TEAM3

Meg Krawczyk |Mitch Suzara | Itzayana Carrillo

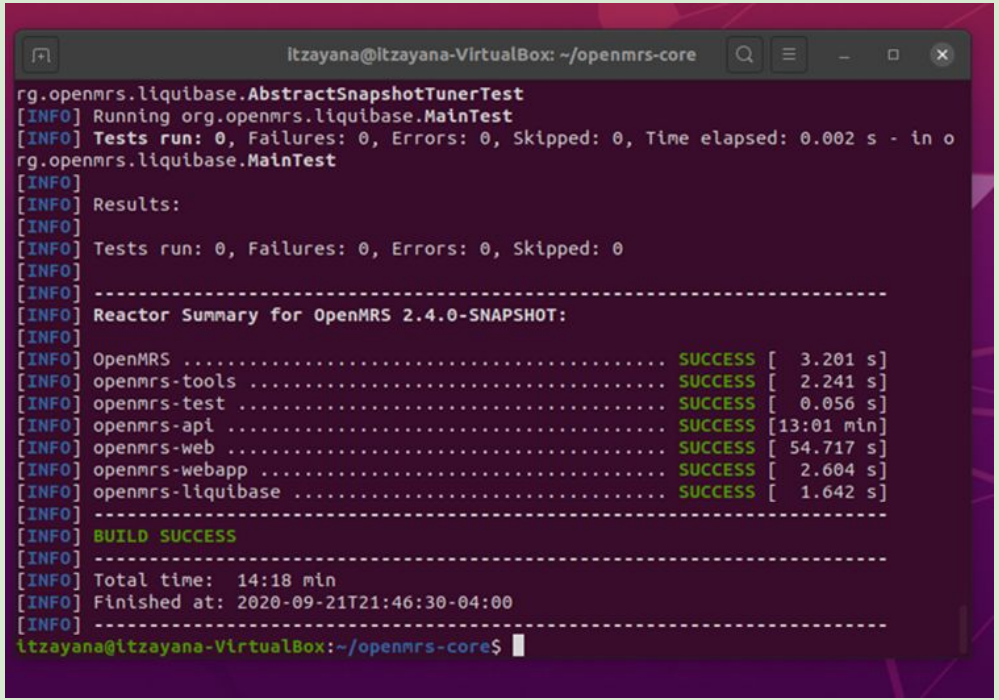
Picking a Project

Running OpenMRS

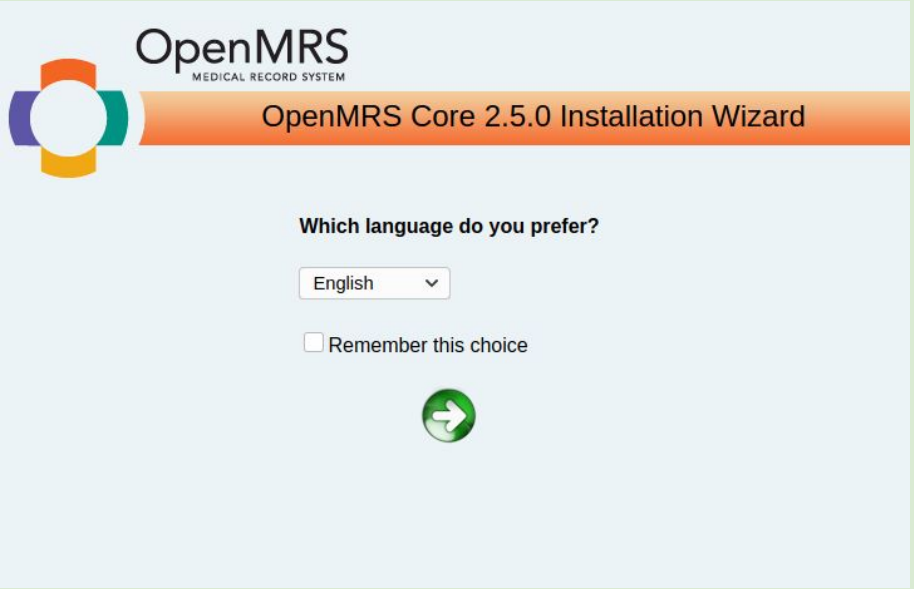
OpenMRS is a program that provides an electronic medical record system and their mission is to:

“Improve health care delivery in resource-constrained environments by coordinating a global community to create and support this software.”

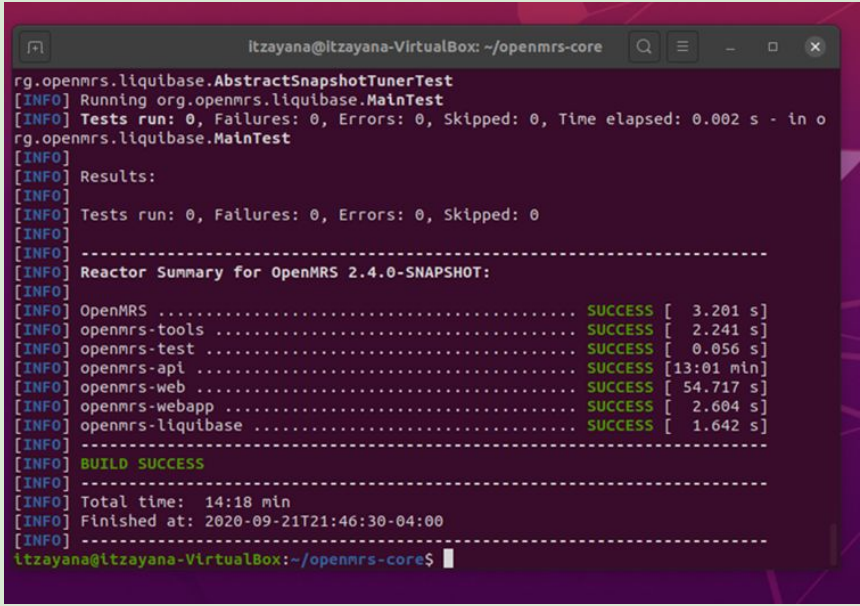
In addition to being a great cause, OpenMrs has been kept up to date and had great documentation which is why we decided to choose it.



