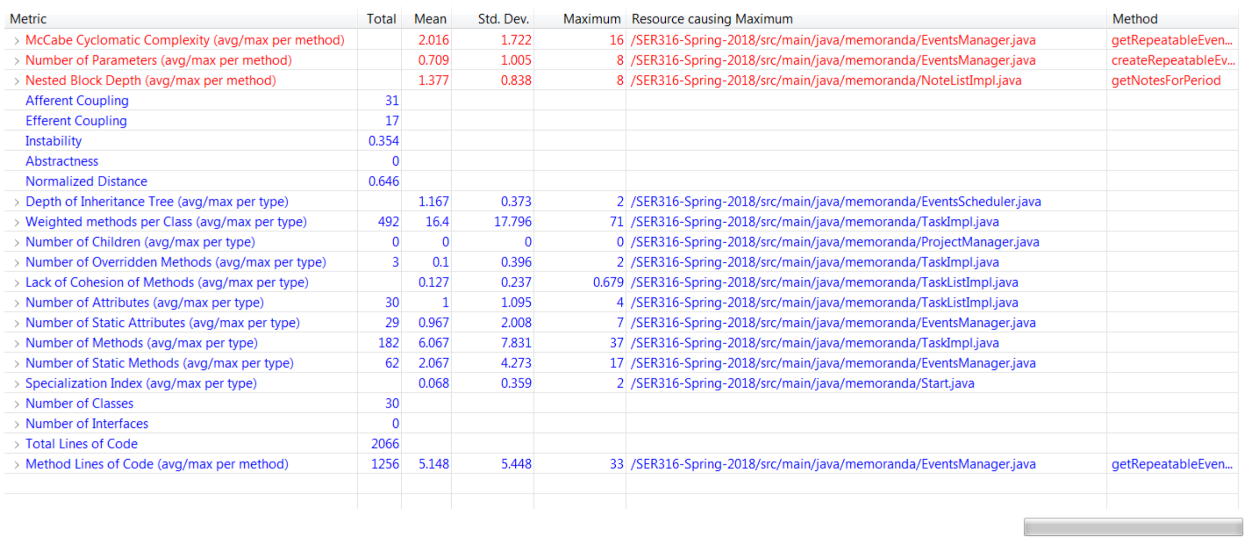


Metric	Total	Mean	Std. Dev.	Maximum	Resource causing Maximum	Method
McCabe Cyclomatic Complexity (avg/max per method)		2.029	1.725	16	/SER316-Spring-2018/src/main/java/memoranda/EventsManager.java	getRepeatableEven...
Number of Parameters (avg/max per method)		0.708	1.007	8	/SER316-Spring-2018/src/main/java/memoranda/EventsManager.java	createRepeatableEv...
Nested Block Depth (avg/max per method)		1.383	0.84	8	/SER316-Spring-2018/src/main/java/memoranda/NoteListImpl.java	getNotesForPeriod
Afferent Coupling	31					
Efferent Coupling	16					
Instability	0.34					
Abstractness	0					
Normalized Distance	0.66					
Depth of Inheritance Tree (avg/max per type)		1.167	0.373	2	/SER316-Spring-2018/src/main/java/memoranda/EventsScheduler.java	
Weighted methods per Class (avg/max per type)	493	16.433	17.83	71	/SER316-Spring-2018/src/main/java/memoranda/TaskImpl.java	
Number of Children (avg/max per type)	0	0	0	0	/SER316-Spring-2018/src/main/java/memoranda/EventsScheduler.java	
Number of Overridden Methods (avg/max per type)	3	0.1	0.396	2	/SER316-Spring-2018/src/main/java/memoranda/TaskImpl.java	
Lack of Cohesion of Methods (avg/max per type)		0.127	0.237	0.679	/SER316-Spring-2018/src/main/java/memoranda/TaskListImpl.java	
Number of Attributes (avg/max per type)	30	1	1.095	4	/SER316-Spring-2018/src/main/java/memoranda/TaskListImpl.java	
Number of Static Attributes (avg/max per type)	29	0.967	2.008	7	/SER316-Spring-2018/src/main/java/memoranda/EventsManager.java	
Number of Methods (avg/max per type)	181	6.033	7.834	37	/SER316-Spring-2018/src/main/java/memoranda/TaskImpl.java	
Number of Static Methods (avg/max per type)	62	2.067	4.273	17	/SER316-Spring-2018/src/main/java/memoranda/EventsManager.java	
Specialization Index (avg/max per type)		0.068	0.359	2	/SER316-Spring-2018/src/main/java/memoranda/Start.java	
Number of Classes	30					
Number of Interfaces	0					
Total Lines of Code	2067					
Method Lines of Code (avg/max per method)	1260	5.185	5.454	33	/SER316-Spring-2018/src/main/java/memoranda/EventsManager.java	getRepeatableEven...