Learning Experience: Building and Compiling Projects



VS



Picking Methods

Class	Method	Requirements
OpemmrsUtil	lastMomentOfDay	This method will take a date and time, then shift the time to be the last second of the day on that date.
DateUtil	DateUtil	This method will return a Date and time with the milliseconds truncated
OpenmrsUtil	containsOnlyDigits	This method returns true if a string only contains digits
OpenmrsUtil	convertToInteger	This method turns a long into an integer, as long as it does not exceed the integer memory limit
OpenmrsUtil	containsUpperAndLower	This method returns true if a string has upper and lower case letters

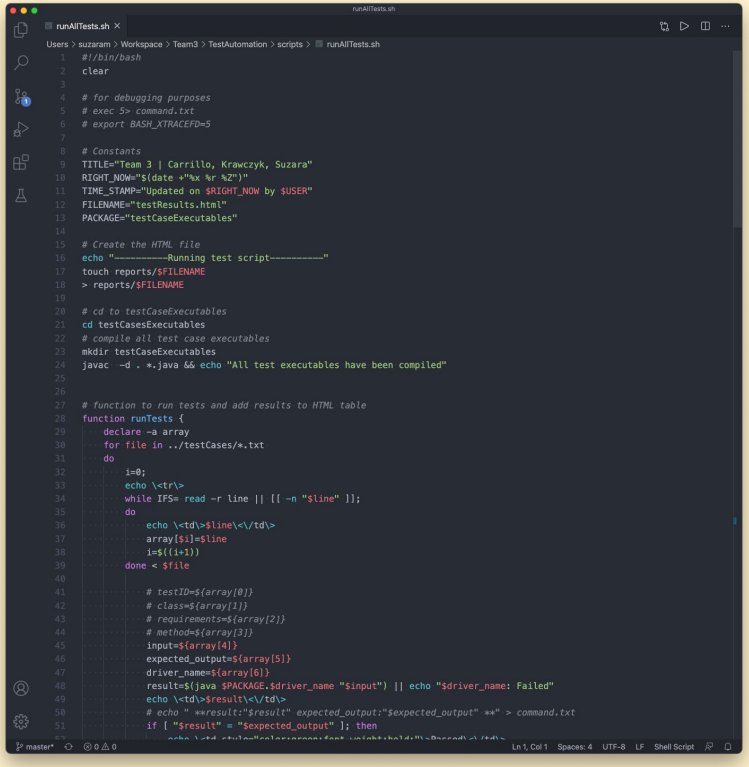
Learning Experience: DrugsByNameComparator

DrugsByNameComparator was originally one of the methods we wanted to test because it was comparing two drug names.

- Originally the DrugsByNameComparaitor seemed like a good candidate for testing, but upon further inspection it's strange outputs made it difficult to calculate the expected output.
- So, we decided to replace it with the lastMomentOfDay method.
- However, through this experience, we learned how important it is for the code to be testable

Creating The Automated Testing Script

Creating the testing script was an enjoyable learning experience. It involved a great amount of researching and applying bits and pieces at a time like building a complex puzzle. Learning all the capabilities of the bash shell opened our minds to how much power can be harnessed with a simple script.



Learning Experience: Scripting

The scripting learning experience was quite a challenge. Our team had little to no experience with the bash shell so learning often felt like jumping into the deep end of the pool with no flotation device nearby. After the steep learning curve and some constructive feedback from Dr. Bowring, we were able to put together a script that accomplished the task at hand. Some of the obstacles we faced were having the script knowing about certain methods which is not the best practice when creating an automated testing framework. Overall, we learned much from our mistakes which resulted in a testing framework we are all proud of.

Creating Test Cases and Drivers

```java
package testCaseExecutables;
import java.util.Calendar;
import java.util.Date;
import java.time.Instant;

public class getLastMomentOfDayDriver{
	public static void main(String[] args) {
		if(args.length < 1){
			System.out.println("No input to test");
		}
		else{
			String[] dateInfo = (args[0].split("/"));
			int[] date = new int[dateInfo.length];
			for(int i = 0; i <dateInfo.length; i++){

				date[i]= Integer.parseInt(dateInfo[i]);
				if(i ==0){
					date[i] = date[i] - 1900;
				}
				if(i == 1){
					date[i] = date[i] - 1;
				}
			}
			Date date1 = new 		Date(date[0],date[1],date[2],date[3],date[4],date[5]);

				System.out.println(OpenmrsUtil.getLastMomentOfDay(date1));
		}
	}
}
```

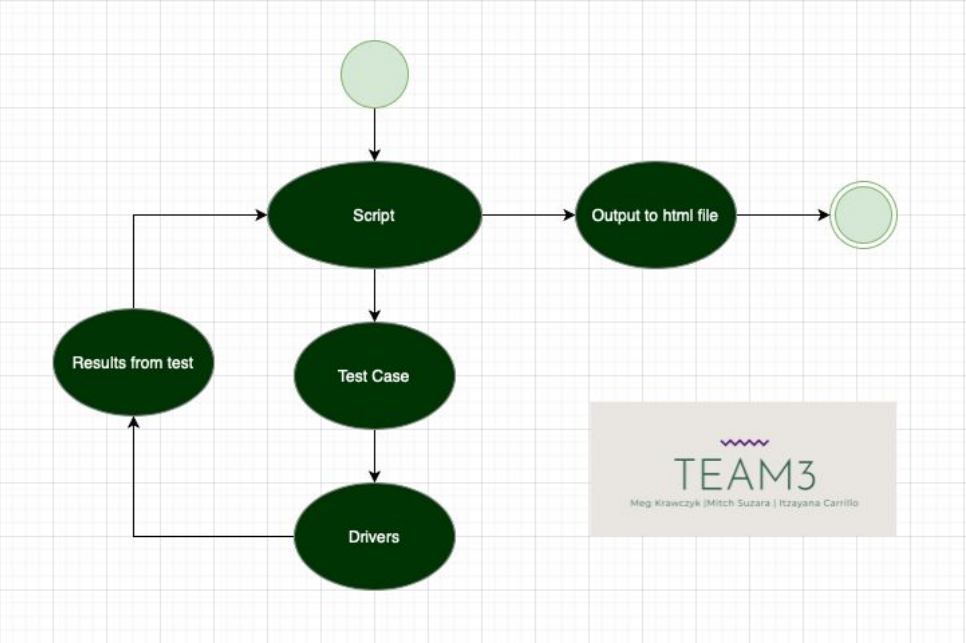
1. 05
2. OpenmrsUtil
3. This method will take a date and time, then shift the time to be the last second of the day on that date.
4. getLastMomentOfDay
5. 1998/12/20/20/45/30
6. Sun Dec 20 23:59:59 EST 1998
7. getLastMomentOfDayDriver

Learning Experience: DO NOT USE WINDOWS

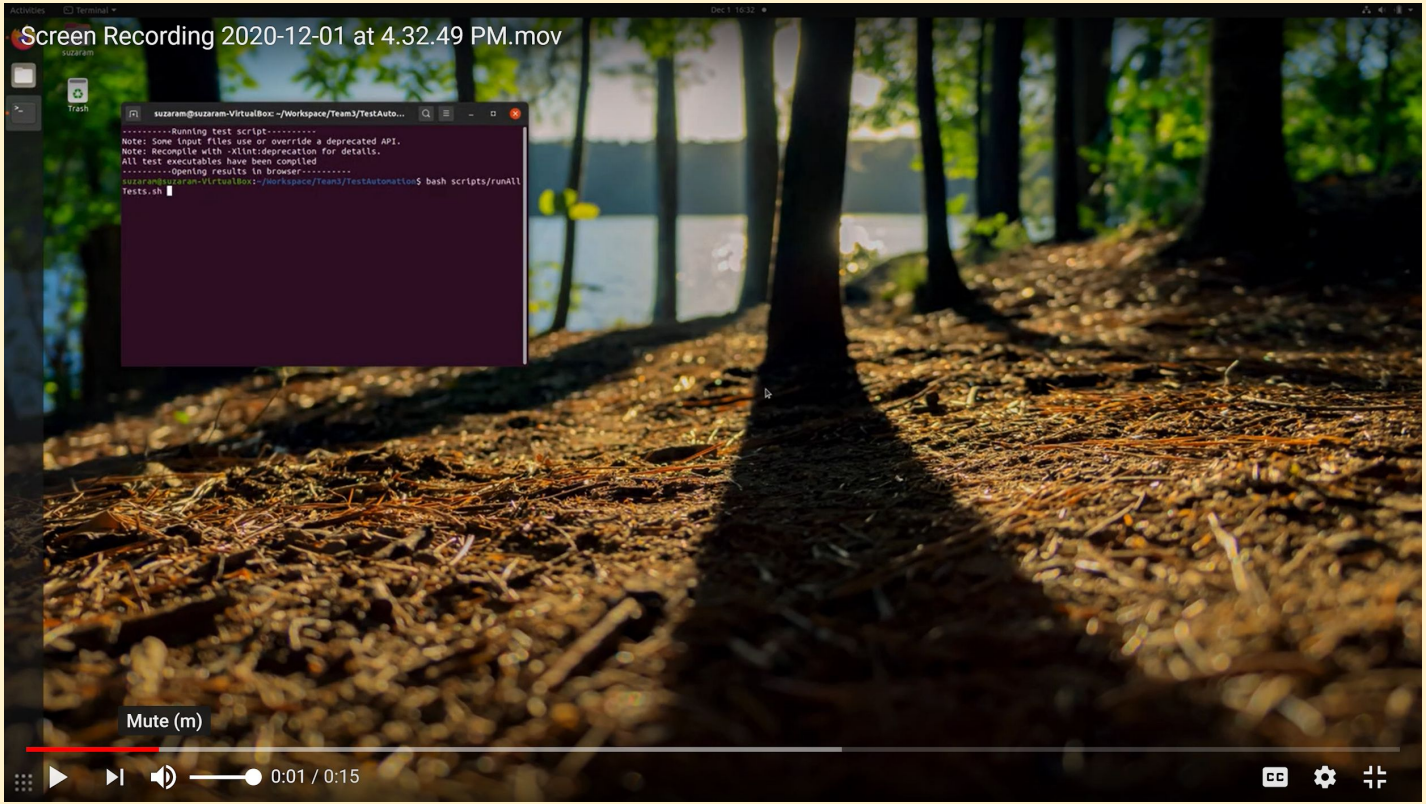
We learned the hard way that you should not mix Operating systems

- 5 of our test case files were created in windows and those 5 test cases kept causing issues with our script.
- It added an invisible “\r” to the end of our expected output, meaning that the output would fail even if it had the same value.