8) Both Afferent and Efferent coupling improved.

Task 3:

1) In ProjectManager.java, the methods getActiveProjects and getActiveProjectsNumber are almost exact duplicates of each other. Since the purpose of getActiveProjectsNumber is to count the number of active projects, and the purpose of getActiveProjects is to return a list of active projects, the duplication is easily refactored by changing getActiveProjectsNumber. I modified this method to call getActiveProjects and then return the size of the list produced.
2) ResourceListImpl.java had a very long message chain when instantiating a Resource. I shortened it by overloading the Resource constructor to accept a Xom element directly, rather than making the calls to fetch the data inside the ResourceListImpl class.



Metric	Total	Mean	Std. Dev.	Maximum	Resource causing Maximum	Method
McCabe Cyclomatic Complexity (avg/max per method)		2.016	1.722	16	/SER316-Spring-2018/src/main/java/memoranda/EventsManager.java	getRepeatableEven...
Number of Parameters (avg/max per method)		0.709	1.005	8	/SER316-Spring-2018/src/main/java/memoranda/EventsManager.java	createRepeatableEv...
Nested Block Depth (avg/max per method)		1.377	0.838	8	/SER316-Spring-2018/src/main/java/memoranda/NoteListImpl.java	getNotesForPeriod
Afferent Coupling	31					
Efferent Coupling	17					
Instability	0.354					
Abstractness	0					
Normalized Distance	0.646					
Depth of Inheritance Tree (avg/max per type)		1.167	0.373	2	/SER316-Spring-2018/src/main/java/memoranda/EventsScheduler.java	
Weighted methods per Class (avg/max per type)	492	16.4	17.796	71	/SER316-Spring-2018/src/main/java/memoranda/TaskImpl.java	
Number of Children (avg/max per type)	0	0	0	0	/SER316-Spring-2018/src/main/java/memoranda/ProjectManager.java	
Number of Overridden Methods (avg/max per type)	3	0.1	0.396	2	/SER316-Spring-2018/src/main/java/memoranda/TaskImpl.java	
Lack of Cohesion of Methods (avg/max per type)		0.127	0.237	0.679	/SER316-Spring-2018/src/main/java/memoranda/TaskListImpl.java	
Number of Attributes (avg/max per type)	30	1	1.095	4	/SER316-Spring-2018/src/main/java/memoranda/TaskListImpl.java	
Number of Static Attributes (avg/max per type)	29	0.967	2.008	7	/SER316-Spring-2018/src/main/java/memoranda/EventsManager.java	
Number of Methods (avg/max per type)	182	6.067	7.831	37	/SER316-Spring-2018/src/main/java/memoranda/TaskImpl.java	
Number of Static Methods (avg/max per type)	62	2.067	4.273	17	/SER316-Spring-2018/src/main/java/memoranda/EventsManager.java	
Specialization Index (avg/max per type)		0.068	0.359	2	/SER316-Spring-2018/src/main/java/memoranda/Start.java	
Number of Classes	30					
Number of Interfaces	0					
Total Lines of Code	2066					
Method Lines of Code (avg/max per method)	1256	5.148	5.448	33	/SER316-Spring-2018/src/main/java/memoranda/EventsManager.java	getRepeatableEven...

3)
4) The metrics did not change significantly… Efferent coupling increased by 1, since ResourceListImpl.java now depends on Xom Elements. However Cyclomatic Complexity and Instability both slightly improved.