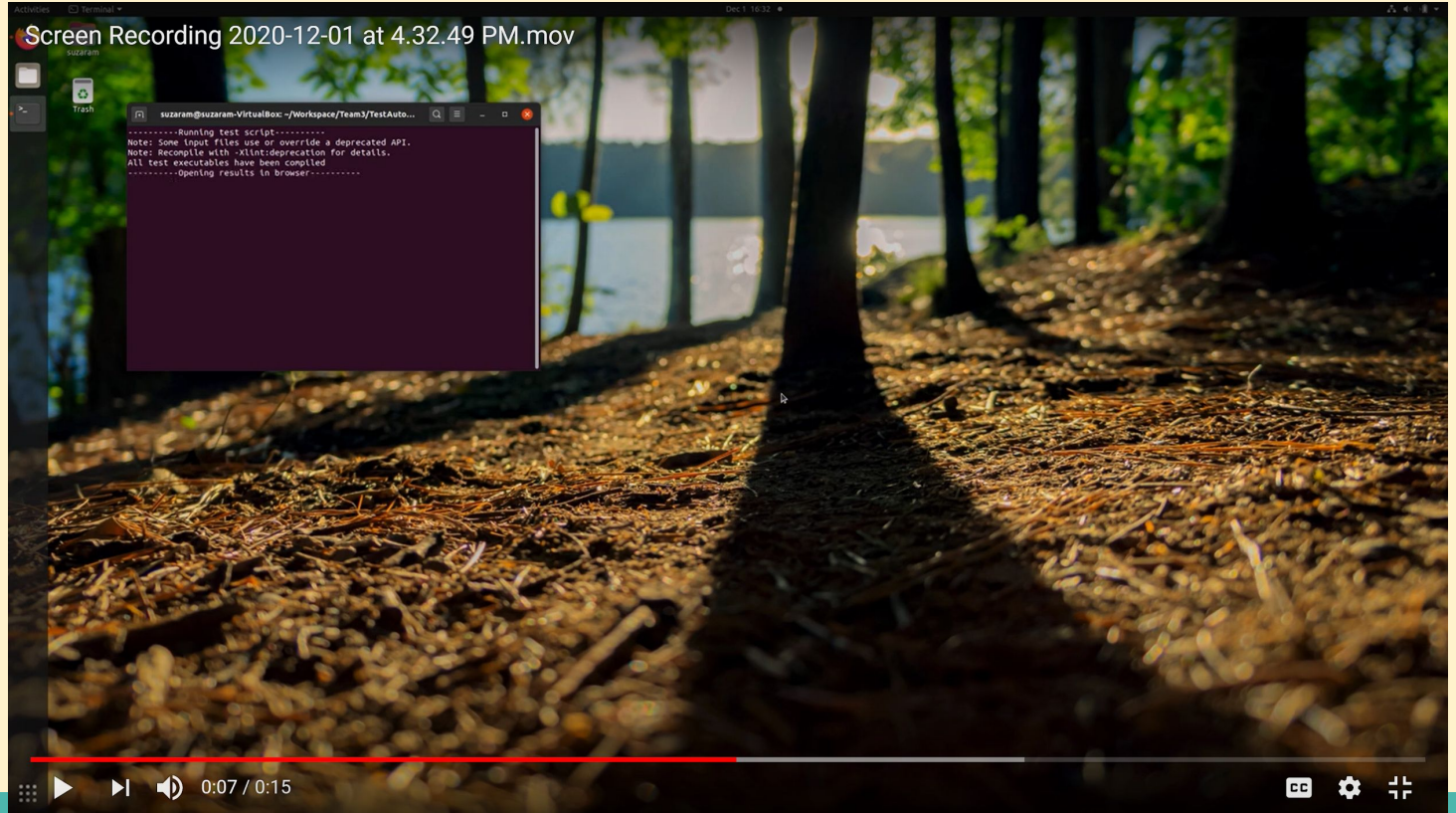
Testing Framework



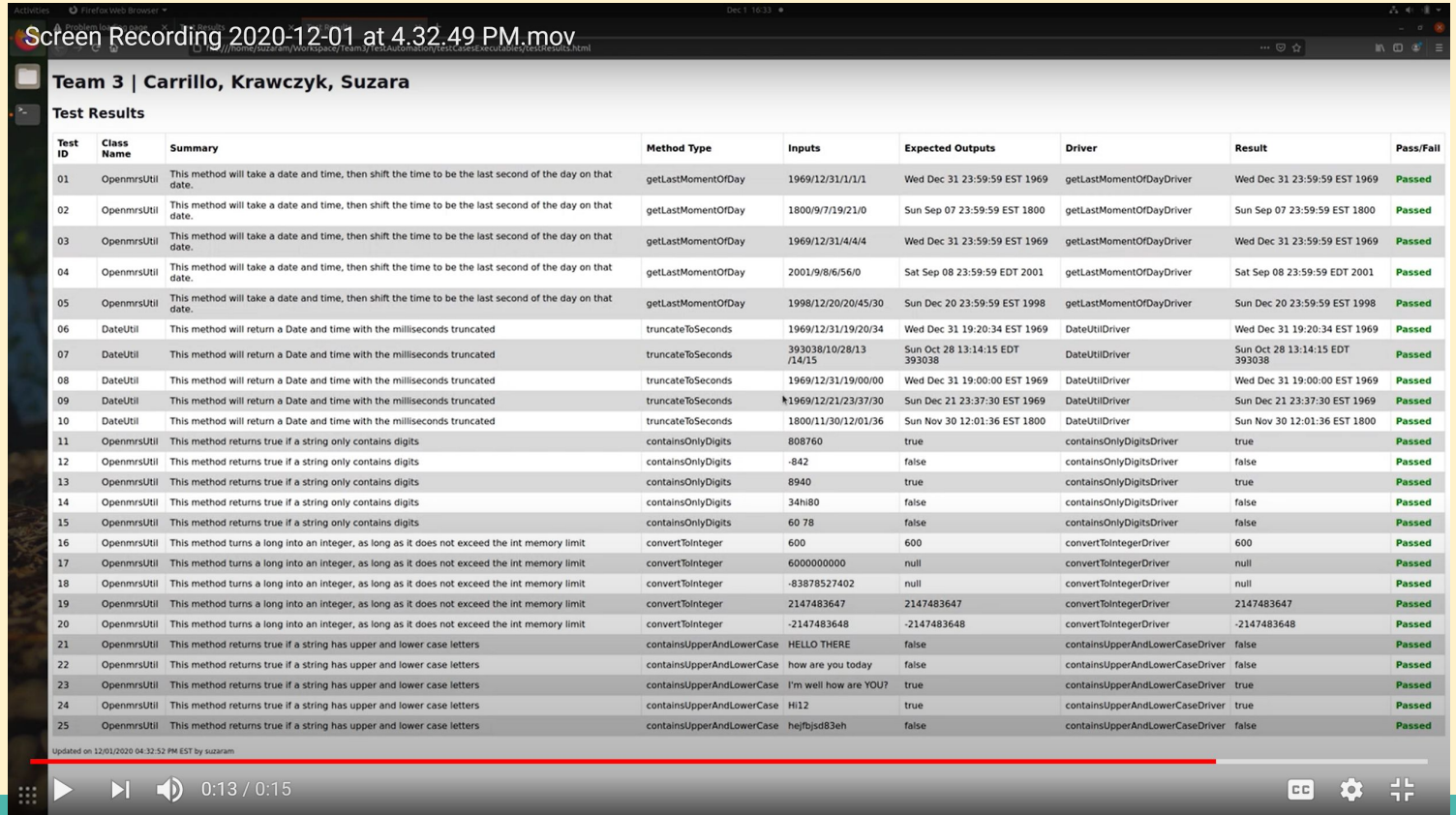
Testing Framework Video screenshots pt1



Testing Framework Video screenshots pt2



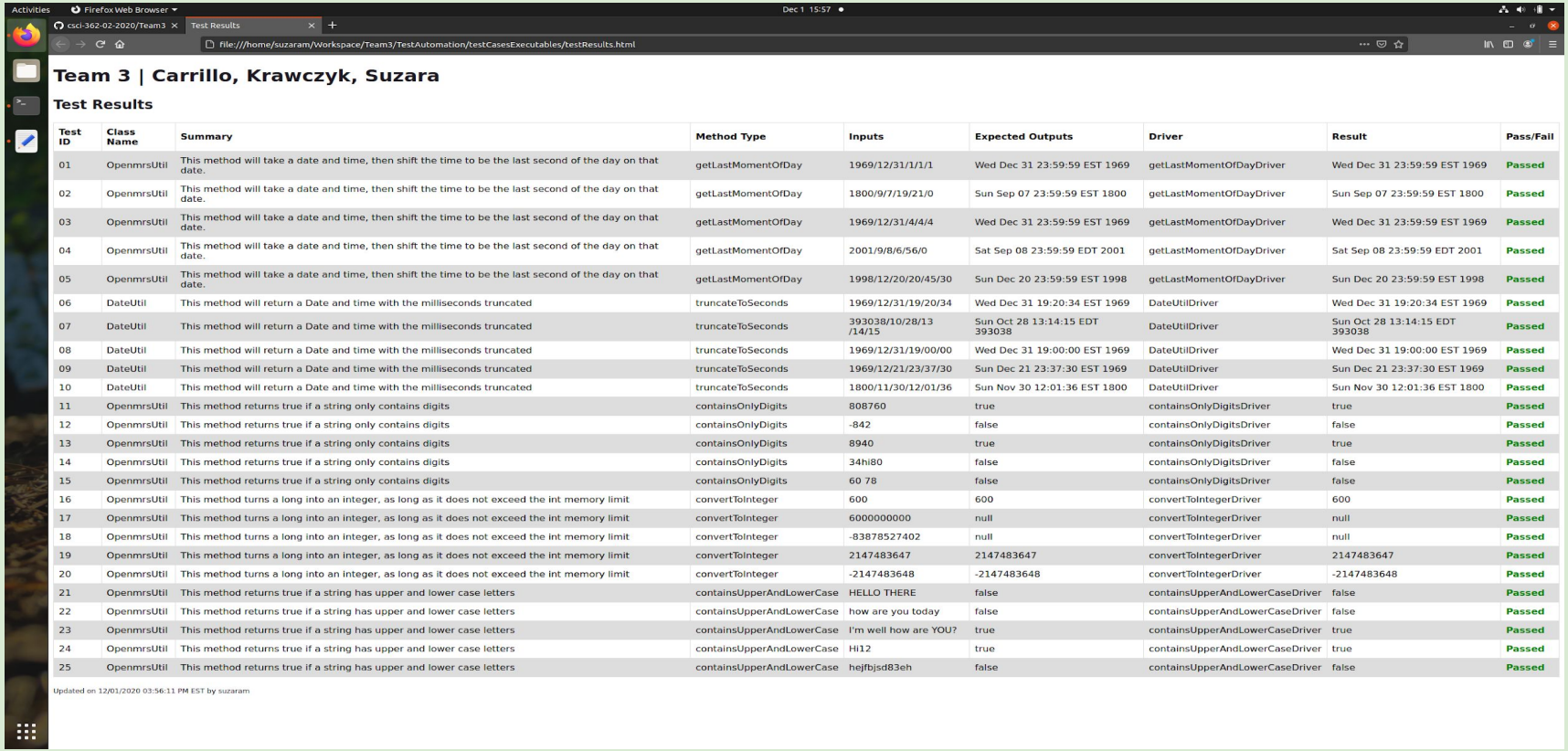
Testing Framework Video screenshots pt3



Test ID	Class Name	Summary	Method Type	Inputs	Expected Outputs	Driver	Result	Pass/Fail
01	OpenmrsUtil	This method will take a date and time, then shift the time to be the last second of the day on that date.	getLastMomentOfDay	1969/12/31/1/1/1	Wed Dec 31 23:59:59 EST 1969	getLastMomentOfDayDriver	Wed Dec 31 23:59:59 EST 1969	Passed
02	OpenmrsUtil	This method will take a date and time, then shift the time to be the last second of the day on that date.	getLastMomentOfDay	1800/9/7/19/21/0	Sun Sep 07 23:59:59 EST 1800	getLastMomentOfDayDriver	Sun Sep 07 23:59:59 EST 1800	Passed
03	OpenmrsUtil	This method will take a date and time, then shift the time to be the last second of the day on that date.	getLastMomentOfDay	1969/12/31/4/4/4	Wed Dec 31 23:59:59 EST 1969	getLastMomentOfDayDriver	Wed Dec 31 23:59:59 EST 1969	Passed
04	OpenmrsUtil	This method will take a date and time, then shift the time to be the last second of the day on that date.	getLastMomentOfDay	2001/9/8/6/56/0	Sat Sep 08 23:59:59 EDT 2001	getLastMomentOfDayDriver	Sat Sep 08 23:59:59 EDT 2001	Passed
05	OpenmrsUtil	This method will take a date and time, then shift the time to be the last second of the day on that date.	getLastMomentOfDay	1998/12/20/20/45/30	Sun Dec 20 23:59:59 EST 1998	getLastMomentOfDayDriver	Sun Dec 20 23:59:59 EST 1998	Passed
06	DateUtil	This method will return a Date and time with the milliseconds truncated	truncateToSeconds	1969/12/31/19/20/34	Wed Dec 31 19:20:34 EST 1969	DateUtilDriver	Wed Dec 31 19:20:34 EST 1969	Passed
07	DateUtil	This method will return a Date and time with the milliseconds truncated	truncateToSeconds	393038/10/28/13 /14/15	Sun Oct 28 13:14:15 EDT 393038	DateUtilDriver	Sun Oct 28 13:14:15 EDT 393038	Passed
08	DateUtil	This method will return a Date and time with the milliseconds truncated	truncateToSeconds	1969/12/31/19/00/00	Wed Dec 31 19:00:00 EST 1969	DateUtilDriver	Wed Dec 31 19:00:00 EST 1969	Passed
09	DateUtil	This method will return a Date and time with the milliseconds truncated	truncateToSeconds	1969/12/21/23/37/30	Sun Dec 21 23:37:30 EST 1969	DateUtilDriver	Sun Dec 21 23:37:30 EST 1969	Passed
10	DateUtil	This method will return a Date and time with the milliseconds truncated	truncateToSeconds	1800/11/30/12/01/36	Sun Nov 30 12:01:36 EST 1800	DateUtilDriver	Sun Nov 30 12:01:36 EST 1800	Passed
11	OpenmrsUtil	This method returns true if a string only contains digits	containsOnlyDigits	808760	true	containsOnlyDigitsDriver	true	Passed
12	OpenmrsUtil	This method returns true if a string only contains digits	containsOnlyDigits	-842	false	containsOnlyDigitsDriver	false	Passed
13	OpenmrsUtil	This method returns true if a string only contains digits	containsOnlyDigits	8940	true	containsOnlyDigitsDriver	true	Passed
14	OpenmrsUtil	This method returns true if a string only contains digits	containsOnlyDigits	34hi80	false	containsOnlyDigitsDriver	false	Passed
15	OpenmrsUtil	This method returns true if a string only contains digits	containsOnlyDigits	60 78	false	containsOnlyDigitsDriver	false	Passed
16	OpenmrsUtil	This method turns a long into an integer, as long as it does not exceed the int memory limit	convertToInteger	600	600	convertToIntegerDriver	600	Passed
17	OpenmrsUtil	This method turns a long into an integer, as long as it does not exceed the int memory limit	convertToInteger	6000000000	null	convertToIntegerDriver	null	Passed
18	OpenmrsUtil	This method turns a long into an integer, as long as it does not exceed the int memory limit	convertToInteger	-83878527402	null	convertToIntegerDriver	null	Passed
19	OpenmrsUtil	This method turns a long into an integer, as long as it does not exceed the int memory limit	convertToInteger	2147483647	2147483647	convertToIntegerDriver	2147483647	Passed
20	OpenmrsUtil	This method turns a long into an integer, as long as it does not exceed the int memory limit	convertToInteger	-2147483648	-2147483648	convertToIntegerDriver	-2147483648	Passed
21	OpenmrsUtil	This method returns true if a string has upper and lower case letters	containsUpperAndLowerCase	HELLO THERE	false	containsUpperAndLowerCaseDriver	false	Passed
22	OpenmrsUtil	This method returns true if a string has upper and lower case letters	containsUpperAndLowerCase	how are you today	false	containsUpperAndLowerCaseDriver	false	Passed
23	OpenmrsUtil	This method returns true if a string has upper and lower case letters	containsUpperAndLowerCase	I'm well how are YOU?	true	containsUpperAndLowerCaseDriver	true	Passed
24	OpenmrsUtil	This method returns true if a string has upper and lower case letters	containsUpperAndLowerCase	Hi12	true	containsUpperAndLowerCaseDriver	true	Passed
25	OpenmrsUtil	This method returns true if a string has upper and lower case letters	containsUpperAndLowerCase	hejfbjsd83eh	false	containsUpperAndLowerCaseDriver	false	Passed

Updated on 12/01/2020 04:32:52 PM EST by suzaram

Testing Results



Team 3 | Carrillo, Krawczyk, Suzara

Test Results

Test ID	Class Name	Summary	Method Type	Inputs	Expected Outputs	Driver	Result	Pass/Fail
01	OpenmrsUtil	This method will take a date and time, then shift the time to be the last second of the day on that date.	getLastMomentOfDay	1969/12/31/1/1/1	Wed Dec 31 23:59:59 EST 1969	getLastMomentOfDayDriver	Wed Dec 31 23:59:59 EST 1969	Passed
02	OpenmrsUtil	This method will take a date and time, then shift the time to be the last second of the day on that date.	getLastMomentOfDay	1800/9/7/19/21/0	Sun Sep 07 23:59:59 EST 1800	getLastMomentOfDayDriver	Sun Sep 07 23:59:59 EST 1800	Passed
03	OpenmrsUtil	This method will take a date and time, then shift the time to be the last second of the day on that date.	getLastMomentOfDay	1969/12/31/4/4/4	Wed Dec 31 23:59:59 EST 1969	getLastMomentOfDayDriver	Wed Dec 31 23:59:59 EST 1969	Passed
04	OpenmrsUtil	This method will take a date and time, then shift the time to be the last second of the day on that date.	getLastMomentOfDay	2001/9/8/6/56/0	Sat Sep 08 23:59:59 EDT 2001	getLastMomentOfDayDriver	Sat Sep 08 23:59:59 EDT 2001	Passed
05	OpenmrsUtil	This method will take a date and time, then shift the time to be the last second of the day on that date.	getLastMomentOfDay	1998/12/20/20/45/30	Sun Dec 20 23:59:59 EST 1998	getLastMomentOfDayDriver	Sun Dec 20 23:59:59 EST 1998	Passed
06	DateUtil	This method will return a Date and time with the milliseconds truncated	truncateToSeconds	1969/12/31/19/20/34	Wed Dec 31 19:20:34 EST 1969	DateUtilDriver	Wed Dec 31 19:20:34 EST 1969	Passed
07	DateUtil	This method will return a Date and time with the milliseconds truncated	truncateToSeconds	393038/10/28/13 /14/15	Sun Oct 28 13:14:15 EDT 393038	DateUtilDriver	Sun Oct 28 13:14:15 EDT 393038	Passed
08	DateUtil	This method will return a Date and time with the milliseconds truncated	truncateToSeconds	1969/12/31/19/00/00	Wed Dec 31 19:00:00 EST 1969	DateUtilDriver	Wed Dec 31 19:00:00 EST 1969	Passed
09	DateUtil	This method will return a Date and time with the milliseconds truncated	truncateToSeconds	1969/12/21/23/37/30	Sun Dec 21 23:37:30 EST 1969	DateUtilDriver	Sun Dec 21 23:37:30 EST 1969	Passed
10	DateUtil	This method will return a Date and time with the milliseconds truncated	truncateToSeconds	1800/11/30/12/01/36	Sun Nov 30 12:01:36 EST 1800	DateUtilDriver	Sun Nov 30 12:01:36 EST 1800	Passed
11	OpenmrsUtil	This method returns true if a string only contains digits	containsOnlyDigits	808760	true	containsOnlyDigitsDriver	true	Passed
12	OpenmrsUtil	This method returns true if a string only contains digits	containsOnlyDigits	-842	false	containsOnlyDigitsDriver	false	Passed
13	OpenmrsUtil	This method returns true if a string only contains digits	containsOnlyDigits	8940	true	containsOnlyDigitsDriver	true	Passed
14	OpenmrsUtil	This method returns true if a string only contains digits	containsOnlyDigits	34hi80	false	containsOnlyDigitsDriver	false	Passed
15	OpenmrsUtil	This method returns true if a string only contains digits	containsOnlyDigits	60 78	false	containsOnlyDigitsDriver	false	Passed
16	OpenmrsUtil	This method turns a long into an integer, as long as it does not exceed the int memory limit	convertToInteger	600	600	convertToIntegerDriver	600	Passed
17	OpenmrsUtil	This method turns a long into an integer, as long as it does not exceed the int memory limit	convertToInteger	6000000000	null	convertToIntegerDriver	null	Passed
18	OpenmrsUtil	This method turns a long into an integer, as long as it does not exceed the int memory limit	convertToInteger	-83878527402	null	convertToIntegerDriver	null	Passed
19	OpenmrsUtil	This method turns a long into an integer, as long as it does not exceed the int memory limit	convertToInteger	2147483647	2147483647	convertToIntegerDriver	2147483647	Passed
20	OpenmrsUtil	This method turns a long into an integer, as long as it does not exceed the int memory limit	convertToInteger	-2147483648	-2147483648	convertToIntegerDriver	-2147483648	Passed
21	OpenmrsUtil	This method returns true if a string has upper and lower case letters	containsUpperAndLowerCase	HELLO THERE	false	containsUpperAndLowerCaseDriver	false	Passed
22	OpenmrsUtil	This method returns true if a string has upper and lower case letters	containsUpperAndLowerCase	how are you today	false	containsUpperAndLowerCaseDriver	false	Passed
23	OpenmrsUtil	This method returns true if a string has upper and lower case letters	containsUpperAndLowerCase	I'm well how are YOU?	true	containsUpperAndLowerCaseDriver	true	Passed
24	OpenmrsUtil	This method returns true if a string has upper and lower case letters	containsUpperAndLowerCase	Hi12	true	containsUpperAndLowerCaseDriver	true	Passed
25	OpenmrsUtil	This method returns true if a string has upper and lower case letters	containsUpperAndLowerCase	hejfbjsd83eh	false	containsUpperAndLowerCaseDriver	false	Passed

Updated on 12/01/2020 03:56:11 PM EST by suzaram

Learning Experience: Readability of Results

Team 3 | Carrillo, Krawczyk, Suzara

Test Results

Test ID	Class Name	Summary	Method Type	Inputs	Expected Outputs	Driver	Result	Pass/Fail
01	OpenmrsUtil	This method will take a date and time, then shift the time to be the last second of the day on that date.	getLastMomentOfDay	1969/12 /31/1/1/1	Wed Dec 31 23:59:59 EST 1969	getLastMomentOfDayDriver	Wed Dec 31 23:59:59 EST 1969	Passed
01	OpenmrsUtil	This method will take a date convert it a calender, then shift the time to be the last second of the day on that date.	getLastMomentOfDay	10000	Wed Dec 31 23:59:59 EST 1969	getLastMomentOfDayDriver	Wed Dec 31 23:59:59 EST 1969	Passed
nrsUtil		This method will take a date and time, then shift the time to be the last second of the day on that date.	getLastMomentOfDay	1800/9 /7/19/21/0	Sun Sep 07 23:59:59 EST 1800	getLastMomentOfDayDriver	Sun Sep 07 23:59:59 EST 1800	Passed
02	OpenmrsUtil	This method will take a date convert it a calender, then shift the time to be the last second of the day on that date.	getLastMomentOfDay	-10000000000	Sun Sep 07 23:59:59 EDT 1969	getLastMomentOfDayDriver	Sun Sep 07 23:59:59 EDT 1969	Passed
nrsUtil		This method will take a date and time, then shift the time to be the last second of the day on that date.	getLastMomentOfDay	1969/12 /31/4/4/4	Wed Dec 31 23:59:59 EST 1969	getLastMomentOfDayDriver	Wed Dec 31 23:59:59 EST 1969	Passed
03	OpenmrsUtil	This method will take a date convert it a calender, then shift the time to be the last second of the day on that date.	getLastMomentOfDay	0	Wed Dec 31 23:59:59 EST 1969	getLastMomentOfDayDriver	Wed Dec 31 23:59:59 EST 1969	Passed
nrsUtil		This method will take a date and time, then shift the time to be the last second of the day on that date.	getLastMomentOfDay	2001/9 /8/6/56/0	Sat Sep 08 23:59:59 EDT 2001	getLastMomentOfDayDriver	Sat Sep 08 23:59:59 EDT 2001	Passed
04	OpenmrsUtil	This method will take a date convert it a calender, then shift the time to be the last second of the day on that date.	getLastMomentOfDay	1000000000000	Sat Sep 08 23:59:59 EDT 2001	getLastMomentOfDayDriver	Sat Sep 08 23:59:59 EDT 2001	Passed
nrsUtil		This method will take a date and time, then shift the time to be the last second of the day on that date.	getLastMomentOfDay	1998/12/20/20 /45/30	Sun Dec 20 23:59:59 EST 1998	getLastMomentOfDayDriver	Sun Dec 20 23:59:59 EST 1998	Passed
05	OpenmrsUtil	This method will take a date convert it a calender, then shift the time to be the last second of the day on that date.	getLastMomentOfDay	914209500000	Sun Dec 20 23:59:59 EST 1998	getLastMomentOfDayDriver	Sun Dec 20 23:59:59 EST 1998	Passed

Implementing Errors: Overview

We implemented a few errors in our program to see whether our automated testing framework would catch them.

- The way we decided to implement these errors was through comments
  - In each method, there is a comment that contains a snippet of code with an error in it.
  - To run the code with the error in it, simply uncomment that code segment and comment out the segment above it.

Implementing Errors: lastMomentOfDay

```
calender.set(Calendar.SECOND, 59);

calender.set(Calendar.SECOND, 58); //THIS IS AN ERROR
```

Test ID	Class Name	Summary	Method Type	Inputs	Expected Outputs	Driver	Result	Pass/Fail
01	OpenmrsUtil	This method will take a date and time, then shift the time to be the last second of the day on that date.	getLastMomentOfDay	1969/12/31/1/1/1	Wed Dec 31 23:59:59 EST 1969	getLastMomentOfDayDriver	Wed Dec 31 23:59:58 EST 1969	Failed
02	OpenmrsUtil	This method will take a date and time, then shift the time to be the last second of the day on that date.	getLastMomentOfDay	1800/9/7/19/21/0	Sun Sep 07 23:59:59 EST 1800	getLastMomentOfDayDriver	Sun Sep 07 23:59:58 EST 1800	Failed
03	OpenmrsUtil	This method will take a date and time, then shift the time to be the last second of the day on that date.	getLastMomentOfDay	1969/12/31/4/4/4	Wed Dec 31 23:59:59 EST 1969	getLastMomentOfDayDriver	Wed Dec 31 23:59:58 EST 1969	Failed
04	OpenmrsUtil	This method will take a date and time, then shift the time to be the last second of the day on that date.	getLastMomentOfDay	2001/9/8/6/56/0	Sat Sep 08 23:59:59 EDT 2001	getLastMomentOfDayDriver	Sat Sep 08 23:59:58 EDT 2001	Failed
05	OpenmrsUtil	This method will take a date and time, then shift the time to be the last second of the day on that date.	getLastMomentOfDay	1998/12/20/20 /45/30	Sun Dec 20 23:59:59 EST 1998	getLastMomentOfDayDriver	Sun Dec 20 23:59:58 EST 1998	Failed

Implementing Errors: DateUtil

```
Instant instant = date.toInstant().truncatedTo(ChronoUnit.SECONDS);

Instant instant = date.toInstant().truncatedTo(ChronoUnit.HOURS);
//THIS IS THE ERROR
```

06	DateUtil	This method will return a Date and time with the milliseconds truncated	truncateToSeconds	1969/12/31/19 /20/34	Wed Dec 31 19:20:34 EST 1969	DateUtilDriver	Wed Dec 31 19:00:00 EST 1969	Failed
07	DateUtil	This method will return a Date and time with the milliseconds truncated	truncateToSeconds	393038/10/28/13 /14/15	Sun Oct 28 13:14:15 EDT 393038	DateUtilDriver	Sun Oct 28 13:00:00 EDT 393038	Failed
08	DateUtil	This method will return a Date and time with the milliseconds truncated	truncateToSeconds	1969/12/31/19 /00/00	Wed Dec 31 19:00:00 EST 1969	DateUtilDriver	Wed Dec 31 19:00:00 EST 1969	Passed
09	DateUtil	This method will return a Date and time with the milliseconds truncated	truncateToSeconds	1969/12/21/23 /37/30	Sun Dec 21 23:37:30 EST 1969	DateUtilDriver	Mon Dec 22 00:00:00 EST 1969	Failed
10	DateUtil	This method will return a Date and time with the milliseconds truncated	truncateToSeconds	1800/11/30/12 /01/36	Sun Nov 30 12:01:36 EST 1800	DateUtilDriver	Sun Nov 30 13:00:00 EST 1800	Failed

Implementing Errors: containsOnlyDigits

```
return !test.isEmpty();

return test.isEmpty(); //THIS IS THE ERROR
```

11	OpenmrsUtil	This method returns true if a string only contains digits	containsOnlyDigits	808760	true	containsOnlyDigitsDriver	false	Failed
12	OpenmrsUtil	This method returns true if a string only contains digits	containsOnlyDigits	-842	false	containsOnlyDigitsDriver	false	Passed
13	OpenmrsUtil	This method returns true if a string only contains digits	containsOnlyDigits	8940	true	containsOnlyDigitsDriver	false	Failed
14	OpenmrsUtil	This method returns true if a string only contains digits	containsOnlyDigits	34hi80	false	containsOnlyDigitsDriver	false	Passed
15	OpenmrsUtil	This method returns true if a string only contains digits	containsOnlyDigits	60 78	false	containsOnlyDigitsDriver	false	Passed

Implementing Errors: convertToInteger

```
if (longValue < Integer.MIN_VALUE || longValue > Integer.MAX_VALUE) {

if (longValue > Integer.MIN_VALUE || longValue < Integer.MAX_VALUE) {
//THIS IS THE ERROR
```

16	OpenmrsUtil	This method turns a long into an integer, as long as it does not exceed the int memory limit	convertToInteger	600	600	convertToIntegerDriver	null	Failed
17	OpenmrsUtil	This method turns a long into an integer, as long as it does not exceed the int memory limit	convertToInteger	6000000000	null	convertToIntegerDriver	null	Passed
18	OpenmrsUtil	This method turns a long into an integer, as long as it does not exceed the int memory limit	convertToInteger	-83878527402	null	convertToIntegerDriver	null	Passed
19	OpenmrsUtil	This method turns a long into an integer, as long as it does not exceed the int memory limit	convertToInteger	2147483647	2147483647	convertToIntegerDriver	null	Failed
20	OpenmrsUtil	This method turns a long into an integer, as long as it does not exceed the int memory limit	convertToInteger	-2147483648	-2147483648	convertToIntegerDriver	null	Failed

Implementing Errors: containsUpperAndLower

```
Pattern pattern = Pattern.compile("^(?=.*?[A-Z])(?=.*?[a-z])[\\w|\\W]*$" );

Pattern pattern = Pattern.compile("(?=.*?[a-z])[\\w|\\W]*$"); //THIS IS THE ERROR
```

21	OpenmrsUtil	This method returns true if a string has upper and lower case letters	containsUpperAndLowerCase	HELLO THERE	false	containsUpperAndLowerCaseDriver	false	Passed
22	OpenmrsUtil	This method returns true if a string has upper and lower case letters	containsUpperAndLowerCase	how are you today	false	containsUpperAndLowerCaseDriver	true	Failed
22	OpenmrsUtil	This method returns true if a string has upper and lower case letters	containsUpperAndLowerCase	I'm well how are YOU?	true	containsUpperAndLowerCaseDriver	true	Passed
24	OpenmrsUtil	This method returns true if a string has upper and lower case letters	containsUpperAndLowerCase	Hi12	true	containsUpperAndLowerCaseDriver	true	Passed
25	OpenmrsUtil	This method returns true if a string has upper and lower case letters	containsUpperAndLowerCase	hejfbjsd83eh	false	containsUpperAndLowerCaseDriver	true	Failed

Overall Experience

Overall this group project was a positive learning experience. The team collectively learned a great deal about the importance of testing. Taking the time to test code while it is being developed saves time, resources, and headaches in the long run. We learned about one of the most powerful tools in the computing world; the command line. Having a graphical user interface is convenient, but the power that comes with the command line is far superior. In the end, we enjoyed the semester-long project and look forward to learning more in the continuation of CSCI 462.

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